



2025 Kansas State University Master Plan Update Water Distribution System



March 12, 2013



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SECTION 1

DISTRIBUTION SYSTEM

1.1. EXISTING CONDITIONS

The water distribution system that is owned and operated by Kansas State University consists of multiple types and sizes of pipe. Below is a table that summarizes the current inventory of water distribution piping which includes Ductile Iron Pipe (DIP), Cast Iron Pipe (CIP), Plastic PVC pipe, Galvanized Pipe, and Copper Pipe. The inventory was created from existing As-Built plans with the best information available to the engineer at the time of this report. A map of the water distribution system that illustrates the water main sizes (Figure 1) and a map that illustrates the water main material (Figure 2) are located at the end of this section.

Diameter (in.)	Material (Linear Feet)						Total
	Unknown	DIP	CIP	PVC	Galvanized	Copper	
3/4						217	217
1	1,659					37	1,696
1-1/4						128	128
1-1/2	28						28
1-3/4	46						46
2	911	533			247		1,691
2-1/2	31						31
3	767	330	116				1,213
4	17,910	178	2,138				20,226
6	18,502	2,725	6,979	416			28,622
8	6,625	1,565	1,414	6,979			16,583
10	4,320	2,117	6,567				13,004
16	3,814						3,814
24		803					803
Total	54,613	8,251	17,214	7,395	247	382	88,102

Table 1.1 Inventory of Existing Water Distribution System

The majority of the water distribution piping is of unknown material, however due to the age of the distribution system and the flows observed during field testing, it is expected that the majority of the unknown pipe material is cast iron.

Cast iron mains are rigid pipes that are subject to fractures and corrosion. The most common repairs to cast iron pipes include shear pipe failures and pinhole leaks. Pipe shear failure is generally caused by shifting ground and creates a complete radial fracture. Shear failures are common with nonflexible material. Corrosion and rusting of the ferrous pipe material is the cause for the other leaks within the system. Hard water in cast iron pipes also has a tendency



over time to deposit material along the inside of the pipe. This causes the pipe to become encrusted and can limit the flow capabilities. Waterlines that are made out of these types of materials can also produce brown colored water due to rust encrustation.

Currently, the Main Campus Distribution System, defined as the area of campus that is bound by Denison Ave. on the west, Manhattan Ave. on the east, Anderson Ave. on the south and Kimball Ave. on the north, including the Jardine Apartments, Edwards Hall, and the Rec Complex, is supplied by two connection points located on the corner of Kimball Ave. and Denison Ave. and north of the Center for Childhood Development building. The Kimball/Denison connection is a 24" connection that reduces down to 16" and again down to 10" before it enters the distribution system at the Power Plant. This 10" line supplies a booster pump that is located in the Power Plant.

The Power Plant booster pump has a Variable Frequency Drive (VFD) that controls the speed of the pump. The booster pump is a 75 HP Bell & Gosset/ITT Industries Centrifugal Pump rated at 1500 GPM with 150' of head. The current controls are set to turn the pump on and maintain a constant pressure in the immediate downstream piping of 80 PSI. This pump has no bypass and spins freely when downstream pressure is above 80 PSI. The connection that is located north of the Center for Childhood Development building is a 10" connection. This connection shall be referred to as the 10" Waterline Connection and the Kimball/Denison connection as the Main Supply Connection throughout this report.

At the time of this report Kansas State water distribution system is operated with the 10" Waterline Connection shut off to the main campus system. The connection is only supplying water to the Center for Childhood Development building. The remaining buildings and the entire main campus distribution system is being supplied through the Main Supply Connection. This forces all of the water that is used to flow through the booster pump with the exception of the Jardine Apartments, Edwards Hall, the Rec Complex, Pat Roberts Hall, the Vet Med Complex, Davenport Hall, Pittman Hall, and Dole Hall.

END SECTION



SECTION 2

COMPUTER MODELING

2.1. DISTRIBUTION MODELING

The K-State distribution system was modeled using a computer program called WaterCAD (Select Series 3) developed by Bentley Products. Each pipe of the distribution system was imported into the programs data base from the latest Campus Master Origin AutoCAD File provided by University personnel. The information imported included pipe length, pipe diameter, pipe material, and fire hydrants locations. The AutoCAD file and computer model was then compared to As-Built drawings that were also provided by University personnel in order to confirm waterline locations, material, and size.

Field calibration is a critical step in the development of any hydraulic analysis. Field calibration requires that the existing system be “stressed” at one or more points to evaluate how the remaining portions of the system react. The stress points within the calibration sequence are flowing fire hydrants. This is evaluated with the use of pressure gauges and pitot gauges, which will show the flowing pressure for any fire hydrant within the system.

On March 22, 2012 and March 28, 2012, BG Consultants with the assistance of University Staff conducted flow testing of numerous fire hydrants throughout the Campus. All of the calibration tests where completed with the 10” Connection open. A few tests were completed with the 10” Connection closed such as testing of the booster pump and select zone tests used to confirm system performance with this connection close. These test results are located in the Appendix.

The first portion of the fieldwork included the shutting of existing valves, where available, to provide a one-way flow within a particular pipe to assist in the evaluation of the friction factors within the pipe system. This type of testing is completed on varying sizes of water mains within the system.

The next portion of the fieldwork was the completion of a “zone-flow” analysis. This procedure requires a zone or section of the distribution system to be evaluated under normal operating conditions. The testing first requires that the static, non-flowing, pressure within the targeted section be tested. The next step in the analysis is to flow a single fire hydrant within the zone and record the system pressures at the same points within the system that the static pressures were found initially. This type of field-testing allows the computer modeler to closely resemble the actual distribution system during the development of the model.

The computer program has the ability to calibrate the model automatically using a Genetic Algorithm. The zone-flow field results are input into the model that then runs a set number of trials, typically 10,000, changing unknown variables between each run. After the trial runs, the



computer model returns set conditions for the unknown variables that will produce a model that accurately reflects that flow conditions that were experienced in the field during flow testing.

The main objective during the calibration process is to determine the coefficient of friction, or “C” factor for each type and size of pipe. The “C” factor is adjusted to reflect the reduced amount of flow a particular pipe can allow as the pipe ages or as encrustation builds. As a point of reference, new PVC pipe typically has a “C” factor around 150. After approximately 20 years under normal service conditions PVC pipe typically has a “C” factor around 140. Ductile Iron Pipe as well as Cast Iron Pipe typically has a “C” factor around 130 new and can range greatly from around 110 to 80 after 20 years. The exact amount that the “C” factor is reduced after a period of time can vary greatly depending on multiple variables including water quality and amount of water usage. A “C” factor of 60 is considered to be very low. A “C” factor that is as low as 60 is equivalent to an approximate reduction in pipe diameter of 25%. While a “C” factor of 40 is equivalent to an approximate reduction in pipe diameter of 36%. The K-State calibrated computer model produced expected “C” factors that ranged from 40 to 130. A map that illustrates the expected “C” factors for the water mains in the K-State Water Distribution System (Figure 3) is located at the end of this section.

2.2. WATER DEMAND

A very important part of the water modeling process involves accurately determining the average water demand on the distribution system that is being modeled. The demand of each user on the system must be modeled as accurately as possible as the demand affects the calibration process and the results of the predicted available fire hydrant flows. The available fire hydrant flows are the expected flow rate of each hydrant in the model that causes any point in the model to drop to a pressure of 20 PSI. The available fire hydrant flow rates are not what is expected to be experienced if the hydrant is simply opened, but what can be expected if a pump is attached to the fire hydrant and pumped at a rate that causes a point in the distribution system to drop to 20 PSI.

Water use data was collected from numerous sources that included Johnson Controls, the City of Manhattan, and K-State personnel. All of this data was evaluated in order to determine an average daily water demand for each building on the K-State Campus during a week day in a winter month and when students are in session. A table that summarizes the demands that were used in the water model is located at the end of this section. The information that was provided in order to determine the Average Demand is included in the appendix.

No water use data could be provided for roughly half of the buildings that are supplied by the main distribution system. A demand for each of these buildings was determined based on a comparison in size and usage of similar buildings that have a known demand. The total K-State **Average Daily Demand of 962,546 Gallons** was also taken into consideration when determining the demands for these buildings.



	Known Demands	Estimated Demand		Assume 10 Hrs/d w/Peak of 1
		Unit Avg.	8,448	Demand (GMP)
Brandeberry Indoor Complex	3,144			5.2
Christian Track/FB Practice Fac	6,716			11.2
Frank Myers Field	4,917			8.2
Agronomy Farms	5,431			9.1
Alumni Center				0.0
Animal Husbandry	1,877			3.1
North Farm	57,534			95.9
Putnam Hall	8,321			13.9
Smurthwaite	1,504			2.5
Stone House	685			1.1
Van Zile Hall	5,886			9.8
West Stadium	494			0.8
Bill Snyder Family Stadium	23,880			39.8
Bramlage Coliseum	4,747			7.9
Indoor Football Facility	221			0.4
Vanier Football Complex	1,099			1.8
BIVAP	2,640			4.4
Flour Mill	19,638			32.7
IGP	5,140			8.6
Edwards Hall	444			0.7
Jardine Terrace	40,248			67.1
Rec Complex	536			0.9
Ackert Hall	10,172			17.0
Ahern Field House/Gym	10,026			16.7
Anderson Hall		0.250	2,112	3.5
Beach Art Museum	1,150			1.9
Bluemont Hall		0.500	4,224	7.0
Boyd Hall	6,971			11.6
Burt Hall		0.500	4,224	7.0
Bushnell Hall		0.500	4,224	7.0
Call Hall		8.000	67,587	112.6
Calvin Hall	2,000			3.3
Cardwell Hall	11,090			18.5
Center for Child Development		0.500	4,224	7.0
Chalmers Hall	8,319			13.9
Chem/Biochem Building	11,310			18.9
Coles Hall	53,085			88.5
Danforth Chapel		0.125	1,056	1.8
Davenport Building	415			0.7



