Town of Frederick
Raw Water Infrastructure
Master Plan

Prepared for:

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TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1
- 1.1 Limits of Study 1
- 1.2 Mapping & Surveying 1

2.0 RAW WATER IRRIGATION DEMANDS 1
- 2.1 Irrigation Areas 1
- 2.2 Irrigation Demands 2

3.0 POLICY RECOMMENDATIONS/ASSUMPTIONS 2

4.0 EXISTING RAW WATER IRRIGATION SYSTEMS 3
- 4.1 Existing System 1 3
- 4.2 Existing System 2 4

5.0 SYSTEM DEMANDS & DELIVERY 6
- 5.1 System A 7
- 5.2 System B 9
- 5.3 System C 11
- 5.4 System D 13
- 5.5 System E 14
- 5.6 System F 16
- 5.7 System G 18
- 5.8 Phase 1 Infrastructure Improvements 19

6.0 RAW WATER IRRIGATION MODEL 20
- 6.1 Introduction 20
- 6.2 Assumptions 20
- 6.3 EPANet Input 21
- 6.4 EPANet Output 21

7.0 ANALYSIS OF COST 21

TABLES

		Page
Table 1	Raw Water Demands by Property (Irrigating 7 Days per Week) Condensed	Tables
Table 1.1	Raw Water Demands by Property (Irrigating 7 Days per Week) Expanded	Tables
Table 2	Existing System 1-Bella Rosa Golf Course Raw WaterDemands	4
Table 2.1	Existing Pond C Volume	4
Table 2.2	Existing Raw Water Demand and Volume for Bella Rosa Golf Course-North Pond	4
Table 3	Existing System 2-Centennial Park Raw Water Demands	5
Table 3.1	Existing Pond C Volume	6
Table 3.2	Existing Raw Water Demand and Volume for Pond C	6
Table 4	System A Raw Water Demands	7
Table 4.1	Proposed Pond WP Volume	8
Table 4.2	Usable Pond WP Volume	8
Table 4.3	Raw Water Demand and Volume for Pond WP	8
Table 5	System B Raw Water Demands	9
Table 5.1	System A Shoulder Months Demands	10
Table 6	System C Raw Water Demands	12
Table 6.1	Existing Pond C Volume	12
Table 6.2	Raw Water Demand and Volume for Existing Pond C	12
Table 7	System D Raw Water Demands	13
Table 8	System E Raw Water Demands	15
Table 8.1	System E Shoulder Months Demands	15
Table 9	System F Raw Water Demands	17
Table 9.1	Frederick High School Raw Water Demands	17
Table 9.2	Existing Pond F Volume (Centennial Park Pond)	17
Table 9.3	Usable Pond F Volume	17
Table 9.4	Raw Water Demand and Volume for Pond F	17
Table 10	System G Raw Water Demands	18
Table 11	Phase 1 Pipeline Raw Water Demands	20

FIGURES

Figure 1	Future Infrastructure and Service Areas (Systems A-G)
Figure 2	Existing Raw Water System 1-Bella Rosa Golf Course
Figure 3	Existing Raw Water System 2-Centennial Park
Figure 4	Raw Water Infrastructure-System A
Figure 5	Raw Water Infrastructure-System B
Figure 6	Raw Water Infrastructure-System C
Figure 7	Raw Water Infrastructure-System D
Figure 8	Raw Water Infrastructure-System E
Figure 9	Raw Water Infrastructure-System F
Figure 10	Raw Water Infrastructure-System G
Figure 11	Raw Water Infrastructure-Phase 1 Pipeline

APPENDICES

Appendix A	EPANet Output
Appendix B	Engineers Opinion of Cost

1.0 INTRODUCTION

Civil Resources, LLC was retained by the Town of Frederick to analyze the existing raw water infrastructure and prepare a Raw Water Irrigation Master Plan for irrigating public areas in the Town of Frederick. Currently, most public parks and open spaces are irrigated with potable water supplied by the Town's potable water system except: 1) Bella Rosa Golf Course; 2) the park area on the east side of Milavec Lake; 3) Colorado Boulevard (Weld County Road 13) trail landscaping (east side of WCR 13 between Hwy 52 and WCR 16); 4) Crist Park; and 5) Centennial Park. These areas are irrigated with the Town's existing raw water system. This report analyzes the raw water irrigation demands, existing raw water infrastructure, future infrastructure, areas of irrigation, and provides a plan to provide raw water irrigation within the limits of study.

1.1 Limits of Study

The limits of study for this report are separated into West of Interstate 25 (I-25) and East of I-25 for discussion and planning purposes. West of I-25 the limits of study are bound by Weld County Road (WCR) 18 to the north, west I-25 Frontage Road to the east, State Highway 52 (SH 52) to the south and WCR 5.5 to the west. This area encompasses approximately three square miles. East of I-25 the limits of study include the entire area included in the Town of Frederick's Planning Boundary which includes approximately 11.5 square miles. See Figure 1 for a map of the areas contemplated for raw water irrigation by this plan.

This study presents one alternative for serving raw water irrigation to existing and future developments, however, the sequence of development and the level of participation by Developers may make other alternatives or modifications to this plan more practical. Therefore, this document should be used as a guideline and may need updating as development occurs.

1.2 Mapping and Surveying

United States Geological Survey (USGS) Quad maps containing contours at ten foot intervals were used for estimating elevations in the EPANet Raw Water Model. Final Plat linework for existing subdivisions, when available, was added to the USGS maps to identify the areas that require irrigation. Civil Resources completed topographic and feature surveying along the proposed alignment of the Phase 1 as necessary to complete the design of these improvements where detailed survey was not available.

2.0 RAW WATER IRRIGATION DEMANDS

Irrigation demand is specific to plant type, weather, and application method and will vary from one development to the next. However, reasonable estimates for irrigation demand are needed to plan a reliable and cost-effective Raw Water Irrigation Master Plan. The following information provides the basis for projecting these demands.

2.1 Irrigation Areas

Irrigation areas were estimated based on the following assumptions:

- Each future development contains 25% Open Space (Town of Frederick requirement)
- Each development is required to irrigate the adjacent half of the Right-of-Way for all Arterial Roadways
- Irrigation areas for existing subdivisions are based on AutoCAD drawings from recorded subdivision plats

2.2 *Irrigation Demands*

Irrigation demands were estimated based on the following assumptions:

- 25% - Turf Grass
- 50% - Native Grass
- 5% - Trees/Flowers requiring drip irrigation
- 20% - unirrigated

The Town does not have specific requirements as to the area of turf grass, native grasses, trees/flowers or unirrigated areas that are required in open space. The above percentages were estimated to be reasonable based on existing developments and conversations with Ms. Jennifer Simmons, Planning Director for the Town of Frederick. The general formula for calculating annual irrigation demand is shown below:

$$V = (A_1 \times GC_1 \times D_1) + (A_2 \times GC_2 \times D_2) + \ldots (A_n \times GC_n \times D_n)$$

where V = Irrigation Volume (acre-feet/yr)
A = Total irrigated area (acres)
GC = ground cover type (percent)
D = depth of water required for ground cover type, application method (feet/yr)

The formula above results in the volume of water required per year for each individual irrigated areas. The annual amount of irrigation above is based on average irrigation use and is generally accepted even though actual usage may vary from year to year. This study assumes the following annual amount of irrigation water (D):

- 2.50 feet/year – Turf Grass
- 1.20 feet/year – Native Grass (first three growing seasons only)
- 1.20 feet/year – Trees/Flowers requiring drip irrigation
- 0.00 feet /year – Unirrigated areas

This report assumes that all irrigated areas will be watered for one hour per day, seven days a week for the 180 day growing season. This assumption allows for flexibility in watering patterns, zones and days (e.g. Zones 1-3 could be run for 20 minutes each Mon., Wed., and Sat.; while Zones 4-6 could be run for 20 minutes each Tues., Thur., and Sun). A maximum day demand factor of 1.15 (15%) was applied to the raw water irrigation demands for each property to account for leakage and irrigating multiple areas simultaneously.

3.0 *POLICY RECOMMENDATIONS/ASSUMPTIONS*

This report is intended to be used as a guide for supplying raw water irrigation to the areas shown in Figure 1. Each property that develops should submit to the Town a detailed raw water irrigation plan, model and calculations verifying the raw water requirements are consistent with this report. Since land use and development plans change, properties may be temporarily tied into a raw water system other than shown in this report. For example, a property shown in raw water System B may temporarily be connected to System E. As raw water demands increase all temporary connections should be removed and permanent connections made per the recommendations in this report unless adequate capacity is available.

Typically, the Town of Frederick will own and maintain all infrastructure required to deliver the daily raw water volume to each property. The exception to this is System D. Properties D1 (Hinkle Farms), D2 (Westervelt Annexation), D3 (HCT Annexation), and D4 (Nelson Annexation) will be responsible for constructing, owning and maintaining the diversion structure and all infrastructure required to convey irrigation water from the Lower Boulder Ditch to ponds on each property.

Several properties along the Phase I pipeline are anticipated to be irrigated directly from the delivery main by connecting directly to the raw water main using the pressure from the system to irrigate. Depending on the timing of development these properties may require an in-line filter and booster pump at the raw water main. Since these pressurized raw water systems impact pipe size and timing of delivered raw water they will only be allowed at the Town of Frederick's discretion. For all pressurized systems the Town will specify the time of day when irrigation occurs.

Regardless of whether a property has a raw water pond or is connected directly to the raw water main (pressurized system) the property owner, HOA or Metro District will own and maintain all raw water infrastructure on their property and all infrastructure to deliver the raw water to the areas that require irrigation.

4.0 EXISTING RAW WATER IRRIGATION SYSTEM

Currently, the Town of Frederick has two separately operated raw water irrigation systems in-place. A description of each system follows and are illustrated on Figures 2 and 3.

4.1 Existing System 1

The infrastructure of *Existing System 1* consists of an 8-inch diameter gravity pipeline that conveys raw water by gravity from the Milavec Lake Secondary Outlet to the South and North Ponds in the Bella Rosa Golf Course. The South Pond has a maximum storage volume of 10.8 acre-feet and irrigates approximately 80% of the golf course with a pump that is rated at 450 gallons per minute (gpm) at 90 pounds per square inch (psi). The North Pond has a maximum storage volume of 2.5 acre-feet and irrigates the remaining 20% of the golf course with a pump rated for 165 gpm at 70 psi. Existing System 1 contains currently unallocated capacity that will be utilized to irrigate additional areas in No Name Creek to the north of the Golf Course and Moore Farms to the west.

Telemetry is used to automate filling of both the North and South Ponds at Bella Rosa Golf Course based on minimum pond levels. The calculated gravity delivery capacity of the 8-inch line to the ponds is approximately 1.0 and 1.4 cfs to the North and South Ponds respectively. The calculation is based on the minimum head differential conditions (4932.0 feet in Milavec and 4920.0 feet in ponds)

Table 2 - Existing System 1-Bella Rosa Golf Course Raw Water Demands Raw Water Source - Existing North Pond at Bella Rosa Golf Course			
Property	[1]Demand (gpm)	[2]Native Irr. Demand (gpm)	Irr. Hours (hr)
Bella Rosa Golf Course (north pond)	2,185	0	Varies
[3]Native (20% of Demand)	N/A	N/A	N/A
Totals	**2,185**		

Bella Rosa North Golf Course Pond irrigates approximately 131,100 gallons per day

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)

[2]This report assumes that 20% of the revegetated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

Table 2.1-Existing Pond C Volume			
Elevation (ft)	Area (sf)	Cumulative Volume (cf)	Volume (ac-ft)
4915	724	0	0.000
4916	2,710	1,717	0.039
4917	4,736	3,723	0.125
4918	6,818	5,777	0.258
4919	11,609	9,214	0.469
4920	14,828	13,219	0.772
4921	19,958	17,393	1.172
4922	24,210	22,084	1.679
4923	27,782	25,996	2.276

Table 2.2-Existing Raw Water Demand and Volume for Bella Rosa Golf Course-North Pond		
Total volumed used per day:	131,100 0.40	gallons ac-ft
Available volume in top two feet of pond:	0.91	ac-ft
Max inflow rate to north pond:	450	gpm
Time to fill pond with max day volume:	4.86	hours

4.2 Existing System 2

The infrastructure of *Existing System 2* consists of a two vertical turbine pumps located in the pump house wet well on the northeast side of Milavec Lake. The primary outlet works from Milavec Lake discharges water to the wet well where the five horsepower (HP) pump irrigates the turf grass in the park area immediately adjacent to Milavec Lake. The 60 HP pump delivers raw water from Milavec Lake in an 8-inch waterline located within the Colorado Boulevard ROW to Centennial Park south of Old Town Frederick. This pump is rated at 850 gpm at 220 feet of total dynamic head (TDH). Currently, there are no irrigation taps off this line as it is only used to fill the existing pond at Centennial Park.

Centennial Park pond has a maximum storage capacity of 12.3 acre-feet and surface area of approximately 1.9 acres. The pump house contains a 40 HP vertical turbine pump that delivers irrigation water through an existing 4-inch pipe from the pumphouse to Colorado Boulevard delivering pressurized flow to the trail landscaping from 8th Street to WCR 16 (1st Street). There is a 2-inch line that tees off of the 4-inch line which is used to irrigate Crist Park located on the northeast corner of 5th Street and Main Street. This system also irrigates the turf grass within the Centennial Park Ball Fields and the berms on the south side of Eighth Street. There is also an existing wet well and a 6-inch pipe from the pumphouse that runs to the northeast that is intended to provide raw water irrigation to St. Vrain Valley School District's Frederick Campus but is not currently in operation. Figure 3 shows the approximate irrigation areas that are currently irrigated with raw water. Existing System 2 contains additional capacity that will be utilized to irrigate more area to the east of Centennial Park and along Colorado Boulevard between SH 52 and WCR 16.

Existing System 2 is currently equipped with telemetry to automate the filling of the Centennial Park pond, however, based on conversations with the Town Staff the telemetry equipment has not worked since it was installed. This equipment must be repaired and utilized for the future infrastructure improvements outlined in this report to function as designed. Repairing the existing equipment and determining the future telemetry equipment is beyond the scope of this project.

Table 3 - Existing System 2-Centennial Park Raw Water Demands
Raw Water Source - Centennial Park Pond

Property	[1]Demand (gpm)	[2]Native Irr. Demand (gal)	Total Demand per Day (gal)		Total Demand per Day (af)
Property Currently Irrigated by Pond					
Crist Park	204	0	12,232		0.04
Centennial Park-Ball Fields	363	0	21,809		0.07
Centennial Park-8th Street Berms	414	0	24,827		0.08
		Total Gallons per Day	**58,867**		
		Maximum Inflow from Existing 8-inch pipe	**750**	**gpm**	
		Time to Fill Pond	**1.3**	**Hours**	

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)
[2]This report assumes that 20% of the revegitated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

Table 3.1 - Existing Pond F Volume			
Elevation (ft)	Area (sf)	Cumulative Volume (cf)	Volume (ac-ft)
4077	9,909	0	0.000
4078	16,456	13,183	0.303
4079	22,433	32,627	0.749
4080	29,177	58,432	1.341
4081	38,897	92,469	2.123
4082	45,997	134,916	3.097
4083	51,631	183,730	4.218
4084	59,410	239,251	5.492
4085	70,640	304,276	6.985
4086	75,132	377,162	8.658
4087	79,626	454,541	10.435

With the current raw water demand the water level in the existing pond at Centennial Park drops approximately 1.5 inches per day.

Table 3.2 - Existing Raw Water Demand and Volume for Existing Pond F		
Total volume used per day:	58,867 0.18	gallons ac-ft
Available volume in top two feet of pond:	3.17	ac-ft
Max inflow rate to Centennial Park pond:	450	gpm
Time to fill pond with max day volume:	2.18	hours

5.0 SYSTEM DEMANDS & DELIVERY

The proposed raw water infrastructure is divided into seven separate systems designated as Systems A through G. The systems are separated into respective systems based upon the local raw water storage facility serving each system. All future infrastructure improvements are sized to provide the daily volume of raw water to a pond on each development. These ponds on each development will be owned and maintained by the property owner, Home Owners Association or Metro District. Each development is responsible for distributing the raw water from their pond to areas that require irrigation. The existing pond at Centennial Park and the North Pond at the Bella Rosa Golf Course currently have sufficient volume and top of pond area therefore do not require any modifications to the pond grading. All future ponds shall be designed such that the water surface elevation does not drop more than two feet per day during maximum irrigation flows. All ponds should be constructed with telemetry that is compatible with the Towns existing system and activated when the water surface elevation reaches a minimum level. Under no circumstances shall any pond require manual operation to fill.

Following is a description and design basis for the Phase 1 improvements that will be built in early 2008 and Systems A through G that will be constructed in the future.

5.1 System A

System A is planned to meet irrigation demand projected for the area within the limits of study on the west side of I-25. This area is composed of Sections 27 and 34 and the east half of Sections 28 and 33. See Figure 4. A diversion structure on the Lower Boulder Ditch will supply raw water to the proposed pond located on the northeast corner of the Wyndham Hill Development. This diversion structure, pond and pumphouse are currently being designed as part of the Phase 1 infrastructure improvements. The pump house located at this pond will supply irrigation water to fill the future ponds on each of the following developments:

- A1 (Wyndham Hill) – 169.89 irrigated acres
- A2 (Wildflower) – 70.10 irrigated acres
- A3 (Future Development) – 43.87 irrigated acres
- A4 (Future Development) – 43.87 irrigated acres
- A5 (Future Development)– 43.87 irrigated acres
- A6 (Doering/Modrall West Annexation) – 38.87 irrigated acres
- Future Development outside limits of study – approximately 1,475 irrigated acres

See Figure 4 for a map of System A and Table 4 for System A demands and Pond A volume. The pump located in the wet well on the Wyndham Hill raw Water Pond for System A is proposed to be a vertical turbine variable speed pump rated for 1400 gpm at 140 feet of total dynamic head. An additional demand of 454,128 gallons per day was added for future development outside the limits of study.

Table 4 - System A Raw Water Demands
Raw Water Source-Phase 1 Pond WP located on the Southwest corner of WCR 16 and the West Frontage Road (Wyndham Hill)

Property	[1]Demand (gpm)	[2]Native Irr. Demand (gpm)	Total Gal/day (gal)		Total Demand per Day (af)
A2-Wildflower	1,656	1,181	113,542		0.35
A3-Future Development	1286	724	85,879		0.26
A4-Future Development	1286	724	85,879		0.26
A5-Future Development	1286	724	85,879		0.26
A6-Doering/Modrall West Annexation	1168	634	77,662		0.24
A1-Wyndham Hill	5222	2735	346,152		1.06
Property outside the scope of this Report					
North of WCR 18	6,624	4,724	454,128		N/A
Inflow - Total Gallons per Day			**1,249,120**		
Maximum Inflow from Lower Boulder Ditch			**1050**	**gpm**	
Time to Fill Pond Wyndham Hill Raw Water Pond			**19.8**	**hours**	
Outflow - Total Gallons per Day			**1,249,120**		
Average Delivery from pump			**1,300**	**gpm**	
Time to Fill Ponds on Each Property			**16.0**	**hours**	

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)

[2]This report assumes that 20% of the revegetated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

	Table 4.1 - Proposed Pond WP Volume To be built in Phase 1 in the NE corner of Wyndham Hill			
	Elevation (ft)	Area (sf)	Cumulative Volume (cf)	Volume (ac-ft)
	4969	0	0	0
	4970	24,823	12,412	0.28
	4971	48,438	49,042	1.13
	4972	61,296	103,909	2.39
	4973	64,791	166,953	3.83
	4974	68,342	233,519	5.36
	4975	71,948	303,664	6.97
	4976	75,614	377,445	8.66
	4977	78,668	454,586	10.44
	4978	81,766	534,803	12.28
2 foot drop	*4978.50*	*83,348*	576,082	13.23
	4979	84,925	618,150	14.19
1 foot drop	*4979.50*	*86,526*	661,013	15.17
	4980	88,099	704,669	16.18
Max WSEL	***4980.50***	***89,720***	749,124	17.20
	4981	91,311	794,381	18.24
	4982	94,562	887,318	20.37

Table 4.2 - Usable Pond WP Volume		
Top 1 foot	2.02	ac-ft
Top 2 feet	3.97	ac-ft

Table 4.3 - Raw Water Demand and Pond WP Volume To be built in Phase 1 in the NE corner of Wyndham Hill		
Total volumed used per day:	1,249,120 3.83	gallons ac-ft
Available volume in top two feet of pond:	3.97	ac-ft
Maximum inflow rate to Pond WP:	1050	gpm
Time to fill pond with max day volume:	19.8	hours

5.2 *System B*

System B is planned to meet irrigation demand projected for the area generally bound by WCR 20.5 (north), WCR 11.5 (east), WCR 18 (south) and I-25 (west). See Figure 5. System B will supply irrigation water to fill the future ponds on each of the following developments:

- B1 (Waters Edge) – 20.48 irrigated acres
- B5 (Haley No. 2 Annexation) – 44.36 irrigated acres
- B6 (Future Development) – 44.36 irrigated acres
- B8 (Future Development) – 3.60 irrigated acres
- B9 (Doering/Modrall East Annexation) – 44.36 irrigated acres
- B10 (Johnson Farm Annexation) – 21.22 irrigated acres
- B11 (The Farm) – 25.70 irrigated acres

The following developments are proposed to be irrigated with the use of a booster pump at the connection to the main irrigation line adjacent to each property:

- B2 (Summit View Estates) – 6.77 irrigated acres
- B3 (Eagle Valley)– 7.62 irrigated acres
- B4 (Raspberry Hill Residential) – 24.34 irrigated acres
- B7 (Fox Run) – 17.47 irrigated acres

See Figure 5 for a map of System B and Table 5 for raw water irrigation demands. The pump located in the wet well for System B is proposed to be a vertical turbine variable speed pump rated for 1100 gpm at 185 feet of total dynamic head. The pumphouse/wet well proposed to be located on the west side of Milavec Lake as part of Phase 1 Improvements will house the vertical turbine pump for this system as well as System E.

Table 5 - System B Raw Water Demands
Raw Water Source-Milavec Lake

Property	[1]Demand (gpm)	[2]Native Demand (gpm)	Total Gal/Day		Total Demand per Day (af)
B1-Waters Edge	566	348	38,109		0.12
B5-Haley No. 2 Annexation	1,329	724	88,429		0.27
B6-Future Development	1,329	724	88,429		0.27
B8-Future Development	155	45	88,429		0.27
B9-Doering/Modrall East Annexation	1,329	724	88,429		0.27
B10-Johnson Farm Annexation	698	329	45,807		0.14
B11-The Farm	671	448	45,619		0.14
Booster Pump					
B2-Summit View Estates	204	68	13,082		N/A
B3-Eagle Valley	661	0	39,661		N/A
B4-Raspberry Hill Residential	668	415	45,053		N/A
B7-Fox Run	1,380	0	82,810		N/A
		Total Gallons per Day	**663,858**		N/A
		Maximum Delivery from Pipleline B	**1000**	**gpm**	
		Time to Fill Ponds	**11.1**	**hours**	

During shoulder months System B will fill the raw water ponds at Hickle Farms, HCT Annexation and the Westervelt Annexation. During non-shoulder months these properties fill their raw water ponds directly from the Lower Boulder Ditch.

Table 5.1 - System A Shoulder Months Demands					
Property	[1]Demand (gpm)	[2]Native Demand (gpm)	Total Gal/Day		Total Demand per Day (af)
D1-Hinkle Farms	546	272	36,014		0.11
D2-Westervelt Annexation	994	582	66,628		0.20
D3-HCT Annexation	1,336	762	89,330		0.27
Shoulder Month Demand For Future Ponds	N/A	N/A	200,000		
Gallons Per Day (System D & Future Demand)			**391,972**		
Gallons Per Day (System B)			**1,055,829**		
Total Gallons per Day			**1,447,801**		
Maximum Delivery from Pipeline B			**1,000**	**gpm**	
Time to Fill Ponds in Shoulder Months			**24.1**	**hours**	

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)

[2]This report assumes that 20% of the revegetated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

5.3 System C

System C is planned to meet irrigation demand projected for No Name Creek and the Moore Farm Detention Pond. See Figure 6. System C utilizes the existing water storage pond, pump and pumphouse at the North Pond. This pond is filled with raw water from Milavec Lake via the existing 8-inch gravity pipeline that starts at the existing outlet pipe on the secondary outlet works on the east side of Milavec Lake and continues north where it fills the South and North Pond at the Bella Rosa Golf Course. The existing pond and pump at the North Pond has sufficient capacity to irrigate the parks on each of the following developments:

- C2 (Moore Farms North Detention Pond) – 3.88 irrigated acres
- C3 (No Name Creek West Park) – 3.01 irrigated acres
- C4 (No Name Creek South Park, West Side of Road) – 0.72 irrigated acres
- C5 (No Name Creek South Park, East Side of Road) – 0.98 irrigated acres
- C6 (No Name Creek North Park, West Side of Creek) – 1.70 irrigated acres
- C7 (No Name Creek North Park, East side of Creek) – 0.67 irrigated acres
- C8 (No Name Creek East Entrance) – 1.06 irrigated acres
- C9 (WCR 20 from WCR 11.5 to WCR 13) – 1.79 irrigated acres

The following irrigated areas are currently irrigated with the existing north pond and pumphouse on the Bella Rosa Golf Course:

- C1 (North Area at Bella Rosa Golf Course) – 0.35 ac-ft (114,000 gallons) per day based on actual meter readings

See Figure 6 for a map of System C and Table 6 for raw water irrigation demands and Pond C volume. The existing 40 horsepower pump rated for 165 gpm at 220 feet of total dynamic head and the existing pond volume is sufficient for the additional irrigated areas listed above without any modifications.

Table 6 - System C Raw Water Demands Raw Water Source-Existing North Pond at Bella Rosa Golf Course				
Property	[1]Demand (gpm)	Native Irr. Demand (gpm)	[2]Supply (gpm)	Irr. Hours (hr)
Property Currently Irrigated by Pond				
C1-Bella Rosa Golf Course (north pond)	2,185	0	N/A	Varies
Property To Be Irrigated by Pond				
C2-Moore Farms	367	23	200	1.9
C3-No Name West Park	261	0	185	1.4
C4-South Park (west Side of Road)	62	0	185	0.3
C5-South Park (east Side of Road)	85	0	185	0.5
C6-North Park (west side of creek)	147	0	150	1.0
C7-North Park (east side of creek)	58	0	130	0.4
C8-No Name Creek East Entrance	92	0	160	1.6
C9-WCR 20 (WCR 11.5 to WCR 13)	155	0	155	1.0
Totals	**3,413**			**8.2**

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)

[2]Supply is the flowrate that raw water can be delivered in the main adjacent to the property with a minimum pressure of 40 psi. To obtain the supply only one property may be irrigating at any one time.

[3]This report assumes that 20% of the revegetated native areas per pond will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

Table 6.1 - Existing Pond C Volume			
Elevation (ft)	Area (sf)	Cumulative Volume (cf)	Volume (ac-ft)
4915	724	0	0.000
4916	2,710	1,717	0.039
4917	4,736	3,723	0.125
4918	6,818	5,777	0.258
4919	11,609	9,214	0.469
4920	14,828	13,219	0.772
4921	19,958	17,393	1.172
4922	24,210	22,084	1.679
4923	27,782	25,996	2.276

*No pond grading required for additional irrigation demand.

Table 6.2 - Raw Water Demand and Volume for Existing Pond C		
Total volumed used per day:	204,791 0.63	gallons ac-ft
Available volume in top two feet of pond:	0.91	ac-ft
Max inflow rate to north pond:	450	gpm
Time to fill pond with max day volume:	7.58	hours

5.4 *System D*

System D is planned to meet irrigation demand projected for the area generally bound by WCR 18 (north), WCR 11 (east), Hwy 52 (south), and I-25 (west). See Figure 7. The four properties that are located within these limits will fill their raw water ponds directly from the Lower Boulder Ditch The design and location of the ponds and diversion structures will occur when each property develops. During the shoulder months when the Ditch is dry the ponds on Properties D1, D2 & D3 will be filled daily via the 8-inch pipe in WCR 11 that is part of System B. The four properties that will fill their raw ponds directly off the Ditch are as follows:

- D1 (Hinkle Farms) – 17.19 irrigated acres
- D2 (Westervelt Annexation) – 34.80 irrigated acres
- D3 (HCT Annexation) – 45.97 irrigated acres
- D4 (Nelson Annexation) – 166.67 irrigated acres

See Figure 7 for a map of System D and Table 7 for raw water irrigation demands. No pumps are required for System D because when the Ditch is running the ponds will be filled directly off of the Ditch and when the Ditch is dry raw water will be supplied to the ponds via System B and D.

Table 7 - System D Raw Water Demands
Raw Water Source-Each property diverts directly off of the Lower Boulder Ditch

Property	[1]Demand (gpm)	[2]Native Demand (gpm)	Total Demand per Day (gpd)		Total Demand per Day (af)
D1-Hinkle Farms	546	272	36,014		0.11
D2-Westervelt Annexation	994	582	66,628		0.20
D3-HCT Annexation	1,336	762	89,330		0.27
D4-Nelson Annexation	4,382	2,897	297,660		0.91
		Total Gallons per Day	**489,631**		N/A

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)
[2]This report assumes that 20% of the revegetated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

5.5 *System E*

System E is planned to meet irrigation demand projected for properties generally along the alignment starting at the intersection of WCR 11.5/WCR 18 south to WCR 16, then turning east to WCR 19. See Figure 8. The water source for this system is Milavec Lake via a wet well located to the west of the lake. This is the same wet well and pumphouse constructed in Phase 1 that will be utilized in System B as well. The two systems share the wet well and pumphouse but do not share internal piping since under normal operating conditions they will operate as two separate systems. The wet well, pumphouse, 650 gpm interim pump and the mainline pipe from the wet well to Maple Street will be constructed with the Phase 1 improvements. See Section 5.8 for a detailed description of the Phase 1 improvements.

