PREPARED FOR:

CITY OF BELTON, MISSOURI

WATER SYSTEM MASTER PLAN

OCTOBER 2012

TEAM MEMBERS:
DRG ENGINEERS
PONZER-YOUNGQUIST

SUBMITTED BY

DELICH
ROTH &
GOODWILLIE, P.A.
ENGINEERS

913 Sheidley Avenue
Bonner Springs, KS 66012
(913) 441-1100

www.drgengineers.com

QUALITY DRIVEN CLIENT INSPIRED SINCE 1931

CERTIFICATION PAGE

Contract Number N/A

Project Title Water System Master Plan

I am responsible for the development of the ***Water System Master Plan*** dated October 2012 for the City of Belton, Missouri.

_____ (SEAL)

EACH PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS ABOVE ASSUMES RESPONSIBILITY IN THESE BIDDING DOCUMENTS ONLY FOR WHAT IS LISTED ABOVE AND DISCLAIMS (PURSUANT TO SECTION 327.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE SIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT.

Table of Contents

1. EXECUTIVE SUMMARY..... 1-1

STUDY AREA AND SCOPE 1-1

FINDINGS..... 1-2

Population

Water Requirements

Water Distribution System

RECOMMENDATIONS..... 1-4

Capital Improvements Program (CIP)

Water Connection Fee

Water Rates Study

Other Recommendations

2. POPULATION AND LAND USE PROJECTIONS..... 2-1

STUDY AREA DESCRIPTION..... 2-1

CURRENT AND PROJECTED POPULATION..... 2-1

CURRENT AND PROJECTED LAND USE..... 2-4

3. WATER REQUIREMENTS..... 3-1

HISTORICAL AND EXISTING SUPPLY..... 3-1

HISTORICAL AND EXISTING DEMANDS..... 3-1

Belton's Wholesale Customers

Second Water Supply Source

FUTURE WATER DEMANDS..... 3-7

Belton's Wholesale Customers – Future Demands

4. WATER DISTRIBUTION SYSTEM..... 4-1

CONDITION ASSESSMENT..... 4-1

SERVICE LEVEL/PRESSURE ZONES..... 4-4

DISTRIBUTION SYSTEM..... 4-6

System Storage

System Pumping Facilities

System Distribution

WATER SYSTEM SECURITY..... 4-12

WATER SYSTEM ANALYSIS..... 4-13

Model Development

Calibration

Model Results

CAPITAL IMPROVEMENTS PHASING PLAN EVALUATION..... 4-21

5. RECOMMENDED IMPROVEMENTS..... 5-1

INTRODUCTION..... 5-1

GENERAL NEEDS..... 5-2

PUMPING STATIONS..... 5-4

STORAGE FACILITIES..... 5-5

DISTRIBUTION SYSTEM..... 5-5

WATERONE CONNECTION PROJECT ANALYSIS & RECOMMENDATION.... 5-7

Alternatives Life Cycle Costs Analysis

6. CAPITAL IMPROVEMENTS PROGRAM..... 6-1

INTRODUCTION..... 6-1

PROJECT COST ESTIMATE ACCURACY AND CONTENT..... 6-1

PROJECT COST ESTIMATE BASIS..... 6-2

FINANCIAL AND RATE STRUCTURE CONSIDERATIONS..... 6-2

PROJECT CATEGORIZATION, PRIORITIZATION & SCHEDULING..... 6-3

General Needs, Pumping Stations, & Storage Facilities Improvements

Water Supply

Water Lines and Mains

CIP SUMMARY AND RECOMMENDATIONS..... 6-5

7. WATER CONNECTION FEE..... 7-1

INTRODUCTION..... 7-1

CAPITAL CHARGES..... 7-2

Connection Fees

System Buy-in Method

Alternative 1

Alternative 2

Summary

8. WATER RATES STUDY..... 8-1

INTRODUCTION..... 8-1

FINANCIAL ASSESSMENT..... 8-3

Days in Operating Cash

Operating Ratio

Debt Capacity

Revenue and Operating Expense Trends

Current Financial Assessment Summary

WATER RATE STRUCTURE DEVELOPMENT..... 8-11

Assumptions

Future Conditions Summary

Alternatives Evaluation

SUMMARY AND RECOMMENDATIONS..... 8-25

Recommendations

APPENDIX

A – EXECUTIVE SUMMARY: ALTERNATIVE WATER SUPPLY REPORT

B – WATER DISTRIBUTION SYSTEM MAP

C – FIRE HYDRANT TESTING LOCATIONS MAP

D – WATERONE CONNECTION ALTERNATIVES

E – EXISTING SYSTEM MAXIMUM DAY DEMAND GRAPHS

F – EXISTING SYSTEM MAXIMUM DAY DEMAND WITH FIRE FLOWS

G – DETAILED COST ESTIMATES FOR WATERONE ALTERNATIVES

H – CIP PROJECT MAPS

I – WATER RATE ANALYSIS TABLES

List of Tables

TABLE 1-1: CAPITAL IMPROVEMENT PLAN SUMMARY..... 1-6

TABLE 1-2: COMMUNITY CONNECTION FEE COMPARISON..... 1-7

TABLE 2-1: STUDY AREA HISTORICAL POPULATION & FORECAST POPULATION... 2-1

TABLE 2-2: BELTON POPULATION AND LAND USE ESTIMATES..... 2-8

TABLE 3-1: FUTURE WATER SYSTEM DEMAND..... 3-7

TABLE 4-1: HYDRANT CONDITION ASSESSMENT..... 4-2

TABLE 4-2: WATER VALVE CONDITION ASSESSMENT..... 4-4

TABLE 4-3: SYSTEM STORAGE..... 4-6

TABLE 4-4: BOOSTER PUMPING UNITS..... 4-8

TABLE 4-5: PUMP STATION OPERATING LEVELS..... 4-9

TABLE 4-6: WATER MAIN LENGTHS, TYPE OF MATERIAL, & DIAMETERS..... 4-12

TABLE 4-7: PIPE C-VALUES..... 4-14

TABLE 5-1: ALTERNATIVE NO. 1 COST ESTIMATE..... 5-9

TABLE 5-2: ALTERNATIVE NO. 1A COST ESTIMATE..... 5-9
TABLE 5-3: ALTERNATIVE NO. 2 COST ESTIMATE..... 5-10
TABLE 5-4: ALTERNATIVE NO. 2A COST ESTIMATE..... 5-10
TABLE 5-5: ALTERNATIVE NO. 3 COST ESTIMATE..... 5-11
TABLE 5-6: ALTERNATIVE NO. 3A COST ESTIMATE..... 5-11
TABLE 5-7: ALTERNATIVE NO. 1 PRESENT WORTH ANALYSIS..... 5-12
TABLE 5-8: ALTERNATIVE NO. 1A PRESENT WORTH ANALYSIS..... 5-13
TABLE 5-9: ALTERNATIVE NO. 2 PRESENT WORTH ANALYSIS..... 5-13
TABLE 5-10: ALTERNATIVE NO. 2A PRESENT WORTH ANALYSIS..... 5-14
TABLE 5-11: ALTERNATIVE NO. 3 PRESENT WORTH ANALYSIS..... 5-15
TABLE 5-12: ALTERNATIVE NO. 3A PRESENT WORTH ANALYSIS..... 5-15
TABLE 6-1: INDUSTRY STANDARD COST ESTIMATING GUIDELINES..... 6-2
TABLE 6-2: WATER DISTRIBUTION SYSTEM CAPITAL IMPROVEMENTS PROGRAM SUMMARY..... 6-8
TABLE 6-3: WATER DISTRIBUTION SYSTEM CAPITAL IMPROVEMENTS DETAILS..... 6-13
TABLE 7-1: WATER MASTER PLAN CIP – TOTAL GROWTH AND RENEWAL..... 7-1
TABLE 7-2: STORAGE FACILITY COSTS..... 7-5
TABLE 7-3: TRANSMISSION MAIN COSTS..... 7-6
TABLE 7-4: PUMPING STATION COSTS..... 7-7
TABLE 7-5: ALTENATIVE 1 CONNECTION FEE CALCULATION..... 7-9
TABLE 7-6: ALTENATIVE 2 CONNECTION FEE CALCULATION..... 7-11
TABLE 7-7: ALTERNATIVE CONNECTION FEE SCHEDULE COMPARISON..... 7-12
TABLE 7-8: COMMUNITY CONNECTION FEE COMPARISON..... 7-13
TABLE 8-1: WATER FUND MAXIMUM BORROWING CAPACITY..... 8-6
TABLE 8-2: PROJECTED WATER VOLUME & SUPPLIER RATES..... 8-16
TABLE 8-3: PROJECTED FINANCIAL RATIOS – FUTURE CONDITION..... 8-20

TABLE 8-4: PROJECTED FINANCIAL STATEMENT & BALANCE SHEET SUMMARY.... 8-21

TABLE 8-5: ALTERNATIVES WATER RATE INCREASES SUMMARY..... 8-24

List of Figures

FIGURE 2-1: EXISTING LAND USE..... 2-5

FIGURE 2-2: FUTURE LAND USE..... 2-7

FIGURE 3-1: WATER PURCHASED AND SOLD..... 3-4

FIGURE 3-2: AVERAGE DAILY DEMAND..... 3-5

FIGURE 4-1: DISTRIBUTION SYSTEM SCHEMATIC..... 4-3

FIGURE 4-2: WATER DISTRIBUTION SYSTEM MAP.....Appendix B

FIGURE 4-3: FIRE HYDRANT TESTING LOCATIONS MAP.....Appendix C

FIGURE 4-4: PROPOSED PHASING PLAN..... 4-23

FIGURE 5-1: ALTERNATIVES 1 AND 1A.....Appendix D

FIGURE 5-2: ALTERNATIVES 2 AND 2A.....Appendix D

FIGURE 5-3: ALTERNATIVES 3 AND 3A.....Appendix D

FIGURE 6-1A: CIP PROJECT MAP (NW).....Appendix H

FIGURE 6-1B: CIP PROJECT MAP (NE).....Appendix H

FIGURE 6-1C: CIP PROJECT MAP (SE).....Appendix H

FIGURE 6-1D: CIP PROJECT MAP (SW).....Appendix H

FIGURE 7-1: CONNECTION FEE COMPARISON CHART..... 7-14

FIGURE 8-1: DAYS IN OPERATING CASH..... 8-4

FIGURE 8-2: OPERATING RATIO..... 8-5

FIGURE 8-3: REVENUE AND EXPENSE TRENDS..... 8-7

FIGURE 8-4: 2011 WATER FUND EXPENSES..... 8-8

FIGURE 8-5: GALLONS OF WATER SOLD/AVERAGE USAGE PER METER..... 8-9

FIGURE 8-6: HISTORIC POPULATION VERSUS NUMBER OF METERS..... 8-12

FIGURE 8-7: PROJECTED WATER METERS..... 8-13

FIGURE 8-8: AVERAGE GALLONS SOLD PER METER PER MONTH..... 8-14

FIGURE 8-9: PROJECTED GALLONS OF WATER SOLD..... 8-14

FIGURE 8-10: PROJECTED WATER REVENUE..... 8-15

FIGURE 8-11: PROJECTED TOTAL WATER PURCHASED..... 8-17

FIGURE 8-12: PROJECTED OPERATING EXPENSES..... 8-19

FIGURE 8-13: ALTERNATIVES WATER RATE INCREASES – 2012 THRU 2021..... 8-25

PREPARED FOR:

CITY OF BELTON, MISSOURI

WATER SYSTEM MASTER PLAN

OCTOBER 2012

TEAM MEMBERS:
DRG ENGINEERS
PONZER-YOUNGQUIST

SUBMITTED BY

DELICH
ROTH &
GOODWILLIE, P.A.
ENGINEERS

913 Sheidley Avenue
Bonner Springs, KS 66012
(913) 441-1100

www.drgengineers.com

QUALITY DRIVEN CLIENT INSPIRED SINCE 1931

CERTIFICATION PAGE

Contract Number N/A

Project Title Water System Master Plan

I am responsible for the development of the ***Water System Master Plan*** dated October 2012 for the City of Belton, Missouri.

STATE OF MISSOURI
STEPHEN JOSEPH ROTH
NUMBER PE-2005000037
PROFESSIONAL ENGINEER

_____ (SEAL)

11/13/12

EACH PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS ABOVE ASSUMES RESPONSIBILITY IN THESE BIDDING DOCUMENTS ONLY FOR WHAT IS LISTED ABOVE AND DISCLAIMS (PURSUANT TO SECTION 327.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE SIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT.

Table of Contents

1. EXECUTIVE SUMMARY..... 1-1

STUDY AREA AND SCOPE 1-1

FINDINGS..... 1-2

Population

Water Requirements

Water Distribution System

RECOMMENDATIONS..... 1-4

Capital Improvements Program (CIP)

Water Connection Fee

Water Rates Study

Other Recommendations

2. POPULATION AND LAND USE PROJECTIONS..... 2-1

STUDY AREA DESCRIPTION..... 2-1

CURRENT AND PROJECTED POPULATION..... 2-1

CURRENT AND PROJECTED LAND USE..... 2-4

3. WATER REQUIREMENTS..... 3-1

HISTORICAL AND EXISTING SUPPLY..... 3-1

HISTORICAL AND EXISTING DEMANDS..... 3-1

Belton's Wholesale Customers

Second Water Supply Source

FUTURE WATER DEMANDS..... 3-7

Belton's Wholesale Customers – Future Demands

4. WATER DISTRIBUTION SYSTEM..... 4-1

CONDITION ASSESSMENT..... 4-1

SERVICE LEVEL/PRESSURE ZONES..... 4-4

DISTRIBUTION SYSTEM..... 4-6

System Storage

System Pumping Facilities

System Distribution

WATER SYSTEM SECURITY..... 4-12

WATER SYSTEM ANALYSIS..... 4-13

Model Development

Calibration

Model Results

CAPITAL IMPROVEMENTS PHASING PLAN EVALUATION..... 4-21

5. RECOMMENDED IMPROVEMENTS..... 5-1

INTRODUCTION..... 5-1

GENERAL NEEDS..... 5-2

PUMPING STATIONS..... 5-4

STORAGE FACILITIES..... 5-5

DISTRIBUTION SYSTEM..... 5-5

WATERONE CONNECTION PROJECT ANALYSIS & RECOMMENDATION.... 5-7

Alternatives Life Cycle Costs Analysis

6. CAPITAL IMPROVEMENTS PROGRAM..... 6-1

INTRODUCTION..... 6-1

PROJECT COST ESTIMATE ACCURACY AND CONTENT..... 6-1

PROJECT COST ESTIMATE BASIS..... 6-2

FINANCIAL AND RATE STRUCTURE CONSIDERATIONS..... 6-2

PROJECT CATEGORIZATION, PRIORITIZATION & SCHEDULING..... 6-3

General Needs, Pumping Stations, & Storage Facilities Improvements

Water Supply

Water Lines and Mains

CIP SUMMARY AND RECOMMENDATIONS..... 6-5

7. WATER CONNECTION FEE..... 7-1

INTRODUCTION..... 7-1

CAPITAL CHARGES..... 7-2

Connection Fees

System Buy-in Method

Alternative 1

Alternative 2

Summary

8. WATER RATES STUDY..... 8-1

INTRODUCTION..... 8-1

FINANCIAL ASSESSMENT..... 8-3

Days in Operating Cash

Operating Ratio

Debt Capacity

Revenue and Operating Expense Trends

Current Financial Assessment Summary

WATER RATE STRUCTURE DEVELOPMENT..... 8-11

Assumptions

Future Conditions Summary

Alternatives Evaluation

SUMMARY AND RECOMMENDATIONS..... 8-25

Recommendations

APPENDIX

A – EXECUTIVE SUMMARY: ALTERNATIVE WATER SUPPLY REPORT

B – WATER DISTRIBUTION SYSTEM MAP

C – FIRE HYDRANT TESTING LOCATIONS MAP

D – WATERONE CONNECTION ALTERNATIVES

E – EXISTING SYSTEM MAXIMUM DAY DEMAND GRAPHS

F – EXISTING SYSTEM MAXIMUM DAY DEMAND WITH FIRE FLOWS

G – DETAILED COST ESTIMATES FOR WATERONE ALTERNATIVES

H – CIP PROJECT MAPS

I – WATER RATE ANALYSIS TABLES

List of Tables

TABLE 1-1: CAPITAL IMPROVEMENT PLAN SUMMARY..... 1-6

TABLE 1-2: COMMUNITY CONNECTION FEE COMPARISON..... 1-7

TABLE 2-1: STUDY AREA HISTORICAL POPULATION & FORECAST POPULATION... 2-1

TABLE 2-2: BELTON POPULATION AND LAND USE ESTIMATES..... 2-8

TABLE 3-1: FUTURE WATER SYSTEM DEMAND..... 3-7

TABLE 4-1: HYDRANT CONDITION ASSESSMENT..... 4-2

TABLE 4-2: WATER VALVE CONDITION ASSESSMENT..... 4-4

TABLE 4-3: SYSTEM STORAGE..... 4-6

TABLE 4-4: BOOSTER PUMPING UNITS..... 4-8

TABLE 4-5: PUMP STATION OPERATING LEVELS..... 4-9

TABLE 4-6: WATER MAIN LENGTHS, TYPE OF MATERIAL, & DIAMETERS..... 4-12

TABLE 4-7: PIPE C-VALUES..... 4-14

TABLE 5-1: ALTERNATIVE NO. 1 COST ESTIMATE..... 5-9

TABLE 5-2: ALTERNATIVE NO. 1A COST ESTIMATE..... 5-9
TABLE 5-3: ALTERNATIVE NO. 2 COST ESTIMATE..... 5-10
TABLE 5-4: ALTERNATIVE NO. 2A COST ESTIMATE..... 5-10
TABLE 5-5: ALTERNATIVE NO. 3 COST ESTIMATE..... 5-11
TABLE 5-6: ALTERNATIVE NO. 3A COST ESTIMATE..... 5-11
TABLE 5-7: ALTERNATIVE NO. 1 PRESENT WORTH ANALYSIS..... 5-12
TABLE 5-8: ALTERNATIVE NO. 1A PRESENT WORTH ANALYSIS..... 5-13
TABLE 5-9: ALTERNATIVE NO. 2 PRESENT WORTH ANALYSIS..... 5-13
TABLE 5-10: ALTERNATIVE NO. 2A PRESENT WORTH ANALYSIS..... 5-14
TABLE 5-11: ALTERNATIVE NO. 3 PRESENT WORTH ANALYSIS..... 5-15
TABLE 5-12: ALTERNATIVE NO. 3A PRESENT WORTH ANALYSIS..... 5-15
TABLE 6-1: INDUSTRY STANDARD COST ESTIMATING GUIDELINES..... 6-2
TABLE 6-2: WATER DISTRIBUTION SYSTEM CAPITAL IMPROVEMENTS PROGRAM SUMMARY..... 6-8
TABLE 6-3: WATER DISTRIBUTION SYSTEM CAPITAL IMPROVEMENTS DETAILS..... 6-13
TABLE 7-1: WATER MASTER PLAN CIP – TOTAL GROWTH AND RENEWAL..... 7-1
TABLE 7-2: STORAGE FACILITY COSTS..... 7-5
TABLE 7-3: TRANSMISSION MAIN COSTS..... 7-6
TABLE 7-4: PUMPING STATION COSTS..... 7-7
TABLE 7-5: ALTENATIVE 1 CONNECTION FEE CALCULATION..... 7-9
TABLE 7-6: ALTENATIVE 2 CONNECTION FEE CALCULATION..... 7-11
TABLE 7-7: ALTERNATIVE CONNECTION FEE SCHEDULE COMPARISON..... 7-12
TABLE 7-8: COMMUNITY CONNECTION FEE COMPARISON..... 7-13
TABLE 8-1: WATER FUND MAXIMUM BORROWING CAPACITY..... 8-6
TABLE 8-2: PROJECTED WATER VOLUME & SUPPLIER RATES..... 8-16
TABLE 8-3: PROJECTED FINANCIAL RATIOS – FUTURE CONDITION..... 8-20

TABLE 8-4: PROJECTED FINANCIAL STATEMENT & BALANCE SHEET SUMMARY.... 8-21

TABLE 8-5: ALTERNATIVES WATER RATE INCREASES SUMMARY..... 8-24

List of Figures

FIGURE 2-1: EXISTING LAND USE..... 2-5

FIGURE 2-2: FUTURE LAND USE..... 2-7

FIGURE 3-1: WATER PURCHASED AND SOLD..... 3-4

FIGURE 3-2: AVERAGE DAILY DEMAND..... 3-5

FIGURE 4-1: DISTRIBUTION SYSTEM SCHEMATIC..... 4-3

FIGURE 4-2: WATER DISTRIBUTION SYSTEM MAP.....Appendix B

FIGURE 4-3: FIRE HYDRANT TESTING LOCATIONS MAP.....Appendix C

FIGURE 4-4: PROPOSED PHASING PLAN..... 4-23

FIGURE 5-1: ALTERNATIVES 1 AND 1A.....Appendix D

FIGURE 5-2: ALTERNATIVES 2 AND 2A.....Appendix D

FIGURE 5-3: ALTERNATIVES 3 AND 3A.....Appendix D

FIGURE 6-1A: CIP PROJECT MAP (NW).....Appendix H

FIGURE 6-1B: CIP PROJECT MAP (NE).....Appendix H

FIGURE 6-1C: CIP PROJECT MAP (SE).....Appendix H

FIGURE 6-1D: CIP PROJECT MAP (SW).....Appendix H

FIGURE 7-1: CONNECTION FEE COMPARISON CHART..... 7-14

FIGURE 8-1: DAYS IN OPERATING CASH..... 8-4

FIGURE 8-2: OPERATING RATIO..... 8-5

FIGURE 8-3: REVENUE AND EXPENSE TRENDS..... 8-7

FIGURE 8-4: 2011 WATER FUND EXPENSES..... 8-8

FIGURE 8-5: GALLONS OF WATER SOLD/AVERAGE USAGE PER METER..... 8-9

FIGURE 8-6: HISTORIC POPULATION VERSUS NUMBER OF METERS..... 8-12

FIGURE 8-7: PROJECTED WATER METERS..... 8-13

FIGURE 8-8: AVERAGE GALLONS SOLD PER METER PER MONTH..... 8-14

FIGURE 8-9: PROJECTED GALLONS OF WATER SOLD..... 8-14

FIGURE 8-10: PROJECTED WATER REVENUE..... 8-15

FIGURE 8-11: PROJECTED TOTAL WATER PURCHASED..... 8-17

FIGURE 8-12: PROJECTED OPERATING EXPENSES..... 8-19

FIGURE 8-13: ALTERNATIVES WATER RATE INCREASES – 2012 THRU 2021..... 8-25

1. EXECUTIVE SUMMARY

The purpose of this report is to provide the City of Belton, Missouri an updated comprehensive Master Plan of its water supply and distribution system. The recommendations presented in the report can serve as the basis for improvements to accommodate future growth and enhance the City's service level to its customers. Implementation of the report's recommendations will provide an adequate, long-term and dependable water supply system for the City.

STUDY AREA AND SCOPE

The study area mainly includes the existing Belton City limits. The City currently encompasses approximately 9,232 acres of developed and undeveloped land. It is generally bounded on the north by the Cass County line (155th St.), Holmes Road on the west, Missouri Highway 71 on the east, and 187th St. on the south.

The planning period for this updated Water System Master Plan is from 2013 through 2035.

Services provided during preparation of this Master Plan include the following:

- Population Projections and Land Use – Population projections and land use for the City was reviewed and updated for the planning period.
- System Modeling – Using the City's GIS network and water hydraulic modeling software, two models were developed. The first model is based

on the City's existing water distribution system with current water demands. The second model contains the City's projected water demand at the end of the planning period, which includes the existing distribution system along with the infrastructure necessary to serve the future growth areas.

- Capital Improvements Program Development – A new Capital Improvements Program (CIP) was developed based on the results of the System Modeling phase. It addresses both renewal projects (i.e. replacing old water mains), and growth projects (i.e. new water storage facilities) to handle the growth expected during the planning period.

- Water Rate Study – A comprehensive study on City water rates utilizing the proposed capital improvements program was conducted to determine the necessary funding mechanisms that will ensure City revenues meet the Water Services Division's expenditures and the costs to implement recommended renewal projects identified by the CIP.

- Water Connection Fee Development – The Water Connection Fee was updated to provide necessary funding to implement the projects that are needed to address the demand placed on the water system by the City's future growth.

FINDINGS

POPULATION

Projections indicate that the City's population may increase about 28% in the next 22 years. This growth will occur mainly to the south and west of the current

city limits. The population projections were prepared based on historical data provided by the City and data obtained from the Mid-America Regional Council (MARC).

WATER REQUIREMENTS

The City of Belton has been a wholesale customer of Kansas City, Missouri (KCMO) since July of 1965. The current contract, which allows the City to purchase up to 4-million gallons (MG) of water per day, was in effect until May 16, 2007. During the negotiations that have been underway to execute a new water purchase agreement, the City elected to conduct a study on the feasibility of purchasing water from sources other than from the City of Kansas City, Missouri. An *Alternative Water Supply Study* was completed in August 2011. The purpose of this study was to evaluate alternative water supply sources to address the City of Belton's current and future water demands. The City's desire is to ultimately have access to drinking water from two separate sources which would provide the assurance and dependability that the City's water needs will consistently and reliably be met now and over the next 20 years. The study resulted in a recommendation to purchase water from two water suppliers within the region: Water District No. 1 of Johnson County, Kansas (WaterOne) and KCMO, thus allowing the City to access water from two separate sources and providing a higher level of assurance, protection, consistency, and operational flexibility in supplying water to its customers.

WATER DISTRIBUTION SYSTEM

Evaluation of the City's current water distribution system infrastructure resulted in the following findings:

- The City currently has less than one-half day of water storage capacity for use in emergencies.
- In some locations, fire flow did not meet the City's standards. This is due to lower, but previously acceptable standards, and to an aging water infrastructure.
- There are areas where water mains do not loop, thus creating dead-ends in the system. This causes problems with water quality and leaves many areas of the City without a backup source of water in emergency situations.
- The Holmes Road Pump Station's pumps are operating significantly below the manufacturer's published pump performance curves. This reduction in pumping efficiency increases the pump run times and the frequency of periods when multiple pumps must be operated to meet demand, resulting in higher power costs.

RECOMMENDATIONS

CAPITAL IMPROVEMENTS PROGRAM (CIP)

It is highly recommended that the City upgrade the water distribution system by a) immediately constructing additional storage facilities, b) in the near future, constructing the necessary capital improvements to connect to the water distribution system of Water District No. 1 of Johnson County, Kansas (WaterOne)

and entering into a new water purchase agreement as a supplemental source of water, c) installing new water mains to close loops and provide adequate fire flow pressure, and d) upgrading the pump station's pumps, facilities, and computer control system. It is also recommended that the City take the necessary steps to plan for growth by proactively overseeing the construction of new facilities and water lines. A summary of the recommend improvements is shown in Table 1-1.

CIP PHASING PLAN

An evaluation was conducted of various phasing plan alternatives to balance the required capital improvements with the ability of the City to fund the work. The final sequencing plan's objectives would be to phase in the improvements such that the daily and peak day demands are still met while increases in water rates are reduced such that they will be more affordable to the City's customers.

The phasing plan selected by the City to best address the improvement objectives was to implement a six year, 3-phased approach for major capital improvements in a sequence which was more affordable over the long-term for City customers. The timing for these improvements depend on receiving a consistent supply of water from KCMO and the level of growth/development within the City that would increase water demand.

1. **Phase 1** - Commence with the installation of the 3.0 MG elevated storage tank first starting in Calendar Year 2013. The tank would rely on being filled from water supplied solely by the two existing KCMO connections. Improvements at the existing 300,000 gallon storage tank and additional water distribution lines would also be required. To ensure adequate

pumping for the short term, rehabilitation work would be required at the existing Holmes Rd. pump station. *Phase 1 cost is estimated to be $10.9 Million.*

2. **Phase 2** - Construct the new 24-inch transmission line (approximately 27,000 lf.) between WaterOne's system and the City's existing Holmes Road Pump station. Once connected, the City would be required to pay the WaterOne System Development Charge (SDC) for the first 1.0 MGD. Additionally, implement several waterline renewal projects estimated to cost about $500,000 to accelerate the pipe renewal program. These improvements would be targeted to start in Year 2017. *Phase 2 cost is estimated to be $10.0 Million.*
3. **Phase 3** - Installation of the new Holmes Road Booster Station, the 2.0 MG ground storage tank, and approximately 14,500 lineal feet of 16 and 24-inch transmission main from the new Holmes Rd. pump station to the new 3.0 MG elevated tank. These improvements would be undertaken in the Year 2018. *Phase 3 cost is estimated to be $10.2 Million.*

Insert Table 1-1

WATER CONNECTION FEE

It is recommended that the City revise the water connection fee structure as shown in the table below. Modifying the connection fee to $3,195 allows the City to institute a philosophy of "growth paying for growth". Table 1-2 shows how the recommended water connection fee of $3,195 compares with other local municipalities.

Table 1-2: Community Connection Fee Comparison

Community	Residential Fee[1]	Comment
Belton, MO	$3,195	Master Plan Recommendation
Raymore, MO	$2,263	
Grain Valley, MO	$3,149 & $4,724	For 5/8" and 3/4" respectively
Liberty, MO	$2,225	
Smithville, MO	$2,400	
Lee's Summit, MO	$3,054	
Johnson County, KS - Water No. 1	$5,480 & $7,940	For 5/8" and 3/4" respectively (2012)
Olathe, KS	$4,030	Single Family House, Duplex

[1]5/8" to 3/4" meter

WATER RATES STUDY

A financial assessment of the City's water fund was initially undertaken to determine the current condition of the water fund. Following that step, an evaluation and development of a water rate structure was conducted to meet the following objectives: (1) accurately reflect the cost of water, (2) is fair and equitable, (3) meets the debt service requirements resulting from capital improvements identified in this Water Master Plan, and (4) meets various financial ratios in order to have a fundamental and sustainable water fund.

It is recommended that the City consider implementing the following action to enhance the water fund and to create an equitable and healthy water rate structure:

- Review different capital improvement implementation or phasing plans to spread out capital costs to reduce the amount of funds the City will need to borrow in the first several years, potentially resulting in lower increases in water rates.
- Establish in the water fund rate structure a debt service rate component and an infrastructure rate component along with the existing base rate.
- Immediately increase the consumption charge (rate per 1,000 gallons used) by at least 5% to reflect the increase in the cost of purchasing water from KCMO, and make adjustments annually to ensure projected annual operating expenses are covered by water revenue.
- Evaluate and establish a plan to reduce the interfund charge (overhead allocation charge) to about 5% of water revenue and eliminate the franchise tax that is charged to the water fund.
- Evaluate and incorporate a cost of service by customer class program to better identify and apportion annual revenue requirements among different customer classes based on their demand on the water system.
- Evaluate and incorporate a block rate system in the water rate structure to address the costs on the water system during high customer demand and usage.
- Adopt best management practices with regards to information management, data collection, reporting and adopting fiscal policies and strategies for the water fund.

OTHER RECOMMENDATIONS

- Perform regular (every 7-10 years) Water Master Plan updates to ensure that the City's goals remain proactive and that funding mechanisms are in place to achieve these goals.
- Allocate the necessary resources and funding to ensure the continuous updating of the GIS network and hydraulic modeling software.
- Renegotiate the existing water purchase contract with Kansas City, Missouri and the existing water sales contract with Cass County Public Water Supply District No. 8.
- Prepare a study to investigate additional sources of funding to support the Capital Improvements Program (CIP). These sources should include, but not be limited to, community development block grants and low interest loans through the State Revolving Fund (SRF) Loan program.

More specific recommendations can be found in *Section 5 – Recommended Improvements*, of this report.

2. POPULATION AND LAND USE PROJECTIONS

To plan for future growth of the water distribution system for the planning period, an estimate of the anticipated population growth for the City was determined.

STUDY AREA DESCRIPTION

The study area includes the existing Belton city limits. The City currently does not have any plans in the near future to annex additional property. The City currently consists of approximately 9,232 acres of developed and undeveloped land. It is generally bounded on the north by the Cass County line (155th St.), Holmes Road on the west, Missouri Highway 71 on the east, and 187th St. to the south.

CURRENT AND PROJECTED POPULATION

Population projections were prepared based on historical data provided by the City, and data furnished by the Mid-America Regional Council (MARC). MARC compiles and updates local and regional U.S. Census Bureau data, employment, birth and death rates, immigration and emigration rates and economic data to forecast local and regional demographic trends in the Kansas City metropolitan area, including Belton and all of Cass County.

The *2004 Long-Range Population, Households and Employment Forecast* prepared by MARC stated that Cass County would lead the Kansas City metropolitan area and the component counties in *rate of population growth* over the forecast period

through 2030. In particular, "North Cass County", including Belton, Raymore, and Pleasant Hill Township and the surrounding area is forecast to grow by 78% over the 30-year period. However, since 2008, recent trends have indicated that this projected growth is unlikely.

The report previously included a figure and population data based on area census tracts. Between the 2000 and 2010 census the tracts were redrawn and several tracts now include parts of Belton as well as other cities. Thus it has become difficult to show population growth comparisons in a beneficial manner and the data was not used.

Several surrounding communities were selected as being similar in growth or representative of the rate of growth that is being experienced in the City of Belton. These areas are identified as *Community Analysis Areas,* or CAAs, by MARC. The growth rate projections in the four selected areas were included for comparison purposes. The areas selected for comparison are CAAs identified by MARC in the *2004 Long Range Plan* as North Cass County, Eastern Jackson County and Liberty. The forecast growth rates for these areas are included in Table 2–1.

The MARC also compiles annual U.S. Census Bureau updates of the area's estimated city populations. During the development of the City's 2005 Water Master Plan, the 2003 Census Bureau population estimates for Belton were 21,931 for the year 2000 and 23,575 in 2003. This represents a 2.45% annual rate of growth for the City over this three-year period. This is consistent with MARC's

projected population growth rate of 2.46% per year for North Cass County through 2010. This rate of growth, when applied to the City through 2010, was to yield an estimated population of nearly 28,000.

However, in accordance with the 2010 Census Bureau data, the growth rate was much lower, and the 2010 Census numbers revealed a population of 23,116 for Belton. As a result, using a more conservative approach to future growth in the next ten years puts Belton at a population of 25,534 by 2020. It was assumed that the growth rate over the next 24 years would remain steady at 1% annually.

MARC's projected growth rates as well as actual trends based on current data for North Cass County were applied to arrive at a population forecast through the year 2035. The resulting projection for Belton is a population of 29,645 in 2035 based on a 1% annual growth starting in 2011. This figure appears reasonable when compared with historical and projected growth rates in the selected CAAs. The population history and forecast for Belton is shown in Table 2–1.

Table 2-1: Study Area Historical Population and Forecast Population

	Population History & Forecast						Belton	
Year	North Cass Co.	Growth % annual	E. Jackson incl. Lee's Summit	Growth % annual	Liberty	Growth % annual	History & Forecast Belton	Growth % annual
1970	19,801		31,342		13,704		12,270	
1980	24,467	2.14	62,400	7.13	16,251	1.72	13,533	1.00
1990	33,636	3.23	89,296	3.65	20,459	2.33	18,270	3.10
2000	46,012	3.18	115,394	2.60	26,232	2.52	21,772	1.80
2003							23,575[a]	2.00
2010	58,722	2.47	138,133	1.81	29,149	1.06	23,116[b]	0.60
2015							24,295	1.00
2020	70,584	1.86	156,167	1.23	35,805	2.08	25,534	1.00
2025							26,837	1.00
2030	81,722	1.48	173,371	1.05	42,461	1.72	28,206	1.00
2035							29,645	1.00

a. 2003 US Census
b. 2010 US Census

CURRENT AND PROJECTED LAND USE

In order to estimate population growth during the planning period, population projections were matched with land use projections. The current land use data was gathered by studying the City's current 2011 land use maps. The existing land use is shown on Figure 2-1.

FIGURE 2-1

The future land use map was developed by the City's Planning Department and was used for this part of the study. The future land use map is shown on Figure 2-2. The future land use map was prepared based on the projections of the current trends with consideration of other influential factors, such as:

- Areas within the city limits that are vacant and available for development
- Availability of City services such as water, sewers, roads and streets

Residential land use for 2020 and 2030 was projected based on a linear increase in annual residential land development from 2010 to the year ultimate development occurs. This approach required that an estimate be made as to the year when ultimate population development will occur.

The current and ultimate populations were established by applying demographic data and housing unit-density data acquired from the 2010 U.S. Census. The census recorded an average household size of 2.61 people and a housing unit-vacancy rate of 8.7%. Average housing unit densities were then assigned to each residential land-use type as shown in Table 2-2. The household size and vacancy rate data were applied to the estimated housing unit densities for each residential type. This correlated well with the most recent U.S. Census Bureau data for Belton.

FIGURE 2-2

Table 2-2: Belton Population and Land Use Estimates

		Year 2005			Year 2011			Year 2020			Year 2030		
Land Use Type	Average Density Units/acre	2005 Acres	# of Units	Population*	2011 Acres	# of Units	Population*	2020 Acres	# of Units	Population*	2030 Acres	# of Units	Population*
RESIDENTIAL													
Single-Family	3	1,585	4,755	12,242	1,730	5,190	12,367	2,248	6,744	16,722	2,903	8,709	21,594
Large Lot Single family	0.20	479	96	247	550	110	262	500	100	248	450	90	223
Two-Family	4	208	832	2,142	210	840	2,002	140	560	1,389	100	400	992
Multi / Tri / Quad-plex	10	129	1,291	3,323	192	1,916	4,565	160	1,600	3,967	130	1,300	3,223
Mobil Home Park	7	263	1,841	4,740	235	1,645	3,920	185	1,295	3,211	125	875	2,170
RESIDENTIAL - Developed		**2,664**	**8,815**	**22,693**	**2,917**	**9,701**	**23,116**	**3,233**	**10,299**	**25,536**	**3,708**	**11,374**	**28,202**
NON-RESIDENTIAL			Percent of Total	Acres per 1000 cap		Percent of Total	Acres per 1000 cap		Percent of Total	Acres per 1000 cap		Percent of Total	Acres per 1000 cap
Business Park, Office, Hotel		13	0.3%	0.6	20	0.3%	0.9	23	0.3%	0.9	26	0.3%	0.9
Commercial		312	6.2%	13.7	333	5.6%	14.4	374	5.6%	14.6	425	5.6%	14.9
Industrial		172	3.4%	7.6	589	9.8%	25.5	650	9.8%	25.5	740	9.8%	26.2
Church, School, Institutional		495	9.8%	21.8	526	8.8%	22.8	585	8.8%	22.9	665	8.8%	23.4
Parkland, Open Space, Cemetery		424	8.4%	18.7	343	5.7%	14.8	380	5.7%	14.9	430	5.7%	15.2
Streets, ROW		981	19.4%	43.2	1,257	21.0%	54.4	1,394	21.0%	54.6	1,590	21.0%	56.4
NON-RESIDENTIAL - Developed		**2,397**			**3,068**			**3,406**			**3,876**		
TOTAL DEVELOPED		**5,062**			**5,985**	185	Acre/yr	**6,639**	65	Acre/yr	**7,584**	47	Acre/yr
Vacant, Agricultural		4,056			3,247			2,593			1,648		
TOTAL CITY		**9,118**			**9,232**			**9,232**			**9,232**		

*** average 2.71 (2005), 2.61, (2011, 2020, 2030) people per household and 8.7%(2011), 5% (2005, 2020, 2030) vacancy rate**

Remove this sheet

Based upon these projections, the 2030 residential development will include a total of 3,708 acres. At the current household size and occupancy rates, the fully developed population for the study area was estimated to be 50,800 people. When the housing unit densities, occupancy rate and household sizes assumptions were applied to the land use forecast, a reasonable correlation with the previously discussed population forecast was produced. This provided verification of the land use estimates.

Non-residential land uses were projected by calculating the number of acres per capita for the current land use and the ultimate land use. Changes in the acreage per capita for non-residential uses were applied linearly as development occurs. The results for non-residential land use development are also included in Table 2-2.

3. WATER REQUIREMENTS

HISTORIC AND EXISTING SUPPLY

The City of Belton has been a wholesale customer of Kansas City, Missouri (KCMO) since July of 1965. The current water purchase agreement, which allows the City to purchase up to 4 million gallons (MG) of water per day, expired on until May 16, 2007. KCMO has usually provided sufficient supply to Belton in the past, although during high peak demand periods, has had difficulty in consistently meeting the City's demands. KCMO has not assured the City that it will be able to consistently meet current as well as future City demands. The City continues to receive water from KCMO in accordance with the terms of the expired agreement and is currently negotiating a new multi-year contract with an expected maximum monthly flow of 4.0 MGD. This wholesale agreement may include a "take or pay" or minimum monthly usage provision that will go into effect once Belton connects to a second water supply source. Kansas City is aware that Belton is negotiating with Water District No. 1 of Johnson County, Kansas, (WaterOne) as a supplemental water supply. Details of Belton's efforts to procure additional water is presented in the 2011 report titled "Belton Alternate Water Supply Report," as prepared by Delich, Roth & Goodwillie (DRG). See the Executive Summary of this report in Appendix A.

HISTORIC AND EXISTING DEMANDS

The City has historically collected water demand information from water meters installed at the Holmes Road and North Scott connections to KCMO. These were originally recorded on a weekly basis but are currently being recorded monthly.

This data was used to calculate the average daily flow values. Unfortunately, this information was not useful in estimating the peak-day or peak-hour values. The City installed a new Supervisory Control and Data Acquisition (SCADA) System in 2003. Available records from the SCADA system were reviewed to see if reliable peak day and peak hour demands could be determined. The Holmes Road Booster Pump Stations does not have a downstream flow meter. The flow to each booster pump station is measured at the KCMO connection and the City does not have SCADA access to KCMO meter data. In an effort to estimate daily flows, the City had the SCADA system programmed to measure pump run time and speed. Based on this information and the pump characteristics, the SCADA system was able to generate the estimated daily water pumped from each station. In an effort to determine the reliability of the SCADA data, each month's SCADA data was compared with the corresponding flows from the KCMO meter. It was determined that the City's SCADA data was estimating flows much higher than actually measured by the KCMO meter. With the absence of reliable peak day and peak hour demands, the peak day demand has been assumed to be 2.0 times the average day demand and the peak hour demand has been assumed to be 2.0 times the peak day demand.

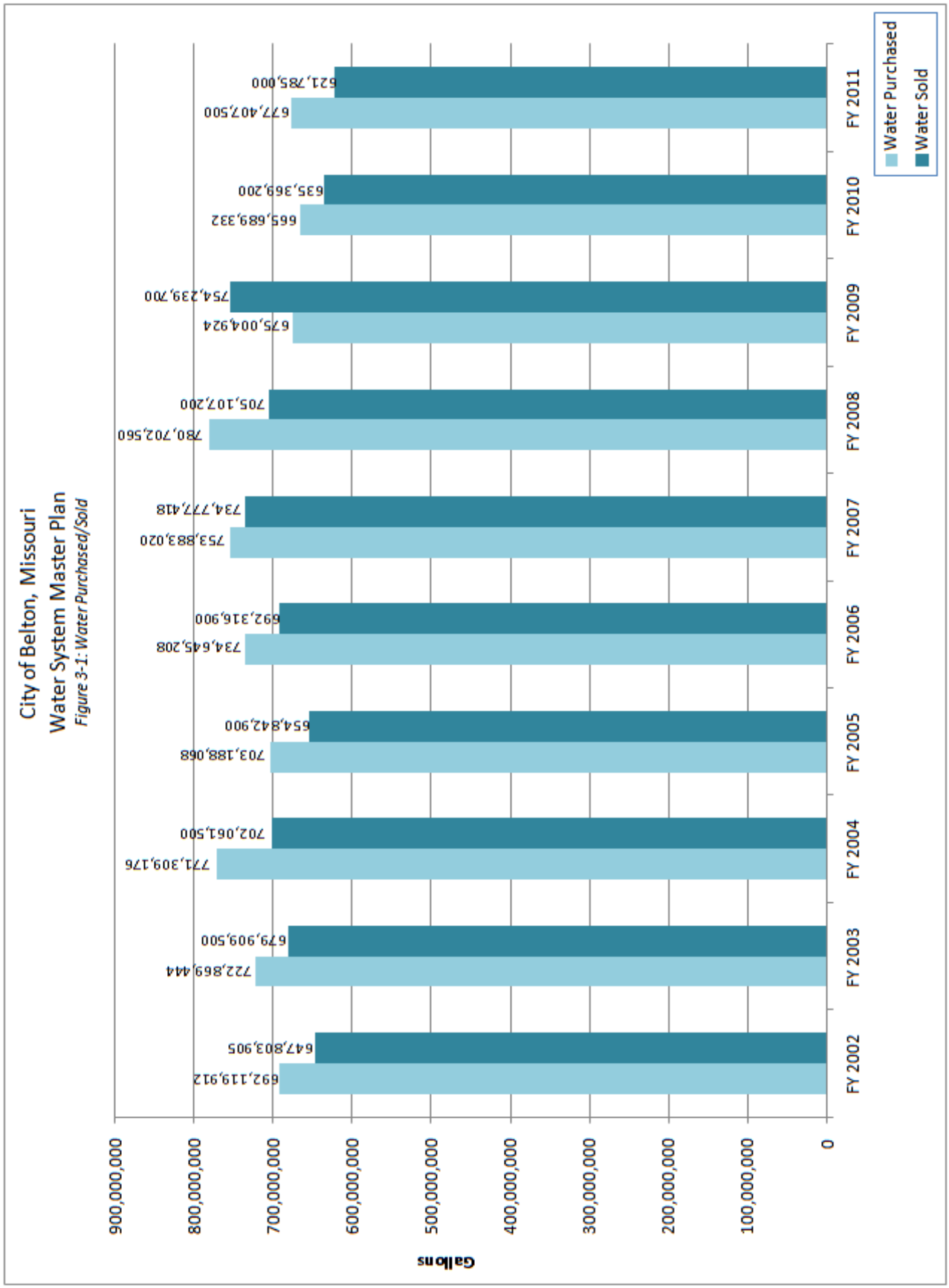
The City provided monthly water usage data that covered the period from FY 2002 (April 2001 – March 2002) through FY 2011 (April 2010 – March 2011). A graph of these values is shown in Figure 3-1. During this same time period, the amount of water purchased from KCMO ranged from a low of 665.7 MG (1.82 MGD) in 2010 to a high of 780.7 MG (2.1 MGD) in 2008. During this same time period, the number of meters increased by 2.8%, but the amount of water

purchased decreased by 12.5%. This can be attributed to the downturn in the economy and the cool summer/extremely wet weather. Refer to Figure 3-2 showing the average daily demand for the City.

For the purpose of this report, the 2011 demands are assumed to be:

- 2.1 MGD average day demand
- 4.2 MGD peak day demand
- 8.4 MGD peak hour demand

The above demands are based on previously discussed factors.


City of Belton, Missouri
Water System Master Plan
Figure 3-1: Water Purchased/Sold
Gallons
900,000,000
800,000,000
700,000,000
600,000,000
500,000,000
400,000,000
300,000,000
200,000,000
100,000,000
0
FY 2002
FY 2003
FY 2004
FY 2005
FY 2006
FY 2007
FY 2008
FY 2009
FY 2010
FY 2011
692,119,912
647,803,905
722,869,444
679,909,500
771,309,176
702,061,500
703,188,068
654,842,900
734,645,208
692,316,900
753,883,020
734,777,418
780,702,560
705,107,200
675,004,924
754,239,700
665,689,332
635,369,200
677,407,500
621,785,000
Water Purchased
Water Sold

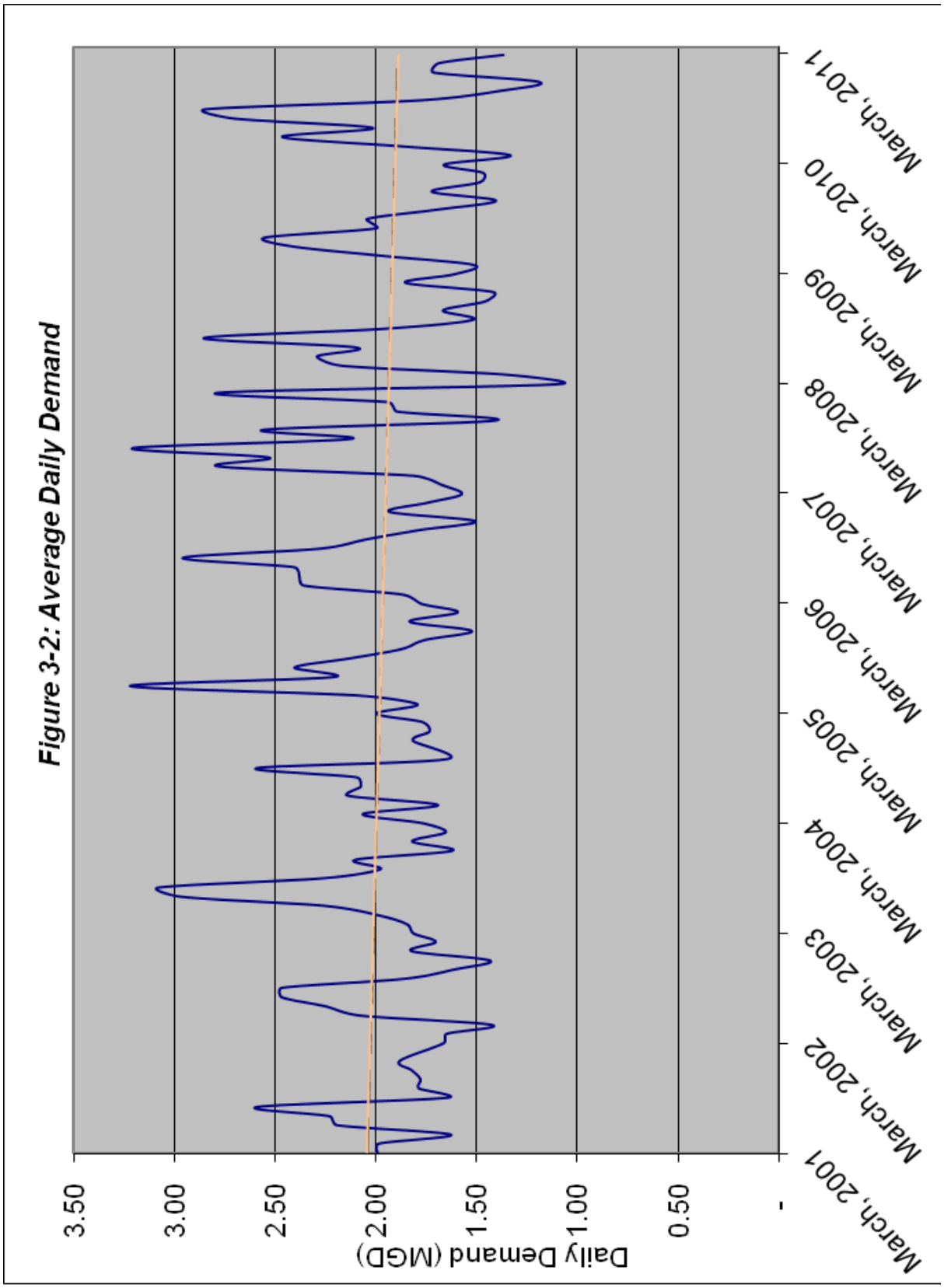


Figure 3-2: Average Daily Demand

Belton's Wholesale Customers

Belton currently sells water to the Loch Lloyd development and Cass County Public Water Supply District No. 8. Loch Lloyd is a planned golf course community located west of the City. It currently purchases water at a wholesale water rate with an average demand of 155,520 gallons per day (gpd), which is 7.4% of the City's 2.1 MGD average daily use. District No. 8's connection is located near 166th and Holmes Road. It currently purchases water based on a contract that expired in 2007 with an average demand of 13,800 gpd, which is 0.6% of the City's average daily use.

Second Water Supply Source

In the past, the City did have the capability to supplement the water supply provided by Kansas City, Missouri (KCMO) in the event of an emergency, such as a transmission main break in their system. There are several entities surrounding the City that have a water distribution system the City could conceivably connect to. These include Cass County Public Water Supply Districts (PWSD) No. 2, 8, and 10, Jackson County PWSD No. 1, Tri-County Water Authority, the City of Raymore and WaterOne of Johnson County, Kansas.

As previously stated, the City has recently completed a detailed report which includes recommendations regarding a second water supply source. See the Executive Summary of the 2011 report prepared by Delich, Roth & Goodwillie, PA, in Appendix A.

FUTURE WATER DEMANDS

The population and future land use projections detailed in *Section 2- Population and Land Use Projections* of this report were used to develop an estimate of the City's water demand for the planning period. It was assumed that the 2.0 peaking factor will remain constant throughout the planning period. The increase in water demand is summarized in Table 3-1.

Table 3-1: Future Water System Demand

	Design Year					
	2011	2015	2020	2025	2030	2035
Population	23,347	24,295	25,534	26,837	28,206	29,645
Average-Day (MGD)	2.1	2.2	2.3	2.4	2.6	2.7
Peak-Day (MGD)	4.2	4.4	4.6	4.8	5.2	5.4

Conversations have been held between the City and the KCMO Water Services Department to determine if KCMO can consistently and reliably meet the future maximum day demands of the City. It was determined that, at this time, KCMO alone would not be able to consistently provide the City with additional water needed to meet the City's current maximum day demand, although recent operational and mechanical improvements conducted in the Summer of 2012 by KCMO staff have improved supply during peak day demands. KCMO would also be unable to provide the City with adequate and dependable water supply to meet their future maximum day demands. As previously stated, the City hired DRG to perform a water supply study to determine the most economical and reliable solution to their water supply needs.

BELTON'S WHOLESALE CUSTOMERS – FUTURE DEMANDS

The Loch Lloyd community anticipates steady development within the planning period. Projections are for a 1% growth, similar to what Belton anticipates. It should be noted that Loch Lloyd has considered negotiating an agreement with KCMO to purchase water at some time in the future. At this time, it is not known when or if Loch Lloyd will begin purchasing water from KCMO. For the purposes of this report, it will be assumed that Loch Lloyd will continue as a wholesale customer of the City. City staff indicated that Public Water Supply District No. 8 is fully developed, thus no significant increase in demand is anticipated.

4. WATER DISTRIBUTION SYSTEM

The City purchases water from the City of Kansas City, Missouri. This water enters Belton's system at the Holmes Road and North Scott Pump Stations. Pump station operations are controlled by the level in Tower #1 through the City's SCADA system. The water is then distributed through a network of transmission mains which are 12-inch in diameter and larger. Water is distributed to customers through a system of distribution mains which are between 2-inch and 10-inch in diameter. Figure 4-1 shows a schematic of the water supply system. A map of the existing distribution system is shown in Figure 4-2 in Appendix B.

CONDITION ASSESSMENT

In 2004, a condition assessment was conducted for all of the City's above-ground water distribution system facilities. This included three storage facilities, two pump stations, water valves, and hydrants. Tables 4-1 and 4-2 show the condition assessments for the hydrants and water valves. The four different condition ratings for the fire hydrants were as follows:

- Good – Replacement or repair is not required.
- Moderate – The hydrant was partially buried or leaning.
- Poor – The hydrant has a visible defect.
- Inaccessible – there is a physical barrier to prevent the hydrant from being accessed, such as a fence.

Results of the field assessment in 2004 indicate that 99.3% of all hydrants were in good to moderate condition. Since a detailed condition assessment was not conducted during the development of this plan, it was assumed that all hydrants installed since the 2004 are in good condition.

It was also assumed that all water valves installed since the 2004 are in good condition. The four different condition ratings for the water valves previously were as follows;

- Good - No maintenance is necessary.
- Moderate – The valve is buried and had to been excavated to be located.
- Poor – The valve had a defect, such as a missing or cracked lid or the valve stem was broken or bent.
- Inaccessible – there is a physical barrier to prevent the valve from being accessed such as a fence.

Table 4-1: Hydrant Condition Assessment

	Total	Good	Moderate	Poor	Inaccessible	Isolation Valves	Private
Fire Hydrants (1)	1117	1105	5	0	1	909	23

(1) Based on 2004 condition assessment. All hydrants installed since 2004 are assumed to be in good condition.

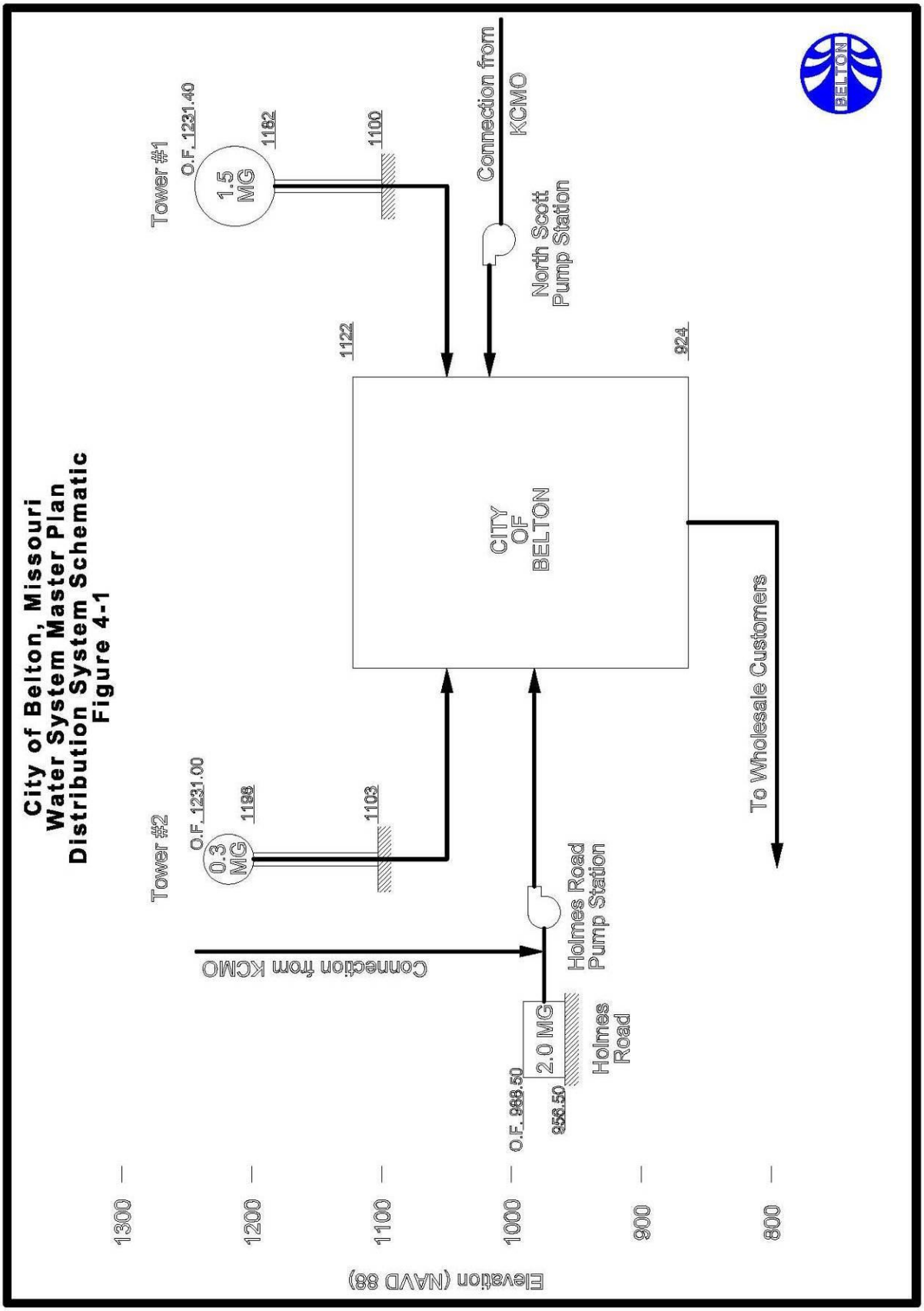

City of Belton, Missouri
Water System Master Plan
Distribution System Schematic
Figure 4-1
Tower #1
O.F. 1231.40
1.5 MG
1182
1100
Connection from KCMO
North Scott Pump Station
1122
924
CITY OF BELTON
To Wholesale Customers
Tower #2
O.F. 1231.00
0.3 MG
1188
1103
Connection from KCMO
Holmes Road Pump Station
2.0 MG
O.F. 988.50
956.50
Holmes Road
1300
1200
1100
1000
900
800
Elevation (NAVD 88)

Table 4-2: Water Valve Condition Assessment

	Total	Good	Moderate	Poor	Inaccessible
Valves(1)					
Gate	1366	1212	43	24	57
Butterfly	5	5			
Hydrant Isolation	946	847	30	12	32
Total	2317	2061	73	36	89

(1) Based on 2004 condition assessment. All valves installed since 2004 are assumed to be in good condition.

Results of the field assessments work indicated that over 92% of the valves were in good to moderate condition. The condition of the storage facilities and the pumping stations is discussed in the *Distribution System* section of this report.

SERVICE LEVEL/PRESSURE ZONES

The current water distribution network is a one-pressure-zone system. The lowest static pressures are 47-50 psi and are along the ridgeline south of Markey Road, between Prospect Avenue and North Scott Road. The highest pressures are approximately 110 psi. There are two areas having high pressures: a) the area south of Cambridge, between Hwy Y and Cleveland and b) the area along and south of 155th Street, just east of Terry Avenue. The static pressure is based on a hydraulic grade line of 1,226 feet, which is five feet below the overflow pipe on Tower #1.

The Missouri Department of Natural Resources (MDNR) recommends a normal working pressure in the water distribution system of 60 psi. MDNR also recommends a minimum pressure of 35 psi at all points in the distribution system under all conditions of design flow, not including fire flows. Currently, the

minimum system pressure during peak hour conditions is 41 psi along the ridgeline south of Markey Road.