	Known Demands	Estimated Demand		Assume 10 Hrs/d w/Peak of 1
		Unit Avg.	8,448	Demand (GMP)
Derby (Moore, Haymaker, Ford)	87,173			145.3
Dickens Hall		0.500	4,224	7.0
Dole Hall		0.500	4,224	7.0
Durland Hall	2,844			4.7
Dykstra Hall		0.250	2,112	3.5
East Stadium		0.125	1,056	1.8
Eisenhower Hall	1,289			2.1
English/Counseling Services		0.125	1,056	1.8
Facility Shops		0.125	1,056	1.8
Fairchild Hall	100			0.2
Feed Tech		4.000	33,793	56.3
Fiedler Hall	3,869			6.4
Galichia		0.500	4,224	7.0
Goodnow Hall	14,707			24.5
Hale	8,749			14.6
Holton Hall	750			1.3
Holtz Hall		0.125	1,056	1.8
International Student Center		0.125	1,056	1.8
Ion Lab		0.500	4,224	7.0
Justin Hall	2,458			4.1
Kedzie Hall	166			0.3
King Hall		2.000	16,897	28.2
Kramer	23,936			39.9
Leadership Studies	707			1.2
Leasure Hall	873			1.5
Marlatt Hall	27,440			45.7
McCain		0.125	1,056	1.8
Mosier Hall	244,098			406.8
Myers Building	775			1.3
Natatorium		4.000	33,793	56.3
Nichols Hall		0.125	1,056	1.8
Parking Garage	150			0.3
Pat Roberts Hall		2.000	16,897	28.2
Pittman Building	394			0.7
Power Plant (Boilers/Chill Plant)	55,457			92.4
Presidents House		0.125	1,056	1.8
Rathbone Hall	2,421			4.0
Seaton Court	17,947			29.9
Seaton Hall	42,235			70.4
Shellenberger		1.000	8,448	14.1

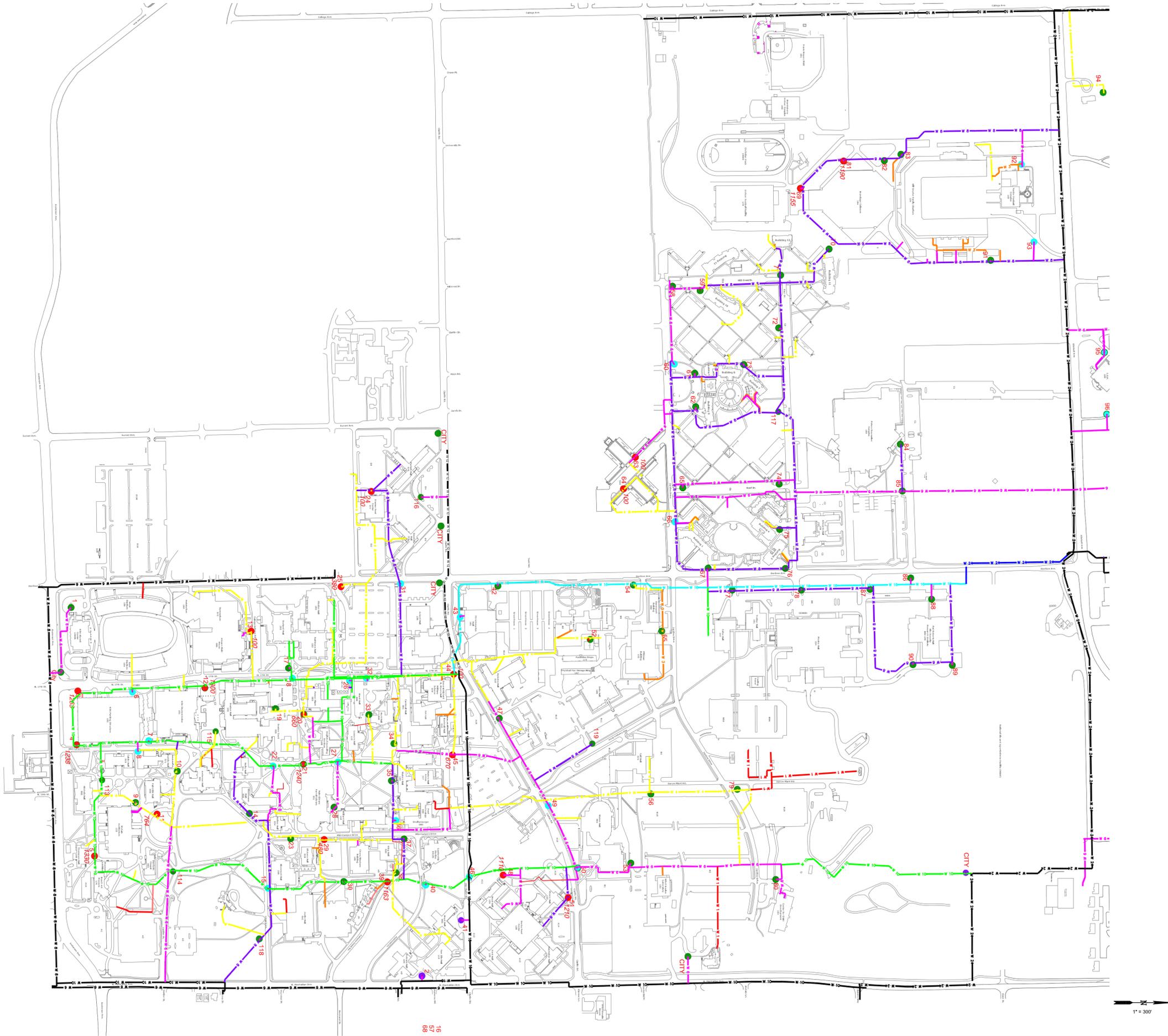


	Known Demands	Estimated Demand		Assume 10 Hrs/d w/Peak of 1
		Unit Avg.	8,448	Demand (GMP)
Thompson Hall		0.125	1,056	1.8
Throckmorton Hall	17,663			29.4
Trotter Hall		1.000	8,448	14.1
Umberger Hall	965			1.6
Union 1(West Side?)	23,945			39.9
Union 2(East Side?)	3,625			6.0
Ward Hall	413			0.7
Waters Hall		0.500	4,224	7.0
Weber Hall		1.000	8,448	14.1
West Hall	7,399			12.3
Willard Hall	2,011			3.4
Wind Erosion Lab		0.750	6,336	10.6
Total into KSU Distribution System		962,546 GPD		1,604 GPM

Table 2.1 Summary of Average Daily Demand for each Building on K-State Campus

END SECTION





LEGEND	
SIZING - COLOR CODING	
	0.75" Water Pipe
	1" Water Pipe
	1.25" Water Pipe
	1.5" Water Pipe
	2" Water Pipe
	3" Water Pipe
	4" Water Pipe
	6" Water Pipe
	8" Water Pipe
	10" Water Pipe
	12" Water Pipe
	16" Water Pipe
	24" Water Pipe
	4" City Water Pipe
	6" City Water Pipe
	8" City Water Pipe
	10" City Water Pipe
	12" City Water Pipe
	16" City Water Pipe
	24" City Water Pipe
	Fire Hydrant - No Testing
	Fire Hydrant - Flow Test
	Fire Hydrant - Static/Residual Test
	Fire Hydrant - Number
	Fire Hydrant - Flow

KANSAS STATE UNIVERSITY
MANHATTAN, KS
FIGURE 1A
EXISTING WATER SYSTEM - SIZING

Engineer: BC
 Drafter: JP
 Project No.
 12-1078M
 FIGURE
 1A

NO.	REVISIONS	DATE	INITIALS



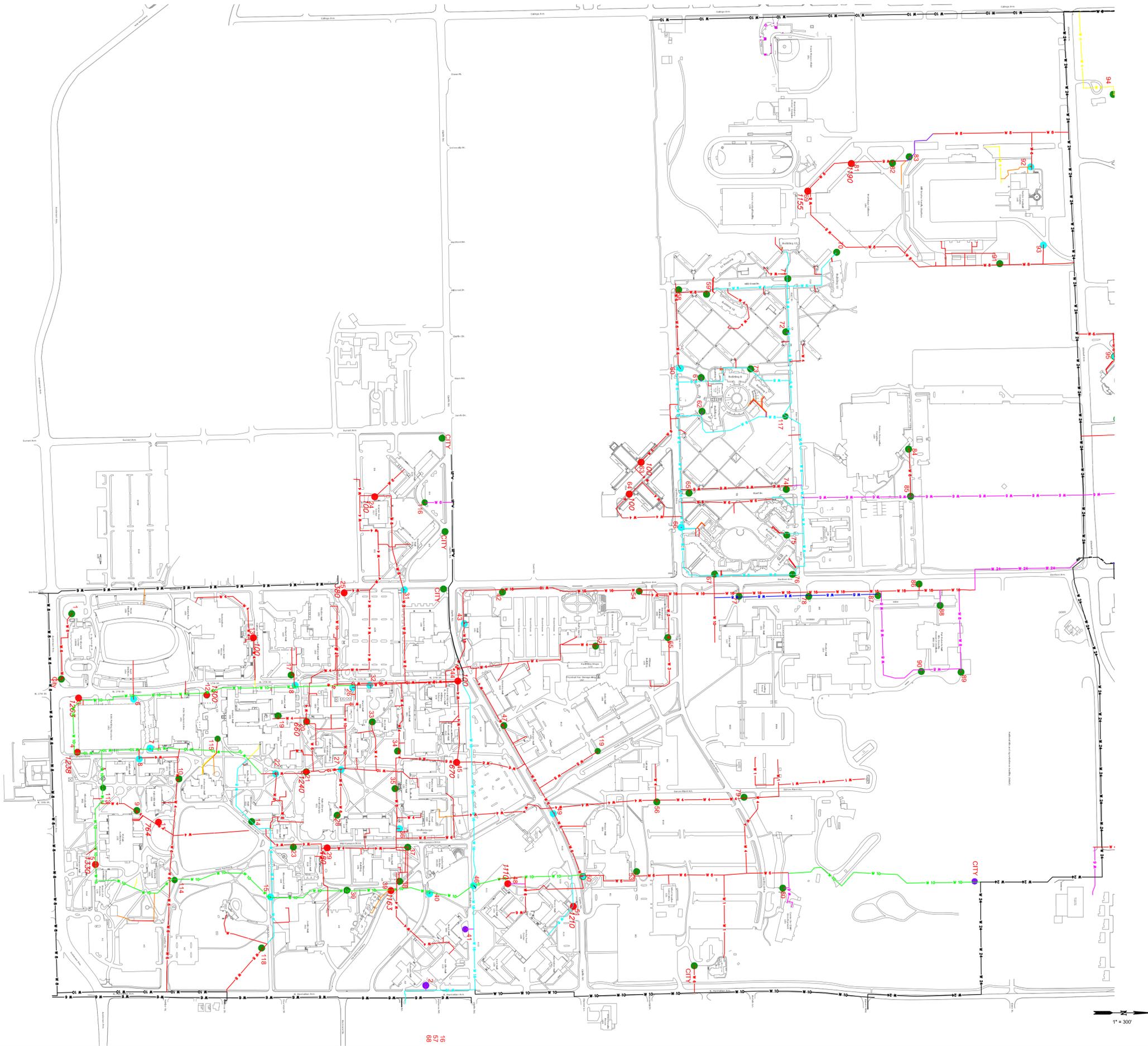
LEGEND
SIZING - COLOR CODING

	0.75" Water Pipe
	1" Water Pipe
	1.25" Water Pipe
	1.5" Water Pipe
	2" Water Pipe
	3" Water Pipe
	4" Water Pipe
	6" Water Pipe
	8" Water Pipe
	10" Water Pipe
	12" Water Pipe
	16" Water Pipe
	24" Water Pipe
	4" City Water Pipe
	6" City Water Pipe
	8" City Water Pipe
	10" City Water Pipe
	12" City Water Pipe
	16" City Water Pipe
	24" City Water Pipe

