Warren County Water District

2013 Capital Improvement Plan

Water System Facilities

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Prepared by the Engineering Staff of Warren County Water District

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EXECUTIVE SUMMARY

A Capital Improvement Plan (CIP) identifies and prioritizes capital infrastructure improvements required to maintain and improve water service. This will allow Warren County Water District (Warren Water) to successfully carry out its commitment to "provide quality and commitment in every drop." This CIP is an update to the 2008 CIP for Water System Facilities. The updates include adjustments for changes in growth trends and new regulations.

Significant growth has continued in Warren Water's service area. The 2010 population of Warren County was 113,792 according to the US Census, an increase of 23% from 2000. Utilizing projections from the Kentucky State Data Center, the population of Warren County is expected to continue to grow through the planning period of 2040 to over 182,939. This growth is expected to increase Warren Water's 2012 average daily demand from 7,376,000 gallons per day to 13,112,200 gallons per day in 2040. Likewise, peak daily demand is anticipated to increase to 25,437,200 gallons per day in 2040 from 14,352,000 gallons per day reached in June, 2012.

The proposed CIP includes 19 projects with a total estimated cost of approximately $11,720,000. The capital projects in the CIP are organized into 4 phases based on the timeframe recommended for implementation. Construction for projects in Phase 1 is recommended in 2014 and 2015. Phase 2 projects have been designated for construction in 2016 – 2020. Phases 3 and 4 have been designated for the following 10 year periods of 2021 – 2030 and 2031 – 2040 respectively. These projects have a total estimated cost of $6,370,000.

The improvements proposed in the CIP will increase transmission capacity throughout the service area to keep pace with proposed increases in demand. The proposed improvements will also increase service quality and reliability.

Certain notable improvements are listed below:

- Significant increase to transmission capacity to Three Springs and Richpond areas in 2014.
- Improvements to pressure, transmission capacity, storage capacity, and system reliability in areas surrounding Morgantown Road (Hwy 231) on the western side of Warren County beginning in 2015.
- Improvements to water quality and system reliability in Gott and surrounding areas in 2018.
- Replacement of storage and transmission facilities in 2021 to Smiths Grove which will improve service.
- Improvements to storage and transmission facilities in the Russellville Road area in 2026.

The facilities associated with the standby supply project will convey water to a large portion of southwestern Warren County in the event of damage to the primary transmission system. The maintenance projects consist of the re-painting of 21 water storage tanks through 2030. Although costly, proper maintenance of these tanks is essential to maintain a high level of service. Table 1 summarizes the proposed improvements for the planning period along with the cost standby supply facilities and major tank maintenance costs.

Implementation of the plan will increase storage capacity without the creation of excess storage capacity which can lead to lower water quality. Finally, this CIP leverages previous improvements and proposes strategic new improvements to result in an overall increase in system reliability and efficiency.

TABLE 1

Overall Capital Improvement Plan Summary

Phase	Proposed Water Lines (miles)	Proposed Pump Stations[1]	Increased Storage Capacity (Gal)[2]	Total System Storage Capacity (Gal)	Average System Demand (GPD)	Project Cost (2013 $)	Maintenance (2013 $)	Standby Supply (2013 $)	Total Cost (2013 $)
Existing				11,900,000	7,367,600				
1 (2014-2015)	5.8	2	100,000	12,000,000	8,400,500	$2,130,000	$800,000	$120,000	$3,050,000
2 (2016-2020)	6.6	5	400,000	12,400,000	10,122,100	3,540,000	1,700,000		5,240,000
3 (2021-2030)	5.1	7	900,000	13,300,000	11,580,800	4,070,000	3,750,000		7,820,000
4 (2031-2040)	4.0	1	500,000	13,800,000	13,112,200	1,980,000			1,980,000
					TOTAL	**$ 11,720,000**	**$ 6,250,000**	**$ 120,000**	**$ 17,970,000**

[1] Including major upgrades and relocations
[2] Adjusted for tanks removed from service

INTRODUCTION

General

Warren Water provides water service to Warren County, KY outside the service area of Bowling Green Municipal Utilities (BGMU). Within Warren County, Warren Water serves approximately 45% of the City of Bowling Green's land area, as well as the communities of Smiths Grove, Plum Springs, Oakland, and Woodburn.

A CIP is a long-range plan, which identifies capital projects, estimates the cost of the projects, and provides a planning schedule for the implementation of the projects. This CIP is a Water Master Plan that establishes a road map for water improvements currently anticipated for Warren County during the planning period. The planning period of this CIP is 2013 through 2040.

The purpose of this CIP is to identify projects that are required to:

1. Increase system capacity as system demands increase.
2. Ensure that the system continues to deliver a quality product and remains in compliance with Kentucky Public Service Commission (PSC), Division of Water (DOW), and Environmental Protection Agency (EPA) requirements.
3. Replace facilities which will reach the end of their service life within the planning period.
4. Ensure the most efficient use of Warren Water's funds that will result in the best service to all customers.

This report is also intended to provide Warren Water's Management and Board of Commissioners with a tool to use in planning and coordinating the financial and logistical requirements for improvements to the water system.

As with all studies of this type which rely on projections of future occurrences, the certainty regarding the underlying predictions and corresponding recommendations

diminishes as the time frame moves further into the future. Therefore, while recommendations listed for the near term projects should be implemented as described herein, the recommendations for medium and long term projects should be re-examined prior to implementation. This study will be updated as necessary so that adjustments may be made to account for unanticipated growth in specific areas, the announcement of new industrial customers that are large water users, or any other factor or set of factors that would have a significant impact on the system.

Existing Water Distribution System

Warren Water provides potable water to 26,040 active customers (as of June 2013) through approximately 1,125 miles of transmission and distribution pipeline. The system utilizes 26 storage tanks and conveys water throughout the system with the use of 29 pump stations.

The system is divided into 39 areas of service called Sources. A Source is a delineated pipe network within the system. All water entering a Source or exiting into another Source is metered. This allows water consumption to be calculated separately for each Source. Sources may also have dissimilar pressure grades because, in many cases, pump stations or pressure reducing valves (PRV's) are situated at Source dividing points. Appendix A contains an existing system map depicting all Sources.

Requirements for Customer Demands

Warren County has been and continues to be one of the fastest growing counties in the Commonwealth of Kentucky. According to US Census data, Warren County's population increased by 23% from the year 2000 to 2010. In 2000 the population was 92,522, and by 2010 the population had grown to 113,792. Based on population projections by the Kentucky State Data Center, it is projected that Warren County will experience a population increase of approximately 60% through the end of the

planning period. Figure 1 shows the historic and projected population of Warren County from 1970 to 2040.

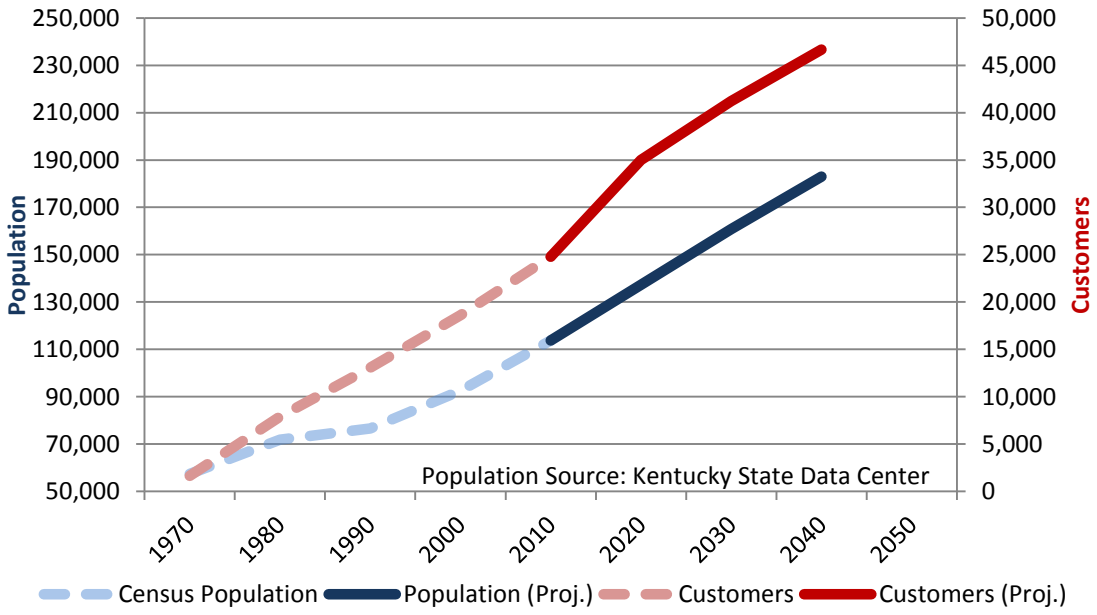


Figure 1: Warren County Population and Warren Water Customers, 1970 – 2040.

Growth on Warren Water's system is occurring at a rate greater than that of the County in general. In 2012 alone, 848 customers were added to the water system. This growth is very beneficial to Warren Water, however the system's transmission and storage capacity must be increased to continue to meet the demand of these existing customers and provide for future growth.

Warren Water is under the jurisdiction of the Kentucky Public Service Commission (PSC). Regulations of the PSC require that all water systems have storage facilities with a capacity equal to the average daily demand on the system. During the "test year" for this CIP, which was October 1, 2011 through September 30, 2012, the average daily consumption on the system was approximately 7,368,000 gallons per day (gpd). The existing system has a storage capacity of 11,900,000 gallons, a surplus of 4,533,000 gallons. However, projections indicate that the system's average daily

demand will climb to approximately 13,112,000 gpd by the year 2040. Therefore, a minimum of 1,212,000 gallons of additional storage capacity will be required by the end of the planning period.