Normal pressures of 60 psi provide adequate flow for fire suppression, as well as normal daily use. Having the City located within a single pressure zone causes two situations to arise. Some areas within the City currently have water pressure exceeding 100 psi. Pressure at this level leads to an increased number of main leaks and breaks. Secondly, there are areas of the City which have water pressure less than 50 psi. With static water pressure this low, it is more difficult to provide adequate fire flow, as well as meeting normal daily uses.

It is recommended that the City address the high pressure issues by continuing the current practice of replacing the old cast iron pipe located at the lower elevations in the City. By replacing the cast iron pipe, the City has been gradually upgrading its infrastructure as well as reducing the amount of water main breaks due to high system pressure. As mentioned in the 2005 Master Plan, should the City decide to create a second pressure zone in the future, the ideal elevation for this zone would be 1,017.1 feet. However, given the topography of the City, adding a second pressure zone would entail a significant investment. It would require either splitting or installing pressure control valves in mains that cross pressure zones, installing additional elevated storage tanks, and changing the pump operation at both pump stations. Creating a two-pressure zone system is not recommended.

DISTRIBUTION SYSTEM

SYSTEM STORAGE

The City is currently served by two elevated tanks and one ground storage facility. The ground level storage tank is located at 16401 Holmes Road and has a capacity of 2.0-million gallons (MG). Water Tower #1 is located at 1728 Cunningham Parkway and has a capacity of 1.5 MG. Water Tower #2 is located at 100 Hargis Street and has a capacity of 300,000-gallons. This provides a City combined total capacity of 3.8 MG. This information is summarized in Table 4-3.

Table 4-3: System Storage

Name	Type	Year	Volume (MG)	Overflow Elevation (NAVD 88)
Holmes Road	Ground	1967	2.0	988.5 ft
Tower #1	Elevated	1982	1.5	1231.2 ft
Tower #2	Elevated	1967	0.3	1231.0 ft
		Total	3.8	

Existing elevated storage (1.8 MG) can provide approximately 85% of the current average daily demand and less than 43% of the peak-day demand for use in emergency situations, as is shown in Table 3-1. Neither of these situations includes the 2.0 MG ground storage tank due to its relative elevation to the City's water distribution system. As shown in Figure 4-1, both elevated water towers along with the majority of the City, would need to be drained before the ground storage tank would be able to provide water. Should a supply interruption occur during a peak-day in the summer, the City would only be able to provide water to its customers for approximately 10 hours, assuming both elevated tanks are near full at the time of the interruption. A visual condition assessment of the two

towers and the one tank was not performed. The City currently has a contract with the Utility Services Company for inspection and repair of all of the City's storage tanks. A review of the latest reports from Utility Services indicated that the tanks appear to be in good condition with no major defects or maintenance issues.

Equalization storage, at a usable elevation, is normally calculated as the maximum hour demand rate minus the average day rate for a 4-hour period. Equalization storage is normally taken as one-half of the total storage at a usable elevation. The remaining storage is normally considered to be available for emergency conditions. Minimum storage requirements for the current and projected conditions are calculated below:

Current Conditions

Equalization Storage (5,844-1,458) x 4 x 60	=	1,050,000 gallons
Emergency Storage	=	1,050,000 gallons
Total Recommended Storage		2,100,000 gallons

Projected Year 2035 Conditions

Equalization Storage (7,500-1,875) x 4 x 60	=	1,350,000 gallons
Emergency Storage	=	1,350,000 gallons
Total Recommended Storage		2,700,000 gallons

Because the City is surrounded by other water systems and expansion of the water system beyond the current city limits is unlikely, the ultimate development of the City was reviewed to make sure future selected tank size would be appropriate. It is expected that the ultimate City population within the existing City limits will be 50,000 with a corresponding average demand of 5.0 MGD. With

this demand, the total recommended ultimate storage will be 5.0 MG. Therefore, the recommended size of the additional elevated storage is 3.0 MG.

SYSTEM PUMPING FACILITIES

The City utilizes two booster pump stations to supply water from KCMO. The Holmes Road Pump Station is located at 16401 Holmes Road. This station contains two vertical turbine pumps and one horizontal split-case pump. The North Scott Pump Station is located just south of 155th Street on North Scott Avenue. It contains four horizontal split-case pumps. Table 4-4 is a summary of all of the existing pumps.

Table 4-4: Booster Pumping Units

No.	Installed	Manufacturer	Rated Capacity		Rated Head, ft.	Pump Motor		
			gpm	MGD		hp	rpm	Drive
Holmes Road Pump Station								
1	1984	Fairbanks Morse	1,000	1.44	350	125	1,770	Constant
2	1984	Fairbanks Morse	1,000	1.44	350	125	1,770	Constant
3	1991	Aurora	1,000	1.44	350	125	3,565	Constant
		Total	3,000	4.32				
North Scott Avenue Pump Station								
1	2010	Flow Serve	1,750	2.52	232	125	1,750	Variable
2	1983	Worthington	1,000	1.44	150	75	1,800	Variable
3	2005	Fairbanks Morse	1,000	1.44	188	75	1,800	Variable
4	2005	Fairbanks Morse	1,000	1.44	188	75	1,800	Variable
		Total	4,750	6.84				

The pumps at both pump stations alternate in operation and are controlled by the water level in Tower #1. For example, if pump #1 starts as a lead pump, then pump #2 will start as the lag pump. The next time the pumps activate, pump #2 will start as the lead pump and pump #3 will be the lag pump. The lead pump in

the Holmes Road Pump Station starts first, followed by the lead pump in the North Scott Pump Station. The lag pump at Holmes Road will be the third to start, followed by the North Scott lag pump. Table 4-5 illustrates the pump start/stop elevations.

Table 4-5: Pump Station Operating Levels

Pump	Tower #1 Levels (NAVD 88)	
	Start	Stop
Holmes Road Pump Station		
Lead 1	1,226.40	1,228.60
Lag 1	1,220.40	1,222.60
Lag 2	1,208.40	1,218.40
North Scott Avenue Pump Station		
Lead 1	1,225.40	1,229.00
Lag 1	1,218.40	1,219.00

Four system conditions impact the plan of operation for the two pump stations. First, the pumps at the Holmes Road Pumping Station are set to operate first, because electrical power is cheaper at the Holmes Road station than at the North Scott station. Second, the cost for water purchased from KCMO is cheaper at the Holmes Road pumping station. Because Kansas City, Missouri (KCMO) has to pump water from the west side of town to get it to the North Scott station, an additional pumping surcharge is added to the cost of the water. The third issue is the amount of water that KCMO can physically supply to the Holmes Road station. In the event multiple pumps are in operation at the Holmes Road station, or during peak summer demands prior to Year 2012, the pressure in KCMO's distribution system would drop to the point where insufficient water is provided to other KCMO wholesale and retail customers. When this would happen, the

amount of water available to the City at the Holmes Road station would drop to around 0.7 to 0.8 MGD. Lastly, the pumps at the North Scott Pumping Station are operated using variable frequency drives (VFD). This arrangement allows the City to better control how much water the pumps need to pump. Unfortunately, when the VFDs run at 100% speed, the KCMO system cannot deliver enough water to the pumps, thus causing potentially damaging cavitation problems.

In the rare situations where both the lead and lag pumps at the Holmes Road Pump Station are on, system pressures exceed the rating of the old cast iron pipe, resulting in water main breaks.

The condition assessment of the North Scott Pumping Station was conducted during the construction of the 2005 North Scott Pump Station Improvements project. The visual assessment did not identify any defects or major repair needs in the existing equipment or facility. The emergency power generator was found to be sufficiently sized to operate the pump station during a power outage. One issue that was not addressed was the need for flow metering. As previously discussed, the existing SCADA data for both of the North Scott and Holmes Road Stations do not match the KCMO metered amounts. It is recommended that the City consider installing metering facilities at the Holmes Road pump station. This will allow for accurate monitoring of peak day and peak hour demands.

The Holmes Road Pumping Station, which was built in 1967, has exceeded its useful life. The pumping station was upgraded in 1982 through the installation of a third pump and a Motor Control Center (MCC). During the construction of

this project, the contractor did not demolish or remove existing electrical wires and copper tubing infrastructure that no longer serve a purpose. This complicates making improvements to the station because extensive investigations must be made to identify active versus inactive electrical systems. The facility is also poorly heated and cooled, making it an unsafe working environment for City maintenance staff. It was also noted that a piece of plywood covers the stairwell over the basement floor behind the control panel. Maintenance personnel must stand on the plywood to access the rear of the control panel. This places them in an unsafe condition, 16 feet above the basement floor. A review of the emergency power generator indicated that it is of sufficient size to operate the pumping station during a power outage.

System Distribution

The City maintains approximately 128 miles of water main. A summary of the pipe lengths, type of material, and diameters are listed in Table 4-6. Currently, 87.2% of all piping is greater than or equal to 6" in diameter. Also, a total of 35.3% of all piping is either small diameter (less than or equal to 4") or of material that should be considered for replacement (cast iron or asbestos cement).

Table 4-6: Water Main Lengths, Type of Material, and Diameters

Dia	Asbestos Cement	Cast Iron	Ductile Iron	HDPE	PVC	Total	% Total
2"		3,909 ft			3,552 ft	7,461 ft	1.1%
4"		67,869 ft	2,696 ft		8,235 ft	78,800 ft	11.7%
6"	12,001 ft	44,102 ft	5,243 ft		127,144 ft	188,490 ft	27.9%
8"	5,985 ft	15,403 ft	15,256 ft	438 ft	201,636 ft	238,718 ft	35.4%
10"	722 ft	833 ft	357 ft		28,275 ft	30,187 ft	4.5%
12"	23 ft	693 ft	24,714 ft		31,408 ft	56,838 ft	8.4%
14"			17,433 ft			17,433 ft	2.6%
16"			54,741 ft		1,839 ft	56,580 ft	8.4%
Totals	18,731 ft	132,809 ft	120,440 ft	438 ft	402,089 ft	674,507 ft	100%

City records indicate that approximately 7%-9% of the water that is purchased from KCMO is lost within the distribution network. These losses can be attributed to leaks, water main breaks, and unmetered connections. Improvements to the system, such as replacement of aging mains, will help reduce water losses and extra expense to the City.

WATER SYSTEM SECURITY

The security of a City's water distribution system has always been a high priority. Water distribution facilities have traditionally been protected from tampering by the use of fences and locked gates. While these measures provide a level of protection from individuals who intend to deface or tamper with equipment, they provide little protection from those intent on causing widespread health problems. It is recommended that the City staff continue its proactive approach to addressing system security and complying with the EPA guidelines within the *Public Health Security and Bioterrorism Preparedness and Response Act of 2002*.

WATER SYSTEM ANALYSIS

Belton's water distribution system was analyzed using WaterGEMS Version V8i, from Bentley Systems. The water distribution system was imported into WaterGEMS from the City's 2005 system model. This data included pipe diameter, type, and age, pump stations and pumping characteristics, and water storage facilities. The existing model was compared to the City's GIS pipe data to verify size, type and age of all piping.

MODEL DEVELOPMENT

The hydraulic model was developed from the assimilation of information from four areas;

- Pipe and Node Feature Data. The pipe and node information stored in the City's existing system model, consists of physical locations and pipe attributes, such as diameter, material, age and elevations.
- Water Demand Information. Water demands represent points at which water is being consumed within the system.
- Specialty Feature Data. For the hydraulic model to simulate real-world conditions, specific information such as pump curves, and storage tanks sizes and shapes, must be added to the model.
- Operating Rules. These are the parameters by which features such as tank altitude valves open and close and pumps start and stop.

Pipe and Node Feature Data

The basic pipe data required for hydraulic model development is pipe diameter, roughness and the minor loss coefficients. All of this data was contained in the City's existing 2005 system model. Pipes installed since the 2005 model were added to the current model using the City's existing GIS data. Pipe material was used to assign initial values for coefficient of friction (C-values) in the model. The C-value indicates the pipe roughness and is the major factor in determining head loss for a given model run. Data for minor losses could be derived from data present in the GIS to some extent, but minor losses are not typically calculated or required for a distribution system model, as the pipe wall losses tend to be much more important in long lengths of pipe. The initial C-values which were assigned based on pipe material and age are shown in Table 4-7.

Table 4-7: Pipe C-values

Pipe Material	C-value
Ductile iron	130
Cast iron	120
PVC	130
Asbestos Cement	120
HDPE	125

Demand Allocation

Two sources of information were utilized to allocate the existing demand throughout the system. First, the City provided monthly information on water purchased from KCMO, as shown in Table 3-1. Second, the City provided large user demands for customers using more than 30,000 gallons per month.

These large demands were allocated at the addresses provided. The remaining demand (2.1 MGD less the total for large users) was allocated equally among the remaining customers at the locations provided by the City.

Future demands were estimated using both the future land use GIS data and the population projections. The future land use was initially compared to the existing land use to identify changes that are projected to occur during the planning period. Using the acreages provided in Table 2-2, a future land use map was developed for each of the time frames. Development was assumed to start in the core of the City and to proceed outwards towards the study boundaries.

Demands were added for each scenario for each land use throughout the planning period. The demands created by the City's wholesale customers, discussed previously in Section 3, were then added based on the information that they provided.

As previously discussed, peak day to average day and peak hour to average hour factors of 2.0 and 4.0, respectively, were used to simulate real-world demand conditions. These factors were then used to assess demand to the hydraulic model. At the City's direction, minimum fire flows of 1,500 gpm will be provided for residential areas and 3,500 gpm will be furnished in all non-residential areas. Additionally, the fire flow analysis was run with a minimum residual pressure of 20 psi.

With many of the commercial and industrial developments, the City receives requests for specific fire flows and pressure requirements. If pressures higher than the 20 psi modeled in this report are needed, the City should have their model rerun to determine whether the requested fire flows and corresponding pressures can be attained. It is recommended that the City make this a standard practice for any new non-residential development.

Specialty Feature Data

The process for developing specialty features included the following areas.

- Pump Curve data was derived from pump curves provided by the manufacturer. A shutoff point (flow of 0), several intermediate points and a run out point (maximum flow) were selected and manually loaded into the model as curves.
- Tank data was derived from information provided and tank design drawings. The tank geometry was used to derive a head/storage relationship for each tank.
- Valve data for the specialty valve in the system was derived. The setting for the pressure sustaining valve upstream of the ground reservoir near the Holmes Road pump station could not be provided. Based on data provided from the City, prior to 2012 it appeared that during peak summer demand, the KCMO Holmes Road connection could only provide approximately 500 gpm. Therefore, a flow control valve was added and set at 500 gpm to simulate the worst case scenario. The valve was opened and closed based upon the tank level.

Operating Rules

Operating rules were provided by the City and entered manually. While the City rotates the rules concerning lead and lag pumps each day, this cannot be easily accommodated in the model. A single pump was selected to be the lead, lag, etc. and used to operate based on the start/stop elevations provided by the City.

CALIBRATION

Hydrant flow tests were conducted throughout the City during the preparation of the Master Plan to calibrate the hydraulic model. The locations of the fire flow tests are shown on Figure 4-3 in Appendix B, and the test results are presented in Appendix C.

Of the 13 hydrants that were tested, eight showed flows within 10% $\pm$ of the modeled flow. This was considered acceptable for the purpose of this report. The other five tests were along existing large mains. The pressure drop for each of these five tests was only 2 to 3 psi. Based on similar systems, pressure drops of 10 psi or less can result in inaccurate flows. The only way to obtain accurate readings at these locations would have been to take flow readings at two or more hydrants simultaneously. This would produce a larger pressure drop and a better chance for a more accurate flow reading. Based on the results of the eight acceptable tests, it was concluded that the model had been properly calibrated.

MODEL RESULTS

Once calibrated, the hydraulic model was used to identify current deficiencies in the system before operational and mechanical improvements were made by KCMO during the Summer of 2012. The following are the results of these worst case analyses. For a graphical representation and a printout of the system pressures, see Appendices D & E.

Existing System – Current Maximum Day Demand (prior to Year 2012)

1. The Holmes Road ground storage tank is unable to replenish and becomes empty at 2:00 am of Day 2 of the simulation.
2. Holmes Road Pump No. 1, when pumping by itself, is pumping 1,364 gpm at 242 feet TDH (total dynamic head) and has a discharge pressure of 120 psi. With Pumps 1 and 2 pumping together, each is pumping at 1,260 gpm at 134 feet TDH and a discharge pressure of 135 psi.
3. North Scott Pumps are set to operate as variable speed pumps with a fixed discharge flow rate of 1,100 gpm. With one pump on, the pump head is 138 feet TDH and the discharge pressure is 89 psi. With two pumps on, the TDH for each pump is 147 feet and the discharge pressure is 93 psi. The flow is fixed at 1,100 gpm.
4. The 300,000 gallon elevated tank is able to replenish on Day 1 by 10:15 pm. On Day 2 of the simulation, the tank is not able to replenish and becomes empty by 6:00 pm.

5. The 1.5 MG elevated tank is able to replenish by 2:00 am of Day 2. The tank is not able to replenish at the end of Day 2 and drops to a low level of 1,199 (down 32 feet) at 9:00 pm.

6. Low pressure during peak hour demands with the elevated storage down 10 feet is 40 psi near the intersection of Kenneth and Cleveland. The high pressures during tank replenishment, with the elevated tanks down 10 feet is 150 psi at the discharge of the Homes Road pump station. The highest pressure within the distribution system is 116 psi near the intersection of Colbern Drive and Mary Way.

Most of the problems during maximum day demand are related to the inability to keep the Holmes Road ground storage tank full, because of the insufficient supply of water from KCMO.

Existing System – Current Maximum Day Demand with Fire Flows (prior to Year 2012)

1. Fire flows range from a low of 43 gpm (end of existing 2-inch line) to a high of 6000 gpm (along existing 16-inch lines).

2. There are a total of 195 junction nodes with fire flows less than 1,500 gpm, all of which are on 4-inch or smaller lines. This amounts to 13% of the total junction nodes on the model.

3. There are 588 junction nodes with flows between 1,500 gpm and 3,500 gpm. These amounts to 39.4% of the total junction nodes in the new model.

4. There are 707 junction nodes with fire flows greater than 3,500 gpm. This amounts to 47.6% of the total junction nodes in the model.

Renewal Projects

As described above, the hydraulic model was able to identify deficiencies in the City's existing water supply and storage system. The model was also able to identify deficiencies in the distribution system such as bottlenecks caused by small diameter pipes, or low pressures within dead-end sections of pipes. A fire flow analysis was performed on the system to highlight the areas of the water distribution network which are unable to meet the standards for pressure and flow capacity. Estimates for replacing these sections were then calculated and included in the CIP. Improvement projects generated by the modeling work are addressed in Section 6 – Capital Improvements Program.

Growth Projects

Using the future demand that had been determined for the planning period, the model was modified to simulate the anticipated growth of the City. At the direction of City staff, 16-inch water lines were placed along section lines to provide transmission mains to serve the growth areas. Modeling of the distribution network of 8-inch and 12-inch that will be installed by the developers was not necessary for the hydraulic model. Current City policy dictates that the installation of these lines is the responsibility of the developers. Estimates of construction costs were not created for these distribution lines and the CIP does not contain any growth projects of this type.

CAPITAL IMPROVEMENTS PHASING PLANS EVALUATION

An evaluation was conducted of various phasing plan alternatives to balance the required capital improvements with the ability of the City to fund the work. The final sequencing plan's objectives would be to phase in the improvements such that the daily and peak day demands are still met while increases in water rates are reduced, i.e. are more affordable and sensitive to the customers' economic circumstances. The alternatives were evaluated based upon the following criteria:

- The phasing plan was technically feasible to implement.
- Did not create unacceptable and unsafe operational conditions for the City.
- Resulted in a lower increase in water rates.
- Met the annual funding limitations of the MDNR SRF Loan Program

Selected Phasing Plan

The phasing plan selected by the City to best address the improvement objectives was to implement a 3-phased approach for capital improvements in a sequence which was more affordable over the long-term for City customers. This chosen alternative includes three main phases of capital improvements over an estimated six year period. The timing for these improvements depend on receiving a consistent supply of water from KCMO and the level of growth/development within the City that would increase water demand. Figure 4-4 illustrates the proposed phasing plan.

4. **Phase 1** - Commence with the installation of the 3.0 MG elevated storage tank first starting in Calendar Year 2013. The tank would rely

on being filled from water supplied solely by the two existing KCMO connections. Improvements at the existing 300,000 gallon storage tank and additional water distribution lines would also be required. To ensure adequate pumping for the short term, rehabilitation work would be required at the existing Holmes Rd. pump station. *Phase 1 cost is estimated to be $10.9 Million.*

5. **Phase 2** - Construct the new 24-inch transmission line (approximately 27,000 lf.) between WaterOne's system and the City's existing Holmes Road Pump station. Once connected, the City would be required to pay the WaterOne SDC fee for the first 1.0 MGD. Implement several waterline renewal projects estimated to cost about $500,000 to accelerate this pipe renewal program. These improvements would be targeted to start in Year 2017. *Phase 2 cost is estimated to be $10.0 Million.*
6. **Phase 3** - Installation of the new Holmes Road Booster Station, the 2.0 MG ground storage tank, and approximately 14,500 lineal feet of 16 and 24-inch transmission main from the new Holmes Rd. pump station to the new 3.0 MG elevated tank. These improvements would be delayed until Year 2018. *Phase 3 cost is estimated to be $10.2 Million.*

Phasing Plan Modeling Results

Until such time the WaterOne connection is made in 2017 to provide two sources of water to the City, it was necessary to review how the system would operate over the short-term with a new tower in place but water only supplied by KCMO. The following operational assumptions were made for this sequencing plan:

FIGURE 4-4

- Maximum day demand would be modeled over a 48 hour period.
- The existing Holmes Road pump station will be allowed to pump water into the three elevated storage tanks up to the 2.0 MGD available from KCMO. The City would operate 2 pumps at this facility in automatic mode.
- Both pump stations would be used to fill the new tank as well as the existing tanks.
- The North Scott pump station would operate two pumps, each at a maximum capacity of 1100 gallons per minute (3.2 MGD), and still maintain adequate suction pressure.
- Total water supply available from KCMO was 5.5 MGD during peak day demand.

Based on the above operating conditions and the proposed Phase 1 improvements only, the model was run for a two-day, worst case situation with the following system operating results:

1. The existing Holmes Road ground storage tank is able to supply water to the distribution system from 7:00 am on the first day until the end of the second day. The existing ground storage tank water level drops throughout the simulation to a low point of 958.0 (30 feet below overflow) by the end of Day 2.
2. The water level in the existing 1.5 MG elevated tank and in the new 3.0 MG Markey Road tank both fall to an elevation of 1215, or 15 feet below each tank's overflow elevation by 9:00 pm on the first day and is able to replenish by 6:00 am on Day 2.

3. The existing 300,000 gallon elevated tank water level drops to elevation 1218.0 (12 feet below its overflow level) at 9:00 pm on Day 1 and is able to replenish by 4:00 am on Day 2.
4. Pump Nos. 3 and 4 at the N. Scott Booster Pumping Station operated for a total of 14.0 and 38.5 hours, respectively, during the two day period.
5. Pump Nos. 1 and 2 at the existing Holmes Road Booster Pumping Station operated for a total of 39.5 and 27.0 hours, respectively, during the two day period.
6. Fire flows could be consistently maintained throughout the system at or above the 1,500 gpm flowrate required for adequate fire fighting during this phasing plan period. Sufficient fire flow would be available and assured following construction of the Phase 2 improvements – connection to the WaterOne water distribution system.

Based upon the results of the modeling analysis, the operating and fire flow conditions created by this scenario appear to be sufficient and meet the industry standards for flow capacity and pressure. It also appears that this phasing plan would not create operational problems and challenges for City staff for the short term. Finally, by phasing the construction of the needed improvements under this alternative, projected water rates would gradually increase over time, thus resulting in less of a burden on the rate payers. Therefore, it is recommended that this phasing plan be implemented starting with the Phase 1 capital improvements targeted for Year 2013.

5. RECOMMENDED IMPROVEMENTS

INTRODUCTION

The City experienced a surge in growth in the 1990s and early 2000s. Because of this growth, significant capital improvements were recommended for the City's water system in the 2005 Water Master Plan. Although the current economic condition has stifled new development, there remains are large number of capital improvement renewal projects which need to be undertaken. Additionally, the life expectancy of existing facilities and water mains has and will continue to decrease. These water distribution system improvements are needed to upgrade and replace aging infrastructure, address fire flow issues, and provide capacity for future growth. *Section 6 – Capital Improvements Program*, details the development of the capital improvements necessary to retain adequate service to the City's customers and residents.

The recommended improvements to the water distribution system are organized into the following five (5) main groups:

- General needs for proper system operation, maintenance and management, including the SCADA system upgrade, improvements to the Computer Maintenance & Management System (CMMS) software, a new Operation & Maintenance Facility, completion of studies, reports, and evaluations to determine long-term capital improvement needs and financial planning to maintain the viability of the City's water distribution system.

- Upgrade the City's pumping stations to address current problems, enhance reliability, and provide adequate capacity to meet present and future needs.
- Upgrade storage facilities to support water delivery for current and anticipated future population growth.
- Upgrade the water supply system by accessing a second source of water through a new connection to the existing water system operated by WaterOne.
- Water line and transmission main improvements required to provide sufficient flow to existing customers and provide service to future population growth areas.

GENERAL NEEDS

Recommended improvements to benefit City operation and management of the water distribution system include:

- Update the existing water connection fee structure used as the funding mechanism to sufficiently recover the costs of upgrading and expanding.
- Continue to implement and upgrade as necessary a full Computer Maintenance and Management System (CMMS).
- Continue to upgrade the City's Supervisory Control and Data Acquisition (SCADA) system to increase the performance of the system's response to fluctuating and emergency demands.

- Construct an Operations and Maintenance Facility for City staff, to allow them to better serve the needs of the community. A new facility will serve as a storage facility for spare parts and City-owned equipment and provide a central location for staff offices and records storage.
- Procure and install an Asset Management (AM) System to allow the City to more thoroughly track and maintain the City's existing and future assets as well as allowing for asset management based-decision making.
- Perform regular (every 7 to 10 years) Water Master Plan updates to ensure that the City's goals remain proactive and that funding mechanisms are in place to achieve these goals.
- Implement the recommendations presented in the 2011 Alternative Water Supply Study report.
- Perform a staffing and space needs study to determine the City's ability to adequate staff and provide resources for the short and long-term.
- Allocate the necessary resources and funding to ensure the continuous updating of the GIS network and hydraulic modeling software.
- Renegotiate the existing water purchase contract with Kansas City, Missouri and the existing water sales contract with Cass County Public Water Supply District No. 8.
- At such time the connection is to be made, negotiate and execute a new multi-year water purchase agreement with WaterOne of Johnson County, Kansas, as a second water supply source.

- Prepare a study to investigate additional sources of funding to support the Capital Improvements Program (CIP). These sources should include, but not be limited to, community development block grants, state and federal energy conservation grants, and low interest loans through the MDNR State Revolving Fund (SRF) Loan program.
- During the annual budget development process, utilize the water rate model to evaluate and develop the appropriate water rates that will generate the necessary revenue to cover annual operating expenditures, costs for ongoing infrastructure improvements and capital debt service amounts.
- Develop a standard procedure to analyze the fire flow demands for all non-residential developments. The hydraulic model should be run for the specific requirements of each development to make sure fire flow demands can be met.
- Continue the City's proactive approach to addressing system security and complying with the EPA guidelines within the *Public Health Security and Bioterrorism Preparedness and Response Act of 2002*.

PUMPING STATIONS

- In 2018, replace the existing Holmes Road Pumping Station with a new booster station designed to transport and distribute water obtained from WaterOne.
- Install disinfection systems at both pumping stations, if necessary, at the time new EPA regulations require such systems.

- Install a metering station at Holmes Road Pumping Station.
- When required in the future as growth occurs, expand the new Holmes Road Booster Station to meet the demand placed upon the water distribution system by the continuing growth of the City and potential Loch Lloyd.

STORAGE FACILITIES

- In Year 2013, construct a new 3-million gallon storage facility south of Markey Road and East of Prospect Road and install the associated distribution mains to connect to the existing water distribution system.
- In Year 2018, install a new 2.0 MG ground storage tank as part of the new Holmes Road booster pump station facility following the connection to WaterOne.
- Maintain and make needed repairs and improvements to the existing 300,000 gallon elevated storage tank.

DISTRIBUTION SYSTEM

- In Year 2017, make a connection to the WaterOne water distribution system by installing the necessary transmission line between WaterOne and the City's existing Holmes Road pump station.
- In Year 2018, install the required water transmission mains between the old Holmes Road pump station and the new booster station facility and 3.0 MG elevated tank.

- Upgrade the existing system to create 16-inch loops along section lines. These loops will feed an interconnecting grid of 12-inch and 8-inch water mains to provide adequate fire flow and pressures to existing customers and future growth areas.
- Replace aging and small water mains on a continuous basis to improve the integrity of the system and reduce water loss through leaks in the older pipes.
- Construct new water mains within the City's current and future service area as growth and water demand dictates.
- The City should continue its current practice to address the high system pressure issues by replacing the old cast iron pipe located at the lower elevations in the City. By replacing the cast iron pipe, the City has been gradually upgrading its infrastructure as well as reducing the amount of water main breaks due to high system pressure.

WATERONE CONNECTION PROJECT ANALYSIS AND RECOMMENDATIONS

The two highest priorities for the City are to increase their elevated storage volume and to secure a second supply of water from WaterOne. In order to determine the most economical solution to these needs, a total of six alternatives have been investigated. The alternatives that were investigated are explained below:

Alternative No. 1 - Construct a 24-inch supply line from the State Line and Kenneth Road intersection to the existing Homes Road ground storage tank. Abandon the existing Holmes Road booster pump station and construct a new booster pump station at the existing site. Install new 24-inch and 16-inch transmission mains to the new Markey Road elevated tank. Install a new altitude valve and mixing system for the existing 300,000 gallon tank. For a illustration of this alternative, refer to Figure No. 5-1 in Appendix D.

Alternative No. 1A – Same as Alternative No. 1, except the 24-inch supply line will be from the State Line across the north end of the Loch Lloyd development to the existing Holmes Road ground storage tank. See Figure No. 5-1 in Appendix D.

Alternative No. 2 – Construct a 24-inch supply line from State line and Kenneth Road to a new booster pump station and 2.0 MG ground storage site near the entrance to the Loch Lloyd properties, on the east side of Holmes Road. Abandon the existing Holmes Road booster pump station and 2.0 MG ground storage tank. Construct a new 16-inch transmission line to a new Markey Road elevated tank and install a new altitude valve and mixing system in the existing 300,000 gallon elevated tank. See Figure No. 5-2 in Appendix

D. Because of the higher elevation of the new booster pump station and ground storage tank, the existing KCMO Holmes Road supply connection would no longer be used.

Alternative No. 2A – Same as Alternative No. 2, except that the 24-inch supply line will be from the State line across the north end of the Loch Lloyd properties to the new booster pump station and ground storage site. See Figure No. 5-2 in Appendix D.

Alternative No. 3 – Construct a new 24-inch supply line from the State line and Kenneth Road to a new booster pump station site located ½ mile east of Holmes Road and the entrance to Loch Lloyd. Abandon the existing Holmes Road booster pump station and ground storage tank. Construct new 16-inch transmission lines to the New Markey Road elevated tank along with new altitude valve and mixing system for the existing 300,000 gallon tank. The KCMO Holmes Road supply connection will no longer be accessible, due to the elevation of the new booster pump station and ground storage tank. See Figure No. 5-3 in Appendix D.

Alternative No. 3A – Same as Alternative No. 3 except that the 24-inch supply line will be from the State line across the north end of Loch Lloyd development to the new booster pump station and ground storage site. See Figure No. 5-3 in Appendix D.

The following are summaries of the opinions of probable total project costs for the six alternatives. See Appendix G for detailed cost breakdowns.

Table 5-1: Alternative No. 1 Cost Estimate

Alternative No. 1			
1.	Transmission Main Improvements	$	5,505,800
2.	Booster Pump Station Improvements		1,825,000
3.	Storage Improvements		5,717,000
	Subtotal	$	13,047,800
	Contingency (25%)		3,262,100
	Subtotal Construction	$	16,309,900
	Engineering/Legal/Administration		4,077,500
	Total Project Cost	**$**	**20,387,400**

Table 5-2: Alternative No. 1A Cost Estimate

Alternative No. 1A			
1.	Transmission Main Improvements	$	5,898,200
2.	Booster Pump Station Improvements		1,825,000
3.	Storage Improvements		5,717,000
	Subtotal	$	13,440,200
	Contingency (25%)		3,360,200
	Subtotal Construction	$	16,800,400
	Engineering/Legal/Administration		4,200,100
	Total Project Cost	**$**	**21,000,500**

Table 5-3: Alternative No. 2 Cost Estimate

Alternative No. 2			
1.	Transmission Main Improvements	$	5,292,200
2.	Booster Pump Station Improvements		1,605,000
3.	Storage Improvements		7,062,000
	Subtotal	$	13,959,600
	Contingency (25%)		3,490,000
	Subtotal Construction	$	17,449,600
	Engineering/Legal/Administration		4,362,500
	Total Project Cost	**$**	**21,812,100**

Table 5-4: Alternative No. 2A Cost Estimate

Alternative No. 2A			
1.	Transmission Main Improvements	$	5,490,300
2.	Booster Pump Station Improvements		1,605,000
3.	Storage Improvements		7,062,000
	Subtotal	$	14,157,300
	Contingency (25%)		3,539,400
	Subtotal Construction	$	17,696,700
	Engineering/Legal/Administration		4,424,200
	Total Project Cost	**$**	**22,120,900**

Table 5-5: Alternative No. 3 Cost Estimate

Alternative No. 3			
1.	Transmission Main Improvements	$	5,768,600
2.	Booster Pump Station Improvements		1,705,000
3.	Storage Improvements		7,062,000
	Subtotal	$	14,535,600
	Contingency (25%)		3,634,000
	Subtotal Construction	$	18,169,600
	Engineering/Legal/Administration		4,542,400
	Total Project Cost	**$**	**22,712,000**

Table 5-6: Alternative No. 3A Cost Estimate

Alternative No. 3A			
1.	Transmission Main Improvements	$	5,970,100
2.	Booster Pump Station Improvements		1,705,000
3.	Storage Improvements		7,062,000
	Subtotal	$	14,737,100
	Contingency (25%)		3,684,300
	Subtotal Construction	$	18,421,400
	Engineering/Legal/Administration		4,605,400
	Total Project Cost	**$**	**23,026,800**

Alternatives Life Cycle Costs Analysis

Based upon initial total project costs, Alternative No. 1 appears to be the most economical. However, this initial project cost does not take into account the ongoing costs associated with the power, labor, operation and maintenance, and replacement cost of the proposed facilities. The following tables are summaries of the life cycle costs analysis, as Total Present Worth, conducted for each alternative.

Table 5-7: Alternative No. 1 Present Worth Value

Alternative No. 1 – Present Worth	
1. Initial Cost ($19,516,737 x .07358)	$ 20,387,400
2. Power Costs	2,456,724
3. Labor	214,820
4. Maintenance/Repairs	1,210,366
5. Replacement	128,505
Total Present Worth	**$ 24,397,815**

Assumptions:

1. Tanks are recoated every 10 years and repainted every 20 years.
2. New Booster Pump Station Pumps will be 200 HP.
3. Motors replaced every 10 years and pumps replaced every 20 years.
4. Interest Rate and inflation factor are equal.
5. Total life cycle = 50 years.

Table 5-8: Alternative No. 1A Present Worth Value

Alternative No. 1A – Present Worth	
1. Initial Cost ($20,129,788 x .07358)	$ 21,000,500
2. Power Costs	2,456,724
3. Labor	214,820
4. Maintenance/Repairs	1,210,366
5. Replacement	128,505
Total Present Worth	**$ 25,010,915**

Assumptions:

1. Tanks are recoated every 10 years and repainted every 20 years.
2. New Booster Pump Station Pumps will be 200 HP.
3. Motors replaced every 10 years and pumps replaced every 20 years.
4. Interest Rate and inflation factor are equal.
5. Total life cycle = 50 years.

Table 5-9: Alternative No. 2 Present Worth Value

Alternative No. 2 – Present Worth	
1. Initial Cost ($19,516,737 x .07358)	$ 21,812,100
2. Power Costs	1,228,384
3. Labor	214,820
4. Maintenance/Repairs	795,853
5. Replacement	75,498
Total Present Worth	**$ 24,126,655**

Assumptions:

1. Welded steel tanks recoated every 10 years and repainted every 20 years.
2. Ground storage tanks assumed to be prestressed concrete (no recoating or repainting).
3. New Booster Pump Station Pumps will be 100 HP.

4. Motors replaced every 10 years and pumps replaced every 20 years.
5. Interest Rate and inflation factor are equal.
6. Total life cycle = 50 years.

Table 5-10: Alternative No. 2A Present Worth Value

Alternative No. 2A – Present Worth	
6. Initial Cost ($19,516,737 x .07358)	$ 22,120,900
7. Power Costs	1,228,384
8. Labor	214,820
9. Maintenance/Repairs	795,853
10. Replacement	75,498
Total Present Worth	**$ 24,435,455**

Assumptions:

7. Welded steel tanks recoated every 10 years and repainted every 20 years.
8. Ground storage tanks assumed to be prestressed concrete (no recoating or repainting).
9. New Booster Pump Station Pumps will be 100 HP.
10. Motors replaced every 10 years and pumps replaced every 20 years.
11. Interest Rate and inflation factor are equal.
12. Total life cycle = 50 years.

Table 5-11: Alternative No. 3 Present Worth Value

Alternative No. 3 – Present Worth	
1. Initial Cost ($21,803,250 x .07358)	$ 22,712,000
2. Power Costs	1,228,384
3. Labor	214,820
4. Maintenance/Repairs	795,853
5. Replacement	75,498
Total Present Worth	**$ 25,026,555**

Assumptions:

1. Welded steel tanks recoated every 10 years and repainted every 20 years.
2. Ground storage tanks assumed to be prestressed concrete (no recoating or repainting).
3. New Booster Pump Station Pumps will be 100 HP.
4. Motors replaced every 10 years and pumps replaced every 20 years.
5. Interest Rate and inflation factor are equal.
6. Total life cycle = 50 years.

Table 5-12: Alternative No. 3A Present Worth Value

Alternative No. 3A – Present Worth	
1. Power Costs	1,228,384
2. Labor	214,820
3. Maintenance/Repairs	795,853
4. Replacement	75,498
Total Present Worth	**$ 25,341,355**

Assumptions:

1. Welded steel tanks recoated every 10 years and repainted every 20 years.
2. Ground storage tanks assumed to be prestressed concrete.

3. New Booster Pump Station Pumps will be 100 HP.
4. Motors replaced every 10 years and pumps replaced every 20 years.
5. Interest Rate and inflation factor are equal.
6. Total life cycle = 50 years.

Based on the Total Present Worth value, Alternative No. 2 appears to be the most economical. The proposed site for Alternatives No. 2, No. 2A, No. 3 and No. 3A will be on land currently being considered for mixed use development. The City had had initial conversations with the developers and they prefer that the facilities be located as shown in Alternatives No. 3 and No. 3A. Even though the present worth for Alternative No. 3 is estimated to be 3.7% higher than the present worth for Alternative No. 2, the City has expressed a desire to work with the developer on the final location. For the purpose of this report, Alternative No. 3 is recommended. It is recommended that the City continue to negotiations with the developer for the final location of the new facilities.

It should be noted that construction of the recommended improvements and the ongoing Capital Improvements Program will depend on passage of a revenue bond issue slated for April 2013. With passage of this bond issue, the City will be eligible for low-interest loans from the State Revolving Fund (SRF) loan program, administered by MDNR.

Should the Bond Issue fail to pass to fund the various improvement projects, the City may need to implement the following actions during times when peak water demand exceeds the available capacity of water that can be obtained from KCMO:

1. Moratorium on new water service connections.
2. Public and private water conservation measures during peak summer usages.
3. Enactment of the City's Emergency Management Plan.

6. CAPITAL IMPROVEMENTS PROGRAM

INTRODUCTION

This Capital Improvements Program (CIP) presents probable project costs and prioritized system improvements determined from the 2004 condition assessment of existing facilities and the recent hydraulic modeling of projected flows through the year 2035. The end result of this study is a CIP that itemizes suggested improvements on a yearly basis for the first three years (starting in 2013 through 2015) and five-year average estimates for each of the four subsequent five-year periods through 2035.

The timing of the growth projects listed in the CIP is based on the City's current projections of when and where growth will occur. The projected population for each 5-year period has been included in the CIP tables to assist the City in evaluating the need for growth projects. By comparing projected population figures with actual census data, the City will be able to determine when the projects need to be built.

PROJECT COST ESTIMATE ACCURACY AND CONTENT

The construction cost estimates for proposed system improvements are presented in terms of 2012 dollars. The accuracy of project cost estimates vary depending on the level of detail to which the project has been defined. Feasibility studies and master plans represent the lowest level of accuracy, whereas pre-bid estimates, also known as engineer's estimates of probable construction cost, represent the highest level. The American Association of Cost

Engineers developed the industry standards shown in Table 6-1 as a guide for managers in preparing budgets.

Table 6-1: Industry Standard Cost Estimating Guidelines

Estimate Type and Project Stage	Anticipated Accuracy (percent)
Order-of-Magnitude Estimates (facility plans and master plans)	+50 to -30
Budget Estimates (preliminary design reports)	+30 to -15
Definitive Estimates (pre-bid estimates of probable construction cost)	+15 to -5

The estimates presented within this master plan are considered to be within the order-of-magnitude accuracy level.

PROJECT COST ESTIMATE BASIS

Order-of-magnitude construction and project costs were developed for each project identified in Table 6-2, which appears at the end of this section. Each project listed includes a 25-percent contingency to account for unforeseen conditions and project variability that is normally present between a project's planning and bidding phases. An additional 25-percent factor is applied to the project construction cost, with contingencies included, to account for engineering, legal, and administrative (ELA) expenses. Fiscal budgets for the study period include an annual inflation rate of 3 percent per year.

FINANCIAL AND RATE STRUCTURE CONSIDERATIONS

The CIP project cost estimates have been prepared to provide guidance in establishing priorities. This program will also assist the City in scheduling

upgrades in service in advance of, or coinciding with, future growth and development. Actual project costs will vary from the cost estimates presented in the CIP based on a variety of factors. Funding needs must be carefully reviewed prior to making specific financial decisions or establishing final yearly budgets.

The City's current rate structure does not provide adequate funding for operation and maintenance costs and debt service of the proposed water system capital improvements. Therefore, a cost-of-services study was completed as part of the Master Plan update and the results of the study are included in Section 8 of this report. It is anticipated that the City's rate structure can be adjusted to a level that matches the actual costs to distribute drinking water. The cost-of-services study addresses future project funding alternatives, including state and local grant programs, the state revolving fund (SRF) loan program, bonds, etc.

PROJECT CATEGORIZATION, PRIORITIZATION & SCHEDULING

Table 6-2 presents detailed project cost information and annual budget levels required to complete construction and installation of the identified improvements through the year 2035. Table 6-3 provides descriptions of water main capital improvements for this same period. The improvements listed in Tables 6-2 and 6-3 were prioritized and scheduled for completion within each category (i.e. General Needs, Pumping Station, and Storage Facilities, Water Supply, and Water Lines and Mains) on the following basis:

General Needs, Pumping Stations, and Storage Facilities Improvements

- Existing pumping stations and storage facilities requiring improvement or rehabilitation or new pump stations and storage facilities required to meet current demands are categorized as "renewal" capital improvements.
- Capital improvements required to meet future demands are categorized as "growth" capital improvements.
- Projects with a priority ranking of 1 are needed within the first 3-year planning budget (2013-2015), those projects having a priority ranking of 2 are needed in the second term (2016-2020), projects with a priority ranking of 3 are needed in the third term (2021-2025), projects with a priority ranking of 4 are needed in the fourth term (2026-2030) and projects with a priority ranking of 5 are needed in the fifth term (2031-2035).
- Capital improvements needed during the first (2013-2015) and second terms (2016-2020) have been further ranked within the associated time period; a priority ranking of 1a is for fiscal Year 2013, 1b is for 2014, 2a is for 2016, 2b is for 2017, and soon on.

Water Supply

- Capital improvements in this series are categorized as "growth" and are specifically associated with construction improvements to access a supplemental source of water from Water District No. 1 of Johnson County, Kansas.

WATER LINES AND MAINS

- Existing water lines and transmission mains that lack sufficient capacity to convey present or future fire flows (as determined by the water distribution system hydraulic model) are categorized as "renewal" capital improvements.
- The replacement of cast iron and asbestos cement pipe are categorized as "renewal" capital improvements.
- Water lines and mains required to provide service to future development areas are categorized as "growth" capital improvements.
- Projects with a priority ranking of 1 are needed within the first 3-year planning budget (2013-2015), those projects having a priority ranking of 2 are needed in the second term (2016-2020), projects with a priority ranking of 3 are needed in the third term (2021-2025), projects with a priority ranking of 4 are needed in the fourth term (2026-2030) and projects with a priority ranking of 5 are needed in the fifth term (2031-2035).
- Capital improvements needed during the first (2013-2015) and second terms (2016-2020) have been further ranked within the associated time period; a priority ranking of 1a is for 2013, 1b is for 2014, 2a is for 2016, 2b is for 2017, and soon on.

CIP SUMMARY AND RECOMMENDATIONS

The plan of action for the City's water system can be summarized as follows:

- Secure a supplemental source of water from WaterOne of Johnson County, Kansas, and upgrade the existing pumping, storage and transmission system to meet current and projected water needs.
- Reinforce the existing water distribution system to provide optimal flows and pressures at all major piping nodes.
- Proactively plan for service area expansion by developing adequate revenue sources to fund the necessary capital improvements and operational costs to meet present and future water supply needs.
- Update the City's management system through the development of an asset management program with an updated Computerized Maintenance Management System (CMMS).

The CIP "renewal" projects have been prioritized by balancing the City's desire to continue removing old pipe from the system (cast iron and asbestos cement) along with the need to provide adequate flows and pressures. The areas with the lowest flows and pressures are addressed first and appear throughout the CIP in order of severity. The CIP "growth" projects have been prioritized based on anticipated growth patterns and the infrastructure necessary to meet those needs.

Although the program set forth in this section covers the period through the year 2035, the CIP should be reviewed and updated annually as part of the City's continuing efforts to maintain a high level of service to its customers. Proactive planning will enable the City to serve its current population and anticipated service area growth satisfactorily.

It has been recommended that the City explore alternate sources of funding to support the CIP. Funding of those projects recommended for construction during the first 3-year period will need to be provided through a City bond issue in conjunction with a State Revolving Fund (SRF) loan. Implementation of the recommended water rate study and new connection fee rate structure is required to enable the City be able to support additional growth and maintenance.

TABLE 6-2

City of Belton, Missouri
Water System Master Plan

Table 6-3: Belton Water Distribution System, Capital Improvement Detail

Project No.		Growth Renewal	Priority	Diameter (in)	Length (ft)	Project Description
WDS-	40300	Growth	1b	16	725	Bel-Ray Circle to Bel-Ray Blvd
WDS-	40400	Growth	1b	16	500	Hwy 58 - Bel-Ray to east end of existing 6"
WDS-	40500	Growth	1b	16	1,675	Dean Ext - Tank to Catron Ext
WDS-	40600	Growth	1b	16	1,845	Dean Ext - Catron Ext to East 179th
WDS-	40700	Growth	1b	16	5,905	Prospect - Hwy 58 S to East Cambridge
WDS-	40800	Growth	1c	16	5,310	East Cambridge - Prospect to Cleveland
WDS-	40900	Growth	1c	16	2,020	Bel-Ray Place - Hwy 58 to South Hwy 71 Crossing
WDS-	41100	Growth	1c	12	900	Hwy Y - South to Catron
WDS-	41200	Growth	1c	12	1,850	Hwy Y - Catron to E Cambridge
WDS-	41300	Growth	1c	12	1,250	Catron - Hwy Y to Maier
WDS-	41400	Growth	1c	12	1,375	Catron - Maier to end of existing 8"
WDS-	41500	Growth	1c	12	2,875	Catron Extension - End of Existing 8" to Dean Ext
WDS-	41600	Growth	2	16	3,100	East Cambridge W of S. Mullen
WDS-	41700	Growth	2	16	1,210	S. Mullen - End of existing 16" to E Cambridge
WDS-	41800	Growth	2	16	2,600	East 179th - S. Mullen to Dean Ext
WDS-	41900	Growth	2	12	4,125	Markey Parkway Ext - State Hwy Y to Mullen
WDS-	42000	Growth	2	16	8,425	North loop to end of Prospect
WDS-	42800	Growth	2	12 & 16	7,500	Prospect Ave 16" - East 155th to Hwy 58
WDS-	42900	Growth	2	16	3,110	Markey Parkway Ext - N Scott East to Hwy 71
WDS-	43000	Growth	3	12	1,900	Markey Parkway Ext - Hwy Y NW to New 16"
WDS-	43400	Growth	2	16	1,400	S Cleveland - E Cambridge to existing 16"
WDS-	43500	Growth	3	16	2,700	Cleveland - Sunrise to E Cambridge
WDS-	43600	Growth	3	16	2,675	Cleveland - Hwy 58 to Sunrise
WDS-	43700	Growth	3	12	800	Sunrise - Cleveland to Buenta Vista
WDS-	43900	Growth	3	16	2,150	East Cambridge - Cleveland to Pawnee
WDS-	44500	Growth	3	16	2,000	E Cambridge - Pawnee to Scott
WDS-	44600	Growth	3	16	1,125	E Cambridge - Scott to Hwy Y
WDS-	44700	Growth	3	16	125	Connect Scott to Hwy Y at E Cambridge
WDS-	44800	Growth	4	12	1,425	South Street - Scott to Hwy Y
WDS-	44900	Growth	3	12	1,000	Hwy 58 - Starlight to South Peculiar
WDS-	45000	Growth	3	12	1,475	Hwy 58 (North Side) - South Mullen to existing16"
WDS-	45200	Growth	3	12	3,075	Bel-Ray Blvd. - State Hwy 58 to Spring Valley
WDS-	45500	Growth	3	12	2,000	Hwy Y - South to Minnie
WDS-	45600	Growth	3	12	1,200	Hwy Y - Minnie to Hwy 58
WDS-	45700	Growth	3	12	3,175	Hwy 58 (south side) - Hwy Y to end of existing 12"
WDS-	45900	Growth	3	16	1,675	East 179th - Dean Ext to S. Peculiar
WDS-	46000	Growth	3	12	3,000	Vicie - East 155th to East 160th
WDS-	46200	Growth	3	16	3,075	N. Hwy 71 Crossing to East 163rd
WDS-	46300	Growth	5	12	1,950	East 162nd & Kay - west to New 16"
WDS-	46400	Growth	4	16	3,300	East Outer Rd. - East 163rd to Middle Hwy 71 Crossing
WDS-	46500	Growth	4	12	1,075	Bel-Ray Dr. - Jasmine to Spring Valley
WDS-	46600	Growth	4	16	3,300	South Kentucky - N. end of 16" to 163rd
WDS-	46700	Growth	4	16	4,475	East 155th - Vicie to Harris
WDS-	46800	Growth	4	12	4,700	Harris - 163rd to East 155th
WDS-	46900	Growth	4	12	1,775	Dean Ext - East 179th to Node 122
WDS-	47000	Growth	4	12	2,525	Node 122 west to South Mullen
WDS-	47100	Growth	4	12	2,525	Dean Ext - Node 122 to N. Cass Pkwy
WDS-	47200	Growth	4	16	4,250	N. Cass Pkwy - S. Peculiar to S. Mullen
WDS-	47300	Growth	4	16	4,400	S. Peculiar - East 179th to N. Cass Pkwy
WDS-	47400	Growth	4	12	900	Vivian/Elmyra Connector
WDS-	48500	Growth	4	16	3,500	East Outer - North Hwy 71 Crossing to near Grand
WDS-	48600	Growth	4	16	2,850	East Outer & 155th Street near Grant to Valley

City of Belton, Missouri
Water System Master Plan

Table 6-3: Belton Water Distribution System, Capital Improvement Detail

Project No.		Growth Renewal	Priority	Diameter (in)	Length (ft)	Project Description
WDS-	48700	Growth	5	16	1,925	East 155th Street - Valley to Vicie
WDS-	48900	Growth	5	16	1,900	East Outer Rd. - Hwy 71 Middle Crossing to Crystal Street
WDS-	49000	Growth	5	12	2,150	East Outer Rd. - Crystal to Spring Valley & Jasmine
WDS-	49100	Growth	5	16	2,275	Middle Hwy 71 Crossing - West & South to S. Mullen
WDS-	49200	Growth	5	16	3,250	East Outer Rd. - Crystal Street to Hwy 58
WDS-	49300	Growth	5	16	3,900	Kentucky - East 155th to end of existing 16"
WDS-	49400	Growth	5	16	2,700	East 155th - Harris to Kentucky
WDS-	49500	Growth	5	16	2,650	Hwy Y - East Cambridge to end of 6"
WDS-	50400	Growth	5	16	1,550	S. Mullen - East 179th to new 12"
WDS-	50500	Growth	5	16	2,250	S. Mullen - New 12" south to N. Cass Pkwy
WDS-	51500	Growth	5	16	5,275	165th & Hwy D west to Prospect
WDS-	51600	Growth	5	12	3,650	East 155th to 16" crossing west of Prospect
WDS-	51700	Growth	5	12	5,300	Hwy D to Prospect south of 155th
WDS-	51800	Growth	5	12	4,000	Mid 51500 South to New 16"
WDS-	60000	Renewal	4	12	2,325	North side of Hwy 58 - Westover to N. Scott
WDS-	60100	Renewal	2	8	610	N Chestnut Street small line Improvements
WDS-	60200	Renewal	1c	8 & 16	885	East Outer Rd. and Grand Street Area - Small Line Improvements
WDS-	60300	Renewal	2	8 & 12	11,675	162nd N to 160th - Kay Ave E to Valentine Ave - Small Line Improvements
WDS-	60400	Renewal	2	8	2,250	Vicie Ave near 163rd St. - Small Line Improvements
WDS-	60500	Renewal	1b	8	300	Spring Valley Ct. - Small Line Improvements
WDS-	60600	Renewal	1b	8	750	Myron Ave - small line improvements
WDS-	60700	Renewal	1b	8	825	Hawthorne Ct - small line improvements
WDS-	60800	Renewal	1b	8	600	Manor Ct - small line improvements
WDS-	60900	Renewal	1b	8	675	Turner Rd - small line improvements
WDS-	61000	Renewal	1b	8	400	End of A Street and East Ave - Small Line Improvements
WDS-	61100	Renewal	1b	8	900	South of Walnut Between Colbern and Baldwin
WDS-	61200	Renewal	1b	8	1,150	Mill Ave - Baldwin to Scott
WDS-	61300	Renewal	2	8 & 12	12,410	Cast Iron Replacement Priority Area 1
WDS-	61400	Renewal	1b	8 & 12	5,180	Asbestos Cement Pipe Replacements Priority Area 1
WDS-	61500	Renewal	1c	8	2,050	Belton Avenue - Markey to King
WDS-	61600	Renewal	1b	8	3,600	Asbestos Cement Pipe Replacements Priority Area 2
WDS-	61700	Renewal	2	12	1,050	163rd (south side) - west of Vicie to Terry
WDS-	61800	Renewal	2	12	3,925	163rd - South Mullen to Hight & Spring Valley to Kentucky
WDS-	61900	Renewal	1c	8 & 12	3,955	Asbestos Cement Pipe Replacements Priority Area 3
WDS-	62000	Renewal	2	8	14,770	Cast Iron Replacement Priority Area 2
WDS-	62100	Renewal	2	16	525	South Kentucky - Spring Valley to 6" South
WDS-	62200	Renewal	2	16	350	South Kentucky - Spring Valley to 6" North
WDS-	62300	Renewal	2	12	1,750	Spring Valley - Bel-Ray Dr to 163rd
WDS-	62400	Renewal	1c	8	3,750	Asbestos Cement Pipe Replacements Priority Area 4
WDS-	62600	Renewal	2	16	1,950	163rd - Hight to Spring Valley
WDS-	62700	Renewal	3	12	1,075	Airway - Westover to Park
WDS-	62800	Renewal	3	12	1,850	Park - Airway to King & Belton
WDS-	62900	Renewal	3	12	650	King - Belton to Berry
WDS-	63000	Renewal	3	12	625	King - Berry to N Scott
WDS-	63100	Renewal	3	12	2,870	Westover Road - Shawn Dr. to Hwy 58
WDS-	63200	Renewal	3	12	1,175	Kenneth - Westover to Cleveland
WDS-	63300	Renewal	3	12	1,250	Kenneth - Cleveland to Sandra
WDS-	63400	Renewal	3	12	800	Sandra - Kenneth to Sherman
WDS-	63500	Renewal	3	12	1,020	Sherman - Sandra to Cherry Hill
WDS-	63600	Renewal	3	12	1,550	Cherry Hill - Sherman to Hwy 58
WDS-	63800	Renewal	3	12	750	Vivian - small line improvements

7. WATER CONNECTION FEE

INTRODUCTION

The improvements identified in this report will require a significant investment by the City. Projects totaling over $43.3 million have been recommended over the next eight years (2013-2020). Equally important to implementing these improvements, is providing the means to fund them. To continue a strategy of "growth paying for growth", the City's water Connection Fees needed to be updated. Therefore, an equitable and legally defensible water Connection Fee was developed. This will allow the City to accommodate growth without burdening existing customers with the cost of providing service to new customers. Table 7-1 presents an overview of the CIP project costs separated by the growth and renewal categories.

Table 7-1: Water Master Plan CIP – Total Growth and Renewal

CIP Category	Growth in 2013$	Renewal in 2013$
General Needs (studies, reports, etc.)[1]	$ -	$2,381,000
Pumping Stations[2]	$3,440,000	$2,248,400
Storage Facilities[2]	$8,644,800	$2,817,000
Water Supply	$15,464,600	$ -
Water Lines and Mains[2]	$14,121,000	$11,988,000
Total	$41,690,400	$19,434,400

[1] Excluded from Connection Fee calculations (almost all renewal related)

[2] Includes 25% Contingency and 25% Engineering & Administration Fees

CAPITAL CHARGES

In 2005, a capital cost recovery mechanism was designed to recover the cost of capital improvements needed to meet the demand requirements for planned growth in the city's water system service area. The 2011 update of the Water Master Plan included a review and update of the current connection fee structure implemented by the City.

CONNECTION FEES

Connection Fees provide a method for recovering the costs of expanding the water system to accommodate new customers. These are one-time charges paid by new development to fund the infrastructure constructed to serve it. The costs used to develop Connection Fees are separate from those used in developing the City's water rate charges.

The basic concept for developing the Connection Fees begins by determining the current and future capital costs needed to provide service for new growth. These capital costs, divided by the capacity of each element, forms the basis for calculating the Connection Fee.

There were two alternative methods used for calculating the Connection Fee. Both are based on the "buy-in" method.

System Buy-In Method

The methodology used in this study was similar to the method used in the 2004 study, which recognizes that each new connection places a demand upon the established water distribution system. The new connection should thus contribute on a pro-rata basis to supporting the system's operation. Various techniques can be used to determine the value of the system to which the new connection is being made. One technique is to use the historical gross book value of the system, plus planned capital improvements. Another technique employs estimates of current replacement costs of fixed assets for the existing system plus planned capital improvements.

Hybrids of both techniques were used to develop alternative Connection Fee calculations for this study; however, both are based on the system buy-in concept. These alternative Connection Fee calculations are described as follows:

- **Alternative 1 -** Connection Fee calculated based on original asset cost divided by design capacity of the asset (storage, pumping, transmission).
- **Alternative 2** - Connection Fee calculated based on asset replacement cost divided by estimated system capacity at the end of the planning period.

Alternative 1

There are three basic components of a water system for which capacity must be available to serve customers. These are: a) water treatment, b) finished water

storage, and c) water pumping and transmission. The cost of capacity for each of these components are developed below.

Water Treatment

The City currently purchases its water from KCMO and intends to purchase additional water from WaterOne of Johnson County, Kansas. The costs for all improvements to supply water from WaterOne to the City to meet the City's needs will be born solely by the City. Therefore, it was necessary for the City to revisit the Connection Fee calculation to include these additional costs.

Storage

The City has a number of storage facilities. These are listed, along with their estimated construction costs, in Table 7-2. Based upon the construction costs and the planned increases in system capacity, the cost per gallon for storage is $1.85. The existing 2,000,000-gallon ground reservoir at the Holmes Road pump station was not included in the connection fee calculation. This is because this storage facility will be replaced by the proposed 2-million gallon storage tank in 2018; thus including it in the connection fee calculation would double count the capacity and cost for this tank.

Table 7-2: Storage Facility Costs

	Year	Capacity (Gallons)	Cost
Existing Storage Tanks			
Ground Reservoir	1967	-	$ -
1.5-MG Tank	1982	1,500,000	$1,125,000
300K storage tank	1967	-	$ -
	Total:	1,500,000	$1,125,000
	Future		
Elevated Tank	2013	3,000,000	$8,664,800
Improve Existing Elevated Tank	2013	300,000	$297,000
Ground Storage Tank	2018	2,000,000	$2,520,000
	Total:	5,300,000	$11,481,800

Cost Per Unit of Service:

Water Storage
Additional Cost: $12,606,800
Storage Capacity (2035): 6,800,000
Cost/Gallon: $1.85

Transmission & Pumping

The cost of core transmission capacity can be legitimately recovered from the utility Connection Fee. Core transmission excludes smaller size lines that are paid for by developers or through the local facility charge. The estimated construction costs for pipelines 12-inches and greater were used to calculate the capacity cost. Pipe sizes less than 12-inches are considered part of the water system's distribution network and are excluded from this calculation. Additionally, a portion of the new 24" transmission that will connect the City with WaterOne was included in the calculation. This particular project adds value to existing customers (renewal), but approximately 70% of the capital cost was allocated to future growth. The transmission costs are presented in

Table 7-3. Based upon the construction costs and the planned increases in system transmission mains, the cost per peak-hour gallon for storage is $2.37.