	Fire Hydrant - No Testing
	Fire Hydrant - Flow Test
	Fire Hydrant- Static/Residual Test
	Fire Hydrant- Number
	Fire Hydrant- Flow

1" = 300'

NO.	REVISIONS	DATE	INITIALS



LEGEND	
MATERIAL - COLOR CODING	
	City
	PVC
	CIP
	Copper
	DIP
	Unknown
	Galvanized
	FIRE HYDRANT - NO TESTING
	FIRE HYDRANT - FLOW TEST
	FIRE HYDRANT- STATIC/RESIDUAL TEST
	FIRE HYDRANT- NUMBER
	FIRE HYDRANT-FLOW

KANSAS STATE UNIVERSITY
MANHATTAN, KS

FIGURE 2A
EXISTING WATER SYSTEM - MATERIAL

Engineer: BC

Drafter: JP

Project No.
12-1078M

FIGURE
2A

NO.	REVISIONS	DATE	INITIALS



LEGEND	
MATERIAL - COLOR CODING	
	City
	PVC
	CIP
	Copper
	DIP
	Unknown
	Galvanized
	FIRE HYDRANT - NO TESTING
	FIRE HYDRANT - FLOW TEST
	FIRE HYDRANT- STATIC/RESIDUAL TEST
	FIRE HYDRANT- NUMBER
	FIRE HYDRANT-FLOW

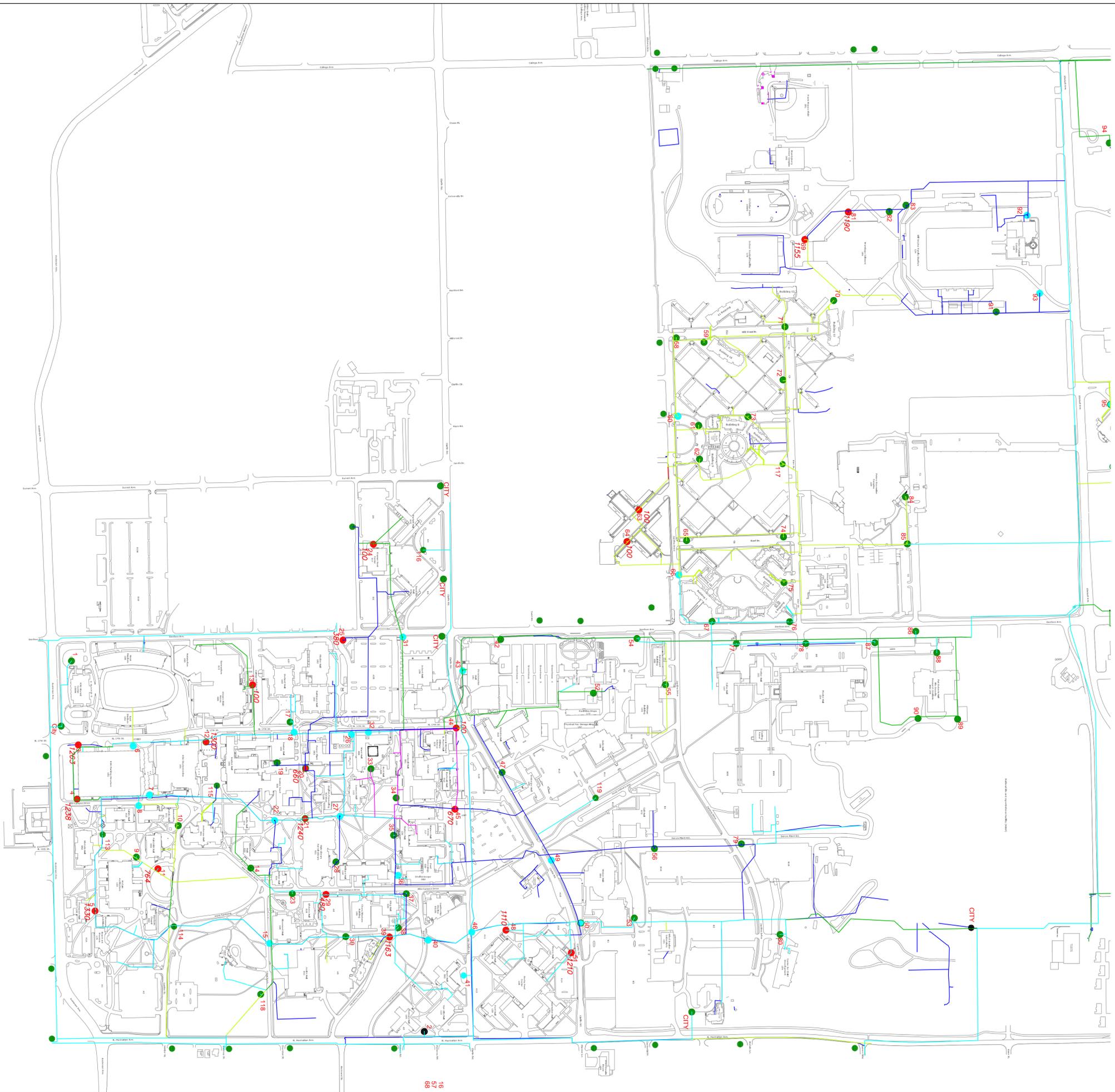
1" = 300'

NO.	REVISIONS	DATE	INITIALS

KANSAS STATE UNIVERSITY
 MANHATTAN, KS

FIGURE 2B
 EXISTING WATER SYSTEM - MATERIAL

Engineer: BC
Drafter: JP
Project No. 12-1078M
FIGURE 2B



LEGEND
"C" FACTORS

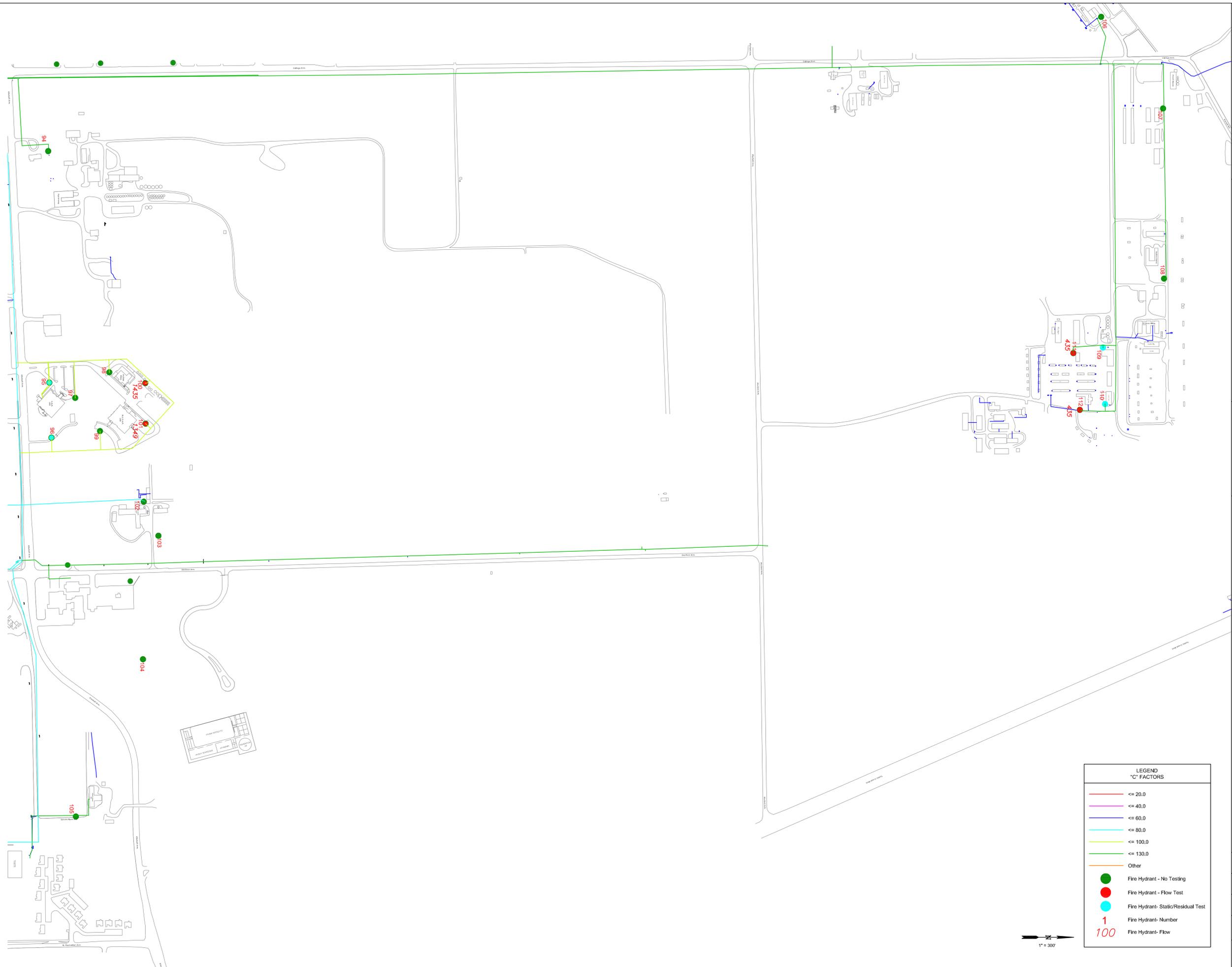
—	<= 20.0
—	<= 40.0
—	<= 60.0
—	<= 80.0
—	<= 100.0
—	<= 130.0
—	Other
●	Fire Hydrant - No Testing
●	Fire Hydrant - Flow Test
●	Fire Hydrant - Static/Residual Test
1	Fire Hydrant - Number
100	Fire Hydrant - Flow

1" = 300'

NO.	REVISIONS	DATE	INITIALS

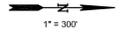
KANSAS STATE UNIVERSITY
 MANHATTAN, KS
FIGURE 3A
 EXISTING WATER SYSTEM - "C" FACTORS

Engineer: BC
Drafter: JP
Project No. 12-1078M
FIGURE 3A



LEGEND
"C" FACTORS

—	<= 20.0
—	<= 40.0
—	<= 60.0
—	<= 80.0
—	<= 100.0
—	<= 130.0
—	Other
●	Fire Hydrant - No Testing
●	Fire Hydrant - Flow Test
●	Fire Hydrant- Static/Residual Test
1	Fire Hydrant- Number
100	Fire Hydrant- Flow



NO.	REVISIONS	DATE	INITIALS

SECTION 3

DISTRIBUTION SYSTEM ANALYSIS

3.1. SYSTEM PRESSURES

In analyzing the distribution system for any community, one of the main concerns is the pressures provided at all points throughout the system. The Kansas Department of Health and Environment (KDHE) recommends a minimum of **20 psi** in waterlines under all flow conditions. In general, we do not recommend that service pressure fluctuate more than **10 psi**. We also recommend a service range of **60 psi to 80 psi** for public water supply systems. We analyzed the existing system and found that static pressures throughout the system are typically well above the recommended value between 80 and 100 psi. During normal usage we found that the water distribution system works within KDHE requirements.