Ultimately, the wet well and pump configuration will supply irrigation water to fill all future ponds on each of the following developments:

- E1 (WCR 11.5 from WCR 16.5 to WCR 18) – 0.39 irrigated acres
- E2 (Meadowlark Business Park) – 20.20 irrigated acres
- E3 (Future Development) –19.79 irrigated acres
- E4 (West View) – 9.74 irrigated acres
- E5 (Strear Property) – 142.92 irrigated acres
- E9 (Future Development) – 20.17 irrigated acres
- E10 (Hidden Creek) – 26.48 irrigated acres
- E11 (Future Development) – 9.10 irrigated acres
- E12 (Future Development) – 51.38 irrigated acres
- E13 (Future Development) – 43.38 irrigated acres
- E14 (Future Development) – 3.38 irrigated acres
- E15 (Future Development) – 3.38 irrigated acres
- E16 (Future Development) – 3.38 irrigated acres
- E17 (Future Development) – 3.38 irrigated acres

The following developments will be irrigated with the use of a booster pump at the connection to the main irrigation line shown Figure 8.

- E6 (Fireman's Park) – 1.77 irrigated acres
- E7 (Maple Ridge II) – 8.45 irrigated acres
- E8 (Coal Ridge Estates) – 9.42 irrigated acres

During the shoulder months when the Lower Boulder Ditch is dry System E will provide the entire raw water irrigation demand to D4-Nelson Annexation and a portion of the raw water irrigation demand to Pond A located in System A. Other sources of raw water during the shoulder months will have to be provided from the area west of WCR 5 which is out of the scope of this report.

See Figure 8 for a map of System E and Table 8 for raw water irrigation demands. The pump located in the wet well for System E shall be a vertical turbine variable speed pump rated for 1300 gpm at 260 feet of total dynamic head.

Table 8 - System E Raw Water Demands Raw Water Source-Milavec Lake					
Property	[1]Demand (gpm)	[2]Native Demand (gpm)	Total Demand per Day (gpd)		Total Demand per Day (af)
E1-WCR 11.5 (WCR 16.5 to WCR 18)	34	0	2,030		N/A
E2-Meadowlark Commercial	540	349	36,580		0.11
E3-Future Development	536	339	36,227		0.11
E4-West View	230	161	15,712		0.05
E5-Strear Property	3,817	2,467	258,629		0.79
E9-Future Development	627	323	41,473		0.13
E10-Hidden Creek	799	431	53,133		0.16
E11-Future Development	317	136	20,653		0.06
E12-Future Development	1,434	869	96,475		0.30
E13-Future Development	1,244	724	83,328		0.26
E14-Future Development	293	0	17,593		0.05
E15-Future Development	293	0	17,593		0.05
E16-Future Development	293	0	17,593		0.05
E17-Future Development	293	0	17,593		0.05
Booster Pump					
E6-Firemans Park	154	0	9,213		N/A
E7-Maple Ridge II	244	140	16,344		N/A
E8-Coal Ridge Estates	224	171	15,481		N/A
		Total Gallons per Day	**755,649**		N/A
		Maximum Delivery from Pump at Milavec Lake	**800**	**gpm**	
		Time to Fill Ponds/Irrigate the Above Properties	**15.7**	**hours**	

Table 8.1 - System E Shoulder Months Demands					
Property	[1]Demand (gpm)	[2]Native Demand (gpm)	Total Demand per Day (gpd)		Total Demand per Day (af)
[3]D4-Nelson Annexation (System D)	4,382	2,897	**297,660**		0.91
[4]Wyndham Hill Pond (Phase 1)	N/A	N/A	**100,000**		
		Gallons per Day (System D & Phase 1 Pond)	**397,660**		
		Gallons per Day (System E)	**755,649**		
		Total Gallons per Day	**1,153,308**		
		Maximum Delivery from Pump at Milavec Lake	**800**	**gpm**	
		Time to Fill Ponds/Irrigate the Above Properties	**24.0**	**hours**	

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)

[2]This report assumes that 20% of the revegetated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

[3]System E provides the full demand of raw water for the Nelson Annexation in the shoulder months.

[4]System E provides 200,000 gallons per day of the total Phase 1 Pond demand of 1,249,120 gallons per day. Additional water storage sources located to the west will be determined in the future and will provide the balance of the daily raw water demand for

5.6 System F

System F is planned to meet irrigation demand projected for properties generally along the alignment starting at the existing raw water pond at Centennial Park east along WCR 14.5 to WCR 19. See Figure 9. System F utilizes the existing water storage pond and pumphouse at Centennial Park. This pond is filled with raw water from Milavec Lake via the existing 8-inch pipeline that starts at the existing pumphouse on the east side of Milavec Lake, south down Colorado Boulevard where it turns east just south of the regional detention pond and discharges into the pond at Centennial Park.

The existing pond and pump at Centennial Park have additional capacity to fill the future ponds on each of the following developments:

- F1 (Crist Park) – 2.35 irrigated acres
- F2 (Colorado Boulevard Median and East ROW) – 0.62 irrigated acres
- F3 (Centennial Park 8th Street Berms) – 4.77 irrigated acres
- F4 (Centennial Park Ball Fields) – 4.19 irrigated acres
- F5 (Miners Park Town Center) – 24.91 irrigated acres
- F6 (Carriage Hills Marketplace) – 11.06 irrigated acres
- F7 (Carriage Hills, Filing 2) – 6.86 irrigated acres
- F8 (Josephine Annexation) – 33.38 irrigated acres
- F9 (Future Development) – 43.38 irrigated acres
- F10 (Future Development) – 3.38 irrigated acres
- F11 (Future Development) – 19.85 irrigated acres
- F12 (Future Development) – 13.68 irrigated acres
- F13 (Future Development) – 3.38 irrigated acres
- F14 (St. Vrain Valley School District, High School Ball Fields) – 30.17 irrigated acres

The existing pond at Centennial Park has sufficient volume to supply raw water to irrigate the Frederick High School ball fields but lacks pump capacity. The St. Vrain Valley School District will need to provide and install their own pump in the wet well located to the east of the existing pumphouse. The Town of Frederick will meter and collect fees for their raw water usage.

See Figure 9 for a map of System F and Table 9 for raw water irrigation demands and Pond F volume. The existing pond and 40 horsepower pump rated for 500 gpm at 225 feet of total dynamic head located at the Centennial Park pond has sufficient capacity to fill ponds on the additional irrigated areas above.

Table 9 - System F Raw Water Demands Raw Water Source-Existing Pond Located at Centenial Park					
Property	[1]Demand (gpm)	[2]Native Irr. Demand (gal)	Total Demand per Day (gal)		Total Demand per Day (af)
F1-Crist Park	204	0	12,232		N/A
F2-WCR 13 Median & E. ROW	26	0	1,549		N/A
F3-Centenial Park-8th Street Berms	414	0	24,827		N/A
F4-Centenial Park-Ball Fields	363	0	21,809		N/A
F5-Miners Park Center	606	394	41,076		0.13
F6-Carriage Hills Marketplace	263	200	18,176		0.06
F7-Carriage Hills, Filing 2	595	0	35,721		0.11
F8-Josephine Annexation	786	543	53,700		0.16
F9-Future Development	1,244	724	83,328		0.26
F10-Future Development	293	0	17,593		0.05
F11-Future Development	773	273	49,637		0.15
F12-Future Development	626	161	39,506		0.12
F13-Future Development	293	0	17,593		0.05
		Total Gallons per Day	**416,745**		
		Pump Design Flowrate	**500**	**gpm**	
		Time to Fill Ponds/Irrigate on Above Properties	**13.9**	**Hours**	

Table 9.1 - Frederick High School Raw Water Demands					
Property	[1]Demand (gpm)	[2]Native Demand (gpm)	Total Demand per Day (gpd)		Total Demand per Day (af)
F14-Frederick High School Fields (SVVSD)	2,617	0	**157,032**		N/A
		Gallons per Day (SVVSD)	**157,032**		
		Gallons per Day (System F)	**416,745**		
		Total Gallons per Day	**573,777**		
		Maximum Delivery from Existing 8" Inflow Pipe From Milavec	**750**	**gpm**	
		Time to Fill Centenial Park Pond	**12.8**	**hours**	

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)

[2]This report assumes that 20% of the revegetated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

	Table 9.2 - Existing Pond F Volume (Centennial Park Pond)			
	Elevation (ft)	Area (sf)	Cumulative Volume (cf)	Volume (ac-ft)
	4077	9,909	0	0.000
	4078	16,456	13,183	0.303
	4079	22,433	32,627	0.749
	4080	29,177	58,432	1.341
	4081	38,897	92,469	2.123
	4082	45,997	134,916	3.097
	4083	51,631	183,730	4.218
2 foot drop	*4084*	*59,410*	*239,251*	*5.492*
1 foot drop	*4085*	*70,640*	*304,276*	*6.985*
Max WSEL	***4086***	***75,132***	***377,162***	***8.658***
Freeboard	4087	79,626	454,541	10.435

The existing pond at Centennial Park will drop approximately 1.1 feet per day.

Table 9.3 - Usable Pond F Volume		
Top 1 foot	1.67	ac-ft
Top 2 feet	3.17	ac-ft

Table 9.4 - Raw Water Demand and Volume for Pond F (Centennial Park Pond)		
Total volumed used per day:	573,777 1.76	gallons ac-ft
Available volume in top two feet of pond:	3.17	ac-ft
Max inflow rate to Centennial Park pond:	750	gpm
Time to fill pond with max day volume:	12.8	hours

5.7 System G

System G is planned to meet irrigation demand projected along Colorado Boulevard between WCR 16 and 18. See Figure 10. The raw water source for this system is Milavec Lake via the existing 8-inch pipeline in Colorado Boulevard from Milavec Lake to the Centennial Park Pond. The only modification to the existing 8-inch pipeline in Colorado Boulevard will be connecting sprinkler systems to the pipeline for the following developments:

- G1 (Van Deventer) – 2.50 irrigated acres
- G2 (Rocky Mountain Christian Church) – 8.07 irrigated acres
- G3 (Countryside) - 4.87 irrigated acres

The existing pump rated for 850 gpm at 220 feet of total dynamic head will provide sufficient flow and pressure to irrigate the developments above assuming the total demand is greater than 200 gpm. If development phasing or timing of construction cause irrigations requirements to drop below 200 gpm a booster pump at the 8-inch main will be required. If the developments above irrigate during the time when the 8-inch main is filling the Centennial Park pond then the booster pump will not be required. This existing 8-inch main will continue to fill the pond at Centennial Park daily.

See Figure 10 for a map of System G and Table 10 for the raw water irrigation demands.

Table 10 - System G Raw Water Demands
Raw Water Source - Existing 8-inch pipe in Colorado Boulevard

Property	[1]Demand (gpm)	[2]Native Irr. Demand (gal)	Total Demand per Day (gal)		Total Demand per Day (af)
Properties Requiring Booster Pumps					
G1-Van Deventer	132	24	8,236		0.03
G2-Rocky Mountain Christian Church	243	131	16,183		0.05
G3-Countryside	422	0	25,348		
Total Gallons per Day			**49,766**		
Maximum Flow in Existing 8-Inch Pipe			**800**	**gpm**	
Time to Irrigate Above Properties with Maximum Flow			**1.0**	**hours**	

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)
[2]This report assumes that 20% of the revegetated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

5.8 *Phase 1 Infrastructure Improvements*

Phase 1 infrastructure Improvements are part of System A and System E. Design of Phase 1 improvements is currently in progress consisting of two areas of infrastructure improvements, west side of I-25 and the east side of I-25.

On the west side of I-25 the Phase 1 infrastructure improvements include a diversion and check structure on the Lower Boulder Ditch to divert raw ditch water into a new pond located on the northeast corner of the Wyndham Hill Property. The pond has an approximate top surface area of 2.0 acres and a volume of 17.2 acre-feet. The wet well on the north side of the pond houses a vertical turbine pump rated at 1400 gpm at 140 feet of TDH. This pond and pumphouse is the raw water source for System A. The 12-inch pipe on the discharge side of the pump will be extended 20 linear feet and capped to allow for connection of the future pipe.

On the east side of I-25 the Phase 1 infrastructure improvements are part of System E and consist of a wet well and pumphouse located on the future Waters Edge Subdivision west of Milavec Lake. The wet well is filled via the existing 36-inch Reinforced Concrete Pipe that conveys raw water from the Leyton Lateral to fill the Lake. An interim vertical turbine variable speed pump rated at 650 gpm at 125 feet of TDH will be installed in the pumphouse. Once raw water demand increases this pump will have to be exchanged out for the ultimate pump. See Section 5.5. The proposed Phase 1 pipeline conveys flow from the pump station west to William Bailey Avenue (WCR 11.5) where it turns south for approximately 6,000 feet to WCR 16. The pipe is aligned in the Weld County right-of-way from WCR 18 to WCR 16.5 then enters Town of Frederick right-of-way dedicated with the West View Final Plat. At WCR 16 the pipeline turns east where it follows WCR 16 (First Street) across Colorado Boulevard for approximately 5000 feet terminating at Maple Street. This pipe will be extended to the east in the future to supply raw water for future developments. The size of pipe varies from 10-inch at the pumphouse to WCR 16 where it is reduced to an 8-inch pipe to the end of the Phase 1 improvements. See Figure 11.

The following is a list of properties that will be served by the Phase 1 Improvements:

- B1 (Waters Edge, temporary) – 20.48 irrigated acres
- E1 (WCR 11.5 from WCR 16.5 to WCR 18) – 0.39 irrigated acres
- E2 (Meadowlark Commercial) – 20.20 irrigated acres
- E3 (Future Development) – 19.79 irrigated acres
- E4 (West View) – 9.74 irrigated acres
- E5 (Strear Property) – 142.92 irrigated acres
- E6 (Fireman's Park, booster pump required) – 1.77 irrigated acres

B1-Waters Edge will temporarily be served from the Phase 1 Improvements (System E) until the System B infrastructure is constructed.

The following is a list of additional properties that can be served with the interim pump if the Phase 1 pipeline is extended approximately 3000 linear feet to the east in WCR 16:

- E7 (Maple Ridge II) – 8.45 irrigated acres
- E8 (Coal Ridge Estates) – 9.42 irrigated acres
- E9 (Future Development) – 20.17 irrigated acres
- E10 (Hidden Creek) – 26.48 irrigated acres
- E11 (Future Development) – 9.10 irrigated acres

See Figure 11 for a map of the Phase 1 Improvements and Table 11 for raw water irrigation demands. The Phase 1 Pipeline requires an interim pump rated for 650 gpm at 135 feet of total dynamic head (TDH) to deliver raw water irrigation to the properties listed above.

Table 11 - Phase 1 Pipeline Raw Water Demands
Raw Water Source - Milavec Lake

Property	[1]Demand (gpm)	[2]Native Demand (gpm)	Total Demand per Day (gpd)		Total Demand per Day (af)
Properties to be served by Phase 1 Pipeline & Pump					
B1-Waters Edge (temporary)	566	348	38,109		0.12
E1-WCR 11.5 (WCR 16.5 to WCR 18)	34	0	2,030		0.01
E2-Meadowlark Commercial	540	349	36,580		0.11
E3-Future Development	536	339	36,227		0.11
E4-West View	230	161	15,712		0.05
E5-Strear Property	3,817	2,467	258,629		0.79
E6-Firemans Park (booster pump)	154	0	9,213		N/A
		Gallons per Day	**396,499**		
Properties to be served by Phase 1 Pipeline & Pump if pipe is extended east on WCR 16.					
E7-Maple Ridge II	244	140	16,344		0.05
E8-Coal Ridge Estates	224	171	15,481		0.05
E9-Future Development	627	323	41,473		0.13
E10-Hidden Creek	799	431	53,133		0.16
E11-Future Development	317	136	20,653		0.06
		Gallons per Day	**147,084**		N/A
		Total Gallons per Day	**543,583**		
		Maximum Delivery from Pump at Milavec Lake	**400**	**gpm**	
		Time to Fill Ponds/Irrigate the Above Properties	**22.6**	**hours**	

[1]Demand assumes irrigating one hour per day, 7 days a week. See Table 1 - Irrigation Demands by Property (Irrigating 7 Days Per Week)
[2]This report assumes that 20% of the revegetated native areas per development will be irrigated at one time since irrigation is only required for the first three years after planting to establish the native vegetation.

6.0 RAW WATER IRRIGATION MODEL

6.1 Introduction

The raw water irrigation system was modeled using EPANet, a water modeling program written by the Environmental Protection Agency. The model is composed of reservoirs, pumps, nodes and pipes. The program uses the Hazen-Williams equation to calculate the pressures and flow rates available at design points and pipes within the system. The peak demand period was simulated to evaluate the adequacy of the system during worst case demands.

6.2 Assumptions

Below is a summary of assumptions for Raw Water Irrigation Model:

- All open space area is divided into 25% turf grass, 50% Native grass, 5% trees/flowers requiring drip irrigation and 20% non-irrigated areas
- Native grass only requires irrigation for the first three growing season to establish. It was assumed that a maximum of 20% of the native irrigation areas would require irrigation at one time.
- Required amount of irrigation is 2.50 feet/year for turf grass, 1.20 feet/year for native grass and trees/flowers requiring drip irrigation
- Maximum velocity 8 feet per second

- Major pipe loss calculated with Hazen-Williams equation
- Hazen-Williams "C" value for all pipes – 120
- Most pipes shown in the figures in this report are to fill ponds on each future development. Only the properties shown directly connecting to the raw water mainline pipes without a pond should be allowed to irrigate off of the pressurized system.
- See Figures 1 through 11 for pipe alignments

6.3 EPANet Inputs

The EPANet inputs are as follows:

Reservoirs

- Total Head – Elevation set at the same elevation of the node on the suction side of the pump. This assumes that the pond will not provide any elevation head to the pump since they are at the same elevation.

Pumps

- Pump Curve – The specific pump curve for each pump modeled.

Nodes

- Elevation – Taken from the USGS Quad Maps with 10 foot contours

Pipes

- Length – Length of pipe in feet
- Diameter of Pipe – Diameter of pipe in inches
- Roughness Coefficient – 100 for all pipes

See Appendix E for EPANet Inputs.

6.4 EPANet Output

The EPANet Output includes pressures and the nodes and flow through the pipes. Since each of the raw water irrigation systems are composed of a network of pipes there is an infinite amount of output that could be generated by varying the raw water demand at every node. Because of this, only what we feel is the worst case scenario resulting in the lowest flows and highest pressures in each system are presented in Appendix A. These scenarios include a theoretical raw water demand on different nodes throughout each system based on the raw water demands of future developments. These demands can and will change as development progresses and therefore the output included in Appendix A should only be used as a guide. As each property develops an updated water model should be used to verify new developments are consistent to this report.

7.0 ANALYSIS OF COST

The Engineers Opinion of Cost was prepared for the general raw water pipeline alignments shown in Figure 1 of this report. Once a detailed survey and design is completed for each section the pipe alignments and lengths may change. The costs in Appendix B should be used a general guide only.

Assumptions:

- All waterlines have three feet of cover

- All amounts are in 2008 Construction Dollars
- The waterline cost includes mobilization, lowerings, valves, air-vacs, pavement restoration, fittings, thrust blocks, etc.
- It may be possible for properties included in one system to be temporarily connected to another system which would affect the analysis of cost. For the analysis of cost we assume all properties are connected into the systems as shown in this report
- Prices will vary depending on the length of pipe being constructed

TABLES

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Max Day Demand (gpm)	Native Grass Demand (gpm)
SYSTEM A				
A1-Wyndham Hill				
Open Space	515.00	128.75	3,060	2,331
Commercial Area	89.36	22.34	531	404
HWY 52 (WCR 5.5 to West F.R.)	5.37	5.37	466	0
WCR 7 (HWY 52 to WCR 16)	5.37	5.37	466	0
WCR 16 (WCR 5.5 to WCR 7)	1.30	1.30	113	0
WCR 16 (WCR 7.5 to West F.R.)	1.30	1.30	113	0
Wyndham Hill Parkway (WCR 5.5 to West F.R.)	2.34	2.34	203	0
Zimmerman Ave (HWY 52 to WCR 16)	1.56	1.56	135	0
Billings Ave (HWY 52 to WCR 16)	1.56	1.56	135	0
TOTALS	***623.16***	***169.89***	***5,222***	***2,735***
A2-Wildflower				
Open Space	261.00	65.25	1,551	1,181
WCR 16 (WCR 7 to West F.R.)	1.30	1.30	28	0
WCR 7 (1450 feet)	0.98	0.98	21	0
West F.R. (WCR 16 to WCR 16.5)	1.79	1.79	39	0
WCR 7.5 (WCR 16 to WCR 16.5)	0.78	0.78	17	0
TOTALS	***265.85***	***70.10***	***1,656***	***1,181***
A3-Future Development (NW Corner of WCR 7/16)				
Open Space	160.00	40.00	951	724
WCR 16 (WCR 5.5 to WCR 7)	1.30	1.30	113	0
WCR 5.5 (WCR 16 to WCR 16.5)	0.39	0.39	34	0
WCR 16.5 (WCR 5.5 to WCR 7)	0.39	0.39	34	0
WCR 7 (WCR 16 to WCR 16.5)	1.79	1.79	155	0
TOTALS	***163.87***	***43.87***	***1,286***	***724***
A4-Future Development (SW Cornter of WCR 7/18)				
Open Space	160.00	40.00	951	724
WCR 16.5 (WCR 5.5 to WCR 7)	0.39	0.39	34	0
WCR 5.5 (WCR 16.5 to WCR 18)	0.39	0.39	34	0
WCR 18 (WCR 5.5 to WCR 7)	1.30	1.30	113	0
WCR 7 (WCR 16.5 to WCR 18)	1.79	1.79	155	0
TOTALS	***163.87***	***43.87***	***1,286***	***724***
A5-Future Development (SE Corner of WCR 7/18)				
Open Space	160.00	40.00	951	724
WCR 16.5 (WCR 7 to WCR 7.5)	0.39	0.39	34	0
WCR 7 (WCR 16.5 to WCR 18)	1.79	1.79	155	0
WCR 18 (WCR 7 to WCR 7.5)	1.30	1.30	113	0
WCR 7.5 (WCR 16.5 to WCR 18)	0.39	0.39	34	0
TOTALS	***163.87***	***43.87***	***1,286***	***724***
A6-Doering/Modrall West Annexation				
Open Space	140.00	35.00	832	634
WCR 16.5 (WCR 7.5 to West F.R.)	0.39	0.39	34	0
WCR 7.5 (WCR 16.5 to WCR 18)	0.39	0.39	34	0
WCR 18 (WCR 7.5 to West F.R.)	1.30	1.30	113	0
West F.R. (WCR 16.5 to WCR 18)	1.79	1.79	155	0

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Max Day Demand (gpm)	Native Grass Demand (gpm)
TOTALS	***143.87***	***38.87***	***1,168***	***634***
SYSTEM B				
B1-Waters Edge				
Open Space	19.23	19.23	457	348
WCR 11.5 (WCR 18 to WCR 18.5)	0.39	0.39	34	0
WCR 18 (1750 feet)	0.86	0.86	75	0
TOTALS	***20.48***	***20.48***	***566***	***348***
B2-Summit View Estates				
E. Park	3.78	3.78	90	68
Central Park	1.32	1.32	115	0
NE Detention Ponds	0.86	0.86	0	0
WCR 11 (1200 feet)	0.81	0.81	0	0
TOTALS	***6.77***	***6.77***	***204***	***68***
B3-Eagle Valley				
SE Park (larger)	3.00	3.00	260	0
SE Park (smaller)	2.04	2.04	177	0
WCR 11 (WCR18 to WCR 18.5)	1.79	1.79	155	0
WCR 18 (1600 feet)	0.79	0.79	69	0
TOTALS	***7.62***	***7.62***	***661***	***0***
B4-Raspberry Hill Residential				
Open Space	91.67	22.92	545	415
WCR 18 (1600 feet)	0.79	0.79	69	0
WCR 9.5 (WCR 18 to WCR 18.5)	0.39	0.39	34	0
WCR 18.5 (1600 feet)	0.24	0.24	21	0
TOTALS	***93.09***	***24.34***	***668***	***415***
B5-Haley No. 2 Annexation				
Open Space	160.00	40.00	951	724
WCR 18.5 (WCR 9 to WCR 9.5)	0.39	0.39	34	0
East F.R. (WCR 18.5 to WCR 20)	1.79	1.79	155	0
WCR 20 (East F.R. to WCR 9.5)	1.79	1.79	155	0
WCR 9.5 (WCR 18.5 to WCR 20)	0.39	0.39	34	0
TOTALS	***164.36***	***44.36***	***1,329***	***724***
B6-Future Development (SW Corner of WCR 11/20)				
Open Space	160.00	40.00	951	724
WCR 20 (WCR 9.5 to WCR 11)	1.79	1.79	155	0
WCR 9.5 (WCR 20 to WCR 20.5)	0.39	0.39	34	0
WCR 20.5 (WCR 9.5 to WCR 11)	0.39	0.39	34	0
WCR 11 (WCR 18.5 to WCR 20)	1.79	1.79	155	0
TOTALS	***164.36***	***44.36***	***1,329***	***724***
B7-Fox Run				
Greenway (N/S)	10.30	10.30	758	0
SE Park	2.49	2.49	216	0
NE Park	2.34	2.34	203	0
WCR 11 (1500 feet)	1.02	2.34	203	0
TOTALS	***16.15***	***17.47***	***1,380***	***0***

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Max Day Demand (gpm)	Native Grass Demand (gpm)
B8-Future Development (SE Corner of WCR 11/20)				
Open Space	10.00	2.50	59	45
WCR 11 (700 feet)	0.35	0.35	30	0
WCR 20 (1100 feet)	0.75	0.75	65	0
TOTALS	***11.10***	***3.60***	***155***	***45***
B9-Doering/Modrall East Annexation				
Open Space	160.00	40.00	951	724
WCR 20 (WCR 9.5 to WCR 11)	1.79	1.79	155	0
WCR 9.5 (WCR 20 to WCR 20.5)	0.39	0.39	34	0
WCR 20.5 (WCR 9.5 to WCR 11)	0.39	0.39	34	0
WCR 11 (WCR 20 to WCR 20.5)	1.79	1.79	155	0
TOTALS	***164.36***	***44.36***	***1,329***	***724***
B10-Johnson Farm Annexation				
Open Space	72.60	18.15	431	329
WCR 20 (1320 feet)	0.89	0.89	77	0
WCR 11 (WCR 20 to WCR 20.5)	1.79	1.79	155	0
WCR 20.5 (1320 feet)	0.39	0.39	34	0
TOTALS	***75.67***	***21.22***	***698***	***329***
B11-The Farm				
Open Space	99.00	24.75	588	448
WCR 20 (1400 feet)	0.95	0.95	82	0
TOTALS	***99.95***	***25.70***	***671***	***448***
SYSTEM C				
C1-Bella Rosa North Pond				
North Pond Irrigation Area	13.61	Metered Usage	1,610	0
TOTALS	***13.61***		***1,610***	***0***
C2-Moore Farms				
Commercial	5.08	1.3	30	23
North Detention Pond	3.00	3.00	260	0
WCR 20 (1300 feet)	0.88	0.88	76	0
TOTALS	***8.96***	***5.15***	***367***	***23***
C3-No Name Creek				
No Name West Park	3.01	3.01	261	0
TOTALS	***3.01***	***3.01***	***261***	***0***
C4-No Name Creek				
South Park (West Side of Road)	0.72	0.72	62	0
TOTALS	***0.72***	***0.72***	***62***	***0***
C5-No Name Creek				
South Park (East Side of Road)	0.98	0.98	85	0
TOTALS	***0.98***	***0.98***	***85***	***0***
C6-No Name Creek				
North Park (West Side of Road)	1.70	1.70	147	0

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Max Day Demand (gpm)	Native Grass Demand (gpm)
TOTALS	***1.70***	***1.70***	***147***	***0***
C7-No Name Creek				
North Park (East Side of Road)	0.67	0.67	58	0
TOTALS	***0.67***	***0.67***	***58***	***0***
C8- No Name Creek				
East Entrance	1.06	1.06	92	0
TOTALS	***1.06***	***1.06***	***92***	***0***
C9-No Name Creek				
WCR 20 (WCR 11.5 to WCR 13)	1.79	1.79	155	0
TOTALS	***1.79***	***1.79***	***155***	***0***
SYSTEM D				
D1-Hinkle Farm				
Open Space	15.01	15.01	357	272
WCR 11 (WCR 16.5 to WCR 18)	1.79	1.79	155	0
WCR 18 (1700 feet)	0.39	0.39	34	0
TOTALS	***17.19***	***17.19***	***546***	***272***
D2-Westervelt Annexation				
Open Space	128.60	32.15	764	582
WCR 16 (1950 feet)	0.96	0.96	83	0
WCR 16.5. (WCR 9.5 to WCR 11)	0.39	0.39	34	0
WCR 11 (WCR 16 to WCR 16.5)	1.30	1.30	113	0
TOTALS	***131.25***	***34.80***	***994***	***582***
D3-HCT Annexation				
Open Space	168.40	42.10	1,001	762
WCR 16 (WCR 9 to WCR 9.5)	1.30	1.30	113	0
East F.R. (WCR 16 to WCR 16.5)	1.79	1.79	155	0
WCR 16.5 (WCR 9 to WCR 9.5)	0.39	0.39	34	0
WCR 9.5 (WCR 16 to WCR 16.5)	0.39	0.39	34	0
TOTALS	***172.27***	***45.97***	***1,336***	***762***
D4-Nelson Annexation				
Open Space	640.00	160.00	3,803	2,897
HWY 52 (East F.R. to WCR 11)	1.79	1.79	155	0
East F.R. (HWY 52 to WCR 16)	1.79	1.79	155	0
WCR 16 (East F.R. to WCR 11)	1.30	1.30	113	0
WCR 11 (HWY 52 to WCR 16)	1.79	1.79	155	0
TOTALS	***646.67***	***166.67***	***4,382***	***2,897***
SYSTEM E				
E1-WCR 11.5 (WCR 16.5 TO WCR 18)				
ROW	0.39	0.39	34	0
TOTALS	***0.39***	***0.39***	***34***	***0***
E2-Meadowlark Business Park				