As system demands increase, pumping and transmission main capacities must also keep pace. Such improvements will be required in future years. All of the projects outlined herein will be designed to meet the demands expected through the planning period. The PSC and the Kentucky Division of Water (DOW) require that all water systems maintain a minimum of 30 pounds per square inch (psi) at all customer meters. When demands increase to certain levels and lower operating pressures result, improvements will be required to meet the standards required by PSC and DOW.

Requirements for Fire Protection

PSC regulations require that a minimum of 250 gallons per minute (gpm) be available at any location that a fire hydrant is to be installed. Warren County ordinances and regulations require 250 gpm at 20 psi residual pressure for fire hydrants that are installed in residential areas and 600 gpm at 20 psi residual pressure for fire hydrants installed in commercial or industrial areas. The City of Bowling Green requires that 600 gpm at 20 psi residual pressure be available to all hydrants inside the city's corporate limits. Fire flows must be considered when improvements are being made to meet system demand. Improvements must not compromise the system's existing fire protection capability.

A Fire Protection Plan was created by Warren Water in 1993 which involved a series of projects which would result in the availability of fire flows and the installation of a fire hydrant within 2.5 miles of all locations in Warren County. Many of the projects in this proposal have been completed during the past 20 years. Some of the projects outlined in this CIP will result in the further completion of this goal. A map located in

Appendix B outlines the areas of existing fire protection, areas of fire protection which will be added as a result of this CIP, and areas from the original proposal which will still be required to meet the goal of placing a fire hydrant within 2.5 miles of all points in Warren County.

PROJECTED SYSTEM DEMANDS

To obtain projections for future system demand, a variety of factors were considered. For residential demands, projected populations, average persons per household, and historical average customer usage are the primary factors that influence projected water demands. For commercial customers, a correlation was developed between rate of residential growth and commercial growth. Areas where large commercial developments are anticipated were also considered. Large increases in demand could occur in undeveloped industrial areas such as exist in the South Central Kentucky Industrial Park and the Kentucky Transpark. Industrial projections have been calculated assuming a moderate level of industrial growth.

The average quantity of water used by a particular customer varies from year to year. The major factor that influences this variance is the amount of rainfall during a given year, especially during the summer months. When there is little rain, lawn irrigation and other outdoor water use causes system demand to significantly exceed average levels. Since there is no way to predict when these conditions will occur, Warren Water must be prepared at all times. Therefore, the system demand projections presented herein represent “dry year” demand, which is the demand that would be anticipated in a year with less than average rainfall.

Demand projections for this Plan have been based on projections contained in the 2008 Capital Improvement Plan, with various modifications and refinements. A “test year” was established from October 1, 2011 to September 30, 2012. This date range contained demand patterns that were ideal for planning purposes. Actual system demand was tabulated for each Source within the system. This established a baseline for demand projections. A peaking factor (the ratio of the maximum daily flow and average daily flow) was also tabulated for each Source. Peak demand is used in the sizing of pumps and water mains.

System demand projections have been prepared for two conditions. Table 2 indicates the projected demand for each Source on an average day. Table 3 indicates the projected demand for each Source on a peak day, the highest anticipated daily demand during a given year. By 2040, the average daily demand is projected to increase by 78 percent and the peak daily demand is projected to increase by 82 percent. Table 4 contains average and peak demands summarized by water purchase location.

Once system demand projections were established, a comparison was made of the projected demand and the existing capacity of transmission mains, pump stations, and storage tanks. If existing facilities are not sufficient to supply the projected demand, upgrades are required. Subsequent sections of this document outline the necessary upgrades.

TABLE 2

Projected Average Day Water Demand 2012-2040 (GPD)

Source No.	& Name	2012[1] Average Demand	2020 Average Demand	2030 Average Demand	2040 Average Demand
01	BG North	48,500	51,700	55,700	59,700
02	Kelly Vance	638,000	768,800	928,800	1,088,900
02A	Porter Pike	220,000	238,800	261,800	284,700
03	Mizpah	345,800	1,377,800	1,436,800	1,516,800
05	Detour Rd	186,200	227,800	279,800	330,800
06	Girken	57,900	71,500	89,500	106,500
07	Richardsville	132,200	137,800	143,800	149,800
07A	Ben Leo	64,200	64,200	65,200	65,200
08	Sandhill	109,600	114,400	119,400	125,400
09	Smiths Grove	73,600	77,600	82,600	87,600
09A	Oakland	180,400	199,400	223,200	247,000
10	Hays	175,200	183,400	193,600	203,800
11	Barren County	36,300	39,500	43,500	47,500
11N	BGMU Source	1,400	1,400	1,400	1,400
11S	Cemetery Rd	266,400	370,800	417,300	465,300
11T	Barrington Manor	200,800	219,900	247,300	280,100
11U	Drakes Creek	302,600	474,700	721,300	1,016,500
12	Bluegrass	448,200	511,400	587,400	663,400
13	Plano	366,700	514,700	596,700	678,700
15	South Alvaton	154,800	162,800	171,800	180,800
16	Boyce	120,700	123,900	126,900	129,900
17	Hwy 240	69,000	93,000	123,000	153,000
17A	Three Springs	780,400	1,282,200	1,539,800	1,794,200
18	Nashville Rd	735,100	860,500	924,900	988,500
19	Old Hwy 31W South	225,800	293,000	375,000	457,000
19A	Woodburn	99,600	118,800	141,300	163,800
20	Grider Pond	245,400	277,400	316,400	355,400
21	Hwy 68 West	256,700	295,100	341,100	386,100
22	Rockfield	140,100	141,700	142,700	144,700
23	Fuqua Rd	98,900	102,500	107,000	111,300
24	Hwy 231N	199,800	219,000	243,000	268,000
24A	Morgantown Rd #1	76,800	182,400	192,400	201,900
25	Morgantown Rd #2	79,900	81,500	82,500	83,500
26	Hadley	73,000	73,800	73,800	74,800
28	Beech Bend Rd	21,100	25,100	30,100	35,100
29	Briggs Hill	130,700	137,100	146,100	156,100
30	Hwy 68W MM	5,800	6,700	7,900	9,000
	TOTAL	7,376,000	10,122,100	11,580,800	13,112,200

[1] Oct. 2011-Sept. 2012 Actual Demand

TABLE 3

Projected Peak Day Water Demand 2012-2040 (GPD)

Source No.	& Name	2012[1] Peaking Factor	2012[1] Peak Demand	2020 Peak Demand	2030 Peak Demand	2040 Peak Demand
01	BG North	1.65	80,100	85,300	91,900	98,500
02	Kelly Vance	2.06	1,316,100	1,585,900	1,916,000	2,246,200
02A	Porter Pike	1.80	396,500	430,400	471,900	513,100
03	Mizpah	1.67	576,600	2,297,300	2,395,700	2,529,100
05	Detour Rd	2.12	394,900	483,200	593,500	701,600
06	Girken	2.02	117,000	144,500	180,900	215,300
07	Richardsville	2.15	284,600	296,600	309,500	322,400
07A	Ben Leo	2.30	147,400	147,400	149,700	149,700
08	Sandhill	2.67	292,500	305,300	318,600	334,700
09	Smiths Grove	2.33	171,700	181,000	192,700	204,400
09A	Oakland	1.95	351,700	388,800	435,200	481,600
10	Hays	2.10	367,200	384,400	405,800	427,200
11	Barren County	3.14	114,200	124,200	136,800	149,400
11N	BGMU Source	4.86	6,800	6,800	6,800	6,800
11S	Cemetery Rd	2.65	706,000	982,600	1,105,800	1,233,000
11T	Barrington Manor	3.26	654,300	716,500	805,800	912,700
11U	Drakes Creek	3.80	1,148,700	1,802,000	2,738,200	3,858,800
12	Bluegrass	1.98	888,400	1,013,600	1,164,300	1,314,900
13	Plano	2.13	780,500	1,095,500	1,270,000	1,444,600
15	South Alvaton	2.36	365,500	384,400	405,700	426,900
16	Boyce	2.50	301,500	309,500	317,000	324,500
17	Hwy 240	2.84	196,200	264,400	349,700	435,000
17A	Three Springs	2.54	1,980,200	3,253,500	3,907,100	4,552,700
18	Nashville Rd	1.54	1,134,200	1,327,700	1,427,000	1,525,100
19	Old Hwy 31W South	1.58	357,600	464,000	593,800	723,700
19A	Woodburn	2.87	285,800	340,900	405,500	470,000
20	Grider Pond	2.37	582,000	657,800	750,300	842,800
21	Hwy 68 West	2.14	549,900	632,200	730,800	827,200
22	Rockfield	1.93	269,700	272,800	274,700	278,600
23	Fuqua Rd	1.72	170,500	176,700	184,400	191,900
24	Hwy 231N	1.58	316,000	346,400	384,300	423,900
24A	Morgantown Rd #1	2.24	172,100	408,600	431,000	452,300
25	Morgantown Rd #2	2.27	181,100	184,700	187,000	189,300
26	Hadley	2.35	171,700	173,500	173,500	175,900
28	Beech Bend Rd	3.03	63,900	76,000	91,200	106,300
29	Briggs Hill	1.95	254,600	267,100	284,600	304,100
30	Hwy 68W MM	2.43	14,100	16,300	19,200	21,900
	TOTAL SYSTEM		14,352,000	19,523,100	22,408,600	25,437,200