Table 7-3: Transmission Main Costs

LF	Year	Diameter	Cost
Existing			
56,838	1992-2010	12"	$1,990,200
17,433	1967-2010	14"	$702,100
56,580	2001-2010	16"	$2,546,400
		Total:	$5,238,700
Future			
	2013-2035	12" & 16"	$14,121,000
Water Supply	2017	24"	$6,251,000
		Total:	$20,372,000
	Total Transmission:		$25,610,700

Cost Per Unit of Service:

Transmission
Cost: $25,610,700
Peak-Hour Demand (2035): 10,800,000
Cost/Peak-Hour/Gallon: $2.37

The cost for pumping stations is also part of the transmission cost. Since pumping stations are designed to meet peak-day demand, these costs are based on the peak-day capacity of the pump stations. These costs are shown in Table 7-4. Based upon the construction costs and the planned increases in system pumping capacity, the cost per peak-day gallon for storage is $0.21.

Table 7-4: Pumping Station Costs

		Year	Capacity	Cost
Pumping Stations				
Holmes				
Holmes Pump #1	Expansion	2018	3.00	$3,120,000
Holmes Pump #2	Expansion	2018	3.00	
Holmes Pump #3	Expansion	2018	3.00	
Holmes Pump #4	Expansion	2027	3.00	$320,000
		Total:	12.00	$3,440,000
North Scott				
NS Pump #1	Current	2010	2.52	
NS Pump #2	Current	1983	1.44	
NS Pump #3	Current	2005	1.44	
NS Pump #4	Current	2005	1.44	$519,000
		Total	6.84	$519,000
		Total:	18.84	$3,959,000
Cost Per Unit of Service:				
Pump Stations				
Cost:	$3,959,000			
Peak-Day Capacity (2035):	18,840,000			
Cost/Peak-Day/Gallon	**$0.21**			

Alternative 1 Connection Fee Calculation

In developing Alternative 1 Connection Fees, the buy-in costs for each of the three major water system components was combined to determine the total buy-in cost to serve new connections. An Equivalent Residential Unit (5/8" - 3/4" meter) is defined as a customer that uses 270-gallons per day on an annual average basis (based on 100-gallons per capita). Since pump stations are sized to meet peak-day demands, a factor of 2.0 was applied to the

Equivalent Residential Unit (ERU) to determine the peak-day demand. Therefore, peak-day demand for a residential unit was calculated to be 540-gallons per day.

Transmission facilities are sized to meet peak-hour conditions. Using a peak-hour factor of 4.0, 1,080-gallons per unit per day was calculated as the peak-hour demand for a residential unit. Based upon the storage requirements provided by the City, 282-gallons per ERU was used. Using these values, along with the unit costs of capacity developed in the previous section, the total buy-in cost of serving a new residential connection to the water system was computed. Table 7-5 presents this buy-in cost calculation, the total of which is $3,195 for a residential unit.

Table 7-5: Alternative 1 Connection Fee Calculation

Water Treatment					
	$ -	/Gallon			
	270	Average-Day/ERU	$ -	=	$ -
Storage					
	$1.85	/Gallon			
	282	Gallons/ERU			
	282	Storage Gallons	$1.85	=	$521.70
Transmission					
	$2.28	/Peak-Hour			
	270	Gallons/ERU			
	1080	Peak-Hour/ERU	$2.28	=	$2,559.60
Pumping					
	$0.21	/Peak-Day			
	270	Average Day/ERU			
	540	Peak-Day/ERU	$0.21	=	$113.40

Water Transmission	$2,559.60
Pumping Station	$113.40
Storage	$521.70
Treatment	$ -
Proposed Impact Fee/ERU	$3,195.00

This Connection Fee of $3,195 per Equivalent Residential Unit (ERU) was used to develop a Connection Fee schedule based on meter size. ERU conversion factors were taken from AWWA Manual No. M1. These factors are based on the flow rates of each meter size compared to that for a 5/8" meter. The Connection Fee schedule is presented in Table 7-7.

ALTERNATIVE 2

For the second alternative, the systems asset value was changed from original cost to replacement cost. Using the Engineering News-Record (ENR) construction and building cost indices, water system asset values were escalated from the average year of their construction to present-day costs. These replacement costs were combined with the costs for the improvements included in the CIP to determine the total system capital cost.

The Connection Fee was then calculated by dividing this cost by the corresponding total planned system capacity. This calculation is summarized in Table 7-6.

Table 7-6: Alternative 2 Connection Fee Calculation

	Original Cost	2013 $
Water Treatment		
Existing Treatment	$ -	$ -
CIP Treatment	$ -	$ -
Total Treatment:	$ -	$ -
Storage		
Existing Storage	$1,125,000	$4,290,650
CIP Storage	$ -	$11,184,800
Total Storage:	$1,125,000	$15,475,450
Transmission		
Existing Transmission	$5,238,700	$12,909,650
CIP Transmission	$ -	$14,121,000
Water Supply Transmission	$-	$10,114,600
Total Transmission:	$5,238,700	$37,145,250
Pumping		
Existing Pumping	$519,000	$990,610
CIP Pumping	$ -	$3,120,000
Total Pumping:	$519,000	$4,110,610
Total Cost	$6,882,700	$56,731,310
Total Capacity (2035 Average Day Demand)		2,700,000 gal
	Cost/Gallon =	$21.01
	Gallons/Day	ERU
Average Day Use/ERU	270	$5,670

The Connection Fee schedule based on Alternative 2 and how it compares with Alternate 1 is presented in Table 7-7.

Table 7-7: Alternative Connection Fees Schedule Comparison

Meter Size	Equivalent Size	Alternative No.1 Connection Fee	Alternative No. 2 Connection Fee
5/8"	1	$3,195	$5,670
1"	2.5	$7,990	$14,175
1 1/2"	5	$15,980	$28,350
2"	8	$25,570	$45,360
3"	15	$47,940	$85,050
4"	25	$79,900	$141,750
6"	62.5	$199,700	$354,375

Wholesale Customer Connection Fees

The City should continue implementing their program in handling wholesale customer connection fees that has been underway since the previous Master Plan recommended a fee system be developed.

SUMMARY

The buy-in/incremental cost method upon which Alternatives 1 and 2 are based still remains an accurate and defensible method for establishing and updating capital cost recovery charges. Alternative 1 is recommended for adoption because it better matches the cost of the asset function with customer demand. Thus, the water Connection Fee should be established at $3,195 per ERU (5/8" – 3/4" meter). This is in line with the fees charged by other local communities (see Table 7-8 for comparison of connection fees). Refer to Figure 7-1 which

graphically shows other local communities connection fees for 5/8" and ¾" meters.

Table 7-8: Community Connection Fee Comparison

Community	Residential Fee[1]	Comment
Belton, MO	$3,195	Master Plan Recommendation
Raymore, MO	$2,263	
Grain Valley, MO	$3,149 & $4,724	For 5/8" and 3/4" respectively
Liberty, MO	$2,225	
Smithville, MO	$2,400	
Lee's Summit, MO	$3,054	
Johnson County, KS - Water No. 1	$5,480 & $7,940	For 5/8" and 3/4" respectively (2012)
Olathe, KS	$4,030	Single Family House, Duplex

[1]5/8" to 3/4" meter

Figure 7-1

8. WATER RATE STUDY

INTRODUCTION

A financial assessment of the City's water fund was undertaken to determine the current condition of the water fund. Afterwards, the evaluation and development of a water rate structure was conducted to meet the following objectives: (1) accurately reflect the cost of water, (2) is fair and equitable, (3) meets the debt service requirements resulting from capital improvements identified in this water master plan, and (4) meets various financial ratios in order to have a fundamentally and sustainable water fund.

Water rate structures are becoming an important tool for encouraging the most efficient use of water resources. To promote efficiency, water rate structures must communicate the true cost of water. The true cost of water includes: (1) the water fund's operation and maintenance costs, (2) meeting debt service requirements, (3) costs to meet future demands, and (4) generating adequate reserves.

The following ratios were used as guidance in analyzing and setting the water rate structure:

- Debt Service Coverage Ratio > 1.10
- Operating Ratio > 1.20
- Days in Operating Cash > 180 days

Most water rate structures are made up of two charges. Both charges play a role in determining how effectively a water rate structure communicates an efficiency message to the customer.

- Base Rate = the fixed service fee per billing period, regardless of consumption level. Debt service requirements should be factored in when determining the base rate.
- Consumption Rate = the price for each unit of water consumed.

There are four basic water rate structures which consist of the following:

- Decreasing block rates – The unit price for water decreases as the volume increases. This structure does not generate conservation.
- Increasing block rates – The unit price for water increases as the volume consumed increases. This structure encourages water conservation.
- Uniform rates – The unit price for water is constant regardless of volume. This structure encourages more consumption.
- Seasonal rates – The unit price for water is set to vary from season to season.

The water rate structure should also be designed to create revenue stability for the water fund. Revenue stability allows the water fund to collect revenues to pay for the cost of operations, debt service, and generate adequate reserves. The revenue should not be dependent on economic conditions.

FINANCIAL ASSESSMENT

Initially, a financial assessment of the water enterprise fund was made, starting with a review of the historical audited financial statements of the water fund in order to determine the financial condition of the fund. The water fund was evaluated on the following financial ratios:

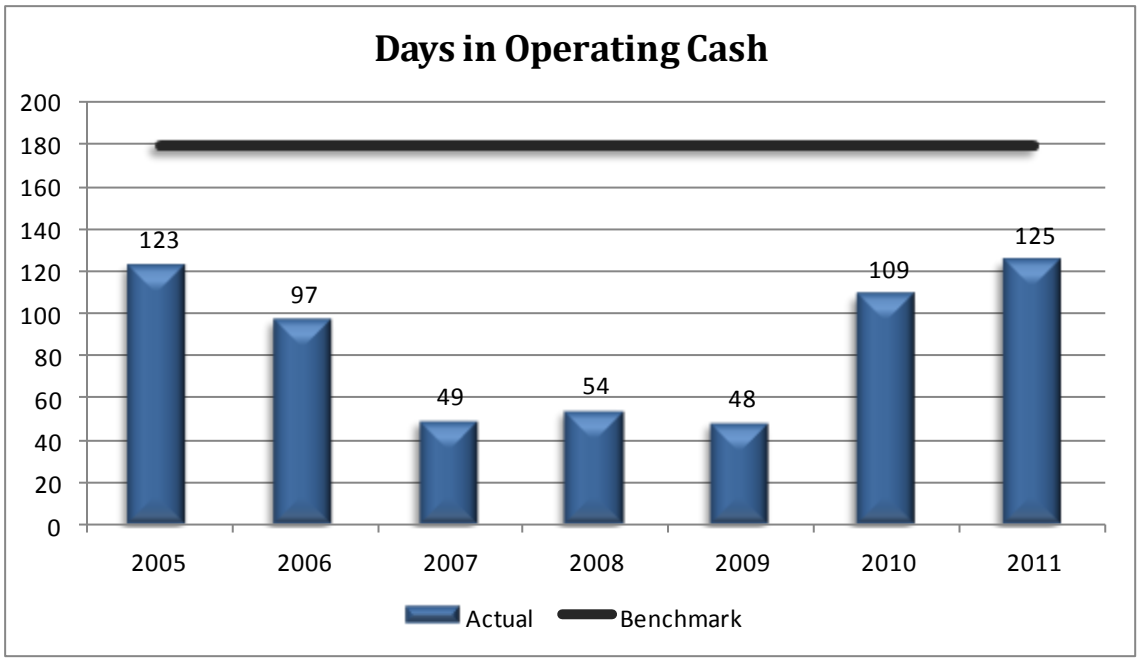
1. *Days in Operating Cash* **–** this ratio is used to determine whether the water fund has adequate cash reserves to meet operating expenses. A ratio greater than or equal to 180 days is considered adequate. The ratio is calculated by dividing Unrestricted Cash by the difference between Operating Expenses and Depreciation plus Amortization divided by 365 days.
2. *Operating Ratio* – this ratio compares water sales to operating expenses less deprecation. A ratio greater than 1.20 is considered normal. The ratio is calculated by dividing Water Revenue by the difference between Operating Expenses and Depreciation plus Amortization.
3. *Debt Service Coverage Ratio* – this ratio is important if the fund has borrowed money and is required in the bond or loan document to meet a debt service coverage ratio, usually ranging from 1.10 to 1.25. The ratio is calculated by adding Net Income (Loss) + Interest Expense + Depreciation and Amortization divided by Principal + Interest (Debt Service).
4. *Trends* – this includes the compounded annual growth rate (CAGR) of water revenue compared to the compounded annual growth rate (CAGR) of operating expenses.
5. *Debt Capacity* – this analysis determines the maximum amount the fund could borrow based on current rates, a debt service coverage ratio of 1.10,

term of 20 years and an interest rate of 5%, which represents the current 20 year bond buyer index.

Days in Operating Cash

Figure 8-1 represents the financial assessment of the water fund before any water rate restructuring. As shown below, the Days in Operating Cash factor is below the benchmark of 180 days. The average Days in Operating Cash figure over the 7 year period was 86 days. In 2011, the water fund had an unrestricted cash balance of $1,601,283. In order to meet the days in cash of 180 days, the cash balance would need to be $2,300,940.

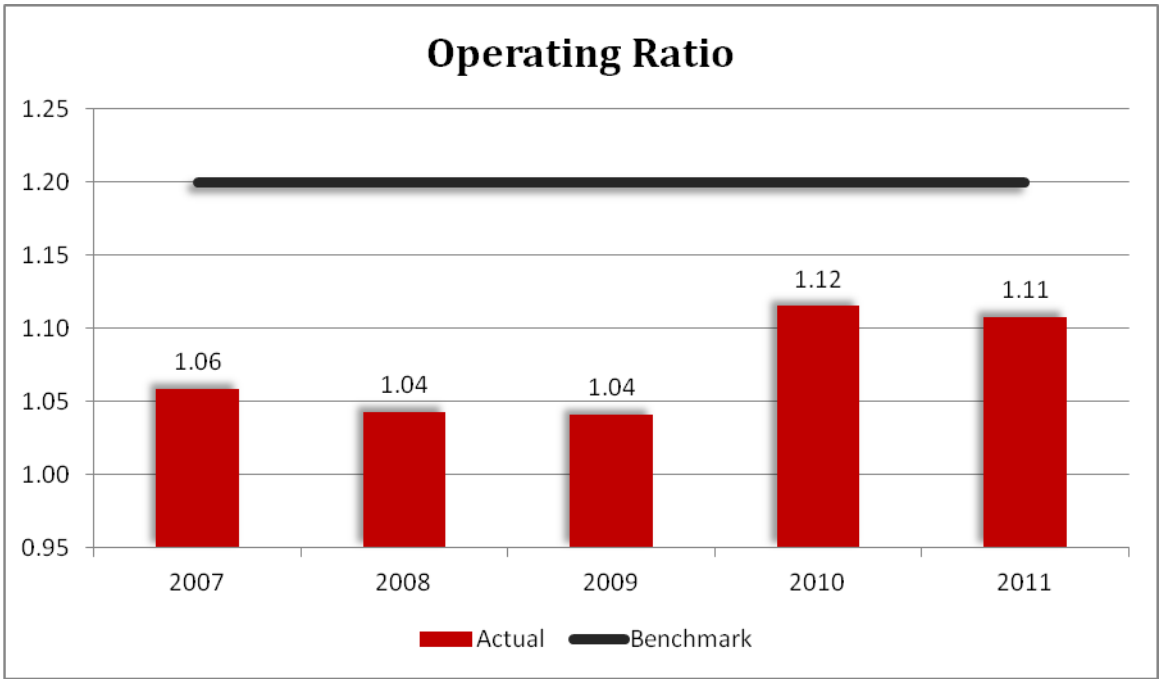
Figure 8-1: Days in Operating Cash



Operating Ratio

Based on the analysis, the current water rate structure is not generating enough revenue to cover the operating expenses plus 20%. In order to meet an Operating Ratio of 1.20 in 2011, the water fund would have needed additional revenue of $391,000 or a reduction in operating expenses or a combination of both. Figure 8-2 shows the comparison of the Operating Ratio for the last 7 years as compared to the recommended benchmark ratio.

Figure 8-2: Operating Ratio



Debt Capacity

Because the water fund currently had minimal debt service, the Debt Service Coverage Ratio was not relevant for 2011. However, the Debt Service Coverage Ratio will become relevant when issuing debt for the major capital improvements projects listed in Chapter 6. Table 8-1 summarizes the results from calculating the

maximum borrowing capacity of the water fund without any water rate restructuring. As show in the table, the amounts were based on the current rate structure and operating expenses, thus the maximum borrowing capacity is $5,349,415. This indicates that any additional borrowing above the $5.3 million will require a rate adjustment to pay for the debt service and meet a debt service coverage ratio of 1.10.

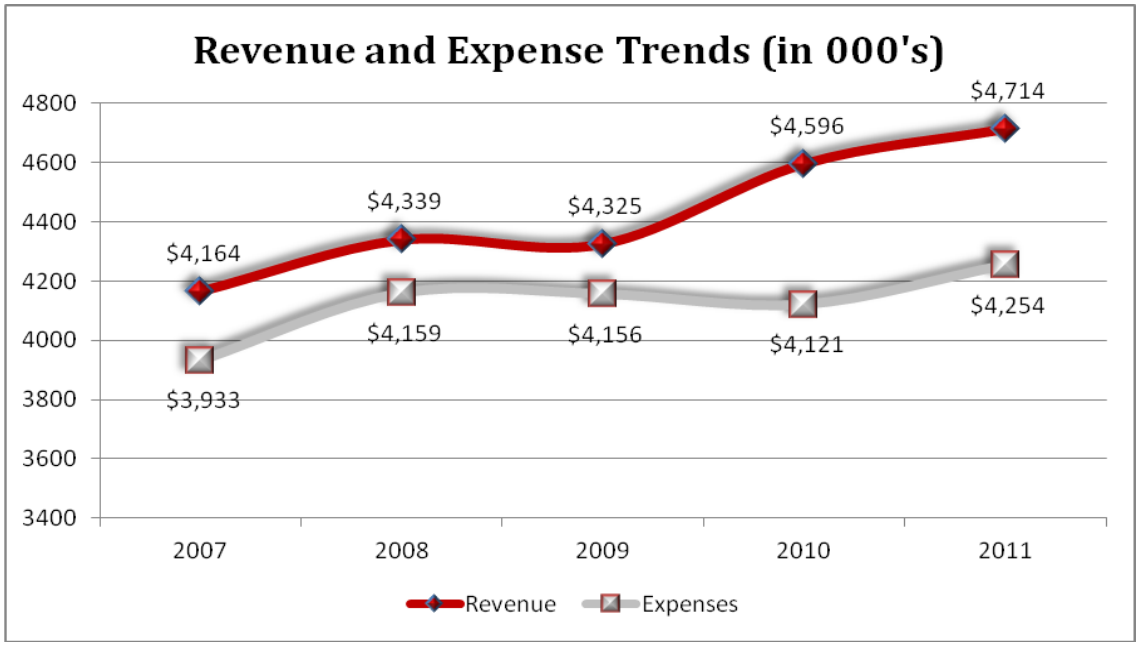
Table 8-1: Water Fund Maximum Borrowing Capacity

Description	Results	
Net Income	$	60,252
Interest Expense	$	30,906
Depreciation	$	381,018
Available for Debt Service	$	472,176
Debt Service Coverage Ratio		1.10
Maximum Debt Service	$	429,251
Term		20
Annual Interest Rate		5%
Maximum Borrowing Amount	$	5,349,415

Revenue and Operating Expense Trends

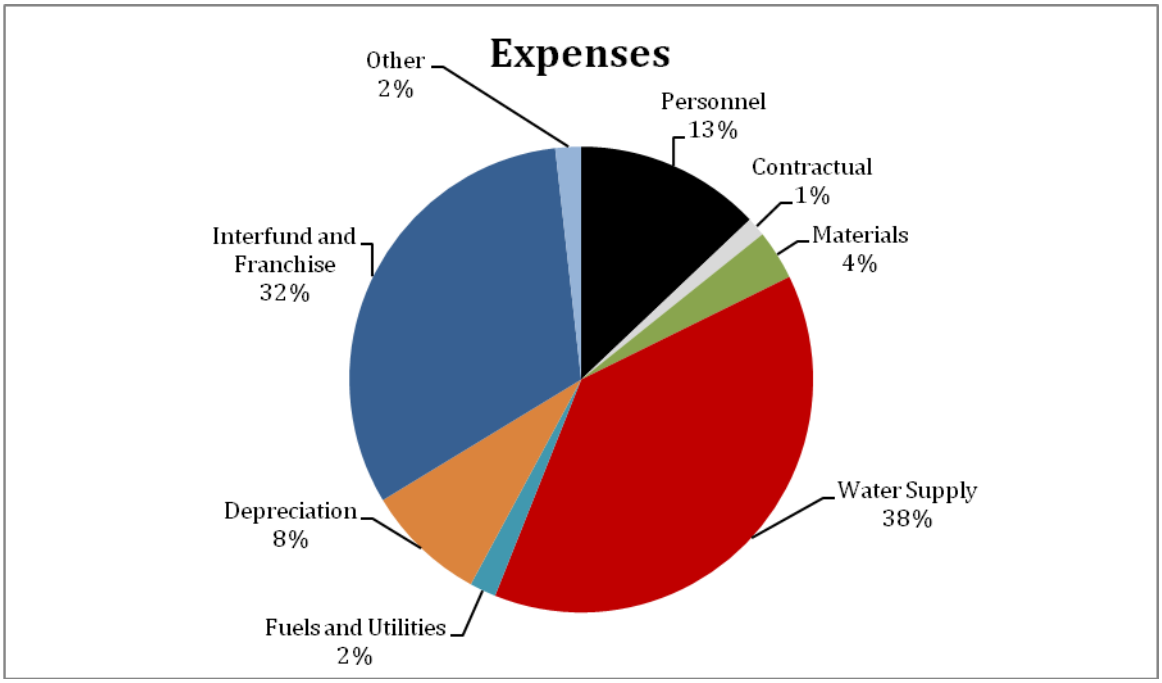
Water revenue has grown at an annual compounded growth rate of 2.51% and operating expenses, excluding depreciation, have grown at an annual compounded growth rate of 1.58%. This is important as the revenue growth should be equal to or greater than the expense growth.

Figure 8-3: Revenue and Expense Trends



From the information obtained from the audited financial statements, Figure 8-4 illustrates the various expenses for 2011. As noted below, the overhead allocation interfund charges, franchise fees, and the water supply payments account for 70% of the expenses. The water supply accounted for 36% of the revenue and the interfund charges accounted for 31% of the revenue. As a result, 67% of the water revenue goes to pay for the water and to the interfund charges.

Figure 8-4: 2011 Water Fund Expenses

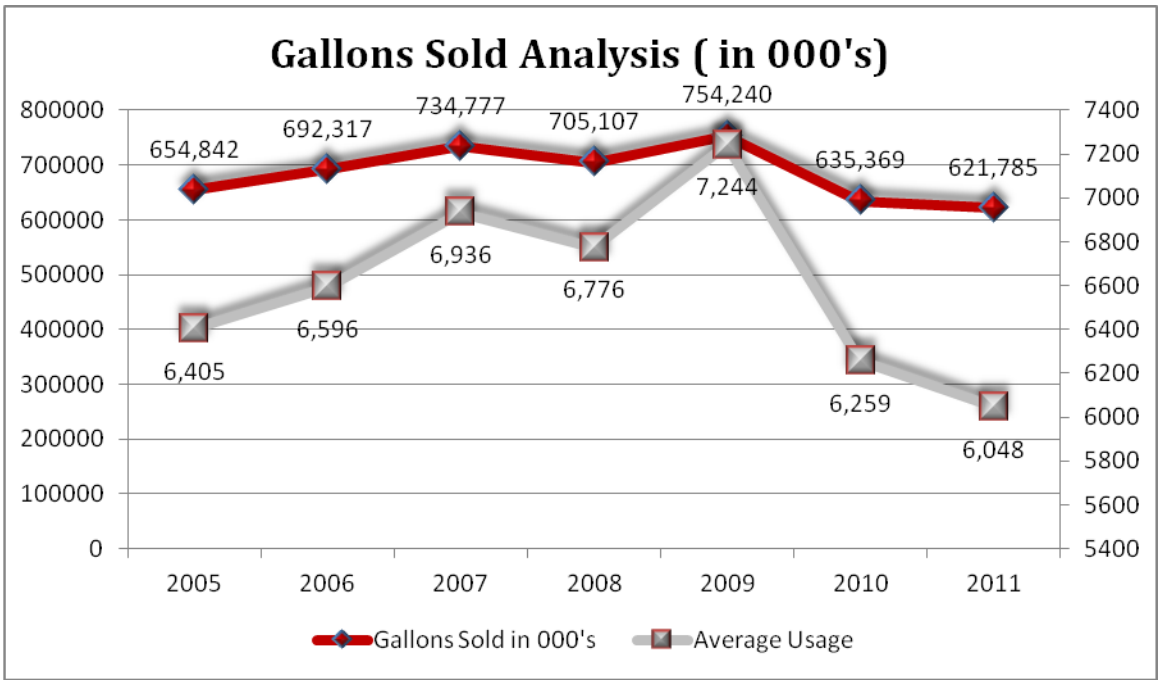


A comparison was also made on the compounded annual growth rate of water purchases to the compounded annual growth rate of water revenue. Water purchases have been growing at an annual compounded growth rate of 4% while water revenue has been growing at an annual compounded growth rate of 2.51%.

Other trends that were reviewed were the gallons of water sold by the City to customers as well as the average revenue per meter per month. Water revenue is impacted by the rate structure, weather changes, economy, etc. As can be seen in Figure 8-5, the total gallons sold has decreased at an annual compounded rate of around 1% since 2005 and the average usage per meter per month, excluding supply of water to wholesale customers, has also decreased at an annual compounded rate of about 1%. The decrease in gallons sold puts more pressure

on the rate structure to generate the revenue necessary to meet annual operations expenses, debt service payments and required reserves.

Figure 8-5: Gallons of Water Sold/Average Usage per Meter



Current Financial Assessment Summary

The following represents a summary of the current financial assessment of the water fund prior to developing a rate structure model that will be used to project the water fund requirements for the next ten years, including the capital improvements identified in the water master plan along with the debt requirements to fund the capital improvements.

- *Days in Operating Cash* – based on the audited statements for 2011, the days in operating cash was 125 which is 69% of the benchmark of 180 days. As a result, the fund received a D grade.

- *Operating Ratio* – based on the audited statements for 2011, the operating ratio was 1.11 which is at 92% of the benchmark of 1.20. As a result, the fund received a B.
- *Debt Capacity* – based on the audited statements for 2011, the maximum borrowing amount of the fund is $5.3 million. The fund had a cash balance of $1.6 million, thus the cash to debt ratio is 30% which is above the benchmark of 20%. As a result, the fund received an A grade.
- *Growth Trends* – in comparing the cost of water to water revenue, the cost of water is growing at an annual compounded growth rate of 4% while the revenue is growing at an annual compounded growth rate of 2.51% which is 63% of the growth in water purchases. As a result, the fund received a D grade.

The total score of the water fund based on the above ratios is 9.0, which averages to 2.25, and results in the fund receiving an overall grade of a C.

In order to improve the current financial condition of the water fund prior to evaluating the impact of the water master plan and debt requirements, the following actions should be considered by the City:

1. In order to meet an Operating Ratio of 1.20, the water fund would need to generate an additional $391,000 in revenue. This results in an increase of the base rate of $4.16 or an increase in the rate per 1,000 of $0.85, assuming a decrease in usage of 20%.

2. The rate per 1,000 should grow at the same rate of the cost of water. As a result, the rate per 1,000 should be increased by $0.30 to maintain the growth rate of the cost of water.
3. The interfund charges, including the franchise tax, account for 31% of the revenue, or approximately $1,439,700 in 2011. This is equivalent to a charge of $15.33 per meter per month. In order to meet the 1.20 Operating Ratio, the interfund charges could be reduced by $391,000 or some combination to reduce the amount of revenue needed to meet the benchmark.

WATER RATE STRUCTURE DEVELOPMENT

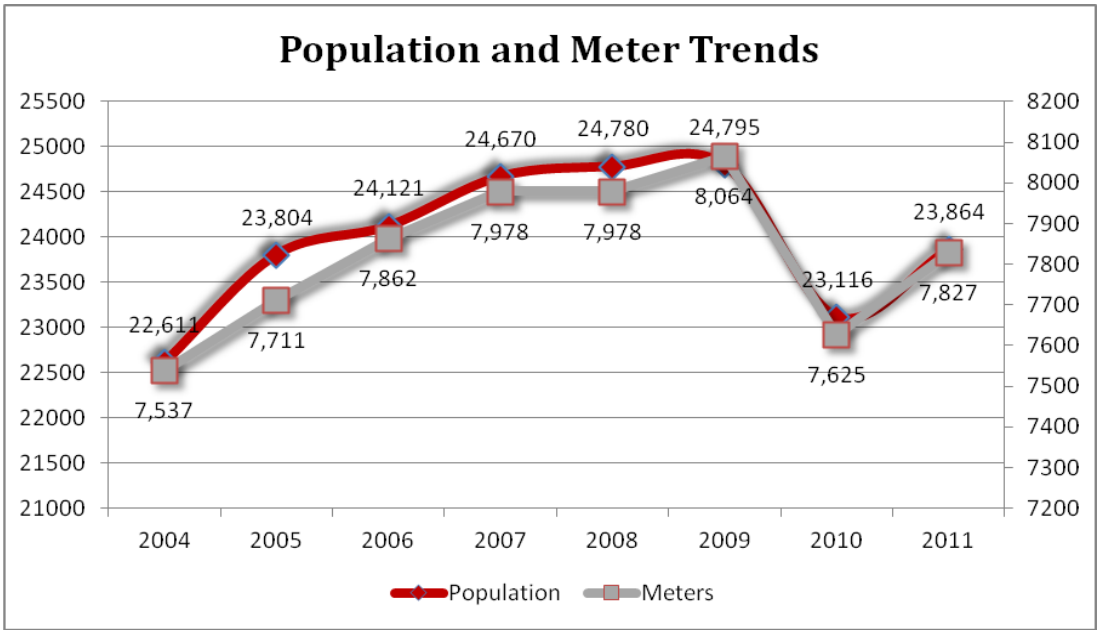
The development of a fair and equitable water rate structure to meet various financial ratios in order to have a fundamentally, sustainable water fund, to address future growth in water demands, and to establish the funding mechanism to pay for the debt service needed to fund required capital improvement projects, several assumptions as well as a number of projections, or future trends, in water revenue and expenditures were made. After establishing future revenue and expenditure requirements, various rate structure options were developed and analyzed. The amount of water purchased from KCMO and from WaterOne, in addition to assuming annual rate increases, was also projected for the next 10 years.

Assumptions

This section represents the various assumptions used in producing the future annual financial statements which reflect the revenue requirements and the resulting key financial ratios.

1. *Number of Meters* - The number of meters is important in determining the total gallons sold, the average usage per meter, the average monthly revenue per meter per month, and in the calculation of total water revenue. In order to determine the number of meters, a comparison was made of the population of the City to the number of meters reported on the primacy fee report. Refer to Figure 8-6 showing this relationship. Based on the data, the population of the City has grown at an annual compounded growth rate of 0.64% since 2004. In addition, the relationship between Population and the Number of Meters has averaged 3.06 since 2004.

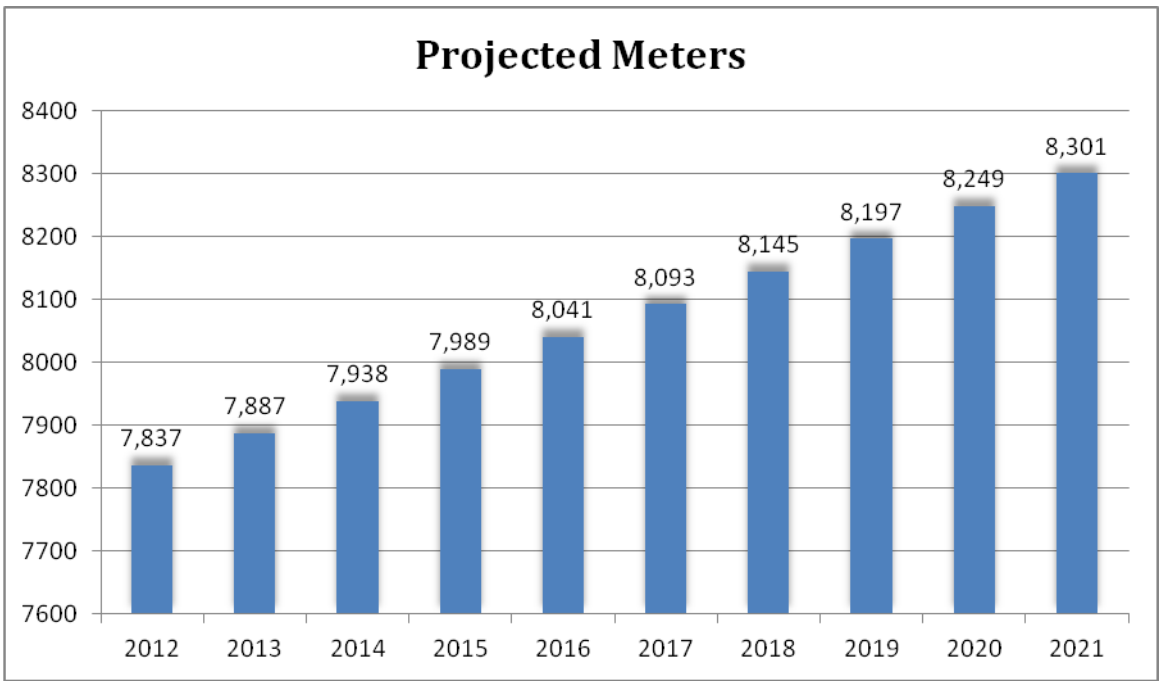
Figure 8-6: Historic Population versus Number of Meters



To determine meter growth, the projected population for the City was based on a 0.64% growth rate. The number of meters will then be

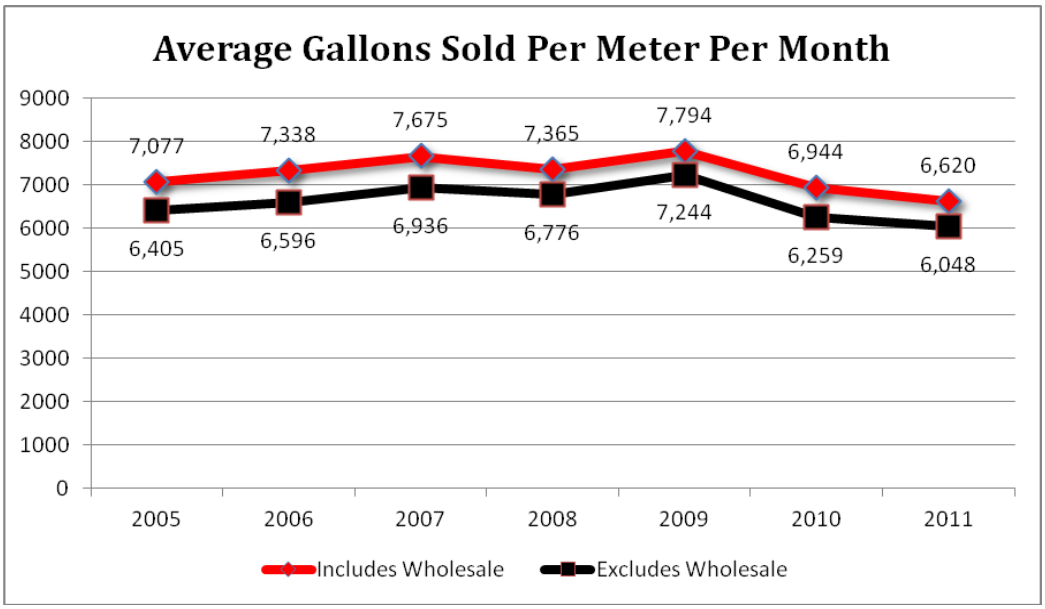
determined based on the population divided by 3.06. The projected meters are as shown in Figure 8-7.

Figure 8-7: Projected Water Meters



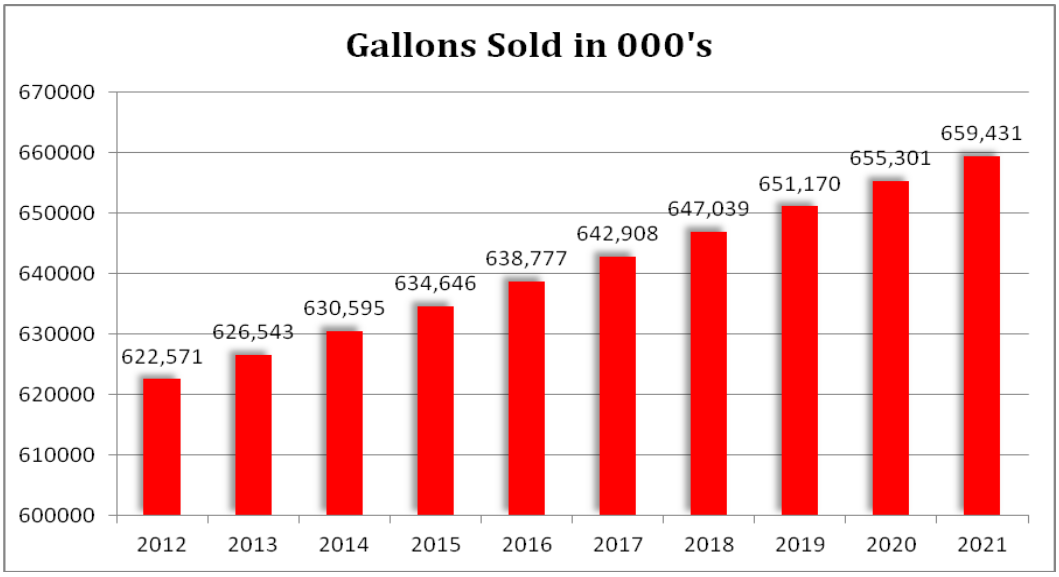
2. *Gallons sold* – To project the number of gallons sold, a review was conducted on the average usage per meter per month. Using the average usage per meter per month and multiplying it by the number of projected meters and then by 12 months, the annual gallons of water sold was determined. Figure 8-8 represents the trends in average usage per meter per month.

Figure 8-8: Average Gallons Sold per Meter per Month



To project gallons sold, we used average gallons sold per meter per month of 6,048 plus 53,710,000 gallons sold annually to wholesale customers. Based on these usage amounts and the number of meters, the projected gallons sold are as shown in Figure 8-9.

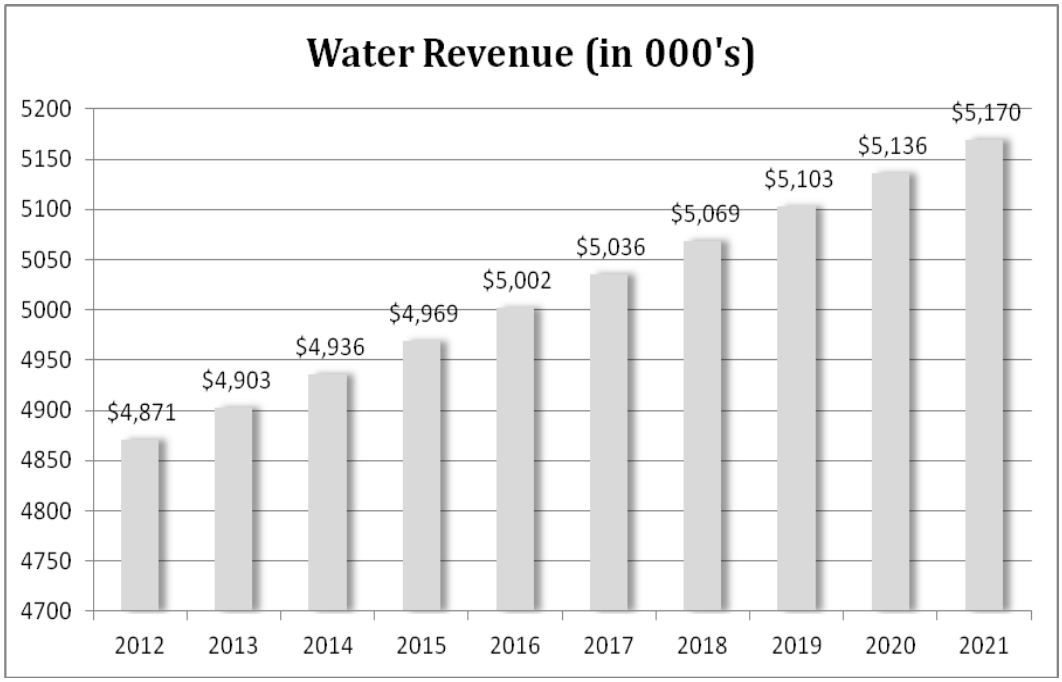
Figure 8-9: Projected Gallons of Water Sold



3. *Water Revenue* – In order to project water revenue, the projected gallons of water sold and the current rate structure was used. The current rate makeup used was as follows:
    - Base Rate: $11.50, for the first 1,500 gallons, which is the minimum gallons before the rate per 1,000 begins (this is a blended rate for customers inside and outside the City limits)
    - Volume Charge: Rate is $7.60 per 1,000 gallons.
    - Wholesale Water Rate: $4.40 per 1,000 gallons.
    - Other Revenue: Includes taxes, late charges, impact fees, etc. which has averaged 7% in addition to water sales.

Figure 8-10 represents projected water revenue based on the current rate structure and the projected gallons sold.

Figure 8-10: Projected Water Revenue



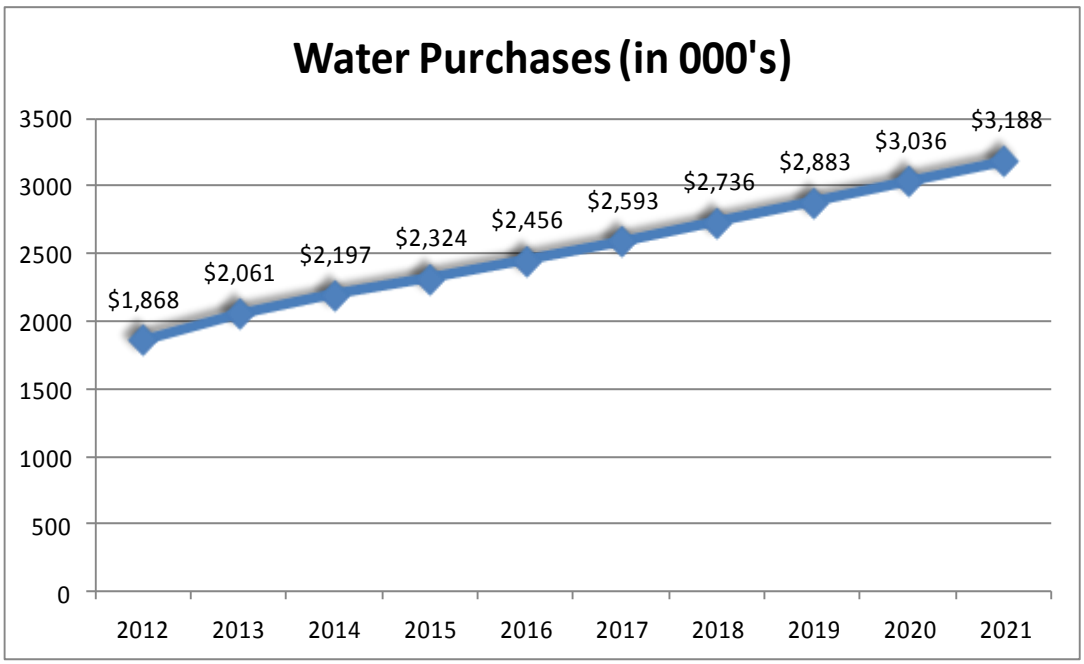
4. *Cost of Water* – The cost of water is projected based on the current and future water purchase rates from the Water Services Department of Kansas City, Missouri and from WaterOne. While the rates from WaterOne for the next 10 years were provided by their financial representatives, the future rate increases for KCMO were assumed to increase as projected below. In addition to the City rates, a review was preformed on the past 7 years of water loss data, which resulted in determining an average annual water loss of approximately 8%. To determine the total gallons of water purchased, the gallons sold in paragraph 3 above included a 10% water loss factor. Table 8-2 lists the projected volume of water purchased over the next ten years and the water rates anticipated from the two water suppliers.

Table 8-2: Projected Water Volume and Rates

Year	Total Water Volume (x 1,000 gals)	KCMO Rates ($/1000 gal)	WaterOne Rates ($/1000 gal)
2012	583,624	2.70	0.00
2013	587,358	3.02	0.00
2014	591,167	3.39	2.93
2015	594,976	3.65	3.08
2016	598,859	3.95	3.23
2017	602,742	4.27	3.38
2018	606,626	4.48	3.53
2019	610,509	4.70	3.68
2020	614,392	4.94	3.83
2021	618,276	5.19	3.98

Figure 8-11 shows the total projected water purchased for 2012 through 2021. To determine the cost of water, the projected gallons purchased, the increases in water supply rates from the two water purveyors, and the allocation of gallons, which was assumed to be split 50/50 beginning in 2014, were used.

Figure 8-11: Projected Total Water Purchased

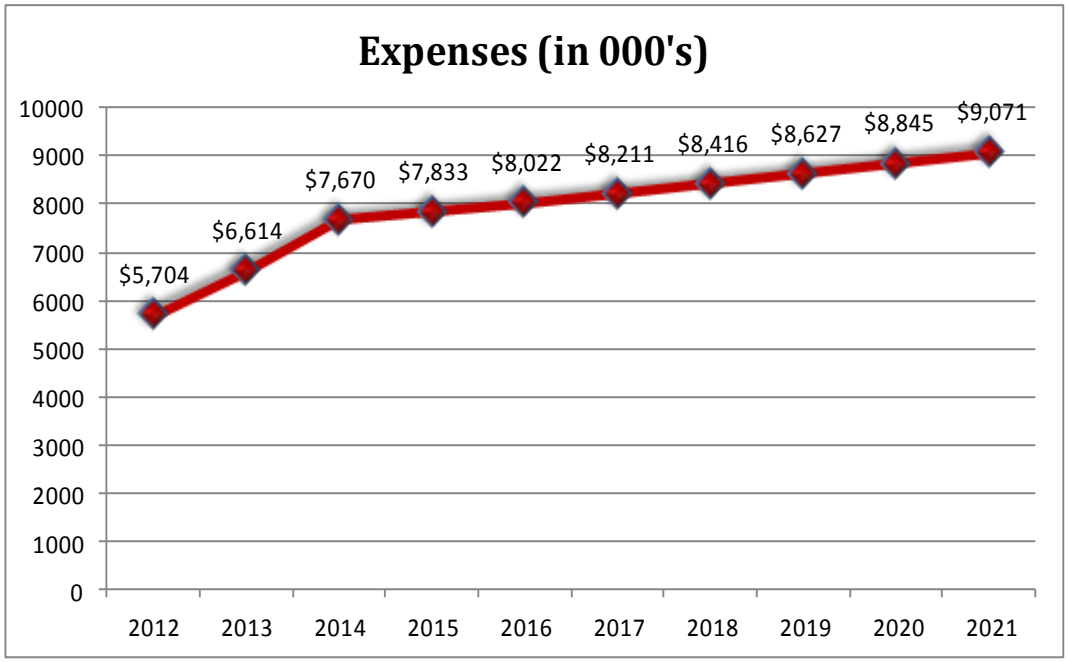


5. *Operating Expenses* – To project future operating expenses, prior audit reports, growth patterns, % of revenues, and other data was reviewed. Year 2011 was used as the base year to project operating expenses for the next 10 years. The largest expenses included the cost of purchasing water, the interfund charges and the franchise tax. The franchise tax was calculated based on 7% of water revenue, which was determined based on previous years of financial records. The interfund amount of

$1,136,000 was based on 2011 amounts. The model was created such that it would allow for a number of changes in several of the annual projected expenses, either as a growth factor, as a specific value, or as a percentage of revenue. For example, the increased in expenses for personnel services could be adjusted from 2.5% to 3.0%. The franchise tax could be changed from 7.0% to 7.2% of revenue. These ranges in values set in the model can assist the City in analyzing the affect the various expenses will have on future water rates.

Depreciation expense was calculated based on the fixed asset schedule and the projected capital improvements. The model also provided estimated life expectancy for various assets established from the fixed asset schedule. Interest expense was based on the borrowing needs and the amortization schedule. Figure 8-12 depicts the projected 10-year operating expenses, including the cost of water, depreciation, interfund charges, the franchise tax, and interest expense. The expenses are projected to grow at annual compounded growth rate of 5%.

Figure 8-12: Projected Operating Expenses



6. *Capital Improvements* – The primary capital improvements identified in the Master Plan capital improvement plan (CIP) involves three phases of work to eventually construct a connection to WaterOne. The first phase, beginning in Year 2013, is expected to cost approximately $11,000,000. Phase 2 and Phase 3 capital improvements are projected to cost about $21.4 Million, starting in Year 2017. Additionally, over the next 10 years, approximately $14.8 Million is planned for water system renewal and growth projects, and another $1.9 Million is expected to be spent on minor repairs and equipment/vehicle replacement. Total capital improvement costs are projected to be about $49,550,000. Because of the current water fund cash balance and the phasing plan, the fund will need to borrow 85% of the CIP amount or $42,000,000.

7. *Borrowing Analysis* – To determine the annual debt service requirements, a 20 year term and an interest rate of 2.50% was used, because State Revolving Fund (SRF) loans are expected to be used to assist with funding the identified projects. The current interest rate for a SRF loan is 2.50%. Based on these assumptions, the debt service will be $2,681,400 annually (two semi-annual payments of $1,340,700).

Future Conditions Summary

Based on the capital outlay recommended for the next 10 years and the current condition of the water fund, Table 8-3 summarizes the Days in Cash, and the Debt Service Coverage and Operating Ratios before any adjustments have been made in the water rates shown previously.

Table 8-3: Projected Financial Ratios – Future Condition

Year	Debt Service Coverage Ratio	Operating Ratio	Days in Operating Cash
2012	3.80	***1.11***	184
2013	***0.15***	***1.05***	3613
2014	***0.32***	1.24	3558
2015	***0.31***	1.23	2844
2016	***0.26***	***1.18***	2437
2017	***0.22***	***1.14***	1508
2018	***0.16***	***1.09***	***151***
2019	***0.10***	***1.06***	***(1135)***
2020	***0.04***	***1.02***	***(1615)***
2021	***(0.02)***	***0.99***	***(1980)***
Recommended Financial Ratios	**1.10-1.25**	**1.20**	**180**

The projected annual financial statements over the next 10 years, was based on the above assumptions, assuming no rate change. Additionally, to project the annual balance sheets for this same period, it was assumed that accounts receivable was 26 days, days in accounts payable was 30 days, accrued payroll as a % of personnel was 5%, and accrued interest was calculated based on the amortization schedule. Property, plant and equipment were based on the amounts from the audited financial statements adjusted for capital improvements and depreciation. As noted in Table 8-4, without any water rate adjustments, the water fund will suffer significant losses and will not meet any debt service coverage ratio requirements.

Table 8-4: Projected Financial Statement and Balance Sheet Summary

Year	***Annual Financial Statement Net Income ($)***	***Annual Balance Sheet Net Assets ($)***
2012	***(201,300)***	8,078,600
2013	***(618,000)***	7,877,300
2014	***(1,250,500)***	7,259,300
2015	***(1,293,400)***	6,008,800
2016	***(1,487,400)***	4,521,400
2017	***(1,702,700)***	2,828,700
2018	***(1,965,300)***	853,400
2019	***(2,207,000)***	***(1,353,600)***
2020	***(2,409,900)***	***(3,763,500)***
2021	***(2,604,200)***	***(6,367,700)***

Table 8-4 also summarizes the projected balance sheet net assets amount for each future year, without any water rate adjustments. As a result, the water fund would have a negative cash balance of $25 million and negative equity of $6.4 million. This indicates the fund would be insolvent without adjustments to rates, expenses or a combination of both.

Alternatives Evaluation

Several iterations of the rate model were undertaken to determine the most effective and equitable means to increase water rates to fund the required capital improvements and collect sufficient revenue to cover future annual operation expenses. The alternatives involved changes to the timing of certain improvements and/or decreases in the interfund payments and franchise tax paid to the General Fund. Various adjustments made to the base rate, to the cost per 1000 gallons used charge and the wholesale rate were also analyzed. A proposed debt service rate and an infrastructure rate component were added to the overall rate structure to better address those capital expenditures in an equitable manner. Additionally, an analysis was conducted to review what the impact on water rates is when incorporating a block rate system during peak usage periods.

1. *Alternative No. 1* – This alternative included only the capital improvement costs to supply a secondary source of water from WaterOne ($32.4 Million), but did not include other renewal or growth projects listed in the CIP. There were no adjustments made to the interfund charge and franchise tax. The debt service coverage ratio was kept to a ratio of 1.10 and the operating ratio was targeted at 1.20. To determine the impact of

the rate change needed to meet the debt service coverage ratio and the operating ratio, a monthly volume of 6,000 gallons as the average usage for the City was assumed for comparison purposes. The Base Rate was adjusted to reflect the changes in debt service requirements, while the consumption rate per 1,000 was adjusted to reflect changes in operations, primarily the growth in water purchases. The wholesale rate was adjusted at an annual rate of 4%. Table 8-5 summarizes the increases in water rates over the next 10 years.

2. *Alternative No. 2* - This alternative has the same Alternative No. 1, except for the other capital improvements have been added ($14.8 Million) for 10 years. For the water fund to pay for these capital improvements without borrowing, the base rate would have needed to increase beginning in 2012. This alternative assumed the rate structure was set up on paying for the capital improvements through the base rate. The rate change was made to build-up cash to pay for all the identified capital improvements. The debt service coverage ratio and operating ratio benchmarks were met without any additional adjustments. The rate change was only for cash flow purposes to fund and pay for the capital improvements. Table 8-5 summarizes the increases in water rates for this alternative.
3. *Alternative No.* 3 - This alternative takes into account the same future capital improvements as identified for Alterntaive No. 1. However, 50% reductions in the interfund charge and franchise tax were incorporated into the model. By reducing these expenses, the resulting base rate was reduced almost $9.00. The reduction in the interfund charge and the

franchise tax ranged from $800,000 to $900,000. Table 8-5 summarizes the increases in water rates for this alternative.

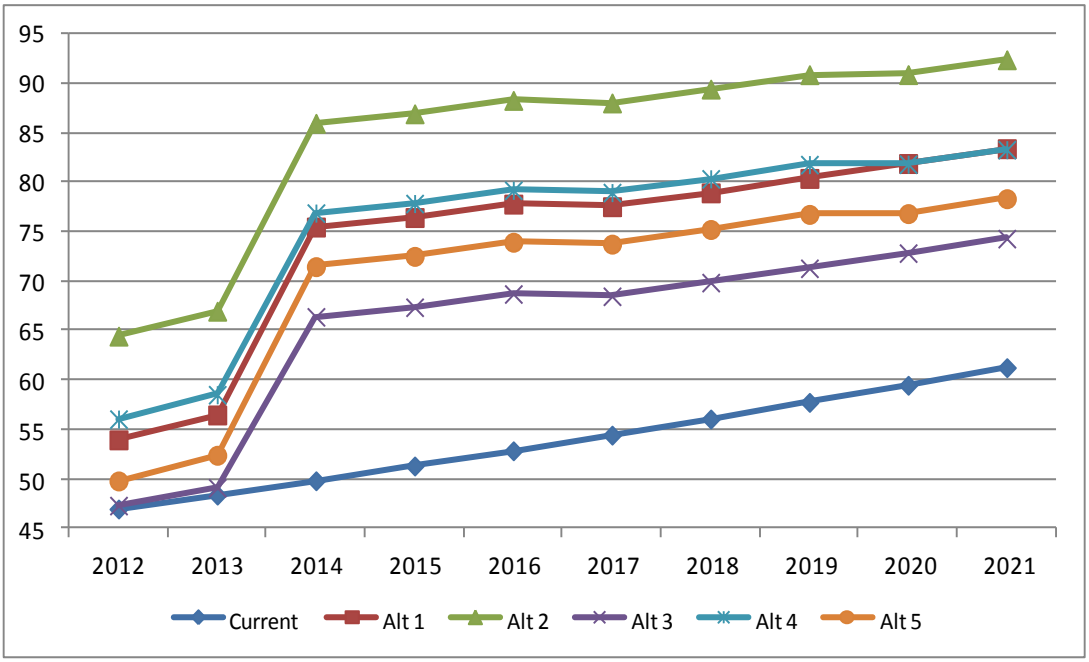
4. *Alternative No*. 4 – This alternative included the same assumptions and reductions in the interfund charge and franchise tax (50%) indicated in Alternative No. 3, and all the capital improvements ($47.2 Million) identified in Alternative No. 2. Table 8-5 summarizes the increases in water rates for this alternative.
5. *Alternative No*. 5 – This alternative was similar to Alternative No. 4 but further reduced the annual interfund charge and franchise tax amounts to only 2.0% of water revenues. Table 8-5 summarizes the increases in water rates for this alternative.

Table 8-5: Alternatives Water Rate Increases Summary

Year	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
2012	$53.95	$64.45	$47.30	$56.05	$49.79
2013	$56.47	$66.97	$49.10	$58.52	$52.39
2014	$75.49	$85.99	$66.40	$76.90	$71.48
2015	$76.45	$86.95	$67.37	$77.87	$72.52
2016	$77.81	$88.31	$68.71	$79.21	$73.95
2017	$77.55	$88.05	$68.48	$78.98	$73.76
2018	$78.95	$89.45	$69.87	$80.37	$75.24
2019	$80.41	$90.91	$71.31	$81.81	$76.77
2020	$81.92	$90.92	$72.85	$81.85	$76.85
2021	$83.42	$92.42	$74.32	$83.32	$78.36
CAGR	4.45%	3.67%	4.62%	4.04%	4.64%

Figure 8-13 illustrates the differences between the five alternatives as rates would increase over the next 10 years.

Figure 8-13: Alternatives Water Rate Increases – 2012 thru 2021



SUMMARY AND RECOMMENDATIONS

As noted in the financial assessment, the water fund has been operating below the operating ratio of 1.20 and days in cash of 180 days. In addition, the revenue growth has not been maintaining or staying even with the expense growth. As a result, regardless of any future capital improvements, the water fund requires rate adjustments.

The City plans to implement several capital improvement projects over the next several years. In order to adequately fund these improvements, changes in the management of the water fund and its rate structure will be necessary. Initally Alternative No. 3 appeared to be the most beneficial rate structure to follow to pay for the planned improvements and keep rates at the lowest increase over time. However, this involved making major changes in the amount of the interfund charges paid to the City's General Fund, as well as major increases to

the base rate, which can have a major impact on rates for lower water users. It is recommended that the basic concept presented in Alternative No. 3 for reducing the interfund charge, creating a CIP phasing plan to spread out capital expenditures, and making adjustments to the base rate and consumption charge be followed. The City can use the water rate model to evaluate several financing options and made modifications which can eventually result in a water rate structure that is more affordable and sensitive to the customer' economic circumstances. Therefore, a specific rate structure is not recommended in this Master Plan, but the concepts presented herein and the recommendations presented below will assist the City in arriving at a very fair and strong rate structure and water fund.

Recommendations

The following recommendations are presented to meet the objectives of the study and the key financial ratios which typical represent a healthy and equitable rate structure. These recommended changes will have an impact to the customer as well as to the water fund.

1. Because of the capital improvements involving the future connection to WaterOne and other renewal and growth projects listed in the CIP, preliminarily the water fund will need to borrow $42,000,000 of the projected $47.2 Million. Normally, the water fund should be in a cash position to borrow 80% of the project amount, which it currently is not. If the City was to hold a bond election requesting public approval to issue bonds in this amount and to borrow the money through the Missouri SRF Loan program, the annual debt service is estimated to be $2,682,000. It is

recommended that the City review different capital improvement implementation or phasing plans to spread out capital costs which may result in reducing the amount the City would need to borrow early on and in lowering the increases in water rates.

2. It is recommended that the water fund establish a debt service rate in addition to the existing base rate. The debt service rate would be based on the additional debt service requirements as a result of the additional borrowing. This rate would also fluctuate in response to the amount of debt borrowed and the amount of future major capital expenditures.
3. In addition, to the debt service rate, it is also recommended that the City establish an infrastructure rate in order to fund future projects. The infrastructure rates would allow the City to pay for minor system improvements and other expenditures, such as a vehicle and equipment replacement program.
4. Because of the overall increase in operating expenses, primarily the cost of water which is assumed to increase at a rate of 5%, it is recommended the consumption charge or rate per 1,000 gallons used be adjusted by 5% to reflect the increase in the cost of water and other operating expenses. This charge should be reviewed and changed if needed annually to ensure projected annual operating expenses are covered by water sales revenue.
5. As noted previously, the interfund charge (overhead allocation) and franchise tax account for 31% of the revenue and represent 32% of the operating expenses. It is recommended the City review a variety of ways to reduce the annual interfund charges and franchise tax amounts. This reduction will help reduce the overall water rates. However, taking this

approach will have a direct impact on the General Fund. The initial recommendation is for the City to reduce the interfund charge and franchise tax by 25% in Year 1, 50% in Year 2, 75% Year 3, and then adjust the amount to 5% of the water revenues. This recommendation also would include the elimination of the franchise tax. Internal discussion among the City management and governing body will be necessary to address this issue and to develop an overall workable plan for reducing this current fund transfer.