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Max Day Demand (gpm)	Native Grass Demand (gpm)
Open Space	77	19.25	458	349
WCR 13 (1400 feet)	0.95	0.95	82	0
TOTALS	***77.95***	***20.20***	***540***	***349***
E3-Future Development (Just West of Westview)				
Open Space	75.00	18.75	446	339
WCR 16 (1320 feet)	0.65	0.65	56	0
WCR 16.5 (1320 feet)	0.39	0.39	34	0
TOTALS	***76.04***	***19.79***	***536***	***339***
E4-West View				
Open Space	8.88	8.88	211	161
WCR 16 (700 feet)	0.47	0.47	10	0
WCR 11.5 (WCR 16 to WCR 16.5)	0.39	0.39	8	0
TOTALS	***9.74***	***9.74***	***230***	***161***
E5-Strear Property				
Open Space	545.00	136.25	3,239	2,467
HWY 52 (WCR 11 to WCR 13)	1.79	1.79	155	0
WCR 11 (HWY 52 to WCR 16)	1.79	1.79	155	0
WCR 16 (WCR 11 to WCR 13)	1.30	1.30	113	0
WCR 13 (HWY 52 to WCR 16)	1.79	1.79	155	0
TOTALS	***551.67***	***142.92***	***3,817***	***2,467***
E6-Fireman's Park				
Park	1.77	1.77	154	0
TOTALS	***1.77***	***1.77***	***154***	***0***
E7-Maple Ridge II				
Open Space	7.76	7.76	184	140
WCR 16 (1400 feet)	0.69	0.69	60	0
TOTALS	***8.45***	***8.45***	***244***	***140***
E8-Coal Ridge Estates				
Open Space	9.42	9.42	224	171
TOTALS	***9.42***	***9.42***	***224***	***171***
E9-Future Development (NW Corner of WCR 15/16)				
Open Space	71.30	17.83	424	323
WCR 16 (1320 feet)	0.65	0.65	56	0
WCR 16.5 (1320 feet)	0.39	0.39	34	0
WCR 15 (WCR 16 to WCR 16.5)	1.30	1.30	113	0
TOTALS	***73.64***	***20.17***	***627***	***323***
E10-Hidden Creek				
Open Space	23.78	23.78	565	431
WCR 15 (2040 feet)	1.01	1.01	88	0
WCR 16.5 (WCR 15.5 to WCR 17)	0.39	0.39	34	0
WCR 15.5 (2040 feet)	1.30	1.30	113	0
TOTALS	***26.48***	***26.48***	***799***	***431***
E11-Future Development (NW Corner of WCR 16/17)				
Open Space	30.00	7.50	178	136
WCR 16 (WCR 15 to WCR 15.5)	1.30	1.30	113	0

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Max Day Demand (gpm)	Native Grass Demand (gpm)
WCR 15 (600 feet)	0.30	0.30	26	0
TOTALS	***31.60***	***9.10***	***317***	***136***
E12-Future Development (NW Corner of WCR 16/17)				
Open Space	192.00	48.00	1,141	869
WCR 16 (WCR 15.5 to WCR 17)	1.30	1.30	113	0
WCR 15.5 (WCR 16 to WCR 16.5)	0.39	0.39	34	0
WCR 16.5 (WCR 15.5 to WCR 17)	0.39	0.39	34	0
WCR 17 (WCR 16 to WCR 16.5)	1.30	1.30	113	0
TOTALS	***195.38***	***51.38***	***1,434***	***869***
E13-Future Development (SW Corner of WCR 16/17)				
Open Space	160.00	40.00	951	724
WCR 14.5 (WCR 15.5 to WCR 17)	0.39	0.39	34	0
WCR 15.5 (WCR 14.5 to WCR 16)	0.39	0.39	34	0
WCR 16 (WCR 15.5 to WCR 17)	1.30	1.30	113	0
WCR 17 (WCR 14.5 to WCR 16)	1.30	1.30	113	0
TOTALS	***163.38***	***43.38***	***1,244***	***724***
E14-Future Development (SE Corner of WCR 16/17)				
Open Space	160.00	0.00	0	0
WCR 14.5 (WCR 17 to WCR 17.5)	0.39	0.39	34	0
WCR 17 (WCR 14.5 to WCR 16)	1.30	1.30	113	0
WCR 16 (WCR 17 to WCR 17.5)	1.30	1.30	113	0
WCR 17.5 (WCR 14.5 to WCR 16)	0.39	0.39	34	0
TOTALS	***163.38***	***3.38***	***293***	***0***
E15-Future Development NE Corner of WCR 16/17)				
Open Space	160.00	0.00	0	0
WCR 16 (WCR 17 to WCR 17.5)	1.30	1.30	113	0
WCR 17 (WCR 16 to WCR 16.5)	0.39	0.39	34	0
WCR 16.5 (WCR 17 to WCR 17.5)	0.39	0.39	34	0
WCR 17.5 (WCR 16 to WCR 16.5)	1.30	1.30	113	0
TOTALS	***163.38***	***3.38***	***293***	***0***
E16-Future Development (NW Corner of WCR 16/19)				
Open Space	160.00	0.00	0	0
WCR 16 (WCR 17.5 to WCR 19)	1.30	1.30	113	0
WCR 17.5 (WCR 16 to WCR 16.5)	0.39	0.39	34	0
WCR 16.5 (WCR 17.5 to WCR 19)	0.39	0.39	34	0
WCR 19 (WCR 16 to WCR 16.5)	1.30	1.30	113	0
TOTALS	***163.38***	***3.38***	***293***	***0***
E17-Future Development (SW Corner of WCR 16/19)				
Open Space	160.00	0.00	0	0
WCR 14.5 (WCR 17.5 to WCR 19)	0.39	0.39	34	0
WCR 17.5 (WCR 14.5 to WCR 16)	0.39	0.39	34	0
WCR 16 (WCR 17.5 to WCR 19)	1.30	1.30	113	0
WCR 19 (WCR 14.5 to WCR 16)	1.30	1.30	113	0
TOTALS	***163.38***	***3.38***	***293***	***0***
SYSTEM F				

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Max Day Demand (gpm)	Native Grass Demand (gpm)
F1-Downtown Frederick				
Crist Park	2.35	2.35	204	0
TOTALS	**2.35**	**2.35**	**204**	**0**
F2-Colorado Boulevard (between Hwy 52 and WCR 16)				
North Median	0.11	0.11	5	0
Middle Median	0.44	0.44	18	0
South Median	0.07	0.07	3	0
East ROW	1.79	1.79	155	0
TOTALS	**2.41**	**0.62**	**26**	**0**
F3-Centennial Park				
8th Street Berms	4.77	4.77	414	0
TOTALS	***4.77***	***4.77***	***414***	***0***
F4-Ball Fields				
Ball Fields	4.19	4.19	363	0
TOTALS	***4.19***	***4.19***	***363***	***0***
F5-Miners Park Town Center				
Open Space	87.00	21.75	517	394
WCR 13 (2100 feet)	1.42	1.42	31	0
HWY 52 (2100 feet)	1.42	1.42	31	0
WCR 13.5 (2100 feet)	0.31	0.31	27	0
TOTALS	***90.16***	***24.91***	***606***	***394***
F6-Carriage Hills Marketplace				
Open Space	35.00	8.75	208	158
HWY 52 (WCR 13.5 to WCR 15)	1.79	1.79	43	32
WCR 13.5 (750 feet)	0.11	0.11	3	2
WCR 15 (600 feet)	0.30	0.30	7	5
Frederick Way (750 feet)	0.11	0.11	3	2
TOTALS	***37.31***	***11.06***	***263***	***200***
F7-Carriage Hills, Filing 2				
Open Space	5.02	5.02	435	0
WCR 15 (WCR 14.5 to WCR 16)	1.30	1.30	113	0
WCR 16 (1100 feet)	0.54	0.54	47	0
TOTALS	***6.86***	***6.86***	***595***	***0***
F8-Josephine Roche Annexation				
Open Space	120.00	30.00	713	543
WCR 14.5 (WCR 15 to WCR 15.5)	0.39	0.39	8	0
WCR 15 (1320 feet)	1.30	1.30	28	0
WCR 16 (1320 feet)	1.30	1.30	28	0
WCR 15.5 (WCR 14.5 to WCR 16)	0.39	0.39	8	0
TOTALS	***123.38***	***33.38***	***786***	***543***
F9-Future Development (NW Corner of WCR 14/17)				
Open Space	160.00	40.00	951	724
WCR 14 (WCR 15.5 to WCR 17)	1.30	1.30	113	0
WCR 15.5 (WCR 14 to WCR 14.5)	0.39	0.39	34	0
WCR 14.5 (WCR 15.5 to WCR 17)	0.39	0.39	34	0
WCR 17 (WCR 14 to WCR 14.5)	1.30	1.30	113	0

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Max Day Demand (gpm)	Native Grass Demand (gpm)
TOTALS	***163.38***	***43.38***	***1,244***	***724***
F10-Future Development (NE Corner of WCR 14/17)				
Open Space	160.00	0.00	0	0
WCR 14 (WCR 17 to WCR 17.5)	1.30	1.30	113	0
WCR 17 (WCR 14 to WCR 14.5)	1.30	1.30	113	0
WCR 14.5 (WCR 17 to WCR 17.5)	0.39	0.39	34	0
WCR 17.5 (WCR 14 to WCR 14.5)	0.39	0.39	34	0
TOTALS	***163.38***	***3.38***	***293***	***0***
F11-Future Development (SE Corner of WCR 14/17)				
Open Space	160.00	0.00	0	0
Commercial Along Hwy 52 (600' Deep)	60.26	15.07	358	273
HWY 52 (WCR 17 to WCR 17.5)	1.79	1.79	155	0
WCR 17.5 (WCR 12.5 to WCR 14)	0.39	0.39	34	0
WCR 14 (WCR 17 to WCR 17.5)	1.30	1.30	113	0
WCR 17 (HWY 52 to WCR 14)	1.30	1.30	113	0
TOTALS	***225.04***	***19.85***	***773***	***273***
F12-Future Development (SW Corner of WCR 14/19)				
Open Space	160.00	0.00	0	0
Commercial Along Hwy 52 (600' Deep)	35.60	8.90	212	161
HWY 52 (WCR 17.5 to WCR 19)	1.79	1.79	155	0
WCR 17.5 (HWY 52 to WCR 14)	0.39	0.39	34	0
WCR 14 (WCR 17.5 to WCR 19)	1.30	1.30	113	0
WCR 19 (HWY 52 to WCR 14)	1.30	1.30	113	0
TOTALS	***200.38***	***13.68***	***626***	***161***
F13-Future Development (NE Corner of WCR 14/19)				
Open Space	160.00	0.00	0	0
WCR 14 (WCR 17.5 to WCR 19)	1.30	1.30	113	0
WCR 17.5 (WCR 14 to WCR 14.5)	0.39	0.39	34	0
WCR 14.5 (WCR 17.5 to WCR 19)	0.39	0.39	34	0
WCR 19 (WCR 14 to WCR 14.5)	1.30	1.30	113	0
TOTALS	***163.38***	***3.38***	***293***	***0***
F14-St. Vrain Valley School District				
Frederick High School Ball Fields	30.17	30.17	2,617	0
TOTALS	***30.17***	***30.17***	***2,617***	***0***
SYSTEM G				
G1-Van Deventer Property				
Open Space	5.35	1.34	32	24
WCR 13 (1350 feet)	0.91	0.91	79	0
WCR 18 (500 feet)	0.25	0.25	22	0
TOTALS	***6.51***	***2.50***	***132***	***24***
G2-Rocky Mountain Christian Church				
Open Space	29.00	7.25	172	131
WCR 13 (900 feet)	0.61	0.61	53	0
WCR 16.5 (1400 feet)	0.21	0.21	18	0
TOTALS	***29.82***	***8.07***	***243***	***131***

Table 1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Condensed				
Area to be Irrigated	**Total Area (ac)**	**Irr. Area (ac)**	**Max Day Demand (gpm)**	**Native Grass Demand (gpm)**
G3-Countryside Subdivision				
Park	3.55	3.55	308	0
WCR 16 (1500 feet)	0.74	0.74	64	0
WCR 16.5 (1300 feet)	0.19	0.19	16	0
WCR 11.5 (WCR 16 to 16.5)	0.39	0.39	34	0
TOTALS	***4.87***	***4.87***	***422***	***0***

Inputs	**% of Total Irrigated Land**	
	25%	% Turf Grass
	50%	% Native Grass
	5%	% Drip
	20%	% unirrigated
	100%	
	2.50	Turf Grass Annual Applied Irrigation (ft)
	1.20	Native Grass Annual Applied Irrigation (ft)
	1.20	Drip Annual Applied Irrigation (ft)
	180	Watering Days Per Year
	1	Watering Hours Per Day
	1.15	Max Day Demand Factor

Table 1.1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Expanded												
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)
SYSTEM A												
A1-Wyndham Hill												
Open Space	515.00	128.75	25%	32.19	64.38	6.44	25.75	88.19	159,666	2,661	3,060	2,331
Commercial Area	89.36	22.34	25%	5.59	11.17	1.12	4.47	15.30	27,704	462	531	404
HWY 52 (WCR 5.5 to West F.R.)	5.37	5.37	100%	5.37	0.00	0.00	0.00	13.43	24,305	405	466	0
WCR 7 (HWY 52 to WCR 16)	5.37	5.37	100%	5.37	0.00	0.00	0.00	13.43	24,305	405	466	0
WCR 16 (WCR 5.5 to WCR 7)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 16 (WCR 7.5 to West F.R.)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
Wyndham Hill Parkway (WCR 5.5 to West F.R.)	2.34	2.34	100%	2.34	0.00	0.00	0.00	5.85	10,591	177	203	0
Zimmerman Ave (HWY 52 to WCR 16)	1.56	1.56	100%	1.56	0.00	0.00	0.00	3.90	7,061	118	135	0
Billings Ave (HWY 52 to WCR 16)	1.56	1.56	100%	1.56	0.00	0.00	0.00	3.90	7,061	118	135	0
TOTALS	***623.16***	***169.89***		***56.57***	***75.55***	***7.55***	***30.22***	***150.50***	***272,459***	***4,541***	***5,222***	***2,735***
A2-Wildflower												
Open Space	261.00	65.25	25%	16.31	32.63	3.26	13.05	44.70	80,918	1,349	1,551	1,181
WCR 16 (WCR 7 to West F.R.)	1.30	1.30	100%	0.33	0.00	0.00	0.00	0.81	1,471	25	28	0
WCR 7 (1450 feet)	0.98	0.98	100%	0.25	0.00	0.00	0.00	0.61	1,109	18	21	0
West F.R. (WCR 16 to WCR 16.5)	1.79	1.79	100%	0.45	0.00	0.00	0.00	1.12	2,025	34	39	0
WCR 7.5 (WCR 16 to WCR 16.5)	0.78	0.78	100%	0.20	0.00	0.00	0.00	0.49	883	15	17	0
TOTALS	***265.85***	***70.10***		***17.53***	***32.63***	***3.26***	***13.05***	***47.73***	***86,406***	***1,440***	***1,656***	***1,181***
A3-Future Development (NW Corner of WCR 7/16)												
Open Space	160.00	40.00	25%	10.00	20.00	2.00	8.00	27.40	49,605	827	951	724
WCR 16 (WCR 5.5 to WCR 7)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 5.5 (WCR 16 to WCR 16.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 16.5 (WCR 5.5 to WCR 7)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 7 (WCR 16 to WCR 16.5)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
TOTALS	***163.87***	***43.87***		***13.87***	***20.00***	***2.00***	***8.00***	***37.08***	***67,121***	***1,119***	***1,286***	***724***
A4-Future Development (SW Cornter of WCR 7/18)												
Open Space	160.00	40.00	25%	10.00	20.00	2.00	8.00	27.40	49,605	827	951	724
WCR 16.5 (WCR 5.5 to WCR 7)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 5.5 (WCR 16.5 to WCR 18)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 18 (WCR 5.5 to WCR 7)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 7 (WCR 16.5 to WCR 18)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
TOTALS	***163.87***	***43.87***		***13.87***	***20.00***	***2.00***	***8.00***	***37.08***	***67,121***	***1,119***	***1,286***	***724***
A5-Future Development (SE Corner of WCR 7/18)												
Open Space	160.00	40.00	25%	10.00	20.00	2.00	8.00	27.40	49,605	827	951	724
WCR 16.5 (WCR 7 to WCR 7.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 7 (WCR 16.5 to WCR 18)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 18 (WCR 7 to WCR 7.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 7.5 (WCR 16.5 to WCR 18)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***163.87***	***43.87***		***13.87***	***20.00***	***2.00***	***8.00***	***37.08***	***67,121***	***1,119***	***1,286***	***724***
A6-Doering/Modrall West Annexation												
Open Space	140.00	35.00	25%	8.75	17.50	1.75	7.00	23.98	43,404	723	832	634
WCR 16.5 (WCR 7.5 to West F.R.)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 7.5 (WCR 16.5 to WCR 18)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 18 (WCR 7.5 to West F.R.)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
West F.R. (WCR 16.5 to WCR 18)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
TOTALS	***143.87***	***38.87***		***12.62***	***17.50***	***1.75***	***7.00***	***33.65***	***60,920***	***1,015***	***1,168***	***634***

Table 1.1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Expanded

Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)
SYSTEM B												
B1-Waters Edge												
Open Space	19.23	19.23	100%	4.81	9.62	0.96	3.85	13.17	23,848	397	457	348
WCR 11.5 (WCR 18 to WCR 18.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 18 (1750 feet)	0.86	0.86	100%	0.86	0.00	0.00	0.00	2.15	3,892	65	75	0
TOTALS	***20.48***	***20.48***		***6.06***	***9.62***	***0.96***	***3.85***	***16.30***	***29,505***	***492***	***566***	***348***
B2-Summit View Estates												
E. Park	3.78	3.78	100%	0.95	1.89	0.19	0.00	2.59	4,688	78	90	68
Central Park	1.32	1.32	100%	1.32	0.00	0.00	0.00	3.30	5,974	100	115	0
NE Detention Ponds	0.86	0.86	100%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
WCR 11 (1200 feet)	0.81	0.81	100%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
TOTALS	***6.77***	***6.77***		***2.27***	***1.89***	***0.19***	***0.00***	***5.89***	***10,662***	***178***	***204***	***68***
B3-Eagle Valley												
SE Park (larger)	3.00	3.00	100%	3.00	0.00	0.00	0.00	7.50	13,578	226	260	0
SE Park (smaller)	2.04	2.04	100%	2.04	0.00	0.00	0.00	5.10	9,233	154	177	0
WCR 11 (WCR18 to WCR 18.5)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 18 (1600 feet)	0.79	0.79	100%	0.79	0.00	0.00	0.00	1.98	3,576	60	69	0
TOTALS	***7.62***	***7.62***		***7.62***	***0.00***	***0.00***	***0.00***	***19.05***	***34,488***	***575***	***661***	***0***
B4-Raspberry Hill Residential												
Open Space	91.67	22.92	25%	5.73	11.46	1.15	4.58	15.70	28,421	474	545	415
WCR 18 (1600 feet)	0.79	0.79	100%	0.79	0.00	0.00	0.00	1.98	3,576	60	69	0
WCR 9.5 (WCR 18 to WCR 18.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 18.5 (1600 feet)	0.24	0.24	100%	0.24	0.00	0.00	0.00	0.60	1,086	18	21	0
TOTALS	***93.09***	***24.34***		***7.15***	***11.46***	***1.15***	***4.58***	***19.25***	***34,848***	***581***	***668***	***415***
B5-Haley No. 2 Annexation												
Open Space	160.00	40.00	25%	10.00	20.00	2.00	8.00	27.40	49,605	827	951	724
WCR 18.5 (WCR 9 to WCR 9.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
East F.R. (WCR 18.5 to WCR 20)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 20 (East F.R. to WCR 9.5)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 9.5 (WCR 18.5 to WCR 20)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***164.36***	***44.36***		***14.36***	***20.00***	***2.00***	***8.00***	***38.30***	***69,338***	***1,156***	***1,329***	***724***
B6-Future Development (SW Corner of WCR 11/20)												
Open Space	160.00	40.00	25%	10.00	20.00	2.00	8.00	27.40	49,605	827	951	724
WCR 20 (WCR 9.5 to WCR 11)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 9.5 (WCR 20 to WCR 20.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 20.5 (WCR 9.5 to WCR 11)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 11 (WCR 18.5 to WCR 20)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
TOTALS	***164.36***	***44.36***		***14.36***	***20.00***	***2.00***	***8.00***	***38.30***	***69,338***	***1,156***	***1,329***	***724***
B7-Fox Run												
Greenway (N/S)	10.30	10.30	100%	7.30	0.00	3.00	0.00	21.85	39,557	659	758	0
SE Park	2.49	2.49	100%	2.49	0.00	0.00	0.00	6.23	11,270	188	216	0
NE Park	2.34	2.34	100%	2.34	0.00	0.00	0.00	5.85	10,591	177	203	0
WCR 11 (1500 feet)	1.02	2.34	100%	2.34	0.00	0.00	0.00	5.85	10,591	177	203	0
TOTALS	***16.15***	***17.47***		***14.47***	***0.00***	***3.00***	***0.00***	***39.78***	***72,009***	***1,200***	***1,380***	***0***
B8-Future Development (SE Corner of WCR 11/20)												

Table 1.1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Expanded

Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)
Open Space	10.00	2.50	25%	0.63	1.25	0.13	0.50	1.71	3,100	52	59	45
WCR 11 (700 feet)	0.35	0.35	100%	0.35	0.00	0.00	0.00	0.88	1,584	26	30	0
WCR 20 (1100 feet)	0.75	0.75	100%	0.75	0.00	0.00	0.00	1.88	3,395	57	65	0
TOTALS	***11.10***	***3.60***		***1.73***	***1.25***	***0.13***	***0.50***	***4.46***	***8,079***	***135***	***155***	***45***
B9-Doering/Modrall East Annexation												
Open Space	160.00	40.00	25%	10.00	20.00	2.00	8.00	27.40	49,605	827	951	724
WCR 20 (WCR 9.5 to WCR 11)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 9.5 (WCR 20 to WCR 20.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 20.5 (WCR 9.5 to WCR 11)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 11 (WCR 20 to WCR 20.5)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
TOTALS	***164.36***	***44.36***		***14.36***	***20.00***	***2.00***	***8.00***	***38.30***	***69,338***	***1,156***	***1,329***	***724***
B10-Johnson Farm Annexation												
Open Space	72.60	18.15	25%	4.54	9.08	0.91	3.63	12.43	22,508	375	431	329
WCR 20 (1320 feet)	0.89	0.89	100%	0.89	0.00	0.00	0.00	2.23	4,028	67	77	0
WCR 11 (WCR 20 to WCR 20.5)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 20.5 (1320 feet)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***75.67***	***21.22***		***7.61***	***9.08***	***0.91***	***3.63***	***20.11***	***36,403***	***607***	***698***	***329***
B11-The Farm												
Open Space	99.00	24.75	25%	6.19	12.38	1.24	4.95	16.95	30,693	512	588	448
WCR 20 (1400 feet)	0.95	0.95	100%	0.95	0.00	0.00	0.00	2.38	4,300	72	82	0
TOTALS	***99.95***	***25.70***		***7.14***	***12.38***	***1.24***	***4.95***	***19.33***	***34,993***	***583***	***671***	***448***
SYSTEM C												
C1-Bella Rosa North Pond												
North Pond Irrigation Area	13.61	North Pond irrigation at Bella Rosa Golf Course was determined by actual metered raw water usage							114,000	1,900	2,185	0
TOTALS	***13.61***								***114,000***	***1,900***	***2,185***	***0***
C2-Moore Farms												
Commercial	5.08	1.27	25%	0.32	0.64	0.06	0.00	0.87	1,575	26	30	23
North Detention Pond	3.00	3.00	100%	3.00	0.00	0.00	0.00	7.50	13,578	226	260	0
WCR 20 (1300 feet)	0.88	0.88	100%	0.88	0.00	0.00	0.00	2.20	3,983	66	76	0
TOTALS	***8.96***	***5.15***		***4.2***	***0.6***	***0.1***	***0.0***	***10.57***	***19,136***	***319***	***367***	***23***
C3-No Name Creek												
No Name West Park	3.01	3.01	100%	3.01	0.00	0.00	0.00	7.53	13,623	227	261	0
TOTALS	***3.01***	***3.01***		***3.01***	***0.00***	***0.00***	***0.00***	***7.53***	***13,623***	***227***	***261***	***0***
C4-No Name Creek												
South Park (West Side of Road)	0.72	0.72	100%	0.72	0.00	0.00	0.00	1.80	3,259	54	62	0
TOTALS	***0.72***	***0.72***		***0.72***	***0.00***	***0.00***	***0.00***	***1.80***	***3,259***	***54***	***62***	***0***
C5-No Name Creek												
South Park (East Side of Road)	0.98	0.98	100%	0.98	0.00	0.00	0.00	2.45	4,435	74	85	0
TOTALS	***0.98***	***0.98***		***0.98***	***0.00***	***0.00***	***0.00***	***2.45***	***4,435***	***74***	***85***	***0***
C6-No Name Creek												
North Park (West Side of Road)	1.70	1.70	100%	1.70	0.00	0.00	0.00	4.25	7,694	128	147	0
TOTALS	***1.70***	***1.70***		***1.70***	***0.00***	***0.00***	***0.00***	***4.25***	***7,694***	***128***	***147***	***0***
C7-No Name Creek												

Table 1.1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Expanded												
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)
North Park (East Side of Road)	0.67	0.67	100%	0.67	0.00	0.00	0.00	1.68	3,032	51	58	0
TOTALS	***0.67***	***0.67***		***0.67***	***0.00***	***0.00***	***0.00***	***1.68***	***3,032***	***51***	***58***	***0***
C8- No Name Creek												
East Entrance	1.06	1.06	100%	1.06	0.00	0.00	0.00	2.65	4,798	80	92	0
TOTALS	***1.06***	***1.06***	***100%***	***1.06***	***0.00***	***0.00***	***0.00***	***2.65***	***4,798***	***80***	***92***	***0***
C9-No Name Creek												
WCR 20 (WCR 11.5 to WCR 13)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
TOTALS	***1.79***	***1.79***		***1.79***	***0.00***	***0.00***	***0.00***	***4.48***	***8,102***	***135***	***155***	***0***
SYSTEM D												
D1-Hinkle Farm												
Open Space	15.01	15.01	100%	3.75	7.51	0.75	3.00	10.28	18,614	310	357	272
WCR 11 (WCR 16.5 to WCR 18)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 18 (1700 feet)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***17.19***	***17.19***		***5.93***	***7.51***	***0.75***	***3.00***	***15.73***	***28,481***	***475***	***546***	***272***
D2-Westervelt Annexation												
Open Space	128.60	32.15	25%	8.04	16.08	1.61	6.43	22.02	39,870	665	764	582
WCR 16 (1950 feet)	0.96	0.96	100%	0.96	0.00	0.00	0.00	2.40	4,345	72	83	0
WCR 16.5. (WCR 9.5 to WCR 11)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 11 (WCR 16 to WCR 16.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***131.25***	***34.80***		***10.69***	***16.08***	***1.61***	***6.43***	***28.65***	***51,864***	***864***	***994***	***582***
D3-HCT Annexation												
Open Space	168.40	42.10	25%	10.53	21.05	2.11	8.42	28.84	52,209	870	1,001	762
WCR 16 (WCR 9 to WCR 9.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
East F.R. (WCR 16 to WCR 16.5)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 16.5 (WCR 9 to WCR 9.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 9.5 (WCR 16 to WCR 16.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***172.27***	***45.97***		***14.40***	***21.05***	***2.11***	***8.42***	***38.51***	***69,725***	***1,162***	***1,336***	***762***
D4-Nelson Annexation												
Open Space	640.00	160.00	25%	40.00	80.00	8.00	32.00	109.60	198,420	3,307	3,803	2,897
HWY 52 (East F.R. to WCR 11)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
East F.R. (HWY 52 to WCR 16)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 16 (East F.R. to WCR 11)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 11 (HWY 52 to WCR 16)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
TOTALS	***646.67***	***166.67***		***46.67***	***80.00***	***8.00***	***32.00***	***126.28***	***228,609***	***3,810***	***4,382***	***2,897***
SYSTEM E												
E1-WCR 11.5 (WCR 16.5 TO WCR 18)												
ROW	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***0.39***	***0.39***		***0.39***	***0.00***	***0.00***	***0.00***	***0.98***	***1,765***	***29***	***34***	***0***
E2-Meadowlark Business Park												
Open Space	77	19.25	25%	4.81	9.63	0.96	3.85	13.19	23,872	398	458	349
WCR 13 (1400 feet)	0.95	0.95	100%	0.95	0.00	0.00	0.95	2.38	4,300	72	82	0
TOTALS	***77.95***	***20.20***		***5.76***	***9.63***	***0.96***	***4.80***	***15.56***	***28,172***	***470***	***540***	***349***