[1] Oct. 2011-Sept. 2012 Actual Demand

TABLE 4

Summary of Projected Average & Peak Day Water Demand 2012-2040 by Water Purchase Location (GPD)

	2012[1] Average Demand	2012[1] Peaking Factor	2012[1] Peak Demand	2020 Average Demand	2020 Peak Demand	2030 Average Demand	2030 Peak Demand	2040 Average Demand	2040 Peak Demand
BG North No. 1 & No. 2	2,272,000	1.67	3,788,000	3,552,700	5,922,900	3,923,700	6,541,400	4,313,700	7,191,600
Cemetery Road	4,512,000	2.09	9,419,000	5,850,500	12,215,500	6,889,200	14,384,300	7,979,100	16,659,900
Hwy 68 West	6,000	2.43	15,000	0	0	0	0	0	0
M-town Rd & Barren River Rd	565,000	1.89	1,066,000	693,800	1,308,700	737,800	1,391,700	784,300	1,479,400
Beech Bend Road	21,000	3.03	64,000	25,100	76,000	30,100	91,200	35,100	106,300
Total	7,376,000		14,352,000	10,122,100	19,523,100	11,580,800	22,408,600	13,112,200	25,437,200

[1] Oct. 2011-Sept. 2012 Actual Demand

REASONS FOR WATER SYSTEM IMPROVEMENTS

System improvements are required due to three primary causes. Some improvements are needed due to an existing system deficiency. Other improvements are required to replace facilities which have reached the end of their service life. Other improvements are required due to increases in customer demand.

There are several situations in which improvements are required due to existing system deficiencies. Redundant facilities are required at critical locations in the system or in locations that have a high risk of damage, such as river crossings. All pump stations in the system are capable of supplying the required demand so that if any one pump fails, the remaining pump(s) will be able to maintain system operation. If a critical system location is identified that does not have redundancy, facilities should be constructed to provide the necessary back-up.

Replacement of a water main is sometimes necessary when frequent line breaks or leaks are experienced on a particular pipeline. There can be several causes of these failures such as pipe material or quality of installation. Replacement of a main or construction of a parallel main is sometimes required to increase the flow or pressure in an area, or to upgrade the system in an area to accommodate fire flows.

Due to the critical nature of the public water supply, facilities must be replaced as they reach the end of their expected service life. The expected life of a system component varies depending upon the type of facility and material used for construction. For example, water pipelines would generally have a longer service life than the electrical motor on a pump. Facilities which are approaching the end of their service life can be identified by frequent failures, increasing maintenance costs, observed degradation, and/or insufficient size or height.

Some projects have been identified that will increase the overall efficiency of the system. Warren Water always strives to design and construct system additions in the most efficient manner possible. This may result in lower energy costs and/or greater system reliability.

The major factor that necessitates system improvements is increases in customer demand. As the number of customers increase and the total demand on the system becomes larger, the system must keep pace with this growth. Since the rate of growth is not consistent across the entire service area, and the capacity of system components for growth are not the same, each Source within the system must be considered individually. Once examined, growth-based improvement projects were identified.

Once all system deficiencies and growth-based needs were recognized, solutions to these issues were identified. Every effort was made to resolve as many deficiencies as possible when developing an improvement project. For example, if a pump station must be replaced because it has reached the end of its service life, the new station was sized to accommodate the projected increases in demand for the area. The location of the pump station was also be examined to identify if, due to the construction of new water mains after the construction of the pump station, a more effective location may be selected.

DESCRIPTION OF PROPOSED PROJECTS

General

The projects proposed in this Plan have been evaluated and prioritized by relative importance with respect to time and need. The priority for many projects was based on the time in which the demand is projected to exceed the transmission capacity in a particular area of the system. The projects which involve the replacement of facilities that are projected to reach the end of their service life during the planning period are prioritized based on the time in which the facility is projected to reach the end of its service life.

The proposed projects have been divided into four phases. Phase 1 contains projects which are recommended to be complete by the end of 2015. Phase 2 contains projects which are recommended to be complete by the end of 2020. Subsequent phases are divided into 10 year periods, 2021 to 2030 for Phase 3, and 2031 to 2040 for Phase 4.

The following information is provided for each project: a brief description of the project, the projected deficiency or other reason the project should be implemented, estimated cost, and recommended time frame for design and construction. All cost projections in this document are indicated in 2013 dollars. A map is enclosed as Appendix C which depicts the location of all proposed projects.

Phase 1 Projects (2014-2015)

Three Springs/Hwy 242 Transmission Line (2014)

Due to the recent construction of South Warren Middle & High Schools, roadway improvements, the completion of a sewer interceptor, and other factors, the Richpond area of Warren County is projected to experience significant growth during the planning period. In order to accommodate the increased water demands

associated with this growth a new 12-inch transmission main, with master meter, is proposed for this area. An alignment was selected from a point on Three Springs Road at the end of an existing 10-inch water line. The main will continue southerly, adjacent to Three Springs Road to Richpond Road (Hwy 242) and then continue westerly, adjacent to Richpond Road to Hwy 31W for a total of approximately 26,000 linear feet.

The proposed 12-inch water line will allow water to be transmitted from the Three Springs Tank directly to the Richpond area, improving water quality and system efficiency by reducing water age and pumping cost. Once the proposed line is in service, a pressure reducing valve will be installed at an existing metering point at the Old Nashville Road Pump Station site which will allow that metering point to only supplement the water supply into the Richpond area rather than its current operation as the primary supply of water. It is estimated the cost of this project will be approximately $971,000. This project is scheduled to be in service in 2014.

Plano Pump Station Upgrade (2014)

The water demand from the Plano Pump Station is projected to exceed the capacity of the station by the year 2014. Therefore the pumps and associated electrical systems at the station must be upgraded to 1,300 gpm to accommodate this demand. Additionally, variable frequency drives will be installed to decrease electrical cost associated with pumping. No additional transmission piping will be required to accommodate the upgrade. The cost of this upgrade is estimated be approximately $45,000.

Morgantown Road Area Improvements (2015)

The Briggs Hill Tank serves an area of Warren County along Glen Lily Road, Barren River Road, and surrounding areas. Because of its condition, size, useful storage

volume, and height, this tank is approaching the end of its service life. Some areas along Glen Lilly Road, particularly in the Hilltop Acres Subdivision, suffer from low pressures due to their high elevation relative to the water level in this tank.

The Morgantown No. 2 Pump Station currently operates to fill the Briggs Hill Tank and the Hammett Hill Tank. The pump station is located near the Morgantown Road Tank, situated between Morgantown Road and Minnie Way. It is projected that peak water demand in this area will exceed the capacity of the pump station.

To remedy these issues a new elevated storage tank, located near the intersection of Glen Lily Road and Hilltop Trail is proposed. The tank will have an overflow elevation of 900 feet and a capacity of 200,000 gallons. A new Glen Lily Pump Station is proposed at a point adjacent to Glen Lily Road. The higher overflow elevation of the proposed tank will provide customers with increased pressures. To facilitate the construction of the pump station, approximately 4,100 linear feet of 8-inch water main will be constructed adjacent to Glen Lily Road from Bill Dedman Road, across the Natcher Parkway, to the proposed pump station. An additional 6-inch water line, approximately 325 feet in length, will be constructed adjacent to West Villa Drive. The existing Morgantown No. 2 Pump Station will be adjusted to only convey water to the Hammett Hill Tank. To ensure appropriate pressures along Bill Dedman Road and a portion of Glen Lily Road, a pressure reducing valve will be installed on the water line supplying these areas.

Along with the necessary replacement of a tank, this project will improve service by increasing pressures and increasing service reliably. Fire protection will also be enhanced along Glen Lily Road. It is estimated the cost of this project will be approximately $1,114,000.

TABLE 5

Phase 1 Project Summary

Item No.	Project Description	Recommended Year for Completion	Estimated Cost	Project Total
1	**Three Springs/Hwy 242 Transmission Line**	2014		
1A	26,000 ft of 12" WL on Three Springs & Richpond Rds.		$ 941,000	
1B	PRV at Old Nashville Rd Pump Station Site		10,000	
1C	Master Meter		25,000	
				$ 976,000
2	**Plano Pump Station Upgrade**	2014		
	Replacement Pumps		$ 45,000	
				$ 45,000
3	**Morgantown Road Area Improvements**	2015		
3A	200,000 Gallon Elevated Storage Tank		$ 620,000	
3B	Glen Lily Pump Station, 250 gpm		175,000	
3C	4,100 ft of 8” WL on Glen Lily Road		200,000	
3D	8” WL Natcher Parkway Crossing		87,000	
3E	325 ft of 6” on West Villa Drive		12,000	
3F	PRV Station		20,000	
				$ 1,114,000
	PHASE 1 TOTAL			**$ 2,130,000**

Phase 2 Projects (2016-2020)

Greenwood Pump Station Upgrade (2016)

The Greenwood Pump Station consists of two pairs of pumps which operate independently. One pair of pumps transmits water to the Greenwood Tank, and the other pair of pumps transmits water to the Three Springs Tank. The demand associated with each pair of pumps in this station is projected to exceed capacity during the planning period. Rather than upgrading all four pumps, it is recommended that demands be diverted from the areas served by the Greenwood Tank and transferred to the Three Springs Tank. This will be accomplished primarily by modifying the transmission to areas west of I-65 in the Bluegrass Source and feeding the Plano Source from the Three Springs Tank. The initial step in this process, recommended as part of this project, is the installation of a 6-inch water

meter near the intersection of Smallhouse and Elrod Roads at Saturn Way. As a result of the Re-sourcing, the existing pumps transmitting water to the Greenwood Tank will not require upgrades. The pumps transmitting water to the Three Springs Tank will be replaced with pumps with an initial capacity of 5,500 gpm and ultimate capacity of 7,500 gpm. A portion of the future upgraded capacity will be assisted by proposed transmission lines associated with a proposed large development. It is recommended that the initial pump upgrade be completed by 2016. The projected cost of the pump upgrade, including associated electrical and station piping, is $275,000.