3.2. FIRE FLOW PROTECTION

Current KDHE regulations require a minimum of 6" diameter waterlines provide fire protection. Approximately 28.7% of the waterlines within the existing distribution system are smaller than 6" and 20 out of the 114 existing fire hydrants are supplied by a waterline that is smaller than 6". The National Fire Protection Agency (NFPA) standard color coding for available fire hydrant flow rates at 20 psi is listed below.

<u>Classification</u>	<u>Flow at 20 psi.</u>	<u>Color Code</u>
Class C	Less than 500 gpm	Red
Class B	500 to 999 gpm	Orange
Class A	1000 to 1499 gpm	Green
Class AA	1500 and above	Blue

During testing 7 out of the 27 fire hydrants tested could not achieve a flow rate greater than 500 gpm. After creating a distribution model using WaterCAD, it was found that 17 out of the 114 total fire hydrants could not achieve 500 gpm while maintaining 20 psi within the system during normal demand usage with the 10" Connection open. A detailed fire code analysis would be required to determine the recommend flows for each hydrant due to the various size and usage of each building across the main campus. However, it typically is recommend that all fire hydrants be able to flow a minimum of 500 gpm and that fire hydrants near large facilities, such as schools, dormitories, etc. be able to flow a minimum of 1500 gpm.

Table A.1, located in the appendix, lists the available fire flow at each hydrant with the 10" Connection both opened and closed. As shown in table A.1, most of the fire hydrants cannot meet the recommended flow of 1500 gpm.



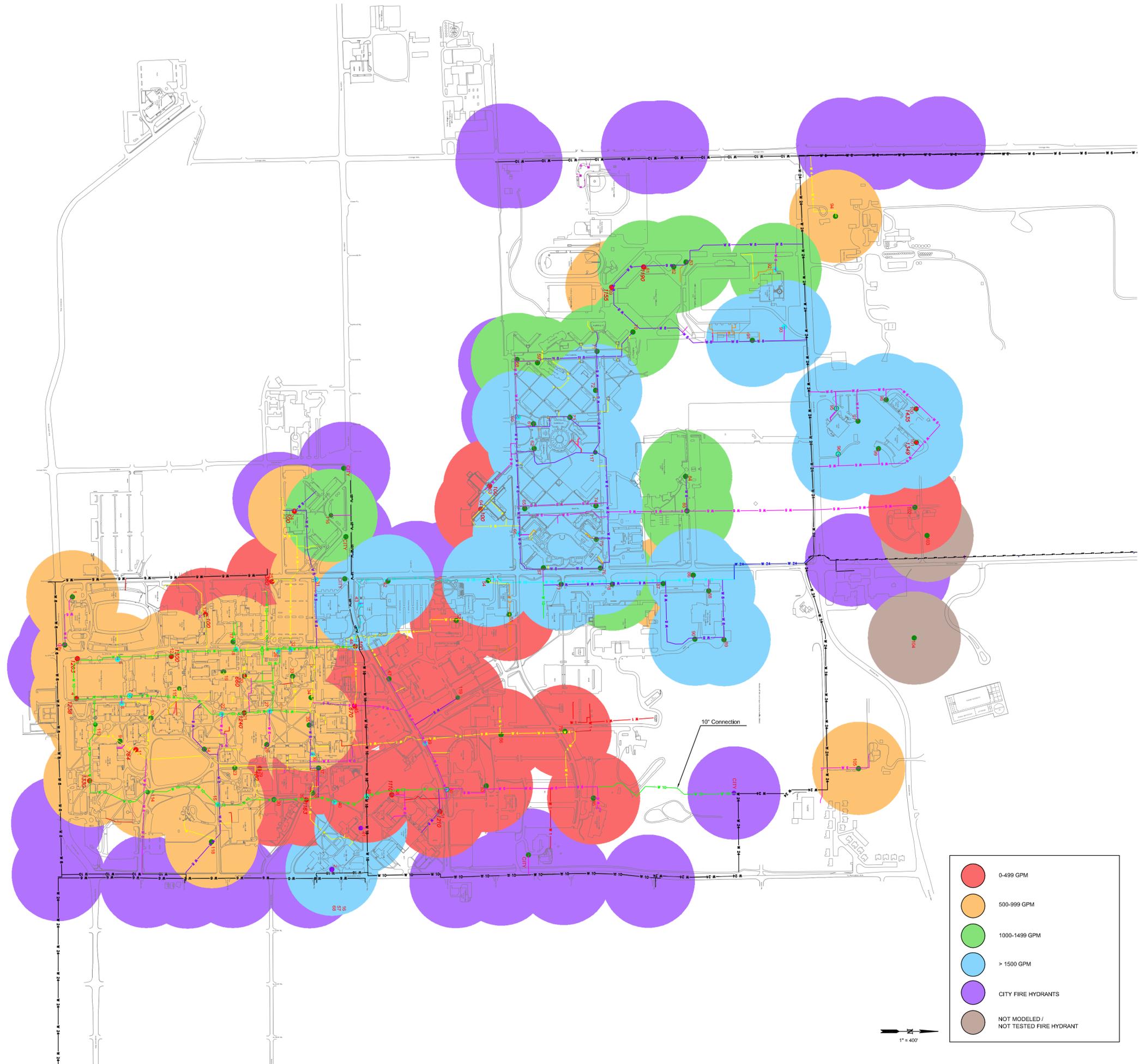
3.3. FIRE HYDRANT SPACING

Fire hydrant spacing is largely set by individual cities and is normally at the discretion of the Fire Chief. This spacing is largely dependent upon the amount of hose each fire truck has available. The objective is that any location within the protection area can be reached by one or more fire hydrants of ample flow. The minimum standard for most cities require fire hydrants to be placed no further than 800 feet apart. This would allow any location to be accessed by 400 feet of fire hose.

The Kansas Department of Health and Environment *Policies, General Considerations, and Design Requirements for Public Water Supply Systems in Kansas* states that fire hydrants should be placed at each street intersection and at intermediate points between intersections. Generally, hydrant spacing may range from 350 feet to 600 feet. This is the same standard as the Ten-States Standard (1997) and as recommended by the State Insurance Service Office. Two maps were created to illustrate the recommended 400 foot radius around each existing fire hydrant within the distribution system. These maps illustrate both the coverage and the NFPA Classification of each fire hydrant located within the distribution system and are located at the end of this section. Figure 4, illustrates the system coverage and available flows with the 10" Connection closed while Figure 5 illustrates the system coverage and available flows with the 10" Connection open.

END SECTION





LEGEND	
SIZING - COLOR CODING	
	0.75" Water Pipe
	1" Water Pipe
	1.25" Water Pipe
	1.5" Water Pipe
	2" Water Pipe
	3" Water Pipe
	4" Water Pipe
	6" Water Pipe
	8" Water Pipe
	10" Water Pipe
	12" Water Pipe
	16" Water Pipe
	24" Water Pipe
	4" City Water Pipe
	6" City Water Pipe
	8" City Water Pipe
	10" City Water Pipe
	12" City Water Pipe
	16" City Water Pipe
	24" City Water Pipe
	Fire Hydrant - No Testing
	Fire Hydrant - Flow Test
	Fire Hydrant - Static/Residual Test
	Fire Hydrant- Number
	Fire Hydrant- Flow

BG CONSULTANTS, INC.
ENGINEERS - ARCHITECTS - SURVEYORS
MANHATTAN, KANSAS HUTCHINSON, KANSAS EMPORIA, KANSAS
LAWRENCE, KANSAS