Table 1.1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Expanded												
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)
E3-Future Development (Just West of Westview)												
Open Space	75.00	18.75	25%	4.69	9.38	0.94	3.75	12.84	23,252	388	446	339
WCR 16 (1320 feet)	0.65	0.65	100%	0.65	0.00	0.00	0.00	1.63	2,942	49	56	0
WCR 16.5 (1320 feet)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***76.04***	***19.79***		***5.73***	***9.38***	***0.94***	***3.75***	***15.44***	***27,959***	***466***	***536***	***339***
E4-West View												
Open Space	8.88	8.88	100%	2.22	4.44	0.44	1.78	6.08	11,012	184	211	161
WCR 16 (700 feet)	0.47	0.47	100%	0.12	0.00	0.00	0.00	0.29	532	9	10	0
WCR 11.5 (WCR 16 to WCR 16.5)	0.39	0.39	100%	0.10	0.00	0.00	0.00	0.24	441	7	8	0
TOTALS	***9.74***	***9.74***		***2.44***	***4.44***	***0.44***	***1.78***	***6.62***	***11,985***	***200***	***230***	***161***
E5-Strear Property												
Open Space	545.00	136.25	25%	34.06	68.13	6.81	27.25	93.33	168,967	2,816	3,239	2,467
HWY 52 (WCR 11 to WCR 13)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 11 (HWY 52 to WCR 16)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 16 (WCR 11 to WCR 13)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 13 (HWY 52 to WCR 16)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
TOTALS	***551.67***	***142.92***		***40.73***	***68.13***	***6.81***	***27.25***	***110.01***	***199,156***	***3,319***	***3,817***	***2,467***
E6-Fireman's Park												
Park	1.77	1.77	100%	1.77	0.00	0.00	0.00	4.43	8,011	134	154	0
TOTALS	***1.77***	***1.77***		***1.77***	***0.00***	***0.00***	***0.00***	***4.425***	***8,011***	***134***	***154***	***0***
E7-Maple Ridge II												
Open Space	7.76	7.76	100%	1.94	3.88	0.39	1.55	5.32	9,623	160	184	140
WCR 16 (1400 feet)	0.69	0.69	100%	0.69	0.00	0.00	0.00	1.73	3,123	52	60	0
TOTALS	***8.45***	***8.45***		***2.63***	***3.88***	***0.39***	***1.55***	***7.04***	***12,746***	***212***	***244***	***140***
E8-Coal Ridge Estates												
Open Space	9.42	9.42	100%	2.36	4.71	0.47	1.88	6.45	11,682	195	224	171
TOTALS	***9.42***	***9.42***		***2.36***	***4.71***	***0.47***	***1.88***	***6.45***	***11,682***	***195***	***224***	***171***
E9-Future Development (NW Corner of WCR 15/16)												
Open Space	71.30	17.83	25%	4.46	8.91	0.89	3.57	12.21	22,105	368	424	323
WCR 16 (1320 feet)	0.65	0.65	100%	0.65	0.00	0.00	0.00	1.63	2,942	49	56	0
WCR 16.5 (1320 feet)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 15 (WCR 16 to WCR 16.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***73.64***	***20.17***		***6.80***	***8.91***	***0.89***	***3.57***	***18.06***	***32,696***	***545***	***627***	***323***
E10-Hidden Creek												
Open Space	23.78	23.78	100%	5.95	11.89	1.19	4.76	16.29	29,490	492	565	431
WCR 15 (2040 feet)	1.01	1.01	100%	1.01	0.00	0.00	0.00	2.53	4,571	76	88	0
WCR 16.5 (WCR 15.5 to WCR 17)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 15.5 (2040 feet)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***26.48***	***26.48***		***8.65***	***11.89***	***1.19***	***4.76***	***23.04***	***41,710***	***695***	***799***	***431***
E11-Future Development (NW Corner of WCR 16/17)												
Open Space	30.00	7.50	25%	1.88	3.75	0.38	1.50	5.14	9,301	155	178	136
WCR 16 (WCR 15 to WCR 15.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 15 (600 feet)	0.30	0.30	100%	0.30	0.00	0.00	0.00	0.75	1,358	23	26	0
TOTALS	***31.60***	***9.10***		***3.48***	***3.75***	***0.38***	***1.50***	***9.14***	***16,543***	***276***	***317***	***136***
E12-Future Development (NW Corner of WCR 16/17)												
Open Space	192.00	48.00	25%	12.00	24.00	2.40	9.60	32.88	59,526	992	1,141	869
WCR 16 (WCR 15.5 to WCR 17)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0

Table 1.1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Expanded

Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)
WCR 15.5 (WCR 16 to WCR 16.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 16.5 (WCR 15.5 to WCR 17)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 17 (WCR 16 to WCR 16.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***195.38***	***51.38***		***15.38***	***24.00***	***2.40***	***9.60***	***41.33***	***74,824***	***1,247***	***1,434***	***869***
E13-Future Development (SW Corner of WCR 16/17)												
Open Space	160.00	40.00	25%	10.00	20.00	2.00	8.00	27.40	49,605	827	951	724
WCR 14.5 (WCR 15.5 to WCR 17)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 15.5 (WCR 14.5 to WCR 16)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 16 (WCR 15.5 to WCR 17)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 17 (WCR 14.5 to WCR 16)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***163.38***	***43.38***		***13.38***	***20.00***	***2.00***	***8.00***	***35.85***	***64,903***	***1,082***	***1,244***	***724***
E14-Future Development (SE Corner of WCR 16/17)												
Open Space	160.00	0.00	0%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
WCR 14.5 (WCR 17 to WCR 17.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 17 (WCR 14.5 to WCR 16)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 16 (WCR 17 to WCR 17.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 17.5 (WCR 14.5 to WCR 16)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***163.38***	***3.38***		***3.38***	***0.00***	***0.00***	***0.00***	***8.45***	***15,298***	***255***	***293***	***0***
E15-Future Development NE Corner of WCR 16/17)												
Open Space	160.00	0.00	0%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
WCR 16 (WCR 17 to WCR 17.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 17 (WCR 16 to WCR 16.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 16.5 (WCR 17 to WCR 17.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 17.5 (WCR 16 to WCR 16.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***163.38***	***3.38***		***3.38***	***0.00***	***0.00***	***0.00***	***8.45***	***15,298***	***255***	***293***	***0***
E16-Future Development (NW Corner of WCR 16/19)												
Open Space	160.00	0.00	0%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
WCR 16 (WCR 17.5 to WCR 19)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 17.5 (WCR 16 to WCR 16.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 16.5 (WCR 17.5 to WCR 19)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 19 (WCR 16 to WCR 16.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***163.38***	***3.38***		***3.38***	***0.00***	***0.00***	***0.00***	***8.45***	***15,298***	***255***	***293***	***0***
E17-Future Development (SW Corner of WCR 16/19)												
Open Space	160.00	0.00	0%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
WCR 14.5 (WCR 17.5 to WCR 19)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 17.5 (WCR 14.5 to WCR 16)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 16 (WCR 17.5 to WCR 19)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 19 (WCR 14.5 to WCR 16)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***163.38***	***3.38***		***3.38***	***0.00***	***0.00***	***0.00***	***8.45***	***15,298***	***255***	***293***	***0***
SYSTEM F												
F1-Downtown Frederick												
Crist Park	2.35	2.35	100%	2.35	0.00	0.00	0.00	5.88	10,636	177	204	0
TOTALS	**2.35**	**2.35**		**2.35**	**0.00**	**0.00**	**0.00**	**5.88**	**10,636**	**177**	**204**	**0**
F2-Colorado Boulevard (between Hwy 52 and WCR 16)												
North Median	0.11	0.11	100%	0.00	0.00	0.11	0.00	0.13	239	4	5	0
Middle Median	0.44	0.44	100%	0.00	0.00	0.44	0.00	0.53	956	16	18	0

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Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)
South Median	0.07	0.07	100%	0.00	0.00	0.07	0.00	0.08	152	3	3	0
East ROW	1.79	1.79	100%	1.79	0.00	0.00	1.00	4.48	8,102	135	155	0
TOTALS	**2.41**	**0.62**		**1.79**	**0.00**	**0.62**	**0.00**	**0.74**	**1,347**	**22**	**26**	**0**
F3-Centennial Park												
8th Street Berms	4.77	4.77	100%	4.77	0.00	0.00	0.00	11.93	21,589	360	414	0
TOTALS	***4.77***	***4.77***		***4.77***	***0.00***	***0.00***	***0.00***	***11.93***	***21,589***	***360***	***414***	***0***
F4-Ball Fields												
Ball Fields	4.19	4.19	100%	4.19	0.00	0.00	0.00	10.48	18,964	316	363	0
TOTALS	***4.19***	***4.19***		***4.19***	***0.00***	***0.00***	***0.00***	***10.48***	***18,964***	***316***	***363***	***0***
F5-Miners Park Town Center												
Open Space	87.00	21.75	25%	5.44	10.88	1.09	4.35	14.90	26,973	450	517	394
WCR 13 (2100 feet)	1.42	1.42	100%	0.36	0.00	0.00	0.00	0.89	1,609	27	31	0
HWY 52 (2100 feet)	1.42	1.42	100%	0.36	0.00	0.00	0.00	0.89	1,609	27	31	0
WCR 13.5 (2100 feet)	0.31	0.31	100%	0.31	0.00	0.00	0.00	0.78	1,418	24	27	0
TOTALS	***90.16***	***24.91***		***6.46***	***10.88***	***1.09***	***4.35***	***17.46***	***31,609***	***527***	***606***	***394***
F6-Carriage Hills Marketplace												
Open Space	35.00	8.75	25%	2.19	4.38	0.44	1.75	5.99	10,851	181	208	158
HWY 52 (WCR 13.5 to WCR 15)	1.79	1.79	100%	0.45	0.90	0.09	0.36	1.23	2,220	37	43	32
WCR 13.5 (750 feet)	0.11	0.11	100%	0.03	0.06	0.01	0.02	0.08	139	2	3	2
WCR 15 (600 feet)	0.30	0.30	100%	0.07	0.15	0.01	0.06	0.20	367	6	7	5
Frederick Way (750 feet)	0.11	0.11	100%	0.03	0.06	0.01	0.02	0.08	139	2	3	2
TOTALS	***37.31***	***11.06***		***2.76***	***5.53***	***0.55***	***2.21***	***7.58***	***13,716***	***229***	***263***	***200***
F7-Carriage Hills, Filing 2												
Open Space	5.02	5.02	100%	5.02	0.00	0.00	0.00	12.55	22,721	379	435	0
WCR 15 (WCR 14.5 to WCR 16)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 16 (1100 feet)	0.54	0.54	100%	0.54	0.00	0.00	0.00	1.36	2,457	41	47	0
TOTALS	***6.86***	***6.86***		***6.86***	***0.00***	***0.00***	***0.00***	***17.16***	***31,062***	***518***	***595***	***0***
F8-Josephine Roche Annexation												
Open Space	120.00	30.00	25%	7.50	15.00	1.50	6.00	20.55	37,204	620	713	543
WCR 14.5 (WCR 15 to WCR 15.5)	0.39	0.39	100%	0.10	0.00	0.00	0.00	0.24	441	7	8	0
WCR 15 (1320 feet)	1.30	1.30	100%	0.33	0.00	0.00	0.00	0.81	1,471	25	28	0
WCR 16 (1320 feet)	1.30	1.30	100%	0.33	0.00	0.00	0.00	0.81	1,471	25	28	0
WCR 15.5 (WCR 14.5 to WCR 16)	0.39	0.39	100%	0.10	0.00	0.00	0.00	0.24	441	7	8	0
TOTALS	***123.38***	***33.38***		***8.35***	***15.00***	***1.50***	***6.00***	***22.66***	***41,028***	***684***	***786***	***543***
F9-Future Development (NW Corner of WCR 14/17)												
Open Space	160.00	40.00	25%	10.00	20.00	2.00	8.00	27.40	49,605	827	951	724
WCR 14 (WCR 15.5 to WCR 17)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 15.5 (WCR 14 to WCR 14.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 14.5 (WCR 15.5 to WCR 17)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 17 (WCR 14 to WCR 14.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***163.38***	***43.38***		***13.38***	***20.00***	***2.00***	***8.00***	***35.85***	***64,903***	***1,082***	***1,244***	***724***
F10-Future Development (NE Corner of WCR 14/17)												
Open Space	160.00	0.00	0%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
WCR 14 (WCR 17 to WCR 17.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 17 (WCR 14 to WCR 14.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 14.5 (WCR 17 to WCR 17.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 17.5 (WCR 14 to WCR 14.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***163.38***	***3.38***		***3.38***	***0.00***	***0.00***	***0.00***	***8.45***	***15,298***	***255***	***293***	***0***

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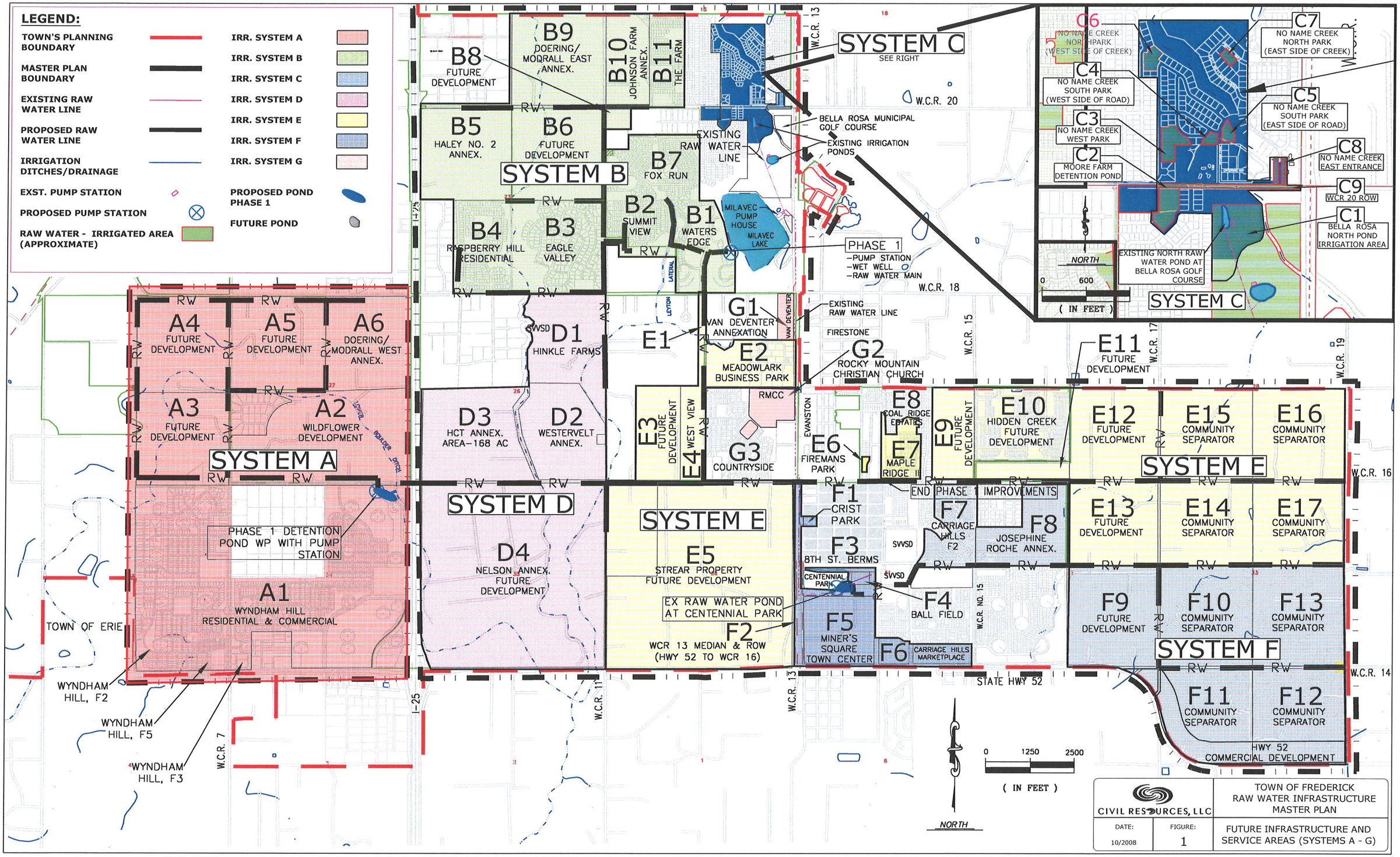
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)
F11-Future Development (SE Corner of WCR 14/17)												
Open Space	160.00	0.00	0%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Commercial Along Hwy 52 (600' Deep)	60.26	15.07	25%	3.77	7.53	0.75	3.01	10.32	18,682	311	358	273
HWY 52 (WCR 17 to WCR 17.5)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 17.5 (WCR 12.5 to WCR 14)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 14 (WCR 17 to WCR 17.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 17 (HWY 52 to WCR 14)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***225.04***	***19.85***		***8.55***	***7.53***	***0.75***	***3.01***	***22.27***	***40,317***	***672***	***773***	***273***
F12-Future Development (SW Corner of WCR 14/19)												
Open Space	160.00	0.00	0%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Commercial Along Hwy 52 (600' Deep)	35.60	8.90	25%	2.23	4.45	0.45	1.78	6.10	11,037	184	212	161
HWY 52 (WCR 17.5 to WCR 19)	1.79	1.79	100%	1.79	0.00	0.00	0.00	4.48	8,102	135	155	0
WCR 17.5 (HWY 52 to WCR 14)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 14 (WCR 17.5 to WCR 19)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 19 (HWY 52 to WCR 14)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***200.38***	***13.68***		***7.01***	***4.45***	***0.45***	***1.78***	***18.05***	***32,671***	***545***	***626***	***161***
F13-Future Development (NE Corner of WCR 14/19)												
Open Space	160.00	0.00	0%	0.00	0.00	0.00	0.00	0.00	0	0	0	0
WCR 14 (WCR 17.5 to WCR 19)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
WCR 17.5 (WCR 14 to WCR 14.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 14.5 (WCR 17.5 to WCR 19)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
WCR 19 (WCR 14 to WCR 14.5)	1.30	1.30	100%	1.30	0.00	0.00	0.00	3.25	5,884	98	113	0
TOTALS	***163.38***	***3.38***		***3.38***	***0.00***	***0.00***	***0.00***	***8.45***	***15,298***	***255***	***293***	***0***
F14-St. Vrain Valley School District												
Frederick High School Ball Fields	30.17	30.17	100%	30.17	0.00	0.00	0.00	75.43	136,550	2,276	2,617	0
TOTALS	***30.17***	***30.17***		***30.17***	***0.00***	***0.00***	***0.00***	***75.43***	***136,550***	***2,276***	***2,617***	***0***
SYSTEM G												
G1-Van Deventer Property												
Open Space	5.35	1.34	25%	0.33	0.67	0.07	0.27	0.92	1,659	28	32	24
WCR 13 (1350 feet)	0.91	0.91	100%	0.91	0.00	0.00	0.00	2.28	4,119	69	79	0
WCR 18 (500 feet)	0.25	0.25	100%	0.25	0.00	0.00	0.00	0.63	1,132	19	22	0
TOTALS	***6.51***	***2.50***		***1.49***	***0.67***	***0.07***	***0.27***	***3.82***	***6,909***	***115***	***132***	***24***
G2-Rocky Mountain Christian Church												
Open Space	29.00	7.25	25%	1.81	3.63	0.36	1.45	4.97	8,991	150	172	131
WCR 13 (900 feet)	0.61	0.61	100%	0.61	0.00	0.00	0.00	1.53	2,761	46	53	0
WCR 16.5 (1400 feet)	0.21	0.21	100%	0.21	0.00	0.00	0.00	0.53	950	16	18	0
TOTALS	***29.82***	***8.07***		***2.63***	***3.63***	***0.36***	***1.45***	***7.02***	***12,702***	***212***	***243***	***131***
G3-Countryside Subdivision												
Park	3.55	3.55	100%	3.55	0.00	0.00	0.00	8.88	16,067	268	308	0
WCR 16 (1500 feet)	0.74	0.74	100%	0.74	0.00	0.00	0.00	1.85	3,349	56	64	0
WCR 16.5 (1300 feet)	0.19	0.19	100%	0.19	0.00	0.00	0.00	0.48	860	14	16	0
WCR 11.5 (WCR 16 to 16.5)	0.39	0.39	100%	0.39	0.00	0.00	0.00	0.98	1,765	29	34	0
TOTALS	***4.87***	***4.87***		***4.87***	***0.00***	***0.00***	***0.00***	***12.18***	***22,042***	***367***	***422***	***0***

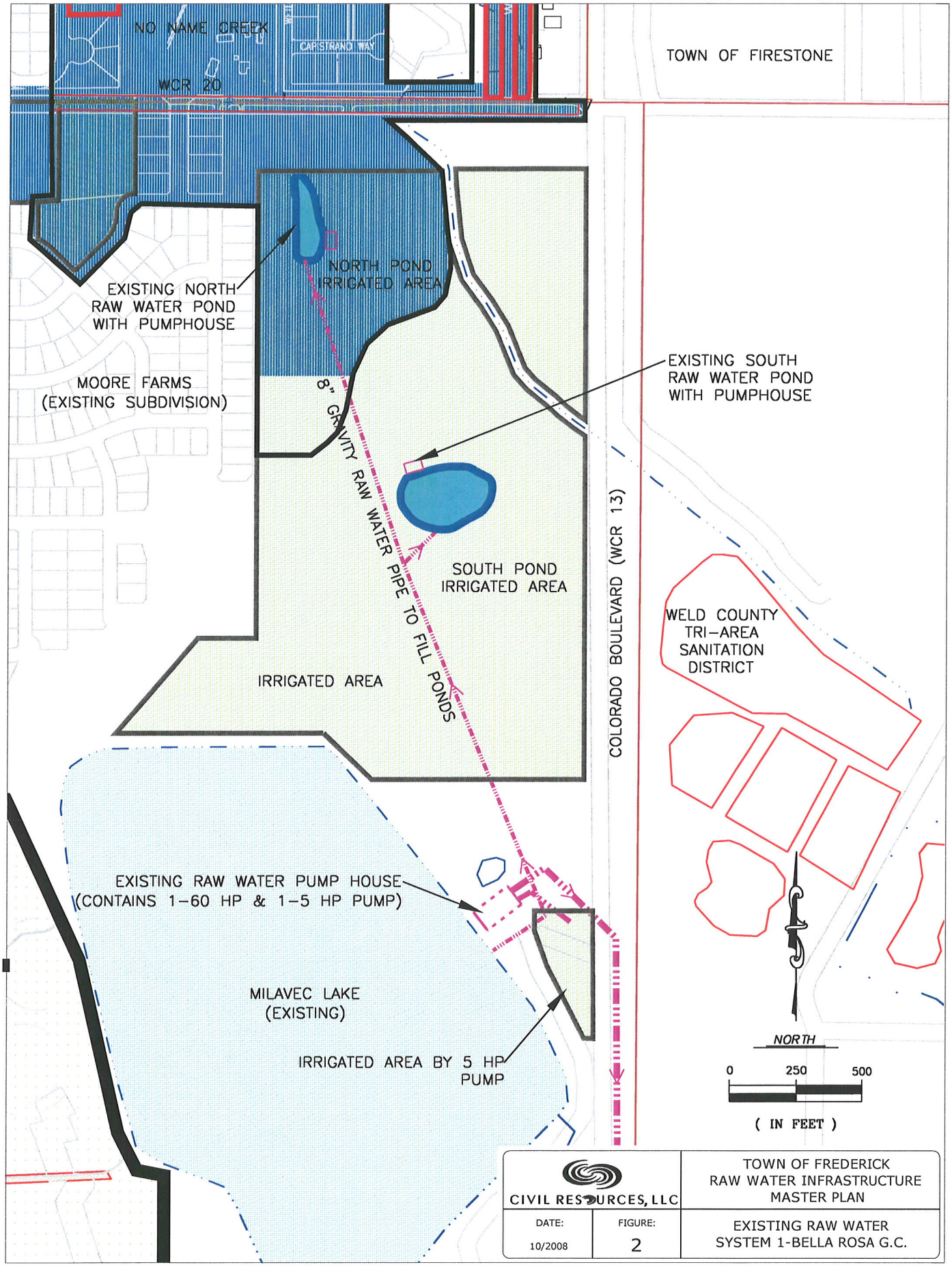
Table 1.1 - Raw Water Demands by Property (Irrigating 7 Days Per Week) - Expanded

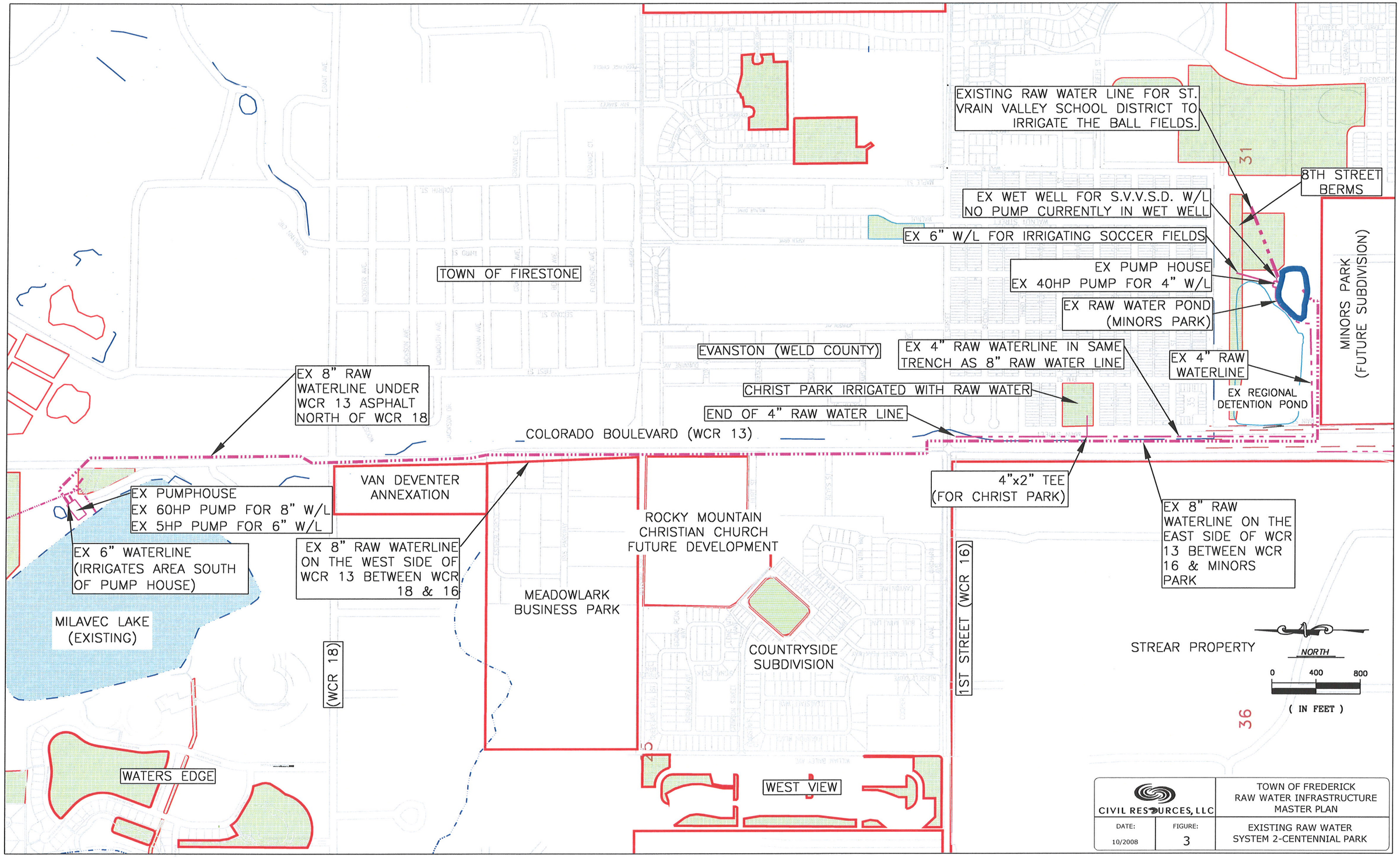
Area to be Irrigated	Total Area (ac)	Irr. Area (ac)	Percentage (%)	Turf Grass (ac)	Native Grass (ac)	Drip Irrigation (ac)	Unirrigated (ac)	Total Outdoor Demand (af)	Avg. Day Demand (gpd)	Avg Day Demand (gpm)	Max Day Demand (gpm)	Native Grass Demand (gpm)

Inputs	% of Total Irrigated Land	
	25%	% Turf Grass
	50%	% Native Grass
	5%	% Drip
	20%	% unirrigated
	100%	
	2.50	Turf Grass Annual Applied Irrigation (ft)
	1.20	Native Grass Annual Applied Irrigation (ft)
	1.20	Drip Annual Applied Irrigation (ft)
	180	Watering Days Per Year
	1	Watering Hours Per Day
	1.15	Max Day Demand Factor