6. Related to Recommendation No. 5 above, it is also recommended that a study be performed on the overhead allocation to determine the amount of administrative costs that should be allocated from water to the City's General Fund and develop a formal method for this allocation.
7. The financial assessment and rate analysis did not include a cost of service by customer class since the *Utility Billing Software* was not able to generate the reporting necessary to develop rates by customer class. A cost of service analysis identifies and apportions annual revenue requirements to the different customer classes based on their demand on the utility system. Customer classes could include the following:
    - Residential - Single Family & Multi-Family
    - Commercial
    - Industrial
    - Wholesale
    - School District
    - Unbilled – City

We recommend the City develop customer classes and a report which would report the amount of usage by class, number of meters by class, size of meter, and average usage by class.

8. Information reporting is important for the management of the utility funds as they are the business funds of the City. It is recommended the City determine if the following reports are available or could be developed to assist in the management of the water fund:
    a. Usage Analysis Report – Provides the number of meters by usage (meters that used between 0 – 1,000 gallons, 1,001 – 2,000, etc.)
    b. Water Loss Report – Both as a gross % and as a unaccountable %. If this could be broken out by master meter, this would be valuable in providing information to distinguish between either meter problems, system leaks, or water supply meter calibration issues.
    c. Top Customer Report – Provides data on the top ten users of the water system.
    d. Rate Analysis Report – This report breaks the revenue out by rate line: base rate, debt service rate, infrastructure rate, etc. This would indicate if the allocation and model design is reasonable to the projected allocation.
    e. Management Report – This report provides a monthly analysis of any selected month, including gallons sold, gallons purchased, water loss %, revenue collected, revenue billed, accounts receivable balance, top 10 users, and usage groupings.

9. The City should consider reviewing all revenue items of the water fund to determine if the costs are being completely recovered. These could include the following:
    - Meter Shut Off/On
    - Impact Fees
    - Water Leaks
    - Developer Fees
    - Meter Reading
10. The City should consider adopting certain formal fiscal policies and strategies for the water fund. These could include developing appropriate reserve funding levels, structured timeline for regular rate reviews, etc. The goal would be to prevent future rate shocks.
11. Under best management practices from the GFOA, the City should prepare a condition assessment report at least every 1 to 3 years on the capital facilities to the City's elected officials. The report could include the following information:
    - Condition ratings on the water infrastructure
    - Indirect condition data (number of water main breaks, water leaks, number of service calls, etc.)
    - Replacement life cycles by infrastructure type
    - Year-to-year changes in net value of assets
    - Actual expenditures and performance data on capital maintenance compared to budgeted expenditures
    - Meter replacement policy (number of meters replaced)

9. APPENDIX

APPENDIX A

Executive Summary
Belton Alternate Water Supply Report

APPENDIX B

Figure No. 4-2 – Water Distribution System Map

APPENDIX C

Figure No. 4-3 – Fire Hydrant Testing Location Maps

APPENDIX D

Figure No. 5-1 – Alternates No. 1 and No. 1A
Figure No. 5-2 – Alternates No. 2 and No. 2A
Figure No. 5-3 – Alternates No. 3 and No. 3A

APPENDIX E

Existing System Graphs
Maximum Day Demand

APPENDIX F

Existing System
Maximum Day Demand
With Fire Flows

APPENDIX G

Detailed Cost Estimates

APPENDIX H

CIP Projects Maps
Figure No. 6-1A
Figure No. 6-1B
Figure No. 6-1C
Figure No. 6-1D

APPENDIX I

Water Rate Analysis Tables

APPENDIX A

Executive Summary

Belton Alternate Water Supply Report

APPENDIX B

Figure No. 4-2 – Water Distribution System Map

APPENDIX C

Figure No. 4-3 – Fire Hydrant Testing Location Maps

APPENDIX D

Figure No. 5-1 – Alternates No. 1 and No. 1A

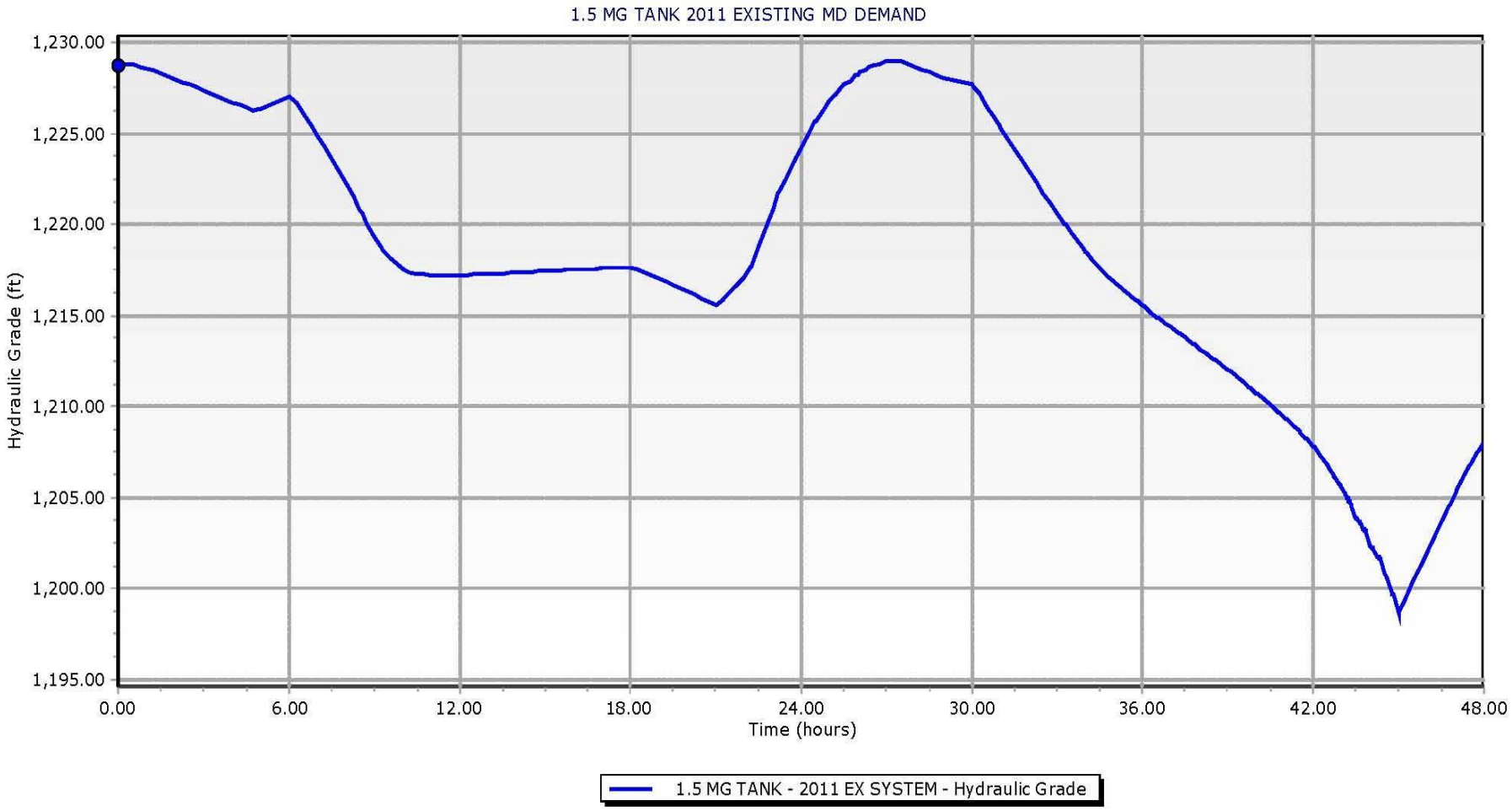
Figure No. 5-2 – Alternates No. 2 and No. 2A

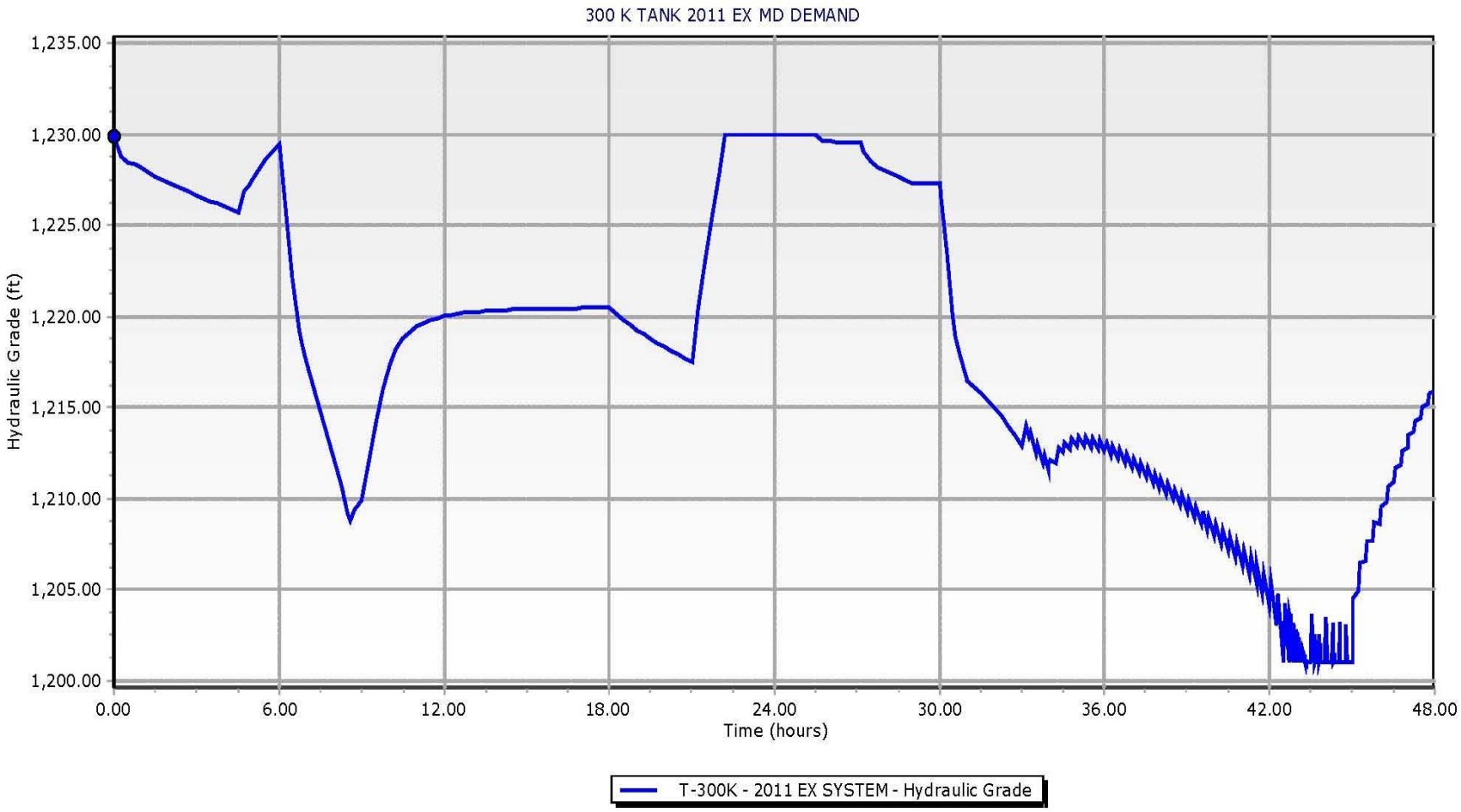
Figure No. 5-3 – Alternates No. 3 and No. 3A

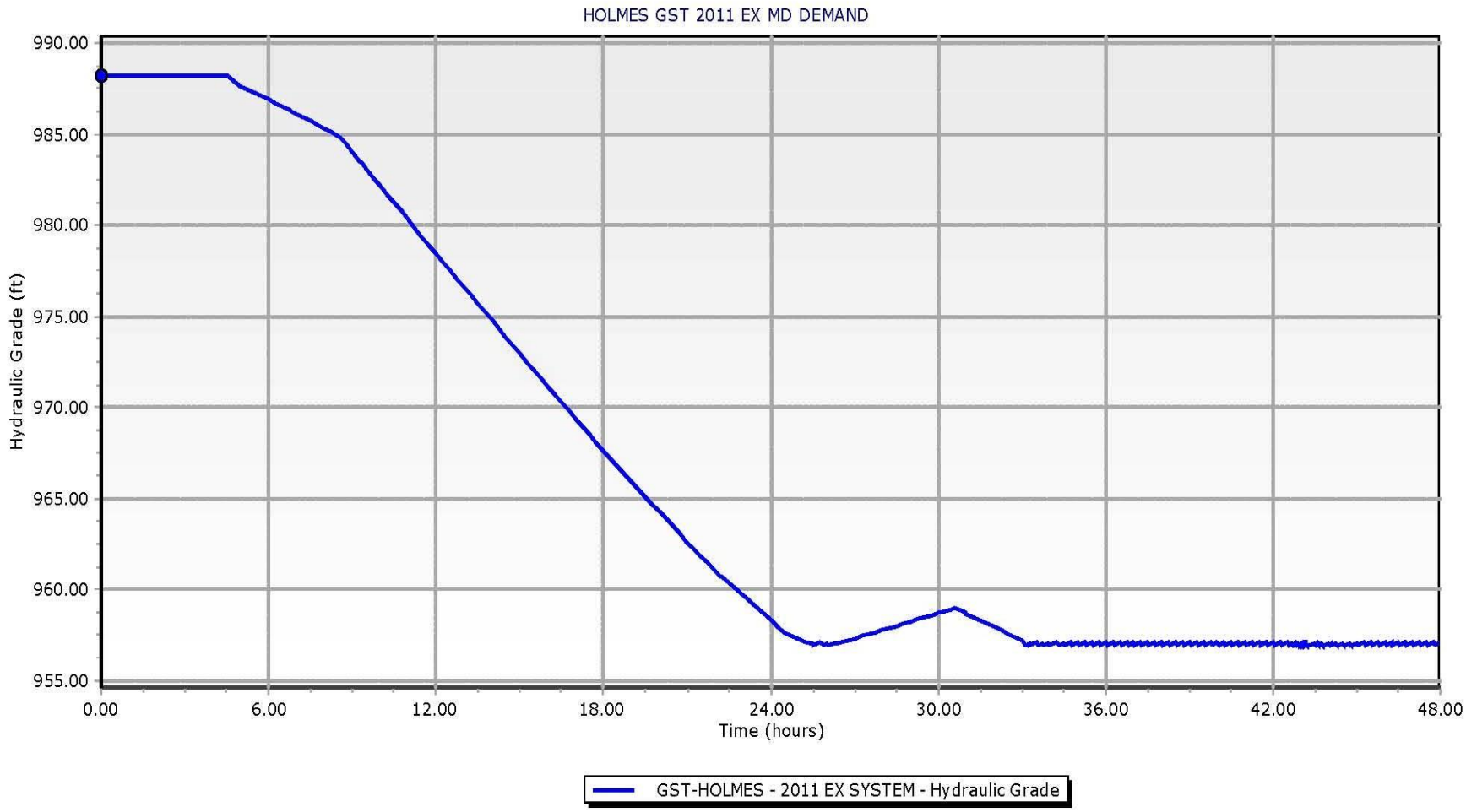
APPENDIX E

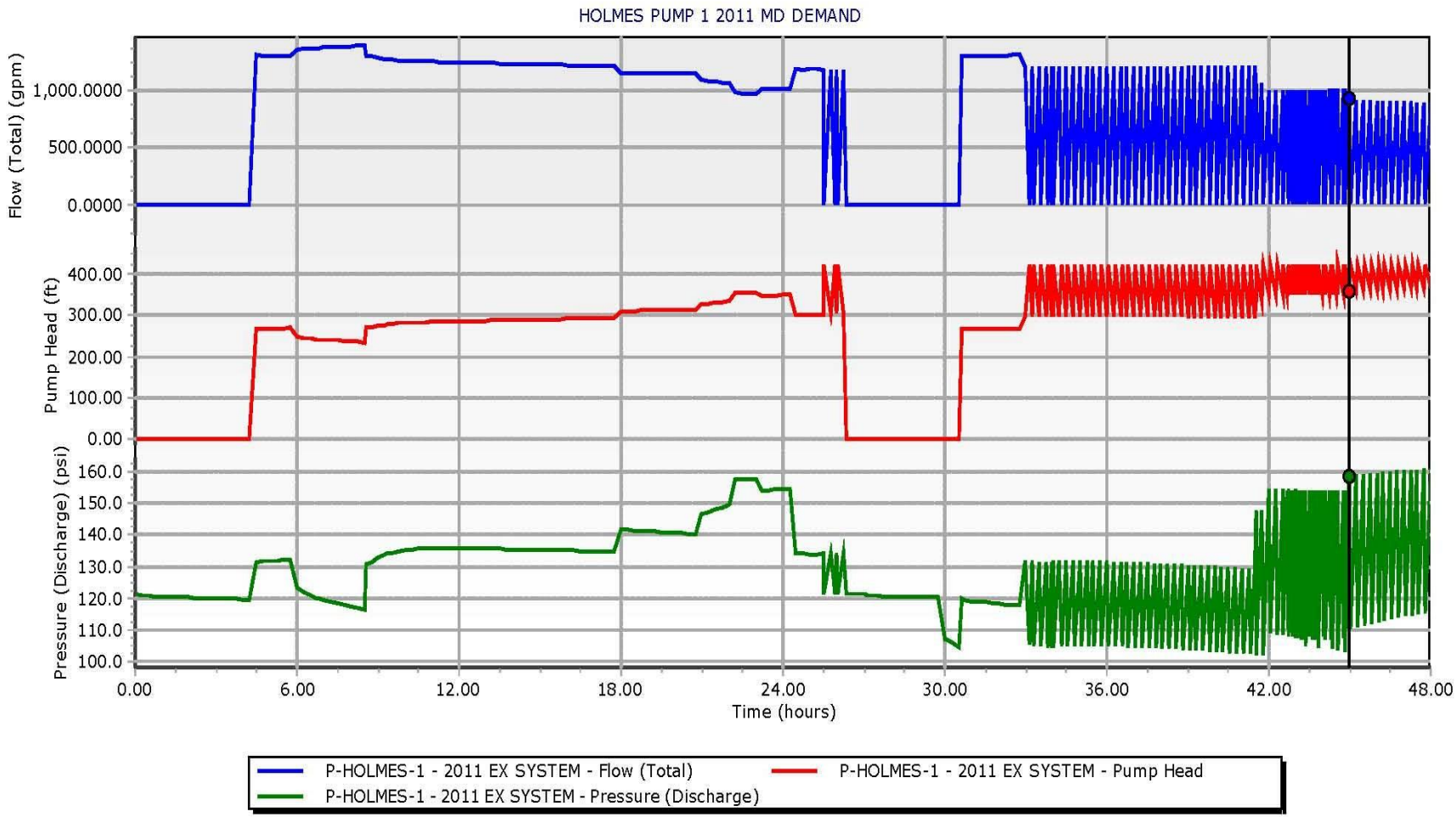
Existing System Graphs

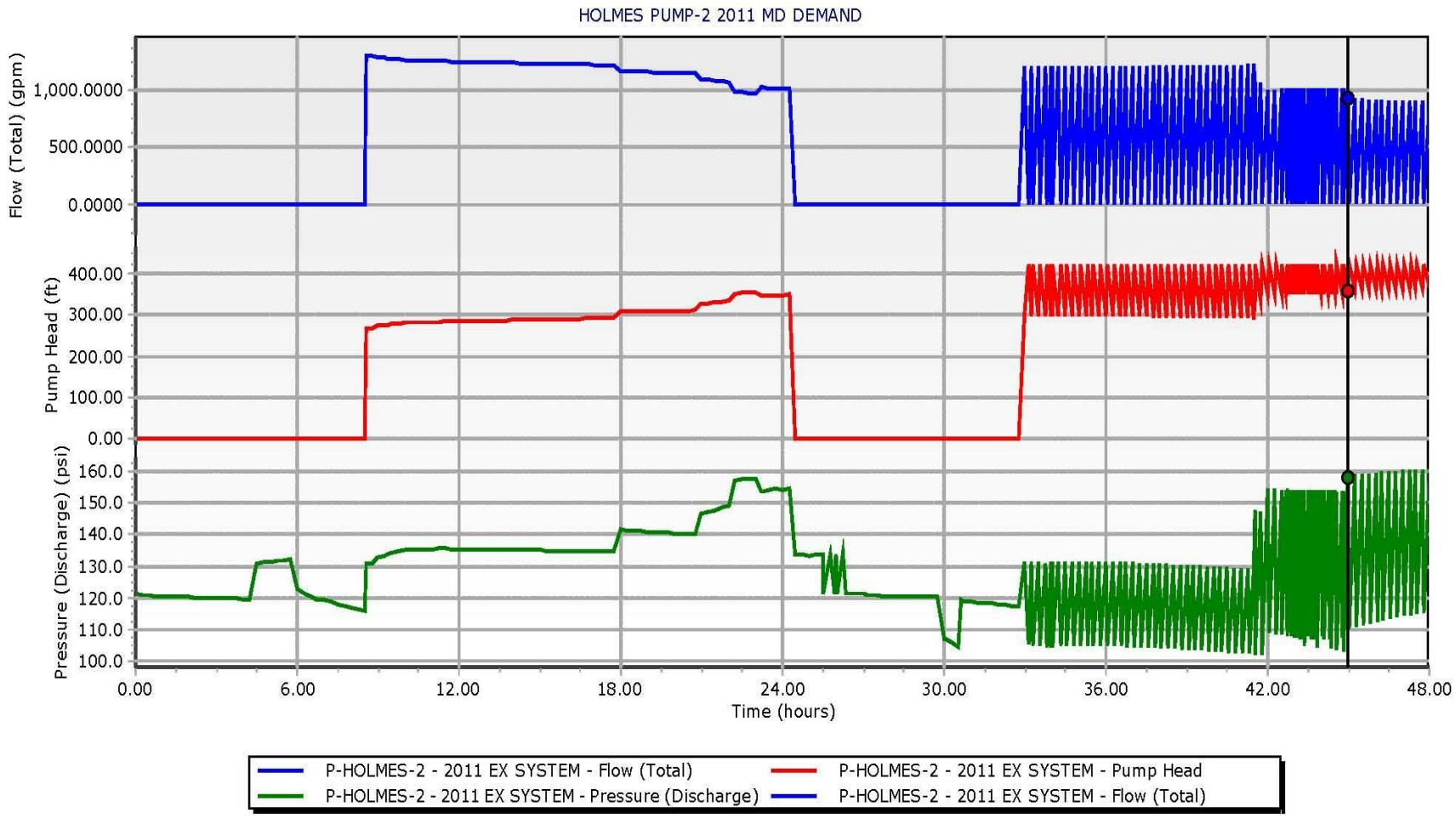
Maximum Day Demand

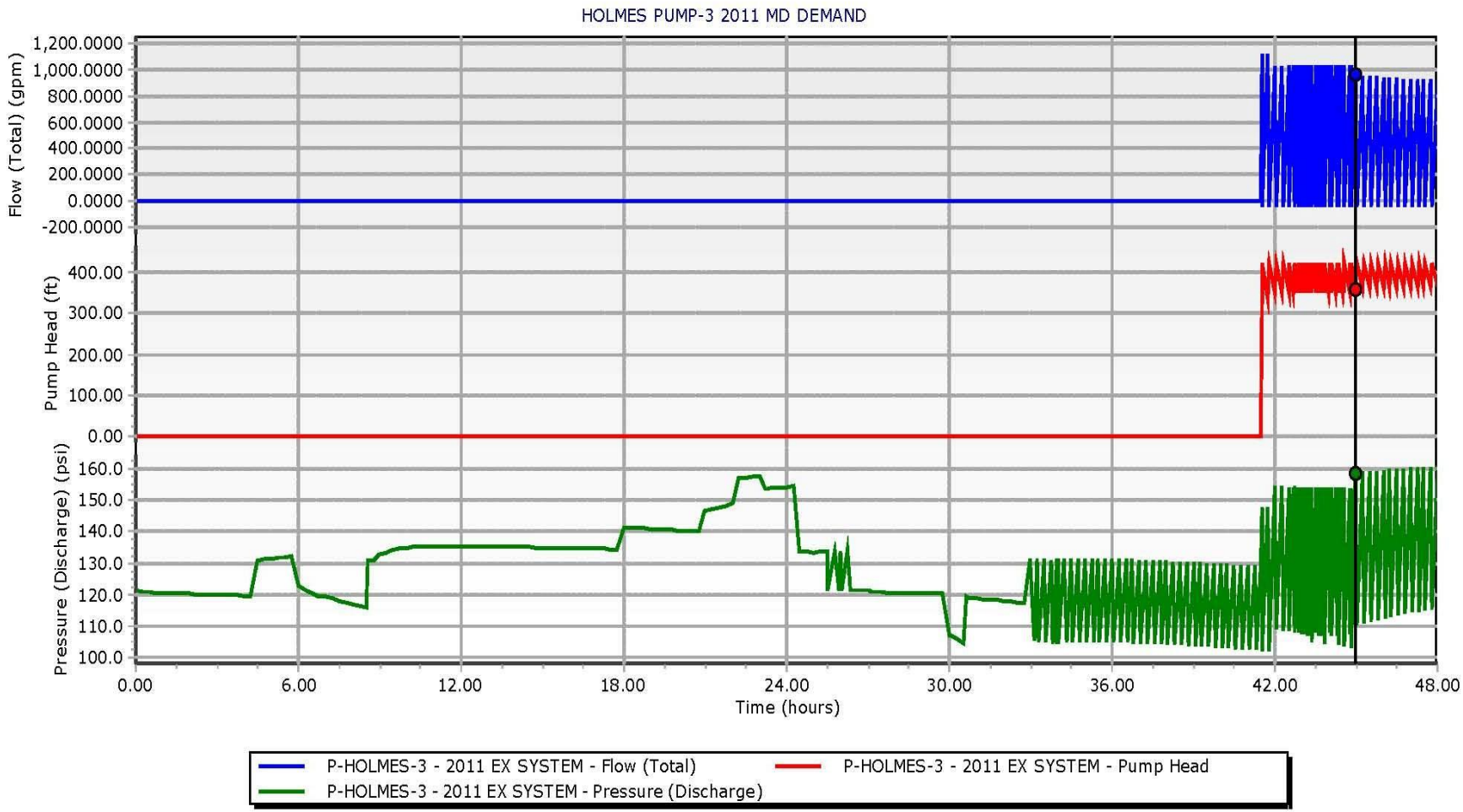

1.5 MG TANK 2011 EXISTING MD DEMAND
1,230.00
1,225.00
1,220.00
1,215.00
1,210.00
1,205.00
1,200.00
1,195.00
Hydraulic Grade (ft)
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
Time (hours)
1.5 MG TANK - 2011 EX SYSTEM - Hydraulic Grade

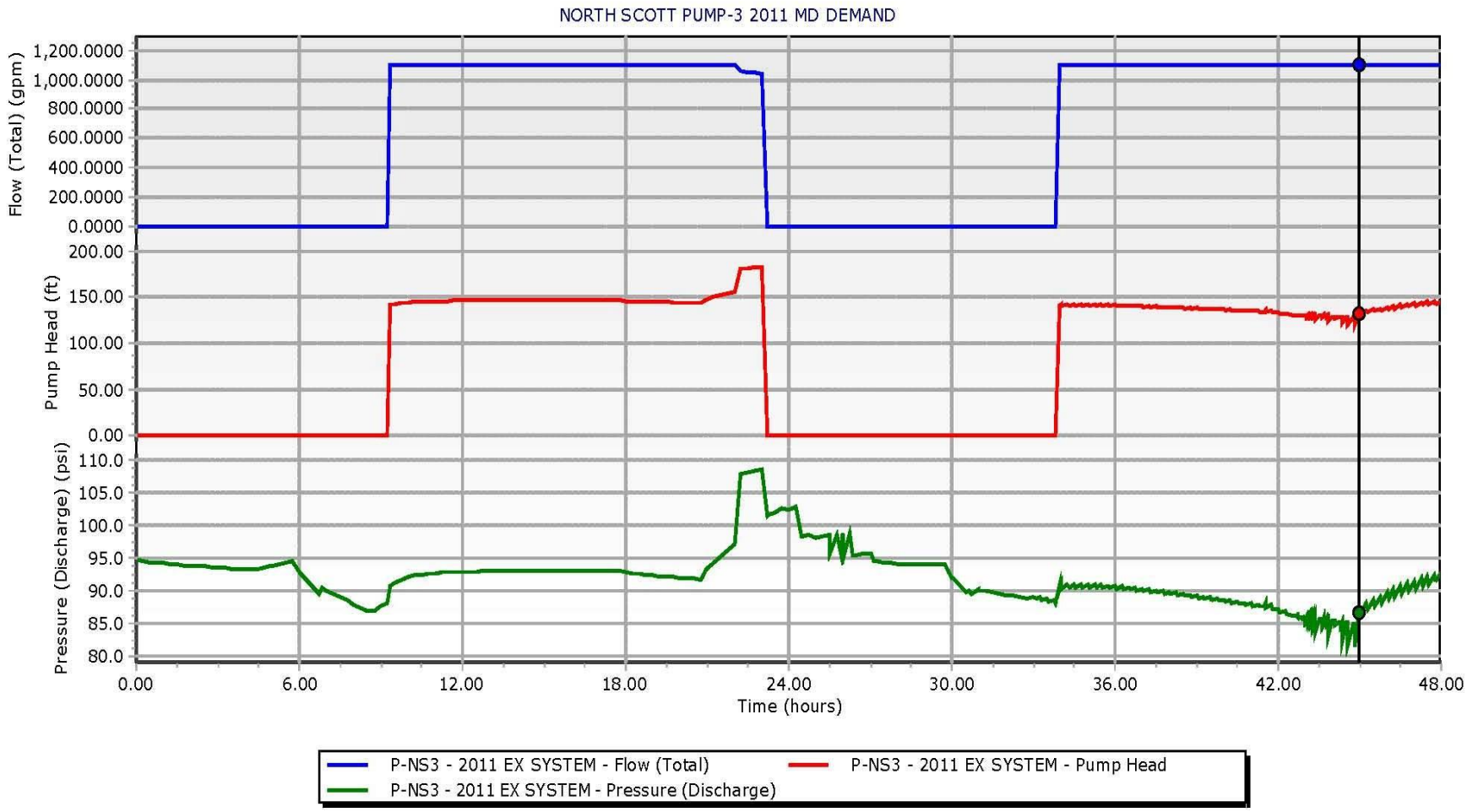

300 K TANK 2011 EX MD DEMAND
1,235.00
1,230.00
1,225.00
1,220.00
1,215.00
1,210.00
1,205.00
1,200.00
Hydraulic Grade (ft)
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
Time (hours)
T-300K - 2011 EX SYSTEM - Hydraulic Grade

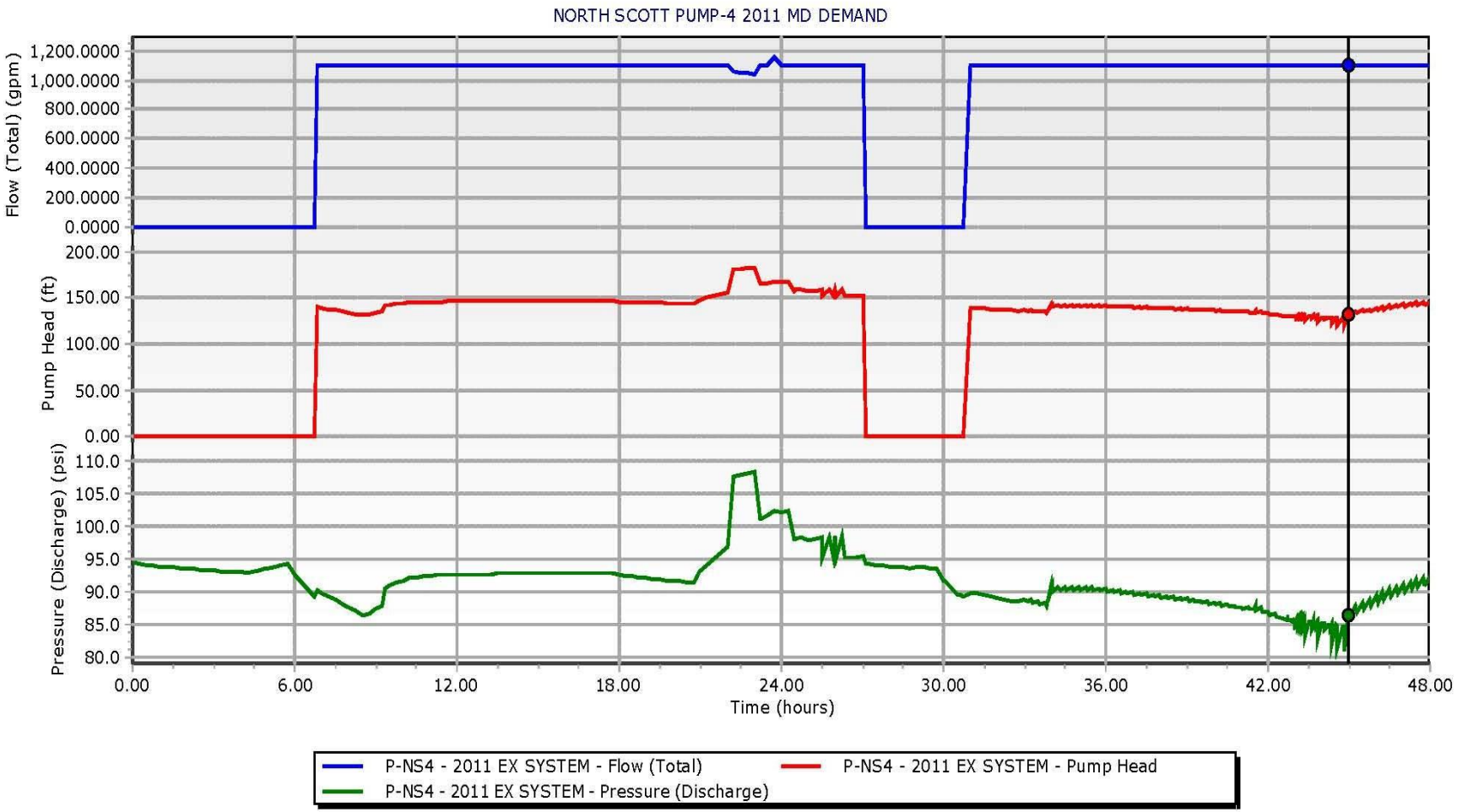

HOLMES GST 2011 EX MD DEMAND
990.00
985.00
980.00
975.00
970.00
965.00
960.00
955.00
Hydraulic Grade (ft)
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
Time (hours)
GST-HOLMES - 2011 EX SYSTEM - Hydraulic Grade


HOLMES PUMP 1 2011 MD DEMAND
Flow (Total) (gpm)
1,000.0000
500.0000
0.0000
Pump Head (ft)
400.00
300.00
200.00
100.00
0.00
Pressure (Discharge) (psi)
160.0
150.0
140.0
130.0
120.0
110.0
100.0
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
Time (hours)
P-HOLMES-1 - 2011 EX SYSTEM - Flow (Total)
P-HOLMES-1 - 2011 EX SYSTEM - Pump Head
P-HOLMES-1 - 2011 EX SYSTEM - Pressure (Discharge)


HOLMES PUMP-2 2011 MD DEMAND
Flow (Total) (gpm)
1,000.0000
500.0000
0.0000
Pump Head (ft)
400.00
300.00
200.00
100.00
0.00
Pressure (Discharge) (psi)
160.0
150.0
140.0
130.0
120.0
110.0
100.0
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
Time (hours)
P-HOLMES-2 - 2011 EX SYSTEM - Flow (Total)
P-HOLMES-2 - 2011 EX SYSTEM - Pump Head
P-HOLMES-2 - 2011 EX SYSTEM - Pressure (Discharge)
P-HOLMES-2 - 2011 EX SYSTEM - Flow (Total)


HOLMES PUMP-3 2011 MD DEMAND
Flow (Total) (gpm)
1,200.0000
1,000.0000
800.0000
600.0000
400.0000
200.0000
0.0000
-200.0000
Pump Head (ft)
400.00
300.00
200.00
100.00
0.00
Pressure (Discharge) (psi)
160.0
150.0
140.0
130.0
120.0
110.0
100.0
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
Time (hours)
P-HOLMES-3 - 2011 EX SYSTEM - Flow (Total)
P-HOLMES-3 - 2011 EX SYSTEM - Pump Head
P-HOLMES-3 - 2011 EX SYSTEM - Pressure (Discharge)


NORTH SCOTT PUMP-3 2011 MD DEMAND
Flow (Total) (gpm)
1,200.0000
1,000.0000
800.0000
600.0000
400.0000
200.0000
0.0000
Pump Head (ft)
200.00
150.00
100.00
50.00
0.00
Pressure (Discharge) (psi)
110.0
105.0
100.0
95.0
90.0
85.0
80.0
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
Time (hours)
P-NS3 - 2011 EX SYSTEM - Flow (Total)
P-NS3 - 2011 EX SYSTEM - Pump Head
P-NS3 - 2011 EX SYSTEM - Pressure (Discharge)


NORTH SCOTT PUMP-4 2011 MD DEMAND
Flow (Total) (gpm)
1,200.0000
1,000.0000
800.0000
600.0000
400.0000
200.0000
0.0000
Pump Head (ft)
200.00
150.00
100.00
50.00
0.00
Pressure (Discharge) (psi)
110.0
105.0
100.0
95.0
90.0
85.0
80.0
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
Time (hours)
P-NS4 - 2011 EX SYSTEM - Flow (Total)
P-NS4 - 2011 EX SYSTEM - Pump Head
P-NS4 - 2011 EX SYSTEM - Pressure (Discharge)