KANSAS STATE UNIVERSITY
MANHATTAN, KS

FIGURE 4A
AVAILABLE FIRE HYDRANT - 10" CONNECTION - CLOSED

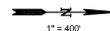
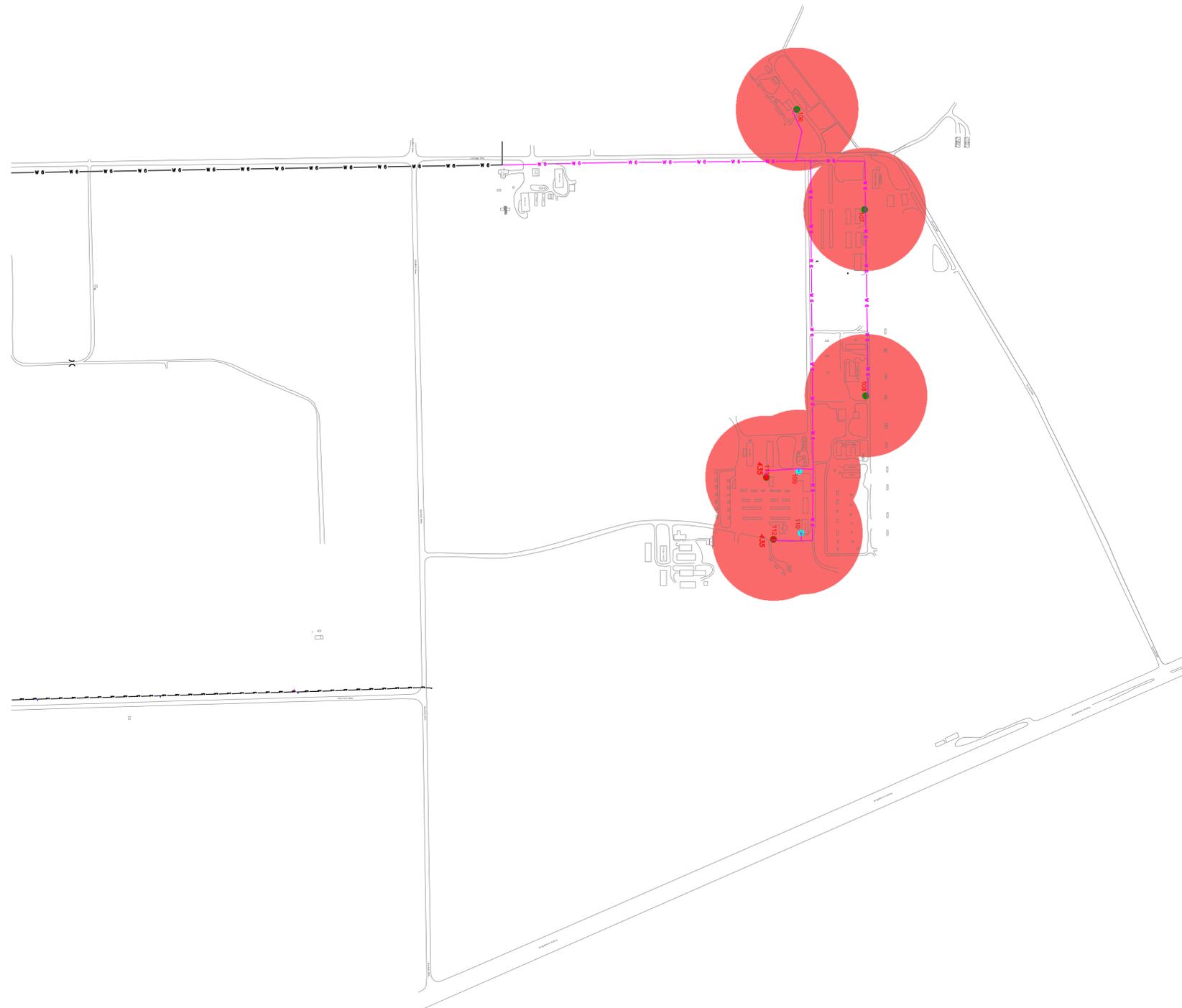
NO.	REVISIONS	DATE	INITIALS

Engineer: BC

Drafter: JP

Project No.
12-1078M

FIGURE
4A



	0-499 GPM
	500-999 GPM
	1000-1499 GPM
	> 1500 GPM
	CITY FIRE HYDRANTS
	NOT MODELED / NOT TESTED FIRE HYDRANT

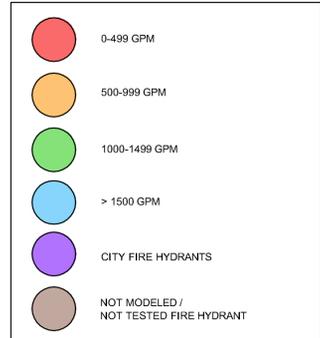
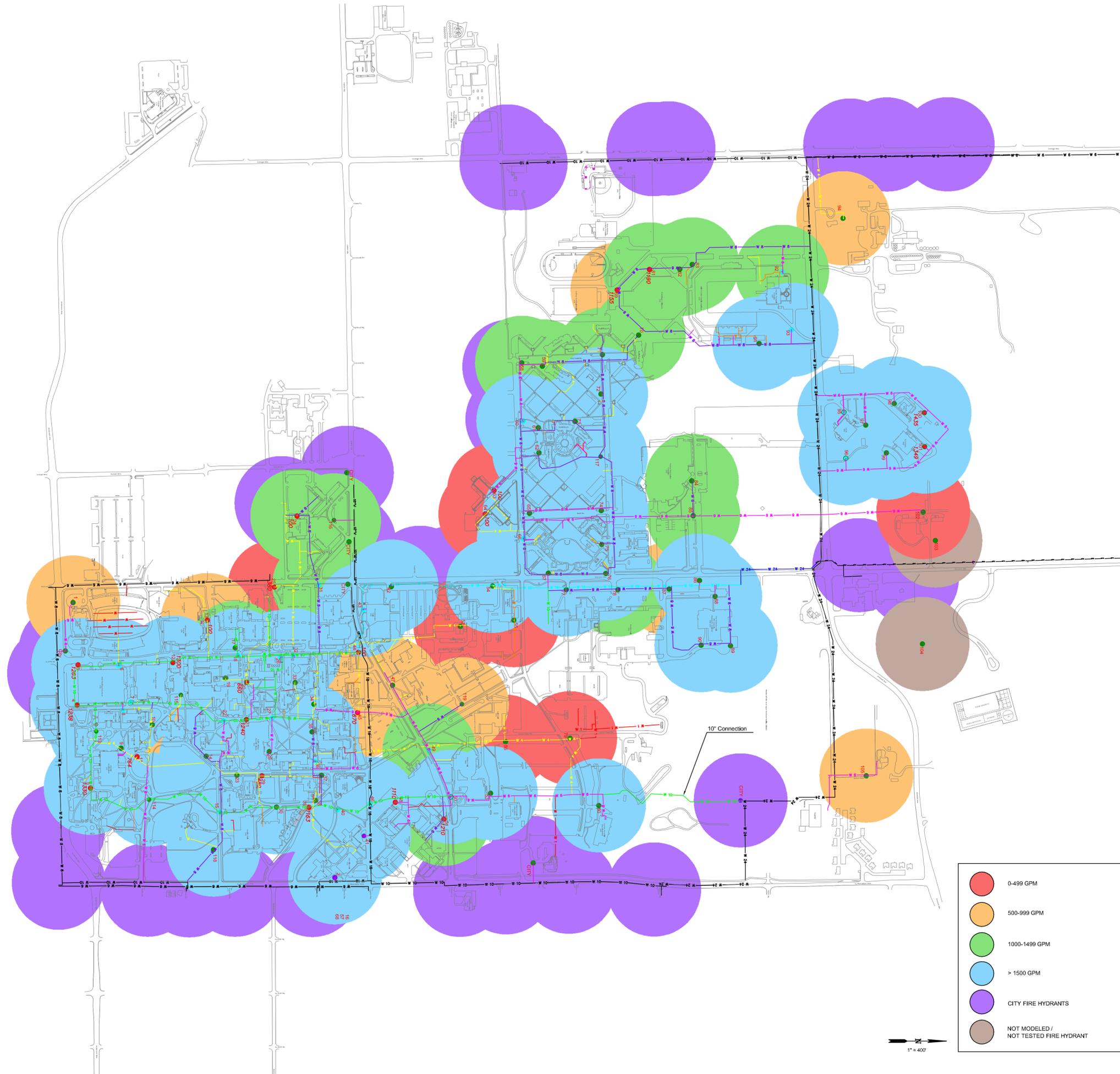
LEGEND SIZING - COLOR CODING	
	0.75" Water Pipe
	1" Water Pipe
	1.25" Water Pipe
	1.5" Water Pipe
	2" Water Pipe
	3" Water Pipe
	4" Water Pipe
	6" Water Pipe
	8" Water Pipe
	10" Water Pipe
	12" Water Pipe
	16" Water Pipe
	24" Water Pipe
	4" City Water Pipe
	6" City Water Pipe
	8" City Water Pipe
	10" City Water Pipe
	12" City Water Pipe
	16" City Water Pipe
	24" City Water Pipe
	Fire Hydrant - No Testing
	Fire Hydrant - Flow Test
	Fire Hydrant- Static/Residual Test
	Fire Hydrant- Number
	Fire Hydrant- Flow

NO.	REVISIONS	DATE	INITIALS

KANSAS STATE UNIVERSITY
 MANHATTAN, KS

FIGURE 4B
 AVAILABLE FIRE HYDRANT - 10" CONNECTION - CLOSED

Engineer: BC
 Drafter: JP
 Project No.
 12-1078M
 FIGURE
 4B



LEGEND SIZING - COLOR CODING	
	0.75" Water Pipe
	1" Water Pipe
	1.25" Water Pipe
	1.5" Water Pipe
	2" Water Pipe
	3" Water Pipe
	4" Water Pipe
	6" Water Pipe
	8" Water Pipe
	10" Water Pipe
	12" Water Pipe
	16" Water Pipe
	24" Water Pipe
	4" City Water Pipe
	6" City Water Pipe
	8" City Water Pipe
	10" City Water Pipe
	12" City Water Pipe
	16" City Water Pipe
	24" City Water Pipe
	Fire Hydrant - No Testing
	Fire Hydrant - Flow Test
	Fire Hydrant - Static/Residual Test
	Fire Hydrant - Number
	Fire Hydrant - Flow