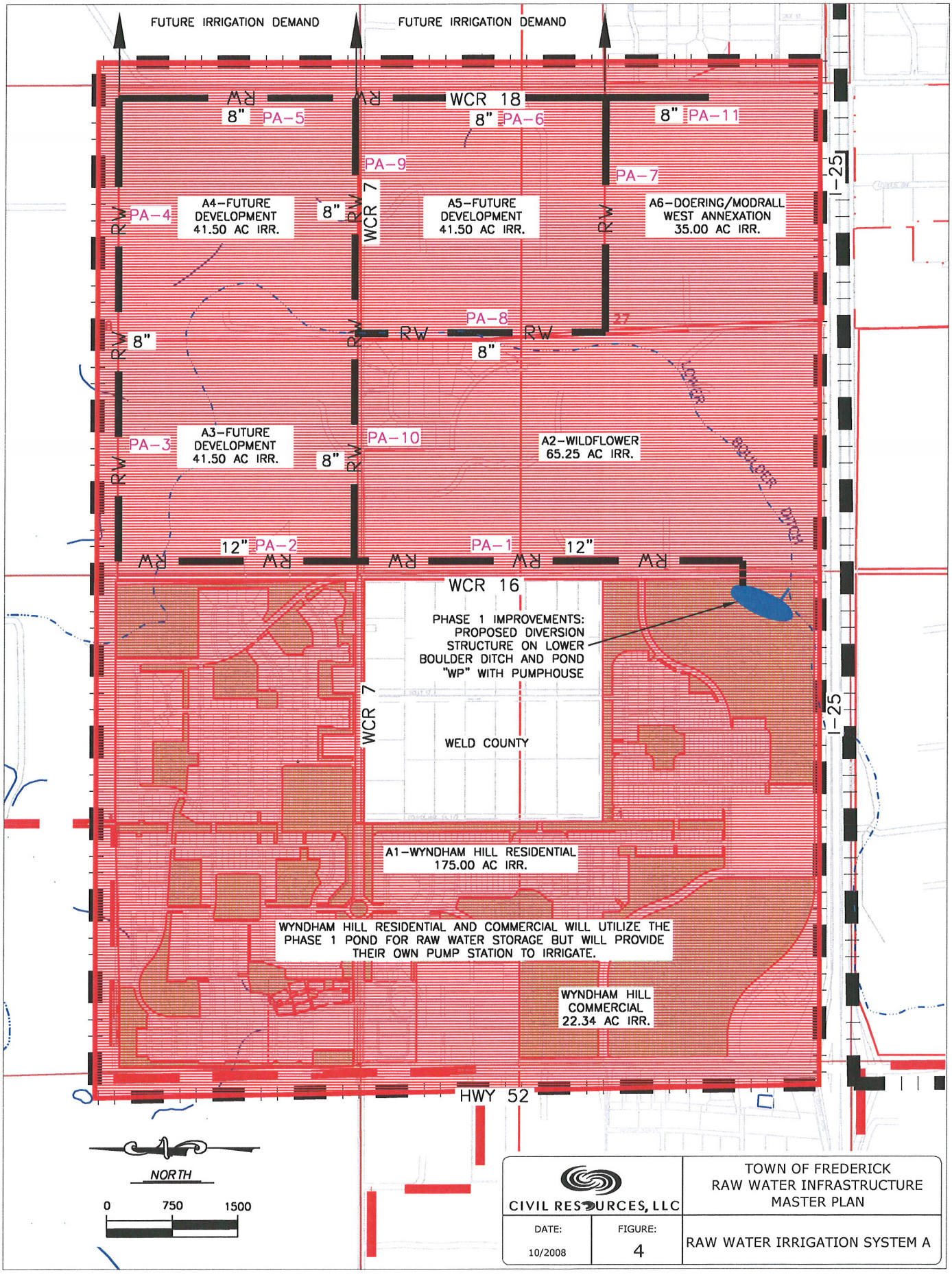
Figures

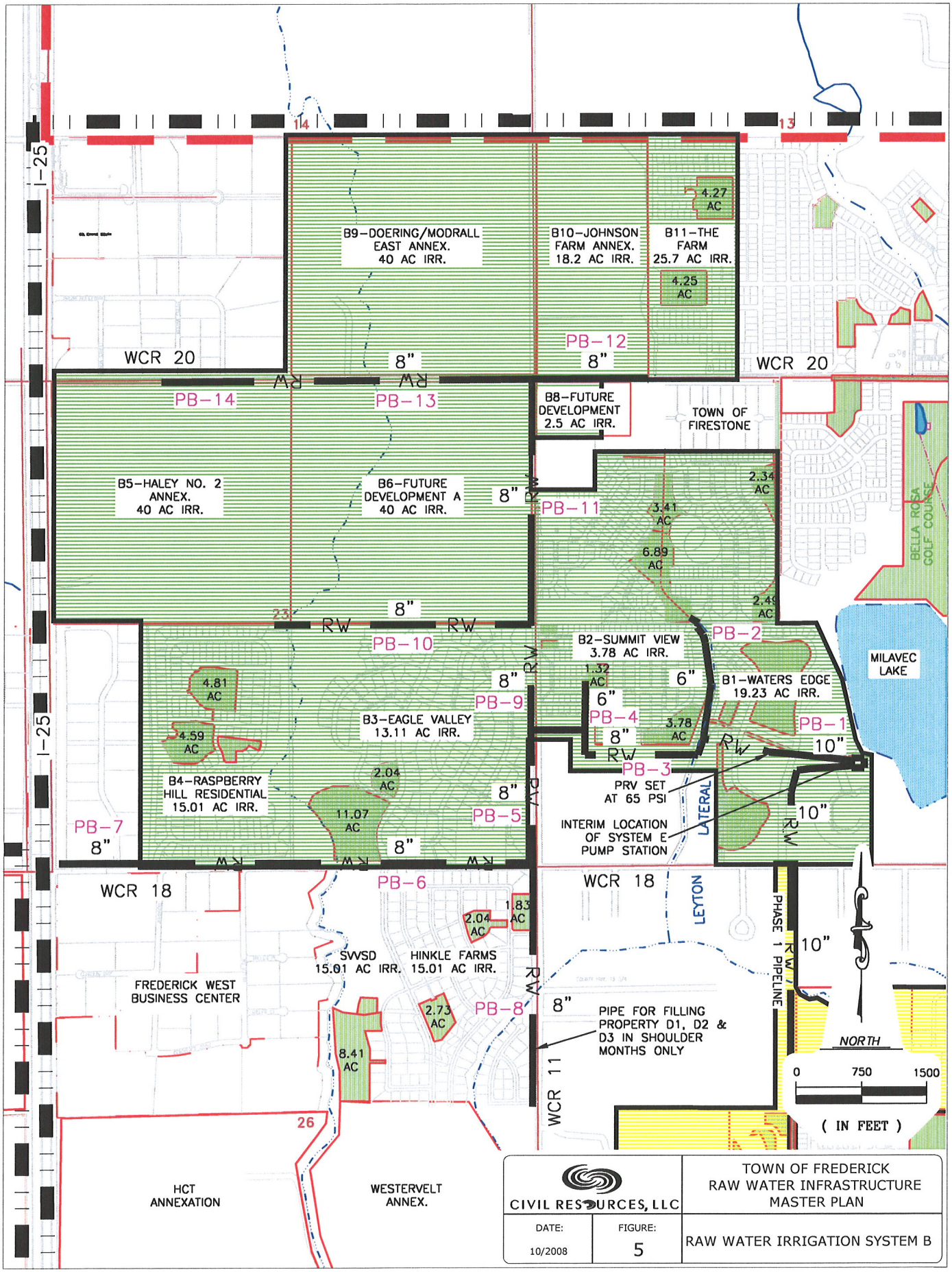

LEGEND:
TOWN'S PLANNING BOUNDARY
MASTER PLAN BOUNDARY
EXISTING RAW WATER LINE
PROPOSED RAW WATER LINE
IRRIGATION DITCHES/DRAINAGE
EXST. PUMP STATION
PROPOSED PUMP STATION
RAW WATER - IRRIGATED AREA (APPROXIMATE)
IRR. SYSTEM A
IRR. SYSTEM B
IRR. SYSTEM C
IRR. SYSTEM D
IRR. SYSTEM E
IRR. SYSTEM F
IRR. SYSTEM G
PROPOSED POND PHASE 1
FUTURE POND
SYSTEM A
SYSTEM B
SYSTEM C
SYSTEM D
SYSTEM E
SYSTEM F
A1 WYNDHAM HILL RESIDENTIAL & COMMERCIAL
A2 WILDFLOWER DEVELOPMENT
A3 FUTURE DEVELOPMENT
A4 FUTURE DEVELOPMENT
A5 FUTURE DEVELOPMENT
A6 DOERING/ MODRALL WEST ANNEX.
B1 WATERS EDGE
B2 SUMMIT VIEW
B3 EAGLE VALLEY
B4 RASPBERRY HILL RESIDENTIAL
B5 HALEY NO. 2 ANNEX.
B6 FUTURE DEVELOPMENT
B7 FOX RUN
B8 FUTURE DEVELOPMENT
B9 DOERING/ MODRALL EAST ANNEX.
B10 JOHNSON FARM ANNEX.
B11 THE FARM
C1 BELLA ROSA NORTH POND IRRIGATION AREA
C2 MOORE FARM DETENTION POND
C3 NO NAME CREEK WEST PARK
C4 NO NAME CREEK SOUTH PARK (WEST SIDE OF ROAD)
C5 NO NAME CREEK SOUTH PARK (EAST SIDE OF ROAD)
C6 NO NAME CREEK NORTH PARK (WEST SIDE OF CREEK)
C7 NO NAME CREEK NORTH PARK (EAST SIDE OF CREEK)
C8 NO NAME CREEK EAST ENTRANCE
C9 WCR 20 ROW
D1 HINKLE FARMS
D2 WESTERVELT ANNEX.
D3 HCT ANNEX. AREA-168 AC
D4 NELSON ANNEX. FUTURE DEVELOPMENT
E1
E2 MEADOWLARK BUSINESS PARK
E3 FUTURE DEVELOPMENT
E4 WEST VIEW
E5 STREAR PROPERTY FUTURE DEVELOPMENT
E6 FIREMANS PARK
E7 MAPLE RIDGE II
E8 COAL RIDGE ESTATES
E9 FUTURE DEVELOPMENT
E10 HIDDEN CREEK FUTURE DEVELOPMENT
E11 FUTURE DEVELOPMENT
E12 FUTURE DEVELOPMENT
E13 FUTURE DEVELOPMENT
E14 COMMUNITY SEPARATOR
E15 COMMUNITY SEPARATOR
E16 COMMUNITY SEPARATOR
E17 COMMUNITY SEPARATOR
F1 CRIST PARK
F2 WCR 13 MEDIAN & ROW (HWY 52 TO WCR 16)
F3 8TH ST. BERMS
F4 BALL FIELD
F5 MINER'S SQUARE TOWN CENTER
F6 CARRIAGE HILLS MARKETPLACE
F7 CARRIAGE HILLS F2
F8 JOSEPHINE ROCHE ANNEX.
F9 FUTURE DEVELOPMENT
F10 COMMUNITY SEPARATOR
F11 COMMUNITY SEPARATOR
F12 COMMUNITY SEPARATOR
F13 COMMUNITY SEPARATOR
G1 VAN DEVENTER ANNEXATION
G2 ROCKY MOUNTAIN CHRISTIAN CHURCH
G3 COUNTRYSIDE
RMCC
BELLA ROSA MUNICIPAL GOLF COURSE
EXISTING IRRIGATION PONDS
EXISTING WATER LINE
MILAVEC PUMP HOUSE
MILAVEC LAKE
PHASE 1
-PUMP STATION
-WET WELL
-RAW WATER MAIN
EXISTING RAW WATER LINE
FIRESTONE
END PHASE 1 IMPROVEMENTS
PHASE 1 DETENTION POND WP WITH PUMP STATION
EX RAW WATER POND AT CENTENNIAL PARK
CENTENNIAL PARK
EXISTING NORTH RAW WATER POND AT BELLA ROSA GOLF COURSE
HWY 52 COMMERCIAL DEVELOPMENT
TOWN OF ERIE
WYNDHAM HILL, F2
WYNDHAM HILL, F5
WYNDHAM HILL, F3
W.C.R. 20
W.C.R. 18
W.C.R. 16
W.C.R. 14
W.C.R. 13
W.C.R. 15
W.C.R. 17
W.C.R. 19
W.C.R. 11
W.C.R. 7
W.C.R. NO. 15
I-25
STATE HWY 52
SVVSD
EVANSTON
VAN DEVENTER
LETTON
LATERAL
BOULDER DITCH
NORTH
0 600
(IN FEET)
0 1250 2500
(IN FEET)
CIVIL RESOURCES, LLC
TOWN OF FREDERICK RAW WATER INFRASTRUCTURE MASTER PLAN
DATE: 10/2008
FIGURE: 1
FUTURE INFRASTRUCTURE AND SERVICE AREAS (SYSTEMS A - G)

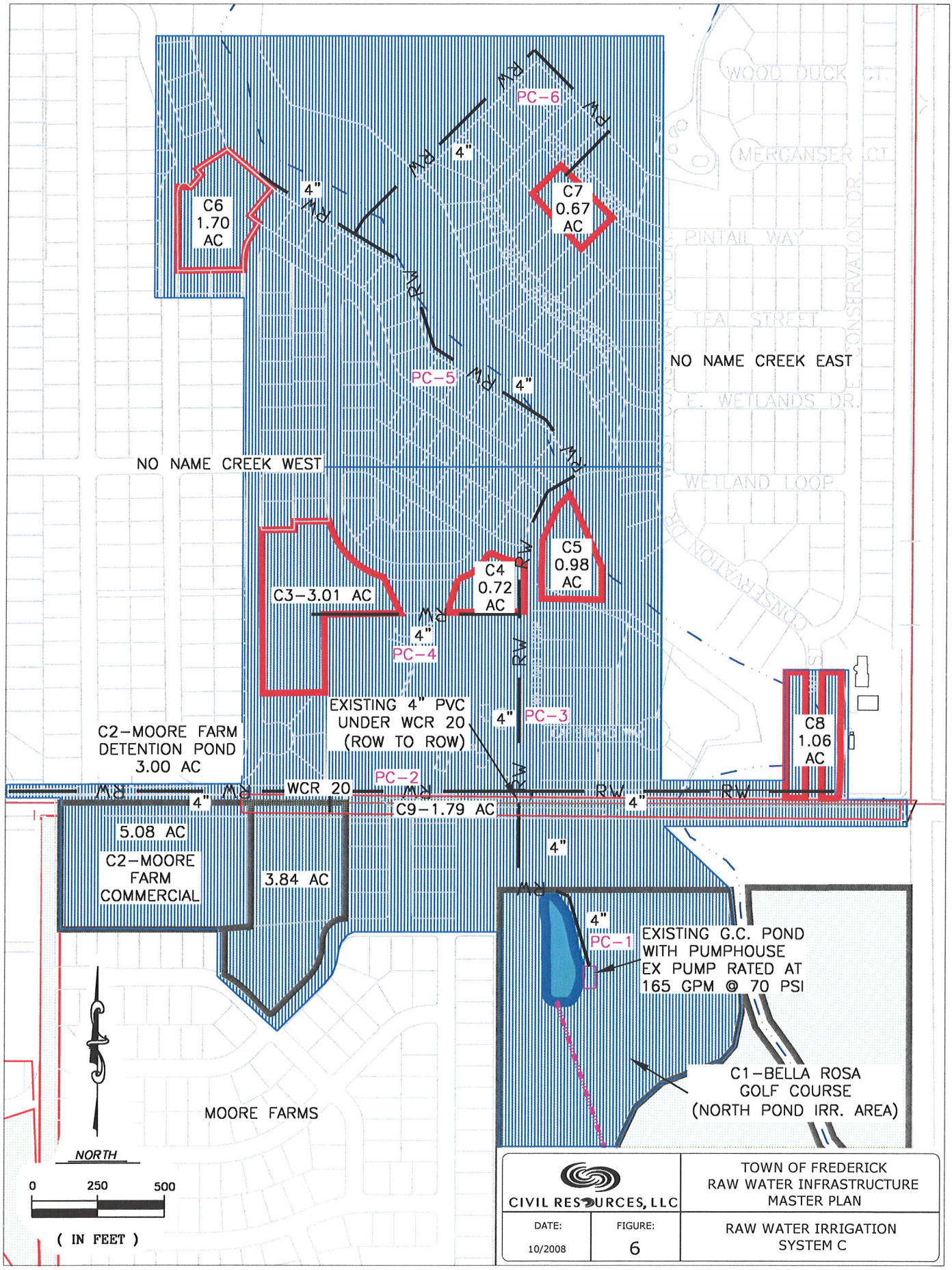

NO NAME CREEK
CAPISTRANO WAY
WCR 20
TOWN OF FIRESTONE
NORTH POND IRRIGATED AREA
EXISTING NORTH RAW WATER POND WITH PUMPHOUSE
MOORE FARMS (EXISTING SUBDIVISION)
8" GRAVITY RAW WATER PIPE TO FILL PONDS
EXISTING SOUTH RAW WATER POND WITH PUMPHOUSE
SOUTH POND IRRIGATED AREA
IRRIGATED AREA
COLORADO BOULEVARD (WCR 13)
WELD COUNTY TRI-AREA SANITATION DISTRICT
EXISTING RAW WATER PUMP HOUSE (CONTAINS 1-60 HP & 1-5 HP PUMP)
MILAVEC LAKE (EXISTING)
IRRIGATED AREA BY 5 HP PUMP
NORTH
0
250
500
(IN FEET)
CIVIL RESOURCES, LLC
TOWN OF FREDERICK RAW WATER INFRASTRUCTURE MASTER PLAN
DATE:
10/2008
FIGURE:
2
EXISTING RAW WATER SYSTEM 1-BELLA ROSA G.C.

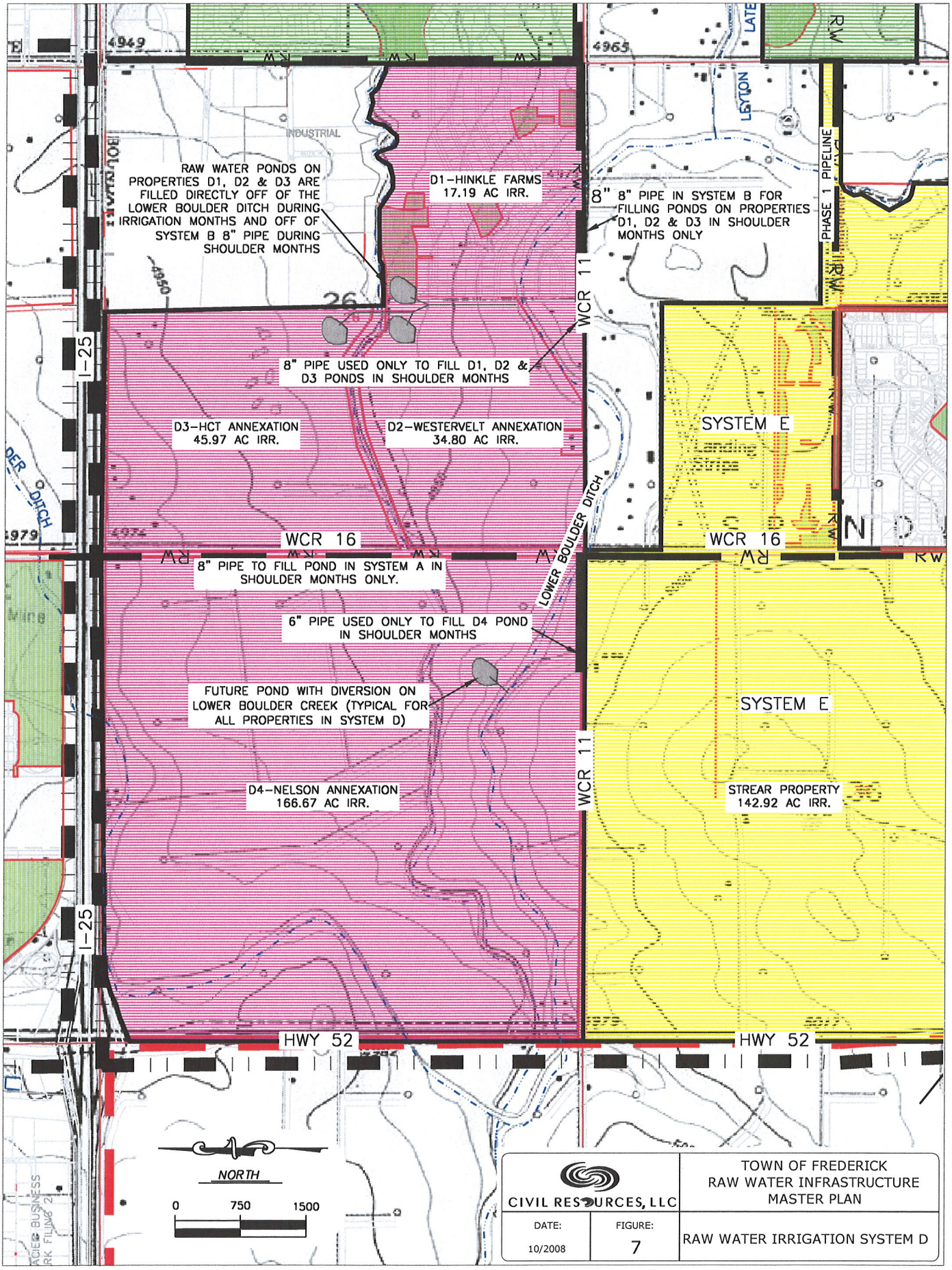


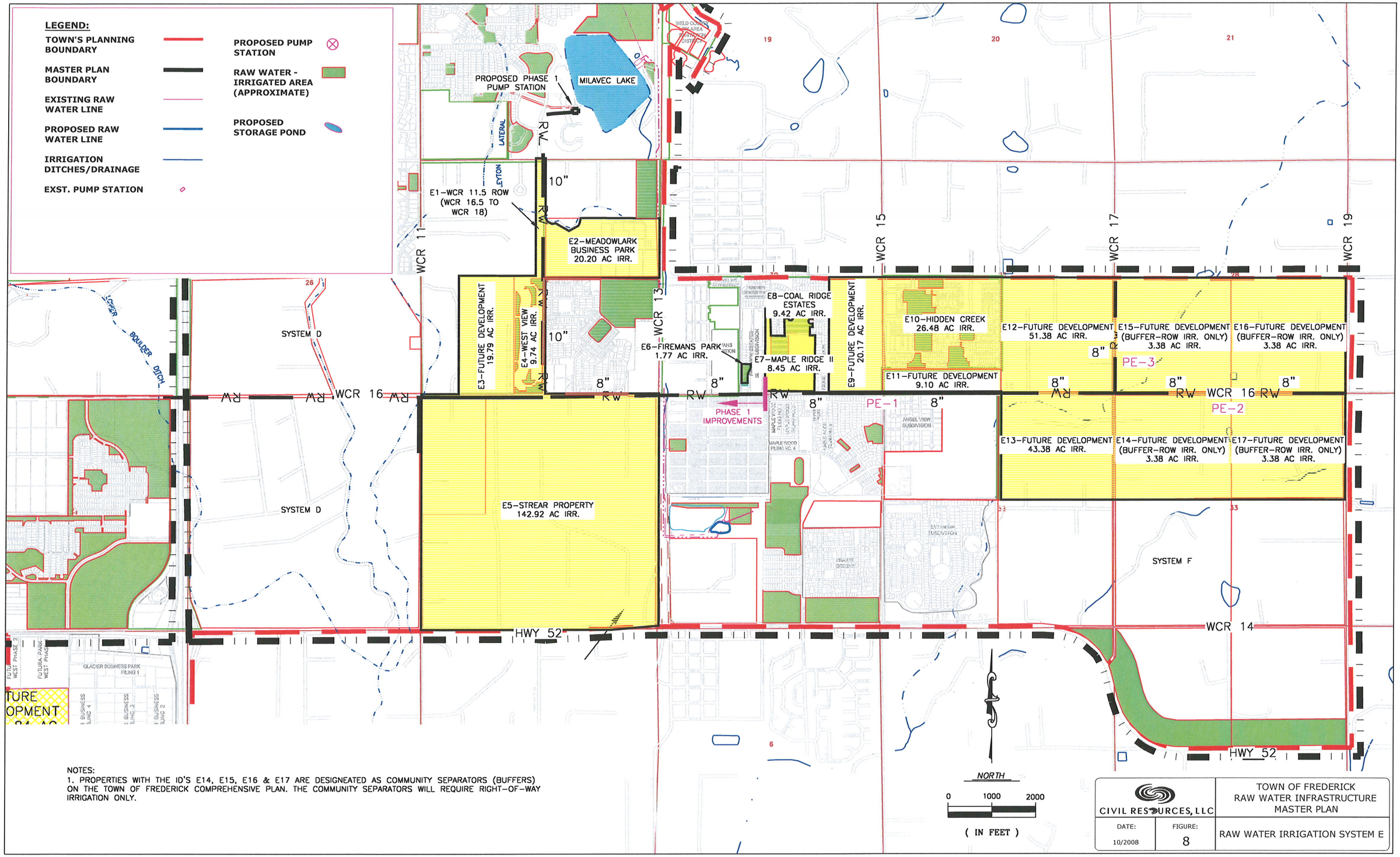
CIVIL RESOURCES, LLC	TOWN OF FREDERICK RAW WATER INFRASTRUCTURE MASTER PLAN
DATE: 10/2008 / FIGURE: 3	EXISTING RAW WATER SYSTEM 2-CENTENNIAL PARK


FUTURE IRRIGATION DEMAND
FUTURE IRRIGATION DEMAND
WCR 18
8" PA-5
8" PA-6
8" PA-11
PA-9
PA-7
I-25
A4-FUTURE DEVELOPMENT 41.50 AC IRR.
A5-FUTURE DEVELOPMENT 41.50 AC IRR.
A6-DOERING/MODRALL WEST ANNEXATION 35.00 AC IRR.
PA-4
8"
WCR 7
PA-8
RW
8"
LOWER BOULDER DITCH
A3-FUTURE DEVELOPMENT 41.50 AC IRR.
PA-3
PA-10
A2-WILDFLOWER 65.25 AC IRR.
12" PA-2
PA-1
12"
WCR 16
PHASE 1 IMPROVEMENTS: PROPOSED DIVERSION STRUCTURE ON LOWER BOULDER DITCH AND POND "WP" WITH PUMPHOUSE
WELD COUNTY
A1-WYNDHAM HILL RESIDENTIAL 175.00 AC IRR.
WYNDHAM HILL RESIDENTIAL AND COMMERCIAL WILL UTILIZE THE PHASE 1 POND FOR RAW WATER STORAGE BUT WILL PROVIDE THEIR OWN PUMP STATION TO IRRIGATE.
WYNDHAM HILL COMMERCIAL 22.34 AC IRR.
HWY 52
NORTH
0 750 1500
CIVIL RESOURCES, LLC
TOWN OF FREDERICK RAW WATER INFRASTRUCTURE MASTER PLAN
DATE: 10/2008
FIGURE: 4
RAW WATER IRRIGATION SYSTEM A


I-25
14
13
B9-DOERING/MODRALL EAST ANNEX. 40 AC IRR.
B10-JOHNSON FARM ANNEX. 18.2 AC IRR.
B11-THE FARM 25.7 AC IRR.
4.27 AC
4.25 AC
WCR 20
WCR 20
8"
PB-12
8"
RW
RW
PB-14
PB-13
B8-FUTURE DEVELOPMENT 2.5 AC IRR.
TOWN OF FIRESTONE
B5-HALEY NO. 2 ANNEX. 40 AC IRR.
B6-FUTURE DEVELOPMENT A 40 AC IRR.
8"
RW
PB-11
2.34 AC
3.41 AC
6.89 AC
BELLA ROSA GOLF COURSE
2.49 AC
23
8"
RW
RW
PB-10
B2-SUMMIT VIEW 3.78 AC IRR.
PB-2
MILAVEC LAKE
4.81 AC
8"
1.32 AC
6"
B1-WATERS EDGE 19.23 AC IRR.
PB-9
6"
PB-4
3.78 AC
PB-1
B3-EAGLE VALLEY 13.11 AC IRR.
4.59 AC
8"
RW
10"
PB-3
PRV SET AT 65 PSI
B4-RASPBERRY HILL RESIDENTIAL 15.01 AC IRR.
2.04 AC
8"
PB-5
INTERIM LOCATION OF SYSTEM E PUMP STATION
LATERAL
10"
PB-7
8"
11.07 AC
8"
RW
RW
RW
WCR 18
PB-6
WCR 18
LEYTON
1.83 AC
2.04 AC
PHASE 1 PIPELINE
10"
SVVSD 15.01 AC IRR.
HINKLE FARMS 15.01 AC IRR.
FREDERICK WEST BUSINESS CENTER
2.73 AC
PB-8
8"
PIPE FOR FILLING PROPERTY D1, D2 & D3 IN SHOULDER MONTHS ONLY
8.41 AC
NORTH
0
750
1500
(IN FEET)
WCR 11
26
HCT ANNEXATION
WESTERVELT ANNEX.
CIVIL RESOURCES, LLC
TOWN OF FREDERICK
RAW WATER INFRASTRUCTURE
MASTER PLAN
DATE:
10/2008
FIGURE:
5
RAW WATER IRRIGATION SYSTEM B

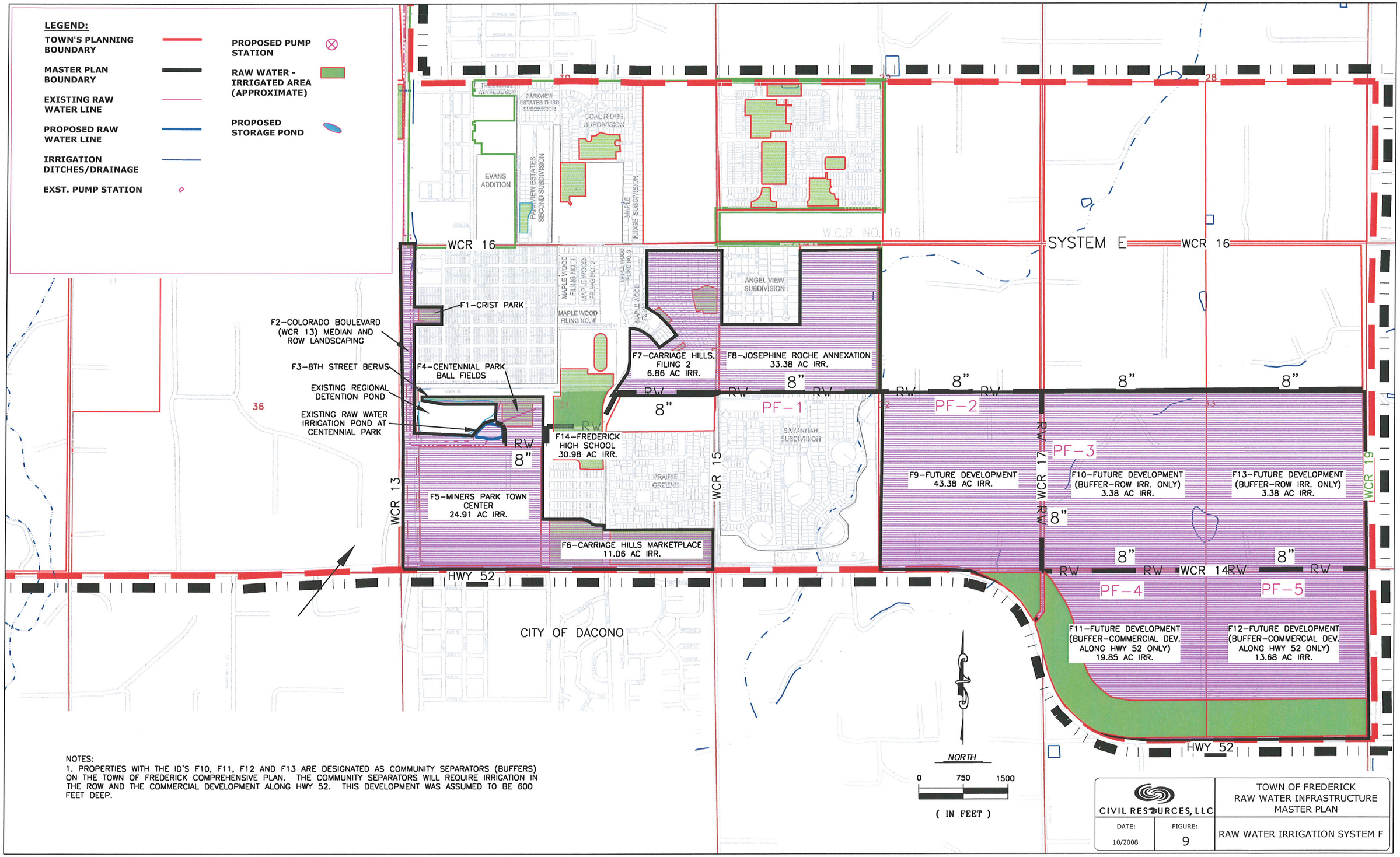

WOOD DUCK CT.
MERCANSER CT.
PINTAIL WAY
TEAL STREET
E. WETLANDS DR.
WETLAND LOOP
CONSERVATION DR.
PC-6
PC-5
PC-4
PC-3
PC-2
PC-1
4"
RW
C6
1.70
AC
C7
0.67
AC
C5
0.98
AC
C4
0.72
AC
C3-3.01 AC
C8
1.06
AC
NO NAME CREEK EAST
NO NAME CREEK WEST
EXISTING 4" PVC
UNDER WCR 20
(ROW TO ROW)
C2-MOORE FARM
DETENTION POND
3.00 AC
WCR 20
C9-1.79 AC
5.08 AC
C2-MOORE
FARM
COMMERCIAL
3.84 AC
EXISTING G.C. POND
WITH PUMPHOUSE
EX PUMP RATED AT
165 GPM @ 70 PSI
C1-BELLA ROSA
GOLF COURSE
(NORTH POND IRR. AREA)
MOORE FARMS
NORTH
0
250
500
(IN FEET)
CIVIL RESOURCES, LLC
TOWN OF FREDERICK
RAW WATER INFRASTRUCTURE
MASTER PLAN
DATE:
10/2008
FIGURE:
6
RAW WATER IRRIGATION
SYSTEM C