Glen Lily Area Improvements (2017)

The area near the intersection of Morgantown Road and Veterans Memorial Lane has experienced rapid growth in recent years. This area and areas to the north along Veterans Memorial Lane are projected to continue this trend for growth. The existing water tank and pump station that serve this area will not be able to accommodate the projected level of growth. For the water system to keep pace with the projected growth new facilities must be constructed. Additionally, a number of homes near the existing Morgantown Tank experience low pressures due the elevation of the reservoir.

This project consists of the construction of a new 500,000 gallon ground storage tank to be located near Glen Lily Road and a new 1,100 gpm pump station. The pump station will be located near the existing water purchase meter at the intersection of Morgantown and Old Morgantown Roads. To connect the pump station to the tank, a new transmission line is proposed. The transmission line includes approximately 3,000 linear feet of 10-inch water line adjacent to Morgantown Road, from the end of an existing 12-inch water line, to Veterans Memorial Lane. A 12-inch water line will then continue adjacent to Veterans

Memorial Lane and Glen Lily Road to the proposed tank, approximately 9,500 linear feet, with an additional 1,550 linear feet of 8-inch to Bill Dedman Road.

The project will also include the construction of a new pump station to be located near the intersection of Morgantown Road and Guinn Court to replace the existing Morgantown No. 2 Pump Station. This pump station will result in a more efficient operation and allow the pressure at homes along Morgantown Road to be increased. Approximately, 2,050 linear feet of 6-inch water line is proposed from Mark Trail to Glen Lily Road to convey water (along with other existing lines) from the proposed tank to the proposed pump station.

An additional improvement associated with this project will be to bring nearly the entire Hwy 231 Source under the influence of the proposed tank. This will be accomplished by lowering the overflow elevation of the proposed tank to 700 feet. The Hwy 231 source is currently served by the BGMU pressure zone. Changes in BGMU's operation, specifically the construction of the "Big Red" Tank and the establishment of a lower pressure zone at the purchase meter, have significantly decreased the pressures in the Hwy 231 Source. Some areas within the source now have a pressure that approaches a level that Warren Water considers to be unacceptably low. To prevent the pressures from rising too high in the lower lying areas of the source, pressure regulators will be installed on meters in some locations.

This project will result in an increased level of service for this area even as it experiences growth. A water main will be constructed adjacent to a significant section of Veterans Memorial Lane which currently has no water service. In addition, pressures in the Hwy 231 Source area will be increased and fire protection capabilities will be enhanced. The overall operational efficiency will be improved for

this entire section of the water system. The estimated cost for this project totals $1,797,000.

Kelly Vance Pump Station Replacement (2018)

The existing Kelly Vance Pump Station is one of the oldest stations in the system. As such, the components of the pump station must be replaced to ensure reliable and efficient service. Rather than reconstructing the pump station at the existing site, it is proposed that the pump station be constructed as an addition to the Louisville Road Pump Station. The Louisville Road Pump Station has been constructed in a manner which will facilitate the expansion to accommodate additional pumps when required. This "dual" pump station will result in a single station that will be more operationally efficient and have lower construction cost compared to similar facilities being constructed on two sites in two buildings. The reliability of the station will be improved by leveraging existing facilities to provide two independent suction pipelines and two independent discharge pipelines.

This project consists of the necessary structure, pumps, piping, and electrical work to complete this portion of the station. Also included with this project is a pair of 16-inch water lines which will be constructed beneath the CSX railroad adjacent to the Louisville Road Pump Station. These lines will connect an existing 16-inch water line to the suction and discharge of pump station.

As a result of this project, the Louisville Road Pump Station will have redundant suction piping, discharge piping, and pumps. However, there is a single electrical power source to the station. To ensure the most reliable service, a standby power source is proposed in the form of a trailer-mounted, diesel powered generator. The generator will be sized to operate pumps to fill both the Plum Springs Tanks and Mizpah Tank simultaneously and automatically operate in the event of grid-power interruption. The trailer-mounted configuration will allow the generator to be

moved to other locations if required to provide emergency power at other pump stations such as Greenwood Pump Station. It is projected that the total cost of the project will be approximately $835,000.

Porter Pike Area Improvements (2019)

The Porter Pike area of Warren County, east of Interstate 65 is currently supplied water through a water main adjacent to Porter Pike. If service is interrupted to this water main, approximately 450 customers are out of service. In addition, the majority of the water mains in this area are dead end mains. Dead end mains are only connected to the system in one location. These mains typically have lower water quality compared to looped water mains.

This project will resolve these issues and provide a greater level of service reliability for customers in this area. A total of 6 separate, relatively short, water mains are proposed, each of which will connect two or more existing mains. The new mains will be constructed adjacent to Red Pond Road, Petty Road, Goshen Church South Road, Bethel Lane, Gotts-Hydro Road, and Carl Jordan Road. The lines will total approximately 14,600 linear feet of 4-inch water line. In addition, two pressure reducing valves will be installed which will provide a backup water supply from the Oakland Source to the portion of the Porter Pike Source east of I-65.

This project will significantly improve the quality of service provided in this area. The water supply will be more reliable and water quality will be improved. This project will also make fire protection available for the first time along approximately 14 miles of roadway. The estimated cost of this project totals $298,000.

McElwain Pump Station Upgrade (2020)

The McElwain Pump Station is located adjacent to Hwy 31W in southern Warren County. This station supplies water to the Woodburn community and surrounding areas. The demand in this area is projected to exceed the capacity of the station by the year 2020. At this point in time the pump station will require upgrades to increase its capacity. This project consists of the upgrade of the station with 625 gpm ultimate capacity and approximately 4,500 feet of 8-inch water line adjacent to Nashville Road. The water line will be installed on the discharge of the pump station to accommodate the higher flow rate. The pump station will initially operate at a flow rate less than the ultimate capacity. A future project which will consist of re-construction of Woodburn Tank in a new location will allow the pumps to operate at their full capacity. The estimated cost of this project is approximately $335,000.

TABLE 6

Phase 2 Project Summary

Item No.	Project Description	Estimated Year for Completion	Estimated Cost	Project Total
4	**Greenwood Pump Station Upgrade**	2016		
4A	Upgrade Pumps 3 & 4 to 5,500 gpm Initial, 7,500 gpm Ult.		$ 250,000	
4B	Saturn Way Master Meter		25,000	
				$ 275,000
5	**Glen Lily Area Improvements**	2017		
5A	500,000 Gallon Ground Storage Reservoir		$ 570,000	
5B	New Morgantown No. 1 PS with Capacity of 1,100 gpm		250,000	
5C	New Morgantown No. 2 PS with Capacity of 250 gpm		175,000	
5D	Meter Regulator Installations		50,000	
5E	3,000 ft of 10” WL on Morgantown Rd		120,000	
5F	8,350 ft of 12"WL on Veterans Mem. Ln & Glen Lilly Rd		480,000	
5G	1,100 ft of 12" WL from Glen Lilly Rd. to Tank Site		47,000	
5H	1,550 ft of 8” WL Glen Lily Rd		47,000	
5I	2,050 ft of 6” WL from Mark Trail to Glen Lily Rd		52,000	
				$ 1,797,000
6	**Kelly Vance Pump Station Replacement**	2018		
6A	New Pump Station at Louisville Rd PS Site, 2,650 gpm		$ 350,000	
6B	Dual 16” WL Railroad Crossings		85,000	
6C	Standby Power System		400,000	
				$ 835,000
7	**Porter Pike Area Improvements**	2019		
7A	3,200 ft of 4" WL on Red Pond Rd		$ 54,400	
7B	2,200 ft of 4" WL on Petty Rd		37,400	
7C	4,200 ft of 4" WL on Bethel Ln		71,200	
7D	1,700 ft of 4" WL on Gohen Church South Rd		28,900	
7E	1,400 ft of 4" WL on Gotts-Hydro Rd		23,800	
7F	1,900 ft of 4" WL on Carl Jordan Rd		32,300	
7G	(2) PRV Stations		50,000	
				$ 298,000
8	**McElwain Pump Station Upgrade (2020)**	2020		
8A	Relocate & Upgrade Pump Station, 625 gpm		$ 200,000	
8B	4,500 ft of 8” WL on Nashville Rd		135,000	
				$ 335,000
	PHASE 2 TOTAL			**$ 3,540,000**

Phase 3 Projects (2121-2030)

Smiths Grove/Little Knob Improvements

Due to its condition, size, and height, the existing tank serving the Smiths Grove Source is approaching the end of its service life. Rather than constructing a new elevated storage tank adjacent to the existing tank site near the intersection of S. Main and Laurel Streets in Smiths Grove, a site on the nearby little knob hill has been selected because it will allow the tank to be designed as a ground storage tank. This style of tank is much more economical to construct and maintain. The capacity of the proposed tank will remain at 200,000 gallons; however the overflow elevation will be raised to result in higher pressures for the area.