APPENDIX F

Existing System

Maximum Day Demand

With Fire Flows

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8E-WN078	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
8E-GV035	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-1	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-2	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-3	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-36	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-37	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-38	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-39	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-40	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-41	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-42	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-43	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-44	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-45	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-46	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-47	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-48	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-50	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-52	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-53	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-54	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-55	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-56	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-57	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-58	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-59	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-60	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-61	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J-62	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-63	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-64	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-65	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-66	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-67	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-68	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-69	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-70	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-71	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-72	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-73	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-77	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-90	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-92	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-93	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-95	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-106	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-113	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-114	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-119	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-120	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-121	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-122	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-123	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-125	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-128	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-130	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-131	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J-137	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-138	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-139	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
J-140	<None>	(N/A)	(N/A)	1,500.0000	(N/A)	(N/A)	(N/A)	20.0
9001_ND	1&23	1	False	1,500.0000	0.0000	1,499.9999	0.0000	20.0
9001_NU	1&23	1	False	1,500.0000	0.0000	1,499.9999	0.0000	20.0
P7_NU	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
P6_NU	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
P5_NU	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
P4_NU	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
P3_NU	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
P2_NU	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
P1_NU	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
9A-WN036	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
9A-WN028	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
9A-WN027	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
9A-WN026	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
9A-WN025	1&23	1	False	1,500.0000	0.0000	1,499.9999	0.0000	20.0
4B-WN008	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
4B-WN007	1&23	1	False	1,500.0000	0.0000	1,499.9999	0.0000	20.0
4B-GV002	1&23	1	False	1,500.0000	0.0000	1,499.9999	0.0000	20.0
3A-WN004	1&23	1	False	1,500.0000	0.0000	1,500.4194	0.4196	20.0
3A-WN003	1&23	1	False	1,500.0000	0.0000	1,499.9999	0.0000	20.0
3A-WN002	1&23	1	False	1,500.0000	0.0000	1,499.9999	0.0000	20.0
26	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
20	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
16	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
14	1&23	1	False	0.0000	0.0000	0.0000	0.0000	0.0
J-142	1&23	1	False	1,500.0000	0.0000	1,499.9999	0.0000	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12F-BOV001	<None>	13	False	1,500.0000	43.2890	1,500.2097	43.4988	20.0
J-91	<None>	13	False	1,500.0000	45.9677	1,499.9999	45.9677	20.0
J-118	<None>	13	False	1,500.0000	46.3982	1,499.9999	46.3982	20.0
9E-WN069	<None>	14	False	1,500.0000	67.8444	1,501.0490	68.8934	20.0
8E-BOV002	<None>	14	False	1,500.0000	94.9538	1,500.3146	95.2685	20.0
9E-WN078	<None>	14	False	1,500.0000	105.0043	1,500.1047	105.1092	20.0
8E-ISV033	<None>	14	False	1,500.0000	106.5852	1,499.9999	106.5852	20.0
9E-WN079	<None>	14	False	1,500.0000	107.6368	1,500.3146	107.9515	20.0
8E-ISV032	<None>	15	False	1,500.0000	117.5205	1,500.3146	117.8352	20.0
8E-WN026	<None>	15	False	1,500.0000	127.2592	1,499.9999	127.2592	20.0
13C-WN051	<None>	15	False	1,500.0000	129.5328	1,500.4194	129.9524	20.0
8E-WN027	<None>	15	False	1,500.0000	136.0362	1,499.9999	136.0362	20.0
9F-WN045	<None>	15	False	1,500.0000	176.3800	1,500.7343	177.1143	20.0
8E-WN028	<None>	16	False	1,500.0000	185.0549	1,500.1047	185.1598	20.0
8E-WN064	<None>	15	False	1,500.0000	191.1910	1,500.2097	191.4008	20.0
12D-WN047	<None>	15	False	1,500.0000	198.1664	1,499.9999	198.1664	20.0
9C-WN015	<None>	3	False	1,500.0000	315.9979	1,500.9441	316.9420	20.0
11B-WN019	<None>	3	False	1,500.0000	353.3330	1,501.1538	354.4869	20.0
7C-WN008	<None>	3	False	1,500.0000	368.6016	1,499.9999	368.6016	20.0
8C-WN050	<None>	3	False	1,500.0000	381.8584	1,500.4194	382.2780	20.0
8D-GV021	<None>	3	False	1,500.0000	385.2947	1,501.0490	386.3437	20.0
11B-BOV004	<None>	3	False	1,500.0000	387.7084	1,500.5244	388.2329	20.0
9E-WN074	<None>	3	False	1,500.0000	396.2969	1,501.4685	397.7655	20.0
9D-WN071	<None>	3	False	1,500.0000	397.2771	1,499.9999	397.2771	20.0
9D-ISV013	<None>	3	False	1,500.0000	401.8420	1,500.8391	402.6812	20.0
9C-WN022	<None>	3	False	1,500.0000	454.3343	1,500.2097	454.5441	20.0
9A-WN001	<None>	3	False	1,500.0000	457.6830	1,500.1047	457.7880	20.0
9F-WN031	<None>	3	False	1,500.0000	458.6283	1,500.7343	459.3625	20.0
10A-WN009	<None>	3	False	1,500.0000	458.8285	1,500.7343	459.5628	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9D-WN012	<None>	3	False	1,500.0000	459.7221	1,500.8391	460.5613	20.0
9D-WN011	<None>	3	False	1,500.0000	461.7921	1,501.0490	462.8412	20.0
10D-WN020	<None>	3	False	1,500.0000	465.4413	1,500.8391	466.2806	20.0
9D-WN014	<None>	3	False	1,500.0000	470.2225	1,501.0490	471.2715	20.0
10D-WN021	<None>	3	False	1,500.0000	495.1661	1,500.8391	496.0053	20.0
9B-WN017	<None>	3	False	1,500.0000	512.8427	1,500.8391	513.6819	20.0
11B-GV018	<None>	3	False	1,500.0000	520.8611	1,501.0490	521.9101	20.0
10D-WN022	<None>	3	False	1,500.0000	521.8062	1,500.6293	522.4355	20.0
8D-WN002	<None>	3	False	1,500.0000	525.1455	1,500.7343	525.8798	20.0
9A-WN002	<None>	19	False	1,500.0000	540.4343	1,500.2097	540.6440	20.0
7F-WN003	<None>	3	False	1,500.0000	562.8788	1,500.3146	563.1935	20.0
10E-GV032	<None>	3	False	1,500.0000	563.6606	1,500.3146	563.9754	20.0
8D-WN001	<None>	3	False	1,500.0000	565.6902	1,500.2097	565.9001	20.0
9D-WN010	<None>	19	False	1,500.0000	585.8906	1,501.0490	586.9396	20.0
9D-GV040	<None>	19	False	1,500.0000	587.7870	1,500.4194	588.2067	20.0
7D-BOV006	<None>	3	False	1,500.0000	587.8925	1,500.2097	588.1023	20.0
8E-ISV035	<None>	3	False	1,500.0000	589.7377	1,500.6293	590.3670	20.0
9C-WN013	<None>	3	False	1,500.0000	594.6918	1,500.9441	595.6359	20.0
9D-WN013	<None>	19	False	1,500.0000	604.7625	1,501.8881	606.6506	20.0
9E-WN046	<None>	3	False	1,500.0000	608.7473	1,500.9441	609.6914	20.0
9C-WN008	<None>	3	False	1,500.0000	612.4460	1,501.6783	614.1245	20.0
13C-BOV001	<None>	3	False	1,500.0000	616.6992	1,500.6293	617.3286	20.0
8C-WN052	<None>	3	False	1,500.0000	622.2573	1,501.3636	623.6209	20.0
9D-WN068	<None>	3	False	1,500.0000	624.5204	1,501.8881	626.4086	20.0
9C-WN012	<None>	3	False	1,500.0000	629.5925	1,501.3636	630.9562	20.0
13D-BOV002	<None>	3	False	1,500.0000	631.1170	1,500.4194	631.5366	20.0
9D-WN015	<None>	19	False	1,500.0000	631.5966	1,502.3076	633.9044	20.0
8D-GV022	<None>	3	False	1,500.0000	631.8220	1,501.3636	633.1857	20.0
9A-WN003	<None>	3	False	1,500.0000	637.4554	1,500.3146	637.7702	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8E-WN050	<None>	3	False	1,500.0000	642.9465	1,500.9441	643.8906	20.0
8C-WN051	<None>	19	False	1,500.0000	649.3260	1,500.2097	649.5358	20.0
8C-GV018	<None>	19	False	1,500.0000	649.7551	1,500.3146	650.0698	20.0
9C-WN016	<None>	3	False	1,500.0000	659.4522	1,500.5244	659.9767	20.0
4E-WN001	<None>	3	False	1,500.0000	663.9791	1,502.2028	666.1821	20.0
4E-GV001	<None>	4	False	1,500.0000	663.9886	1,499.9999	663.9886	20.0
5A-BOV001	<None>	3	False	1,500.0000	664.8674	1,507.3246	672.1921	20.0
9E-WN092	<None>	3	False	1,500.0000	682.0917	1,499.9999	682.0917	20.0
9D-WN069	<None>	3	False	1,500.0000	683.1757	1,501.6783	684.8541	20.0
6F-WN018	<None>	3	False	1,500.0000	704.8875	1,500.3146	705.2022	20.0
8E-WN017	<None>	3	False	1,500.0000	707.4984	1,500.4194	707.9179	20.0
8D-WN044	<None>	3	False	1,500.0000	720.4172	1,501.7832	722.2006	20.0
13C-WN050	<None>	3	False	1,500.0000	725.7686	1,500.5244	726.2932	20.0
9E-GV018	<None>	3	False	1,500.0000	734.0058	1,500.5244	734.5303	20.0
13D-WN077	<None>	3	False	1,500.0000	745.6716	1,500.8391	746.5108	20.0
13D-WN082	<None>	3	False	1,500.0000	760.3452	1,500.3146	760.6599	20.0
9D-WN070	<None>	3	False	1,500.0000	761.3129	1,502.5234	763.8364	20.0
9F-WN030	<None>	3	False	1,500.0000	774.5686	1,500.2097	774.7784	20.0
9C-WN011	<None>	3	False	1,500.0000	775.7893	1,500.6293	776.4186	20.0
6F-WN017	<None>	5	False	1,500.0000	795.9385	1,500.2097	796.1483	20.0
J-87	<None>	3	False	1,500.0000	798.0361	1,499.9999	798.0361	20.0
13D-BOV001	<None>	3	False	1,500.0000	798.8503	1,500.4194	799.2700	20.0
8D-WN025	<None>	3	False	1,500.0000	801.4249	1,501.6783	803.1033	20.0
13E-GV005	<None>	3	False	1,500.0000	804.3588	1,499.9999	804.3588	20.0
8D-WN028	<None>	3	False	1,500.0000	807.2090	1,501.6783	808.8875	20.0
8D-WN032	<None>	3	False	1,500.0000	809.7446	1,501.6783	811.4230	20.0
J-129	<None>	3	False	1,500.0000	815.9043	1,499.9999	815.9043	20.0
8E-WN093	<None>	3	False	1,500.0000	830.8363	1,500.2097	831.0461	20.0
13D-WN075	<None>	3	False	1,500.0000	830.8909	1,500.3146	831.2056	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9D-WN072	<None>	5	False	1,500.0000	836.9005	1,500.6293	837.5299	20.0
9E-BOV004	<None>	3	False	1,500.0000	839.5820	1,501.0490	840.6310	20.0
J372	<None>	3	False	1,500.0000	842.4472	1,499.9999	842.4472	20.0
10A-WN011	<None>	5	False	1,500.0000	842.4789	1,500.2097	842.6887	20.0
10A-WN010	<None>	5	False	1,500.0000	842.4791	1,500.6293	843.1085	20.0
J-9	<None>	3	False	1,500.0000	844.3730	1,500.6293	845.0024	20.0
8E-WN020	<None>	19	False	1,500.0000	852.6015	1,500.4194	853.0211	20.0
10A-WN004	<None>	19	False	1,500.0000	854.0974	1,500.1047	854.2023	20.0
10A-WN005	<None>	19	False	1,500.0000	854.1016	1,501.1538	855.2556	20.0
9B-BOV003	<None>	3	False	1,500.0000	867.2045	1,499.9999	867.2045	20.0
13C-BOV002	<None>	3	False	1,500.0000	867.6586	1,500.5244	868.1832	20.0
7D-WN033	<None>	3	False	1,500.0000	878.2362	1,500.1047	878.3411	20.0
8F-ISV023	<None>	3	False	1,500.0000	887.8649	1,500.5244	888.3894	20.0
9E-WN065	<None>	3	False	1,500.0000	891.0537	1,500.5244	891.5782	20.0
9D-WN057	<None>	5	False	1,500.0000	899.0385	1,501.3636	900.4022	20.0
8D-WN065	<None>	19	False	1,500.0000	910.4860	1,501.2587	911.7448	20.0
10A-GV005	<None>	5	False	1,500.0000	917.5511	1,499.9999	917.5511	20.0
10A-WN003	<None>	5	False	1,500.0000	917.5516	1,500.8391	918.3908	20.0
10A-BOV001	<None>	5	False	1,500.0000	917.5523	1,500.2097	917.7621	20.0
8F-WN047	<None>	3	False	1,500.0000	938.1718	1,500.6293	938.8012	20.0
6F-WN016	<None>	5	False	1,500.0000	940.6115	1,500.4194	941.0311	20.0
13D-WN065	<None>	3	False	1,500.0000	956.0598	1,500.6293	956.6891	20.0
9G-WN004	<None>	3	False	1,500.0000	975.6758	1,501.2587	976.9345	20.0
J-76	<None>	3	False	1,500.0000	993.5279	1,499.9999	993.5279	20.0
9F-WN023	<None>	3	False	1,500.0000	1,000.1866	1,500.1047	1,000.2914	20.0
9F-GV016	<None>	3	False	1,500.0000	1,002.5313	1,501.8881	1,004.4194	20.0
13E-WN006	<None>	3	False	1,500.0000	1,005.0995	1,500.7343	1,005.8338	20.0
9F-WN029	<None>	3	False	1,500.0000	1,016.2903	1,500.1047	1,016.3952	20.0
13E-GV004	<None>	3	False	1,500.0000	1,020.9977	1,500.2097	1,021.2075	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8D-WN053	<None>	3	False	1,500.0000	1,022.9196	1,501.8881	1,024.8077	20.0
13E-BOV001	<None>	18	False	1,500.0000	1,042.6257	1,499.9999	1,042.6257	20.0
8D-WN041	<None>	3	False	1,500.0000	1,042.7460	1,501.5734	1,044.3195	20.0
9C-WN019	<None>	3	False	1,500.0000	1,078.5107	1,501.5734	1,080.0842	20.0
8E-WN016	<None>	20	False	1,500.0000	1,082.2911	1,500.6293	1,082.9205	20.0
9F-WN057	<None>	3	False	1,500.0000	1,084.4420	1,500.2097	1,084.6519	20.0
13E-WN009	<None>	3	False	1,500.0000	1,090.3955	1,501.1599	1,091.5555	20.0
10A-GV004	<None>	5	False	1,500.0000	1,118.6118	1,499.9999	1,118.6118	20.0
11A-BOV002	<None>	3	False	1,500.0000	1,120.4156	1,501.1538	1,121.5696	20.0
10A-WN002	<None>	5	False	1,500.0000	1,121.5114	1,499.9999	1,121.5114	20.0
10A-GV003	<None>	5	False	1,500.0000	1,121.5116	1,499.9999	1,121.5116	20.0
10A-WN012	<None>	5	False	1,500.0000	1,121.5120	1,500.5244	1,122.0365	20.0
8F-GV023	<None>	20	False	1,500.0000	1,131.5707	1,501.3636	1,132.9344	20.0
7D-WN038	<None>	3	False	1,500.0000	1,143.1064	1,500.6293	1,143.7358	20.0
13D-WN072	<None>	3	False	1,500.0000	1,161.4452	1,500.2097	1,161.6550	20.0
9D-WN050	<None>	3	False	1,500.0000	1,166.1824	1,501.2587	1,167.4410	20.0
9F-GV015	<None>	3	False	1,500.0000	1,170.7925	1,501.2587	1,172.0513	20.0
7D-WN040	<None>	3	False	1,500.0000	1,171.2207	1,500.4194	1,171.6403	20.0
150	<None>	3	False	1,500.0000	1,178.0536	1,499.9999	1,178.0536	20.0
13D-WN029	<None>	3	False	1,500.0000	1,188.0447	1,500.6293	1,188.6741	20.0
11B-BOV002	<None>	3	False	1,500.0000	1,189.4489	1,500.2097	1,189.6587	20.0
8D-WN054	<None>	3	False	1,500.0000	1,207.6100	1,501.0490	1,208.6589	20.0
9F-WN032	<None>	20	False	1,500.0000	1,224.1021	1,501.1538	1,225.2560	20.0
J-49	<None>	3	False	1,500.0000	1,226.4016	1,499.9999	1,226.4016	20.0
9D-WN054	<None>	3	False	1,500.0000	1,233.1143	1,500.9441	1,234.0583	20.0
9G-WN048	<None>	20	False	1,500.0000	1,235.9017	1,503.7762	1,239.6781	20.0
11B-WN048	<None>	3	False	1,500.0000	1,244.1553	1,499.9999	1,244.1553	20.0
9D-GV006	<None>	3	False	1,500.0000	1,254.5903	1,500.4194	1,255.0099	20.0
11B-WN016	<None>	5	False	1,500.0000	1,257.3989	1,501.3636	1,258.7626	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8G-WN014	<None>	3	False	1,500.0000	1,257.7753	1,500.8391	1,258.6144	20.0
13D-GV039	<None>	20	False	1,500.0000	1,257.8123	1,500.2097	1,258.0221	20.0
13D-WN022	<None>	5	False	1,500.0000	1,258.3002	1,501.1538	1,259.4541	20.0
8D-WN049	<None>	3	False	1,500.0000	1,264.2338	1,500.5244	1,264.7583	20.0
13D-WN076	<None>	3	False	1,500.0000	1,265.3477	1,500.4194	1,265.7672	20.0
9F-WN006	<None>	3	False	1,500.0000	1,267.0597	1,501.8881	1,268.9479	20.0
7D-WN039	<None>	5	False	1,500.0000	1,270.7380	1,501.0490	1,271.7871	20.0
9G-WN047	<None>	20	False	1,500.0000	1,272.4617	1,506.0841	1,278.5459	20.0
8G-WN016	<None>	3	False	1,500.0000	1,285.0724	1,500.8391	1,285.9116	20.0
8G-WN013	<None>	3	False	1,500.0000	1,299.7109	1,500.9441	1,300.6552	20.0
9D-WN027	<None>	20	False	1,500.0000	1,303.4392	1,501.0490	1,304.4883	20.0
8E-WN052	<None>	20	False	1,500.0000	1,304.3639	1,500.8391	1,305.2031	20.0
J-79	<None>	3	False	1,500.0000	1,308.0270	1,499.9999	1,308.0270	20.0
8G-WN012	<None>	3	False	1,500.0000	1,315.5851	1,500.9441	1,316.5292	20.0
8G-GV033	<None>	20	False	1,500.0000	1,317.9734	1,499.9999	1,317.9734	20.0
7D-ISV042	<None>	3	False	1,500.0000	1,318.0157	1,500.4194	1,318.4354	20.0
8G-WN033	<None>	20	False	1,500.0000	1,318.0181	1,499.9999	1,318.0181	20.0
8G-WN010	<None>	20	False	1,500.0000	1,318.2567	1,500.4194	1,318.6763	20.0
8G-GV029	<None>	5	False	1,500.0000	1,318.6073	1,499.9999	1,318.6073	20.0
8G-WN031	<None>	5	False	1,500.0000	1,318.6074	1,499.9999	1,318.6074	20.0
8G-WN034	<None>	3	False	1,500.0000	1,318.6083	1,500.1047	1,318.7131	20.0
8G-WN011	<None>	20	False	1,500.0000	1,318.6085	1,500.6293	1,319.2379	20.0
8G-WN008	<None>	5	False	1,500.0000	1,318.6090	1,500.3146	1,318.9238	20.0
8G-WN009	<None>	5	False	1,500.0000	1,318.6094	1,501.1538	1,319.7633	20.0
7D-WN041	<None>	5	False	1,500.0000	1,328.1824	1,500.6293	1,328.8118	20.0
8F-WN041	<None>	20	False	1,500.0000	1,333.3535	1,500.8391	1,334.1926	20.0
9F-WN015	<None>	3	False	1,500.0000	1,341.8713	1,501.0490	1,342.9204	20.0
13D-WN033	<None>	3	False	1,500.0000	1,349.5531	1,501.4685	1,351.0216	20.0
9D-WN058	<None>	3	False	1,500.0000	1,354.2573	1,501.4685	1,355.7260	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
7D-ISV043	<None>	3	False	1,500.0000	1,370.1383	1,500.4194	1,370.5579	20.0
13C-WN046	<None>	3	False	1,500.0000	1,370.7777	1,500.2097	1,370.9875	20.0
8E-WN041	<None>	3	False	1,500.0000	1,380.7493	1,501.5734	1,382.3228	20.0
11F-WN001	<None>	3	False	1,500.0000	1,386.5327	1,521.4143	1,407.9471	20.0
9F-WN018	<None>	3	False	1,500.0000	1,387.4534	1,500.1047	1,387.5582	20.0
10G-GV001	<None>	3	False	1,500.0000	1,390.7771	1,499.9999	1,390.7771	20.0
13D-WN028	<None>	20	False	1,500.0000	1,394.1248	1,500.7343	1,394.8590	20.0
6F-BOV001	<None>	3	False	1,500.0000	1,412.8492	1,500.4194	1,413.2689	20.0
7D-BOV003	<None>	3	False	1,500.0000	1,420.4540	1,500.6293	1,421.0835	20.0
7D-ISV044	<None>	3	False	1,500.0000	1,422.1403	1,500.2097	1,422.3501	20.0
11B-WN049	<None>	3	False	1,500.0000	1,424.1243	1,500.5244	1,424.6487	20.0
7D-WN043	<None>	4	False	1,500.0000	1,430.3158	1,500.7343	1,431.0502	20.0
8D-WN007	<None>	3	False	1,500.0000	1,440.2286	1,500.4194	1,440.6483	20.0
8E-WN029	<None>	35	False	1,500.0000	1,447.0745	1,500.6293	1,447.7039	20.0
10F-WN044	<None>	3	False	1,500.0000	1,462.5608	1,500.1047	1,462.6658	20.0
7E-WN082	<None>	18	False	1,500.0000	1,472.5353	1,500.5244	1,473.0598	20.0
13C-WN034	<None>	35	False	1,500.0000	1,475.3273	1,499.9999	1,475.3273	20.0
13D-WN032	<None>	5	False	1,500.0000	1,475.8962	1,500.8391	1,476.7354	20.0
J-86	<None>	20	False	1,500.0000	1,475.8978	1,499.9999	1,475.8978	20.0
9D-WN045	<None>	18	False	1,500.0000	1,479.0508	1,501.9929	1,481.0438	20.0
8D-WN017	<None>	18	False	1,500.0000	1,492.9827	1,500.6293	1,493.6121	20.0
13C-WN030	<None>	2	True	1,500.0000	1,518.5106	1,500.2097	1,518.7205	20.0
11B-GV017	<None>	2	True	1,500.0000	1,521.8671	1,500.4194	1,522.2867	20.0
12B-WN009	<None>	2	True	1,500.0000	1,525.0972	1,500.8391	1,525.9364	20.0
7D-BOV004	<None>	2	True	1,500.0000	1,525.4020	1,500.8391	1,526.2411	20.0
8F-WN043	<None>	2	True	1,500.0000	1,525.9990	1,501.3636	1,527.3627	20.0
11E-ISV014	<None>	2	True	1,500.0000	1,529.2874	1,500.6293	1,529.9169	20.0
9G-WN037	<None>	2	True	1,500.0000	1,529.7052	1,501.5734	1,531.2786	20.0
7D-GV042	<None>	20	True	1,500.0000	1,531.8303	1,500.2097	1,532.0402	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
10A-GV007	<None>	5	True	1,500.0000	1,544.9611	1,499.9999	1,544.9611	20.0
10A-WN001	<None>	5	True	1,500.0000	1,547.2004	1,499.9999	1,547.2004	20.0
10A-GV008	<None>	5	True	1,500.0000	1,549.7339	1,500.4194	1,550.1534	20.0
8D-WN003	<None>	3	True	1,500.0000	1,567.3586	1,500.7343	1,568.0929	20.0
10A-GV009	<None>	5	True	1,500.0000	1,568.5840	1,501.1538	1,569.7379	20.0
11E-ISV016	<None>	2	True	1,500.0000	1,573.4897	1,500.7343	1,574.2241	20.0
8G-WN025	<None>	3	True	1,500.0000	1,574.1625	1,500.6293	1,574.7919	20.0
9E-WN075	<None>	3	True	1,500.0000	1,578.8195	1,501.5734	1,580.3929	20.0
7D-WN007	<None>	3	True	1,500.0000	1,580.4116	1,500.4194	1,580.8312	20.0
10A-WN013	<None>	3	True	1,500.0000	1,590.8424	1,501.9929	1,592.8354	20.0
J60	<None>	3	True	1,500.0000	1,599.3514	1,501.3636	1,600.7152	20.0
6E-WN032	<None>	3	True	1,500.0000	1,607.6296	1,500.8391	1,608.4688	20.0
6F-BOV003	<None>	3	True	1,500.0000	1,614.7402	1,500.6293	1,615.3696	20.0
11B-GV016	<None>	3	True	1,500.0000	1,617.8296	1,502.6224	1,620.4520	20.0
11A-GV011	<None>	5	True	1,500.0000	1,625.7035	1,499.9999	1,625.7035	20.0
11A-WN036	<None>	5	True	1,500.0000	1,625.7036	1,500.8391	1,626.5428	20.0
6F-GV007	<None>	3	True	1,500.0000	1,628.2874	1,500.7343	1,629.0217	20.0
9D-WN053	<None>	3	True	1,500.0000	1,630.5460	1,501.0490	1,631.5951	20.0
8D-WN043	<None>	3	True	1,500.0000	1,633.1536	1,500.3146	1,633.4683	20.0
9F-WN007	<None>	3	True	1,500.0000	1,643.6903	1,502.3076	1,645.9982	20.0
13D-WN081	<None>	5	True	1,500.0000	1,648.5865	1,501.3636	1,649.9503	20.0
8G-BOV002	<None>	3	True	1,500.0000	1,649.9098	1,499.9999	1,649.9098	20.0
10A-WN017	<None>	5	True	1,500.0000	1,649.9220	1,500.7343	1,650.6563	20.0
7D-BOV005	<None>	20	True	1,500.0000	1,652.6720	1,502.3076	1,654.9797	20.0
7D-WN045	<None>	5	True	1,500.0000	1,653.0778	1,500.5244	1,653.6023	20.0
9F-WN065	<None>	3	True	1,500.0000	1,677.8591	1,500.9441	1,678.8032	20.0
9F-WN064	<None>	20	True	1,500.0000	1,682.7252	1,500.2097	1,682.9351	20.0
9B-GV011	<None>	3	True	1,500.0000	1,683.3547	1,500.8391	1,684.1938	20.0
9E-WN088	<None>	3	True	1,500.0000	1,691.5127	1,500.8391	1,692.3518	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8G-BOV001	<None>	3	True	1,500.0000	1,692.0770	1,500.3146	1,692.3917	20.0
J-15	<None>	3	True	1,500.0000	1,693.9031	1,499.9999	1,693.9031	20.0
8D-WN019	<None>	3	True	1,500.0000	1,698.3751	1,500.3146	1,698.6898	20.0
11A-WN037	<None>	5	True	1,500.0000	1,718.3423	1,501.0490	1,719.3912	20.0
9F-WN068	<None>	3	True	1,500.0000	1,719.7334	1,500.3146	1,720.0481	20.0
9F-WN067	<None>	3	True	1,500.0000	1,725.6272	1,500.2097	1,725.8372	20.0
10F-WN042	<None>	3	True	1,500.0000	1,726.1619	1,501.4685	1,727.6305	20.0
11A-GV004	<None>	5	True	1,500.0000	1,728.3257	1,499.9999	1,728.3257	20.0
11A-GV030	<None>	5	True	1,500.0000	1,728.5242	1,501.4685	1,729.9928	20.0
8E-WN019	<None>	5	True	1,500.0000	1,731.3994	1,501.4685	1,732.8679	20.0
6E-WN035	<None>	3	True	1,500.0000	1,734.2261	1,500.1047	1,734.3309	20.0
7D-BOV007	<None>	3	True	1,500.0000	1,735.1312	1,500.1047	1,735.2361	20.0
8G-WN021	<None>	3	True	1,500.0000	1,736.9048	1,500.4194	1,737.3243	20.0
8E-WN042	<None>	3	True	1,500.0000	1,738.8876	1,501.5734	1,740.4611	20.0
11A-WN038	<None>	3	True	1,500.0000	1,739.7426	1,502.5176	1,742.2603	20.0
10B-WN005	<None>	3	True	1,500.0000	1,766.5989	1,499.9999	1,766.5989	20.0
11A-WN043	<None>	5	True	1,500.0000	1,771.0433	1,500.3146	1,771.3580	20.0
8E-WN039	<None>	3	True	1,500.0000	1,773.1324	1,501.0490	1,774.1815	20.0
13D-GV033	<None>	20	True	1,500.0000	1,788.6870	1,500.1047	1,788.7919	20.0
13D-WN035	<None>	20	True	1,500.0000	1,790.4635	1,500.3146	1,790.7782	20.0
11B-WN031	<None>	4	True	1,500.0000	1,790.8898	1,500.2097	1,791.0996	20.0
8F-GV027	<None>	3	True	1,500.0000	1,791.3221	1,500.2097	1,791.5320	20.0
6E-WN034	<None>	3	True	1,500.0000	1,799.0262	1,499.9999	1,799.0262	20.0
13D-WN041	<None>	3	True	1,500.0000	1,801.6246	1,501.2587	1,802.8835	20.0
9G-WN036	<None>	3	True	1,500.0000	1,814.6450	1,501.3636	1,816.0087	20.0
J-33	<None>	20	True	1,500.0000	1,823.6440	1,500.3146	1,823.9586	20.0
8G-WN023	<None>	5	True	1,500.0000	1,835.0458	1,500.7343	1,835.7800	20.0
8F-WN059	<None>	3	True	1,500.0000	1,837.9584	1,500.8391	1,838.7975	20.0
13C-WN032	<None>	5	True	1,500.0000	1,840.1167	1,501.3636	1,841.4805	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9E-WN064	<None>	3	True	1,500.0000	1,840.7327	1,500.2097	1,840.9424	20.0
13D-WN034	<None>	3	True	1,500.0000	1,841.0770	1,501.7832	1,842.8602	20.0
13A-WN001	<None>	3	True	1,500.0000	1,842.6229	1,500.6293	1,843.2523	20.0
13D-WN040	<None>	5	True	1,500.0000	1,843.6512	1,502.1990	1,845.8502	20.0
J56	<None>	3	True	1,500.0000	1,844.3185	1,499.9999	1,844.3185	20.0
11A-WN011	<None>	5	True	1,500.0000	1,845.4355	1,500.3146	1,845.7501	20.0
8D-WN051	<None>	3	True	1,500.0000	1,847.6093	1,501.6783	1,849.2876	20.0
11A-WN032	<None>	3	True	1,500.0000	1,860.3722	1,500.3146	1,860.6868	20.0
11E-ISV017	<None>	3	True	1,500.0000	1,868.8644	1,500.5244	1,869.3890	20.0
13A-WN002	<None>	5	True	1,500.0000	1,868.9441	1,500.1047	1,869.0490	20.0
6F-WN002	<None>	3	True	1,500.0000	1,878.7520	1,500.2097	1,878.9617	20.0
11A-WN013	<None>	5	True	1,500.0000	1,879.6938	1,501.0490	1,880.7427	20.0
7D-WN032	<None>	21	True	1,500.0000	1,892.7397	1,501.2587	1,893.9987	20.0
13A-WN004	<None>	5	True	1,500.0000	1,895.9629	1,499.9999	1,895.9629	20.0
12B-GV034	<None>	3	True	1,500.0000	1,902.1802	1,500.6293	1,902.8096	20.0
10F-BOV002	<None>	3	True	1,500.0000	1,902.7976	1,500.9441	1,903.7417	20.0
11A-WN034	<None>	3	True	1,500.0000	1,904.4261	1,500.6293	1,905.0555	20.0
11A-WN033	<None>	5	True	1,500.0000	1,904.4563	1,500.4194	1,904.8760	20.0
J54	<None>	21	True	1,500.0000	1,914.3881	1,505.4547	1,919.8428	20.0
9F-WN060	<None>	3	True	1,500.0000	1,915.7458	1,500.4194	1,916.1655	20.0
11A-GV036	<None>	5	True	1,500.0000	1,927.5251	1,499.9999	1,927.5251	20.0
7D-WN025	<None>	3	True	1,500.0000	1,928.8252	1,500.7343	1,929.5594	20.0
11A-WN012	<None>	5	True	1,500.0000	1,929.2183	1,500.7343	1,929.9526	20.0
7D-WN018	<None>	3	True	1,500.0000	1,929.4387	1,501.3636	1,930.8025	20.0
11C-WN018	<None>	3	True	1,500.0000	1,929.9149	1,499.9999	1,929.9149	20.0
11A-BOV001	<None>	3	True	1,500.0000	1,933.6650	1,500.1047	1,933.7699	20.0
8G-WN024	<None>	3	True	1,500.0000	1,935.1567	1,500.1047	1,935.2616	20.0
8G-WN020	<None>	21	True	1,500.0000	1,935.3168	1,500.3146	1,935.6313	20.0
12A-WN022	<None>	5	True	1,500.0000	1,935.9060	1,500.2097	1,936.1157	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12A-WN001	<None>	5	True	1,500.0000	1,935.9081	1,500.3146	1,936.2228	20.0
12A-WN020	<None>	5	True	1,500.0000	1,935.9106	1,500.2097	1,936.1205	20.0
13D-GV035	<None>	21	True	1,500.0000	1,945.0673	1,501.5299	1,946.5973	20.0
13D-WN080	<None>	21	True	1,500.0000	1,945.1155	1,500.3146	1,945.4301	20.0
9E-BOV005	<None>	3	True	1,500.0000	1,945.6298	1,501.2587	1,946.8885	20.0
7D-WN001	<None>	5	True	1,500.0000	1,956.6404	1,501.2587	1,957.8993	20.0
11B-GV032	<None>	3	True	1,500.0000	1,958.1036	1,501.5734	1,959.6771	20.0
7D-WN035	<None>	3	True	1,500.0000	1,967.6083	1,500.5244	1,968.1328	20.0
9D-WN036	<None>	3	True	1,500.0000	1,971.0159	1,501.3636	1,972.3796	20.0
13C-WN033	<None>	5	True	1,500.0000	1,983.2394	1,500.9441	1,984.1833	20.0
10G-WN001	<None>	3	True	1,500.0000	1,984.5066	1,507.3999	1,991.9065	20.0
11A-WN035	<None>	3	True	1,500.0000	1,990.0980	1,500.6293	1,990.7275	20.0
12B-WN030	<None>	3	True	1,500.0000	1,993.6874	1,500.8391	1,994.5265	20.0
8F-WN009	<None>	3	True	1,500.0000	1,994.3044	1,500.6293	1,994.9338	20.0
9A-WN012	<None>	3	True	1,500.0000	1,999.0338	1,500.1047	1,999.1387	20.0
12C-WN002	<None>	3	True	1,500.0000	2,001.0062	1,499.9999	2,001.0062	20.0
J-124	<None>	3	True	1,500.0000	2,010.1942	1,499.9999	2,010.1942	20.0
8D-WN010	<None>	3	True	1,500.0000	2,015.4961	1,500.4194	2,015.9159	20.0
8G-WN022	<None>	3	True	1,500.0000	2,015.8281	1,500.4194	2,016.2478	20.0
9D-WN047	<None>	3	True	1,500.0000	2,016.6823	1,500.8391	2,017.5214	20.0
11A-WN027	<None>	3	True	1,500.0000	2,022.9692	1,500.4194	2,023.3889	20.0
11A-WN031	<None>	21	True	1,500.0000	2,047.6665	1,501.0490	2,048.7153	20.0
11A-WN028	<None>	5	True	1,500.0000	2,047.8818	1,500.3146	2,048.1963	20.0
12C-WN009	<None>	3	True	1,500.0000	2,054.1707	1,501.8881	2,056.0591	20.0
8F-ISV029	<None>	3	True	1,500.0000	2,054.6768	1,500.5244	2,055.2012	20.0
12B-WN017	<None>	3	True	1,500.0000	2,056.7688	1,500.8391	2,057.6079	20.0
12D-WN021	<None>	3	True	1,500.0000	2,077.5317	1,499.9999	2,077.5317	20.0
J-110	<None>	3	True	1,500.0000	2,089.1521	1,499.9999	2,089.1521	20.0
11E-ISV019	<None>	3	True	1,500.0000	2,099.5291	1,500.5244	2,100.0537	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
13D-WN061	<None>	3	True	1,500.0000	2,101.0217	1,500.3146	2,101.3364	20.0
13C-WN031	<None>	21	True	1,500.0000	2,104.7244	1,501.3636	2,106.0879	20.0
11A-WN048	<None>	5	True	1,500.0000	2,124.2932	1,499.9999	2,124.2932	20.0
7D-WN064	<None>	3	True	1,500.0000	2,141.6931	1,501.3636	2,143.0569	20.0
13C-GV017	<None>	3	True	1,500.0000	2,145.4702	1,499.9999	2,145.4702	20.0
13D-WN015	<None>	5	True	1,500.0000	2,165.9094	1,500.8391	2,166.7485	20.0
9G-WN050	<None>	3	True	1,500.0000	2,178.8875	1,500.3146	2,179.2021	20.0
3C-WN001	<None>	3	True	1,500.0000	2,180.9199	1,607.9999	2,288.9199	20.0
7D-WN036	<None>	3	True	1,500.0000	2,185.3389	1,500.3146	2,185.6536	20.0
6F-WN014	<None>	5	True	1,500.0000	2,189.8000	1,501.1538	2,190.9539	20.0
12E-WN012	<None>	3	True	1,500.0000	2,191.4961	1,503.1448	2,194.6409	20.0
12E-WN011	<None>	3	True	1,500.0000	2,192.3733	1,500.1047	2,192.4783	20.0
8G-WN026	<None>	21	True	1,500.0000	2,194.2681	1,501.0490	2,195.3169	20.0
8F-WN034	<None>	3	True	1,500.0000	2,197.3354	1,501.6783	2,199.0139	20.0
12C-WN016	<None>	3	True	1,500.0000	2,198.5774	1,501.8881	2,200.4656	20.0
11A-WN015	<None>	5	True	1,500.0000	2,200.5176	1,501.6783	2,202.1960	20.0
10F-BOV001	<None>	3	True	1,500.0000	2,204.6995	1,500.6293	2,205.3289	20.0
12E-WN047	<None>	3	True	1,500.0000	2,205.2109	1,507.5145	2,212.7256	20.0
13D-WN078	<None>	3	True	1,500.0000	2,206.3706	1,500.6293	2,207.0000	20.0
12E-WN053	<None>	3	True	1,500.0000	2,206.7029	1,502.8499	2,209.5530	20.0
J-126	<None>	3	True	1,500.0000	2,206.7534	1,499.9999	2,206.7534	20.0
9F-WN048	<None>	3	True	1,500.0000	2,208.9968	1,501.0490	2,210.0457	20.0
12A-ISV023	<None>	3	True	1,500.0000	2,220.2356	1,499.9999	2,220.2356	20.0
12A-WN033	<None>	3	True	1,500.0000	2,220.8777	1,499.9999	2,220.8777	20.0
6F-WN008	<None>	5	True	1,500.0000	2,237.7710	1,500.2097	2,237.9810	20.0
10F-ISV026	<None>	3	True	1,500.0000	2,251.1138	1,500.4194	2,251.5334	20.0
9D-WN049	<None>	3	True	1,500.0000	2,251.9590	1,499.9999	2,251.9590	20.0
7D-GV077	<None>	3	True	1,500.0000	2,252.3745	1,501.4685	2,253.8430	20.0
11A-WN026	<None>	5	True	1,500.0000	2,253.9919	1,501.5734	2,255.5654	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8C-WN020	<None>	3	True	1,500.0000	2,253.9932	1,503.3567	2,257.3501	20.0
11A-GV022	<None>	5	True	1,500.0000	2,254.0371	1,500.7343	2,254.7712	20.0
9F-WN053	<None>	3	True	1,500.0000	2,254.2151	1,500.8391	2,255.0542	20.0
6E-WN052	<None>	3	True	1,500.0000	2,255.3779	1,501.2587	2,256.6370	20.0
12D-WN020	<None>	3	True	1,500.0000	2,256.9583	1,499.9999	2,256.9583	20.0
12D-WN022	<None>	3	True	1,500.0000	2,259.3435	1,500.3146	2,259.6580	20.0
7D-WN009	<None>	3	True	1,500.0000	2,263.7290	1,501.7832	2,265.5122	20.0
9G-GV021	<None>	3	True	1,500.0000	2,265.9639	1,500.2097	2,266.1736	20.0
11B-WN050	<None>	3	True	1,500.0000	2,267.0247	1,500.5244	2,267.5491	20.0
11A-GV019	<None>	5	True	1,500.0000	2,267.7661	1,501.1538	2,268.9202	20.0
9D-WN048	<None>	3	True	1,500.0000	2,270.1160	1,502.7273	2,272.8433	20.0
7D-GV030	<None>	5	True	1,500.0000	2,270.9502	1,500.1047	2,271.0552	20.0
11A-WN008	<None>	5	True	1,500.0000	2,273.3530	1,500.2097	2,273.5627	20.0
9E-WN103	<None>	3	True	1,500.0000	2,274.1316	1,500.6293	2,274.7612	20.0
11A-WN050	<None>	5	True	1,500.0000	2,275.2646	1,501.0490	2,276.3137	20.0
11A-WN001	<None>	5	True	1,500.0000	2,275.2727	1,500.2097	2,275.4824	20.0
10G-WN002	<None>	3	True	1,500.0000	2,277.9255	1,499.9999	2,277.9255	20.0
6E-WN008	<None>	3	True	1,500.0000	2,278.5308	1,501.3636	2,279.8943	20.0
13D-WN016	<None>	5	True	1,500.0000	2,278.7639	1,500.3146	2,279.0786	20.0
J268	<None>	3	True	1,500.0000	2,279.6643	1,500.1047	2,279.7693	20.0
8F-WN044	<None>	3	True	1,500.0000	2,280.1096	1,500.8391	2,280.9490	20.0
8D-WN013	<None>	3	True	1,500.0000	2,280.1196	1,500.3146	2,280.4341	20.0
J348	<None>	3	True	1,500.0000	2,283.9456	1,500.6293	2,284.5750	20.0
7D-WN013	<None>	3	True	1,500.0000	2,286.9915	1,501.8881	2,288.8799	20.0
11A-WN020	<None>	5	True	1,500.0000	2,288.9880	1,502.5176	2,291.5056	20.0
11A-WN029	<None>	5	True	1,500.0000	2,291.6355	1,500.8391	2,292.4746	20.0
7D-WN047	<None>	5	True	1,500.0000	2,292.5188	1,500.8391	2,293.3579	20.0
9G-WN046	<None>	3	True	1,500.0000	2,297.1338	1,500.9441	2,298.0779	20.0
10F-ISV030	<None>	3	True	1,500.0000	2,301.7539	1,500.5244	2,302.2786	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9G-BOV004	<None>	3	True	1,500.0000	2,303.1311	1,500.4194	2,303.5508	20.0
12E-WN010	<None>	3	True	1,500.0000	2,304.4207	1,509.0648	2,313.4856	20.0
12A-GV027	<None>	5	True	1,500.0000	2,311.4861	1,501.3636	2,312.8499	20.0
J294	<None>	3	True	1,500.0000	2,318.7737	1,500.1047	2,318.8787	20.0
9G-WN049	<None>	21	True	1,500.0000	2,318.9988	1,501.1538	2,320.1528	20.0
9G-GV018	<None>	21	True	1,500.0000	2,319.0005	1,500.2097	2,319.2102	20.0
7D-WN026	<None>	3	True	1,500.0000	2,326.8726	1,500.9441	2,327.8167	20.0
9G-WN045	<None>	5	True	1,500.0000	2,328.6042	1,501.1538	2,329.7583	20.0
6F-WN010	<None>	5	True	1,500.0000	2,338.4924	1,500.6293	2,339.1218	20.0
11E-WN055	<None>	3	True	1,500.0000	2,340.3843	1,500.5244	2,340.9087	20.0
7D-WN058	<None>	5	True	1,500.0000	2,341.3008	1,500.9441	2,342.2449	20.0
6E-WN028	<None>	3	True	1,500.0000	2,342.3965	1,501.2587	2,343.6553	20.0
J286	<None>	3	True	1,500.0000	2,343.9116	1,499.9999	2,343.9116	20.0
9G-BOV005	<None>	3	True	1,500.0000	2,344.9495	1,500.4194	2,345.3691	20.0
J-12	<None>	3	True	1,500.0000	2,345.4934	1,501.0490	2,346.5425	20.0
11E-WN049	<None>	3	True	1,500.0000	2,345.6016	1,500.5244	2,346.1262	20.0
9G-WN032	<None>	3	True	1,500.0000	2,348.3079	1,501.2587	2,349.5667	20.0
6E-WN015	<None>	3	True	1,500.0000	2,348.9224	1,501.6783	2,350.6006	20.0
13E-WN001	<None>	3	True	1,500.0000	2,349.5288	1,500.2097	2,349.7385	20.0
12B-GV011	<None>	3	True	1,500.0000	2,358.9800	1,501.8881	2,360.8682	20.0
13C-WN008	<None>	3	True	1,500.0000	2,360.0000	1,501.5734	2,361.5735	20.0
J-34	<None>	3	True	1,500.0000	2,363.8042	1,501.3636	2,365.1677	20.0
11B-BOV003	<None>	3	True	1,500.0000	2,365.7634	1,501.4685	2,367.2322	20.0
8F-WN040	<None>	3	True	1,500.0000	2,368.6013	1,501.1538	2,369.7554	20.0
6E-WN029	<None>	3	True	1,500.0000	2,369.1748	1,501.4685	2,370.6433	20.0
8F-GV043	<None>	3	True	1,500.0000	2,369.1917	1,500.7343	2,369.9260	20.0
J112	<None>	3	True	1,500.0000	2,376.9063	1,499.9999	2,376.9063	20.0
6E-WN009	<None>	3	True	1,500.0000	2,378.0403	1,501.0490	2,379.0891	20.0
8E-BOV001	<None>	3	True	1,500.0000	2,381.4011	1,499.9999	2,381.4011	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
11A-WN030	<None>	6	True	1,500.0000	2,386.6406	1,500.3146	2,386.9553	20.0
8F-WN061	<None>	3	True	1,500.0000	2,386.8872	1,500.1047	2,386.9919	20.0
8D-WN008	<None>	5	True	1,500.0000	2,387.3145	1,501.0490	2,388.3633	20.0
13B-ISV006	<None>	3	True	1,500.0000	2,387.4719	1,500.5244	2,387.9963	20.0
7B-WN001	<None>	3	True	1,500.0000	2,389.2859	1,499.9999	2,389.2859	20.0
7D-WN063	<None>	3	True	1,500.0000	2,391.4685	1,500.6293	2,392.0979	20.0
8G-WN005	<None>	3	True	1,500.0000	2,399.3518	1,500.7343	2,400.0862	20.0
8E-WN037	<None>	5	True	1,500.0000	2,407.4473	1,500.1047	2,407.5522	20.0
8D-WN020	<None>	5	True	1,500.0000	2,422.1563	1,500.9441	2,423.1003	20.0
8F-GV032	<None>	3	True	1,500.0000	2,422.6584	1,500.7343	2,423.3926	20.0
13D-WN060	<None>	5	True	1,500.0000	2,425.3635	1,499.9999	2,425.3635	20.0
6E-WN051	<None>	3	True	1,500.0000	2,426.8093	1,501.2587	2,428.0681	20.0
13B-WN016	<None>	3	True	1,500.0000	2,430.7761	1,502.0979	2,432.8743	20.0
7D-WN037	<None>	5	True	1,500.0000	2,431.2180	1,500.8391	2,432.0571	20.0
9G-WN026	<None>	6	True	1,500.0000	2,431.2385	1,500.4194	2,431.6582	20.0
8D-BOV002	<None>	3	True	1,500.0000	2,444.3350	1,500.8391	2,445.1741	20.0
12B-WN052	<None>	3	True	1,500.0000	2,445.9304	1,500.5244	2,446.4551	20.0
11E-ISV011	<None>	3	True	1,500.0000	2,451.0962	1,500.7343	2,451.8306	20.0
8D-WN004	<None>	3	True	1,500.0000	2,453.8049	1,500.3146	2,454.1194	20.0
9G-WN023	<None>	6	True	1,500.0000	2,456.6106	1,500.6293	2,457.2400	20.0
11A-GV033	<None>	5	True	1,500.0000	2,466.9209	1,500.9441	2,467.8650	20.0
8D-WN018	<None>	5	True	1,500.0000	2,467.7007	1,500.6293	2,468.3301	20.0
13D-WN024	<None>	5	True	1,500.0000	2,476.3826	1,503.8624	2,480.2449	20.0
7D-WN008	<None>	3	True	1,500.0000	2,479.6975	1,500.6293	2,480.3269	20.0
9E-WN061	<None>	3	True	1,500.0000	2,480.3008	1,499.9999	2,480.3008	20.0
7D-WN046	<None>	5	True	1,500.0000	2,488.5349	1,500.1047	2,488.6399	20.0
6E-WN039	<None>	3	True	1,500.0000	2,489.1389	1,500.7343	2,489.8733	20.0
7D-BOV002	<None>	3	True	1,500.0000	2,491.4404	1,500.3146	2,491.7549	20.0
11A-GV006	<None>	6	True	1,500.0000	2,494.5806	1,500.1047	2,494.6855	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
11A-WN002	<None>	6	True	1,500.0000	2,500.3760	1,500.5244	2,500.9004	20.0
11A-WN005	<None>	6	True	1,500.0000	2,503.5422	1,500.3146	2,503.8569	20.0
J266	<None>	3	True	1,500.0000	2,505.3496	1,501.0490	2,506.3987	20.0
7D-WN061	<None>	3	True	1,500.0000	2,509.8418	1,501.2587	2,511.1006	20.0
8G-GV001	<None>	3	True	1,500.0000	2,514.5981	1,500.5244	2,515.1226	20.0
3B-GV003	<None>	3	True	1,500.0000	2,516.4766	1,503.8812	2,520.3577	20.0
13D-WN008	<None>	3	True	1,500.0000	2,518.1809	1,500.9441	2,519.1250	20.0
13B-WN015	<None>	3	True	1,500.0000	2,519.3545	1,503.1470	2,522.5015	20.0
13D-WN019	<None>	3	True	1,500.0000	2,531.1563	1,502.4126	2,533.5688	20.0
13C-WN025	<None>	3	True	1,500.0000	2,535.1626	1,501.9929	2,537.1558	20.0
11C-GV003	<None>	3	True	1,500.0000	2,535.3201	1,499.9999	2,535.3201	20.0
13D-WN010	<None>	5	True	1,500.0000	2,538.7039	1,500.4194	2,539.1235	20.0
13D-GV006	<None>	5	True	1,500.0000	2,539.4756	1,499.9999	2,539.4756	20.0
J290	<None>	5	True	1,500.0000	2,542.7678	1,500.7343	2,543.5020	20.0
J-75	<None>	3	True	1,500.0000	2,542.8574	1,499.9999	2,542.8574	20.0
8F-WN052	<None>	3	True	1,500.0000	2,543.0603	1,500.8391	2,543.8994	20.0
J-13	<None>	3	True	1,500.0000	2,547.2598	1,499.9999	2,547.2598	20.0
11C-WN015	<None>	3	True	1,500.0000	2,551.9551	1,499.9999	2,551.9551	20.0
J-112	<None>	3	True	1,500.0000	2,552.9946	1,499.9999	2,552.9946	20.0
7D-WN016	<None>	3	True	1,500.0000	2,561.5073	1,500.2097	2,561.7170	20.0
9G-BOV002	<None>	21	True	1,500.0000	2,562.1338	1,499.9999	2,562.1338	20.0
9G-WN020	<None>	5	True	1,500.0000	2,562.5244	1,500.3146	2,562.8391	20.0
13D-WN009	<None>	3	True	1,500.0000	2,569.5110	1,500.9441	2,570.4551	20.0
13D-WN052	<None>	3	True	1,500.0000	2,573.7444	1,500.9441	2,574.6885	20.0
6E-WN044	<None>	3	True	1,500.0000	2,574.0627	1,502.0979	2,576.1609	20.0
7D-WN015	<None>	3	True	1,500.0000	2,576.2900	1,502.4126	2,578.7026	20.0
13D-WN020	<None>	3	True	1,500.0000	2,580.5564	1,502.6224	2,583.1792	20.0
J272	<None>	3	True	1,500.0000	2,585.7830	1,500.9441	2,586.7271	20.0
7D-WN062	<None>	3	True	1,500.0000	2,586.8311	1,500.9441	2,587.7751	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12A-WN024	<None>	6	True	1,500.0000	2,590.2327	1,500.5244	2,590.7573	20.0
J346	<None>	3	True	1,500.0000	2,591.5925	1,500.1047	2,591.6973	20.0
8F-WN058	<None>	3	True	1,500.0000	2,594.0769	1,501.2587	2,595.3359	20.0
9E-GV019	<None>	3	True	1,500.0000	2,596.5313	1,500.5244	2,597.0557	20.0
8G-WN029	<None>	23	True	1,500.0000	2,599.3196	1,500.2097	2,599.5293	20.0
7D-WN029	<None>	3	True	1,500.0000	2,599.8579	1,502.0979	2,601.9558	20.0
J-11	<None>	23	True	1,500.0000	2,601.1125	1,501.0490	2,602.1614	20.0
J-10	<None>	23	True	1,500.0000	2,601.1160	1,500.4194	2,601.5356	20.0
J284	<None>	5	True	1,500.0000	2,605.3154	1,500.2097	2,605.5251	20.0
9G-WN038	<None>	3	True	1,500.0000	2,607.9163	1,501.5734	2,609.4897	20.0
9G-GV041	<None>	3	True	1,500.0000	2,609.5662	1,500.9441	2,610.5103	20.0
9G-GV005	<None>	5	True	1,500.0000	2,612.0840	1,500.2097	2,612.2937	20.0
13D-WN013	<None>	3	True	1,500.0000	2,612.8538	1,501.3636	2,614.2175	20.0
J318	<None>	3	True	1,500.0000	2,617.7441	1,501.0490	2,618.7930	20.0
J208	<None>	3	True	1,500.0000	2,618.2937	1,500.5244	2,618.8184	20.0
9G-WN035	<None>	3	True	1,500.0000	2,618.4905	1,499.9999	2,618.4905	20.0
7D-WN022	<None>	3	True	1,500.0000	2,618.8918	1,500.7343	2,619.6262	20.0
13B-WN024	<None>	3	True	1,500.0000	2,624.1509	1,500.6293	2,624.7805	20.0
8G-WN004	<None>	3	True	1,500.0000	2,628.8188	1,500.7343	2,629.5532	20.0
13D-WN004	<None>	3	True	1,500.0000	2,628.8889	1,501.8881	2,630.7773	20.0
12A-WN006	<None>	6	True	1,500.0000	2,629.8696	1,500.5244	2,630.3940	20.0
12A-WN025	<None>	6	True	1,500.0000	2,635.1777	1,500.7343	2,635.9119	20.0
7D-WN054	<None>	3	True	1,500.0000	2,635.2502	1,501.9929	2,637.2434	20.0
13D-WN079	<None>	3	True	1,500.0000	2,638.8372	1,500.7343	2,639.5715	20.0
10E-BOV001	<None>	3	True	1,500.0000	2,649.1294	1,499.9999	2,649.1294	20.0
11B-WN034	<None>	6	True	1,500.0000	2,657.6152	1,501.3636	2,658.9790	20.0
7D-WN049	<None>	5	True	1,500.0000	2,672.6497	1,500.5244	2,673.1743	20.0
11C-GV002	<None>	3	True	1,500.0000	2,674.8994	1,499.9999	2,674.8994	20.0
12D-WN029	<None>	3	True	1,500.0000	2,681.3091	1,535.7499	2,717.0591	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12B-BOV001	<None>	3	True	1,500.0000	2,684.5605	1,500.4194	2,684.9802	20.0
11A-GV034	<None>	5	True	1,500.0000	2,688.2026	1,500.2097	2,688.4124	20.0
8D-BOV001	<None>	3	True	1,500.0000	2,702.6084	1,500.4194	2,703.0281	20.0
13B-GV001	<None>	3	True	1,500.0000	2,703.8735	1,500.9441	2,704.8176	20.0
11B-WN047	<None>	3	True	1,500.0000	2,704.2446	1,501.4685	2,705.7131	20.0
J280	<None>	5	True	1,500.0000	2,707.5620	1,500.3146	2,707.8767	20.0
10E-WN060	<None>	3	True	1,500.0000	2,708.0625	1,501.0490	2,709.1116	20.0
8F-WN025	<None>	3	True	1,500.0000	2,711.5020	1,500.5244	2,712.0264	20.0
13C-WN020	<None>	3	True	1,500.0000	2,714.7937	1,501.9929	2,716.7869	20.0
8D-WN006	<None>	3	True	1,500.0000	2,715.3633	1,501.1538	2,716.5173	20.0
13D-WN074	<None>	3	True	1,500.0000	2,716.7578	1,500.7343	2,717.4922	20.0
J110	<None>	3	True	1,500.0000	2,716.9966	1,499.9999	2,716.9966	20.0
7D-GV057	<None>	4	True	1,500.0000	2,722.7502	1,500.3146	2,723.0649	20.0
11A-WN004	<None>	5	True	1,500.0000	2,723.0137	1,500.4194	2,723.4333	20.0
11C-WN021	<None>	3	True	1,500.0000	2,723.5330	1,499.9999	2,723.5330	20.0
J278	<None>	5	True	1,500.0000	2,724.1135	1,499.9999	2,724.1135	20.0
13D-WN044	<None>	3	True	1,500.0000	2,724.1589	1,500.1047	2,724.2639	20.0
12B-WN047	<None>	3	True	1,500.0000	2,724.6335	1,500.6293	2,725.2629	20.0
9G-WN034	<None>	5	True	1,500.0000	2,727.6638	1,500.7343	2,728.3982	20.0
13E-GV007	<None>	3	True	1,500.0000	2,734.3848	1,499.9999	2,734.3848	20.0
13C-GV025	<None>	4	True	1,500.0000	2,737.1726	1,499.9999	2,737.1726	20.0
13C-WN045	<None>	3	True	1,500.0000	2,737.4290	1,501.4685	2,738.8975	20.0
13D-WN053	<None>	3	True	1,500.0000	2,741.1824	1,500.3146	2,741.4968	20.0
13C-GV026	<None>	4	True	1,500.0000	2,744.6719	1,500.1047	2,744.7769	20.0
13B-GV023	<None>	4	True	1,500.0000	2,745.6663	1,501.7832	2,747.4495	20.0
9A-WN007	<None>	3	True	1,500.0000	2,748.7163	1,500.2097	2,748.9260	20.0
8G-WN003	<None>	5	True	1,500.0000	2,750.7139	1,501.5734	2,752.2874	20.0
J-101	<None>	3	True	1,500.0000	2,756.7676	1,499.9999	2,756.7676	20.0
13D-WN017	<None>	6	True	1,500.0000	2,757.1650	1,501.0490	2,758.2139	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
7D-WN066	<None>	4	True	1,500.0000	2,757.5305	1,500.9441	2,758.4744	20.0
8F-WN036	<None>	3	True	1,500.0000	2,758.4536	1,501.2587	2,759.7126	20.0
13B-ISV021	<None>	4	True	1,500.0000	2,759.9885	1,499.9999	2,759.9885	20.0
13B-WN032	<None>	22	True	1,500.0000	2,760.3262	1,500.9441	2,761.2703	20.0
13C-WN016	<None>	4	True	1,500.0000	2,764.7793	1,501.5734	2,766.3528	20.0
7D-BOV001	<None>	3	True	1,500.0000	2,765.1450	1,500.3146	2,765.4597	20.0
13B-WN006	<None>	4	True	1,500.0000	2,766.4011	1,500.6293	2,767.0305	20.0
12C-WN028	<None>	3	True	1,500.0000	2,771.3330	1,500.5244	2,771.8574	20.0
8F-WN057	<None>	3	True	1,500.0000	2,773.5249	1,500.3146	2,773.8396	20.0
13D-GV024	<None>	6	True	1,500.0000	2,774.3977	1,500.4194	2,774.8174	20.0
8C-WN034	<None>	4	True	1,500.0000	2,774.6084	1,502.6224	2,777.2312	20.0
13B-WN004	<None>	4	True	1,500.0000	2,780.3474	1,500.5244	2,780.8721	20.0
13B-WN008	<None>	4	True	1,500.0000	2,784.7466	1,501.2587	2,786.0054	20.0
7D-WN060	<None>	3	True	1,500.0000	2,793.3955	1,500.3146	2,793.7102	20.0
8G-WN030	<None>	5	True	1,500.0000	2,795.7468	1,500.1047	2,795.8516	20.0
13B-WN042	<None>	6	True	1,500.0000	2,799.6292	1,500.7343	2,800.3633	20.0
9D-WN035	<None>	3	True	1,500.0000	2,808.7366	1,500.6293	2,809.3660	20.0
8F-WN010	<None>	5	True	1,500.0000	2,812.9814	1,500.9441	2,813.9255	20.0
8B-WN002	<None>	3	True	1,500.0000	2,818.5774	1,506.1890	2,824.7666	20.0
12D-WN049	<None>	3	True	1,500.0000	2,825.3752	1,500.8800	2,826.2551	20.0
J314	<None>	3	True	1,500.0000	2,829.8162	1,500.5244	2,830.3406	20.0
13C-WN024	<None>	6	True	1,500.0000	2,833.3274	1,500.8391	2,834.1665	20.0
13C-GV024	<None>	6	True	1,500.0000	2,834.6792	1,500.8391	2,835.5183	20.0
8F-WN055	<None>	5	True	1,500.0000	2,834.8616	1,499.9999	2,834.8616	20.0
11B-WN025	<None>	6	True	1,500.0000	2,835.0063	1,501.4685	2,836.4749	20.0
8F-WN018	<None>	3	True	1,500.0000	2,836.1533	1,501.1538	2,837.3074	20.0
J138	<None>	3	True	1,500.0000	2,841.2524	1,499.9999	2,841.2524	20.0
12B-WN025	<None>	3	True	1,500.0000	2,842.5884	1,500.6293	2,843.2178	20.0
13D-WN069	<None>	3	True	1,500.0000	2,845.8691	1,499.9999	2,845.8691	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8G-WN001	<None>	5	True	1,500.0000	2,848.5259	1,500.7343	2,849.2603	20.0
8G-GV003	<None>	5	True	1,500.0000	2,848.5591	1,500.2097	2,848.7688	20.0
13B-WN043	<None>	5	True	1,500.0000	2,852.9570	1,499.9999	2,852.9570	20.0
13B-WN036	<None>	5	True	1,500.0000	2,852.9570	1,499.9999	2,852.9570	20.0
13B-WN035	<None>	5	True	1,500.0000	2,852.9570	1,499.9999	2,852.9570	20.0
13B-WN039	<None>	6	True	1,500.0000	2,852.9871	1,500.9441	2,853.9312	20.0
13C-WN043	<None>	6	True	1,500.0000	2,853.0049	1,500.1047	2,853.1099	20.0
13C-BOV003	<None>	6	True	1,500.0000	2,853.0056	1,499.9999	2,853.0056	20.0
13B-WN037	<None>	6	True	1,500.0000	2,853.0154	1,500.2097	2,853.2251	20.0
13C-WN042	<None>	4	True	1,500.0000	2,853.0229	1,501.3796	2,854.4028	20.0
13C-WN038	<None>	6	True	1,500.0000	2,853.0229	1,500.1047	2,853.1277	20.0
12A-WN023	<None>	6	True	1,500.0000	2,866.8977	1,500.2097	2,867.1074	20.0
8D-WN056	<None>	4	True	1,500.0000	2,868.0720	1,502.9371	2,871.0093	20.0
13C-WN019	<None>	4	True	1,500.0000	2,880.6365	1,500.5244	2,881.1611	20.0
11E-ISV006	<None>	3	True	1,500.0000	2,891.3623	1,500.5244	2,891.8870	20.0
13C-WN011	<None>	4	True	1,500.0000	2,892.0366	1,502.0979	2,894.1348	20.0
12B-WN033	<None>	3	True	1,500.0000	2,896.7107	1,500.6293	2,897.3401	20.0
6F-WN007	<None>	5	True	1,500.0000	2,899.3838	1,501.5734	2,900.9573	20.0
13B-WN038	<None>	4	True	1,500.0000	2,905.1196	1,501.7832	2,906.9028	20.0
12D-WN040	<None>	3	True	1,500.0000	2,908.4458	1,499.9999	2,908.4458	20.0
J-6	<None>	4	True	1,500.0000	2,911.5503	1,499.9999	2,911.5503	20.0
J-7	<None>	6	True	1,500.0000	2,911.5510	1,500.3146	2,911.8655	20.0
6E-WN030	<None>	21	True	1,500.0000	2,917.6350	1,501.0490	2,918.6841	20.0
13C-GV009	<None>	4	True	1,500.0000	2,921.8447	1,499.9999	2,921.8447	20.0
13C-WN047	<None>	4	True	1,500.0000	2,922.4016	1,500.1047	2,922.5063	20.0
7D-WN056	<None>	4	True	1,500.0000	2,924.0427	1,501.1538	2,925.1965	20.0
13B-WN023	<None>	4	True	1,500.0000	2,929.0474	1,501.4685	2,930.5161	20.0
11E-ISV010	<None>	3	True	1,500.0000	2,930.9341	1,500.5244	2,931.4585	20.0
13B-WN029	<None>	4	True	1,500.0000	2,931.0708	1,501.0490	2,932.1196	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
7C-GV006	<None>	6	True	1,500.0000	2,932.5967	1,503.1898	2,935.7866	20.0
J226	<None>	6	True	1,500.0000	2,934.4482	1,500.1047	2,934.5532	20.0
8F-WN062	<None>	5	True	1,500.0000	2,937.4502	1,499.9999	2,937.4502	20.0
7C-GV004	<None>	22	True	1,500.0000	2,937.7917	1,499.9999	2,937.7917	20.0
12C-GV002	<None>	4	True	1,500.0000	2,937.9888	1,500.1047	2,938.0938	20.0
7C-WN009	<None>	6	True	1,500.0000	2,938.4263	1,499.9999	2,938.4263	20.0
8F-WN056	<None>	5	True	1,500.0000	2,938.6360	1,499.9999	2,938.6360	20.0
8F-WN016	<None>	3	True	1,500.0000	2,941.9377	1,500.6293	2,942.5674	20.0
12C-WN005	<None>	4	True	1,500.0000	2,960.3362	1,501.8881	2,962.2246	20.0
13C-WN013	<None>	4	True	1,500.0000	2,963.2251	1,501.0490	2,964.2739	20.0
J260	<None>	5	True	1,500.0000	2,963.8110	1,500.2097	2,964.0208	20.0
12D-WN042	<None>	3	True	1,500.0000	2,966.8250	1,499.9999	2,966.8250	20.0
12C-WN047	<None>	4	True	1,500.0000	2,974.0864	1,500.3146	2,974.4009	20.0
7D-WN050	<None>	6	True	1,500.0000	2,974.1489	1,501.3636	2,975.5125	20.0
12B-WN010	<None>	4	True	1,500.0000	2,978.4695	1,500.4194	2,978.8892	20.0
6F-WN006	<None>	23	True	1,500.0000	2,982.6816	1,501.9929	2,984.6748	20.0
12C-WN025	<None>	3	True	1,500.0000	2,985.7590	1,500.4194	2,986.1787	20.0
J228	<None>	6	True	1,500.0000	2,986.2241	1,499.9999	2,986.2241	20.0
13D-WN018	<None>	5	True	1,500.0000	2,990.4590	1,500.7343	2,991.1934	20.0
13C-WN022	<None>	6	True	1,500.0000	2,996.4595	1,502.2028	2,998.6624	20.0
12B-WN050	<None>	4	True	1,500.0000	2,997.5828	1,500.9441	2,998.5266	20.0
11E-ISV008	<None>	3	True	1,500.0000	3,001.0408	1,500.4194	3,001.4604	20.0
12B-BOV003	<None>	3	True	1,500.0000	3,001.9509	1,505.2449	3,007.1960	20.0
13D-WN070	<None>	3	True	1,500.0000	3,002.4683	1,499.9999	3,002.4683	20.0
J222	<None>	6	True	1,500.0000	3,002.5889	1,500.1047	3,002.6936	20.0
11D-ISV002	<None>	3	True	1,500.0000	3,005.8975	1,500.4194	3,006.3171	20.0
J220	<None>	4	True	1,500.0000	3,013.0034	1,499.9999	3,013.0034	20.0
12B-WN001	<None>	4	True	1,500.0000	3,014.7883	1,500.1047	3,014.8933	20.0
J124	<None>	3	True	1,500.0000	3,015.8352	1,499.9999	3,015.8352	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J218	<None>	4	True	1,500.0000	3,015.9197	1,499.9999	3,015.9197	20.0
J216	<None>	4	True	1,500.0000	3,016.0947	1,499.9999	3,016.0947	20.0
12A-WN007	<None>	4	True	1,500.0000	3,016.5857	1,501.2587	3,017.8445	20.0
7C-WN005	<None>	6	True	1,500.0000	3,018.2515	1,499.9999	3,018.2515	20.0
10F-GV010	<None>	4	True	1,500.0000	3,018.9031	1,499.9999	3,018.9031	20.0
13B-WN030	<None>	4	True	1,500.0000	3,021.2288	1,501.4685	3,022.6975	20.0
8B-WN005	<None>	3	True	1,500.0000	3,021.4878	1,505.8743	3,027.3621	20.0
10F-WN021	<None>	4	True	1,500.0000	3,024.3577	1,500.1047	3,024.4626	20.0
10F-GV012	<None>	4	True	1,500.0000	3,028.3184	1,499.9999	3,028.3184	20.0
9D-WN041	<None>	3	True	1,500.0000	3,031.1477	1,503.3567	3,034.5046	20.0
13C-WN014	<None>	4	True	1,500.0000	3,032.6055	1,502.7273	3,035.3330	20.0
13D-WN068	<None>	21	True	1,500.0000	3,032.7109	1,500.1047	3,032.8159	20.0
13D-WN005	<None>	4	True	1,500.0000	3,033.1379	1,501.3636	3,034.5017	20.0
8D-WN011	<None>	3	True	1,500.0000	3,036.3064	1,500.2097	3,036.5161	20.0
J338	<None>	3	True	1,500.0000	3,036.3286	1,500.3146	3,036.6431	20.0
13C-WN035	<None>	6	True	1,500.0000	3,036.9602	1,500.8391	3,037.7993	20.0
13C-WN001	<None>	4	True	1,500.0000	3,037.6553	1,502.2028	3,039.8582	20.0
10F-BOV003	<None>	3	True	1,500.0000	3,041.2971	1,500.6293	3,041.9265	20.0
12B-WN059	<None>	6	True	1,500.0000	3,041.8589	1,500.4194	3,042.2786	20.0
8D-WN040	<None>	6	True	1,500.0000	3,041.9561	1,502.5176	3,044.4736	20.0
7D-WN030	<None>	3	True	1,500.0000	3,043.2507	1,500.6293	3,043.8801	20.0
13D-GV014	<None>	4	True	1,500.0000	3,044.8342	1,499.9999	3,044.8342	20.0
13B-WN001	<None>	4	True	1,500.0000	3,053.8213	1,500.7343	3,054.5554	20.0
13D-WN050	<None>	6	True	1,500.0000	3,056.2236	1,501.2587	3,057.4824	20.0
13B-WN045	<None>	6	True	1,500.0000	3,059.4954	1,501.0490	3,060.5442	20.0
12A-WN013	<None>	6	True	1,500.0000	3,064.0945	1,500.1047	3,064.1995	20.0
12A-WN018	<None>	6	True	1,500.0000	3,064.1196	1,500.2097	3,064.3293	20.0
8C-WN023	<None>	4	True	1,500.0000	3,065.4363	1,501.4685	3,066.9048	20.0
12A-WN014	<None>	6	True	1,500.0000	3,071.0867	1,501.0490	3,072.1355	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12A-ISV006	<None>	6	True	1,500.0000	3,071.0876	1,499.9999	3,071.0876	20.0
J306	<None>	3	True	1,500.0000	3,076.0864	1,500.7343	3,076.8208	20.0
13D-WN047	<None>	6	True	1,500.0000	3,076.9583	1,500.7343	3,077.6924	20.0
8D-GV026	<None>	3	True	1,500.0000	3,078.5928	1,500.8391	3,079.4321	20.0
12B-WN046	<None>	4	True	1,500.0000	3,081.4602	1,501.2587	3,082.7192	20.0
13D-WN073	<None>	6	True	1,500.0000	3,082.2642	1,500.2097	3,082.4739	20.0
11C-WN019	<None>	3	True	1,500.0000	3,083.5669	1,500.1047	3,083.6716	20.0
13B-WN033	<None>	4	True	1,500.0000	3,083.9785	1,502.4126	3,086.3911	20.0
13B-WN011	<None>	4	True	1,500.0000	3,088.9182	1,500.6293	3,089.5476	20.0
7D-WN059	<None>	22	True	1,500.0000	3,096.6829	1,501.0490	3,097.7317	20.0
9G-WN051	<None>	3	True	1,500.0000	3,098.4668	1,501.9929	3,100.4600	20.0
12B-WN054	<None>	4	True	1,500.0000	3,103.2698	1,500.3146	3,103.5842	20.0
12B-WN056	<None>	6	True	1,500.0000	3,108.3164	1,500.7343	3,109.0508	20.0
12B-WN042	<None>	6	True	1,500.0000	3,109.9990	1,500.3146	3,110.3135	20.0
8C-WN017	<None>	4	True	1,500.0000	3,112.4763	1,501.0490	3,113.5254	20.0
11E-ISV005	<None>	3	True	1,500.0000	3,113.7214	1,500.6293	3,114.3508	20.0
J256	<None>	4	True	1,500.0000	3,120.1697	1,500.7343	3,120.9041	20.0
13C-WN006	<None>	6	True	1,500.0000	3,120.2871	1,503.6714	3,123.9585	20.0
9E-WN062	<None>	3	True	1,500.0000	3,125.4075	1,500.8499	3,126.2576	20.0
12B-WN037	<None>	4	True	1,500.0000	3,127.3105	1,501.2587	3,128.5693	20.0
8D-WN026	<None>	3	True	1,500.0000	3,134.7129	1,500.1047	3,134.8179	20.0
J72	<None>	3	True	1,500.0000	3,135.9551	1,502.6224	3,138.5779	20.0
J122	<None>	3	True	1,500.0000	3,138.5967	1,499.9999	3,138.5967	20.0
J230	<None>	6	True	1,500.0000	3,140.2939	1,501.6783	3,141.9724	20.0
12B-WN058	<None>	6	True	1,500.0000	3,144.0647	1,502.3076	3,146.3726	20.0
12A-WN011	<None>	5	True	1,500.0000	3,145.2668	1,502.3076	3,147.5745	20.0
8D-WN024	<None>	3	True	1,500.0000	3,149.4314	1,501.6783	3,151.1096	20.0
8C-WN015	<None>	4	True	1,500.0000	3,153.5969	1,502.7273	3,156.3245	20.0
10F-WN022	<None>	5	True	1,500.0000	3,157.0920	1,500.7343	3,157.8262	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12C-WN012	<None>	6	True	1,500.0000	3,171.3889	1,501.9929	3,173.3821	20.0
J332	<None>	4	True	1,500.0000	3,171.5427	1,499.9999	3,171.5427	20.0
8F-WN048	<None>	5	True	1,500.0000	3,172.9910	1,501.1538	3,174.1450	20.0
J70	<None>	3	True	1,500.0000	3,174.2947	1,503.3567	3,177.6516	20.0
11D-ISV029	<None>	3	True	1,500.0000	3,174.4250	1,499.9999	3,174.4250	20.0
11D-ISV003	<None>	3	True	1,500.0000	3,175.8333	1,500.5244	3,176.3577	20.0
11C-WN016	<None>	3	True	1,500.0000	3,179.3025	1,506.1300	3,185.4324	20.0
12B-WN051	<None>	6	True	1,500.0000	3,186.5557	1,500.6293	3,187.1851	20.0
12C-WN029	<None>	6	True	1,500.0000	3,186.9243	1,501.0490	3,187.9731	20.0
8C-WN024	<None>	4	True	1,500.0000	3,187.8940	1,503.5665	3,191.4607	20.0
12B-WN055	<None>	5	True	1,500.0000	3,192.0334	1,500.7343	3,192.7676	20.0
12B-GV040	<None>	5	True	1,500.0000	3,196.4871	1,499.9999	3,196.4871	20.0
12C-GV010	<None>	4	True	1,500.0000	3,198.4932	1,501.7832	3,200.2764	20.0
8D-WN016	<None>	3	True	1,500.0000	3,206.0837	1,501.3636	3,207.4475	20.0
J128	<None>	3	True	1,500.0000	3,206.8757	1,499.9999	3,206.8757	20.0
9D-WN059	<None>	3	True	1,500.0000	3,207.4858	1,500.6293	3,208.1152	20.0
12B-WN049	<None>	6	True	1,500.0000	3,218.4927	1,500.9441	3,219.4365	20.0
12A-WN026	<None>	4	True	1,500.0000	3,226.3633	1,500.2097	3,226.5730	20.0
8C-WN008	<None>	4	True	1,500.0000	3,226.4407	1,501.2587	3,227.6995	20.0
8C-WN036	<None>	6	True	1,500.0000	3,229.6157	1,501.6783	3,231.2939	20.0
11E-ISV003	<None>	3	True	1,500.0000	3,230.7263	1,500.6293	3,231.3557	20.0
J238	<None>	4	True	1,500.0000	3,231.0122	1,501.9929	3,233.0054	20.0
9E-WN048	<None>	5	True	1,500.0000	3,231.1150	1,500.2097	3,231.3247	20.0
12C-WN021	<None>	3	True	1,500.0000	3,234.7024	1,500.5244	3,235.2271	20.0
8C-WN041	<None>	4	True	1,500.0000	3,241.1016	1,501.2587	3,242.3604	20.0
8C-WN013	<None>	4	True	1,500.0000	3,241.7566	1,501.9929	3,243.7498	20.0
12B-GV018	<None>	4	True	1,500.0000	3,246.4580	1,500.7343	3,247.1924	20.0
12B-WN048	<None>	4	True	1,500.0000	3,246.4604	1,500.1047	3,246.5654	20.0
8C-GV013	<None>	4	True	1,500.0000	3,248.3826	1,500.1047	3,248.4873	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8D-WN012	<None>	3	True	1,500.0000	3,248.8889	1,500.2097	3,249.0986	20.0
10D-ISV010	<None>	3	True	1,500.0000	3,253.4172	1,500.7343	3,254.1514	20.0
13D-WN055	<None>	4	True	1,500.0000	3,254.9512	1,500.2097	3,255.1609	20.0
10E-WN044	<None>	3	True	1,500.0000	3,263.8125	1,504.8298	3,268.6426	20.0
9E-WN056	<None>	3	True	1,500.0000	3,281.3989	1,500.7343	3,282.1333	20.0
12B-ISV017	<None>	6	True	1,500.0000	3,286.0874	1,499.9999	3,286.0874	20.0
12B-WN044	<None>	6	True	1,500.0000	3,286.0898	1,500.1047	3,286.1946	20.0
12B-GV022	<None>	6	True	1,500.0000	3,288.3713	1,500.4194	3,288.7910	20.0
12B-WN041	<None>	6	True	1,500.0000	3,288.3762	1,500.6293	3,289.0056	20.0
8C-GV022	<None>	4	True	1,500.0000	3,290.4458	1,502.8323	3,293.2783	20.0
12C-WN019	<None>	4	True	1,500.0000	3,291.1250	1,502.2028	3,293.3279	20.0
J-17	<None>	3	True	1,500.0000	3,294.2673	1,499.9999	3,294.2673	20.0
J236	<None>	4	True	1,500.0000	3,296.0388	1,501.5734	3,297.6123	20.0
12B-GV024	<None>	4	True	1,500.0000	3,302.0635	1,500.6293	3,302.6929	20.0
12B-WN045	<None>	4	True	1,500.0000	3,302.2439	1,500.6293	3,302.8733	20.0
8C-WN029	<None>	4	True	1,500.0000	3,306.1091	1,501.5734	3,307.6826	20.0
8C-GV021	<None>	4	True	1,500.0000	3,307.9587	1,499.9999	3,307.9587	20.0
12D-WN012	<None>	3	True	1,500.0000	3,309.7649	1,511.1399	3,320.9050	20.0
8F-WN004	<None>	5	True	1,500.0000	3,314.1409	1,501.7832	3,315.9241	20.0
3B-BOV001	<None>	4	True	1,500.0000	3,323.8276	1,499.9999	3,323.8276	20.0
12C-WN024	<None>	6	True	1,500.0000	3,324.2888	1,500.8391	3,325.1279	20.0
12B-WN035	<None>	6	True	1,500.0000	3,347.0886	1,500.5244	3,347.6133	20.0
12B-ISV026	<None>	5	True	1,500.0000	3,347.4707	1,499.9999	3,347.4707	20.0
12B-WN036	<None>	5	True	1,500.0000	3,347.4719	1,500.5244	3,347.9966	20.0
12B-GV030	<None>	4	True	1,500.0000	3,347.7754	1,500.4194	3,348.1951	20.0
12B-WN040	<None>	5	True	1,500.0000	3,347.8071	1,500.5244	3,348.3318	20.0
12A-WN016	<None>	22	True	1,500.0000	3,348.0059	1,500.8391	3,348.8450	20.0
8D-WN033	<None>	4	True	1,500.0000	3,350.6653	1,501.1538	3,351.8191	20.0
12B-WN038	<None>	4	True	1,500.0000	3,360.4771	1,500.6293	3,361.1064	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8C-WN003	<None>	4	True	1,500.0000	3,361.1382	1,503.1470	3,364.2852	20.0
12B-WN034	<None>	4	True	1,500.0000	3,363.5024	1,500.6293	3,364.1318	20.0
3B-GV002	<None>	22	True	1,500.0000	3,364.9189	1,500.7343	3,365.6531	20.0
3B-WN006	<None>	22	True	1,500.0000	3,365.0498	1,500.6293	3,365.6792	20.0
11E-GV021	<None>	21	True	1,500.0000	3,365.2734	1,500.2097	3,365.4832	20.0
12A-WN027	<None>	4	True	1,500.0000	3,371.3254	1,500.7343	3,372.0596	20.0
12D-WN043	<None>	4	True	1,500.0000	3,372.6162	1,499.9999	3,372.6162	20.0
7C-WN007	<None>	4	True	1,500.0000	3,375.5613	1,546.8348	3,422.3962	20.0
8F-WN049	<None>	3	True	1,500.0000	3,376.0408	1,501.7832	3,377.8240	20.0
8C-WN064	<None>	4	True	1,500.0000	3,377.7195	1,499.9999	3,377.7195	20.0
7C-WN006	<None>	5	True	1,500.0000	3,377.7195	1,499.9999	3,377.7195	20.0
12A-WN028	<None>	4	True	1,500.0000	3,387.5344	1,500.3146	3,387.8489	20.0
12A-GV024	<None>	4	True	1,500.0000	3,387.5347	1,501.4685	3,389.0034	20.0
J250	<None>	4	True	1,500.0000	3,392.0618	1,500.5244	3,392.5864	20.0
10D-ISV011	<None>	3	True	1,500.0000	3,397.4658	1,500.7343	3,398.2002	20.0
12B-BOV002	<None>	4	True	1,500.0000	3,401.5349	1,499.9999	3,401.5349	20.0
12B-GV006	<None>	4	True	1,500.0000	3,401.5352	1,500.7343	3,402.2695	20.0
11E-WN015	<None>	21	True	1,500.0000	3,402.9526	1,501.4685	3,404.4214	20.0
8D-WN039	<None>	6	True	1,500.0000	3,412.0674	1,500.8391	3,412.9065	20.0
12B-WN039	<None>	4	True	1,500.0000	3,412.1611	1,500.9441	3,413.1052	20.0
12B-WN027	<None>	4	True	1,500.0000	3,412.1611	1,500.6293	3,412.7905	20.0
12B-ISV029	<None>	4	True	1,500.0000	3,412.1633	1,499.9999	3,412.1633	20.0
10F-WN023	<None>	4	True	1,500.0000	3,428.1560	1,501.7832	3,429.9392	20.0
J248	<None>	4	True	1,500.0000	3,428.9380	1,501.8881	3,430.8264	20.0
10F-GV007	<None>	4	True	1,500.0000	3,430.8735	1,500.4194	3,431.2932	20.0
9G-WN030	<None>	3	True	1,500.0000	3,431.6682	1,501.2587	3,432.9270	20.0
12C-GV033	<None>	4	True	1,500.0000	3,432.6309	1,500.1047	3,432.7356	20.0
12C-WN050	<None>	4	True	1,500.0000	3,433.1831	1,500.1047	3,433.2881	20.0
12B-WN029	<None>	4	True	1,500.0000	3,434.3853	1,501.2587	3,435.6440	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12B-GV032	<None>	4	True	1,500.0000	3,434.3853	1,500.4194	3,434.8049	20.0
J344	<None>	6	True	1,500.0000	3,441.7417	1,500.9441	3,442.6858	20.0
4B-WN001	<None>	4	True	1,500.0000	3,467.0476	1,499.9999	3,467.0476	20.0
3B-WN001	<None>	4	True	1,500.0000	3,467.0476	1,499.9999	3,467.0476	20.0
4B-WN004	<None>	4	True	1,500.0000	3,467.0491	1,499.9999	3,467.0491	20.0
4B-GV008	<None>	4	True	1,500.0000	3,467.0491	1,499.9999	3,467.0491	20.0
4B-WN009	<None>	4	True	1,500.0000	3,467.0493	1,499.9999	3,467.0493	20.0
P6_ND	<None>	4	True	1,500.0000	3,467.0505	1,499.9999	3,467.0505	20.0
P5_ND	<None>	4	True	1,500.0000	3,467.0505	1,499.9999	3,467.0505	20.0
22	<None>	4	True	1,500.0000	3,467.0505	1,499.9999	3,467.0505	20.0
18	<None>	4	True	1,500.0000	3,467.0505	1,499.9999	3,467.0505	20.0
24	<None>	4	True	1,500.0000	3,467.0518	1,499.9999	3,467.0518	20.0
P7_ND	<None>	4	True	1,500.0000	3,467.0537	1,499.9999	3,467.0537	20.0
12B-WN023	<None>	4	True	1,500.0000	3,467.6064	1,500.6293	3,468.2358	20.0
12B-ISV007	<None>	4	True	1,500.0000	3,467.6067	1,499.9999	3,467.6067	20.0
J252	<None>	4	True	1,500.0000	3,469.4805	1,500.8391	3,470.3196	20.0
8F-WN022	<None>	3	True	1,500.0000	3,472.7014	1,501.5734	3,474.2749	20.0
8C-WN043	<None>	5	True	1,500.0000	3,472.9395	1,501.6783	3,474.6177	20.0
12B-WN022	<None>	4	True	1,500.0000	3,474.1260	1,501.0490	3,475.1748	20.0
10E-WN046	<None>	3	True	1,500.0000	3,479.4915	1,499.9999	3,479.4915	20.0
9E-WN080	<None>	3	True	1,500.0000	3,480.9280	1,503.2518	3,484.1797	20.0
12C-WN026	<None>	21	True	1,500.0000	3,482.3586	1,501.0490	3,483.4075	20.0
8F-GV040	<None>	3	True	1,500.0000	3,487.1631	1,500.8391	3,488.0022	20.0
11E-GV019	<None>	3	True	1,500.0000	3,492.5786	1,500.2097	3,492.7883	20.0
8F-GV039	<None>	3	True	1,500.0000	3,493.8347	1,500.4194	3,494.2544	20.0
3B-WN005	<None>	20	True	1,500.0000	3,496.9741	1,501.4685	3,498.4429	20.0
8F-WN039	<None>	3	True	1,500.0000	3,497.0718	1,500.5244	3,497.5964	20.0
4B-WN006	<None>	4	True	1,500.0000	3,497.1350	1,499.9999	3,497.1350	20.0
J336	<None>	3	True	1,500.0000	3,499.7876	1,500.2097	3,499.9973	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
P4_ND	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
P3_ND	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
P2_ND	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
P1_ND	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J98	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J92	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J90	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J80	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
J66	<None>	2	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
J64	<None>	2	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
J44	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J42	<None>	2	True	1,500.0000	3,500.0000	1,502.2028	3,502.2029	20.0
J40	<None>	2	True	1,500.0000	3,500.0000	1,501.7832	3,501.7832	20.0
J36	<None>	2	True	1,500.0000	3,500.0000	1,501.2587	3,501.2588	20.0
J350	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J342	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
J340	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
J330	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
J328	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
J326	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
J324	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
J312	<None>	2	True	1,500.0000	3,500.0000	1,501.7832	3,501.7832	20.0
J310	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J308	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
J304	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
J300	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
J30	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
J298	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J296	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J28	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J26	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J24	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
J22	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J214	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
J206	<None>	3	True	1,500.0000	3,500.0000	1,501.3636	3,501.3638	20.0
J202	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
J20	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J198	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
J190	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
J188	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
J186	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
J184	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
J180	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
J18	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J176	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
J174	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
J172	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
J168	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
J166	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
J160	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
J156	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
J154	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
J150	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
J144	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
J136	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J134	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J132	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J130	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J126	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J120	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J118	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J116	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J106	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J104	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9G-WN041	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9G-WN029	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9G-WN027	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9G-WN018	<None>	2	True	1,500.0000	3,500.0000	1,501.3636	3,501.3638	20.0
9G-WN017	<None>	2	True	1,500.0000	3,500.0000	1,503.8812	3,503.8811	20.0
9G-WN015	<None>	2	True	1,500.0000	3,500.0000	1,501.2587	3,501.2588	20.0
9G-WN014	<None>	2	True	1,500.0000	3,500.0000	1,501.6783	3,501.6782	20.0
9G-WN012	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
9G-WN011	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
9G-WN008	<None>	2	True	1,500.0000	3,500.0000	1,503.5665	3,503.5667	20.0
9G-WN006	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
9G-WN003	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
9G-WN002	<None>	2	True	1,500.0000	3,500.0000	1,501.3596	3,501.3599	20.0
9G-GV055	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9G-GV028	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9G-BOV003	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
9G-BOV001	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9F-WN071	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-WN070	<None>	2	True	1,500.0000	3,500.0000	1,502.5176	3,502.5176	20.0
9F-WN069	<None>	2	True	1,500.0000	3,500.0000	1,501.2587	3,501.2588	20.0
9F-WN066	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9F-WN063	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9F-WN062	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9F-WN061	<None>	2	True	1,500.0000	3,500.0000	1,501.9648	3,501.9648	20.0
9F-WN059	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9F-WN051	<None>	2	True	1,500.0000	3,500.0000	1,502.8298	3,502.8301	20.0
9F-WN046	<None>	2	True	1,500.0000	3,500.0000	1,501.9929	3,501.9932	20.0
9F-WN044	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9F-WN043	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9F-WN042	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9F-WN041	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9F-WN040	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9F-WN039	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-WN038	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
9F-WN037	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
9F-WN036	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
9F-WN035	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9F-WN026	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9F-WN024	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
9F-WN022	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-WN017	<None>	2	True	1,500.0000	3,500.0000	1,505.9600	3,505.9600	20.0
9F-WN012	<None>	2	True	1,500.0000	3,500.0000	1,503.2098	3,503.2100	20.0
9F-WN010	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-WN009	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-WN004	<None>	2	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
9F-GV038	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9F-GV037	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV035	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV034	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9F-GV033	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9F-GV027	<None>	2	True	1,500.0000	3,500.0000	1,502.6224	3,502.6226	20.0
9F-GV026	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9F-GV024	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV023	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV022	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV020	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV017	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV012	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9F-GV011	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9F-GV010	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV009	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9F-GV008	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9F-GV007	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9F-GV004	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9E-WN105	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN104	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN102	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN099	<None>	2	True	1,500.0000	3,500.0000	1,501.3636	3,501.3638	20.0
9E-WN098	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9E-WN097	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN095	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
9E-WN094	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN093	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN091	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9E-WN089	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9E-WN087	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9E-WN086	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9E-WN085	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN082	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
9E-WN076	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
9E-WN073	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9E-WN070	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN068	<None>	2	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
9E-WN063	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN055	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN053	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
9E-WN051	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN049	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN045	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
9E-WN044	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
9E-WN043	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9E-WN042	<None>	2	True	1,500.0000	3,500.0000	1,502.0979	3,502.0979	20.0
9E-WN041	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN040	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN039	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
9E-WN036	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
9E-WN035	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9E-WN033	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
9E-WN031	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN030	<None>	2	True	1,500.0000	3,500.0000	1,502.1990	3,502.1990	20.0
9E-WN029	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN028	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
9E-WN027	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9E-WN026	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
9E-WN025	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
9E-WN024	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9E-WN022	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN021	<None>	2	True	1,500.0000	3,500.0000	1,501.6783	3,501.6782	20.0
9E-WN020	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-WN018	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9E-WN011	<None>	2	True	1,500.0000	3,500.0000	1,502.3076	3,502.3079	20.0
9E-GV088	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-GV076	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9E-GV063	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
9E-GV053	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-GV047	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-GV043	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
9E-GV037	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9E-GV034	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-GV021	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
9E-GV015	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9E-GV014	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9E-GV013	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-GV001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9E-BOV001	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
9D-WN079	<None>	2	True	1,500.0000	3,500.0000	1,501.2587	3,501.2588	20.0
9D-WN078	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9D-WN077	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9D-WN063	<None>	2	True	1,500.0000	3,500.0000	1,504.4144	3,504.4146	20.0
9D-WN062	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
9D-WN061	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
9D-WN060	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9D-WN043	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9D-WN029	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9D-WN024	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9D-WN022	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
9D-WN017	<None>	2	True	1,500.0000	3,500.0000	1,505.1897	3,505.1897	20.0
9D-WN006	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9D-WN004	<None>	2	True	1,500.0000	3,500.0000	1,504.0695	3,504.0696	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9D-GV060	<None>	2	True	1,500.0000	3,500.0000	1,508.3096	3,508.3096	20.0
9D-GV058	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9D-GV055	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9D-GV050	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9D-GV034	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9D-GV021	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9D-GV020	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9D-GV004	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9D-GV001	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9C-WN021	<None>	2	True	1,500.0000	3,500.0000	1,503.1995	3,503.1995	20.0
9C-WN018	<None>	2	True	1,500.0000	3,500.0000	1,511.8317	3,511.8315	20.0
9C-GV017	<None>	2	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
9B-WN023	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9B-WN022	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9B-WN020	<None>	2	True	1,500.0000	3,500.0000	1,505.2245	3,505.2244	20.0
9B-WN019	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9B-WN018	<None>	2	True	1,500.0000	3,500.0000	1,502.2440	3,502.2439	20.0
9B-WN016	<None>	2	True	1,500.0000	3,500.0000	1,510.3923	3,510.3926	20.0
9B-WN014	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
9B-WN008	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
9B-WN007	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9B-WN006	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9B-WN003	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
9B-WN002	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
9B-WN001	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
9B-GV020	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9B-GV019	<None>	2	True	1,500.0000	3,500.0000	1,501.2587	3,501.2588	20.0
9B-GV016	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9B-GV007	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
9B-GV006	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9B-GV002	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
9B-BOV002	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN038	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9A-WN037	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
9A-WN033	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN032	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN031	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN030	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN029	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN023	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN021	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN020	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
9A-WN019	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN018	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-WN017	<None>	2	True	1,500.0000	3,500.0000	1,505.3599	3,505.3599	20.0
9A-WN015	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9A-WN014	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
9A-WN013	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
9A-GV012	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
9A-GV010	<None>	2	True	1,500.0000	3,500.0000	1,526.9592	3,526.9595	20.0
9A-GV008	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8F-WN067	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8F-WN066	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8F-WN064	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8F-WN054	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
8F-WN050	<None>	2	True	1,500.0000	3,500.0000	1,501.3636	3,501.3638	20.0
8F-WN038	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
8F-WN031	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8F-WN030	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8F-WN029	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
8F-WN027	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8F-WN017	<None>	2	True	1,500.0000	3,500.0000	1,501.2587	3,501.2588	20.0
8F-WN015	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
8F-WN011	<None>	2	True	1,500.0000	3,500.0000	1,501.2587	3,501.2588	20.0
8F-WN008	<None>	2	True	1,500.0000	3,500.0000	1,501.3636	3,501.3638	20.0
8F-WN006	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
8F-GV065	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
8F-GV064	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
8F-GV063	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
8F-GV060	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
8F-GV059	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8F-GV015	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8F-GV010	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
8F-GV009	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
8F-GV007	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
8E-WN088	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
8E-WN087	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
8E-WN085	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8E-WN084	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-WN082	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
8E-WN081	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-WN080	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
8E-WN079	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8E-WN076	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8E-WN073	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
8E-WN071	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
8E-WN070	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8E-WN069	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
8E-WN065	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
8E-WN061	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-WN060	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8E-WN058	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-WN056	<None>	2	True	1,500.0000	3,500.0000	1,501.5597	3,501.5598	20.0
8E-WN053	<None>	2	True	1,500.0000	3,500.0000	1,501.3636	3,501.3638	20.0
8E-WN047	<None>	2	True	1,500.0000	3,500.0000	1,503.2200	3,503.2200	20.0
8E-WN046	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-WN040	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
8E-WN035	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
8E-WN033	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
8E-WN032	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
8E-WN025	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
8E-WN024	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8E-WN023	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8E-WN022	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-WN021	<None>	2	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
8E-WN013	<None>	2	True	1,500.0000	3,500.0000	1,502.0979	3,502.0979	20.0
8E-WN010	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
8E-WN009	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8E-WN006	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8E-WN003	<None>	2	True	1,500.0000	3,500.0000	1,501.6783	3,501.6782	20.0
8E-ISV036	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-GV069	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-GV065	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-GV060	<None>	2	True	1,500.0000	3,500.0000	1,501.2449	3,501.2449	20.0
8E-GV057	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8E-GV049	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8E-GV042	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8E-GV025	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
8D-WN064	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8D-WN062	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
8D-WN058	<None>	3	True	1,500.0000	3,500.0000	1,501.2000	3,501.2000	20.0
8D-WN046	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8D-WN035	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8D-WN034	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
8D-WN030	<None>	3	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
8D-WN029	<None>	3	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
8D-WN027	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
8D-WN014	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
8D-GV040	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
8D-GV039	<None>	3	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
8D-GV030	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8D-GV029	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8D-GV010	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8D-GV003	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
8C-WN060	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
8C-WN058	<None>	3	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
8C-WN057	<None>	2	True	1,500.0000	3,500.0000	1,504.4058	3,504.4058	20.0
8C-WN055	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
8C-WN054	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8C-WN045	<None>	2	True	1,500.0000	3,500.0000	1,501.7832	3,501.7832	20.0
8C-WN039	<None>	2	True	1,500.0000	3,500.0000	1,502.2028	3,502.2029	20.0
8C-WN001	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
8C-GV016	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
8C-GV014	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
8C-GV009	<None>	3	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
8C-GV004	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
7E-WN011	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
7E-WN010	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
7E-WN007	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
7E-WN002	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
7E-GV004	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
7D-WN076	<None>	2	True	1,500.0000	3,500.0000	1,501.4445	3,501.4443	20.0
7D-WN073	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
7D-WN069	<None>	2	True	1,500.0000	3,500.0000	1,510.4299	3,510.4299	20.0
7D-WN067	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
7D-WN034	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
7D-GV071	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
7D-ARV001	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
74	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
6E-WN050	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
6E-WN043	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
6E-WN033	<None>	2	True	1,500.0000	3,500.0000	1,501.9929	3,501.9932	20.0
6E-WN026	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
6E-WN025	<None>	2	True	1,500.0000	3,500.0000	1,501.9929	3,501.9932	20.0
6E-WN022	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
6E-WN021	<None>	2	True	1,500.0000	3,500.0000	1,501.9929	3,501.9932	20.0
6E-WN020	<None>	2	True	1,500.0000	3,500.0000	1,501.9929	3,501.9932	20.0
6E-WN019	<None>	2	True	1,500.0000	3,500.0000	1,502.0979	3,502.0979	20.0
6E-WN018	<None>	2	True	1,500.0000	3,500.0000	1,501.8881	3,501.8882	20.0
6E-WN013	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
6E-WN011	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
6E-WN007	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
6E-WN005	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
6E-WN001	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
6E-GV027	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
6E-GV024	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
6E-GV002	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
6E-GV001	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
6D-WN012	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
6D-WN009	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
6D-WN001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
6D-ISV006	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
5D-WN008	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
5D-WN003	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
5D-GV003	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
5D-ARV002	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
5D-ARV001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4E-WN003	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4E-WN002	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4E-ISV003	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4D-WN016	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4D-WN015	<None>	2	True	1,500.0000	3,500.0000	1,501.2449	3,501.2449	20.0
4D-WN014	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4D-WN011	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
4D-WN009	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4D-GV004	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
4D-GV003	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4D-ARV001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4C-WN003	<None>	3	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
4C-WN002	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4C-WN001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
4C-GV002	<None>	3	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
4B-WN003	<None>	2	True	1,500.0000	3,500.0000	1,502.1599	3,502.1602	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
4B-GV006	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
28	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
160	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
13E-WN016	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
13E-WN015	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
13E-WN014	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
13E-WN012	<None>	2	True	1,500.0000	3,500.0000	1,504.4698	3,504.4700	20.0
13E-WN011	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
13E-WN010	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
13E-WN002	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
13D-WN064	<None>	2	True	1,500.0000	3,500.0000	1,503.6399	3,503.6401	20.0
13D-WN063	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
13D-WN059	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
13D-WN058	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
12E-WN054	<None>	2	True	1,500.0000	3,500.0000	1,501.9395	3,501.9397	20.0
12E-WN051	<None>	2	True	1,500.0000	3,500.0000	1,501.4197	3,501.4197	20.0
12E-WN049	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12E-WN048	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-WN046	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-WN044	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-WN043	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12E-WN039	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-WN035	<None>	2	True	1,500.0000	3,500.0000	1,502.4799	3,502.4800	20.0
12E-WN033	<None>	2	True	1,500.0000	3,500.0000	1,501.7100	3,501.7100	20.0
12E-WN032	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12E-WN027	<None>	2	True	1,500.0000	3,500.0000	1,502.2799	3,502.2800	20.0
12E-WN025	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-WN023	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-WN016	<None>	2	True	1,500.0000	3,500.0000	1,503.0299	3,503.0300	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12E-WN014	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
12E-WN006	<None>	2	True	1,500.0000	3,500.0000	1,505.9600	3,505.9600	20.0
12E-WN004	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
12E-ISV021	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-GV023	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12E-GV020	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-GV017	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
12E-GV014	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12E-GV009	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12E-BOV003	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12E-BOV001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN055	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN054	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN052	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN050	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12D-WN048	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12D-WN046	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN044	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN038	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN037	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN032	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12D-WN031	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN027	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN017	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN016	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0
12D-WN015	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
12D-WN013	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN006	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-WN004	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12D-WN003	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12D-GV027	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12D-GV020	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12D-GV017	<None>	2	True	1,500.0000	3,500.0000	1,500.7699	3,500.7700	20.0
12D-GV015	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-GV008	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12D-GV007	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
12D-GV001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12C-WN044	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12C-WN043	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12C-WN041	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
12C-WN040	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
12C-WN039	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
12C-WN037	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
12C-WN036	<None>	2	True	1,500.0000	3,500.0000	1,501.2587	3,501.2588	20.0
12C-WN034	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
12C-WN033	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
12C-WN032	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
12C-WN031	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
12C-WN020	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
12C-WN018	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
12C-WB052	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
12C-GV030	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12C-GV017	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
12B-WN060	<None>	2	True	1,500.0000	3,500.0000	1,501.7770	3,501.7771	20.0
12B-WN028	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
12B-WN021	<None>	2	True	1,500.0000	3,500.0000	1,501.7832	3,501.7832	20.0
12B-WN007	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
12B-WN006	<None>	2	True	1,500.0000	3,500.0000	1,501.8881	3,501.8882	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
12B-GV036	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
12B-GV001	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
11E-WN053	<None>	2	True	1,500.0000	3,500.0000	1,504.1499	3,504.1501	20.0
11E-WN051	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
11E-WN048	<None>	2	True	1,500.0000	3,500.0000	1,508.3600	3,508.3601	20.0
11E-WN046	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
11E-WN045	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11E-WN044	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11E-WN043	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11E-WN040	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
11E-WN034	<None>	2	True	1,500.0000	3,500.0000	1,501.9929	3,501.9932	20.0
11E-WN032	<None>	2	True	1,500.0000	3,500.0000	1,502.5176	3,502.5176	20.0
11E-WN031	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
11E-WN030	<None>	2	True	1,500.0000	3,500.0000	1,501.8881	3,501.8882	20.0
11E-WN029	<None>	2	True	1,500.0000	3,500.0000	1,502.0979	3,502.0979	20.0
11E-WN028	<None>	2	True	1,500.0000	3,500.0000	1,502.0979	3,502.0979	20.0
11E-WN023	<None>	2	True	1,500.0000	3,500.0000	1,506.5038	3,506.5039	20.0
11E-WN019	<None>	2	True	1,500.0000	3,500.0000	1,501.5734	3,501.5735	20.0
11E-WN014	<None>	3	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
11E-WN013	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
11E-WN011	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
11E-WN010	<None>	2	True	1,500.0000	3,500.0000	1,501.6783	3,501.6782	20.0
11E-WN008	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
11E-WN007	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
11E-WN005	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
11E-WN003	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
11E-WN002	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
11E-GV045	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11E-GV034	<None>	2	True	1,500.0000	3,500.0000	1,504.5106	3,504.5107	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
11E-GV031	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
11E-GV015	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
11E-GV014	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
11E-BOV001	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
11E-BFV001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11D-WN043	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11D-WN042	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11D-WN041	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11D-WN039	<None>	2	True	1,500.0000	3,500.0000	1,500.7799	3,500.7800	20.0
11D-WN038	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11D-WN035	<None>	2	True	1,500.0000	3,500.0000	1,502.8600	3,502.8599	20.0
11D-WN034	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
11D-WN033	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11D-WN032	<None>	2	True	1,500.0000	3,500.0000	1,502.8798	3,502.8799	20.0
11D-WN030	<None>	2	True	1,500.0000	3,500.0000	1,501.5898	3,501.5898	20.0
11D-WN025	<None>	2	True	1,500.0000	3,500.0000	1,506.7399	3,506.7400	20.0
11D-WN022	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11D-WN020	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
11D-WN015	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
11D-WN014	<None>	2	True	1,500.0000	3,500.0000	1,507.4199	3,507.4199	20.0
11D-WN013	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
11D-WN011	<None>	2	True	1,500.0000	3,500.0000	1,506.7697	3,506.7698	20.0
11D-WN009	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
11D-WN008	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
11D-WN007	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
11D-WN005	<None>	2	True	1,500.0000	3,500.0000	1,500.6293	3,500.6294	20.0
11D-WN004	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
11D-ISV006	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
11D-ISV005	<None>	2	True	1,500.0000	3,500.0000	1,500.5244	3,500.5247	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
11D-GV021	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
11C-WN023	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11C-WN022	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
11C-WN010	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11C-WN008	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
11C-WN007	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11C-WN005	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11C-WN004	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11C-WN001	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
11C-GV010	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11B-WN044	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11B-WN043	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
11B-WN040	<None>	2	True	1,500.0000	3,500.0000	1,501.9929	3,501.9932	20.0
11B-WN037	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
11B-WN036	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
11B-WN030	<None>	2	True	1,500.0000	3,500.0000	1,500.9598	3,500.9600	20.0
11B-WN028	<None>	2	True	1,500.0000	3,500.0000	1,501.3636	3,501.3638	20.0
11B-WN004	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
11B-WN002	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
11B-WN001	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
11B-ISV014	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11B-GV031	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11B-GV029	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
11B-GV028	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
11B-GV026	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
11B-GV023	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
11B-GV010	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
11B-GV006	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
11B-GV002	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
11B-BOV001	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
10F-WN050	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
10F-WN049	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
10F-WN047	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
10F-WN046	<None>	2	True	1,500.0000	3,500.0000	1,502.0299	3,502.0300	20.0
10F-WN045	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
10F-WN043	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
10F-WN039	<None>	2	True	1,500.0000	3,500.0000	1,501.6783	3,501.6782	20.0
10F-WN035	<None>	2	True	1,500.0000	3,500.0000	1,501.8881	3,501.8882	20.0
10F-WN034	<None>	2	True	1,500.0000	3,500.0000	1,501.3636	3,501.3638	20.0
10F-WN031	<None>	2	True	1,500.0000	3,500.0000	1,501.1538	3,501.1541	20.0
10F-WN027	<None>	2	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
10F-WN018	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
10F-WN011	<None>	2	True	1,500.0000	3,500.0000	1,501.5734	3,501.5735	20.0
10F-WN008	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
10F-WN004	<None>	2	True	1,500.0000	3,500.0000	1,504.1958	3,504.1960	20.0
10F-WN002	<None>	2	True	1,500.0000	3,500.0000	1,503.5665	3,503.5667	20.0
10F-GV036	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
10F-GV034	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
10F-GV033	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
10F-GV022	<None>	2	True	1,500.0000	3,500.0000	1,500.7343	3,500.7344	20.0
10F-GV021	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
10F-GV015	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
10F-GV001	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
10E-WN059	<None>	2	True	1,500.0000	3,500.0000	1,504.8947	3,504.8945	20.0
10E-WN058	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
10E-WN057	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
10E-WN055	<None>	2	True	1,500.0000	3,500.0000	1,500.9441	3,500.9441	20.0
10E-WN054	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
10E-WN053	<None>	2	True	1,500.0000	3,500.0000	1,502.6044	3,502.6045	20.0
10E-WN051	<None>	2	True	1,500.0000	3,500.0000	1,507.4530	3,507.4529	20.0
10E-WN050	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
10E-WN047	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
10E-WN045	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
10E-WN043	<None>	2	True	1,500.0000	3,500.0000	1,500.3146	3,500.3147	20.0
10E-WN042	<None>	2	True	1,500.0000	3,500.0000	1,501.8881	3,501.8882	20.0
10E-WN041	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
10E-WN039	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
10E-WN038	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
10E-WN035	<None>	2	True	1,500.0000	3,500.0000	1,503.0420	3,503.0420	20.0
10E-WN033	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
10E-WN029	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
10E-WN027	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
10E-WN026	<None>	2	True	1,500.0000	3,500.0000	1,501.4685	3,501.4685	20.0
10E-WN025	<None>	2	True	1,500.0000	3,500.0000	1,501.8881	3,501.8882	20.0
10E-WN022	<None>	2	True	1,500.0000	3,500.0000	1,502.0979	3,502.0979	20.0
10E-WN015	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0
10E-WN014	<None>	2	True	1,500.0000	3,500.0000	1,501.5734	3,501.5735	20.0
10E-WN012	<None>	2	True	1,500.0000	3,500.0000	1,502.0979	3,502.0979	20.0
10E-WN009	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
10E-WN005	<None>	2	True	1,500.0000	3,500.0000	1,501.9929	3,501.9932	20.0
10E-GV042	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
10E-GV041	<None>	2	True	1,500.0000	3,500.0000	1,500.4194	3,500.4197	20.0
10E-GV040	<None>	2	True	1,500.0000	3,500.0000	1,500.8391	3,500.8391	20.0
10E-GV036	<None>	2	True	1,500.0000	3,500.0000	1,501.0490	3,501.0488	20.0
10E-GV031	<None>	2	True	1,500.0000	3,500.0000	1,500.1047	3,500.1047	20.0
10E-GV009	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
10E-GV006	<None>	2	True	1,500.0000	3,500.0000	1,500.2097	3,500.2097	20.0