RAW WATER PONDS ON PROPERTIES D1, D2 & D3 ARE FILLED DIRECTLY OFF OF THE LOWER BOULDER DITCH DURING IRRIGATION MONTHS AND OFF OF SYSTEM B 8" PIPE DURING SHOULDER MONTHS
D1-HINKLE FARMS 17.19 AC IRR.
8" 8" PIPE IN SYSTEM B FOR FILLING PONDS ON PROPERTIES D1, D2 & D3 IN SHOULDER MONTHS ONLY
PHASE 1 PIPELINE
8" PIPE USED ONLY TO FILL D1, D2 & D3 PONDS IN SHOULDER MONTHS
D3-HCT ANNEXATION 45.97 AC IRR.
D2-WESTERVELT ANNEXATION 34.80 AC IRR.
SYSTEM E
WCR 11
WCR 16
I-25
LOWER BOULDER DITCH
8" PIPE TO FILL POND IN SYSTEM A IN SHOULDER MONTHS ONLY.
6" PIPE USED ONLY TO FILL D4 POND IN SHOULDER MONTHS
FUTURE POND WITH DIVERSION ON LOWER BOULDER CREEK (TYPICAL FOR ALL PROPERTIES IN SYSTEM D)
D4-NELSON ANNEXATION 166.67 AC IRR.
STREAR PROPERTY 142.92 AC IRR.
HWY 52
NORTH
0 750 1500
CIVIL RESOURCES, LLC
TOWN OF FREDERICK
RAW WATER INFRASTRUCTURE
MASTER PLAN
DATE:
10/2008
FIGURE:
7
RAW WATER IRRIGATION SYSTEM D

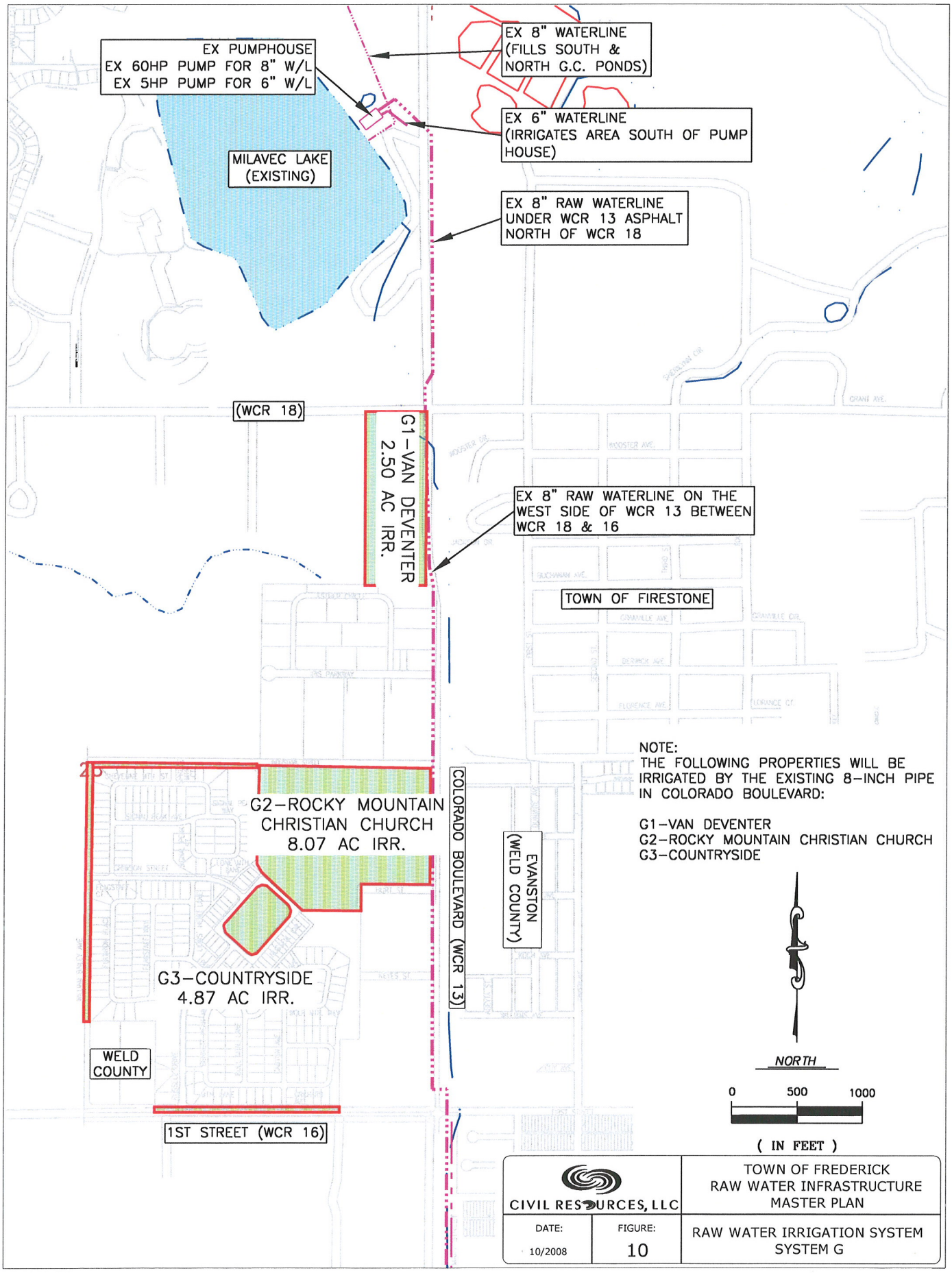


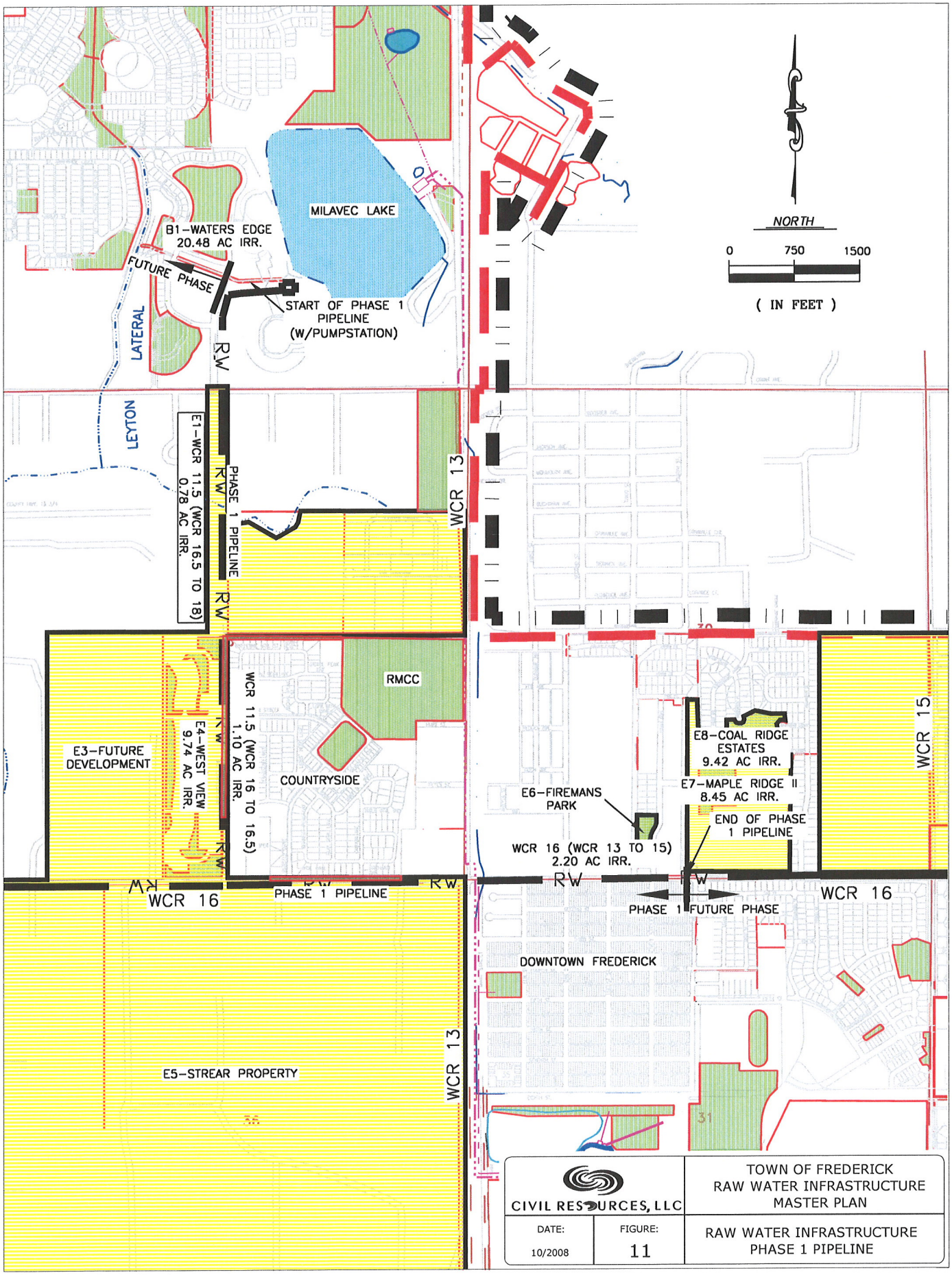
NOTES:
1. PROPERTIES WITH THE ID'S E14, E15, E16 & E17 ARE DESIGNEATED AS COMMUNITY SEPARATORS (BUFFERS) ON THE TOWN OF FREDERICK COMPREHENSIVE PLAN. THE COMMUNITY SEPARATORS WILL REQUIRE RIGHT-OF-WAY IRRIGATION ONLY.

CIVIL RESOURCES, LLC		TOWN OF FREDERICK RAW WATER INFRASTRUCTURE MASTER PLAN
DATE: 10/2008	FIGURE: 8	RAW WATER IRRIGATION SYSTEM E



NOTES:
1. PROPERTIES WITH THE ID'S F10, F11, F12 AND F13 ARE DESIGNATED AS COMMUNITY SEPARATORS (BUFFERS) ON THE TOWN OF FREDERICK COMPREHENSIVE PLAN. THE COMMUNITY SEPARATORS WILL REQUIRE IRRIGATION IN THE ROW AND THE COMMERCIAL DEVELOPMENT ALONG HWY 52. THIS DEVELOPMENT WAS ASSUMED TO BE 600 FEET DEEP.


EX PUMPHOUSE
EX 60HP PUMP FOR 8" W/L
EX 5HP PUMP FOR 6" W/L
EX 8" WATERLINE (FILLS SOUTH & NORTH G.C. PONDS)
EX 6" WATERLINE (IRRIGATES AREA SOUTH OF PUMP HOUSE)
MILAVEC LAKE (EXISTING)
EX 8" RAW WATERLINE UNDER WCR 13 ASPHALT NORTH OF WCR 18
(WCR 18)
G1-VAN DEVENTER 2.50 AC IRR.
EX 8" RAW WATERLINE ON THE WEST SIDE OF WCR 13 BETWEEN WCR 18 & 16
TOWN OF FIRESTONE
G2-ROCKY MOUNTAIN CHRISTIAN CHURCH 8.07 AC IRR.
G3-COUNTRYSIDE 4.87 AC IRR.
COLORADO BOULEVARD (WCR 13)
EVANSTON (WELD COUNTY)
WELD COUNTY
1ST STREET (WCR 16)
NOTE:
THE FOLLOWING PROPERTIES WILL BE IRRIGATED BY THE EXISTING 8-INCH PIPE IN COLORADO BOULEVARD:
G1-VAN DEVENTER
G2-ROCKY MOUNTAIN CHRISTIAN CHURCH
G3-COUNTRYSIDE
NORTH
0
500
1000
(IN FEET)
CIVIL RESOURCES, LLC
TOWN OF FREDERICK
RAW WATER INFRASTRUCTURE
MASTER PLAN
DATE:
10/2008
FIGURE:
10
RAW WATER IRRIGATION SYSTEM
SYSTEM G


MILAVEC LAKE
B1-WATERS EDGE
20.48 AC IRR.
FUTURE PHASE
START OF PHASE 1
PIPELINE
(W/PUMPSTATION)
LATERAL
LEYTON
RW
NORTH
0
750
1500
(IN FEET)
E1-WCR 11.5 (WCR 16.5 TO 18)
0.78 AC IRR.
PHASE 1 PIPELINE
WCR 13
WCR 11.5 (WCR 16 TO 16.5)
1.10 AC IRR.
RMCC
COUNTRYSIDE
E3-FUTURE
DEVELOPMENT
E4-WEST VIEW
9.74 AC IRR.
E8-COAL RIDGE
ESTATES
9.42 AC IRR.
E7-MAPLE RIDGE II
8.45 AC IRR.
E6-FIREMANS
PARK
END OF PHASE
1 PIPELINE
WCR 16 (WCR 13 TO 15)
2.20 AC IRR.
WCR 15
WCR 16
PHASE 1 FUTURE PHASE
DOWNTOWN FREDERICK
E5-STREAR PROPERTY
30
31
CIVIL RESOURCES, LLC
TOWN OF FREDERICK
RAW WATER INFRASTRUCTURE
MASTER PLAN
DATE:
10/2008
FIGURE:
11
RAW WATER INFRASTRUCTURE
PHASE 1 PIPELINE

APPENDIX A

EPANET OUTPUT

System A - Pipe Network Data
Town of Frederick Raw Water Infrastructure

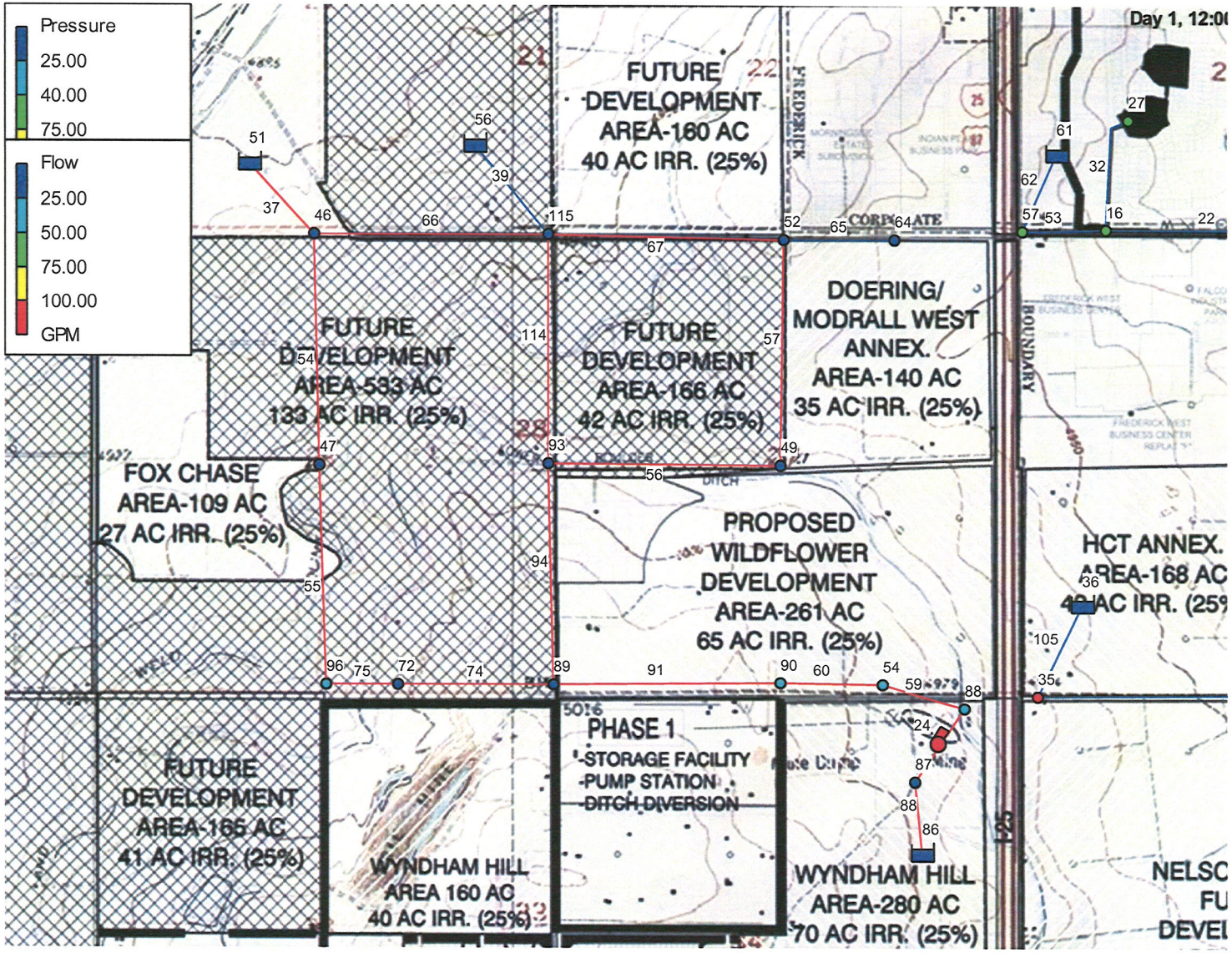
NODES/RESERVOIRS					
Node ID	Elevation (ft)	Base Demand (GPM)	Demand (GPM)	Head (ft)	Pressure (psi)
Resvr 86	5010	#N/A	-1820	5010	0
Junc 87	5010	0	0	5010	0
Junc 88	5010	0	0	5094	37
Junc 54	4995	0	0	5083	38
Junc 90	5010	0	0	5071	26
Junc 89	5016	0	0	5047	14
Junc 72	5000	0	0	5043	19
Junc 96	4970	0	0	5040	30
Junc 47	4940	0	0	4990	22
Junc 46	4915	0	0	4941	11
Junc 115	4940	0	0	4985	19
Junc 52	4975	0	0	4992	7
Junc 64	4960	0	0	4992	14
WCR 7 (Between WCR 16 & 18)					
Junc 115	4940	0	0	4985	19
Junc 93	4990	0	0	5003	6
Junc 89	5016	0	0	5047	14
North of Wildflower					
Junc 93	4990	0	0	5003	6
Junc 49	4980	0	0	4996	7
Junc 52	4975	0	0	4992	7
Northwest Corner					
Junc 46	4915	0	0	4941	11
Resvr 51	4940.5	#N/A	1820	4941	0

PIPES							
Link ID	Length (ft)	Diameter (in)	Roughness	Flow (GPM)	Velocity (fps)	Unit Headloss (ft/Kft)	Friction Factor
Pipe 88	10	200	120	1820	0.0	0.0	0.000
Pump 24	#N/A	#N/A	#N/A	1820	0.0	-84.3	0.000
Pipe 59	1320	12	120	1820	5.2	8.9	0.022
Pipe 60	1320	12	120	1820	5.2	8.9	0.022
Pipe 91	2640	12	120	1820	5.2	8.9	0.022
Pipe 74	1640	12	120	940	2.7	2.6	0.024
Pipe 75	1000	12	120	940	2.7	2.6	0.024
Pipe 55	2640	8	120	-940	6.0	18.9	0.023
Pipe 54	2640	8	120	-940	6.0	18.9	0.023
Pipe 66	2640	8	120	-879	5.6	16.7	0.023
Pipe 67	2640	8	120	-328	2.1	2.7	0.026
Pipe 65	1320	8	120	0	0.0	0.0	0.000
Pipe 114	2640	8	120	552	3.5	7.0	0.024
Pipe 94	2640	8	120	879	5.6	16.7	0.023
Pipe 56	2640	8	120	328	2.1	2.7	0.026
Pipe 57	1640	8	120	328	2.1	2.7	0.026
Pipe 37	10	144	120	-1820	0.0	0.0	0.000

Notes:

1. The above data is from EPANet with a 1820 gallon per minute demand on the Junction 46 at the northwest corner of the pipeline. As raw water demand on the pipeline moves closer to the pump the losses decrease therefore the flowrate goes up.

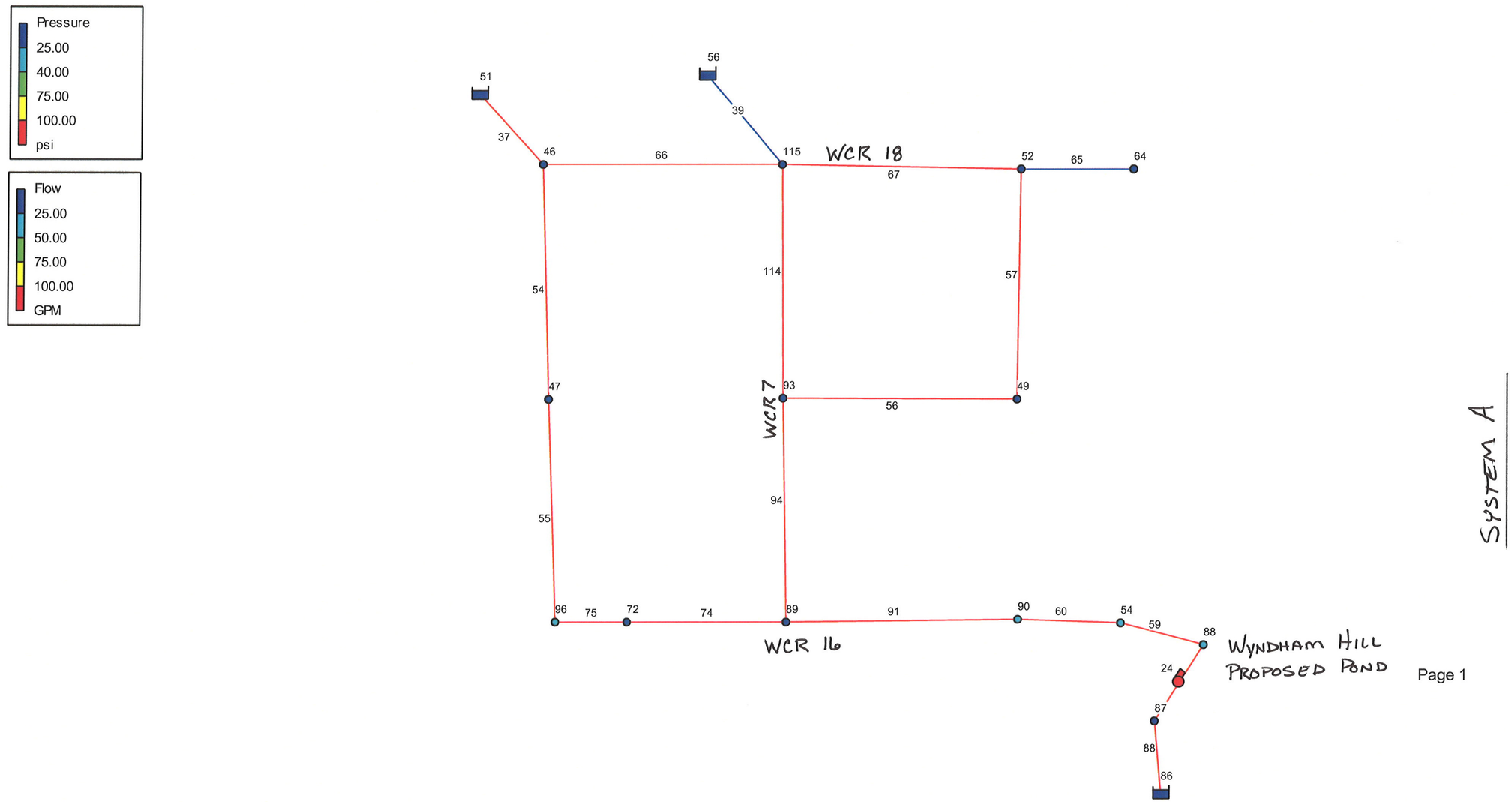
Raw Water Infrastructure Map - Town of Frederick



SYSTEM A

Raw Water Infrastructure Map - Town of Frederick

Day 1, 12:00 AM



EPANET 2

System B - Pipe Network Data
Town of Frederick Raw Water Infrastructure

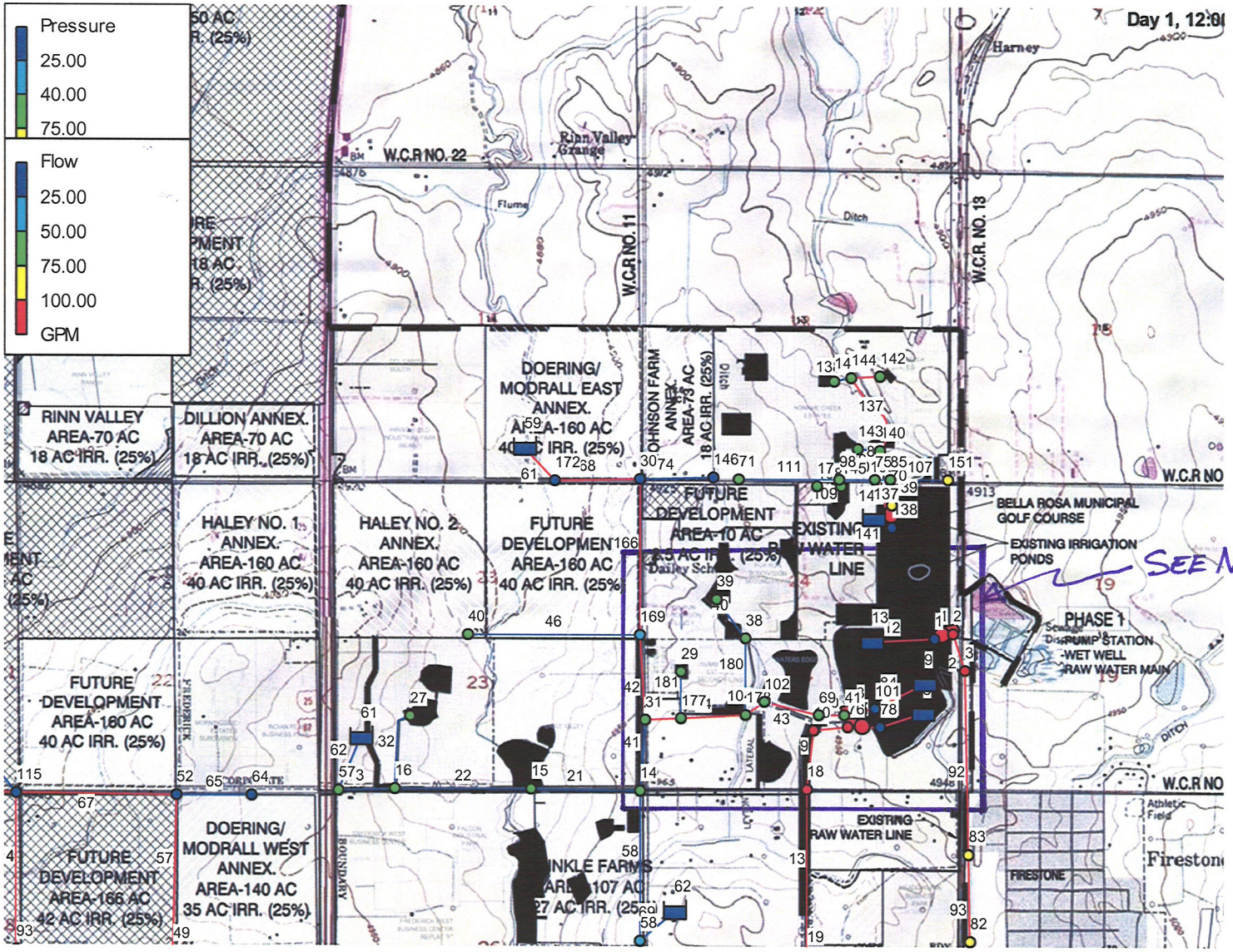
NODES/RESERVOIRS					
Node ID	Elevation (ft)	Base Demand (GPM)	Demand (GPM)	Head (ft)	Pressure (psi)
Resvr 9	4930	#N/A	-1150	4930	0
Junc 101	4930	0	0	4930	0
Junc 41	4930	0	0	5100	73
Junc 69	4942	0	0	5095	66
Junc 102	4942	0	0	5089	63
Junc 178	4960	0	0	5077	51
Junc 177	4960	0	0	5066	46
Junc 31	4948	0	0	5060	48
South Branch					
Junc 31	4948	0	0	5060	48
Junc 14	4965	0	0	5060	41
Junc 15	4925	0	0	5060	58
Junc 16	4929	0	0	5060	57
Junc 57	4949	0	0	5060	48
Raspberry Hill Residential					
Junc 16	4929	0	0	5060	57
Junc 27	4920	0	0	5060	61
Hinkle Farms					
Junc 14	4965	0	0	5060	41
Junc 58	4990	0	0	5060	30
North Branch					
Junc 31	4948	0	0	5060	48
Junc 169	4940	0	0	5024	36
Junc 30	4925	0	0	4951	11
Junc 172	4900	0	0	4915	7
WCR 20 (West)					
Junc 30	4925	0	0	4951	11
Junc 146	4945	0	0	4951	3
Doering Modrall East					
Junc 172	4900	0	0	4915	7
Resvr 59	4915	#N/A	1150	4915	0
Fox Run					
Junc 178	4960	0	0	5077	51
Junc 38	4935	0	0	5077	62
Junc 39	4940	0	0	5077	60
Summit View Estates					
Junc 177	4960	0	0	5066	46
Junc 29	4955	0	0	5066	48
Haley No. 2 Annexation					
Junc 169	4940	0	0	5024	36
Junc 40	4910	0	0	5024	49