Water will be conveyed to the proposed tank via a proposed 200 gpm pump station to be located near the intersection of Oakland Road and Upper Dixie Highway. The proposed pump station will draw suction from the 12-inch water line adjacent to Oakland Road. Water will flow from the pump station to the tank through existing water mains. The water supply will then flow from the proposed tank, through approximately 12,000 linear feet of proposed 8-inch water main, adjacent to Little Knob Road and Hedge Street, to Smiths Grove. Once in Smiths Grove, the water main will be connected to four existing mains to ensure system reliability and adequate fire protection capabilities throughout the community. To facilitate the required Re-sourcing associated with this project, a 4-inch water line, approximately 2,100 feet in length, is proposed adjacent to Smiths Grove-Scottsville Road. The cost of the project is estimated to be approximately $1,046,000.

Three Springs Area Transmission Improvements

This project is the second of two projects to increase transmission capacity to the Three Springs Tank. As part of the first project, the pumps in the Greenwood No. 2 Pump Station are proposed to be upgraded. The initial project will increase the

capacity of the station to 5,500 gpm, the highest flow rate that can be conveyed by existing transmission piping without excessive pressures.

This project consists of approximately 7,300 linear feet of 20-inch water line from a point near the end of the existing Greenwood Lane to Three Springs Tank. Approximately 3,200 linear feet of 12-inch water line is proposed from the proposed 20-inch water line to Plano Road. The existing Plano Pump Station will be relocated to the proposed 12-inch water line. This will allow the Plano area to be served via the Three Spring Tank. The proposed improvements will result in a capacity at the Greenwood No. 2 Pump Station of 7,500 gpm which is sufficient to supply the area through the end of the planning period. The estimated cost of this project is approximately $729,000. A large proposed development is projected to provide a large portion of the funding for this project.

Sandhill Area Improvements

The Sandhill Tank, a ground storage standpipe, supplies water to the Sandhill area. Due to its location and condition, this tank will require significant maintenance during the planning period. However, rather than incurring the expense associated with maintaining or replacing this tank, the area can be supplied from the existing Girkin Tank. The Girkin Tank has excess capacity compared to the projected demand of the area that it currently serves, and the overflow elevation is the same as the Sandhill Tank at 856 feet. To facilitate this change in operation a new master meter is proposed at the intersection of Girkin and Mt. Olivet-Girkin Roads.

As a result of this project the expense associated with maintaining or replacing the Sandhill Tank is eliminated. Additionally, since the Sandhill Pump Station will no longer be required to fill the Sandhill Tank, the expense associated with operating and maintaining the pump station will be eliminated. By reducing average water age,

water quality will be improved in the northern sections of the Sandhill area. The estimated cost of this project is approximately $25,000.

Nashville Road Pump Station Upgrade

The water demand from the Nashville Road Pump Station is projected to exceed the capacity of the station around the year 2024. Therefore, the pumps and associated electrical systems at the station must be upgraded to 1,500 gpm accommodate this demand. No additional transmission piping will be required to accommodate the upgrade. The cost of this upgrade is estimated be approximately $60,000.

High Service Pump Station No. 2 Upgrade

High Service Pump Station No. 2, located at the BGMU WTP, supplies water to the southwestern half of the system. A project is currently underway which will upgrade this station to 9,000 gpm firm capacity. This upgrade is projected to adequately fulfill system demands until approximately 2025. At that point in time, a further upgrade will be required. The current project consists of the replacement of Pumps 1 and 2 with higher capacity pumps. The proposed project will consist of the replacement of Pumps 3 & 4. As a result of the proposed project, the station will have firm capacity of 11,400 gpm. Since this pump station contains four pumps, it is not required that one individual pump be able to provide the total required flow. The station will be designed such that a combination of two or even three pumps will supply the necessary peak flow. To ensure redundancy, the station must be able to supply the required peak flow with the largest pump out of service. The proposed project will also include all necessary electrical and piping work required for the proposed pumps. The pump station upgrade will provide the necessary pumping capacity to serve demands thorough the end of the planning period. The projected cost of the upgrade is $250,000.

Hwy 68 West Reservoir

The existing Hwy 68 West Source is located along Hwy 68 from the William H. Natcher Parkway to Richpond Rockfield Road, and includes surrounding areas. There is a large variance in the elevation from the relatively low areas near the parkway to the higher areas further from Bowling Green. To adequately serve the customers in the higher elevation areas, the Hwy 68 West Tank, which serves this area, must have a relatively high overflow elevation. This causes the pressures closer to Bowling Green to be higher than necessary. In addition, growth is projected to occur in the lower elevation area and additional storage capacity will be desirable.

This project consists of the construction a new 750,000 gallon ground storage tank near the existing tank, but at a lower overflow elevation. This configuration will allow the pressures in the lower elevation areas of the existing source to be lowered to more ideal levels and provide additional storage capacity. The existing tank will be supplied by a new pump station which will draw suction from the proposed tank.

To facilitate the dividing of this Source, a proposed 12-inch water main will be constructed from Hwy 68 to the proposed tank. This main will allow the tank to be filled and will supply water to the lower elevation areas. The existing main from Hwy 68 to the existing tank will supply the higher elevation areas of the source. The projected cost of this project is approximately $1,025,000.

Greenhill Pump Station Upgrade

The water demand in the South Alvaton Source is projected to exceed the capacity of the Greenhill Pump Station around the year 2027. Therefore the pumps must be upgraded to 320 gpm accommodate this demand. This can be accomplished by upgrading the existing pumps. The cost of this upgrade is estimated be approximately $10,000.

Drakes Creek Pump Station Upgrade

The water demand from the Drakes Creek Pump Station is projected to exceed the capacity of the station around the year 2028. Therefore the pumps and associated electrical systems at the station must be upgraded to 2,600 gpm accommodate this demand. No additional transmission piping will be required to accommodate the upgrade. The cost of this upgrade is estimated be approximately $100,000.

Woodburn Tank Replacement

Due to its age, condition, and regulatory requirements for removal of the existing paint, the existing Woodburn Tank will reach the end of its service life during the planning period. Due to the lower elevations served since its original construction, a lower tank overflow elevation of 815 feet may be used. This lower elevation allows a new site closer to the pump station to be used. The proposed capacity of the tank is 300,000 gallons. The cost of this project is estimated be approximately $825,000.

TABLE 7

Phase 3 Project Summary

Item No.	Project Description	Estimated Year for Completion	Estimated Cost	Project Total
9	**Smiths Grove/Little Knob Area Improvements**	2021		
9A	200,000 Gallon Ground Storage Reservoir		$ 500,000	
9B	Little Knob Pump Station, 200 gpm		150,000	
9C	12,000 ft of 8" WL on Little Knob Rd and Hedge St		360,300	
9D	2,100 ft of 4" WL on Smiths Grove-Scottsville Rd		35,700	
				$ 1,046,000
10	**Three Springs Area Transmission Improvements**	2022		
10A	7,300 ft of 20” WL on Greenwood Ln & I-65		$ 438,000	
10B	20” WL I-65 Crossing		107,000	
10C	3,200 ft of 8” on Natcher Parkway		144,000	
10D	Re-locate Plano Pump Station		40,000	
				$ 729,000
11	**Sandhill Area Improvements**	2023		
	6" Master Meter Station		$ 25,000	
				$ 25,000
12	**Nashville Road Pump Station Upgrade**	2024		
	Replacement Pumps, 1,500 gpm		$ 60,000	
				$ 60,000
13	**High Service Pump Station No. 2 Upgrade**	2025		
	Upgrade Pumps 3 & 4 to Total Station Cap. of 11,400 gpm		$ 250,000	
				$ 250,000
14	**Hwy 68 West Reservoir**	2026		
14A	750,000 Gallon Ground Storage Reservoir		$ 750,000	
14B	Pump Station (Proposed Tank to Existing Tank)		150,000	
14C	2,500 ft of 12" WL from Hwy 68 to Reservoir		125,000	
				$ 1,025,000
15	**Greenhill Pump Station Upgrade**	2027		
	Upgrade Pumps, 320 gpm		$ 10,000	
				$ 10,000
16	**Drakes Creek Pump Station Upgrade**	2028		
	Replacement Pumps, 2,600 gpm		$ 100,000	
				$ 100,000
17	**Woodburn Tank Replacement**	2030		
	300,000 Gallon Elevated Storage Tank		$ 825,000	
				$ 825,000
	PHASE 3 TOTAL			**$ 4,070,000**

Phase 4 Projects (2031-2040)

Old Scottsville Road Area Improvements

The existing Drakes Creek Source has experienced a very high rate of growth over the past two decades and growth in this area is projected to continue in the future. This project will increase the storage capacity in this area with the construction a proposed 500,000 gallon elevated storage tank. The proposed tank will serve a new Source which will be created from the southwestern portion of the Drakes Creek Source and the Olde Stone development which is currently supplied from the Plano Source.

The proposed tank will draw water from the Pleasant Hill Tank through a proposed control valve to be located near the intersection of Pleasant Hill and Old Greenhill Roads. In addition to the improvements to the storage facilities in the area, approximately 17,400 feet of 10-inch water main will be constructed adjacent to Greathouse and Old Scottsville Roads to supply adequate flow and pressures to areas of projected growth within the new Source. When implementing this project, construction of three 6-inch water mains will be required to maintain existing fire protection throughout the area. Approximately 80 linear feet will be installed at the intersection of Old Greenhill and Old Scottsville Roads, approximately 1,000 linear feet will be installed adjacent to Roy Thomas Road, and approximately 2,800 linear feet will be installed adjacent to Old Scottsville Road near Carver Lane. The estimated cost of this project is approximately $1,940,000.