Fire Flow Node FlexTable: Fire Flow Report (BELTON 2011 MODEL.wtg)

Current Time: 0.000 hours

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)
J-102	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-103	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-104	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-105	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-107	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-108	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-109	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-111	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-127	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-132	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-133	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-134	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-135	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0
J-136	<None>	2	True	1,500.0000	3,500.0000	1,499.9999	3,500.0000	20.0

Pressure (Calculated Residual) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (System Lower Limit) (psi)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)	Is Fire Flow Run Balanced?
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
(N/A)	20.0	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)

APPENDIX G

Detailed Cost Estimates

City of Belton, Missouri
Water System Master Plan

OPINION OF PROBABLE PROJCET COST
ALTERNATIVE 1 WATER SUPPLY IMPROVEMENTS

Use Existing Site with Supply Line Along Kenneth Road
City of Belton
November 1, 2011

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL
	Transmission Main Improvements				
1	24" Class 350 DIP	16,400	LF	$175	2,870,000
2	24" Restrained Joint Class 350 DIP (Directional Bored)	300	LF	$450	135,000
3	16 C900 DR 18 PVC	20,100	LF	$85	1,708,500
4	36" Steel Encasement (Bored)	200	LF	$650	130,000
5	30" Steel Encasement (Bored)	250	LF	$600	150,000
6	24" Butterfly Valves	6	EA	$10,000	60,000
7	16" Butterfly Valves	24	EA	$6,500	156,000
8	12" gate valves	2	EA	$2,500	5,000
9	10" gate valves	1	EA	$1,900	1,900
10	8" Gate Valves	2	EA	$1,500	3,000
11	6" Gate Valves	2	EA	$1,000	2,000
12	4" Gate Valves	2	EA	$750	1,500
13	Fittings	14,000	LBS	$8	112,000
14	Pavement Repair	350	SY	$75	26,300
15	Connections to Existing Mains	13	EA	$3,000	39,000
16	Relocate Existing Fire Hydrants	15	EA	$2,000	30,000
17	Seeding	35,550	LF	$1	35,600
18	Erosion Control	1	LS	$40,000	40,000
	Contingency (25%)				1,376,500
	Total Construction Cost				6,882,300
	Eng/Legal/Admin (25%)				1,720,600
	Subtotal Transmission Main Improvements				**8,602,900**
	Booster Pump Station Improvements				
19	Connection to Existing Ground Storage Tank (Inlet and Outlet)	2	LS	$25,000	50,000
20	Demolition of Existing Booster Pump Station	1	LS	$50,000	50,000
21	4.0 MGD Booster Pump Station (Expandable to 7.0 MGD)	1	LS	$1,200,000	1,200,000
22	Emergency Generator	1	LS	$200,000	200,000
23	Yard Piping	1	LS	$200,000	200,000
24	Electrical	1	LS	$100,000	100,000
25	SCADA Update	1	LS	$25,000	25,000
	Contingency (25%)				456,300
	Total Construction Cost				2,281,300
	Eng/Legal/Admin (25%)				570,300
	Subtotal Pump Station Improvements				**2,851,600**
	Storage Improvements				
26	3.0 MG Elevated Storage Tank	1	LS	$4,622,000	4,622,000
27	Site Work (3.0 MG Elevated Tank)	1	LS	$50,000	50,000
28	Telemetry (3.0 MG and 300,000 Gallon Elevated Tanks)	2	LS	$25,000	50,000
29	Yard Piping (3.0 MG Elevated Tank)	1	LS	$115,000	115,000
30	Altitude Valve Station (At 3.0 MG Elevated Tank)	1	LS	$75,000	75,000
31	Altitude Valve Station (At 300,000 Gallon Elevated Tank)	1	LS	$115,000	115,000
32	Tank Mixing System (3.0 MG Elevated Tank)	1	LS	$45,000	45,000
33	Tank Mixing System (300,000 Gallon Elevated Tank)	1	LS	$45,000	45,000
34	Tank Interior Improvements(At 3.0 MG Elevated Tank)	1	LS	$600,000	600,000
	Contingency (25%)				1,429,300
	Total Construction Cost				7,146,300
	Eng/Legal/Admin (25%)				1,786,600
	Subtotal Storage Improvements				**8,932,900**
	TOTAL PROJECT COST ALTERNATE NO. 1				**20,387,400**

10.

City of Belton, Missouri
Water System Master Plan

OPINION OF PROBABLE PROJECT COST
ALTERNATIVE 1A WATER SUPPLY IMPROVEMENTS

Use Existing Site with Supply Line North of Loch Lloyd
City of Belton
November 1, 2011

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL
1	24" Class 350 DIP	17,450	LF	$175	3,053,800
2	24" Restrained Joint Class 350 DIP (Directional Bored)	650	LF	$450	292,500
3	16 C900 DR 18 PVC	20,100	LF	$85	1,708,500
4	36" Steel Encasement (Bored)	200	LF	$650	130,000
5	30" Steel Encasement (Bored)	250	LF	$600	150,000
6	24" Butterfly Valves	11	EA	$10,000	110,000
7	16" Butterfly Valves	24	EA	$6,500	156,000
8	12" gate valves	2	EA	$2,500	5,000
9	10" gate valves	1	EA	$1,900	1,900
10	8" Gate Valves	2	EA	$1,500	3,000
11	6" Gate Valves	2	EA	$1,000	2,000
12	4" Gate Valves	2	EA	$750	1,500
13	Fittings	14,000	LBS	$8	112,000
14	Pavement Repair	350	SY	$75	26,300
15	Connections to Existing Mains	13	EA	$3,000	39,000
16	Relocate Existing Fire Hydrants	15	EA	$2,000	30,000
17	Seeding	36,650	LF	$1	36,700
18	Erosion Control	1	LS	$40,000	40,000
	Contingency (25%)				1,474,600
	Total Construction Cost				7,372,800
	Eng/Legal/Admin (25%)				1,843,200
	Subtotal Transmission Main Improvements				**9,216,000**
	Booster Pump Station Improvements				
19	Connection to Existing Ground Storage Tank (Inlet and Outlet)	2	LS	$25,000	50,000
20	Demolition of Existing Booster Pump Station	1	LS	$50,000	50,000
21	4.0 MGD Booster Pump Station (Expandable to 7.0 MGD)	1	LS	$1,200,000	1,200,000
22	Emergency Generator	1	LS	$200,000	200,000
23	Yard Piping	1	LS	$200,000	200,000
24	Electrical	1	LS	$100,000	100,000
25	SCADA Improvements	1	LS	$25,000	25,000
	Contingency (25%)				456,300
	Total Construction Cost				2,281,300
	Eng/Legal/Admin (25%)				570,300
	Subtotal Booster Pump Station Improvements				**2,851,600**
	Storage Improvements				
26	3.0 MG Elevated Storage Tank	1	LS	$4,622,000	4,622,000
27	Site Work (3.0 MG Elevated Tank)	1	LS	$50,000	50,000
28	Telemetry (3.0 MG and 300,000 Gallon Elevated Tanks)	2	LS	$25,000	50,000
29	Yard Piping (3.0 MG Elevated Tank)	1	LS	$115,000	115,000
30	Alitude Valve Station (At 3.0 MG Elevated Tank)	1	LS	$75,000	75,000
31	Alitude Valve Station (At 300,000 Gallon Elevated Tank)	1	LS	$115,000	115,000
32	Tank Mixing System (3.0 MG Elevated Tank)	1	LS	$45,000	45,000
33	Tank Mixing System (300,000 Gallon Elevated Tank)	1	LS	$45,000	45,000
34	Tank Interior Improvements (At 3.0 MG Elevated Tank)	1	LS	$600,000	600,000
	Contingency (25%)				1,429,300
	Total Construction Cost				7,146,300
	Eng/Legal/Admin (25%)				1,786,600
	Subtotal Storage Improvements				**8,932,900**
	TOTAL PROJECT COST ALTERNATE NO. 1A				**21,000,500**

OPINION OF PROBABLE PROJECT COST
ALTERNATIVE 2 WATER SUPPLY IMPROVEMENTS

New Site East of Holmes Road and South of Loch Lloyd Parkway with Supply Line along Kenneth Road
City of Belton
November 1, 2011

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL
1	24" Class 350 DIP	15,200	LF	$175	2,660,000
2	24" Restrained Joint Class 350 DIP (Directional Bored)	300	LF	$450	135,000
3	16 C900 DR 18 PVC	20,100	LF	$85	1,708,500
4	36" Steel Encasement (Bored)	200	LF	$650	130,000
5	30" Steel Encasement (Bored)	250	LF	$600	150,000
6	24" Butterfly Valves	8	EA	$10,000	80,000
7	16" Butterfly Valves	24	EA	$6,500	156,000
8	12" gate valves	2	EA	$2,500	5,000
9	10" gate valves	1	EA	$1,900	1,900
10	8" Gate Valves	2	EA	$1,500	3,000
11	6" Gate Valves	2	EA	$1,000	2,000
12	4" Gate Valves	2	EA	$750	1,500
13	Fittings	12,000	LBS	$8	96,000
14	Pavement Repair	350	SY	$75	26,300
15	Connections to Existing Mains	11	EA	$3,000	33,000
16	Relocate Existing Fire Hydrants	15	EA	$2,000	30,000
17	Seeding	34,380	LF	$1	34,400
18	Erosion Control	1	LS	$40,000	40,000
	Contingency (25%)				1,323,200
	Total Construction Cost				6,615,800
	Eng/Legal/Admin (25%)				1,654,000
	Subtotal Transmission Main Improvements				**8,269,800**
	Booster Pump Station Improvements				
19	4.0 MGD Booster Pump Station (Expandable to 7.0 MGD)	1	LS	$1,150,000	1,150,000
20	Emergency Generator	1	LS	$175,000	175,000
21	Yard Piping	1	LS	$175,000	175,000
22	Electrical	1	LS	$80,000	80,000
23	SCADA Improvements	1	LS	$25,000	25,000
	Contingency (25%)				401,300
	Total Construction Cost				2,006,300
	Eng/Legal/Admin (25%)				501,600
	Subtotal Booster Pump Station Improvements				**2,507,900**
	Storage Improvements				
24	3.0 MG Elevated Storage Tank	1	LS	$4,622,000	4,622,000
25	2.0 MG Ground Storage Tank	1	LS	$1,200,000	1,200,000
26	Site Work (3.0 MG Elevated Tank)	1	LS	$50,000	50,000
27	Site Work (2.0 MG Ground Storage Tank)	1	LS	$50,000	50,000
28	Telemetry (3.0 MG and 300,000 Gallon Elevated Tanks)	2	LS	$25,000	50,000
29	Yard Piping (3.0 MG Elevated Tank)	1	LS	$115,000	115,000
30	Yard Piping (2.0 MG Ground Storage Tank)	1	LS	$50,000	50,000
31	Altitude Valve Station (At 3.0 MG Elevated Tank)	1	LS	$75,000	75,000
32	Altitude Valve Station (At 300,000 Gallon Elevated Tank)	1	LS	$115,000	115,000
33	Tank Mixing System (3.0 MG Elevated Tank)	1	LS	$45,000	45,000
34	Tank Mixing System (2.0 MG Ground Storage Tank)	1	LS	$45,000	45,000
35	Tank Mixing System (300,000 Gallon Elevated Tank)	1	LS	$45,000	45,000
36	Tank Interior Improvements (3.0 MG Elevated Tank)	1	LS	$600,000	600,000
	Contingency (25%)				1,765,500
	Total Construction Cost				8,827,500
	Eng/Legal/Admin (25%)				2,206,900
	Subtotal Storage Improvements				**11,034,400**
	TOTAL PROJECT COST ALTERNATE NO. 2				**21,812,100**

OPINION OF PROBABLE PROJECT COST
ALTERNATIVE 2A WATER SUPPLY IMPROVEMENTS

New Site East of Holmes Road and South of Loch Lloyd Parkway with Supply Line North of Loch Lloyd
City of Belton
November 1, 2011

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL
1	24" Class 350 DIP	15,450	LF	$175	2,703,800
2	24" Restrained Joint Class 350 DIP (Directional Bored)	650	LF	$450	292,500
3	16 C900 DR 18 PVC	20,100	LF	$85	1,708,500
4	36" Steel Encasement (Bored)	200	LF	$650	130,000
5	30" Steel Encasement (Bored)	250	LF	$600	150,000
6	24" Butterfly Valves	8	EA	$10,000	80,000
7	16" Butterfly Valves	24	EA	$6,500	156,000
8	12" gate valves	2	EA	$2,500	5,000
9	10" gate valves	1	EA	$1,900	1,900
10	8" Gate Valves	2	EA	$1,500	3,000
11	6" Gate Valves	2	EA	$1,000	2,000
12	4" Gate Valves	2	EA	$750	1,500
13	Fittings	12,000	LBS	$8	96,000
14	Pavement Repair	300	SY	$75	22,500
15	Connections to Existing Mains	11	EA	$3,000	33,000
16	Relocate Existing Fire Hydrants	15	EA	$2,000	30,000
17	Seeding	34,630	LF	$1	34,600
18	Erosion Control	1	LS	$40,000	40,000
	Contingency (25%)				1,372,600
	Total Construction Cost				6,862,900
	Eng/Legal/Admin (25%)				1,715,700
	Subtotal Transmission Main Improvements				**8,578,600**
	Booster Pump Station Improvements				
19	4.0 MGD Booster Pump Station (Expandable to 7.0 MGD)	1	LS	$1,150,000	1,150,000
20	Emergency Generator	1	LS	$175,000	175,000
21	Yard Piping	1	LS	$175,000	175,000
22	Electrical	1	LS	$80,000	80,000
23	SCADA Improvements	1	LS	$25,000	25,000
	Contingency (25%)				401,300
	Total Construction Cost				2,006,300
	Eng/Legal/Admin (25%)				501,600
	Subtotal Booster Pump Station Improvements				**2,507,900**
	Storage Improvements				
24	3.0 MG Elevated Storage Tank	1	LS	$4,622,000	4,622,000
25	2.0 MG Ground Storage Tank	1	LS	$1,200,000	1,200,000
26	Site Work (3.0 MG Elevated Tank)	1	LS	$50,000	50,000
27	Site Work (2.0 MG Ground Storage Tank)	1	LS	$50,000	50,000
28	Telemetry (3.0 MG and 300,000 Gallon Elevated Tanks)	2	LS	$25,000	50,000
29	Yard Piping (3.0 MG Elevated Tank)	1	LS	$115,000	115,000
30	Yard Piping (2.0 MG Ground Storage Tank)	1	LS	$50,000	50,000
31	Altitude Valve Station (At 3.0 MG Elevated Tank)	1	LS	$75,000	75,000
32	Altitude Valve Station (At 300,000 Gallon Elevated Tank)	1	LS	$115,000	115,000
33	Tank Mixing System (3.0 MG Elevated Tank)	1	LS	$45,000	45,000
34	Tank Mixing System (2.0 MG Ground Storage Tank)	1	LS	$45,000	45,000
35	Tank Mixing System (300,000 Gallon Elevated Tank)	1	LS	$45,000	45,000
36	Tank Interior Improvements (3.0 MG Elevated Tank)	1	LS	$600,000	600,000
	Contingency (25%)				1,765,500
	Total Construction Cost				8,827,500
	Eng/Legal/Admin (25%)				2,206,900
	Subtotal Storage Improvements				**11,034,400**
	TOTAL PROJECT COST ALTERNATE NO. 2A				**22,120,900**

OPINION OF PROBABLE PROJECT COST
ALTERNATIVE 3 WATER SUPPLY IMPROVEMENTS

New Site 2600 Feet East of Holmes Road and South of Loch Lloyd Parkway with Supply Line on Kenneth Road & Holmes Road
City of Belton
November 1, 2011

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL
1	24" Class 350 DIP	17,750	LF	$175	3,106,300
2	24" Restrained Joint Class 350 DIP (Directional Bored)	300	LF	$450	135,000
3	16 C900 DR 18 PVC	20,100	LF	$85	1,708,500
4	36" Steel Encasement (Bored)	200	LF	$650	130,000
5	30" Steel Encasement (Bored)	250	LF	$600	150,000
6	24" Butterfly Valves	10	EA	$10,000	100,000
7	16" Butterfly Valves	24	EA	$6,500	156,000
8	12" gate valves	2	EA	$2,500	5,000
9	10" gate valves	1	EA	$1,900	1,900
10	8" Gate Valves	2	EA	$1,500	3,000
11	6" Gate Valves	2	EA	$1,000	2,000
12	4" Gate Valves	2	EA	$750	1,500
13	Fittings	13,000	LBS	$8	104,000
14	Pavement Repair	300	SY	$75	22,500
15	Connections to Existing Mains	12	EA	$3,000	36,000
16	Relocate Existing Fire Hydrants	15	EA	$2,000	30,000
17	Seeding	36,930	LF	$1	36,900
18	Erosion Control	1	LS	$40,000	40,000
	Contingency (25%)				1,442,200
	Total Construction Cost				7,210,800
	Eng/Legal/Admin (25%)				1,802,700
	Subtotal Transmission Main Improvements				**9,013,500**
	Booster Pump Station Improvements				
19	4.0 MGD Booster Pump Station (Expandable to 7.0 MGD)	1	LS	$1,150,000	1,150,000
20	Emergency Generator	1	LS	$175,000	175,000
21	Yard Piping	1	LS	$175,000	175,000
22	Electrical	1	LS	$180,000	180,000
23	SCADA Improvements	1	LS	$25,000	25,000
	Contingency (25%)				426,300
	Total Construction Cost				2,131,300
	Eng/Legal/Admin (25%)				532,800
	Subtotal Booster Pump Station Improvements				**2,664,100**
	Storage Improvements				
24	3.0 MG Elevated Storage Tank	1	LS	$4,622,000	4,622,000
25	2.0 MG Ground Storage Tank	1	LS	$1,200,000	1,200,000
26	Site Work (3.0 MG Elevated Tank)	1	LS	$50,000	50,000
27	Site Work (2.0 MG Ground Storage Tank)	1	LS	$50,000	50,000
28	Telemetry (3.0 MG and 300,000 Gallon Elevated Tanks)	2	LS	$25,000	50,000
29	Yard Piping (3.0 MG Elevated Tank)	1	LS	$115,000	115,000
30	Yard Piping (2.0 MG Ground Storage Tank)	1	LS	$50,000	50,000
31	Altitude Valve Station (At 3.0 MG Elevated Tank)	1	LS	$75,000	75,000
32	Altitude Valve Station (At 300,000 Gallon Elevated Tank)	1	LS	$115,000	115,000
33	Tank Mixing System (3.0 MG Elevated Tank)	1	LS	$45,000	45,000
34	Tank Mixing System (2.0 MG Ground Storage Tank)	1	LS	$45,000	45,000
35	Tank Mixing System (300,000 Gallon Elevated Tank)	1	LS	$45,000	45,000
36	Tank Interior Improvements (3.0 MG Elevated Tank)	1	LS	$600,000	600,000
	Contingency (25%)				1,765,500
	Total Construction Cost				8,827,500
	Eng/Legal/Admin (25%)				2,206,900
	Subtotal Storage Improvements				**11,034,400**
	TOTAL PROJECT COST ALTERNATE NO. 3				**22,712,000**

City of Belton, Missouri
Water System Master Plan

OPINION OF PROBABLE PROJECT COST
ALTERNATIVE 3A WATER SUPPLY IMPROVEMENTS

New Site 2600 Feet East of Holmes Road and South of Loch Lloyd Parkway with Supply Line North of Loch Lloyd
City of Belton
November 1, 2011

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL
1	24" Class 350 DIP	18,000	LF	$175	3,150,000
2	24" Restrained Joint Class 350 DIP (Directional Bored)	650	LF	$450	292,500
3	16 C900 DR 18 PVC	20,100	LF	$85	1,708,500
4	36" Steel Encasement (Bored)	200	LF	$650	130,000
5	30" Steel Encasement (Bored)	250	LF	$600	150,000
6	24" Butterfly Valves	10	EA	$10,000	100,000
7	16" Butterfly Valves	24	EA	$6,500	156,000
8	12" gate valves	2	EA	$2,500	5,000
9	10" gate valves	1	EA	$1,900	1,900
10	8" Gate Valves	2	EA	$1,500	3,000
11	6" Gate Valves	2	EA	$1,000	2,000
12	4" Gate Valves	2	EA	$750	1,500
13	Fittings	13,000	LBS	$8	104,000
14	Pavement Repair	300	SY	$75	22,500
15	Connections to Existing Mains	12	EA	$3,000	36,000
16	Relocate Existing Fire Hydrants	15	EA	$2,000	30,000
17	Seeding	37,200	LF	$1	37,200
18	Erosion Control	1	LS	$40,000	40,000
	Contingency (25%)				1,492,500
	Total Construction Cost				7,462,600
	Eng/Legal/Admin				1,865,700
	Subtotal Transmission Main Improvements				**9,328,300**
	Booster Pump Station Improvements				
19	4.0 MGD Booster Pump Station (Expandable to 7.0 MGD)	1	LS	$1,150,000	1,150,000
20	Emergency Generator	1	LS	$175,000	175,000
21	Yard Piping	1	LS	$175,000	175,000
22	Electrical	1	LS	$180,000	180,000
23	SCADA Improvements	1	LS	$25,000	25,000
	Contingency (25%)				426,300
	Total Construction Cost				2,131,300
	Eng/Legal/Admin				532,800
	Subtotal Booster Pump Station Improvements				**2,664,100**
	Storage Improvements				
24	3.0 MG Elevated Storage Tank	1	LS	$4,622,000	4,622,000
25	2.0 MG Ground Storage Tank	1	LS	$1,200,000	1,200,000
26	Site Work (3.0 MG Elevated Tank)	1	LS	$50,000	50,000
27	Site Work (2.0 MG Ground Storage Tank)	1	LS	$50,000	50,000
28	Telemetry (3.0 MG and 300,000 Gallon Elevated Tanks)	2	LS	$25,000	50,000
29	Yard Piping (3.0 MG Elevated Tank)	1	LS	$115,000	115,000
30	Yard Piping (2.0 MG Ground Storage Tank)	1	LS	$50,000	50,000
31	Altitude Valve Station (At 3.0 MG Elevated Tank)	1	LS	$75,000	75,000
32	Altitude Valve Station (At 300,000 Gallon Elevated Tank)	1	LS	$115,000	115,000
33	Tank Mixing System (3.0 MG Elevated Tank)	1	LS	$45,000	45,000
34	Tank Mixing System (2.0 MG Ground Storage Tank)	1	LS	$45,000	45,000
35	Tank Mixing System (300,000 Gallon Elevated Tank)	1	LS	$45,000	45,000
36	Tank Interior Improvements (3.0 MG Elevated Tank)	1	LS	$600,000	600,000
	Contingency (25%)				1,765,500
	Total Construction Cost				8,827,500
	Eng/Legal/Admin (25%)				2,206,900
	Subtotal Storage Improvements				**11,034,400**
	TOTAL PROJECT COST ALTERNATE NO. 3A				**23,026,800**

APPENDIX H

CIP Project Maps

Figure No. 6-1A

Figure No. 6-1B

Figure No. 6-1C

Figure No. 6-1D

APPENDIX I

Water Rate Analysis Tables

Table 1-1: Capital Improvements Program Summary

Project No.	Growth Renewal	Priority[4]	Project Description	Current 2013	Growth 2013	Renewal 2013	Fiscal Year Budgets1 2014	Fiscal Year Budgets1 2015	5-Year Fiscal Budgets1 2020	5-Year Fiscal Budgets1 2025	5-Year Fiscal Budgets1 2030	5-Year Fiscal Budgets1 2035	Program Totals
Population Estimate				23,816	23,816	23,816	24,055	24,295	25,534	26,837	28,206	29,645	--
SUMMARY BY PROJECT AREA													
			General Needs (studies, reports, etc. - series 10000)	$ 2,381,000	$ -	$ 81,000	$ 103,000	$ -	$ 2,460,000	$ 130,000	$ -	$ 175,000	$ 2,949,000
			Pumping Stations (series 20000)	$ 5,688,400	$ -	$ 648,400	$ -	$ -	$ 4,601,000	$ 1,013,000	$ 484,000	$ -	$ 6,746,400
			Storage Facilities (series 30000)	$ 11,481,800	$ 8,664,800	$ 297,000	$ -	$ -	$ 2,921,000	$ -	$ -	$ -	$ 11,882,800
			Water Supply (series 35000)	$ 15,464,600	$ 1,184,600	$ -	$ -	$ -	$ 13,153,000	$ -	$ 4,168,000	$ -	$ 18,505,600
			Water Lines and Mains (series 40000 and up)	$ 26,109,000	$ -	$ 190,000	$ 193,000	$ 171,000	$ 8,628,000	$ 10,731,000	$ 8,670,000	$ 8,724,000	$ 37,307,000
			TOTAL ESTIMATED PROJECT COST	$ 61,124,800	$ 9,849,400	$ 1,216,400	$ 296,000	$ 171,000	$ 31,763,000	$ 11,874,000	$ 13,322,000	$ 8,899,000	$ 77,390,800

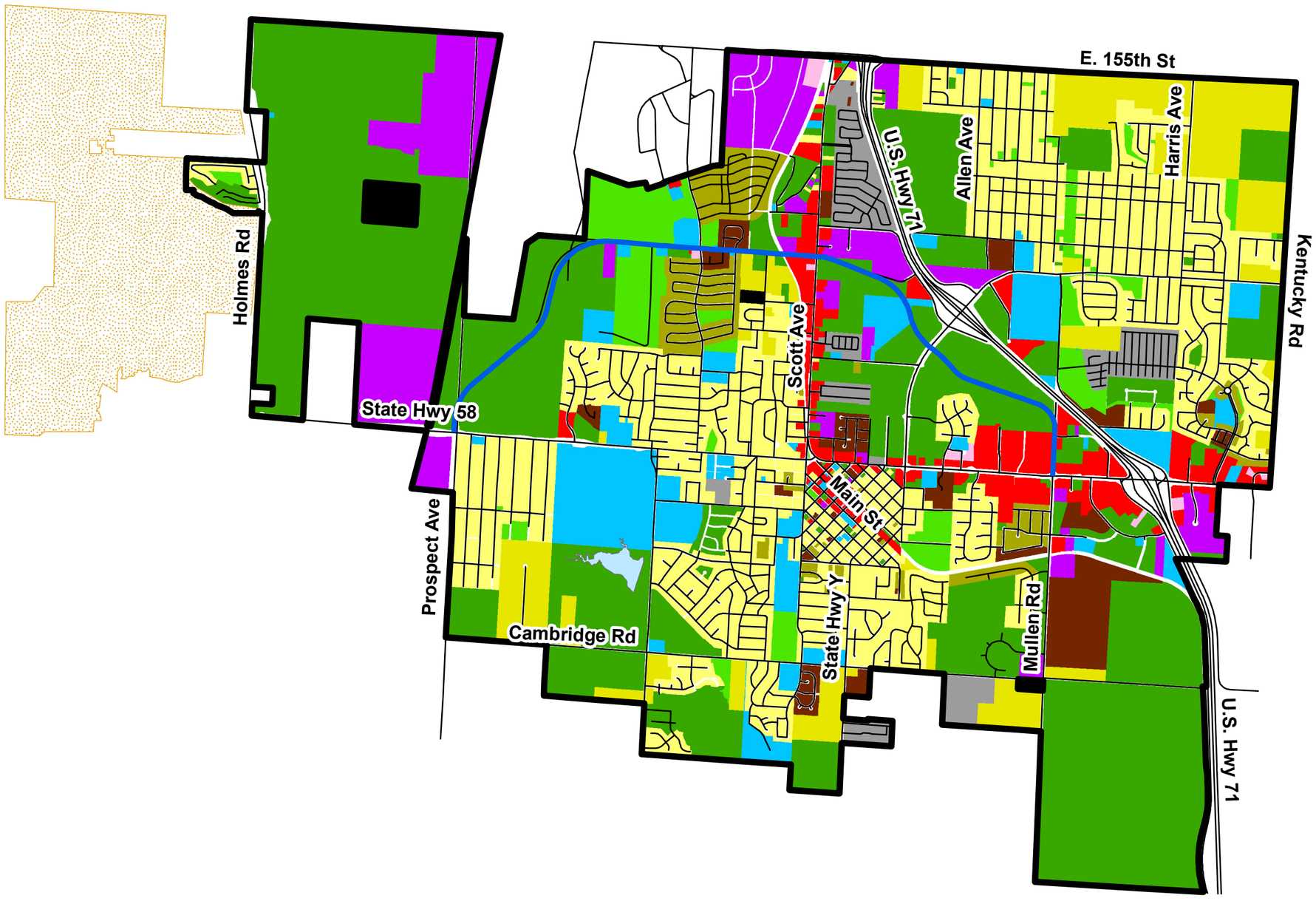
SUMMARY OF WATER LINE PROJECTS BY TYPE	Current 2013	Growth 2013	Renewal 2013	Fiscal Year Budgets1 2014	Fiscal Year Budgets1 2015	5-Year Fiscal Budgets1 2020	5-Year Fiscal Budgets1 2025	5-Year Fiscal Budgets1 2030	5-Year Fiscal Budgets1 2035	Program Totals
Growth Projects	$ 14,121,000	$ -	$ -	$ -	$ -	$ 4,851,000	$ 4,422,000	$ 5,668,000	$ 5,748,000	$ 20,689,000
Renewal Projects	$ 11,988,000	$ -	$ 190,000	$ 193,000	$ 171,000	$ 3,777,000	$ 6,309,000	$ 3,002,000	$ 2,976,000	$ 16,618,000
TOTAL ESTIMATED PROJECT COST	$ 26,109,000	$ -	$ 190,000	$ 193,000	$ 171,000	$ 8,628,000	$ 10,731,000	$ 8,670,000	$ 8,724,000	$ 37,307,000

Notes:
1. Fiscal budgets for the years shown account for an annual inflation rate of 3-percent per year. Budgets for the 5-year periods (2020, 2025, 2030 and 2035) account for inflation from the ending year of the 5-year budget cycle.
2. A project contingency of 25 percent of the total estimated construction cost is included for planning-level budgeting.
3. Project administration, engineering, construction services, legal, financial and easement costs are captured at a rate of 25 percent of the total estimated construction cost, including contingencies.
4. Generally, project priorities of "1" are needed within the first 5-year planning budget, those projects having a priority of 2 are needed in the second term of 2016 to 2020; alphabetic subscripts indicate the year, i.e., 2a = 2016, 2b = 2017, etc.
5. Waterline improvements WDS-40300 through WDS-67700 highlighted in yellow are 12" waterline projects that will be 100% funded by developers. Improvements highlighted in blue are 16" waterline projects that will have shared costs between the developer (equivalent cost of 12" line) and the City (difference in cost between a 16" and 12" waterline).