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FIGURE 5A
AVAILABLE FIRE HYDRANT - 10" CONNECTION - OPEN

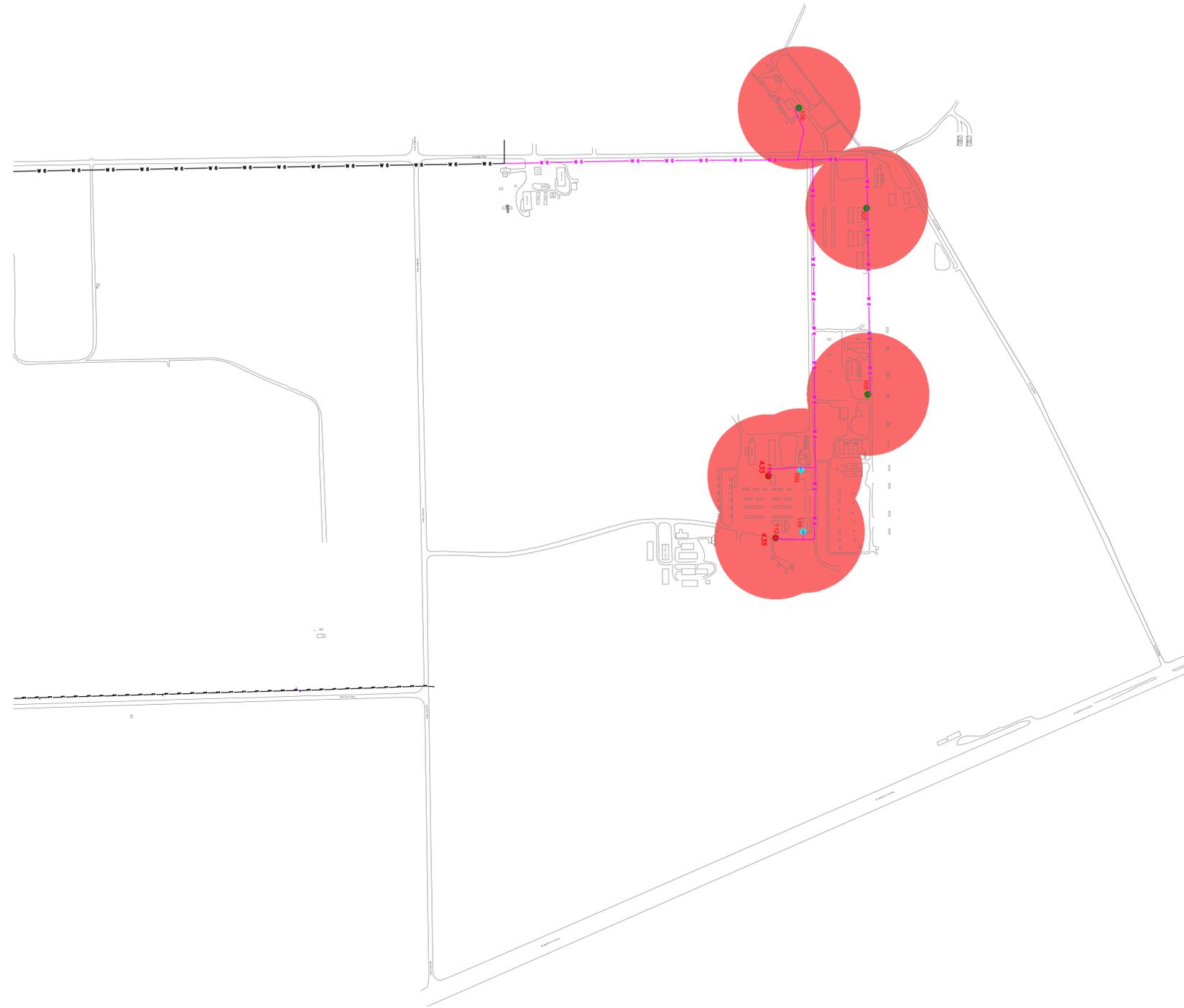
NO.	REVISIONS	DATE	INITIALS

Engineer: BC

Drafter: JP

Project No.
12-1078M

FIGURE
5A



	0-499 GPM
	500-999 GPM
	1000-1499 GPM
	> 1500 GPM
	CITY FIRE HYDRANTS
	NOT MODELED / NOT TESTED FIRE HYDRANT

LEGEND SIZING - COLOR CODING	
	0.75" Water Pipe
	1" Water Pipe
	1.25" Water Pipe
	1.5" Water Pipe
	2" Water Pipe
	3" Water Pipe
	4" Water Pipe
	6" Water Pipe
	8" Water Pipe
	10" Water Pipe
	12" Water Pipe
	16" Water Pipe
	24" Water Pipe
	4" City Water Pipe
	6" City Water Pipe
	8" City Water Pipe
	10" City Water Pipe
	12" City Water Pipe
	16" City Water Pipe
	24" City Water Pipe
	Fire Hydrant - No Testing
	Fire Hydrant - Flow Test
	Fire Hydrant- Static/Residual Test
	Fire Hydrant- Number
	Fire Hydrant- Flow

1" = 400'

NO.	REVISIONS	DATE	INITIALS

KANSAS STATE UNIVERSITY
 MANHATTAN, KS

FIGURE 5B
 AVAILABLE FIRE HYDRANT - 10" CONNECTION - OPEN

Engineer:	BC
Drafter:	JP
Project No.	12-1078M
FIGURE	5B

SECTION 4

DISTRIBUTION SYSTEM DEFICIENCIES AND RECOMMENDATIONS

4.1. AREAS OF DEFICIENCIES

The existing Kansas State University Potable Water Distribution has a few deficiencies, most of the deficiencies result from areas of campus that are not covered by fire hydrants that can produce the recommended flow rate of 1500 gpm at 20 psi. As illustrated in Figure 6, located at the end of this section, there are five main areas of concern.

It should be noted that there are couple of additional deficiencies that are not noted on Figure 6. They include the existing booster pump, fire hydrant flow rates around the Football Stadium, fire hydrant flow rates around the Recreation Complex, fire hydrant flow rates in the area to the northwest of the intersection of Kimball and Denison Avenue, and a few various fire hydrants that are located in isolated areas that are on dead end waterlines. These areas are considered secondary deficiencies and are discussed below.

4.2. SECONDARY DEFICIENCIES

4.2.1. EXISTING BOOSTER PUMP

As mentioned before, the Main Supply Connection enters the K-State Power Plant that supplies a 1500 gpm booster pump. The booster pump does not have a bypass and when the service pressure downstream of the pump is above 80 psi, the pump spins freely as water flows through it. This causes a drop in pressure between 3 and 17 psi, depending on the flow rate through the pump. This can reduce pressure system wide and could potentially force the booster pump to turn on more often than is necessary.

The booster pump also has the potential to limit the available fire hydrants flow rates. The maximum designed flow rate for the pump is 1500 gpm. Therefore when a fire hydrant is opened, that hydrant can only flow at a maximum of 1500 gpm. The flow rate would be expected to be less than 1500 gpm due to friction losses as the water travels through the system.

The booster pump was originally installed to maintain K-State distribution system pressure during times when the City of Manhattan could not supply the required pressure. Since that time, the City of Manhattan has completed multiple improvement project that have decreased the amount of pressure fluctuations that the KSU Campus experiences. In addition, the second 10" Waterline Connection that was installed also helps to reduce pressure fluctuations.



It is recommended that a booster pump bypass be installed to allow for the free flow of water around the booster pump during times when the pump is not needed. However, as stated before this is considered a secondary deficiency and should be kept in mind for any future improvement plans. It is estimated that a booster bypass installation would cost approximately \$50,000 or less.

4.2.2. FOOTBALL STADIUM

As illustrated in Figure 5, the available fire hydrant flow at the time this report was completed, show fire hydrants that are expected to produce less than 1500 gpm at 20 psi. This is considered to be a secondary deficiency. The West Stadium Expansion project and the Basketball Training Facility were both under construction at the time that the computer water model was created. There is a potential that some gate valves were closed or that some waterlines were not in place during field testing. It is expected that upon completion of the construction projects, the fire hydrants in this area will produce the recommended fire hydrant flow rate. Therefore, at this time these fire hydrants are considered a secondary deficiency. It is recommended that these fire hydrants be tested upon the completion of construction and the results are included into the computer model in order to confirm the available flow rates.

4.2.3. RECREATION COMPLEX

The Rec Complex Expansion project was also under construction during the time this report was completed. The expansion project included the replacement of a number of fire hydrants in this area. It was unfeasible to include these fire hydrants in this evaluation and is therefore considered to be a secondary deficiency. It is recommended that these fire hydrants also be tested upon the completion of construction and the results are included into the computer model as well.

4.2.4. NW OF THE INTERSECTION OF KIMBALL AND DENISON

Fire hydrant 102 is located at the end of a dead end 6" waterline. This fire hydrant is located inside of an animal pin and is almost buried. This area has experienced recent improvements including the installation of additional fire hydrants that are served off of a City of Manhattan 12" waterline. These new fire hydrants were not included in the field test. The new fire hydrants are expected to produce available fire hydrant flows greater than 1500 gpm at 20 psi, therefore the hydrants in this area of campus are considered to be secondary deficiencies.

4.2.5. ISOLATED FIRE HYDRANTS ON DEAD END LINES

There are a few areas located throughout the campus that cannot produce the recommended flow rate. In most cases, improvements to the City of Manhattan Distribution System would be required in order to improve the flow rate of these hydrants. These fire hydrants are also



usually covered by other fire hydrants that are expected to produce the recommended flow rate. Therefore, these hydrants are considered to be secondary deficiencies.

4.3. MAJOR DEFICIENCIES

There are 5 areas of the K-State Campus that are considered to be major deficiencies. They include area #1, the Engineering complex/Kramer Complex, Area #2, the South Jardine Apartments, Area #3, Umberger/Call Hall/Dole Hall/Mosier Hall, Area #4, the Derby Complex, and Area #5, the North Farm. Each of these areas is described below and is illustrated in Figure 6. The recommended improvements that are aimed at addressing the noted deficiencies are also illustrated in Figure 6. A detailed EOPC of each recommendation is included below.

4.3.1. AREA #1 ENGINEERING COMPLEX/KRAMER COMPLEX

This area includes the following buildings: Natatorium, Ahearn Gymnasium, Fiedler Hall, Kramer Dinning Hall, and Goodnow and Marlatt Residence Halls. The following fire hydrants are not expected to produce the recommended flow rate of 1500 gpm, hydrant number 13, 17, 25, 24, 116, and 31. This recommendation will replace a 4” waterline that supplies the Natatorium and Ahearn Field House and Gym. It will also replace a 4” waterline that runs from the power plant to the Kramer Dinning Center. This recommendation will include the installation of a new waterline the runs along Denison Ave. from the Natatorium to Fiedler Hall.

Engineers Opinion of Probable Project Cost					
Area #1					
No.	Description	Qty.	Unit	Unit Price	Total Price
1	Mobilization and Incidentals	Lump Sum		\$50,000.00	\$ 50,000.00
2	10" PVC Waterline (In Place)	1700	LF	\$ 40.00	\$ 68,000.00
3	10" PVC Waterline (Bore)	1100	LF	\$ 70.00	\$ 77,000.00
4	Tracer Wire	2800	LF	\$ 0.50	\$ 1,400.00
5	Misc. Fittings	Lump Sum		\$33,000.00	\$ 33,000.00
6	Fire Hydrant Setting	5	EA	\$ 4,000.00	\$ 20,000.00
7	Connect to Existing Waterline	4	EA	\$ 2,000.00	\$ 8,000.00
8	Flowable Fill	165	CY	\$ 90.00	\$ 14,850.00
9	Remove and Replace Surfacing	330	SY	\$ 100.00	\$ 33,000.00
		10%	Contingency		\$ 30,525.00
		Total Construction Cost			\$ 335,775.00
		Design Engineering			\$ 83,943.75
		Total Opinion of Cost			\$ 419,718.75

Table 4.1 – Area #1 EOPC



4.3.2. AREA #2 SOUTH JARDINE APARTMENT

This area includes the following buildings: Jardine Terrace H, I, N, and M. The following fire hydrants are not expected to produce the recommended flow rate of 1500 gpm, hydrant number 63 and 64. This recommendation will replace the 6” and 4” loop that services these four apartment buildings.