Tanglewood Pump Station Upgrade

The water demand from the Tanglewood Pump Station is projected to exceed the capacity of the station around the year 2037. Therefore the pumps and associated electrical systems at the station must be upgraded to 650 gpm accommodate this

demand. No additional transmission piping will be required to accommodate the upgrade. The cost of this upgrade is estimated be approximately $40,000.

TABLE 8

Phase 4 Project Summary

Item No.	Project Description	Estimated Year for Completion	Estimated Cost	Project Total
18	**Old Scottsville Road Area Improvements**	2031		
18A	500,000 Gallon Elevated Storage Tank		$ 1,200,000	
18B	Control Valve Station		30,000	
18C	17,400 ft of 10" WL on Greathouse & Old Scottsville Rds		609,000	
18D	1,000 ft of 6" WL on Roy Thomas Rd		25,000	
18E	80 ft of 6" WL on Old Greenhill Rd at Middle Bridge Rd		6,000	
18F	2,800 ft of 6" WL on Old Scottsville Rd		70,000	
				$ 1,940,000
19	**Tanglewood Pump Station Upgrade**	2037		
	Replacement Pumps, 650 gpm		$ 40,000	
				$ 40,000
	PHASE 4 TOTAL			**$ 1,980,000**

STANDBY SUPPLY

Service reliability is a critical part of providing excellent service to our customers. The water system, in its entirety, was evaluated to determine if any threats to service reliability could be reduced. One project was identified which would efficiently increase service reliability to a large number of customers.

A large portion of the water conveyed to the south and west side of the service area travels through a single large transmission pipeline. This configuration is extremely efficient and standard practice in the water industry. However, it increases the likelihood of service interruption if the line is out of service due to natural or manmade disruptions.

To provide a redundant water supply in this area, two trailer-mounted, diesel-powered pumps are proposed. Modifications at two existing pump stations will allow rapid connection of the portable pumps to the distribution system. These pump stations have previously been removed from normal service, and due to growth on the system, the permanent pumps at these locations cannot convey the required quantity of water. The two pump stations to be modified are the Parkway Pump Station and the Bluegrass Pump Station. Additionally, approximately 350 feet of 8” water line is proposed on Innsbrooke Ave. to prevent low pressures in The Crossings Subdivision during use of the portable pumps at Bluegrass Pump Station. This water line will also provide improved service reliability during normal periods of service. A redundant supply to the Russellville Road area can be provided by drawing water from the Russellville Road Purchase Meter to supply the Hwy 68W Pump Station.

The design capacity of the portable pumps is proposed to be 2,000 gpm each. Therefore, the total volume of water supplied in this standby arrangement will be

approximately 800 gpm at the Russellville Road Purchase Meter, up to 2,000 gpm at the Parkway Pump Station, and up to 2,000 gpm at the Bluegrass Pump Station, depending on BGMU system pressures.

The proposed configuration provides several advantages. By using portable pumps, maintenance costs are reduced compared to permanently installed pumps which would rarely be used. The portable pumps could also be used in other locations as needed for emergency or non-typical operations. Operational expenses will be reduced by eliminating the large electrical services at the existing pump stations. The net savings of power costs will be approximately $5,000 per year compared to current "minimum bill" power costs and would be $7,200 per year if they were upgraded to accommodate current demands.

The estimated cost of the project including the portable pumps, pump station modifications, and water line is approximately $120,000.

WATER STORAGE TANK MAINTENANCE

Water storage tanks are a critical part of Warren Water's water distribution system. Warren Water owns and operates 27 water storage tanks; 26 of these tanks are currently in service. A detailed internal and external inspection is conducted of each storage tank on a 5 year rotating basis. Any minor issues that are identified during the inspections are repaired at the time of the inspection. However, since most of the storage tanks are constructed of plate steel, the paint which protects the steel from corrosion must eventually be replaced.

Numerous factors affect the life of a coating system, but generally, it is expected that it will remain effective for 20 to 25 years. At that point replacement or re-coating is required. Although replacing the coating system on a tank represents a significant financial outlay, delaying this work can lead to tank corrosion that would

require even more costly repairs. If this maintenance is deferred for a significant period of time, the structural integrity of the tank can be compromised. Additionally, water storage tanks are the most visible pieces of water infrastructure. The aesthetic of storage tanks can affect the opinion of the public on the organization.

Table 9 provides an estimate of the cost and time-frame for storage tanks which will require re-coating during the planning period. The projects are separated into CIP phases. Phase 4 tank maintenance projects have not been included due to the uncertainty of required work at that point in the future. The condition of all storage tanks will continue to be monitored and revisions to the schedule will be made to maximize the life and minimize the cost of storage tank maintenance.

TABLE 9

Water Storage Tank Maintenance

Tank	Capacity	Estimated Year for Completion	Tank Preparation Type	Estimated Cost	Phase Total
Phase 1					
Greenwood	250,000	2014	BOB / IFB	$ 200,000	
Petros	300,000	2015	FB	300,000	
Plano	500,000	2015	BOB / IFB	200,000	
Boyce	150,000	2015	BOB / IFB	100,000	
					$ 800,000
Phase 2					
Lovers Lane	2,000,000	2016	BOB / IFB	$ 650,000	
Hadley	100,000	2018	BOB / IFB	100,000	
Highway 31-W	500,000	2018	BOB / IFB	200,000	
Pleasant Hill	500,000	2018	BOB / IFB	200,000	
Highway 68 West	200,000	2020	FB	250,000	
Bays Fork	300,000	2020	FB	300,000	
					$ 1,700,000
Phase 3					
Girkin	500,000	2021	FB	$ 350,000	
Plum Springs No. 3	1,200,000	2021	FB	550,000	
Hayes No. 1	100,000	2022	FB	100,000	
Highway 526	500,000	2022	FB	350,000	
Plum Springs No. 2	500,000	2022	FB	350,000	
Hammit Hill	300,000	2022	FB	200,000	
Richardsville	100,000	2023	BOB / IFB	200,000	
Riverside	50,000	2029	BOB / IFB	100,000	
Mizpah	1,000,000	2030	BOB / IFB	400,000	
Three Springs	2,000,000	2030	BOB / IFB	550,000	
Plano	500,000	2030	FB	600,000	
					$ 3,750,000
GRAND TOTAL					**$ 6,250,000**

Note: BOB = Brush-Off Blast
FB = Full Blast
IFB = Interior Only Full Blast

CAPITAL IMPROVEMENT PLAN SUMMARY

The proposed Capital Improvement Plan is summarized generally in Table 10. The various phases of construction will allow Warren Water to keep pace with the projected increases in system demand throughout the service area. The capital projects will also allow Warren Water to maintain storage capacity above the average daily demand throughout the planning period. This will ensure a high level of service reliability, and fulfill the requirements of the Kentucky PSC regarding storage capacity. However, increasing storage capacity must be considered carefully. Excess storage capacity can result in a decrease in water quality. As water quality regulatory requirements continue to increase, Warren Water must strike a balance between emergency capacity and water quality. Careful planning and operation can result in a system that can operate effectively, even during emergencies, while maintain the highest standards for water quality.

The proposed improvements will enhance Warren Water's ability to attract and support residential, commercial, and industrial development; meet fire protection standards more readily; and increase reliability throughout the water system.

TABLE 10

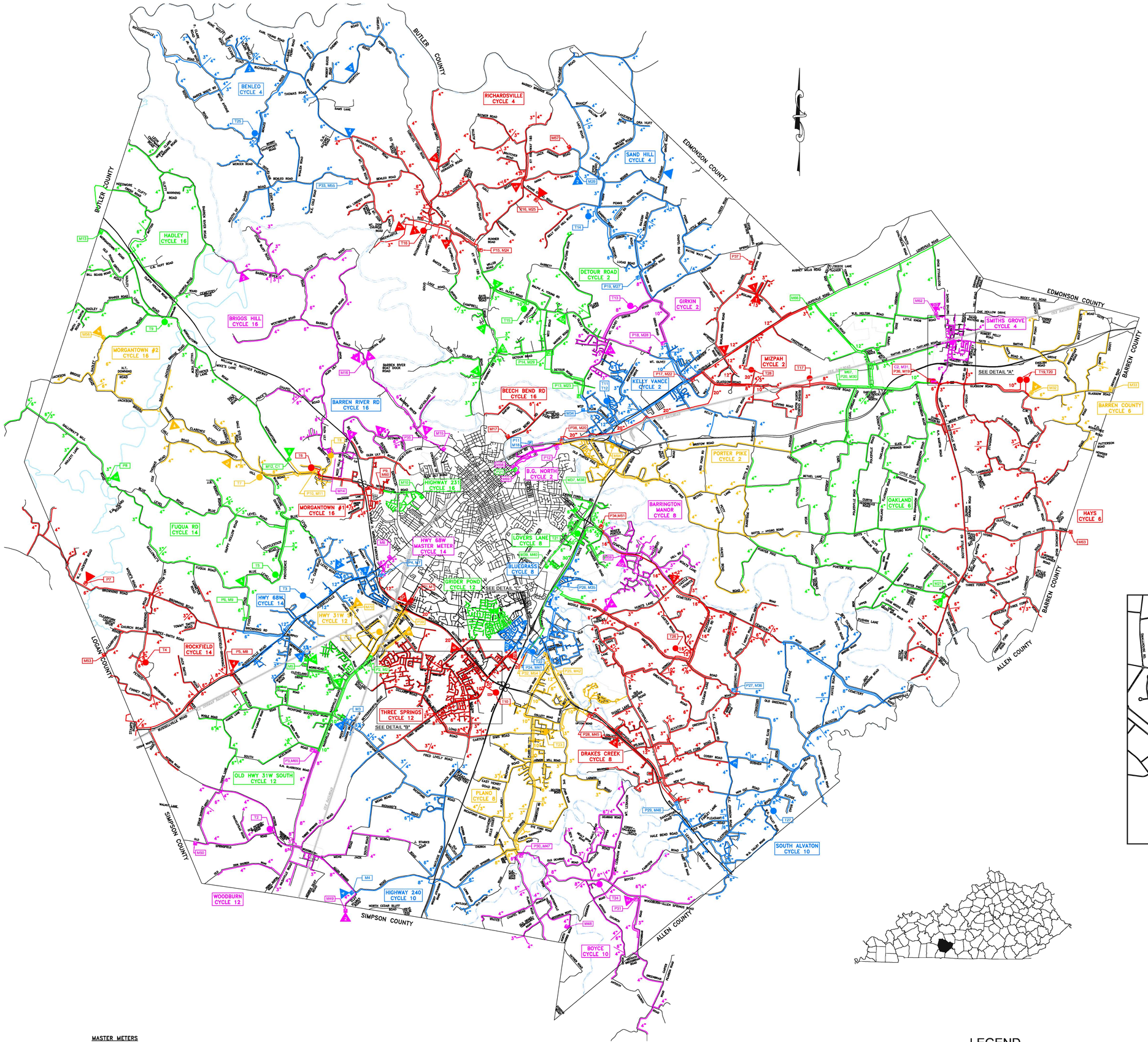
Overall Capital Improvement Plan Summary