Figure 2-1

Existing Land Use Map

City of Belton



N
W E
S

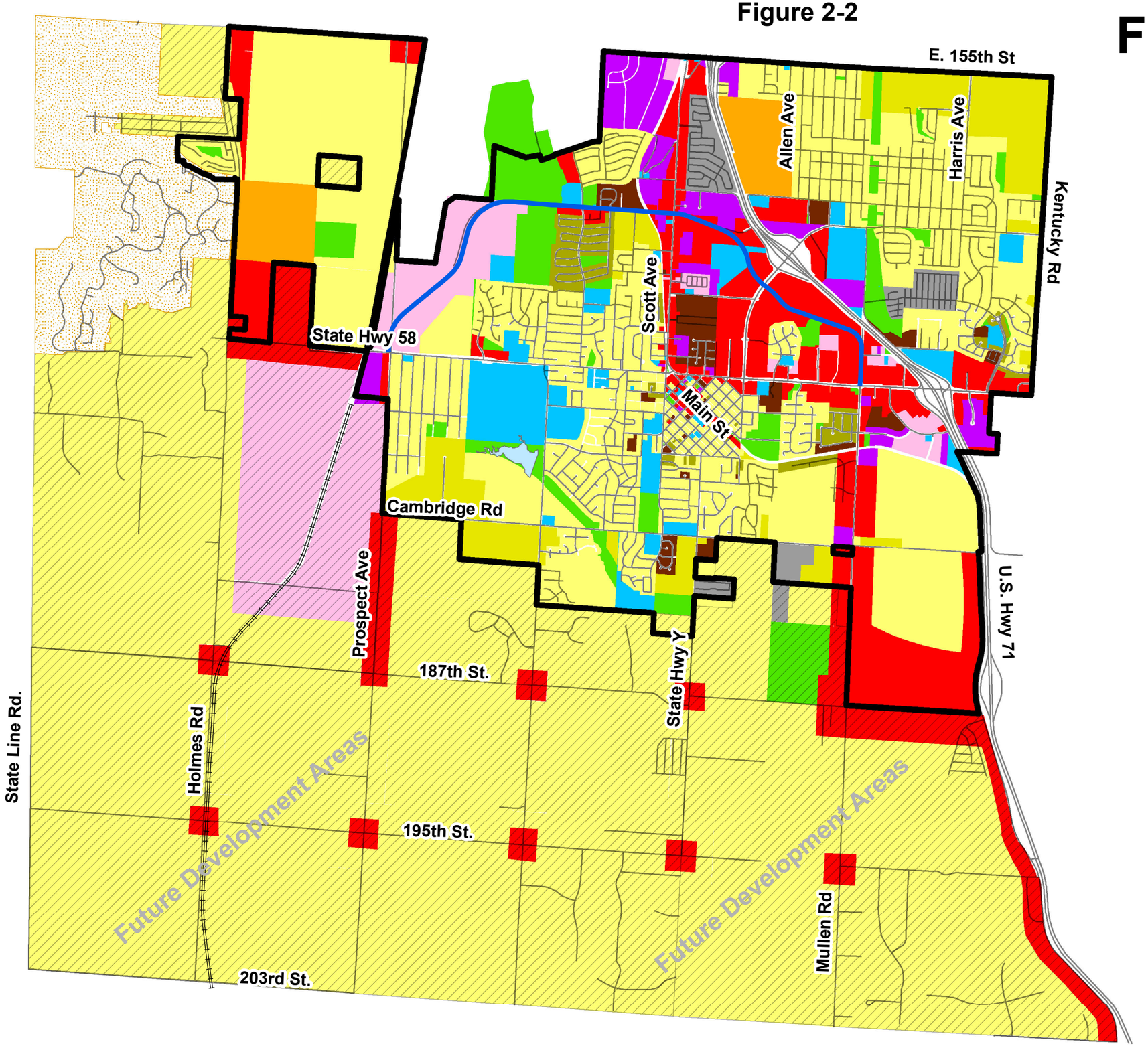
0 0.5 1 2 Miles

- Markey Parkway
- Roads
- Cleveland Lake
- Current Belton Boundary
- Loch Lloyd
- Single-Family
- Large Lot Single-Family
- Two-Family
- Multiple/Tri/Quad Plex
- Mobile Home Park
- Business Park, Office, Hotel
- Commercial
- Industrial
- Church, School, Institutional
- Parkland, Open Space, Cemetary
- Vacant
- Unclassified

Figure 2-2

Future Land Use Map

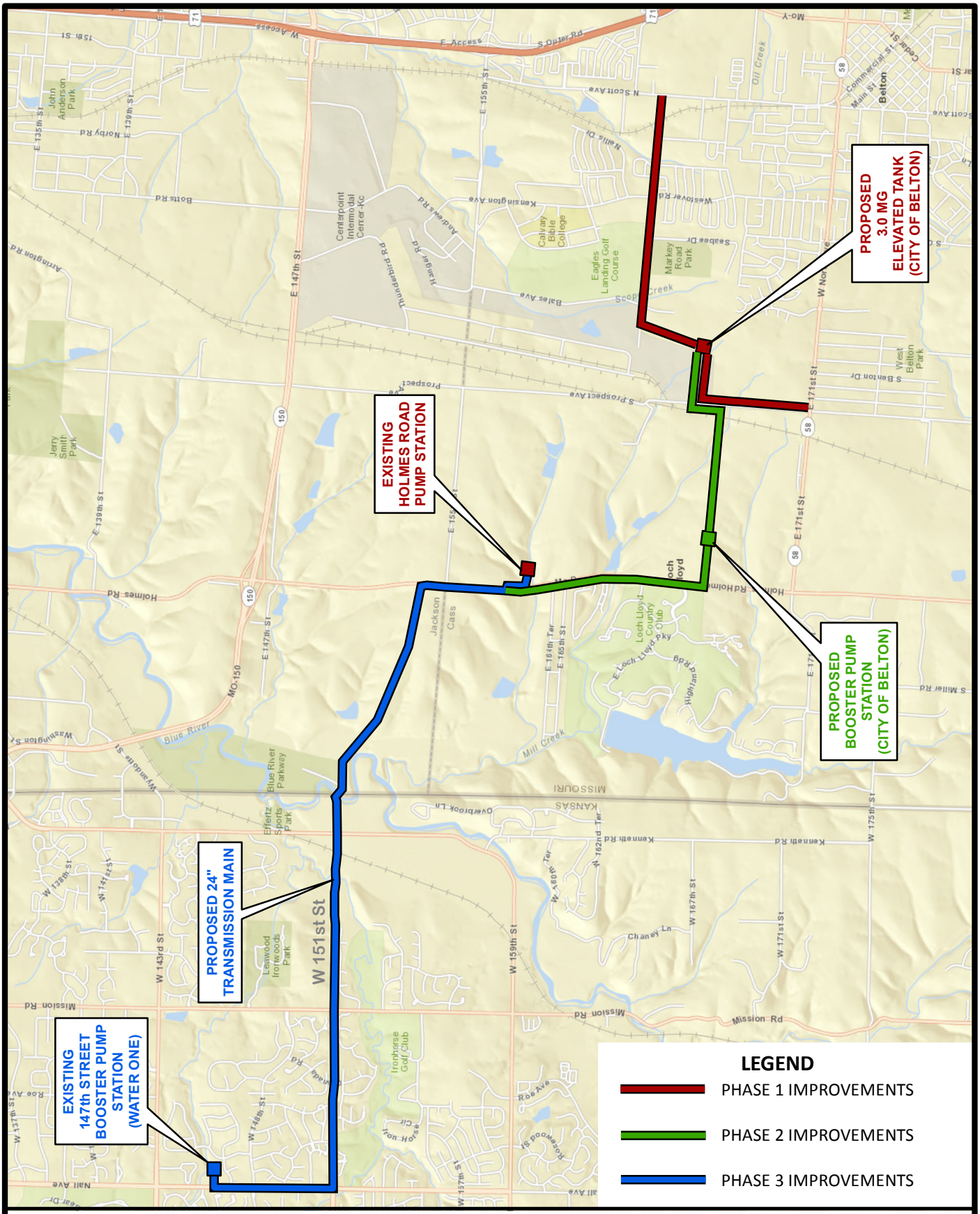
City of Belton



N
W E
S

0 0.5 1 2 Miles

- Roads
- Markey Parkway
- Railroad
- Cleveland Lake
- Current Belton Boundary
- Loch Lloyd
- Single-Family
- Large Lot Single-Family
- Two-Family
- Multiple/Tri/Quad Plex
- Mobile Home Park
- Mixed Use
- Business Park, Office, Hotel
- Commercial
- Industrial
- Church, School, Institutional
- Parkland, Open Space, Cemetary
- Future Development Areas



THE CITY OF BELTON
506 MAIN STREET
BELTON, MO. 64102
PH. 816-331-4331
FAX. 816-322-4620
www.Belton.org

2,000 1,000 0 2,000 4,000 6,000
SCALE IN FEET

WATER SYSTEM IMPROVEMENTS

PROPOSED PHASING PLAN

FIGURE 4-4

City of Belton, Missouri
Water System Master Plan

Table 6-2: Water Distribution System Capital Improvements Program Summary

Project No.	Growth Renewal	Priority[4]	Project Description	Current 2013	Growth 2013	Renewal 2013	Fiscal Year Budgets1 2014	2015	5-Year Fiscal Budgets1 2020	2025	2030	2035	Program Totals
Population Estimate				**23,816**	**23,816**	**23,816**	**24,055**	**24,295**	**25,534**	**26,837**	**28,206**	**29,645**	**--**
General Needs (studies, reports, etc. - series 10000)													
WDS - 10100	Renewal	1b	CMMS and Technology Upgrade	100,000	-	-	103,000						103,000
WDS - 10500	Renewal	1c	SCADA System Upgrade	80,000	-	-		85,000					85,000
WDS - 10600	Renewal	2a	Operations and Maintenance Facility	2,000,000	-	-			2,460,000				2,460,000
WDS - 10800	Renewal	3a	Water Master Plan Update 1	100,000	-	-				143,000			143,000
WDS - 10900	Renewal	5a	Water Master Plan Update 2	100,000	-	-						192,000	192,000
			General Needs Subtotal	**2,380,000**	**-**	**-**	**103,000**	**85,000**	**2,460,000**	**143,000**	**-**	**192,000**	
Pumping Stations (series 20000)													
WDS - 20100	Both G & R	1a	New Holmes Road Pump Station	2,625,000	2,625,000	-							2,625,000
WDS - 20200	Renewal	2b	Holmes Road Disinfection System (on site hypo generation)	800,000	-	-			984,000				984,000
WDS - 20300	Renewal	2b	North Scott Disinfection System (on site hypo generation)	800,000	-	-			984,000				984,000
WDS - 20400	Growth	3a	Holmes Road Pump Station Expansion 1	320,000	-	-				456,000			456,000
WDS - 20500	Growth	4a	North Scott Metering Station	115,000	-				141,000				141,000
			Pumping Station Subtotal	**4,660,000**	**2,625,000**	**-**	**-**	**-**	**2,109,000**	**456,000**	**-**	**-**	
Storage Facilities (series 30000)													
WDS - 30100	Both G & R	1a	3-Million Gallon Elevated Tank	8,642,400	8,642,400	-	-	-	-	-	-	-	8,642,400
WDS - 30200	Renewal	1a	Improvements to Existing 300k Elevated Tank	292,275	-	292,275	-	-	-	-	-	-	292,275
WDS - 30300	Renewal	1a	2-Million Gallon Ground Storage Tank	2,099,700	-	2,099,700	-	-	-	-	-	-	2,099,700
			Storage Facilities Subtotal	**11,034,375**	**8,642,400**	**2,391,975**	**-**	**-**	**-**	**-**	**-**	**-**	
Water Supply (Series 35000)													
WDS - 35100	Both G & R	1a	Water Supply Connection to Water One (SDC)	9,900,000	9,900,000								9,900,000
WDS - 35200	Both G & R	1a	Water Supply Tranmission and Distribution Mains (Missouri)	9,003,250	9,003,250								9,003,250
WDS - 35300	Both G & R	1a	Water Supply and Tranmission Mains (Kansas)	2,200,000	2,200,000								2,200,000
WDS - 35400	Growth	4a	Additional 1.0 MDG from Water One	2,475,000	-				3,044,000				3,044,000
			Water Supply Subtotal	**23,578,250**	**21,103,250**	-	-	-	**3,044,000**	-	-	-	
Water Lines and Mains (series 40000 and up)													
WDS - 40300	Growth	1b	Bel-Ray Circle to Bel-Ray Blvd	112,000	-	-	115,000						115,000
WDS - 40400	Growth	1b	Hwy 58 - Bel-Ray to east end of existing 6"	77,000	-	-	79,000						79,000
WDS - 40500	Growth	1b	Dean Ext - Tank to Catron Ext	64,000	-	-	66,000						66,000
WDS - 40600	Growth	1b	Dean Ext - Catron Ext to East 179th	70,000	-	-	72,000						72,000
WDS - 40700	Growth	1b	Prospect - Hwy 58 S to East Cambridge	907,000	-	-	934,000						934,000
WDS - 40800	Growth	1c	East Cambridge - Prospect to Cleveland	816,000	-	-		866,000					866,000
WDS - 40900	Growth	1c	Bel-Ray Place - Hwy 58 to South Hwy 71 Crossing	310,000	-	-		329,000					329,000
WDS - 41100	Growth	1c	Hwy Y - South to Catron	104,000	-	-		110,000					110,000
WDS - 41200	Growth	1c	Hwy Y - Catron to E Cambridge	213,000	-	-		226,000					226,000
WDS - 41300	Growth	1c	Catron - Hwy Y to Maier	144,000	-	-		153,000					153,000
WDS - 41400	Growth	1c	Catron - Maier to end of existing 8"	158,000	-	-		168,000					168,000
WDS - 41500	Growth	1c	Catron Extension - End of Existing 8" to Dean Ext	-	-	-		-					-
WDS - 41600	Growth	2	East Cambridge W of S. Mullen	118,000	-	-			145,000				145,000
WDS - 41700	Growth	2	S. Mullen - End of existing 16" to E Cambridge	46,000	-	-			57,000				57,000
WDS - 41800	Growth	2	East 179th - S. Mullen to Dean Ext	99,000	-	-			122,000				122,000
WDS - 41900	Growth	2	Markey Parkway Ext - State Hwy Y to Mullen	-	-	-		-					-
WDS - 42000	Growth	2	North loop to end of Prospect	323,000	-	-			397,000				397,000
WDS - 42800	Growth	2	Prospect Ave 16" - East 155th to Hwy 58	288,000	-	-			354,000				354,000
WDS - 42900	Growth	2	Markey Parkway Ext - N Scott East to Hwy 71	120,000	-	-			148,000				148,000

Notes:
1. Fiscal budgets for the years shown account for an annual inflation rate of 3-percent per year. Budgets for the 5-year periods (2020, 2025, 2030 and 2035) account for inflation from the ending year of the 5-year budget cycle.
2. A project contingency of 25 percent of the total estimated construction cost is included for planning-level budgeting.
3. Project administration, engineering, construction services, legal, financial and easement costs are captured at a rate of 25 percent of the total estimated construction cost, including contingencies.
4. Generally, project priorities of "1" are needed within the first 5-year planning budget, those projects having a priority of 2 are needed in the second term of 2016 to 2020; alphabetic subscripts indicate the year, i.e., 2a = 2016, 2b = 2017, etc.
5 Waterline improvements WDS-40300 through WDS-67700 highlighted in yellow are 12" waterline projects that will be 100% funded by developers. Improvements highlighted in blue are 16" waterline projects that will have shared costs between the developer (equivalent cost of 12" line) and the City (difference in cost between a 16" and 12" waterline).

Table 6-2: Water Distribution System Capital Improvements Program Summary

Project No.	Growth Renewal	Priority[4]	Project Description	Current 2013	Growth 2013	Renewal 2013	Fiscal Year Budgets1 2014	Fiscal Year Budgets1 2015	5-Year Fiscal Budgets1 2020	5-Year Fiscal Budgets1 2025	5-Year Fiscal Budgets1 2030	5-Year Fiscal Budgets1 2035	Program Totals
Population Estimate				**23,816**	**23,816**	**23,816**	**24,055**	**24,295**	**25,534**	**26,837**	**28,206**	**29,645**	**--**
WDS - 43000	Growth	3	Markey Parkway Ext - Hwy Y NW to New 16"	-	-	-				-			-
WDS - 43400	Growth	2	S Cleveland - E Cambridge to existing 16"	214,000	-	-			263,000				263,000
WDS - 43500	Growth	3	Cleveland - Sunrise to E Cambridge	414,000	-	-				590,000			590,000
WDS - 43600	Growth	3	Cleveland - Hwy 58 to Sunrise	411,000	-	-				586,000			586,000
WDS - 43700	Growth	3	Sunrise - Cleveland to Buenta Vista	93,000	-	-				133,000			133,000
WDS - 43900	Growth	3	East Cambridge - Cleveland to Pawnee	83,000	-	-				118,000			118,000
WDS - 44500	Growth	3	E Cambridge - Pawnee to Scott	307,000	-	-				438,000			438,000
WDS - 44600	Growth	3	E Cambridge - Scott to Hwy Y	173,000	-	-				247,000			247,000
WDS - 44700	Growth	3	Connect Scott to Hwy Y at E Cambridge	51,000	-	-				73,000			73,000
WDS - 44800	Growth	4	South Street - Scott to Hwy Y	165,000	-	-					273,000		273,000
WDS - 44900	Growth	3	Hwy 58 - Starlight to South Peculiar	115,000	-	-				164,000			164,000
WDS - 45000	Growth	3	Hwy 58 (North Side) - South Mullen to existing16"	170,000	-	-				242,000			242,000
WDS - 45200	Growth	3	Bel-Ray Blvd. - State Hwy 58 to Spring Valley	354,000	-	-				505,000			505,000
WDS - 45500	Growth	3	Hwy Y - South to Minnie	230,000	-	-				328,000			328,000
WDS - 45600	Growth	3	Hwy Y - Minnie to Hwy 58	138,000	-	-				197,000			197,000
WDS - 45700	Growth	3	Hwy 58 (south side) - Hwy Y to end of existing 12"	366,000	-	-				522,000			522,000
WDS - 45900	Growth	3	East 179th - Dean Ext to S. Peculiar	64,000	-	-				91,000			91,000
WDS - 46000	Growth	3	Vicie - East 155th to East 160th	346,000	-	-				493,000			493,000
WDS - 46200	Growth	3	N. Hwy 71 Crossing to East 163rd	472,000	-	-				673,000			673,000
WDS - 46300	Growth	5	East 162nd & Kay - west to New 16"	224,000	-	-						429,000	429,000
WDS - 46400	Growth	4	East Outer Rd. - East 163rd to Middle Hwy 71 Crossing	507,000	-	-					838,000		838,000
WDS - 46500	Growth	4	Bel-Ray Dr. - Jasmine to Spring Valley	123,000	-	-					203,000		203,000
WDS - 46600	Growth	4	South Kentucky - N. end of 16" to 163rd	507,000	-	-					838,000		838,000
WDS - 46700	Growth	4	East 155th - Vicie to Harris	688,000	-	-					1,137,000		1,137,000
WDS - 46800	Growth	4	Harris - 163rd to East 155th	541,000	-	-					894,000		894,000
WDS - 46900	Growth	4	Dean Ext - East 179th to Node 122	-	-	-					-		-
WDS - 47000	Growth	4	Node 122 west to South Mullen	-	-	-					-		-
WDS - 47100	Growth	4	Dean Ext - Node 122 to N. Cass Pkwy	-	-	-					-		-
WDS - 47200	Growth	4	N. Cass Pkwy - S. Peculiar to S. Mullen	163,000	-	-					269,000		269,000
WDS - 47300	Growth	4	S. Peculiar - East 179th to N. Cass Pkwy	170,000	-	-					281,000		281,000
WDS - 47400	Growth	4	Vivian/Elmyra Connector	104,000	-	-					172,000		172,000
WDS - 48500	Growth	4	East Outer - North Hwy 71 Crossing to near Grand	134,000	-	-					221,000		221,000
WDS - 48600	Growth	4	East Outer & 155th Street near Grant to Valley	438,000	-	-					724,000		724,000
WDS - 48700	Growth	5	East 155th Street - Valley to Vicie	296,000	-	-						567,000	567,000
WDS - 48900	Growth	5	East Outer Rd. - Hwy 71 Middle Crossing to Crystal Street	291,000	-	-						558,000	558,000
WDS - 49000	Growth	5	East Outer Rd. - Crystal to Spring Valley & Jasmine	248,000	-	-						475,000	475,000
WDS - 49100	Growth	5	Middle Hwy 71 Crossing - West & South to S. Mullen	349,000	-	-						669,000	669,000
WDS - 49200	Growth	5	East Outer Rd. - Crystal Street to Hwy 58	499,000	-	-						956,000	956,000
WDS - 49300	Growth	5	Kentucky - East 155th to end of existing 16"	150,000	-	-						287,000	287,000
WDS - 49400	Growth	5	East 155th - Harris to Kentucky	104,000	-	-						199,000	199,000
WDS - 49500	Growth	5	Hwy Y - East Cambridge to end of 6"	102,000	-	-						195,000	195,000
WDS - 50400	Growth	5	S. Mullen - East 179th to new 12"	59,000	-	-						113,000	113,000
WDS - 50500	Growth	5	S. Mullen - New 12" south to N. Cass Pkwy	86,000	-	-						165,000	165,000
WDS - 51500	Growth	5	165th & Hwy D west to Prospect	203,000	-	-						389,000	389,000

Notes:
1. Fiscal budgets for the years shown account for an annual inflation rate of 3-percent per year. Budgets for the 5-year periods (2020, 2025, 2030 and 2035) account for inflation from the ending year of the 5-year budget cycle.
2. A project contingency of 25 percent of the total estimated construction cost is included for planning-level budgeting.
3. Project administration, engineering, construction services, legal, financial and easement costs are captured at a rate of 25 percent of the total estimated construction cost, including contingencies.
4. Generally, project priorities of "1" are needed within the first 5-year planning budget, those projects having a priority of 2 are needed in the second term of 2016 to 2020; alphabetic subscripts indicate the year, i.e., 2a = 2016, 2b = 2017, etc.
5 Waterline improvements WDS-40300 through WDS-67700 highlighted in yellow are 12" waterline projects that will be 100% funded by developers. Improvements highlighted in blue are 16" waterline projects that will have shared costs between the developer (equivalent cost of 12" line) and the City (difference in cost between a 16" and 12" waterline).

Table 6-2: Water Distribution System Capital Improvements Program Summary

Project No.	Growth Renewal	Priority[4]	Project Description	Current 2013	Growth 2013	Renewal 2013	Fiscal Year Budgets1 2014	Fiscal Year Budgets1 2015	5-Year Fiscal Budgets1 2020	5-Year Fiscal Budgets1 2025	5-Year Fiscal Budgets1 2030	5-Year Fiscal Budgets1 2035	Program Totals
Population Estimate				**23,816**	**23,816**	**23,816**	**24,055**	**24,295**	**25,534**	**26,837**	**28,206**	**29,645**	**--**
WDS - 51600	Growth	5	East 155th to 16" crossing west of Prospect	-	-	-							-
WDS - 51700	Growth	5	Hwy D to Prospect south of 155th	-	-	-							-
WDS - 51800	Growth	5	Mid 51500 South to New 16"	-	-	-							-
WDS - 60000	Renewal	1a	North side of Hwy 58 - Westover to N. Scott	267,000	-	-							
WDS - 60100	Renewal	2	N Chestnut Street small line Improvements	46,000	-	-			57,000				57,000
WDS - 60200	Renewal	1c	East Outer Rd. and Grand Street Area - Small Line Improvements	110,000	-	-		117,000					117,000
WDS - 60300	Renewal	2	162nd N to 160th - Kay Ave E to Valentine Ave - Small Line Improvements	981,000	-	-			1,207,000				1,207,000
WDS - 60400	Renewal	2	Vicie Ave near 163rd St. - Small Line Improvements	173,000	-	-			213,000				213,000
WDS - 60500	Renewal	1b	Spring Valley Ct. - Small Line Improvements	22,000	-	-	23,000						23,000
WDS - 60600	Renewal	1b	Myron Ave - small line improvements	58,000	-	-	60,000						60,000
WDS - 60700	Renewal	1b	Hawthorne Ct - small line improvements	64,000	-	-	66,000						66,000
WDS - 60800	Renewal	1b	Manor Ct - small line improvements	46,000	-	-	47,000						47,000
WDS - 60900	Renewal	1b	Turner Rd - small line improvements	51,000	-	-	53,000						53,000
WDS - 61000	Renewal	1b	End of A Street and East Ave - Small Line Improvements	30,000	-	-	31,000						31,000
WDS - 61100	Renewal	1b	South of Walnut Between Colbern and Baldwin	69,000	-	-	71,000						71,000
WDS - 61200	Renewal	1b	Mill Ave - Baldwin to Scott	88,000	-	-	91,000						91,000
WDS - 61300	Renewal	2	Cast Iron Replacement Priority Area 1	1,373,000	-	-			1,689,000				1,689,000
WDS - 61400	Renewal	1b	Asbestos Cement Pipe Replacements Priority Area 1	515,000	-	-	530,000						530,000
WDS - 61500	Renewal	1c	Belton Avenue - Markey to King	157,000	-	-		167,000					167,000
WDS - 61600	Renewal	1b	Asbestos Cement Pipe Replacements Priority Area 2	277,000	-	-	285,000						285,000
WDS - 61700	Renewal	2	163rd (south side) - west of Vicie to Terry	122,000	-	-			150,000				150,000
WDS - 61800	Renewal	2	163rd - South Mullen to Hight & Spring Valley to Kentucky	603,000	-	-			742,000				742,000
WDS - 61900	Renewal	1c	Asbestos Cement Pipe Replacements Priority Area 3	435,000	-	-		461,000					461,000
WDS - 62000	Renewal	2	Cast Iron Replacement Priority Area 2	1,134,000	-	-			1,395,000				1,395,000
WDS - 62100	Renewal	2	South Kentucky - Spring Valley to 6" South	80,000	-	-			98,000				98,000
WDS - 62200	Renewal	2	South Kentucky - Spring Valley to 6" North	54,000	-	-			66,000				66,000
WDS - 62300	Renewal	2	Spring Valley - Bel-Ray Dr to 163rd	202,000	-	-			248,000				248,000
WDS - 62400	Renewal	1c	Asbestos Cement Pipe Replacements Priority Area 4	288,000	-	-		306,000					306,000
WDS - 62600	Renewal	3	163rd - Hight to Spring Valley	299,000	-	-				426,000			426,000
WDS - 62700	Renewal	3	Airway - Westover to Park	123,000	-	-				175,000			175,000
WDS - 62800	Renewal	3	Park - Airway to King & Belton	213,000	-	-				304,000			304,000
WDS - 62900	Renewal	3	King - Belton to Berry	75,000	-	-				107,000			107,000
WDS - 63000	Renewal	3	King - Berry to N Scott	72,000	-	-				103,000			103,000
WDS - 63100	Renewal	3	Westover Road - Shawn Dr. to Hwy 58	331,000	-	-				472,000			472,000
WDS - 63200	Renewal	3	Kenneth - Westover to Cleveland	136,000	-	-				194,000			194,000
WDS - 63300	Renewal	3	Kenneth - Cleveland to Sandra	144,000	-	-				205,000			205,000
WDS - 63400	Renewal	3	Sandra - Kenneth to Sherman	93,000	-	-				133,000			133,000
WDS - 63500	Renewal	3	Sherman - Sandra to Cherry Hill	117,000	-	-				167,000			167,000
WDS - 63600	Renewal	3	Cherry Hill - Sherman to Hwy 58	179,000	-	-				255,000			255,000
WDS - 63800	Renewal	3	Vivian - small line improvements	86,000	-	-				123,000			123,000
WDS - 64000	Renewal	3	Wilbur Parrish Circle - Small Line Improvements	22,000	-	-				31,000			31,000

Notes:
1. Fiscal budgets for the years shown account for an annual inflation rate of 3-percent per year. Budgets for the 5-year periods (2020, 2025, 2030 and 2035) account for inflation from the ending year of the 5-year budget cycle.
2. A project contingency of 25 percent of the total estimated construction cost is included for planning-level budgeting.
3. Project administration, engineering, construction services, legal, financial and easement costs are captured at a rate of 25 percent of the total estimated construction cost, including contingencies.
4. Generally, project priorities of "1" are needed within the first 5-year planning budget, those projects having a priority of 2 are needed in the second term of 2016 to 2020; alphabetic subscripts indicate the year, i.e., 2a = 2016, 2b = 2017, etc.
5 Waterline improvements WDS-40300 through WDS-67700 highlighted in yellow are 12" waterline projects that will be 100% funded by developers. Improvements highlighted in blue are 16" waterline projects that will have shared costs between the developer (equivalent cost of 12" line) and the City (difference in cost between a 16" and 12" waterline).

Table 6-2: Water Distribution System Capital Improvements Program Summary

Project No.	Growth Renewal	Priority[4]	Project Description	Current 2013	Growth 2013	Renewal 2013	Fiscal Year Budgets1 2014	2015	5-Year Fiscal Budgets1 2020	2025	2030	2035	Program Totals
Population Estimate				**23,816**	**23,816**	**23,816**	**24,055**	**24,295**	**25,534**	**26,837**	**28,206**	**29,645**	**--**
WDS - 64100	Renewal	3	Locust Hill Circle - Small Line Improvements	40,000	-	-				57,000			57,000
WDS - 64200	Renewal	3	163rd Court - Small Line Improvements	21,000	-	-				30,000			30,000
WDS - 64300	Renewal	4	Vicie Street - 163rd to 162nd - Small Line Improvements	98,000	-	-					162,000		162,000
WDS - 64400	Renewal	4	Greenwald Ct - Small Line Improvements	40,000	-	-					66,000		66,000
WDS - 64500	Renewal	4	Middleton Ct - Small Line Improvements	21,000	-	-					35,000		35,000
WDS - 64600	Renewal	4	McKinley Ct. - Small Line Improvements	27,000	-	-					45,000		45,000
WDS - 64700	Renewal	4	Between Jasmine Ln and Christie Ln - Small Line Improvements	2,000	-	-					3,000		3,000
WDS - 64800	Renewal	4	Bel-Ray Ct. - Small Line Improvements	27,000	-	-					45,000		45,000
WDS - 64900	Renewal	4	Hardee Ct. - Small Line Improvements	18,000	-	-					30,000		30,000
WDS - 65000	Renewal	4	Barry Ct. - Small Line Improvements	18,000	-	-					30,000		30,000
WDS - 65100	Renewal	4	170th Ct. - Small Line Improvements	16,000	-	-					26,000		26,000
WDS - 65400	Renewal	4	South Peculiar Dr. - Small Line Improvements	11,000	-	-					18,000		18,000
WDS - 65500	Renewal	4	Belton Ave. at King; Chadwick Ln; Canterbury Ln - Small Line Improvements	88,000	-	-					145,000		145,000
WDS - 65600	Renewal	4	King at Belton Ave.; Park Dr; Manor Dr; Berry Ave;Airway Ln; Berry St;Sunset Dr. - Small Line Improvements	752,000	-	-					1,243,000		1,243,000
WDS - 65700	Renewal	4	Jefferson Ave near Circle Dr. - Small Line Improvements	98,000	-	-					162,000		162,000
WDS - 65800	Renewal	4	Jefferson Ave near Circle Dr. - Small Line Improvements	22,000	-	-					36,000		36,000
WDS - 65900	Renewal	5	Mark Ln; Hargis Ln; Sunset Ln; Stacy Dr; Concord Ave; between Westover and Cleveland Ave - Small Line Improvements	458,000	-	-						878,000	878,000
WDS - 66000	Renewal	5	Monroe Circle - Small Line Improvements	19,000	-	-						36,000	36,000
WDS - 66100	Renewal	5	Trevis Av - Small Line Improvements	80,000	-	-						153,000	153,000
WDS - 66200	Renewal	5	Oxford Ct. - Small Line Improvements	32,000	-	-						61,000	61,000
WDS - 66300	Renewal	5	Sussex Ct - Small Line Improvements	26,000	-	-						50,000	50,000
WDS - 66400	Renewal	5	Dover Ct. - Small Line Improvements	35,000	-	-						67,000	67,000
WDS - 66600	Renewal	5	Spring Ct. - Small Line Improvements	21,000	-	-						40,000	40,000
WDS - 66700	Renewal	5	North Oak Dr; Sunny Dr; Sunny Circle; Chestnut St; Washington St; Hargis St; E Hargis St. - Small Line Improvements	382,000	-	-						732,000	732,000
WDS - 66800	Renewal	5	A Street -Hwy 58 to Cherry - Small Line Improvements	32,000	-	-						61,000	61,000
WDS - 67000	Renewal	5	Pine St. - Small Line Improvements	37,000	-	-						71,000	71,000
WDS - 67400	Renewal	5	Mill Ave between Dawn and Lacy - Small Line Improvements	56,000	-	-						107,000	107,000
WDS - 67600	Renewal	5	Lacy Ln; Lake Dr; South Ave; Hamilton Ln; Baldwin St; Sunrise Dr. - Small Line Improvements	307,000	-	-						588,000	588,000
WDS - 67700	Renewal	5	Belmo Dr. at Baldwin St - Small Line Improvements	69,000	-	-						132,000	132,000
Total Estimated Water Lines and Mains Project Cost				**26,109,000**	**-**	**-**	**2,523,000**	**2,903,000**	**7,351,000**	**8,182,000**	**7,896,000**	**7,978,000**	**36,833,000**

Notes:
1. Fiscal budgets for the years shown account for an annual inflation rate of 3-percent per year. Budgets for the 5-year periods (2020, 2025, 2030 and 2035) account for inflation from the ending year of the 5-year budget cycle.
2. A project contingency of 25 percent of the total estimated construction cost is included for planning-level budgeting.
3. Project administration, engineering, construction services, legal, financial and easement costs are captured at a rate of 25 percent of the total estimated construction cost, including contingencies.
4. Generally, project priorities of "1" are needed within the first 5-year planning budget, those projects having a priority of 2 are needed in the second term of 2016 to 2020; alphabetic subscripts indicate the year, i.e., 2a = 2016, 2b = 2017, etc.
5. Waterline improvements WDS-40300 through WDS-67700 highlighted in yellow are 12" waterline projects that will be 100% funded by developers. Improvements highlighted in blue are 16" waterline projects that will have shared costs between the developer (equivalent cost of 12" line) and the City (difference in cost between a 16" and 12" waterline).

Table 6-2: Water Distribution System Capital Improvements Program Summary

Project No.	Growth Renewal	Priority[4]	Project Description	Current 2013	Growth 2013	Renewal 2013	Fiscal Year Budgets1 2014	Fiscal Year Budgets1 2015	5-Year Fiscal Budgets1 2020	5-Year Fiscal Budgets1 2025	5-Year Fiscal Budgets1 2030	5-Year Fiscal Budgets1 2035	Program Totals
Population Estimate				23,816	23,816	23,816	24,055	24,295	25,534	26,837	28,206	29,645	--
SUMMARY BY PROJECT AREA													
			General Needs (studies, reports, etc. - series 10000)	$ 2,380,000	$ -	$ -	$ 103,000	$ 85,000	$ 2,460,000	$ 143,000	$ -	$ 192,000	$ 2,983,000
			Pumping Stations (series 20000)	$ 4,660,000	$ 2,625,000	$ -	$ -	$ -	$ 2,109,000	$ 456,000	$ -	$ -	$ 5,190,000
			Storage Facilities (series 30000)	$ 11,034,375	$ 8,642,400	$ 2,391,975	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,034,375
			Water Supply (series 35000)	$ 23,578,250	$ 21,103,250	$ -	$ -	$ -	$ 3,044,000	$ -	$ -	$ -	$ 24,147,250
			Water Lines and Mains (series 40000 and up)	$ 26,109,000	$ -	$ -	$ 2,523,000	$ 2,903,000	$ 7,351,000	$ 8,182,000	$ 7,896,000	$ 7,978,000	$ 36,833,000
			TOTAL ESTIMATED PROJECT COST	$ 67,761,625	$ 32,370,650	$ 2,391,975	$ 2,626,000	$ 2,988,000	$ 14,964,000	$ 8,781,000	$ 7,896,000	$ 8,170,000	$ 80,187,625

SUMMARY OF WATER LINE PROJECTS BY TYPE	Current 2013	Growth 2013	Renewal 2013	Fiscal Year Budgets1 2014	Fiscal Year Budgets1 2015	5-Year Fiscal Budgets1 2020	5-Year Fiscal Budgets1 2025	5-Year Fiscal Budgets1 2030	5-Year Fiscal Budgets1 2035	Program Totals
Growth Projects	$ 14,121,000	$ -	$ -	$ 1,266,000	$ 1,852,000	$ 1,486,000	$ 5,400,000	$ 5,850,000	$ 5,002,000	$ 20,856,000
Renewal Projects	$ 11,988,000	$ -	$ -	$ 1,257,000	$ 1,051,000	$ 5,865,000	$ 2,782,000	$ 2,046,000	$ 2,976,000	$ 15,977,000
TOTAL ESTIMATED PROJECT COST	$ 26,109,000	$ -	$ -	$ 2,523,000	$ 2,903,000	$ 7,351,000	$ 8,182,000	$ 7,896,000	$ 7,978,000	$ 36,833,000

Notes:
1. Fiscal budgets for the years shown account for an annual inflation rate of 3-percent per year. Budgets for the 5-year periods (2020, 2025, 2030 and 2035) account for inflation from the ending year of the 5-year budget cycle.
2. A project contingency of 25 percent of the total estimated construction cost is included for planning-level budgeting.
3. Project administration, engineering, construction services, legal, financial and easement costs are captured at a rate of 25 percent of the total estimated construction cost, including contingencies.
4. Generally, project priorities of "1" are needed within the first 5-year planning budget, those projects having a priority of 2 are needed in the second term of 2016 to 2020; alphabetic subscripts indicate the year, i.e., 2a = 2016, 2b = 2017, etc.
5. Waterline improvements WDS-40300 through WDS-67700 highlighted in yellow are 12" waterline projects that will be 100% funded by developers. Improvements highlighted in blue are 16" waterline projects that will have shared costs between the developer (equivalent cost of 12" line) and the City (difference in cost between a 16" and 12" waterline).

Table 6-3: Belton Water Distribution System, Capital Improvement Detail

Project No.		Growth Renewal	Priority	Diameter (in)	Length (ft)	Project Description
WDS -	40300	Growth	1b	16	725	Bel-Ray Circle to Bel-Ray Blvd
WDS -	40400	Growth	1b	16	500	Hwy 58 - Bel-Ray to east end of existing 6"
WDS -	40500	Growth	1b	16	1,675	Dean Ext - Tank to Catron Ext
WDS -	40600	Growth	1b	16	1,845	Dean Ext - Catron Ext to East 179th
WDS -	40700	Growth	1b	16	5,905	Prospect - Hwy 58 S to East Cambridge
WDS -	40800	Growth	1c	16	5,310	East Cambridge - Prospect to Cleveland
WDS -	40900	Growth	1c	16	2,020	Bel-Ray Place - Hwy 58 to South Hwy 71 Crossing
WDS -	41100	Growth	1c	12	900	Hwy Y - South to Catron
WDS -	41200	Growth	1c	12	1,850	Hwy Y - Catron to E Cambridge
WDS -	41300	Growth	1c	12	1,250	Catron - Hwy Y to Maier
WDS -	41400	Growth	1c	12	1,375	Catron - Maier to end of existing 8"
WDS -	41500	Growth	1c	12	2,875	Catron Extension - End of Existing 8" to Dean Ext
WDS -	41600	Growth	2	16	3,100	East Cambridge W of S. Mullen
WDS -	41700	Growth	2	16	1,210	S. Mullen - End of existing 16" to E Cambridge
WDS -	41800	Growth	2	16	2,600	East 179th - S. Mullen to Dean Ext
WDS -	41900	Growth	2	12	4,125	Markey Parkway Ext - State Hwy Y to Mullen
WDS -	42000	Growth	2	16	8,425	North loop to end of Prospect
WDS -	42800	Growth	2	12 & 16	7,500	Prospect Ave 16" - East 155th to Hwy 58
WDS -	42900	Growth	2	16	3,110	Markey Parkway Ext - N Scott East to Hwy 71
WDS -	43000	Growth	3	12	1,900	Markey Parkway Ext - Hwy Y NW to New 16"
WDS -	43400	Growth	2	16	1,400	S Cleveland - E Cambridge to existing 16"
WDS -	43500	Growth	3	16	2,700	Cleveland - Sunrise to E Cambridge
WDS -	43600	Growth	3	16	2,675	Cleveland - Hwy 58 to Sunrise
WDS -	43700	Growth	3	12	800	Sunrise - Cleveland to Buenta Vista
WDS -	43900	Growth	3	16	2,150	East Cambridge - Cleveland to Pawnee
WDS -	44500	Growth	3	16	2,000	E Cambridge - Pawnee to Scott
WDS -	44600	Growth	3	16	1,125	E Cambridge - Scott to Hwy Y
WDS -	44700	Growth	3	16	125	Connect Scott to Hwy Y at E Cambridge
WDS -	44800	Growth	4	12	1,425	South Street - Scott to Hwy Y
WDS -	44900	Growth	3	12	1,000	Hwy 58 - Starlight to South Peculiar
WDS -	45000	Growth	3	12	1,475	Hwy 58 (North Side) - South Mullen to existing16"
WDS -	45200	Growth	3	12	3,075	Bel-Ray Blvd. - State Hwy 58 to Spring Valley
WDS -	45500	Growth	3	12	2,000	Hwy Y - South to Minnie
WDS -	45600	Growth	3	12	1,200	Hwy Y - Minnie to Hwy 58
WDS -	45700	Growth	3	12	3,175	Hwy 58 (south side) - Hwy Y to end of existing 12"
WDS -	45900	Growth	3	16	1,675	East 179th - Dean Ext to S. Peculiar
WDS -	46000	Growth	3	12	3,000	Vicie - East 155th to East 160th
WDS -	46200	Growth	3	16	3,075	N. Hwy 71 Crossing to East 163rd
WDS -	46300	Growth	5	12	1,950	East 162nd & Kay - west to New 16"
WDS -	46400	Growth	4	16	3,300	East Outer Rd. - East 163rd to Middle Hwy 71 Crossing
WDS -	46500	Growth	4	12	1,075	Bel-Ray Dr. - Jasmine to Spring Valley
WDS -	46600	Growth	4	16	3,300	South Kentucky - N. end of 16" to 163rd
WDS -	46700	Growth	4	16	4,475	East 155th - Vicie to Harris
WDS -	46800	Growth	4	12	4,700	Harris - 163rd to East 155th
WDS -	46900	Growth	4	12	1,775	Dean Ext - East 179th to Node 122
WDS -	47000	Growth	4	12	2,525	Node 122 west to South Mullen
WDS -	47100	Growth	4	12	2,525	Dean Ext - Node 122 to N. Cass Pkwy
WDS -	47200	Growth	4	16	4,250	N. Cass Pkwy - S. Peculiar to S. Mullen
WDS -	47300	Growth	4	16	4,400	S. Peculiar - East 179th to N. Cass Pkwy
WDS -	47400	Growth	4	12	900	Vivian/Elmyra Connector
WDS -	48500	Growth	4	16	3,500	East Outer - North Hwy 71 Crossing to near Grand
WDS -	48600	Growth	4	16	2,850	East Outer & 155th Street near Grant to Valley

Table 6-3: Belton Water Distribution System, Capital Improvement Detail

Project No.		Growth Renewal	Priority	Diameter (in)	Length (ft)	Project Description
WDS -	48700	Growth	5	16	1,925	East 155th Street - Valley to Vicie
WDS -	48900	Growth	5	16	1,900	East Outer Rd. - Hwy 71 Middle Crossing to Crystal Street
WDS -	49000	Growth	5	12	2,150	East Outer Rd. - Crystal to Spring Valley & Jasmine
WDS -	49100	Growth	5	16	2,275	Middle Hwy 71 Crossing - West & South to S. Mullen
WDS -	49200	Growth	5	16	3,250	East Outer Rd. - Crystal Street to Hwy 58
WDS -	49300	Growth	5	16	3,900	Kentucky - East 155th to end of existing 16"
WDS -	49400	Growth	5	16	2,700	East 155th - Harris to Kentucky
WDS -	49500	Growth	5	16	2,650	Hwy Y - East Cambridge to end of 6"
WDS -	50400	Growth	5	16	1,550	S. Mullen - East 179th to new 12"
WDS -	50500	Growth	5	16	2,250	S. Mullen - New 12" south to N. Cass Pkwy
WDS -	51500	Growth	5	16	5,275	165th & Hwy D west to Prospect
WDS -	51600	Growth	5	12	3,650	East 155th to 16" crossing west of Prospect
WDS -	51700	Growth	5	12	5,300	Hwy D to Prospect south of 155th
WDS -	51800	Growth	5	12	4,000	Mid 51500 South to New 16"
WDS -	60000	Renewal	4	12	2,325	North side of Hwy 58 - Westover to N. Scott
WDS -	60100	Renewal	2	8	610	N Chestnut Street small line Improvements
WDS -	60200	Renewal	1c	8 & 16	885	East Outer Rd. and Grand Street Area - Small Line Improvements
WDS -	60300	Renewal	2	8 & 12	11,675	162nd N to 160th - Kay Ave E to Valentine Ave - Small Line Improvements
WDS -	60400	Renewal	2	8	2,250	Vicie Ave near 163rd St. - Small Line Improvements
WDS -	60500	Renewal	1b	8	300	Spring Valley Ct. - Small Line Improvements
WDS -	60600	Renewal	1b	8	750	Myron Ave - small line improvements
WDS -	60700	Renewal	1b	8	825	Hawthorne Ct - small line improvements
WDS -	60800	Renewal	1b	8	600	Manor Ct - small line improvements
WDS -	60900	Renewal	1b	8	675	Turner Rd - small line improvements
WDS -	61000	Renewal	1b	8	400	End of A Street and East Ave - Small Line Improvements
WDS -	61100	Renewal	1b	8	900	South of Walnut Between Colbern and Baldwin
WDS -	61200	Renewal	1b	8	1,150	Mill Ave - Baldwin to Scott
WDS -	61300	Renewal	2	8 & 12	12,410	Cast Iron Replacement Priority Area 1
WDS -	61400	Renewal	1b	8 & 12	5,180	Asbestos Cement Pipe Replacements Priority Area 1
WDS -	61500	Renewal	1c	8	2,050	Belton Avenue - Markey to King
WDS -	61600	Renewal	1b	8	3,600	Asbestos Cement Pipe Replacements Priority Area 2
WDS -	61700	Renewal	2	12	1,050	163rd (south side) - west of Vicie to Terry
WDS -	61800	Renewal	2	12	3,925	163rd - South Mullen to Hight & Spring Valley to Kentucky
WDS -	61900	Renewal	1c	8 & 12	3,955	Asbestos Cement Pipe Replacements Priority Area 3
WDS -	62000	Renewal	2	8	14,770	Cast Iron Replacement Priority Area 2
WDS -	62100	Renewal	2	16	525	South Kentucky - Spring Valley to 6" South
WDS -	62200	Renewal	2	16	350	South Kentucky - Spring Valley to 6" North
WDS -	62300	Renewal	2	12	1,750	Spring Valley - Bel-Ray Dr to 163rd
WDS -	62400	Renewal	1c	8	3,750	Asbestos Cement Pipe Replacements Priority Area 4
WDS -	62600	Renewal	2	16	1,950	163rd - Hight to Spring Valley
WDS -	62700	Renewal	3	12	1,075	Airway - Westover to Park
WDS -	62800	Renewal	3	12	1,850	Park - Airway to King & Belton
WDS -	62900	Renewal	3	12	650	King - Belton to Berry
WDS -	63000	Renewal	3	12	625	King - Berry to N Scott
WDS -	63100	Renewal	3	12	2,870	Westover Road - Shawn Dr. to Hwy 58
WDS -	63200	Renewal	3	12	1,175	Kenneth - Westover to Cleveland
WDS -	63300	Renewal	3	12	1,250	Kenneth - Cleveland to Sandra
WDS -	63400	Renewal	3	12	800	Sandra - Kenneth to Sherman
WDS -	63500	Renewal	3	12	1,020	Sherman - Sandra to Cherry Hill
WDS -	63600	Renewal	3	12	1,550	Cherry Hill - Sherman to Hwy 58
WDS -	63800	Renewal	3	12	750	Vivian - small line improvements

Table 6-3: Belton Water Distribution System, Capital Improvement Detail

Project No.		Growth Renewal	Priority	Diameter (in)	Length (ft)	Project Description
WDS -	64000	Renewal	3	8	300	Wilbur Parrish Circle - Small Line Improvements
WDS -	64100	Renewal	3	8	525	Locust Hill Circle - Small Line Improvements
WDS -	64200	Renewal	3	8	275	163rd Court - Small Line Improvements
WDS -	64300	Renewal	4	12	850	Vicie Street - 163rd to 162nd - Small Line Improvements
WDS -	64400	Renewal	4	8	525	Greenwald Ct - Small Line Improvements
WDS -	64500	Renewal	4	8	275	Middleton Ct - Small Line Improvements
WDS -	64600	Renewal	4	8	350	McKinley Ct. - Small Line Improvements
WDS -	64700	Renewal	4	8	25	Between Jasmine Ln and Christie Ln - Small Line Improvements
WDS -	64800	Renewal	4	8	350	Bel-Ray Ct. - Small Line Improvements
WDS -	64900	Renewal	4	8	225	Hardee Ct. - Small Line Improvements
WDS -	65000	Renewal	4	8	225	Barry Ct. - Small Line Improvements
WDS -	65100	Renewal	4	8	200	170th Ct. - Small Line Improvements
WDS -	65400	Renewal	4	8	150	South Peculiar Dr. - Small Line Improvements
WDS -	65500	Renewal	4	8	1,150	Belton Ave. at King; Chadwick Ln; Canterbury Ln - Small Line Improvements
WDS -	65600	Renewal	4	8	9,800	King at Belton Ave.; Park Dr; Manor Dr; Berry Ave;Airway Ln; Berry St;Sunset Dr. - Small Line Improvements
WDS -	65700	Renewal	4	8	1,275	Jefferson Ave near Circle Dr. - Small Line Improvements
WDS -	65800	Renewal	4	8	300	Jefferson Ave near Circle Dr. - Small Line Improvements
WDS -	65900	Renewal	5	8	5,950	Mark Ln; Hargis Ln; Sunset Ln; Stacy Dr; Concord Ave; between Westover and Cleveland Ave - Small Line Improvements
WDS -	66000	Renewal	5	8	250	Monroe Circle - Small Line Improvements
WDS -	66100	Renewal	5	8	1,050	Trevis Av - Small Line Improvements
WDS -	66200	Renewal	5	8	410	Oxford Ct. - Small Line Improvements
WDS -	66300	Renewal	5	8	330	Sussex Ct - Small Line Improvements
WDS -	66400	Renewal	5	8	425	Dover Ct. - Small Line Improvements
WDS -	66600	Renewal	5	8	275	Spring Ct. - Small Line Improvements
WDS -	66700	Renewal	5	8	4,975	North Oak Dr; Sunny Dr; Sunny Circle; Chestnut St; Washington St; Hargis St; E Hargis St. - Small Line Improvements
WDS -	66800	Renewal	5	8	425	A Street -Hwy 58 to Cherry - Small Line Improvements
WDS -	67000	Renewal	5	8	475	Pine St. - Small Line Improvements
WDS -	67400	Renewal	5	8	725	Mill Ave between Dawn and Lacy - Small Line Improvements
WDS -	67600	Renewal	5	8	4,010	Lacy Ln; Lake Dr; South Ave; Hamilton Ln; Baldwin St; Sunrise Dr. - Small Line Improvements
WDS -	67700	Renewal	5	8	900	Belmo Dr. at Baldwin St - Small Line Improvements
					305,800	feet

Notes:
1. Waterline improvements highlighted in yellow are 12" waterline projects that will be 100% funded by developers.
2. Improvements highlighted in blue are 16"waterline projects that will have shared costs between the developer (equivalent cost of 12" line) and the City (difference in cost between a 16" and 12" waterline).

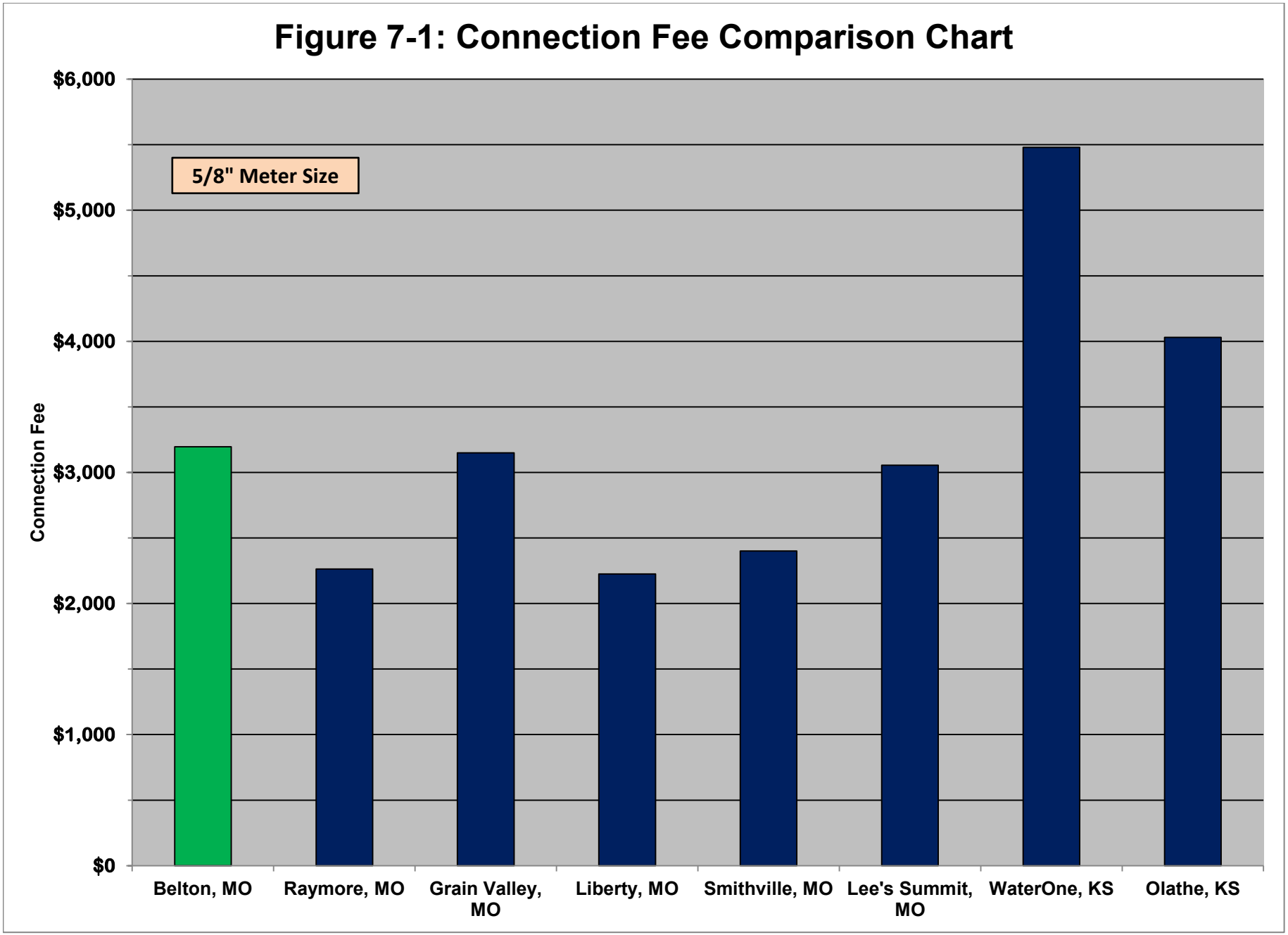


Figure 7-1: Connection Fee Comparison Chart
5/8" Meter Size
Connection Fee
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
Belton, MO
Raymore, MO
Grain Valley, MO
Liberty, MO
Smithville, MO
Lee's Summit, MO
WaterOne, KS
Olathe, KS

2011

Belton Alternative Water Supply Report

Delich, Roth and Goodwillie, P.A.
11/04/2011

Executive Summary

Study Purpose

The purpose of the Alternative Water Supply Study was to evaluate alternative water supply sources to address the City of Belton's current and future water demands. The City's desire is to ultimately have access to drinking water from two separate sources which would provide the assurance and security that the City's water needs will be met over the next 20 years.

During the initial commencement of the study work, it was discovered that other public wholesale and retail water suppliers in the surrounding area, who were also City of Kansas City, Missouri (KCMO) wholesale customers, expressed similar concerns with respect to having a sufficient and reliable source, or sources, of water to meet their projected water needs. Because of similar local issues, an additional objective of the study was to determine the feasibility of organizing a water alliance or coalition and preparing a plan which might be able to supply adequate amount of water to the coalition members over a 20 year planning period.

Tasks Performed

Delich, Roth & Goodwillie (DRG) was retained to assist the City in seeking an alternative or supplemental source of drinking water. DRG provided coordination with the City, other surrounding municipalities, rural water districts, and local and state regulatory agencies to provide timely flow of information and communicate project issues, including resolution and potential impacts to cost and schedule. DRG investigated the potential coordination of other Public Water Suppliers (PWS) within the region with the City of Belton to formulate a regional water authority or coalition. Current and future water supply needs as well as other pertinent information of those interested PWS that agreed to work collectively with the City of Belton was collected.

DRG reviewed the feasibility of the following alternative sources that might be able to meet the City and coalition members' water supply demands:

- *New connection to Water District No. 1 of Johnson County (WaterOne)*. DRG assisted the coalition in developing strategies and in conducting discussions with WaterOne concerning future water needs.
- *Additional water from KCMO.* DRG assisted the PWS in developing strategies and in conducting discussions with the City of Kansas City, Missouri Water Services Department concerning future water needs.
- *New connection to the Tri-County Water Authority (TCWA)*. DRG assisted the coalition in developing strategies and in conducting discussions with TCWA concerning future water needs.
- *Water Reservoirs*. DRG determined the size of reservoir that would be required to provide the necessary water throughout the 20-year planning period as well as potential locations

within Cass County for this water supply reservoir. The possibility of utilizing water from the Truman Reservoir was also evaluated.

- *Water Supply Wells.* DRG reviewed geotechnical information that was available through the Missouri Department of Natural Resources to determine the number and location of wells that would be necessary to provide the necessary water throughout the 20-year planning period.
- *Water Reclamation System.* DRG reviewed the water demand generated by public parks and golf courses within the PWS service area. Using this information DRG analyzed the feasibility of utilizing reclaimed wastewater to meet the needs of these public facilities.

Upon conclusion of the alternatives evaluation, a detailed comparison of the most feasible solutions was undertaken to ensure average daily and peak day flows for the City of Belton would be met cost-effectively. The total accumulated costs for the following options were further analyzed under various flow scenarios and for two different projected growth rates:

- **City of Kansas City, Missouri as a Sole Source**
- **WaterOne and Kansas City, Missouri as Dual Sources**
- **Tri-County Water Authority and Kansas City, Missouri as Dual Sources**

It was determined that the most cost-effective and reliable solution for Belton was to purchase water from two water suppliers (dual sources). The City is to continue purchasing water from KCMO and to construct a new connection to WaterOne that would allow the City to begin purchasing water from WaterOne.

Conclusions

Based on the evaluations of the various alternatives which could feasibly supply water to the City of Belton for the next 20 years, the following recommendations are presented for consideration by the City.

1. The City should purchase water from two water suppliers within the region. Entering into a water purchase agreement with Water District No. 1 of Johnson County, Kansas (WaterOne) and negotiating a new agreement with KCMO will allow the City to access water from two separate sources, thus providing a higher level of assurance, protection, consistency, and operational flexibility in supplying water to its customers.
2. Negotiate a water purchase agreement with WaterOne which allows the City to purchase up to 5.0 MGD of capacity. The agreement term could be up to 20 years in length.
3. Renegotiate a new water purchase agreement this year with KCMO to purchase a maximum amount of 4.0 MGD for a five (5) year term. Before the expiration date of this agreement, renegotiate a new agreement in which the maximum amount of water to be available for purchase is only 2.0 MGD. The term on this agreement could be 10-15 years in length, depending upon growth patterns in Year 2016 and WaterOne's purchase agreement.
4. Due to the uncertainty of the rate of development and growth within the city limits over the planning period, it is recommended that a stair-step approach or strategy be implemented.

This will allow the City to purchase water only when needed or as growth dictates within the next 20 years. Therefore, the water purchase agreement with WaterOne should contain a re-opener clause or provisions which will allow for both parties to amend the terms and amount of water to be purchased. The re-opener would be based on key indicators or "trigger" points that may occur during the term of the agreement. Such trigger points could be the City's rate of development, economic indicators, or other regional water or internal actions that may impact the City's water demands. Figures ES-1 and ES-2 show the recommended approach for two separate growth patterns (1% and 2% rate).

5. The City should develop a plan to reduce water demand during peak usage periods and to encourage water conservation measures by the public and the City.
6. Conduct a water rate study to determine the impact the capital improvements for the recommended alternative will have on customer water rates over the 20 year planning period.
7. Update the 2005 Water Master Plan, including a recommended capital improvements plan (CIP). Research opportunities for funding of these improvements, including the opportunity to apply for financing through the MDNR's State Revolving Fund low-interest loan program.