Engineers Opinion of Probable Project Cost					
Area #2					
No.	Description	Qty.	Unit	Unit Price	Total Price
1	Mobilization and Incidentals	Lump Sum		\$22,000.00	\$ 22,000.00
2	10" PVC Waterline (In Place)	700	LF	\$ 40.00	\$ 28,000.00
3	10" PVC Waterline (Bore)	600	LF	\$ 70.00	\$ 42,000.00
4	Tracer Wire	1300	LF	\$ 0.50	\$ 650.00
5	Misc. Fittings	Lump Sum		\$14,000.00	\$ 14,000.00
6	Fire Hydrant Setting	3	EA	\$ 4,000.00	\$ 12,000.00
7	Connect to Existing Waterline	2	EA	\$ 2,000.00	\$ 4,000.00
8	Flowable Fill	30	CY	\$ 90.00	\$ 2,700.00
9	Remove and Replace Surfacing	60	SY	\$ 100.00	\$ 6,000.00
		10%	Contingency		\$ 13,135.00
		Total Construction Cost			\$144,485.00
		Design Engineering			\$ 36,121.25
		Total Opinion of Cost			\$180,606.25

Table 4.2 – Area #2 EOPC



4.3.3. AREA #3 UMBERGER/CALL HALL/DOLE HALL/MOSIER HALL

This area includes the following buildings: Military Science Building, Bushnell, Dykstra, Umberger, International Student Center, Dole, Pittman, Various Facility Shops, Call, and Mosier Halls. The following fire hydrants are not expected to produce the recommended flow rate of 1500 gpm, hydrant number 44, 45, 47, 49, 52, 55, 56, 75, and 119. This recommendation will replace a 6” waterline that runs along Claflin Road from Throckmorton to Weber Hall and then north to the Center for Childhood Development Center. This recommendation includes the installation of a waterline the runs along Jardine Road from Denison Ave. to the Center for Childhood Development. It also includes the installation of a waterline that follows part of Mid Campus drive from Claflin Road north to Jardine Road, this waterline will continue behind the Vet Complex and connect to the Pat Roberts Hall Waterline Loop. From here the waterline will continue east along the south property line of the proposed NBAF facility and connect to the existing 10” waterline at a point north of the Center for Childhood development.

Engineers Opinion of Probable Project Cost					
Area #3					
No.	Description	Qty.	Unit	Unit Price	Total Price
1	Mobilization and Incidentals	Lump Sum		\$110,000.00	\$110,000.00
2	12" PVC Waterline (In Place)	3900	LF	\$ 45.00	\$175,500.00
3	12" PVC Waterline (Bore)	400	LF	\$ 90.00	\$ 36,000.00
4	10" PVC Waterline (In Place)	3900	LF	\$ 40.00	\$156,000.00
5	10" PVC Waterline (Bore)	400	LF	\$ 70.00	\$ 28,000.00
6	Tracer Wire	4300	LF	\$ 0.50	\$ 2,150.00
7	Misc. Fittings	Lump Sum		\$ 72,000.00	\$ 72,000.00
8	Fire Hydrant Setting	17	EA	\$ 4,000.00	\$ 68,000.00
9	Connect to Existing Waterline	9	EA	\$ 2,000.00	\$ 18,000.00
10	Flowable Fill	80	CY	\$ 90.00	\$ 7,200.00
11	Remove and Replace Surfacing	165	SY	\$ 100.00	\$ 16,500.00
		10%	Contingency		\$ 68,935.00
		Total Construction Cost			\$758,285.00
		Design Engineering			\$189,571.25
		Total Opinion of Cost			\$947,856.25

Table 4.3 – Area #3 EOPC



4.3.4. AREA #4 DERBY COMPLEX

This area includes the following buildings: Derby Dining Center and the Haymaker Residence Hall. The following fire hydrants are not expected to produce the recommended flow rate of 1500 gpm, hydrant number 51. This location also has an area that is not within 400' of any fire hydrants. This recommendation will include the installation of a waterline loop that will wrap around the Derby Dining Center and the four adjacent Residence Halls.

Engineers Opinion of Probable Project Cost					
Area #4					
No.	Description	Qty.	Unit	Unit Price	Total Price
1	Mobilization and Incidentals	Lump Sum		\$33,000.00	\$ 33,000.00
2	10" PVC Waterline (In Place)	1200	LF	\$ 40.00	\$ 48,000.00
3	10" PVC Waterline (Bore)	800	LF	\$ 70.00	\$ 56,000.00
4	Tracer Wire	2000	LF	\$ 0.50	\$ 1,000.00
5	Misc. Fittings	Lump Sum		\$22,000.00	\$ 22,000.00
6	Fire Hydrant Setting	6	EA	\$ 4,000.00	\$ 24,000.00
7	Connect to Existing Waterline	2	EA	\$ 2,000.00	\$ 4,000.00
8	Flowable Fill	50	CY	\$ 90.00	\$ 4,500.00
9	Remove and Replace Surfacing	100	SY	\$ 100.00	\$ 10,000.00
		10%	Contingency		\$ 20,250.00
		Total Construction Cost			\$ 222,750.00
		Design Engineering			\$ 55,687.50
		Total Opinion of Cost			\$ 278,437.50

Table 4.4 – Area #4 EOPC



4.3.5. AREA #5 NORTH FARM

This area includes the all of the buildings and services in located at the North Farm. The following fire hydrants are not expected to produce the recommended flow rate of 1500 gpm, hydrant number 106, 107, 108, 109, 110, 111, and 112. This recommendation will include the installation of a waterline from the intersection of Marlatt and Denison Avenues north to connect with the existing water system that serves the North Farm.

Engineers Opinion of Probable Project Cost					
Area #5					
No.	Description	Qty.	Unit	Unit Price	Total Price
1	Mobilization and Incidentals	Lump Sum		\$45,000.00	\$ 45,000.00
2	12" PVC Waterline (In Place)	3240	LF	\$ 45.00	\$ 145,800.00
3	Tracer Wire	3240	LF	\$ 0.50	\$ 1,620.00
4	Misc. Fittings	Lump Sum		\$22,000.00	\$ 22,000.00
5	Fire Hydrant Setting	4	EA	\$ 4,000.00	\$ 16,000.00
6	Connect to Existing Waterline	2	EA	\$ 2,000.00	\$ 4,000.00
7	Remove and Replace Surfacing	80	SY	\$ 15.00	\$ 1,200.00
		10%	Contingency		\$ 23,562.00
		Total Construction Cost			\$ 259,182.00
		Design Engineering			\$ 64,795.50
		Total Opinion of Cost			\$ 323,977.50

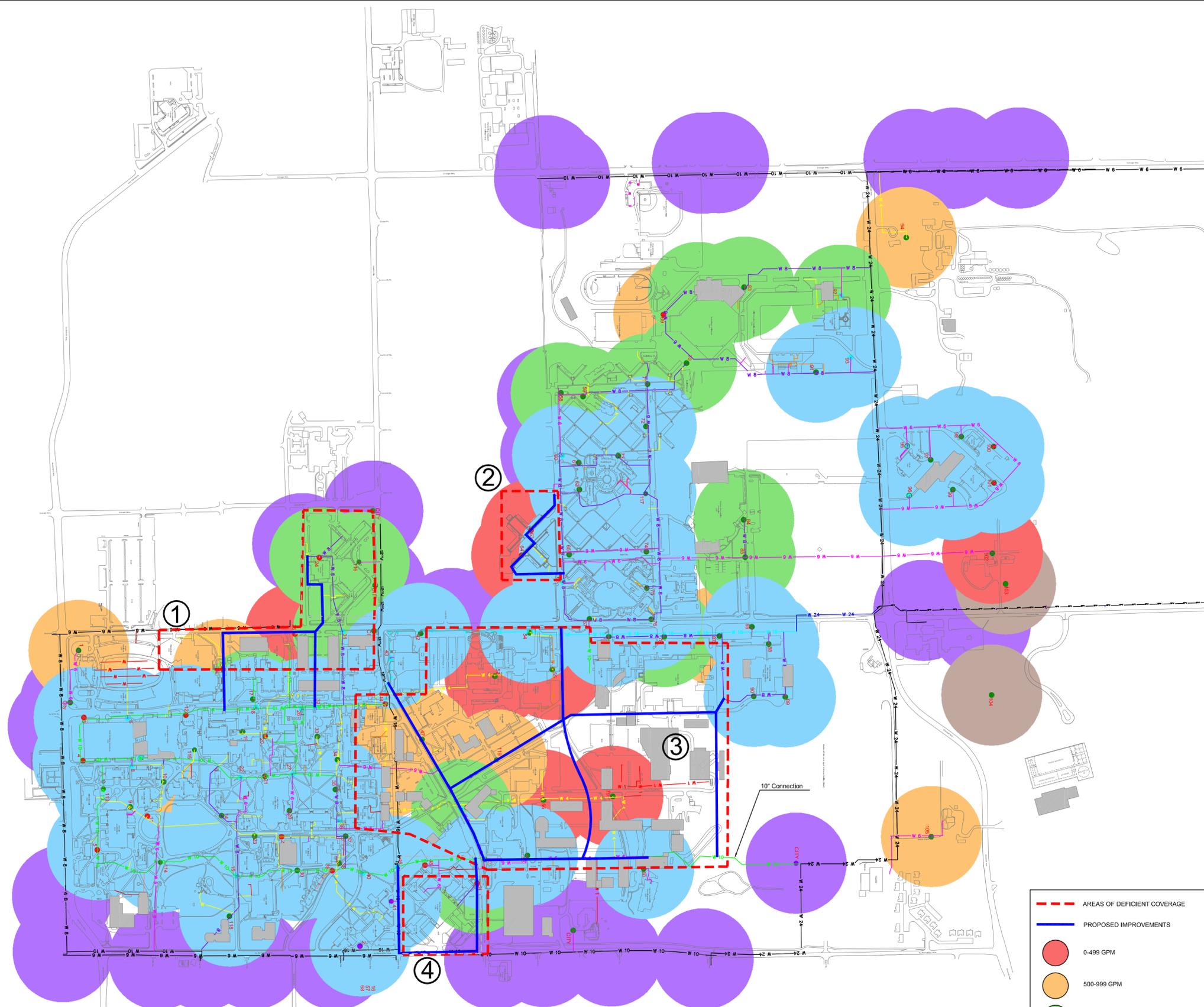
Table 4.5 – Area #5 EOPC

4.4. FUTURE EXPANSION

The current distribution system along with the previously recommended improvements, totaling **\$2,150,596.25**, will provide adequate domestic water supply and fire protection based on the projected future building locations as detailed in the 2025 Campus Master Plan.