Phase	Proposed Water Lines (miles)	Proposed Pump Stations[1]	Increased Storage Capacity (Gal)[2]	Total System Storage Capacity (Gal)	Average System Demand (GPD)	Project Cost (2013 $)	Maintenance (2013 $)	Standby Supply (2013 $)	Total Cost (2013 $)
Existing				11,900,000	7,367,600				
1	5.8	2	100,000	12,000,000	8,400,500	$2,130,000	$800,000	$120,000	$3,050,000
2	6.6	5	400,000	12,400,000	10,122,100	3,540,000	1,700,000		5,240,000
3	5.1	7	900,000	13,300,000	11,580,800	4,070,000	3,750,000		7,820,000
4	4.0	1	500,000	13,800,000	13,112,200	1,980,000			1,980,000
					TOTAL	**$ 11,720,000**	**$ 6,250,000**	**$ 120,000**	**$ 17,970,000**

[1] Including major upgrades and relocations
[2] Adjusted for tanks removed from service

APPENDIX A

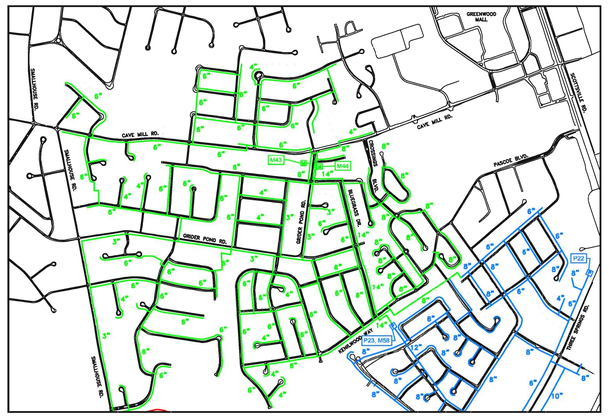
EXISTING SYSTEM MAP



DETAIL 'A' (SCALE: 1" = 1,000')

DETAIL 'B' (SCALE: 1" = 2,000')

DETAIL 'C' (SCALE: 1" = 1,000')



MASTER METERS

ID	NAME	SIZE
M1	HWY 31W SOUTH	6"
M2	OLD 31W SOUTH	6"
M3	RICHPOND AT SCHOOL	1"
M4	HWY 240 AT PRV	4"
M5	MOREHEAD ROAD	4"
M6	HWY 68 WEST	4"
M7	HWY 68 WEST	4"
M8	ROCKFIELD	4"
M9	FUQUA ROAD	4"
M10	HWY 231	4"
M11	MORGANTOWN ROAD #2	4"
M12	HADLEY	4"
M13	BUTLER COUNTY LINE	2"
M14	BRIGGS HILL ROAD	4"
M15	BARREN RIVER ROAD #1	4"
M16	BARREN RIVER ROAD #2	6"
M17	BEECH BEND ROAD	6"
M18	KELLY VANCE	10"
M19	HAYS	4"
M20	MIZPAH	10"
M21	THREE FORKS	3"
M22	FIRESTONE	6"
M23	TANGLEWOOD	6"
M24	RICHARDSVILLE	4"
M25	OLD SANDHILL	4"
M26	ANNA	2"
M27	SANDHILL	4"
M28	GIRKIN	4"
M29	OLD DETOUR ROAD	4"
M30	OLD HAYS	6"
M31	SMITHS GROVE	4"
M32	BARREN COUNTY	4"
M33	BARREN CO. LINE	4"
M34	WATER PLANT	4"
M35	OLD MIDDLE BRIDGE	4"
M36	GREENHILL	4"
M37	CEMETERY ROAD	24"
M38	CEMETERY ROAD	6"
M39	LOVERS LANE	4"
M40	LOVERS LANE	3"
M41	GREENWOOD	6"
M42	PLANO	6"
M43	GRIDER POND	6"
M44	OAKLAND #2	4"
M45	NORTH ALVATON	6"
M46	SOUTH ALVATON	4"
M47	BOYCE	4"
M48	GOODRUM	2"
M49	STARKS ROAD	2"
M50	SPRINGFIELD	2"
M51	DRAKES CREEK	4"
M52	HIGH SERVICE	24"
M53	LOGAN COUNTY	2"
M54	GREENWOOD #2	10"
M55	BENLEO	3"
M56	HADLEY-COHRON	4"
M57	JACK SIMMONS	3"
M58	BLUEGRASS #2	6"
M59	BARRINGTON MANOR	6"
M60	MORGANTOWN #1	6"
M61	TREATMENT PLANT (M.L.S.)	10"
M62	LITTLE KNOB (M.L.S.)	4"
M63	HWY 1297	1½"
M64	PORTER PIKE	6"
M65	MCELWAIN	6"
M66	OAKLAND #1	6"
M67	OAKLAND #2	4"
M68	BG NORTH #1	10"
M69	BG NORTH #2	10"

TANKS

ID	NAME	O.F. ELEV.	GALLONS
T1	HWY 31 W SOUTH	758.00	500,000
T2	WOODBURN	855.00	150,000
T3	HWY 68 WEST	825.00	200,000
T4	PETROS	805.00	300,000
T5	BLUE LEVEL ROAD	895.50	95,000
T6	MORGANTOWN ROAD	715.56	100,000
T7	HAMMITT HILL	872.00	300,000
T8	BRIGGS HILL	871.67	100,000
T9	HADLEY	780.00	100,000
T10	THREE SPRINGS RD.	758.00	2,000,000
T11	PLUM SPRINGS #2	698.00	500,000
T12	PLUM SPRINGS #3	698.00	1,200,000
T13	GIRKIN	836.00	500,000
T14	SANDHILL	836.50	108,000
T15	HWY 526	783.50	500,000
T16	RICHARDSVILLE	867.00	100,000
T17	OAKLAND (M.L.S.)	735.00	50,000
T18	SMITHS GROVE	745.00	100,000
T19	HAYS #1	884.80	100,000
T20	HAYS #2	885.00	200,000
T21	LOVERS LANE	684.00	2,000,000
T22	GREENWOOD	758.42	250,000
T23	PLANO	758.00	500,000
T24	BOYCE	830.00	150,000
T25	RIVERSIDE	855.00	50,000
T26	PLEASANT HILL	785.00	500,000
T27	BAYS FORK	810.00	300,000
T28	MIZPAH	790.00	1,000,000

CONTROL VALVES

ID	NAME
C1	HWY 231
C2	SMITHS GROVE

PUMP STATIONS

ID	NAME	G.P.M.
P1	PARKWAY	900
P2	OLD 31W SOUTH (M.L.S.)	600
P3	MCELWAIN	570
P4	HWY 68 WEST	700
P5	ROCKFIELD	200
P6	FUQUA	175
P7	BROWNING ROAD	150
P8	HWY 1083	40
P9	MORGANTOWN ROAD #1	700
P10	MORGANTOWN ROAD #2	420
P11	KELLY VANCE	2400
P12	RIDGEWAY	980
P13	TANGLEWOOD	600
P14	OLD DETOUR ROAD (M.L.S.)	350
P15	RICHARDSVILLE	200
P16	OLD SANDHILL (M.L.S.)	130
P17	FIRESTONE	500/1000
P18	GIRKIN	250
P19	SANDHILL	150
P20	OLD HAYS (M.L.S.)	450
P21	HIGH SERVICE P.S. #2	2500/5000
P22	OLD GREENWOOD (M.L.S.)	370
P23	BLUEGRASS (M.L.S.)	1400
P24	GREENWOOD	2100
P25	PLANO	750
P26	OLD MIDDLE BRIDGE (M.L.S.)	260
P27	GREENHILL	300
P28	NORTH ALVATON	300
P29	SOUTH ALVATON	200
P30	BOYCE	280
P31	GREENBRIAR	60
P32	GREENWOOD #2	2400
P33	BENLEO	160
P34	DRAKES CREEK	1200
P35	BARREN RIVER ROAD (FIRE BOOSTER ONLY)	450
P36	HAYS	250
P37	BOILING SPRINGS BOOSTER	20
P38	LOUISVILLE RD.	2550
P39	NASHVILLE RD.	850