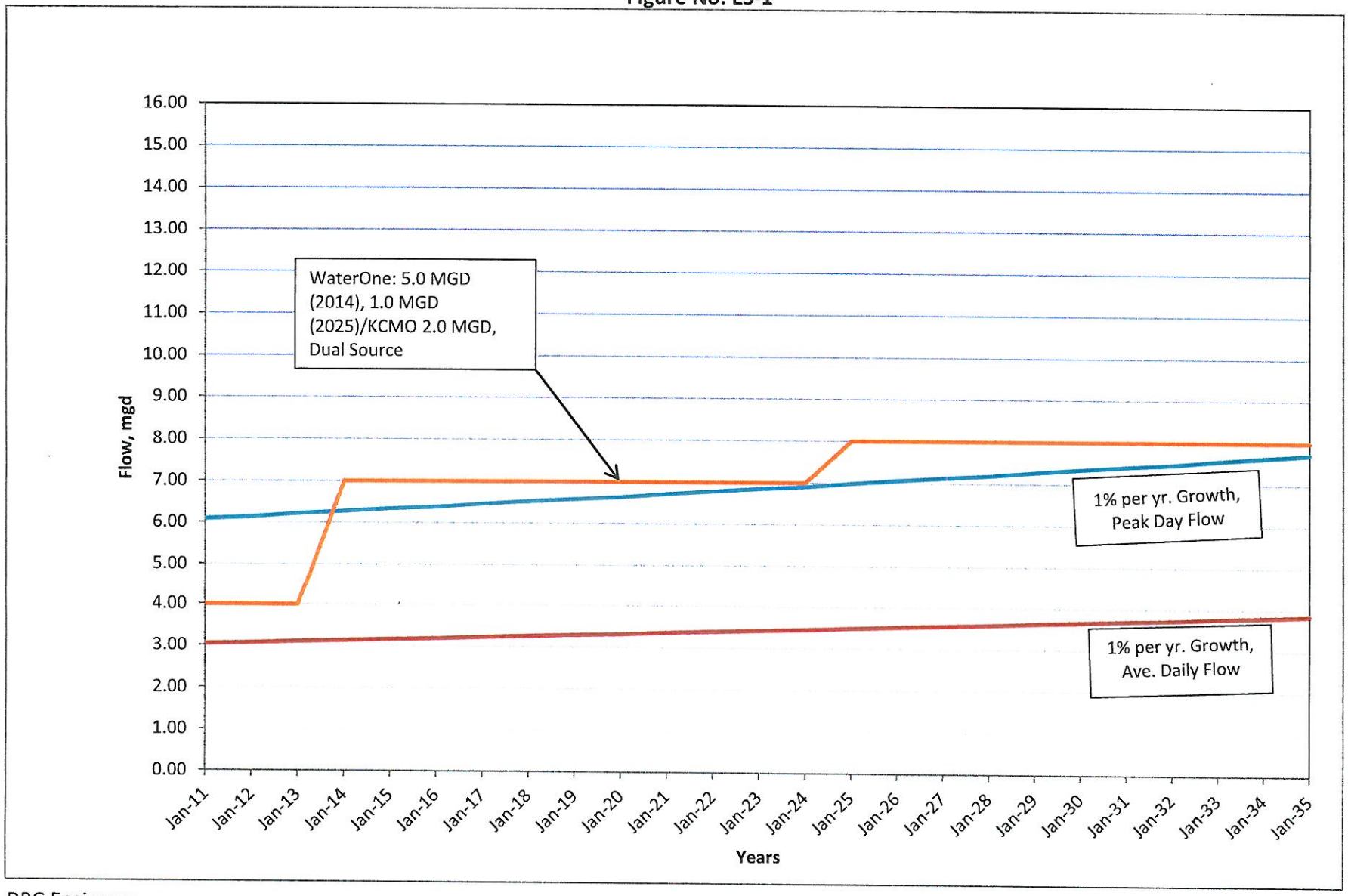
Water Purchase Alternative No. B-2c

1% *Growth*

WaterOne @ 5.0 MGD/KCMO @ 2.0 MGD

Stair Step Approach

Figure No. ES-1



DRG Engineers

08/16/11

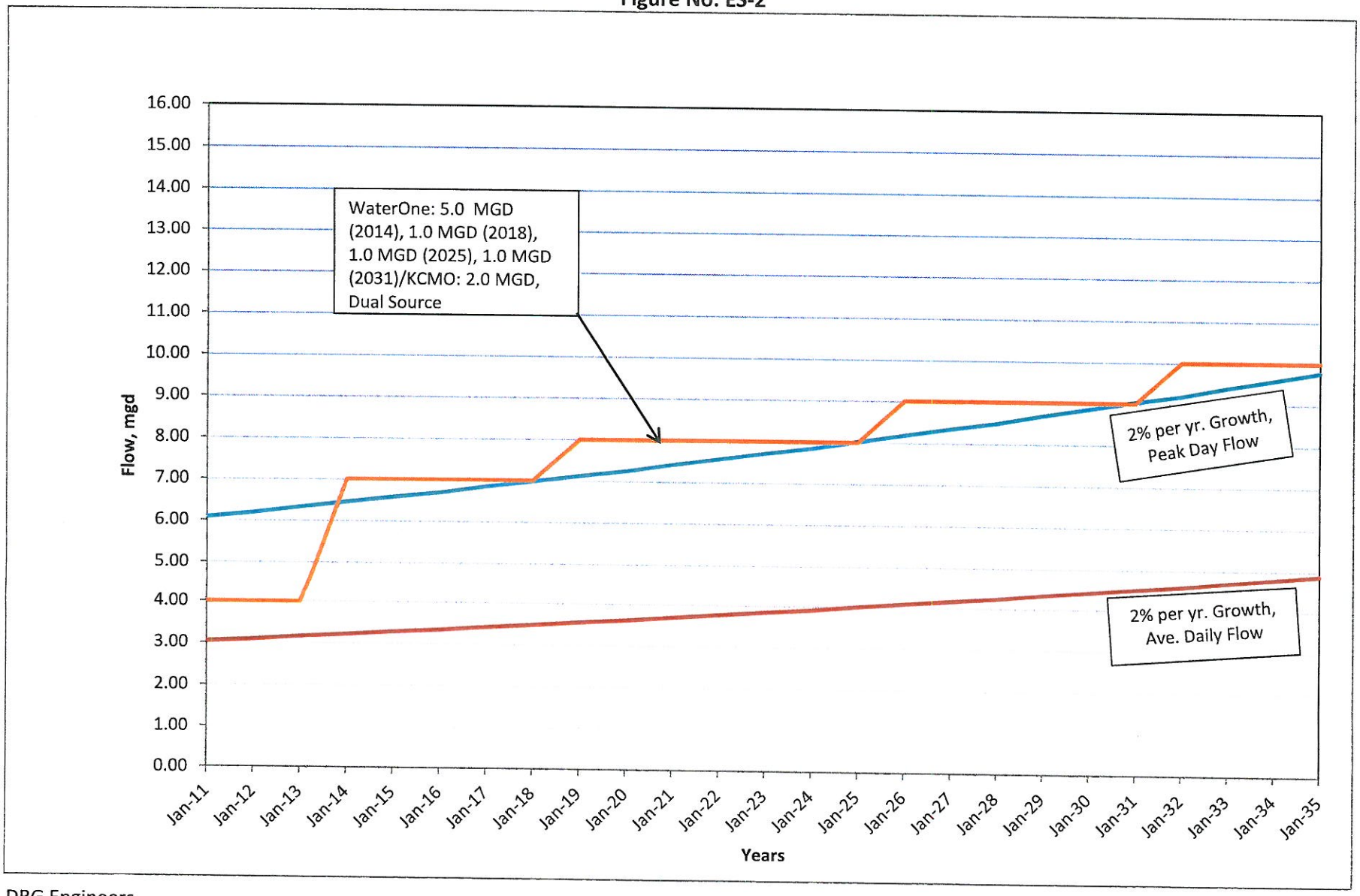
Water Purchase Alternative No. B-2c

2% Growth

WaterOne @ 5.0 MGD/KCMO @ 2.0 MGD

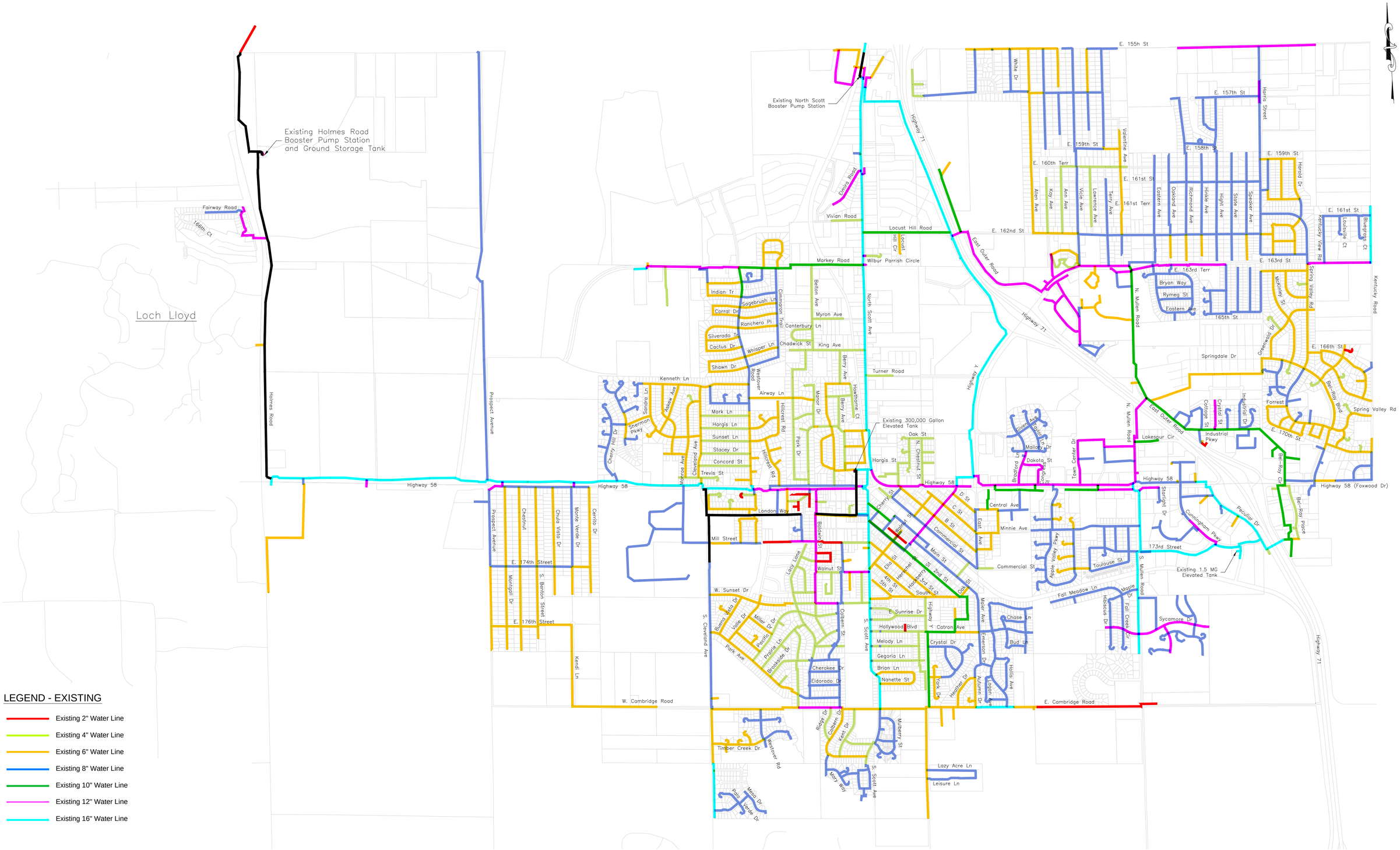
Stair Step Approach

Figure No. ES-2



DRG Engineers

08/16/11



LEGEND - EXISTING

- Existing 2" Water Line
- Existing 4" Water Line
- Existing 6" Water Line
- Existing 8" Water Line
- Existing 10" Water Line
- Existing 12" Water Line
- Existing 16" Water Line

1000 0 1000 2000
SCALE IN FEET

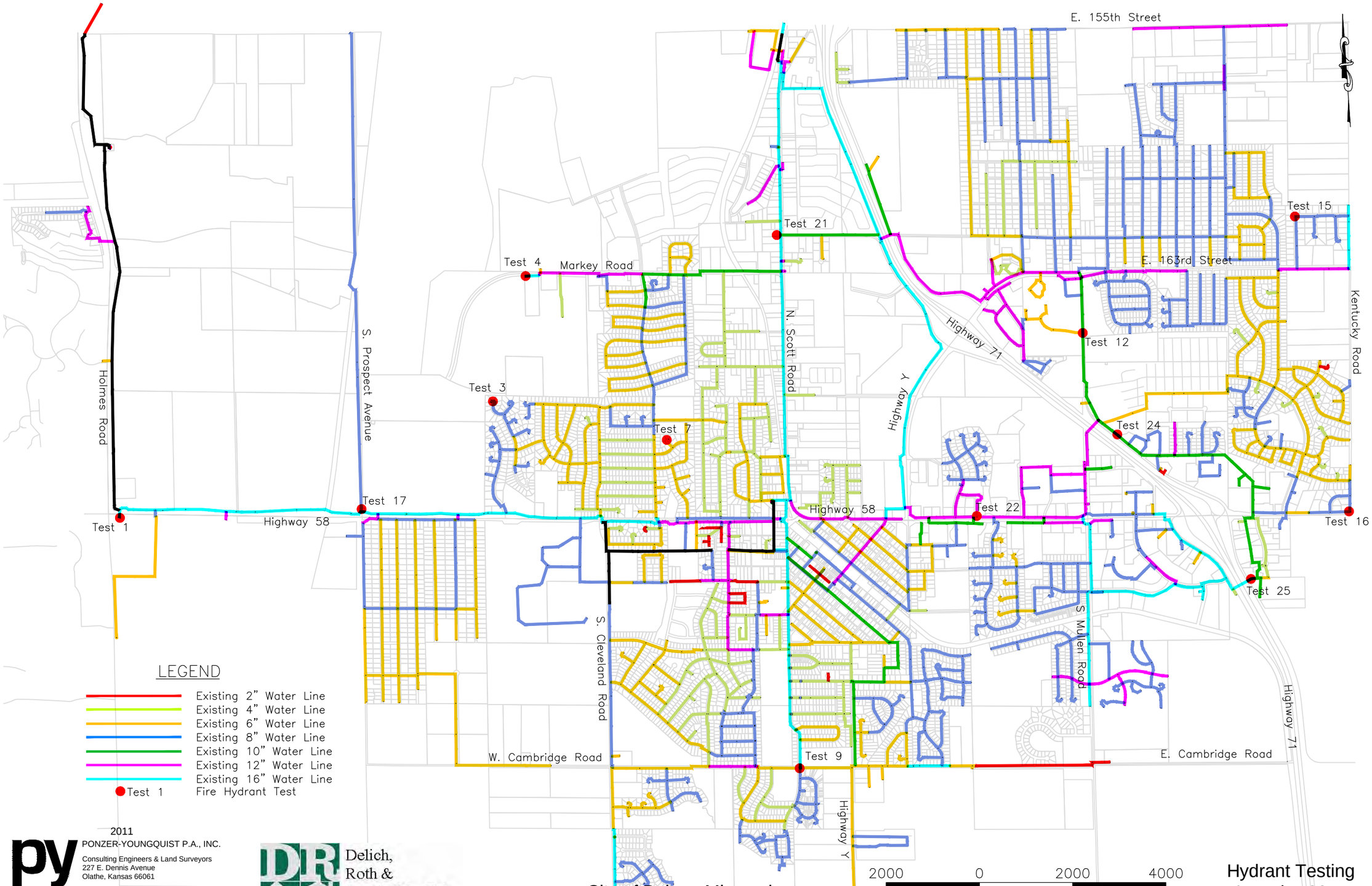
2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061

Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

City of Belton, Missouri
2011 Water System Master Plan

Water Distribution System Map
Figure 4-2

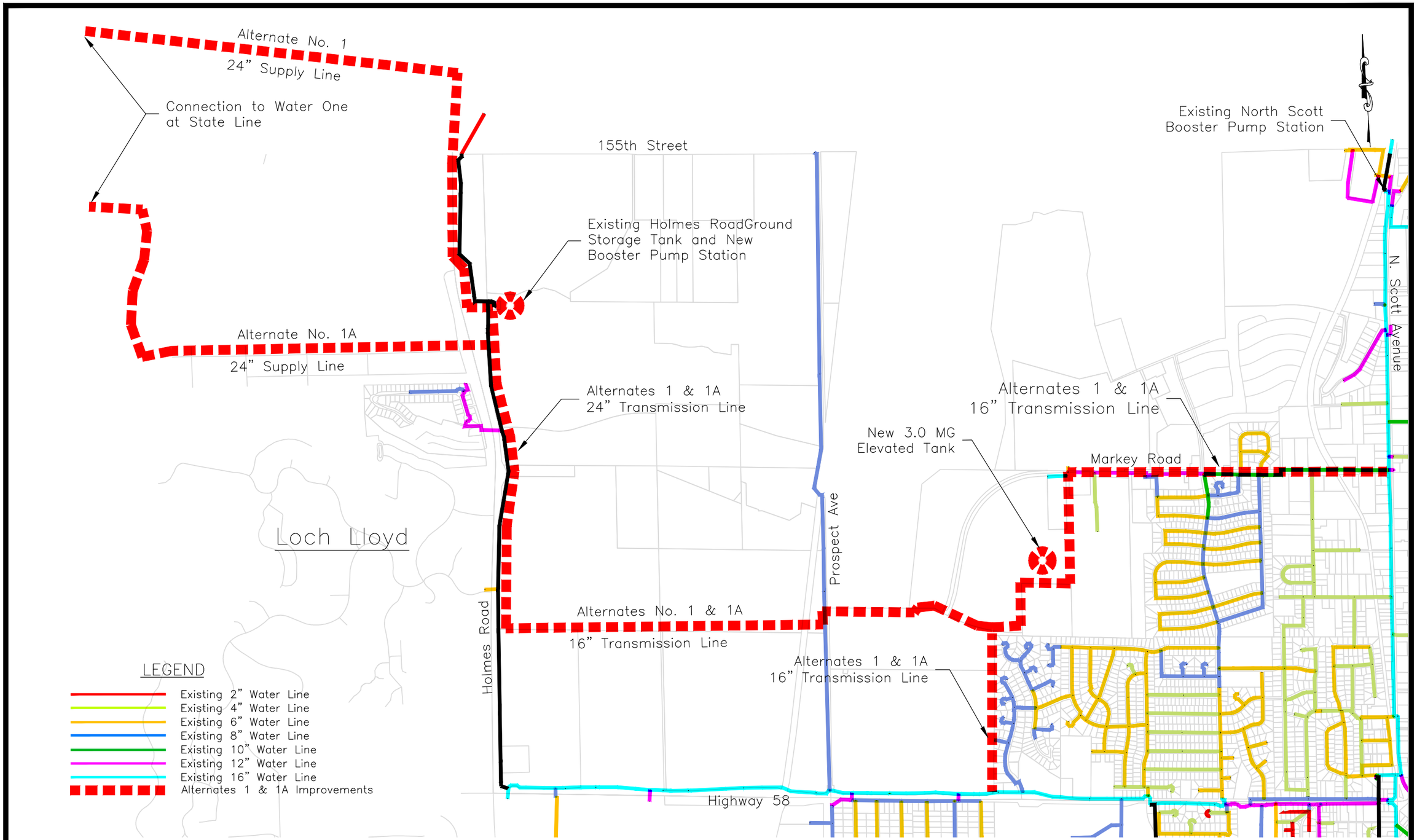


2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061
Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

City of Belton, Missouri
2011 Water System Master Plan

Hydrant Testing
Location Map
Figure 4-3



2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061

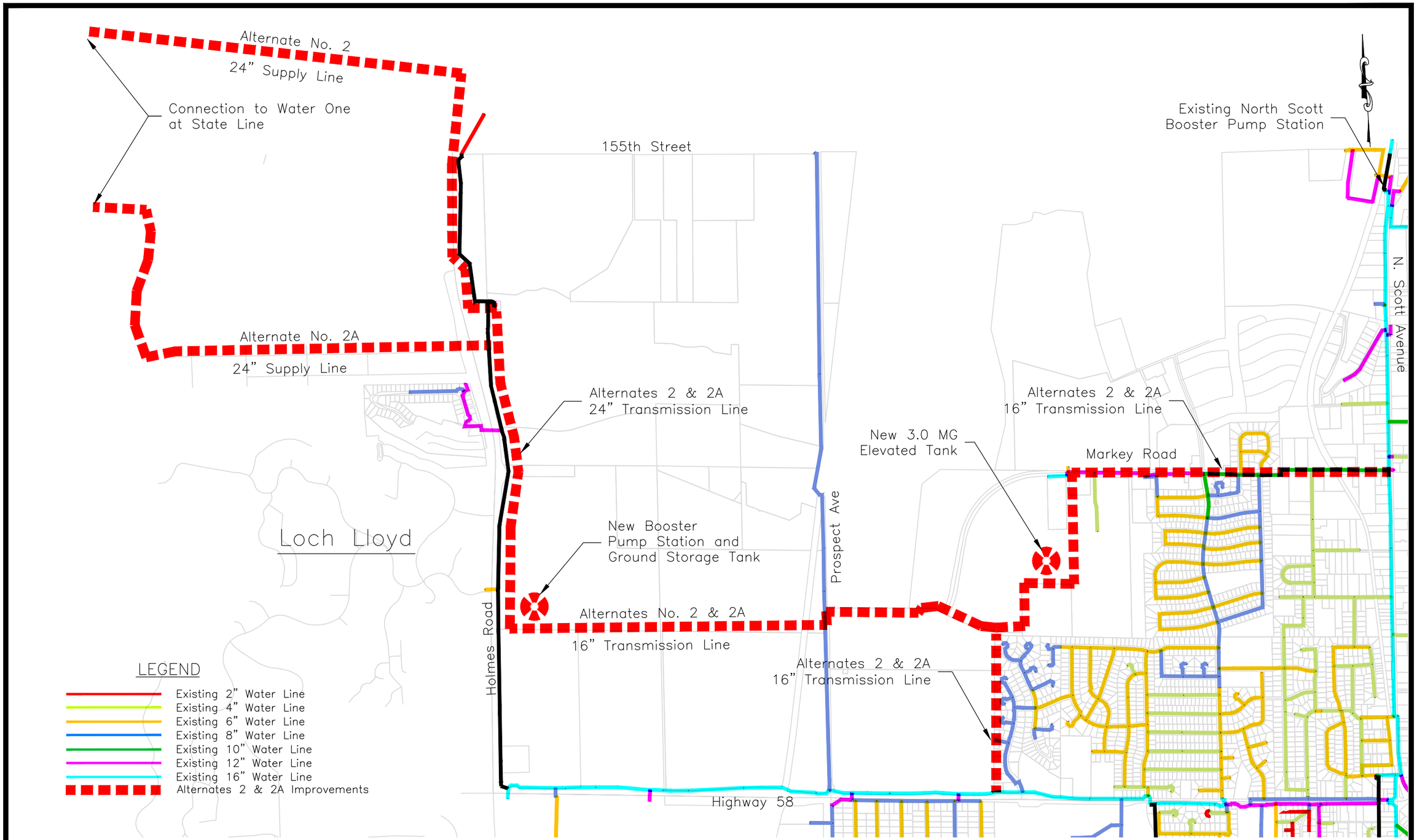
Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

City of Belton, Missouri
2011 Water System Master Plan

1500 0 1500 3000
SCALE IN FEET

Alternates 1 & 1A
Figure 5-1



2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061

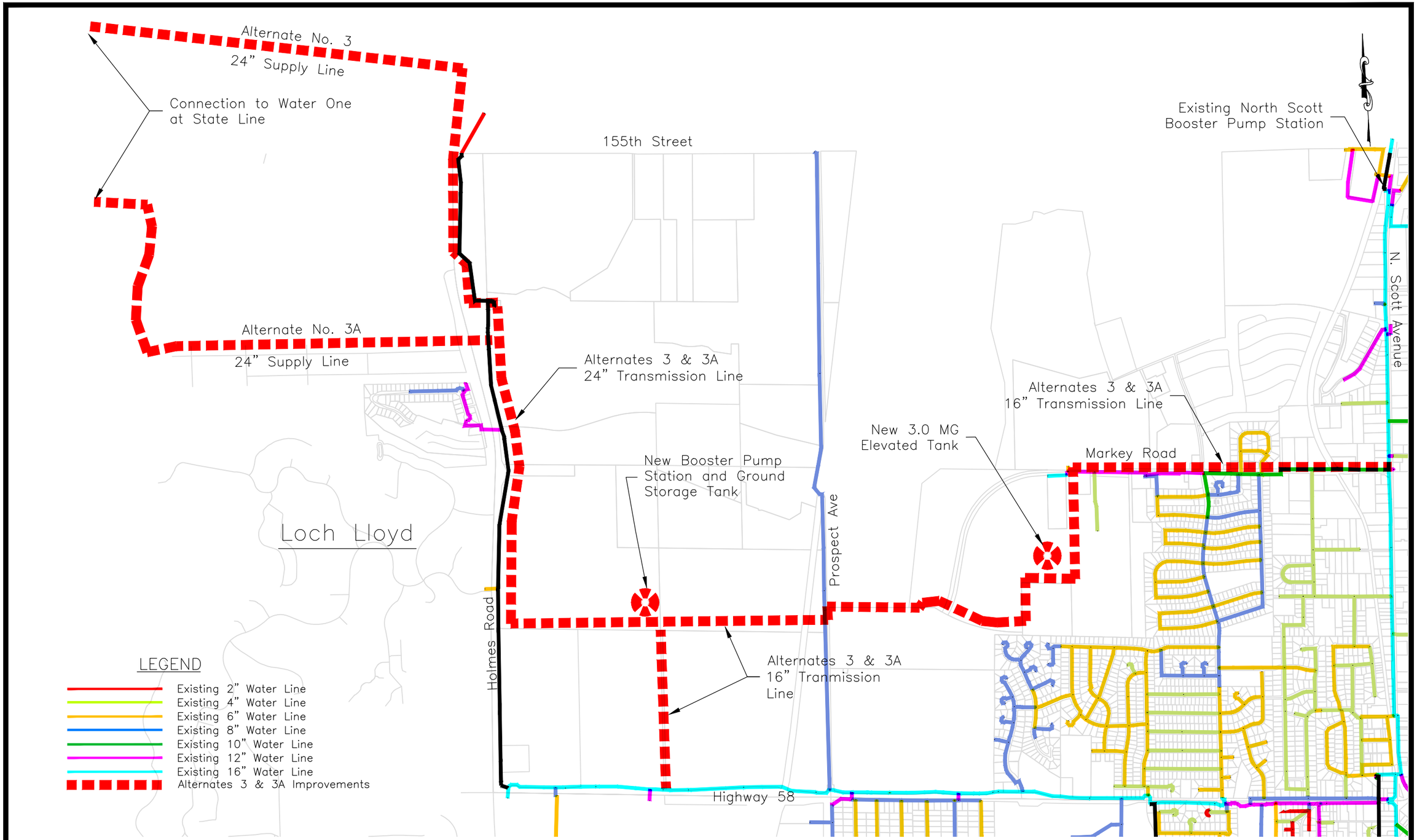
Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

City of Belton, Missouri
2011 Water System Master Plan

1500 0 1500 3000
SCALE IN FEET

Alternates 2 & 2A
Figure 5-2



2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061

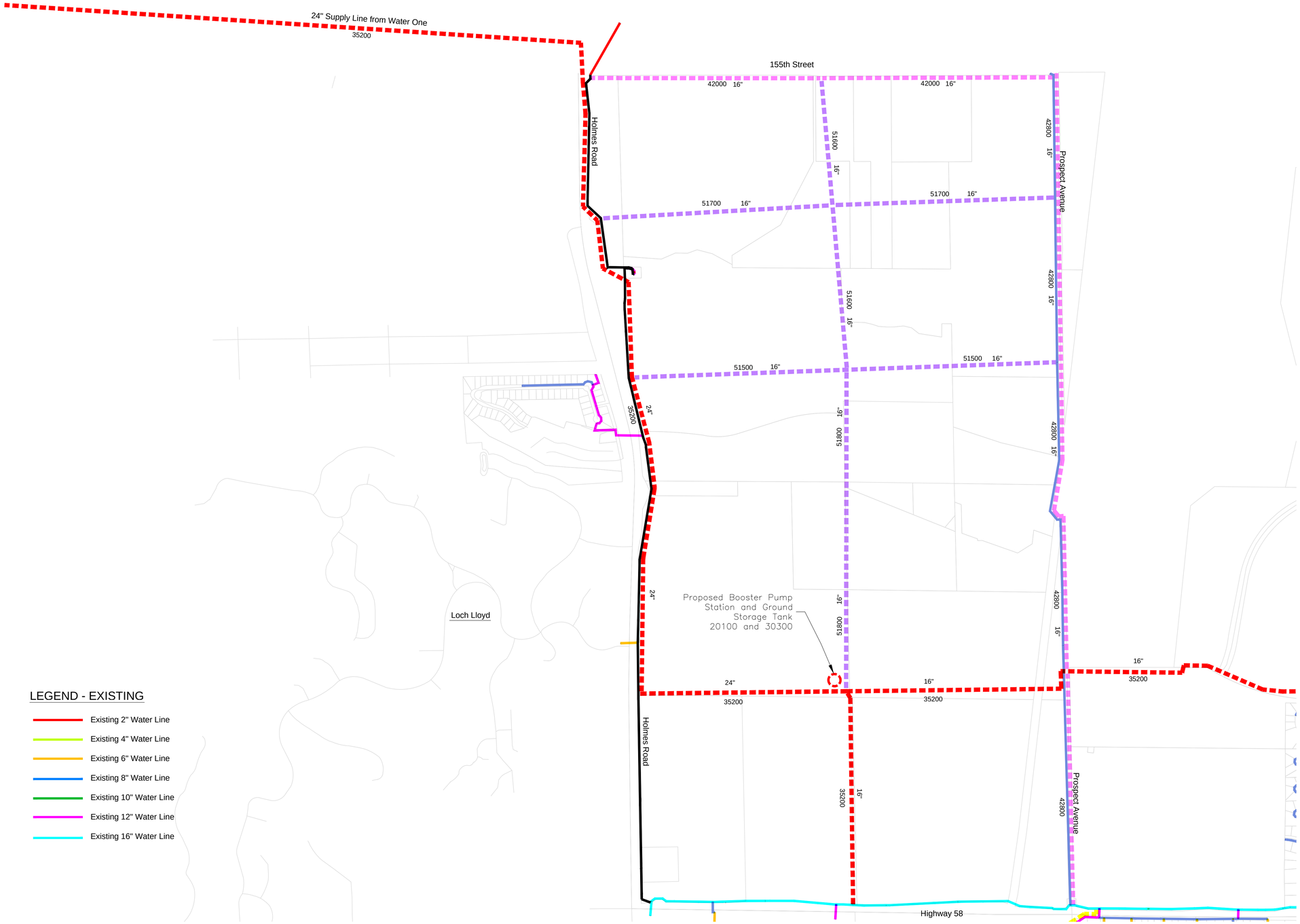
Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

City of Belton, Missouri
2011 Water System Master Plan

1500 0 1500 3000
SCALE IN FEET

Alternates 3 & 3A
Figure 5-3



LEGEND - PROPOSED

- 2013 Proposed Improvements
- 2014 Proposed Improveemets
- 2015 Proposed Improvements
- 2016-2020 Proposed Improvements
- 2021-2025 Proposed Improvements
- 2026-2030 Proposed Improvements
- 2031-2035 Proposed Improvements

LEGEND - EXISTING

- Existing 2" Water Line
- Existing 4" Water Line
- Existing 6" Water Line
- Existing 8" Water Line
- Existing 10" Water Line
- Existing 12" Water Line
- Existing 16" Water Line

2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061

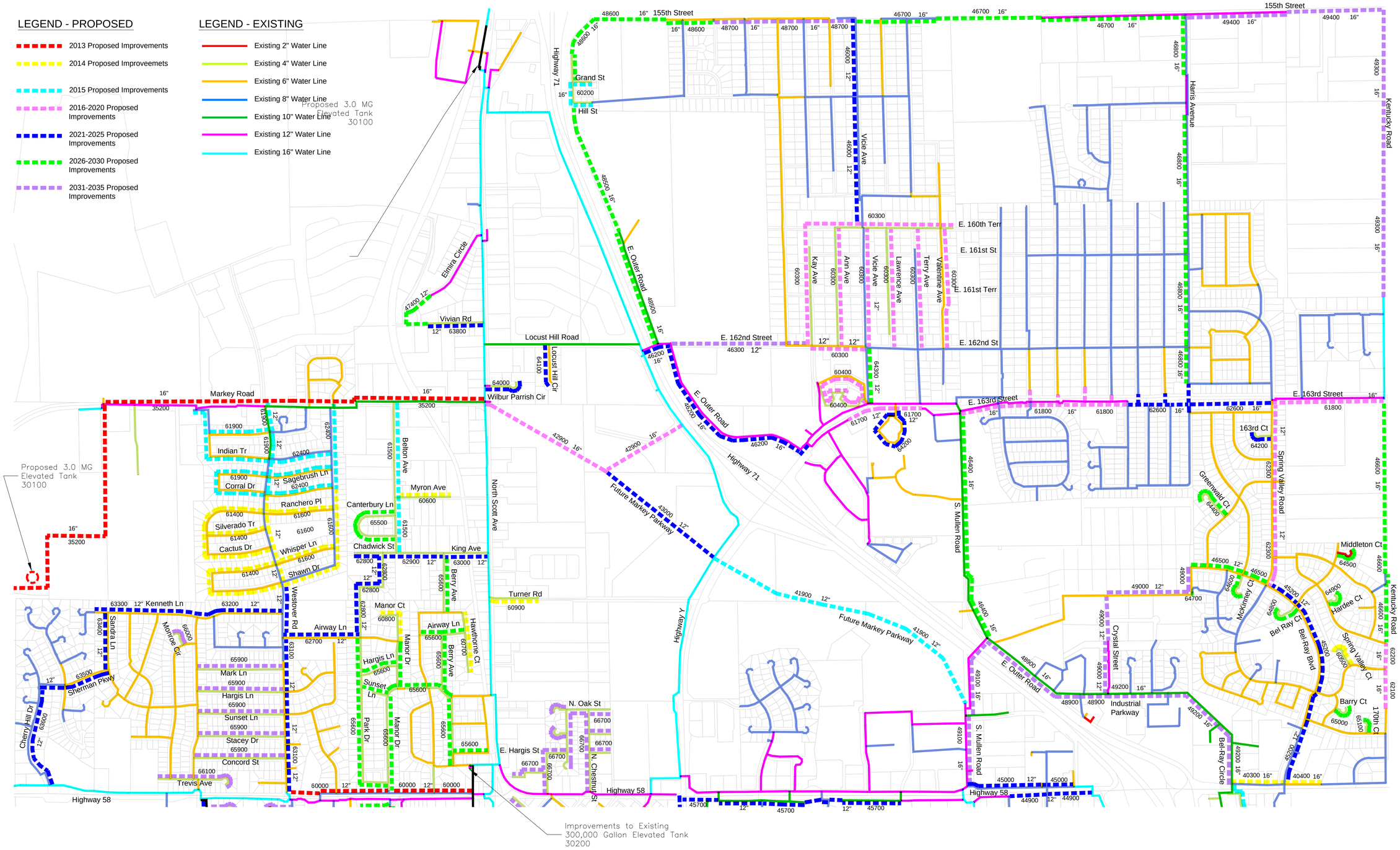
Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

600 0 600 1200
SCALE IN FEET

City of Belton, Missouri
2011 Water System Master Plan

CIP Projects Map
Figure 6-1A

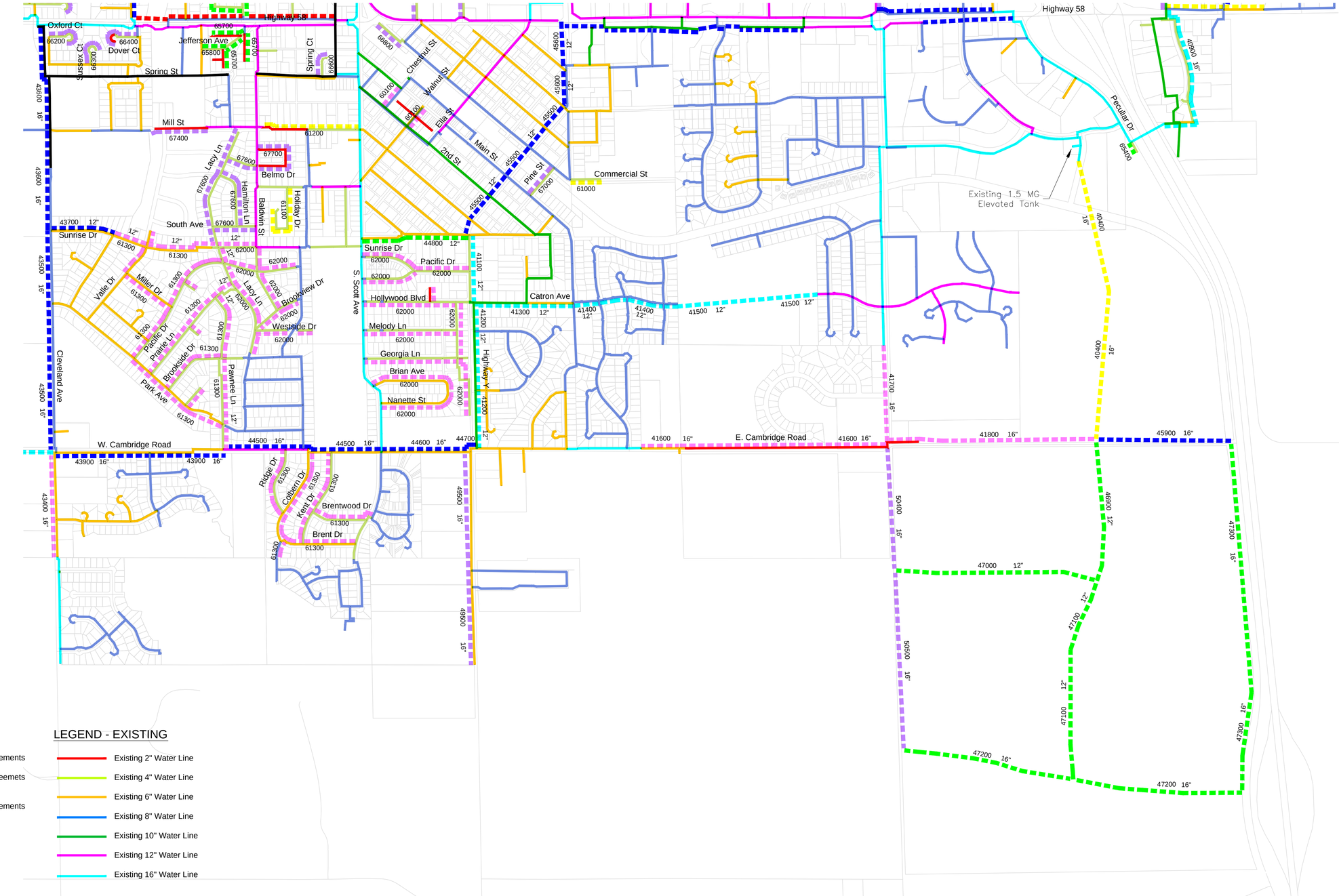


2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061
Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

City of Belton, Missouri
2011 Water System Master Plan

CIP Projects Map
Figure 6-1B



LEGEND - PROPOSED

- 2013 Proposed Improvements
- 2014 Proposed Improveemets
- 2015 Proposed Improvements
- 2016-2020 Proposed Improvements
- 2021-2025 Proposed Improvements
- 2026-2030 Proposed Improvements
- 2031-2035 Proposed Improvements

LEGEND - EXISTING

- Existing 2" Water Line
- Existing 4" Water Line
- Existing 6" Water Line
- Existing 8" Water Line
- Existing 10" Water Line
- Existing 12" Water Line
- Existing 16" Water Line

2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061

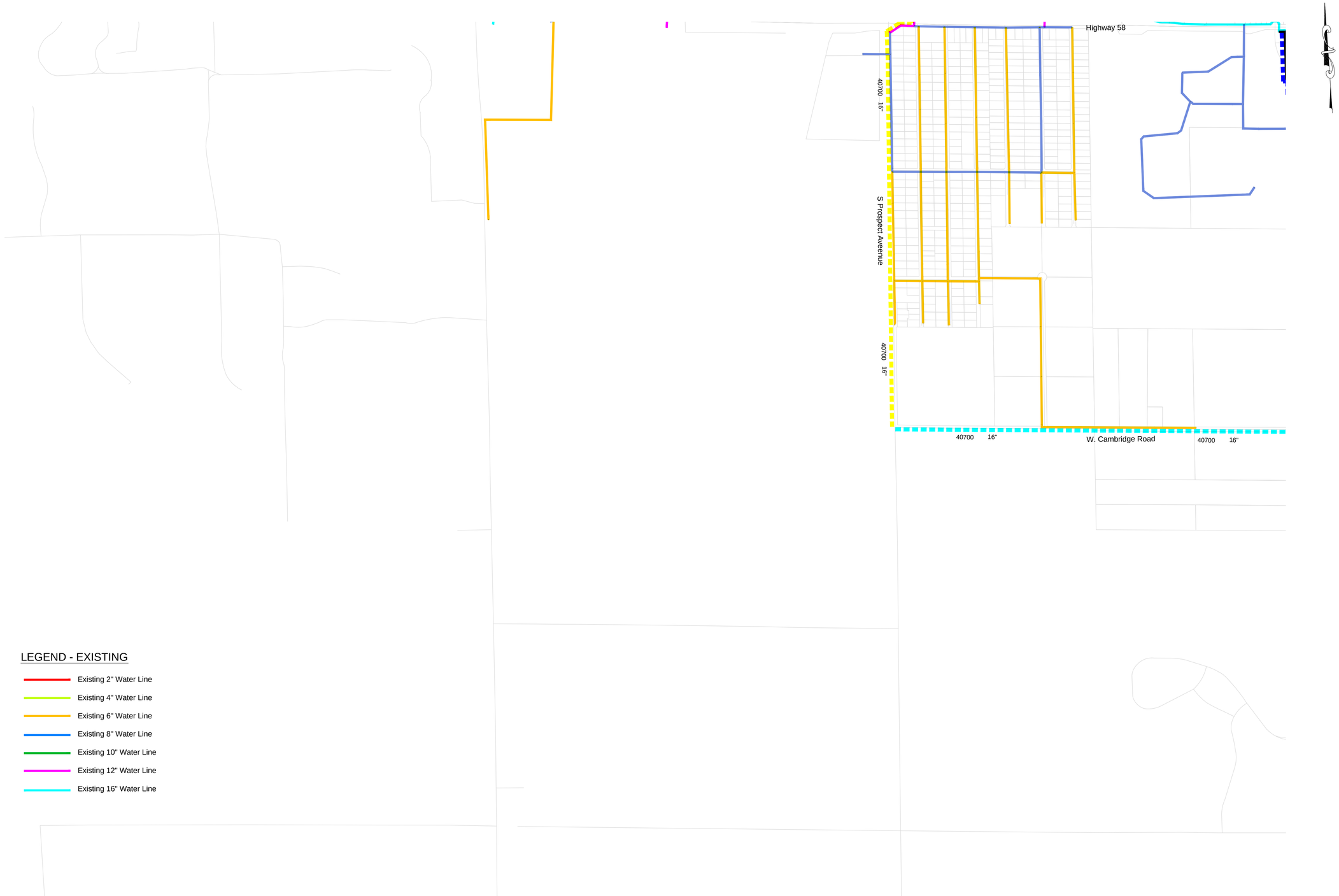
Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

600 0 600 1200
SCALE IN FEET

City of Belton, Missouri
2011 Water System Master Plan

CIP Projects Map
Figure 6-1C



LEGEND - PROPOSED

- 2013 Proposed Improvements
- 2014 Proposed Improveemets
- 2015 Proposed Improvements
- 2016-2020 Proposed Improvements
- 2021-2025 Proposed Improvements
- 2026-2030 Proposed Improvements
- 2031-2035 Proposed Improvements

LEGEND - EXISTING

- Existing 2" Water Line
- Existing 4" Water Line
- Existing 6" Water Line
- Existing 8" Water Line
- Existing 10" Water Line
- Existing 12" Water Line
- Existing 16" Water Line

2011
PONZER-YOUNGQUIST P.A., INC.
Consulting Engineers & Land Surveyors
227 E. Dennis Avenue
Olathe, Kansas 66061

Phone: (913)-782-0541
Fax: (913)-782-0109
Email: py@pyengineers.com

Delich, Roth & Goodwillie, P.A.
Engineers

600 0 600 1200
SCALE IN FEET

City of Belton, Missouri
2011 Water System Master Plan

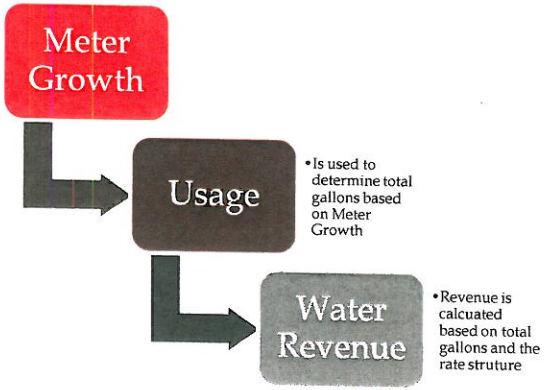
CIP Projects Map
Figure 6-1D

City of Belton, Missouri

Customer Analysis

Total Number of Customers - Base	7,805
Allocation of Customers Using Winter Avera	0.00%
Number of Customer Using Volumetric Meth	7,805

Projected Meters	Total	Winter	Volume
Year 1	7,815	0	7,815
Year 2	7,865	0	7,865
Year 3	7,916	0	7,916
Year 4	7,967	0	7,967
Year 5	8,019	0	8,019
Year 6	8,071		8,071
Year 7	8,123		8,123
Year 8	8,175		8,175
Year 9	8,227		8,227
Year 10	8,279		8,279



% Growth

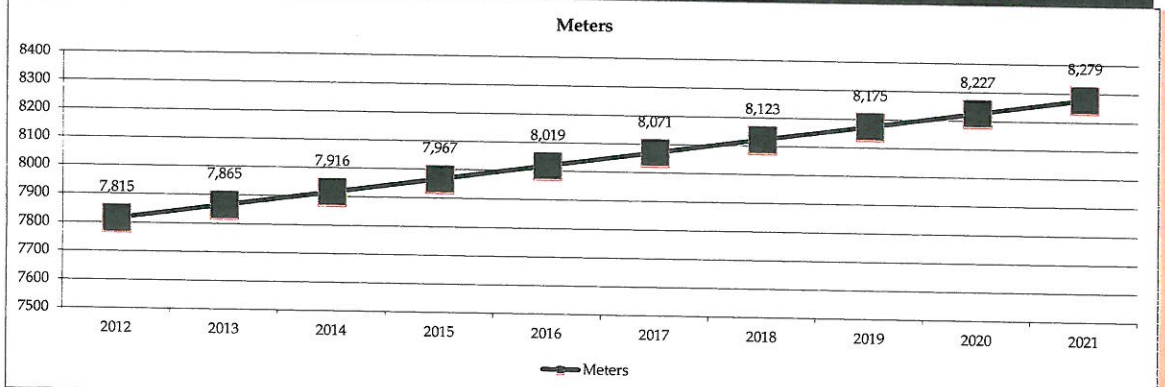
Customer Growth	Year 1	0.13%	☐ % Growth
Customer Growth	Year 2	0.64%	☐ % Growth
Customer Growth	Year 3	0.65%	☐ % Growth
Customer Growth	Year 4	0.64%	☐ % Growth
Customer Growth	Year 5	0.65%	☐ % Growth
Customer Growth	Year 6	0.65%	☐ % Growth
Customer Growth	Year 7	0.65%	☐ % Growth
Customer Growth	Year 8	0.65%	☐ % Growth
Customer Growth	Year 9	0.65%	☐ % Growth
Customer Growth	Year 10	0.65%	☐ % Growth

Manual Growth

Customer Growth	Year 1	10
Customer Growth	Year 2	50
Customer Growth	Year 3	51
Customer Growth	Year 4	51
Customer Growth	Year 5	52
Customer Growth	Year 6	52
Customer Growth	Year 7	52
Customer Growth	Year 8	52
Customer Growth	Year 9	52
Customer Growth	Year 10	52

Projected Meter Growth

Years	Water	Sewer	%	
2011	7,805	7,693	98.57%	
2012	7,815	7,703	10	0.13%
2013	7,865	7,752	49	0.64%
2014	7,916	7,802	50	0.65%
2015	7,967	7,853	50	0.64%
2016	8,019	7,904	51	0.65%
2017	8,071	7,955	51	
2018	8,123	8,006	51	
2019	8,175	8,058	51	
2020	8,227	8,109	51	
2021	8,279	8,160	51	
CAGR	0.59%	0.59%		



As noted above, in order to determine the water revenue, the first step is to project meter growth. Meter growth was determined based on the population growth and the relationship to prior population to the number of meters which was 3.06. Next, once the meter growth is determined, the average monthly usage will be calculated which will determine the annual usage. Last, the water revenue will be calculated based on the projected gallons sold and the rate structure.

City of Belton, Missouri

Customers by Usage Groups

Expected Customers				7,815	7,865	7,916	7,967	8,019	8,071	8,123	8,175	8,227	8,279
From	To	Customers	%	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
0	1,500	966	12%	966	972	978	985	991	998	1,004	1,010	1,017	1,023
1,501	2,000	578	7%	578	582	585	589	593	597	601	605	608	612
2,001	2,500	647	8%	647	651	655	660	664	668	672	677	681	685
2,501	3,000	693	9%	693	697	702	706	711	716	720	725	730	734
3,001	3,500	744	10%	744	749	754	758	763	768	773	778	783	788
3,501	4,000	630	8%	630	634	638	642	646	651	655	659	663	667
4,001	4,500	603	8%	603	607	611	615	619	623	627	631	635	639
4,501	5,000	484	6%	484	487	490	493	497	500	503	506	510	513
5,001	5,500	411	5%	411	414	416	419	422	424	427	430	433	435
5,501	6,000	306	4%	306	308	310	312	314	316	318	320	322	324
6,001	6,500	271	3%	271	273	275	276	278	280	282	283	285	287
6,501		1,482	19%	1,482	1,491	1,501	1,511	1,521	1,531	1,540	1,550	1,560	1,570
		7,815		7,815	7,865	7,916	7,967	8,019	8,071	8,123	8,175	8,227	8,279

City of Belton, Missouri

Usage Analysis

Average Usage
- ○ Use Historical Average
- ◉ Use Static

Rates
Minimum 12.73
Rate Per 1,000 8.49
Includes 1,500

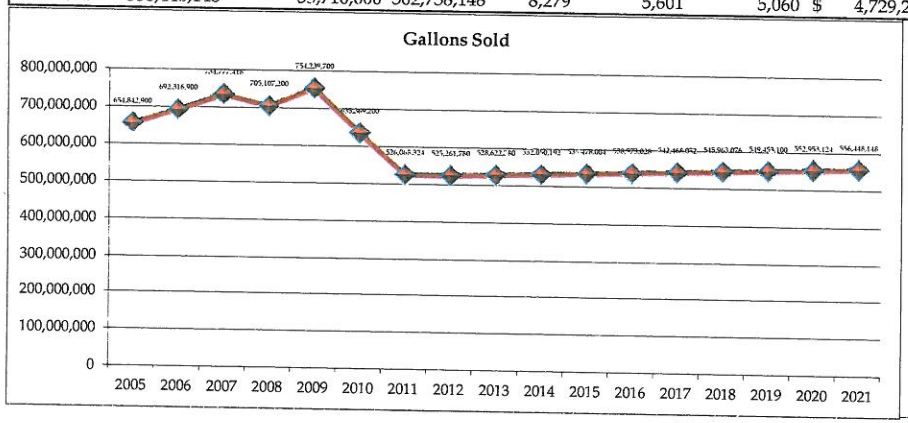
Wholesale Usage
- ○ Use Historical Average
- ◉ Use Static

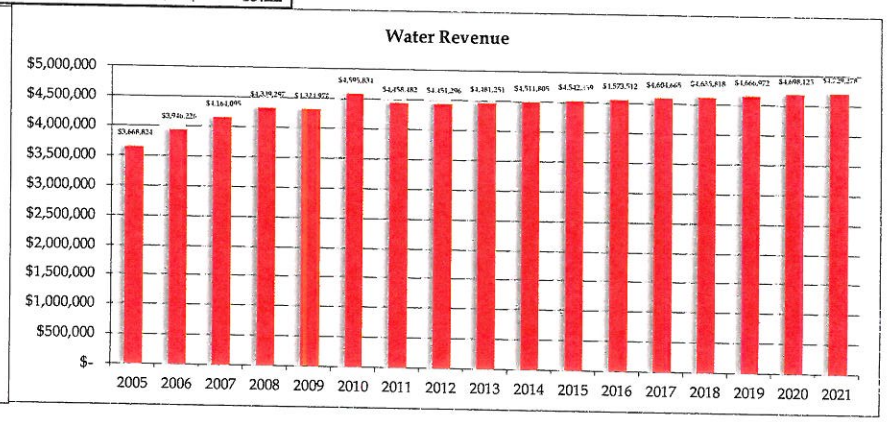
Wholesale Rates
Rate Per 1,000 4.40

Other Revenue 5.00%

Year	Gallons Sold	Wholesale Water	City Only	Meters	Avg Usage	City Only2	Revenue	Avg Bill	City Only3
2005	654,842,900	62,174,000	592,668,900	7,711	7,077	6,405	$ 3,668,824	$ 43.20	$ 36.69
2006	692,316,900	69,981,900	622,335,000	7,862	7,338	6,596	$ 3,946,226	$ 44.81	$ 38.56
2007	734,777,418	70,709,900	664,067,518	7,978	7,675	6,936	$ 4,164,095	$ 45.21	$ 40.25
2008	705,107,200	56,415,700	648,691,500	7,978	7,365	6,776	$ 4,339,297	$ 49.10	$ 42.73
2009	754,239,700	53,275,500	700,964,200	8,064	7,794	7,244	$ 4,324,978	$ 46.24	$ 42.27
2010	635,369,200	62,693,600	572,675,600	7,625	6,944	6,259	$ 4,595,834	$ 55.15	$ 47.21
2011	526,068,324	53,710,900	472,357,424	7,827	5,601	5,029	$ 4,458,482	$ 66.33	$ 44.95
2012	525,261,780	53,710,000	471,551,780	7,815	5,601	5,028	$ 4,451,296	$ 66.23	$ 44.95
2013	528,622,380	53,710,000	474,912,380	7,865	5,601	5,032	$ 4,481,251	$ 66.67	$ 44.98
2014	532,050,192	53,710,000	478,340,192	7,916	5,601	5,036	$ 4,511,805	$ 67.13	$ 45.01
2015	535,478,004	53,710,000	481,768,004	7,967	5,601	5,039	$ 4,542,359	$ 67.58	$ 45.04
2016	538,973,028	53,710,000	485,263,028	8,019	5,601	5,043	$ 4,573,512	$ 68.05	$ 45.07
2017	542,468,052	53,710,000	488,758,052	8,071	5,601	5,046	$ 4,604,665	$ 68.51	$ 45.10
2018	545,963,076	53,710,000	492,253,076	8,123	5,601	5,050	$ 4,635,818	$ 68.97	$ 45.13
2019	549,458,100	53,710,000	495,748,100	8,175	5,601	5,053	$ 4,666,972	$ 69.44	$ 45.16
2020	552,953,124	53,710,000	499,243,124	8,227	5,601	5,057	$ 4,698,125	$ 69.90	$ 45.19
2021	556,448,148	53,710,000	502,738,148	8,279	5,601	5,060	$ 4,729,278	$ 70.36	$ 45.22

To determine water revenue, the gallons sold were computed based on the average usage and the number of meters. The revenue was calculated based on the rates noted above. In addition, the revenue in the water fund includes other items, late charges, impact fees, etc. The % was 7% in 2011, as a result, this % was used to include additional revenue sources.





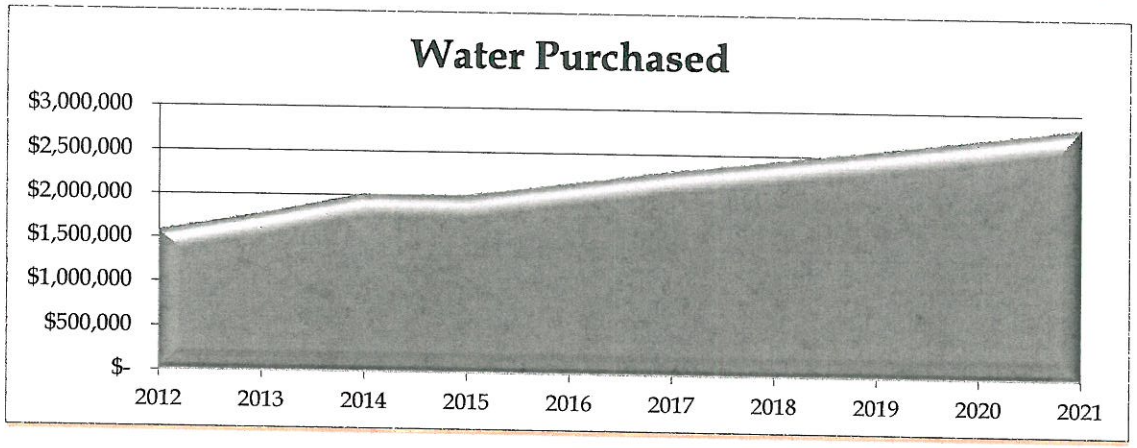
City of Belton, Missouri

Water Purchases

Gallons Sold	Result
Average Month Usage	6,620
Wholesale Usage	53710

In 000's

Water Purchased	Column2	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Water Loss %	10.00%	583,624,200	587,358,200	591,166,880	594,975,560	598,858,920	602,742,280	606,625,640	610,509,000	614,392,360	618,275,720
KCMO Rate		2.70	3.02	3.39	3.65	3.95	4.27	4.48	4.70	4.94	5.19
KCMO Water Purchases		$1,575,785	$1,773,822	$2,004,056	$1,085,830	$1,182,746	$1,286,855	$1,358,841	$1,434,696	$1,517,549	$1,604,425
Water 1 Rate		0.00	0.00	2.93	3.08	3.23	3.38	3.53	3.68	3.83	3.98
Water 1 Water Purchases		$ -	$ -	$ -	$ 916,262	$ 967,157	$1,018,634	$1,070,694	$1,123,337	$1,176,561	$1,230,369
Total Water Costs		$1,575,785	$1,773,822	$2,004,056	$2,002,093	$2,149,904	$2,305,489	$2,429,536	$2,558,033	$2,694,110	$2,834,794
Allocation											
KCMO		100.00%	100.00%	100.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%



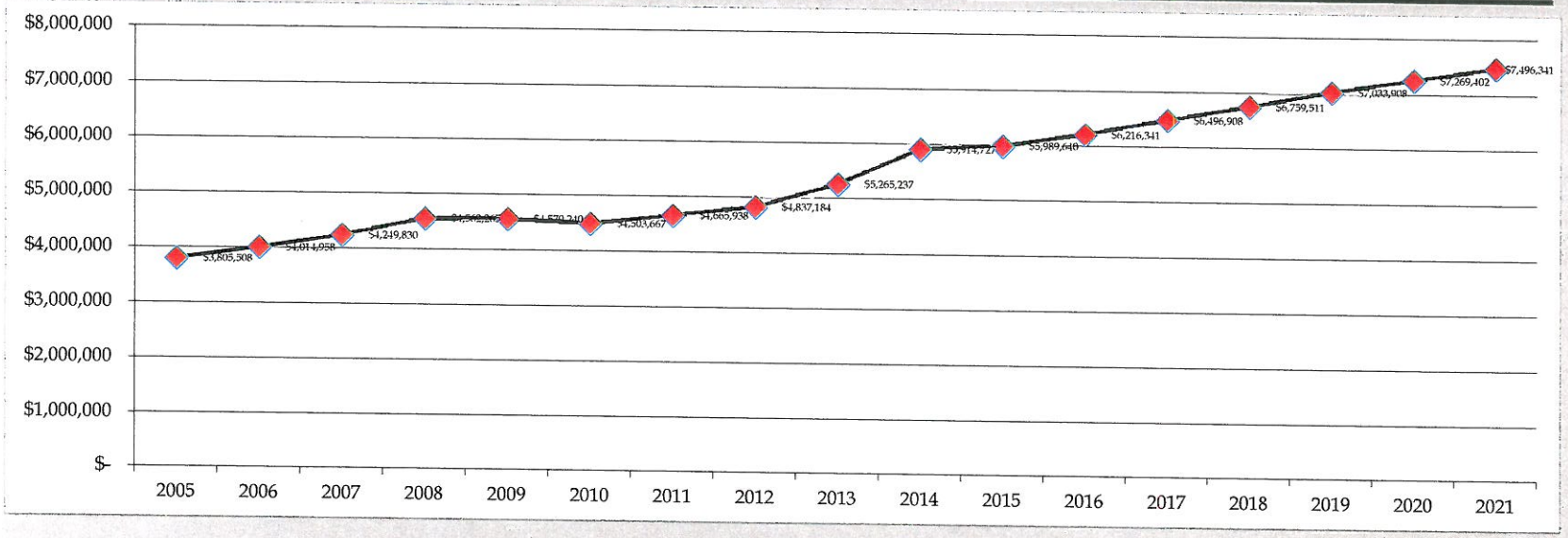
City of Belton, Missouri

Expense Analysis

Operating Expenses	2004	2005	2006	2007	2008	2009	2010	2011	CAGR
Trends		$3,805,508	$4,014,958	$4,249,830	$4,562,265	$ 4,570,240	$4,503,667	$4,665,938	3%
% Change			5.50%	5.85%	7.35%	0.17%	-1.46%	3.60%	
Personnel services		$ 466,720	$ 536,901	$ 603,451	$ 595,701	$ 644,660	$ 656,873	$ 584,379	3%
Contractual services		$ 311,121	$ 149,428	$ 29,802	$ 36,568	$ 33,596	$ 94,783	$ 59,850	-21%
Materials and supplies		$ 11,113	$ 10,260	$ 34,473	$ 104,034	$ 87,195	$ 139,915	$ 156,149	46%
Maintenance and repairs		$ 206,466	$ 239,324	$ 212,897	$ 241,804	$ 199,246	$ 117,092	$ 148,344	-5%
Fuel and lubricants		$ 14,294	$ 19,442	$ 22,599	$ 25,614	$ 22,371	$ 18,691	$ 20,781	5%
Utilities		$ 48,044	$ 50,979	$ 57,572	$ 57,426	$ 65,139	$ 60,548	$ 62,303	4%
Water supply		$1,117,977	$1,300,464	$1,426,660	$1,552,262	$ 1,431,803	$1,516,235	$1,732,029	6%
Inferfund charges for support services		$ 938,339	$ 995,910	$1,146,855	$1,106,742	$ 1,201,541	$1,136,072	$1,136,072	3%
Depreciation and amortization		$ 284,072	$ 293,495	$ 317,352	$ 402,993	$ 414,027	$ 381,996	$ 381,018	4%
Bad debts		$ 7,135	$ 17,780	$ 16,161	$ 11,905	$ 24,473	$ 14,853	$ 36,225	26%
Other		$ 72,832	$ 62,549	$ 110,177	$ 85,504	$ 88,243	$ 12,737	$ 14,292	-21%
Franchise Tax		$ 262,395	$ 273,426	$ 271,831	$ 302,262	$ 318,964	$ 318,846	$ 303,590	2%
Interest Expense					$ 39,450	$ 38,982	$ 35,026	$ 30,906	
In lieu of tax		$ 65,000	$ 65,000						
		$3,805,508	$4,014,958	$4,249,830	$4,562,265	$ 4,570,240	$4,503,667	$4,665,938	3%
Cash		$1,277,979	$1,064,842	$ 567,675	$ 676,899	$ 596,539	$1,345,977	$1,601,283	
		123	97	49	54	48	109	125	
Franchise Tax as a % of Rev		7.15%						6.81%	
		$ 7,135	$ 17,780	$ 16,161	$ 11,905	$ 24,473	$ 14,853	$ 36,225	
Bad Debt as a % of Revenue		0.19%	0.44%	0.38%	0.26%	0.54%	0.33%	0.78%	0.42%

City of Belton, Missouri

Description	Type	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Personnel services	Growth	2.00%	12.00%	5.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Contractual services	Growth	3.00%	3.00%	3.00%	3.00%	3.00%					
Materials and supplies	Growth	2.00%	2.00%	2.00%	2.00%	2.00%					
Maintenance and repairs	Growth	5.00%	10.00%	4.00%	5.00%	6.00%					
Fuel and lubricants	Growth	3.00%	3.00%	4.00%	4.00%	4.00%					
Utilities	Growth	4.00%	4.00%	4.00%	4.00%	4.00%					
Water supply	Growth	1.00%	1.00%	1.00%	1.00%	1.00%					
Inferfund charges for support servi	$ Amount	$1,136,00	$1,136,0	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000
Bad debts	% of Revenu	0.50%									
Other	$ Amount	$15,000	$15,000	$15,000	$15,000	$15,000					
Franchise Tax	% of Revenu	7.00%	7.00%	7.00%	7.00%	7.00%					



To determine water expenses, the history of the accounts and the trendswere reviewed. The methods in projecting the expenses were based on growth which is % or inflationary factory, % of revenues, and estimated dollar amounts. Expenses have been growing at annual compounded growth rate of 4% since 2004.

Interest expense was calculated based on existing amortization schedules and future amortization schedules related to new debt.

Depreciation was calcuated based on existing depreciation schedule and the calculation of future improvements.

DRG

Delich, Roth & Goodwillie, P.A.
Engineers

1001 East 101st Terrace, Suite 210
Kansas City, Missouri 64131
Telephone: (816) 221-4222

913 Sheidley Avenue, Suite 110
Bonner Springs, Kansas 66012
Telephone: (913) 441-1100

www.drgengineers.com