PIPES							
Link ID	Length (ft)	Diameter (in)	Roughness	Flow (GPM)	Velocity (fps)	Unit Headloss (ft/Kft)	Friction Factor
Pipe 84	10	144	120	1150	0.0	0.0	0.000
Pump 8	#N/A	#N/A	#N/A	1150	0.0	-169.6	0.000
Pipe 10	500	10	120	1150	4.7	9.3	0.023
Pipe 43	700	10	120	-1150	4.7	9.3	0.023
Pipe 104	1200	10	120	-1150	4.7	9.3	0.023
Pipe 44	1200	10	120	1150	4.7	9.3	0.023
Pipe 45	700	10	120	1150	4.7	9.3	0.023
Pipe 41	1320	8	120	0	0.0	0.0	0.000
Pipe 21	1500	8	120	0	0.0	0.0	0.000
Pipe 22	1500	8	120	0	0.0	0.0	0.000
Pipe 53	1000	8	120	0	0.0	0.0	0.000
Pipe 32	2200	6	120	0	0.0	0.0	0.000
Pipe 58	2640	8	120	0	0.0	0.0	0.000
Pipe 42	1320	8	120	-1150	7.3	27.4	0.022
Pipe 166	2640	8	120	1150	7.3	27.4	0.022
Pipe 168	1320	8	120	1150	7.3	27.4	0.022
Pipe 174	1320	8	120	0	0.0	0.0	0.000
Pipe 61	10	144	120	-1150	0.0	0.0	0.000
Pipe 180	1500	6	120	0	0.0	0.0	0.000
Pipe 40	1800	6	120	0	0.0	0.0	0.000
Pipe 181	450	6	120	0	0.0	0.0	0.000
Pipe 46	3000	6	120	0	0.0	0.0	0.000

Notes:

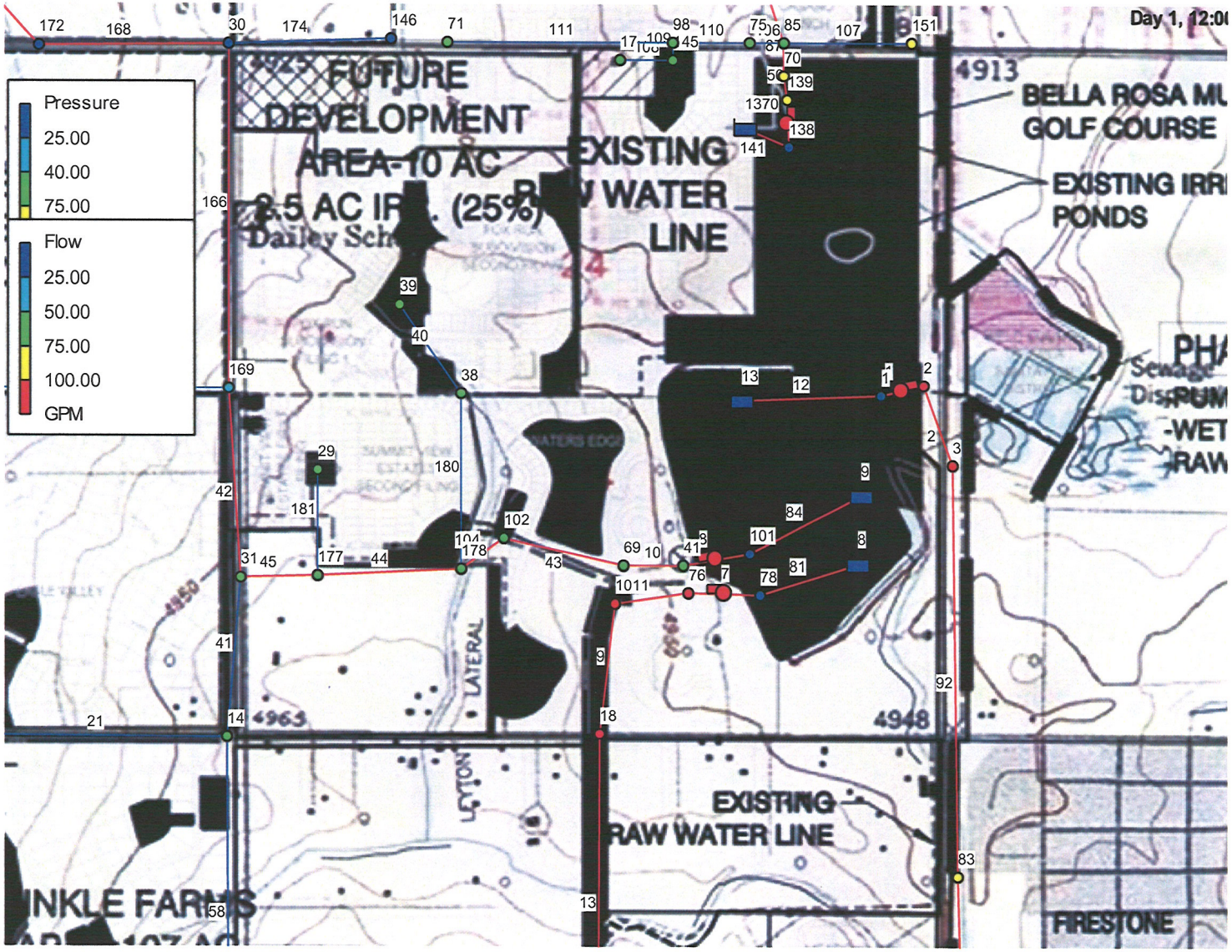
1. The above data is from EPANet with a 1150 gallon per minute demand on the Junction 61 at the northwest corner of the pipeline. As raw water demand on the pipeline moves closer to the pump the losses decrease therefore the flowrate goes up.

Raw Water Infrastructure Map - Town of Frederick



SYSTEM B

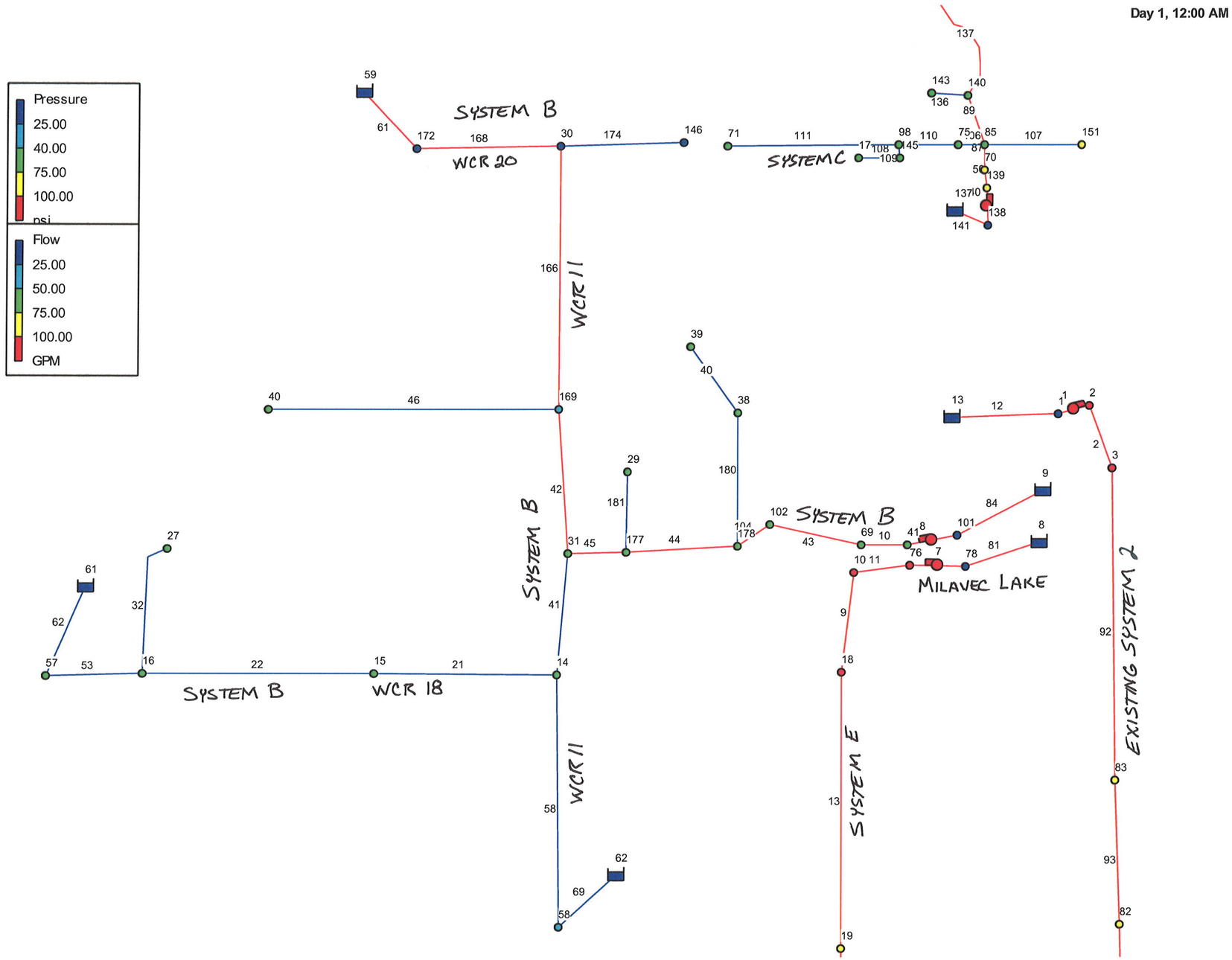
Raw Water Infrastructure Map - Town of Frederick



SYSTEM B - MILAVEC LAKE

Raw Water Infrastructure Map - Town of Frederick

Day 1, 12:00 AM



SYSTEM B

EPANET 2

System C - Pipe Network Data
Town of Frederick Raw Water Infrastructure

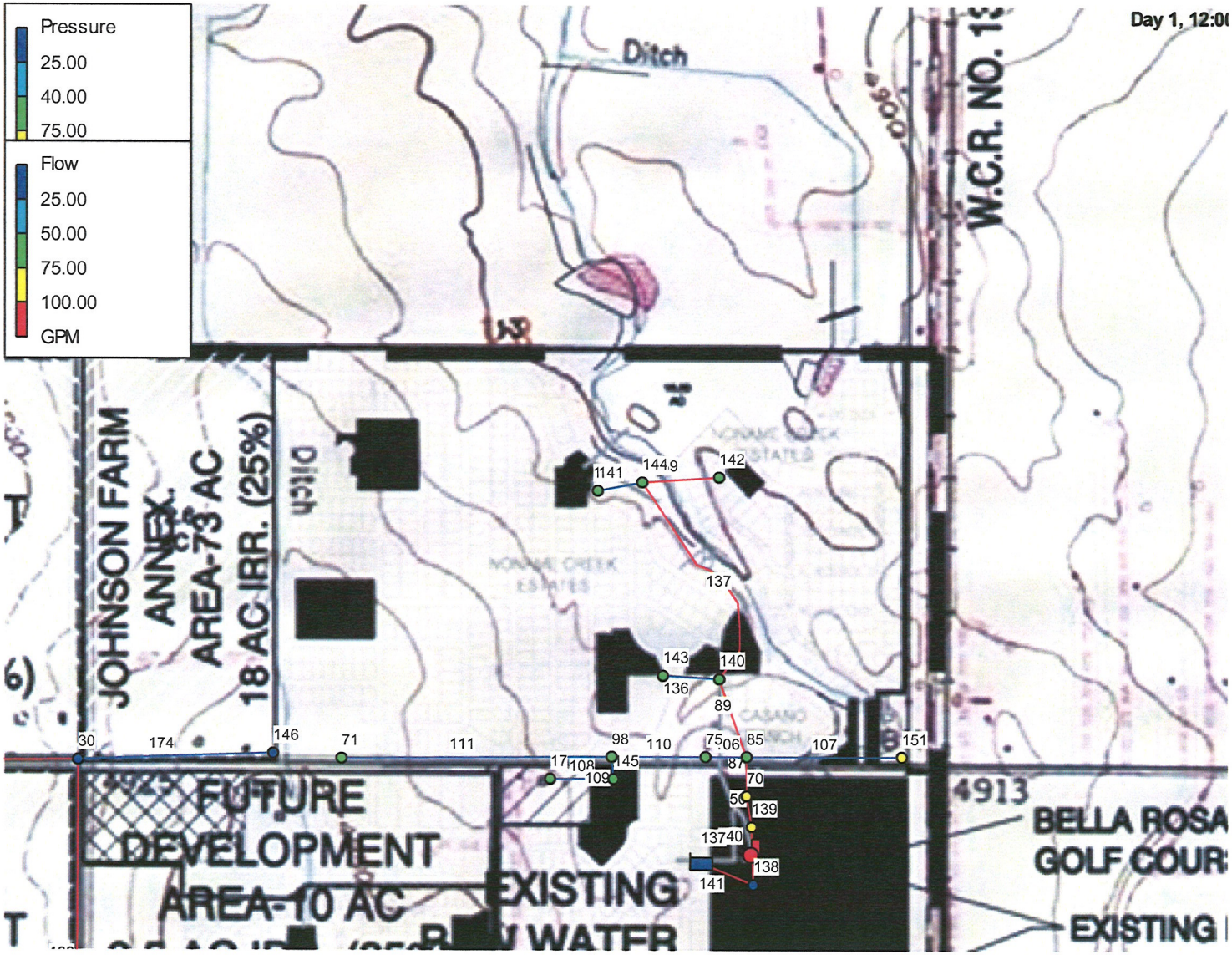
NODES/RESERVOIRS					
Node ID	Elevation (ft)	Base Demand (GPM)	Demand (GPM)	Head (ft)	Pressure (psi)
Resvr 137	4905	#N/A	-131	4905	0
Junc 138	4910	0	0	4905	-2
Junc 139	4910	1	1	5087	77
Junc 70	4910	0	0	5087	76
Junc 85	4920	0	0	5085	72
West Branch (WCR 20)					
Junc 85	4920	0	0	5085	72
Junc 75	4925	0	0	5085	69
Junc 98	4922	0	0	5085	71
Junc 71	4945	0	0	5085	61
Moore Farms Branch					
Junc 98	4922	0	0	5085	71
Junc 145	4930	0	0	5085	67
Junc 17	4933	0	0	5085	66
North Branch (No Name Creek)					
Junc 85	4920	0	0	5085	72
Junc 140	4920	0	0	5072	66
Junc 144	4900	0	0	5045	63
Junc 142	4910	130	130	5027	51
No Name Creek West Park					
Junc 140	4920	0	0	5072	66
Junc 143	4925	0	0	5072	64
Northwest Park					
Junc 144	4900	0	0	5045	63
Junc 141	4910	0	0	5045	59
East Branch (WCR 20)					
Junc 85	4920	0	0	5085	72
Junc 151	4910	0	0	5085	76

PIPES							
Link ID	Length (ft)	Diameter (in)	Roughness	Flow (GPM)	Velocity (fps)	Unit Headloss (ft/Kft)	Friction Factor
Pipe 141	10	150	120	131	0.0	0.0	0.000
Pump 140	#N/A	#N/A	#N/A	131	0.0	-182.0	0.000
Pipe 50	30	4	120	130	3.3	14.2	0.028
Pipe 87	100	4	120	130	3.3	14.2	0.028
Pipe 106	150	4	120	0	0.0	0.0	0.000
Pipe 110	400	4	120	0	0.0	0.0	0.000
Pipe 111	700	4	120	0	0.0	0.0	0.000
Pipe 109	60	4	120	0	0.0	0.0	0.000
Pipe 108	300	4	120	0	0.0	0.0	0.000
Pipe 89	900	4	120	130	3.3	14.2	0.028
Pipe 137	1900	4	120	130	3.3	14.2	0.028
Pipe 139	1300	4	120	130	3.3	14.2	0.028
Pipe 136	525	4	120	0	0.0	0.0	0.000
Pipe 138	30	4	120	0	0.0	0.0	0.000
Pipe 107	1000	4	120	0	0.0	0.0	0.000

Notes:

1. The above data is from EPANet with a 130 gallon per minute demand on the Junction 142 at the northeast corner of the pipeline at Property C7, the north park on the east side of the creek. As raw water demand on the pipeline moves closer to the pump the losses decrease therefore the flowrate goes up.

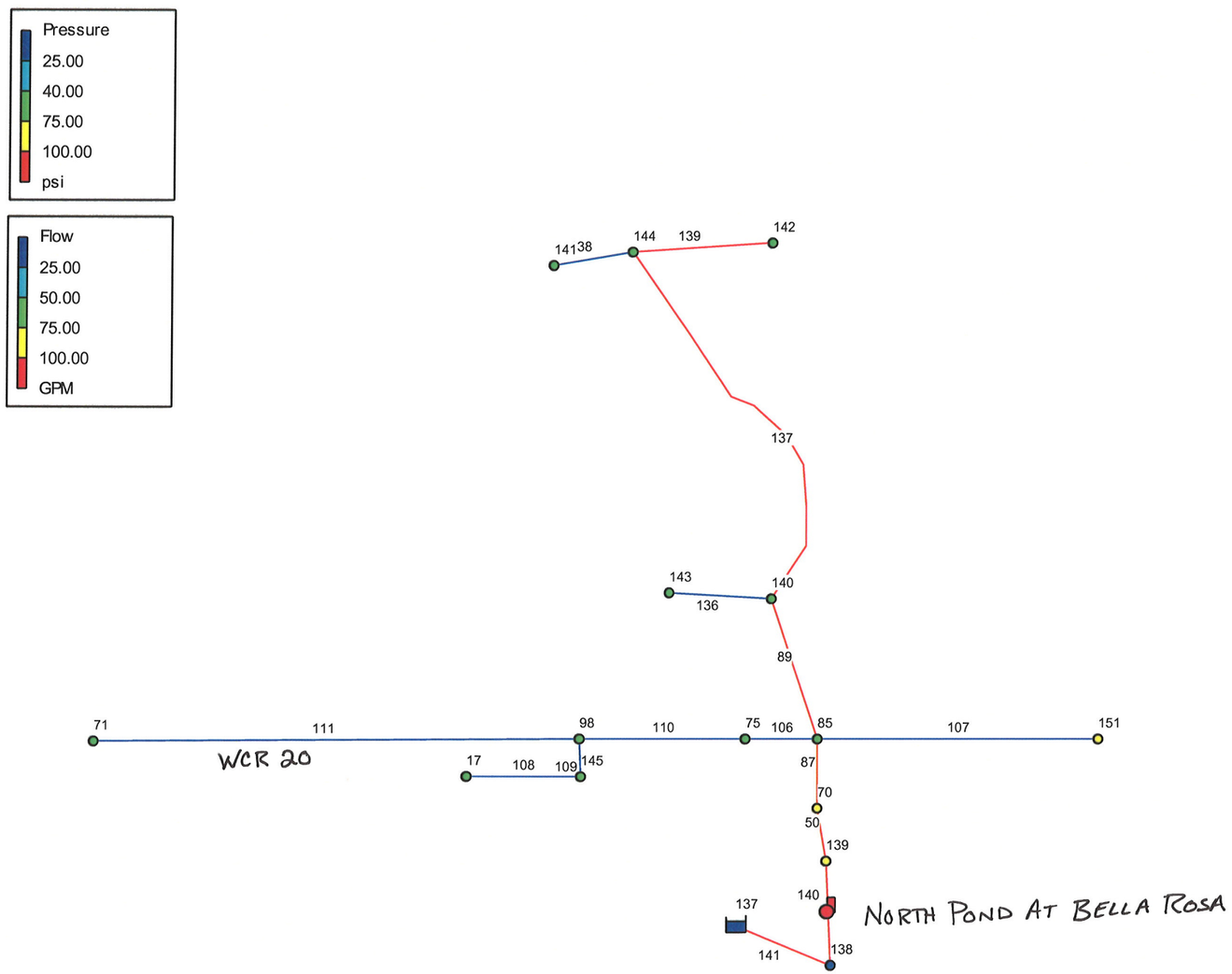
Raw Water Infrastructure Map - Town of Frederick



SYSTEM C

Raw Water Infrastructure Map - Town of Frederick

Day 1, 12:00 AM



SYSTEM C

System D - Pipe Network Data
Town of Frederick Raw Water Infrastructure

NODES/RESERVOIRS						PIPES							
Node ID	Elevation (ft)	Base Demand (GPM)	Demand (GPM)	Head (ft)	Pressure (psi)	Link ID	Length (ft)	Diameter (in)	Roughness	Flow (GPM)	Velocity (fps)	Unit Headloss (ft/Kft)	Friction Factor

All developments in System D require diverting raw water directly from the Lower Boulder Ditch, therefore, there is not pipe network data.

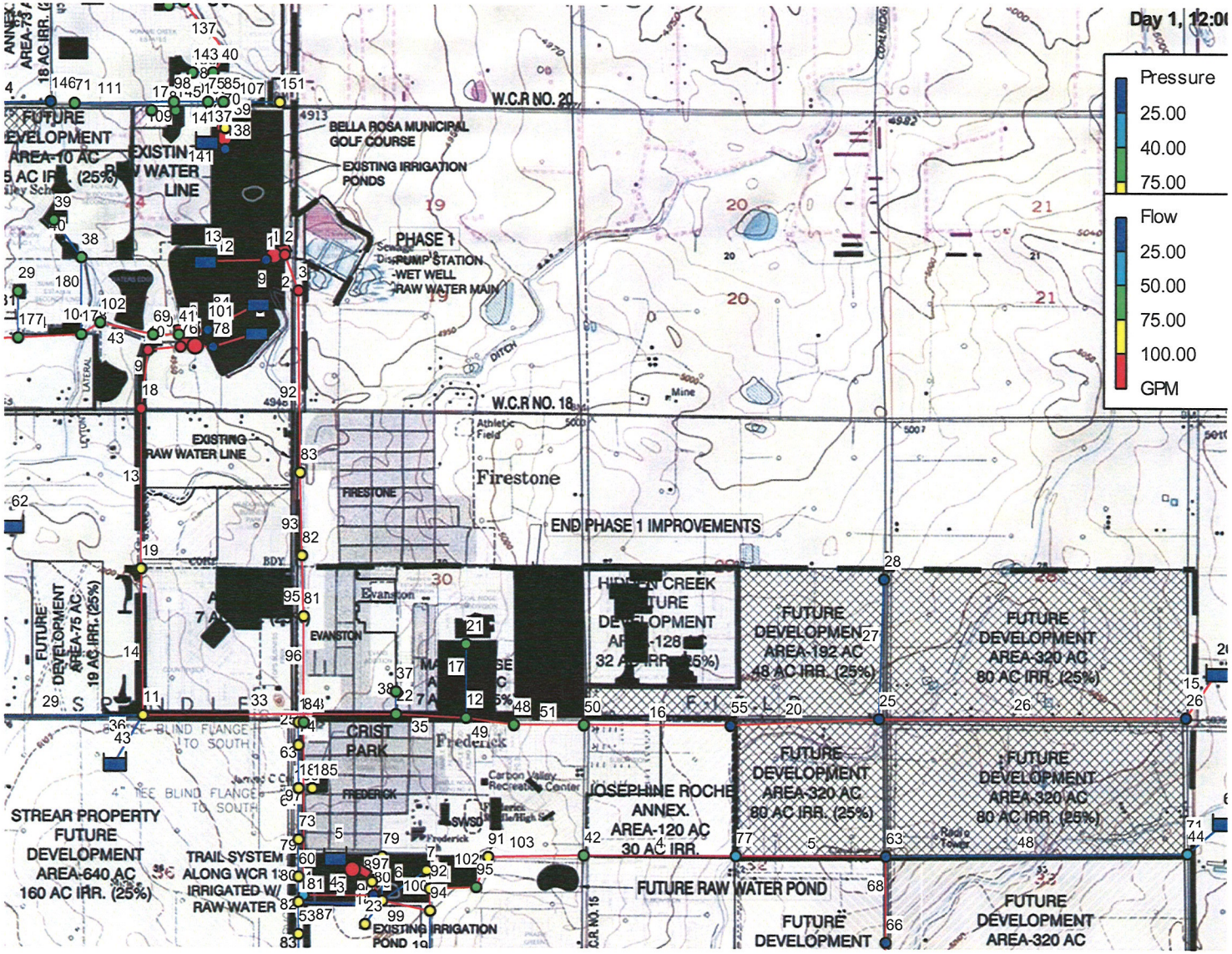
System E - Pipe Network Data
Town of Frederick Raw Water Infrastructure

NODES/RESERVOIRS					
Node ID	Elevation (ft)	Base Demand (GPM)	Demand (GPM)	Head (ft)	Pressure (psi)
Resvr 8	4930	#N/A	-652	4930	0
Junc 78	4930	0	0	4930	0
Junc 76	4930	0	0	5242	135
Junc 10	4942	0	0	5241	129
Junc 18	4960	0	0	5237	120
Junc 19	5000	0	0	5225	97
Junc 11	4998	0	0	5220	96
Resvr 43	5063	#N/A	0	5063	0
Junc 22	5000	0	0	5170	74
Junc 37	5005	0	0	5170	72
Junc 12	5005	0	0	5158	66
Junc 21	5020	0	0	5158	60
Junc 48	5015	0	0	5153	60
Junc 50	5040	0	0	5141	44
Junc 55	5060	0	0	5116	24
Junc 25	5061	0	0	5091	13
Junc 26	5040	0	652	5040	0
WCR 17 (Between WCR 16 & 16.5)					
Junc 25	5061	0	0	5091	13
Junc 28	5035	0	0	5091	24

PIPES							
Link ID	Length (ft)	Diameter (in)	Roughness	Flow (GPM)	Velocity (fps)	Unit Headloss (ft/Kft)	Friction Factor
Pipe 81	10	144	120	652	0.0	0.0	0.000
Pump 7	#N/A	#N/A	#N/A	652	0.0	-312.4	0.000
Pipe 11	500	10	120	-652	2.7	3.2	0.024
Pipe 9	1100	10	120	652	2.7	3.2	0.024
Pipe 13	3780	10	120	652	2.7	3.2	0.024
Pipe 14	1500	10	120	652	2.7	3.2	0.024
Pipe 36	10	144	120	0	0.0	0.0	0.000
Pipe 33	5200	8	120	652	4.2	9.6	0.024
Pipe 38	300	4	120	0	0.0	0.0	0.000
Pipe 35	1300	8	120	652	4.2	9.6	0.024
Pipe 17	500	6	120	0	0.0	0.0	0.000
Pipe 49	500	8	120	652	4.2	9.6	0.024
Pipe 51	1220	8	120	652	4.2	9.6	0.024
Pipe 16	2640	8	120	652	4.2	9.6	0.024
Pipe 20	2640	8	120	652	4.2	9.6	0.024
Pipe 26	5280	8	120	652	4.2	9.6	0.024
Pipe 27	2640	8	120	0	0	0	0

Notes:
1. The above data is from EPANet with a 652 gallon per minute demand on the Junction 26 at the east end of the pipeline. As raw water demand on the pipeline moves closer to the pump (to the west) the losses decrease therefore the flowrate goes up.