LEGEND

- WATER MAIN
- 8" — WATER MAIN SIZE
- P — PUMP STATION
- M — MASTER METER
- PRV
- STORAGE TANK
- SOURCE NAME
- KELLY VANCE CYCLE 2 — BILLING CYCLE

Warren County Water District

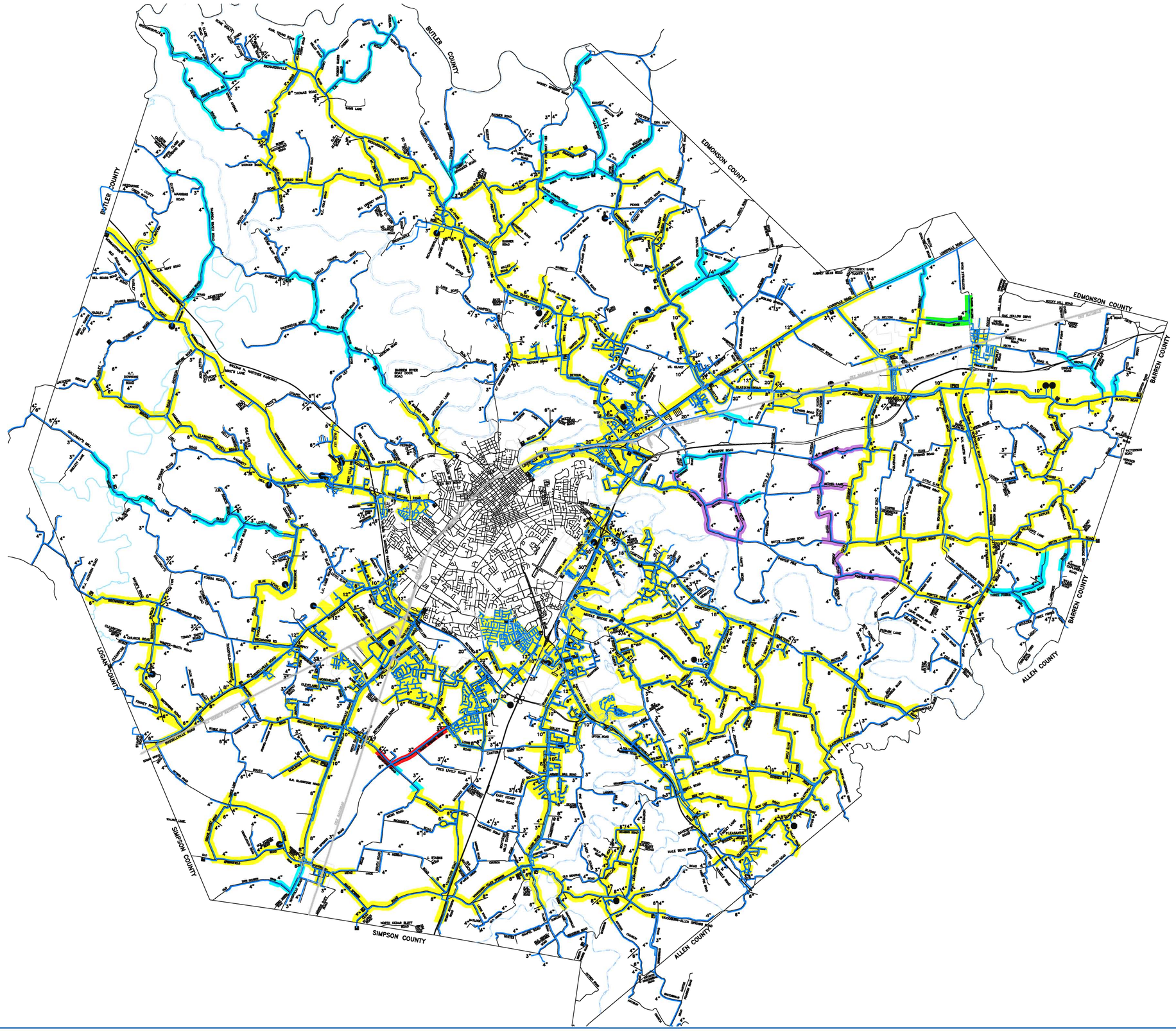
SYSTEM MAP

June 2013

Scale: 1" = 1 Mile

APPENDIX B

FIRE PROTECTION MAP



LEGEND

- WATER LINE
- 4" — WATER SIZE
- P — PUMP STATION
- M — MASTER METER
- STORAGE TANK
- EXISTING FIRE FLOW
- FIRE FLOW RESULTING FROM CAPITAL IMPROVEMENT PLAN PHASE 1
- FIRE FLOW RESULTING FROM CAPITAL IMPROVEMENT PLAN PHASE 2
- FIRE FLOW RESULTING FROM CAPITAL IMPROVEMENT PLAN PHASE 3
- FIRE FLOW RESULTING FROM CAPITAL IMPROVEMENT PLAN PHASE 4
- REMAINING AREA FROM 1993 FROM CAPITAL IMPROVEMENT PLAN

WC WD

Warren County Water District

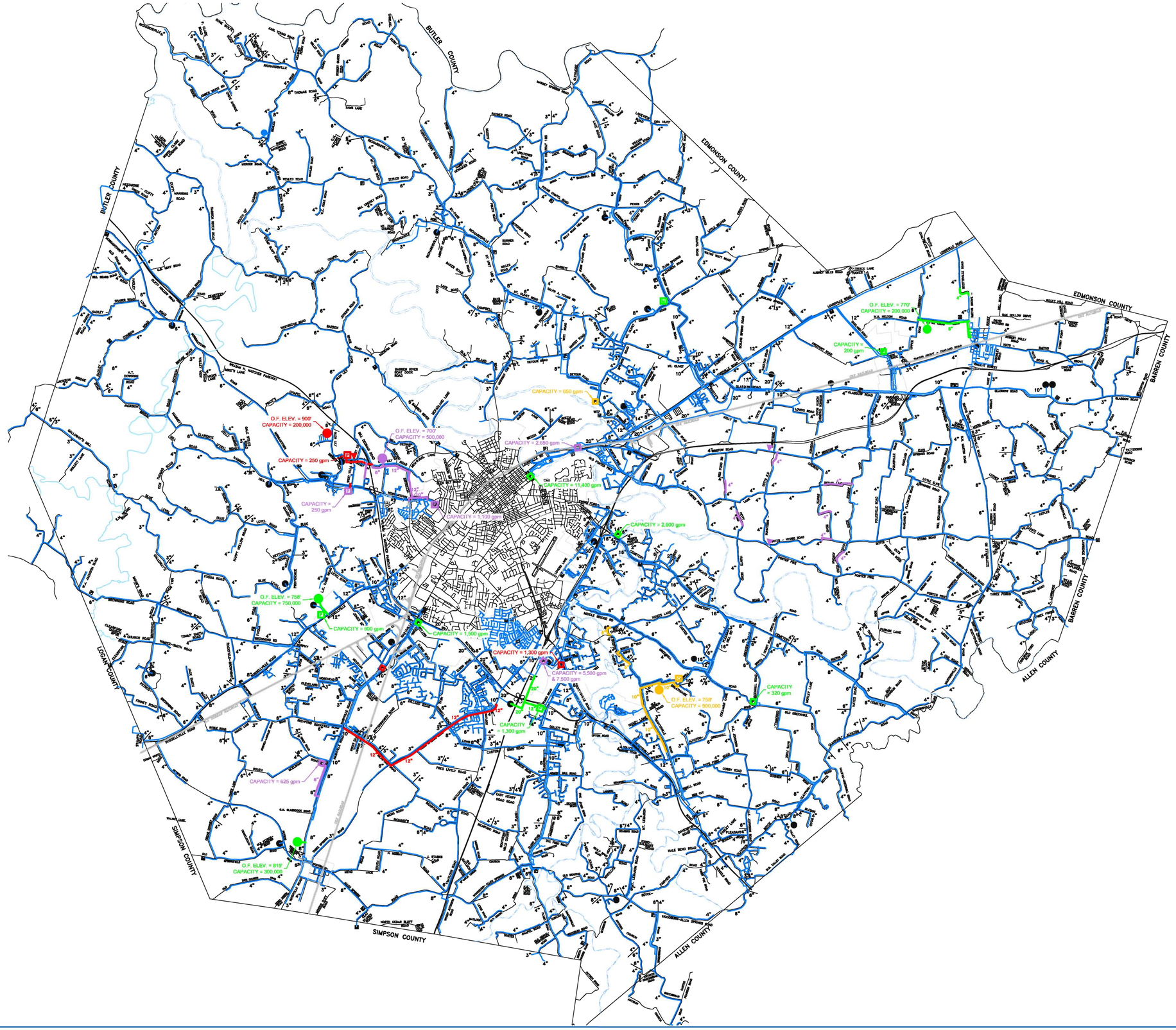
FIRE FLOW MAP

June 2013

Scale: 1" = 7,000'

APPENDIX C

2013 CAPITAL IMPROVEMENT PLAN MAP



LEGEND

- PHASE 1 PROJECTS (2014-2015)
- PHASE 2 PROJECTS (2016-2020)
- PHASE 3 PROJECTS (2021-2030)
- PHASE 4 PROJECTS (2031-2040)
- EXISTING WATER MAIN
- 6" WATER MAIN SIZE
- [P] PUMP STATION
- [M] MASTER METER
- [C] CONTROL VALVE
- ▼ PRESSURE REDUCING VALVE
- ● STORAGE TANK

WC WD

Warren County Water District

2013 CAPITAL IMPROVEMENT PLAN

June 2013

Scale: 1" = 7,000'