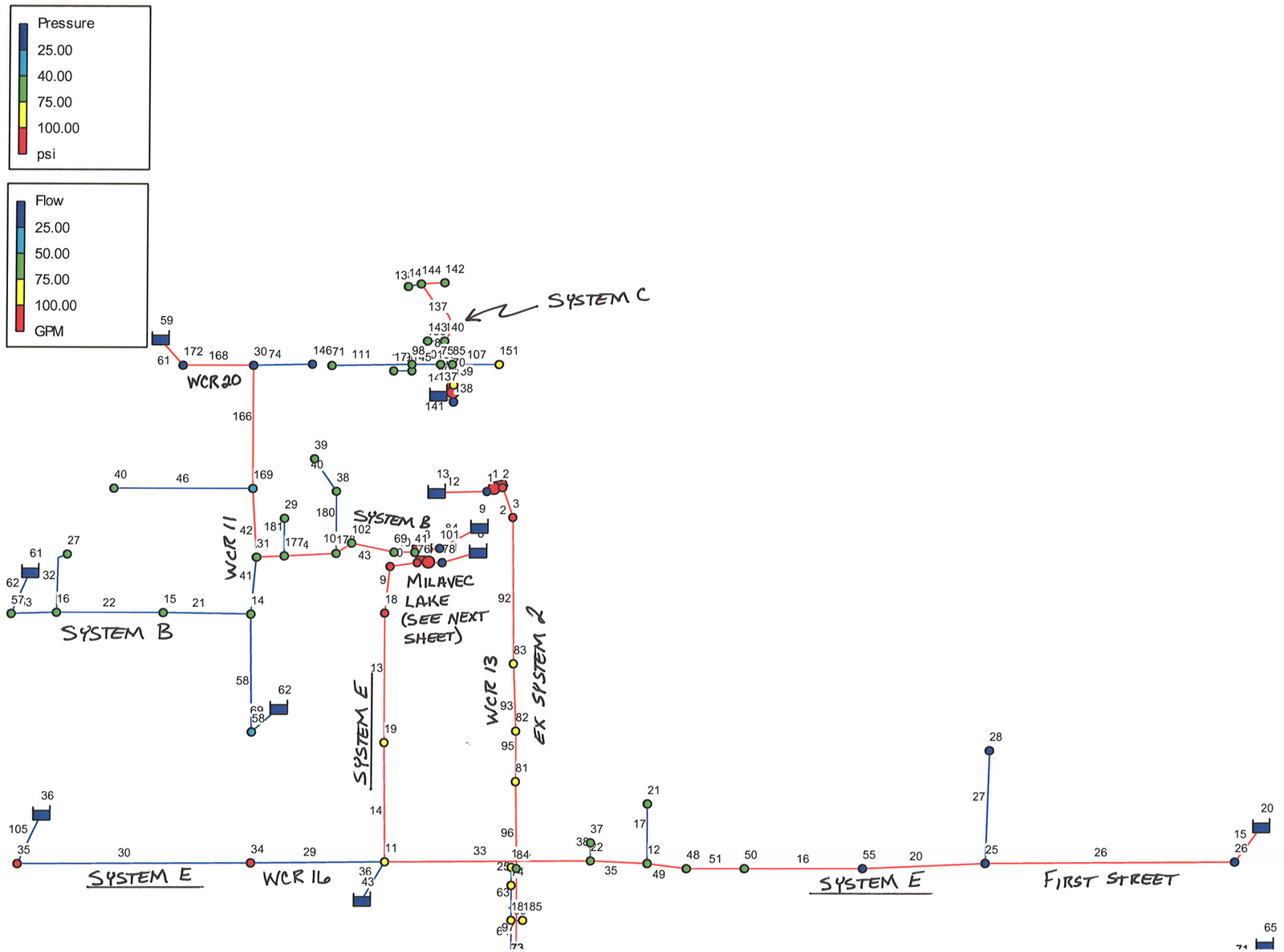
Raw Water Infrastructure Map - Town of Frederick



SYSTEM E

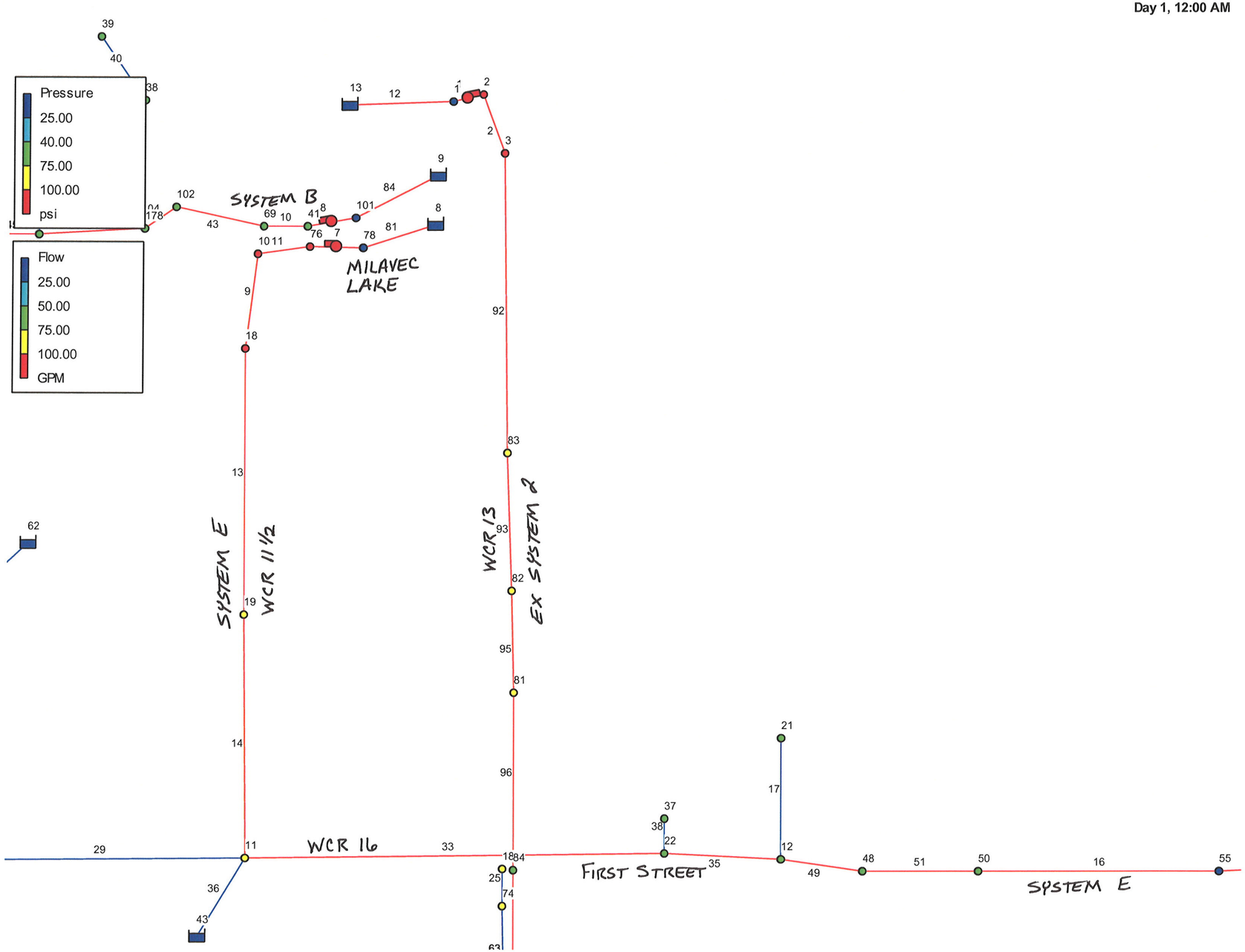
Raw Water Infrastructure Map - Town of Frederick

Day 1, 12:00 AM



Raw Water Infrastructure Map - Town of Frederick

Day 1, 12:00 AM



EPANET 2

System F - Pipe Network Data
Town of Frederick Raw Water Infrastructure

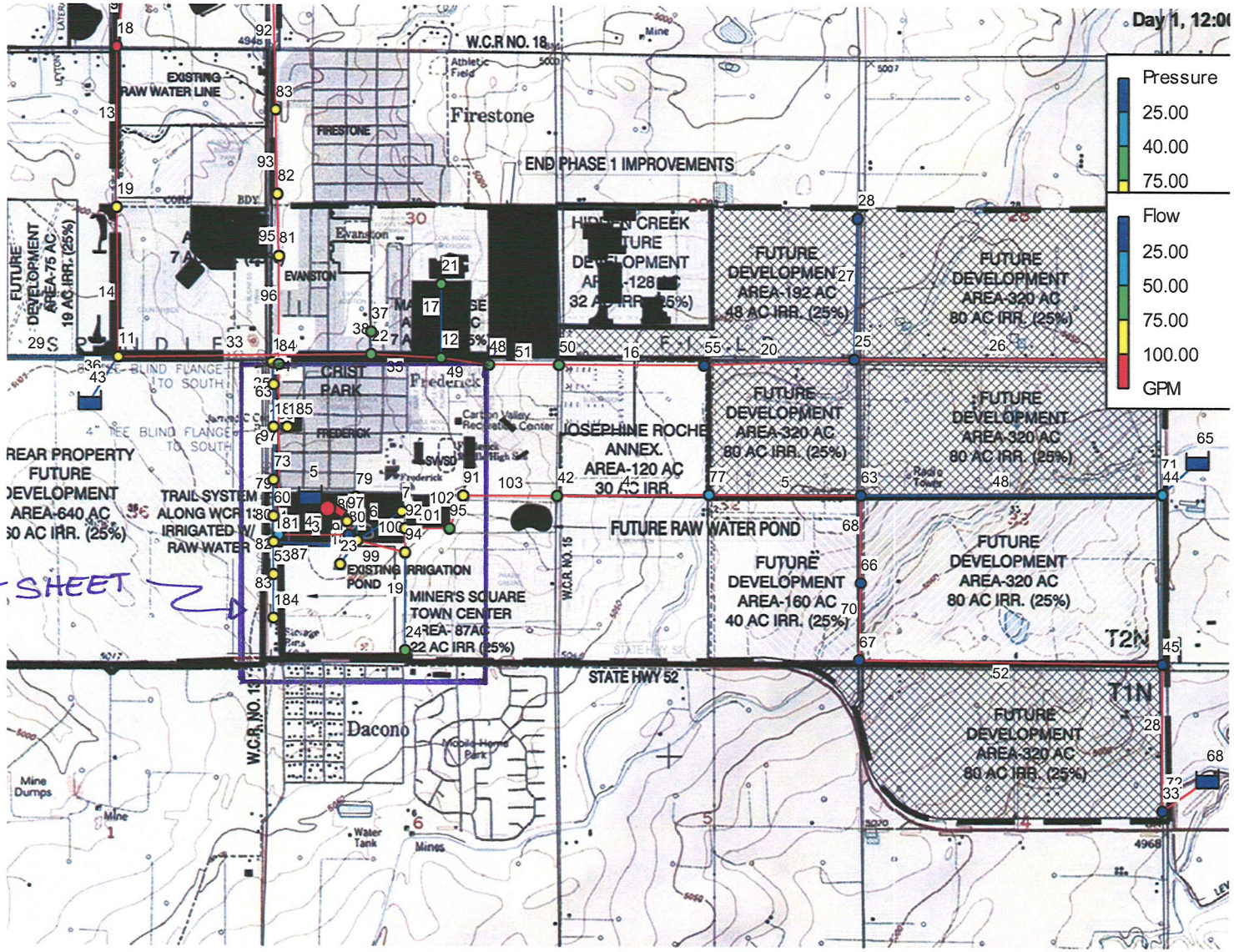
NODES/RESERVOIRS					
Node ID	Elevation (ft)	Base Demand (GPM)	Demand (GPM)	Head (ft)	Pressure (psi)
Resvr 5	4995	#N/A	-570	4995	0
Junc 97	4995	0	0	5193	86
Junc 6	4995	0	0	5193	86
8th Street Berms					
Junc 6	4995	0	0	5193	86
Junc 79	4988	0	0	5193	89
St. Vrain Valley School District					
Junc 6	4995	0	0	5193	86
Junc 7	4995	0	0	5193	86
Miners Park Town Center					
Junc 6	4995	0	0	5193	86
Junc 23	5000	0	0	5193	84
To East					
Junc 6	4995	0	0	5193	86
Junc 94	4998	0	0	5185	81
Carriage Hills Commercall					
Junc 94	4998	0	0	5185	81
Junc 24	5020	0	0	5185	71
To East					
Junc 94	4998	0	0	5185	81
Junc 92	4990	0	0	5183	83
Junc 95	5010	0	0	5176	72
Junc 91	4993	0	0	5171	77
Junc 42	5023	0	0	5158	59
Junc 77	5070	0	0	5139	30
Junc 63	5100	0	0	5119	8
Junc 44	5050	0	0	5119	30
South Extention					
Junc 63	5100	0	0	5119	8
Junc 66	5075	0	0	5109	15
Junc 67	5050	0	0	5099	21
Junc 45	5023	0	0	5060	16
Junc 33	4968	0	0	4980	5
Resvr 68	4980	#N/A	569	4980	0
Centennial Park Pond west to WCR 13					
Junc 6	4995	0	0	5193	86
Junc 181	4995	0	0	5193	86
South in WCR 13					
Junc 181	4995	0	0	5193	86
Junc 53	5005	0	0	5193	81
Junc 184	5010	0	0	5193	79
North in WCR 13					
Junc 181	4995	0	0	5193	86
Junc 60	4996	0	0	5193	85
Junc 73	4990	0	0	5193	88
Junc 182	4988	0	0	5193	89
Junc 74	4980	0	0	5193	92
Junc 183	4982	0	0	5193	91
West to Crist Park					
Junc 182	4988	0	0	5193	89
Junc 185	5011	0	0	5193	79

PIPES							
Link ID	Length (ft)	Diameter (in)	Roughness	Flow (GPM)	Velocity (fps)	Unit Headloss (ft/Kft)	Friction Factor
Pump 3	#N/A	#N/A	#N/A	570	0.0	-197.9	0.000
Pipe 98	20	8	120	570	3.6	7.5	0.024
Pipe 86	350	6	120	0	0.0	0.0	0.000
Pipe 6	1295	6	120	0	0.0	0.0	0.000
Pipe 18	500	6	120	0	0.0	0.0	0.000
Pipe 99	1100	8	120	569	3.6	7.5	0.024
Pipe 19	2000	6	120	0	0.0	0.0	0.000
Pipe 100	250	8	120	569	3.6	7.5	0.024
Pipe 101	900	8	120	569	3.6	7.5	0.024
Pipe 102	650	8	120	569	3.6	7.5	0.024
Pipe 103	1700	8	120	569	3.6	7.5	0.024
Pipe 4	2640	8	120	569	3.6	7.5	0.024
Pipe 5	2640	8	120	569	3.6	7.5	0.024
Pipe 48	5280	8	120	0	0.0	0.0	0.000
Pipe 68	1320	8	120	569	3.6	7.5	0.024
Pipe 70	1320	8	120	569	3.6	7.5	0.024
Pipe 52	5280	8	120	569	3.6	7.5	0.024
Pipe 28	2640	6	120	569	6.5	30.3	0.023
Pipe 72	10	144	120	569	0.0	0.0	0.000
Pipe 90	1900	4	120	1	0.0	0.0	0.000
Pipe 82	380	4	120	0	0.0	0.0	0.000
Pipe 83	1200	4	120	0	0.0	0.0	0.000
Pipe 80	200	4	120	0	0.0	0.0	0.000
Pipe 79	610	4	120	0	0.0	0.0	0.000
Pipe 64	650	4	120	0	0.0	0.0	0.000
Pipe 63	820	4	120	0	0.0	0.0	0.000
Pipe 25	600	4	120	0	0.0	0.0	0.000
Pipe 189	180	2	120	0	0.0	0.0	0.000

Notes:

1. The above data is from EPANet with a 569 gallon per minute demand on the Junction 33 at the east end of the pipeline. As raw water demand on the pipeline moves closer to the pump the losses decrease therefore the flowrate goes up.

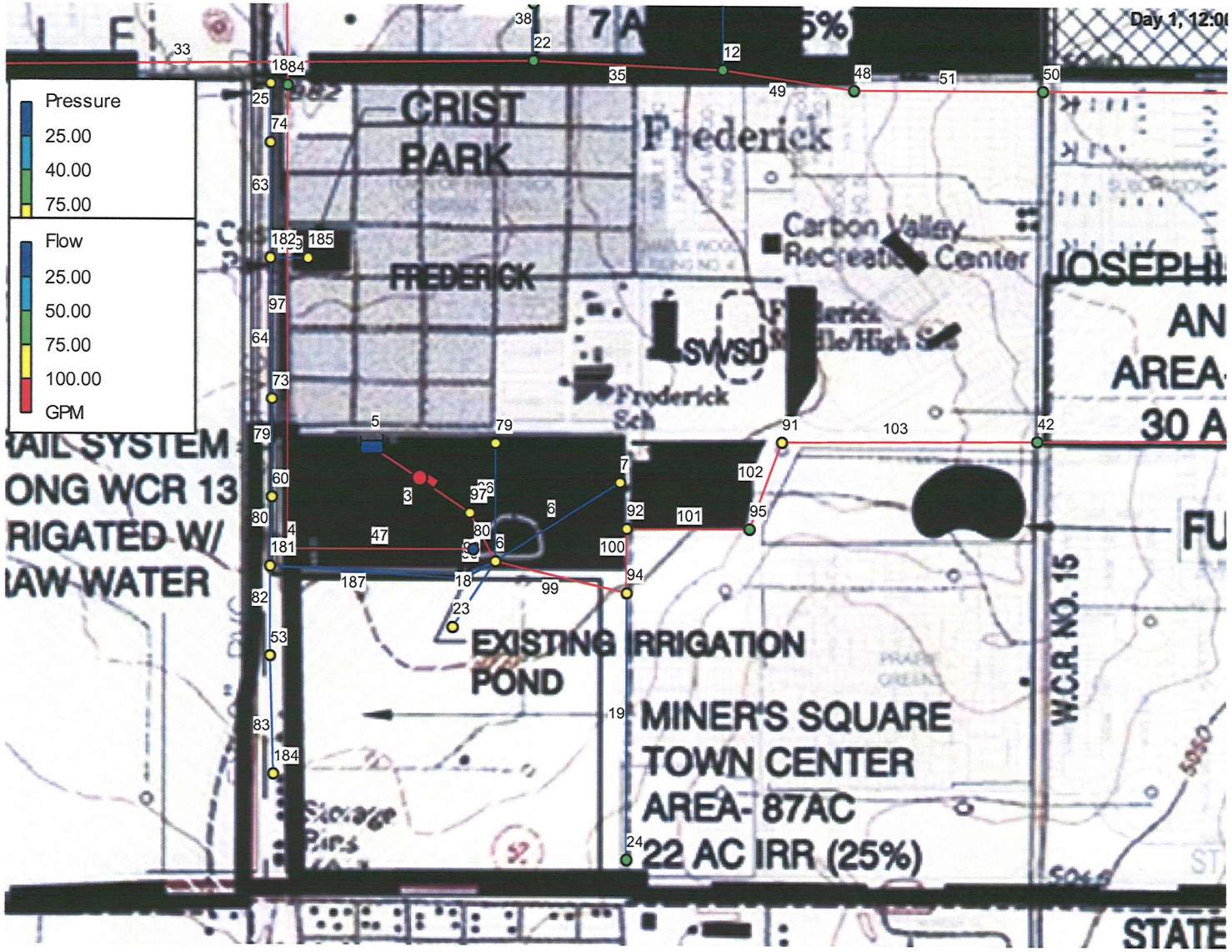
Raw Water Infrastructure Map - Town of Frederick



SEE NEXT SHEET

SYSTEM F

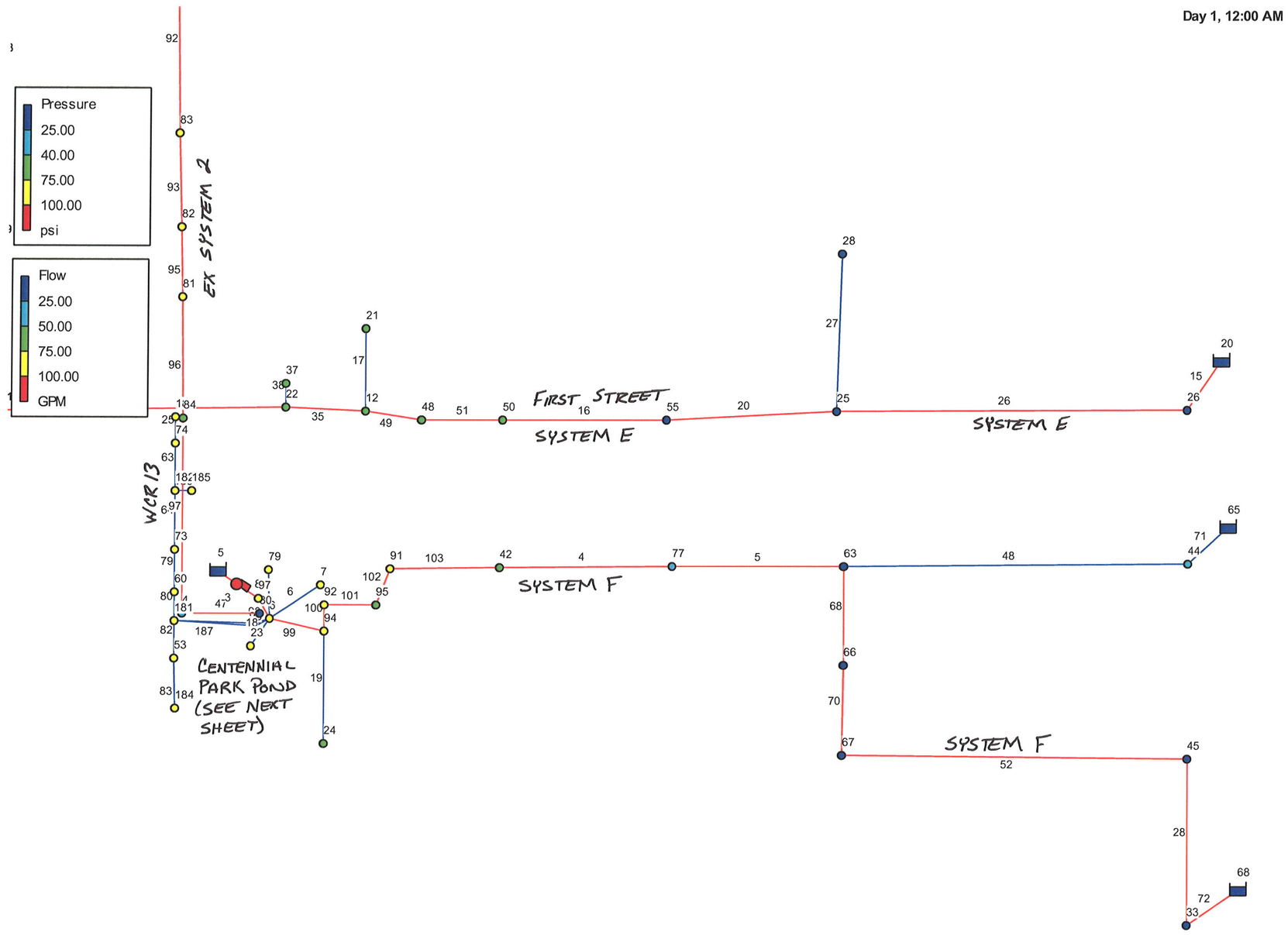
Raw Water Infrastructure Map - Town of Frederick



SYSTEM F - CENTENNIAL PARK POND

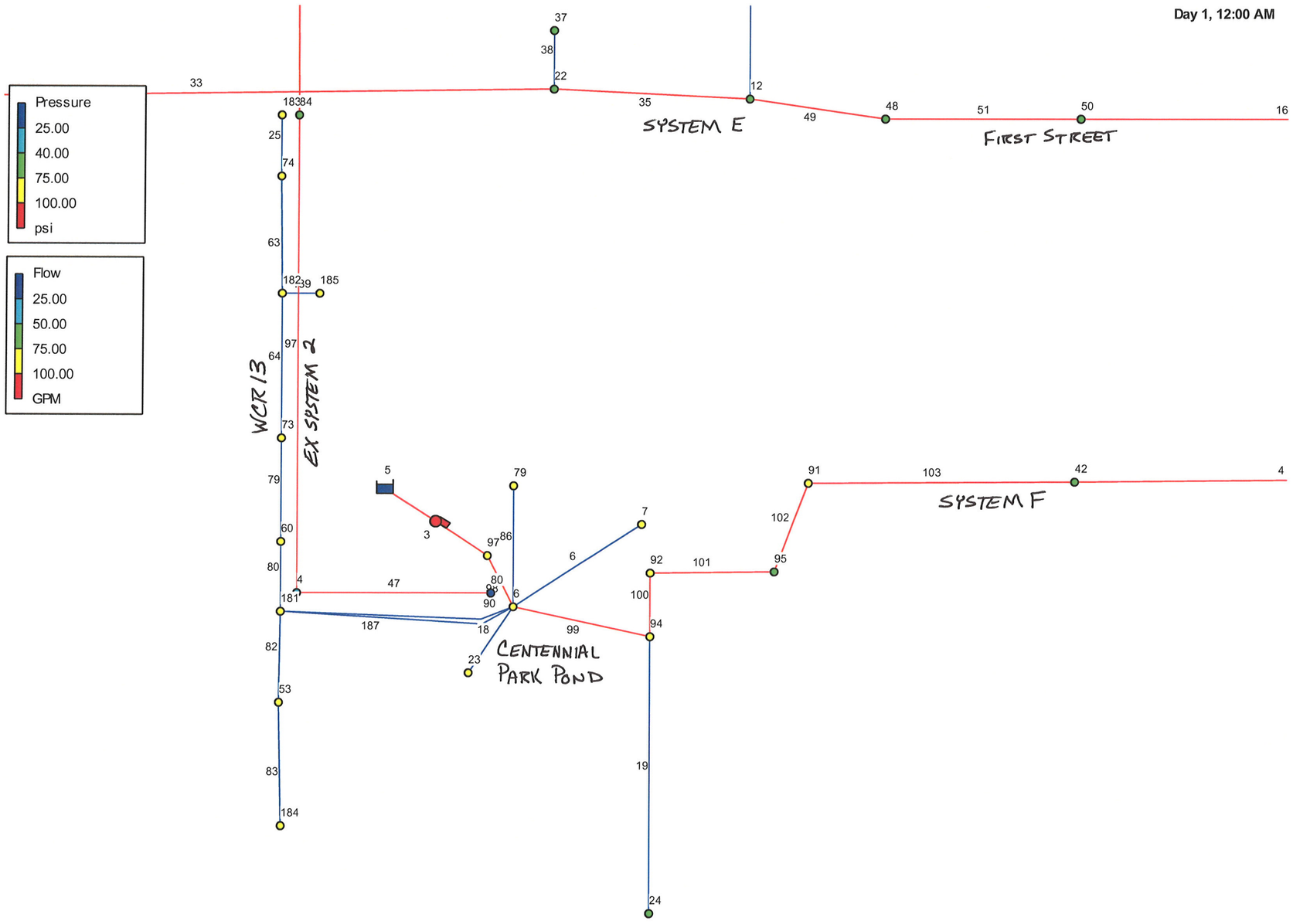
Raw Water Infrastructure Map - Town of Frederick

Day 1, 12:00 AM



EPANET 2

Raw Water Infrastructure Map - Town of Frederick



APPENDIX B

ENGINEERS OPINION OF COST

ANALYSIS OF COST

The Engineers Opinion of Cost was prepared for the general raw water pipeline alignments shown in Figure 1 of this report. Once a detailed survey and design is completed for each section the pipe alignments and lengths may change. The cost's below should be used a general guide only.

Assumptions:

1. All raw waterlines have 3 feet of cover.
2. All amounts are in 2008 construction dollars.
3. The waterline cost includes mobilization, lowerings, valves, air-vacs, pavement restoration, fittings, thrust blocks, etc.
4. It may be possible for properties included in one system to be temporarily connected to a another system. This detail is beyond the scope of this report and shall be designed and reviewed on a case by case basis.

System A				
Item	***Unit***	***Quantity***	***Cost***	***Extension***
1. Waterline				
a. PA-1 - 12-inch C900	LF	4,500	$54.00	$243,000
b. PA-2 - 12-inch C900	LF	2,640	$54.00	$142,560
c. PA-3 - 8-inch C900	LF	2,640	$36.00	$95,040
d. PA-4 - 8-inch C900	LF	2,640	$36.00	$95,040
e. PA-5 - 8-inch C900	LF	2,640	$36.00	$95,040
f. PA-6 - 8-inch C900	LF	2,640	$36.00	$95,040
g. PA-7 - 8-inch C900	LF	2,640	$36.00	$95,040
h. PA-8 - 8-inch C900	LF	2,640	$36.00	$95,040
i. PA-9 - 8-inch C900	LF	2,640	$36.00	$95,040
j. PA-10 - 8-inch C900	LF	2,640	$36.00	$95,040
k. PA-11 - 8-inch C900	LF	1,250	$36.00	$45,000
2. Pump Station				
a. Vertical Turbine Pump (1400 gpm, 140' TDH)	EA	2	$70,000.00	$140,000
			Total	***$1,330,880***
			Total w/10% Contingency	***$1,463,968***

System B				
Item	***Unit***	***Quantity***	***Cost***	***Extension***
1. Waterline				
a. PB-1 - 10-inch C900	LF	1,650	$45.00	$74,250
b. PB-2 - 6-inch C900	LF	1,300	$27.00	$35,100
c. PB-3 - 8-inch C900	LF	2,640	$36.00	$95,040
d. PB-4 - 6-inch C900	LF	550	$27.00	$14,850
e. PB-5 - 8-inch C900	LF	1,470	$36.00	$52,920
f. PB-6 - 8-inch C900	LF	5,250	$36.00	$189,000
g. PB-7 - 8-inch C900	LF	990	$36.00	$35,640
h. PB-8 - 8-inch C900	LF	2,640	$36.00	$95,040
i. PB-9 - 8-inch C900	LF	1,405	$36.00	$50,580
j. PB-10 - 8-inch C900	LF	2,790	$36.00	$100,440
k. PB-11 - 8-inch C900	LF	2,310	$36.00	$83,160
l. PB-12 - 8-inch C900	LF	1,265	$36.00	$45,540
m. PB-13 - 8-inch C900	LF	2,700	$36.00	$97,200
n. PB-14 - 8-inch C900	LF	1,325	$36.00	$47,700
2. Pump Station				
a. Vertical Turbine Pump (1500 gpm, 250' TDH)	EA	1	$80,000.00	$80,000
b. Kicker Pump	EA	1	$15,000.00	$15,000
c. Equipment Building	Built in Phase 1 Improvements			
d. Interior Piping	LS	1	$3,000.00	$3,000
e. Electrical Interconnects	LS	1	$2,000.00	$2,000
f. Telemetry	EA	1	$1,000.00	$1,000
g. Intake Screening	Built in Phase 1 Improvements			
h. McPropeller w/Flowcom Water Meter	EA	1	$6,000.00	$6,000
			Total	***$1,123,460***
			Total w/10% Contingency	***$1,235,806***

System C				
Item	*Unit*	*Quantity*	*Cost*	*Extension*
1. Waterline				
a. PC-1 - 4-inch C900	LF	550	$18.00	$9,900
b. PC-2 - 4-inch C900	LF	2,500	$18.00	$45,000
c. PC-3 - 4-inch C900	LF	840	$18.00	$15,120
d. PC-4 - 4-inch C900	LF	635	$18.00	$11,430
e. PC-5 - 4-inch C900	LF	1,920	$18.00	$34,560
f. PC-6 - 4-inch C900	LF	1,330	$18.00	$23,940
			Total	***$139,950***
			Total w/10% Contingency	***$153,945***

System D				
Item	*Unit*	*Quantity*	*Cost*	*Extension*
1. Structures				
a. Lower Boulder Ditch Diversion Structure	EA	2	$25,000.00	$50,000
			Total	***$50,000***
			Total w/10% Contingency	***$55,000***

System E				
Item	*Unit*	*Quantity*	*Cost*	*Extension*
1. Waterline				
a. PE-1 - 8-inch C905	LF	6,480	$36.00	$233,280
b. PE-2 - 8-inch C905	LF	5,230	$36.00	$188,280
c. PE-3 - 8-inch C905	LF	1,265	$36.00	$45,540
2. Pump Station				
a. Vertical Turbine Pump (1500 gpm, 250' TDH)	EA	1	$80,000.00	$80,000
b. Kicker Pump	EA	1	$15,000.00	$15,000
c. Backup Vertical Turbine Pump	EA	1	$80,000.00	$80,000
			Total	***$642,100***
			Total w/10% Contingency	***$706,310***

System F				
Item	*Unit*	*Quantity*	*Cost*	*Extension*
1. Waterline				
a. PF-1 - 8-inch C905	LF	9,680	$36.00	$348,480
b. PF-2 - 8-inch C905	LF	2,720	$36.00	$97,920
c. PF-3 - 8-inch C905	LF	2,720	$36.00	$97,920
d. PF-4 - 8-inch C905	LF	2,720	$36.00	$97,920
e. PF-5 - 8-inch C905	LF	2,720	$36.00	$97,920
			Total	***$740,160***
			Total w/10% Contingency	***$814,176***

TOTAL COST OF ALL IMPROVEMENTS WITH 10% CONTINGENCY	
SYSTEM A	$1,463,968
SYSTEM B	$1,235,806
SYSTEM C	$153,945
SYSTEM D	$55,000
SYSTEM E	$706,310
SYSTEM F	$814,176
TOTAL	**$4,429,205**