END SECTION





NOTES:
 1. PROPOSED BUILDING FOOTPRINTS FOR THE DERBY AND KRAMER HOUSING AND DINING COMPLEX EXPANSIONS WERE NOT FINALIZED AT THE TIME THIS PLAN WAS DEVELOPED. HOWEVER, WATER AND SEWER USE ESTIMATES WERE CONSIDERED FOR THESE BUILDING EXPANSIONS AND ARE INCLUDED IN THE MODELING RESULTS SHOWN ON THIS PLAN.

LEGEND	
SIZING - COLOR CODING	
	0.75" Water Pipe
	1" Water Pipe
	1.25" Water Pipe
	1.5" Water Pipe
	2" Water Pipe
	3" Water Pipe
	4" Water Pipe
	6" Water Pipe
	8" Water Pipe
	10" Water Pipe
	12" Water Pipe
	16" Water Pipe
	24" Water Pipe
	4" City Water Pipe
	6" City Water Pipe
	8" City Water Pipe
	10" City Water Pipe
	12" City Water Pipe
	16" City Water Pipe
	24" City Water Pipe
	Fire Hydrant - No Testing
	Fire Hydrant - Flow Test
	Fire Hydrant - Static/Residual Test
	Fire Hydrant - Number
	Fire Hydrant - Flow

	AREAS OF DEFICIENT COVERAGE
	PROPOSED IMPROVEMENTS
	0-499 GPM
	500-999 GPM
	1000-1499 GPM
	> 1500 GPM
	CITY FIRE HYDRANTS
	NOT MODELED / NOT TESTED FIRE HYDRANT

1" = 400'

NO.	REVISIONS	DATE	INITIALS



1" = 400'

--- AREAS OF DEFICIENT COVERAGE

— PROPOSED IMPROVEMENTS

- 0-499 GPM
- 500-999 GPM
- 1000-1499 GPM
- > 1500 GPM
- CITY FIRE HYDRANTS
- NOT MODELED / NOT TESTED FIRE HYDRANT

LEGEND
SIZING - COLOR CODING

- 0.75" Water Pipe
- 1" Water Pipe
- 1.25" Water Pipe
- 1.5" Water Pipe
- 2" Water Pipe
- 3" Water Pipe
- 4" Water Pipe
- 6" Water Pipe
- 8" Water Pipe
- 10" Water Pipe
- 12" Water Pipe
- 16" Water Pipe
- 24" Water Pipe
- 4" City Water Pipe
- 6" City Water Pipe
- 8" City Water Pipe
- 10" City Water Pipe
- 12" City Water Pipe
- 16" City Water Pipe
- 24" City Water Pipe
- Fire Hydrant - No Testing
- Fire Hydrant - Flow Test
- Fire Hydrant- Static/Residual Test
- 1 Fire Hydrant- Number
- 100 Fire Hydrant- Flow



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LAWRENCE, KANSAS

NO.	REVISIONS	DATE	INITIALS

KANSAS STATE UNIVERSITY
MANHATTAN, KS

FIGURE 6B
AREAS OF DEFICIENT FIRE HYDRANT COVERAGE

Engineer: BC

Drafter: JP

Project No.
12-1078M

FIGURE
6B

APPENDIX

- Fire Hydrant Field Flow Testing Results
- Booster Pump Station Testing Results
- Provided Water Consumption Data
- Table A.1 – Available Fire Hydrant Flow Rates



Kansas State University
Flow Testing Project No. 12-1078M
3/22/12 to 3/23/12

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/22/2012	
1B	4					70.0	1238	Flow	Diffuser
1C	6		109	70	39			Test	
1D	7		100	65	35			Test	
1A	3					74.0	1263	Flow	Diffuser
1C	6		109	74	35			Test	
1D	7		100	70	30			Test	
1A	3							Flow	Diffuser
1B	4							Flow	Diffuser
1C	6		109	38	71			Test	
1D	7		100	33	67			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/28/2012 9:26	
2A	5					63.0	1330	Flow	
2C	8		97	61	36			Test	
2D	15		105	69	36			Test	
2B	11					24.0	764	Flow	Diffuser
2C	8		97	71	26			Test	
2D	15		105	79	26			Test	
2A	5					45.0	1125	Flow	
2B	9					12.0	537	Flow	Diffuser
2C	8		97	42	55			Test	
2D	15		105	48	57			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/28/2012 9:52	
3A	12					60.0	1300	Flow	
3C	18		93	62	31			Test	
3D	22		95	65	30			Test	
3B	13					0.0	100	Flow	Diffuser
3C	18		93	90	3			Test	
3D	22		95	90	5			Test	
3A	12					53.0	1220	Flow	
3B	13					0.0	100	Flow	Diffuser
3C	18		93	56	37			Test	
3D	22		95	58	37			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/28/2012 10:15	
4A	20					18.0	660	Flow	Diffuser
4C	26		92	72	20			Test	
4D	27		90	72	18			Test	
4B	21					55.0	1240	Flow	
4C	26		92	62	30			Test	
4D	27		90	64	26			Test	
4A	20					10.0	493	Flow	Diffuser
4B	21					37.0	1025	Flow	
4C	26		92	42	50			Test	
4D	27		90	45	45			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	2/28/2012 8:55	
5A	24					0.0	100	Flow	Diffuser
5C	31		93	80	13			Test	
5D	32		96	92	4			Test	
5B	25					5.0	380	Flow	
5C	31		93	86	7			Test	
5D	32		96	91	5			Test	
5A	24					0.0	100	Flow	Diffuser
5B	25					3.0	290	Flow	
5C	31		93	72	21			Test	
5D	32		96	88	8			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	2/28/2012 10:37	
6A	29					8.0	480	Flow	
6C	26		98	85	13			Test	
6D	40		104	95	9			Test	
6B	39					60.0	1163	Flow	Diffuser
6C	26		98	58	40			Test	
6D	40		104	64	40			Test	
6A	29					5.0	380	Flow	
6B	39					50.0	1077	Flow	Diffuser
6C	26		98	49	49			Test	
6D	40		104	55	49			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/28/2012 11:07	
7A	44					0.0	100	Flow	
7C	43		100	100	0			Test	
7D	49		105	102	3			Test	
7B	45					16.0	670	Flow	
7C	43		100	100	0			Test	
7D	49		105	66	39			Test	
7A	44					0.0	100	Flow	
7B	45					14.0	630	Flow	
7C	43		100	100	0			Test	
7D	49		105	63	42			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/28/2012 7:10	
8A	48					44.0	1110	Flow	
8C	46		110	72	38			Test	
8D	50		104	64	40			Test	
8B	51					52.0	1210	Flow	
8C	46		110	73	37			Test	
8D	50		104	66	38			Test	
8A	48					23.0	805	Flow	
8B	51					27.0	875	Flow	
8C	46		110	44	66			Test	
8D	50		104	35	69			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/28/2012 8:20	
9A	64					0.0	100	Flow	
9C	60		83	83	0			Test	
9D	66		96	95	1			Test	
9B	63					0.0	100	Flow	Diffuser
9C	60		83	81	2			Test	
9D	66		96	94	2			Test	
9A	64					0.0	100	Flow	Diffuser
9B	63					0.0	100	Flow	
9C	60		83	81	2			Test	
9D	66		96	82	14			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/28/2012 7:55	
10A	69					59.0	1155	Flow	Diffuser
10C	92		90	77	13			Test	
10D	93		92	91	1			Test	
10B	81					50.0	1190	Flow	
10C	92		90	81	9			Test	
10D	93		92	91	1			Test	
10A	69					24.0	764	Flow	Diffuser
10B	81					25.0	840	Flow	
10C	92		90	63	27			Test	
10D	93		92	91	1			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/28/2012 7:34	
11A	100					73.0	1435	Flow	
11C	95		92	82	10			Test	
11D	96		94	82	12			Test	
11B	101					91.0	1349	Flow	Diffuser
11C	95		92	82	10			Test	
11D	96		94	82	12			Test	
11A	100					62.0	1320	Flow	
11B	101					69.0	1231	Flow	Diffuser
11C	95		92	74	18			Test	
11D	96		94	76	18			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)	3/22/2012	
12A	111					8.0	435	Flow	Diffuser
12C	109		92	9	83			Test	
12D	110		92	10	82			Test	
12B	112					8.0	435	Flow	Diffuser
12C	109		92	16	76			Test	
12D	110		92	9	83			Test	
12A	111					4.0	279	Flow	Diffuser
12B	112					0.0	100	Flow	Diffuser
12C	109		92	4	88			Test	
12D	110		92	0	92			Test	

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Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)		
13A	5					60.0	1300	Flow	
13C	4		101	68	33			Test	
13D	7		98	58	40			Test	
13E	114		112	70	42			Test	
13A	5					36.0	1010	Flow	
13B	113					27.0	875	Flow	
13C	4		101	40	61			Test	
13D	7		98	32	66			Test	
13E	114		112	44	68			Test	
13B	113					52.0	1210	Flow	
13C	4		101	64	37			Test	
13D	7		98	58	40			Test	
13E	114		112	69	43			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)		
14A	21					59.0	1290	Flow	
14C	20		106	70	36			Test	
14D	26		104	66	38			Test	
14E	27		105	70	35			Test	
14A	18					30.0	920	Flow	
14B	21					33.0	965	Flow	
14C	20		106	48	58			Test	
14D	26		104	38	66			Test	
14E	27		105	41	64			Test	
14B	18					52.0	1210	Flow	
14C	20		106	64	42			Test	
14D	26		104	64	40			Test	
14E	27		105	68	37			Test	

Zone Flow			Pressure (psi)		Pressure	Field Flow	Calculated		
Run No.	Hydrant No.	Location	Static	Residual	Loss (psi)	(psi)	Flow (gpm)		
15A	29					10.0	530	Flow	
15C	36		108	98	10			Test	
15D	40		114	115	-1			Test	
15A	29		100			5.0	380	Flow	
15B	39					55.0	1240	Flow	
15C	36		108	60	48			Test	
15D	40		114	60	54			Test	
15B	39					68.0	1385	Flow	
15C	36		108	70	38			Test	
15D	40		114	74	40			Test	

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Time	Up Stream Pressure	Actual Meter Reading (Units in 6 Sec.)	Booster Meter Reading (CCF/Min)	Booster Meter Reading (GPM)	Predicted FH Flow (GPM)	Down Stream Pressure	Fire Hydrant (Actual)		Fire Hydrant (Target)		Difference in Predicted Flow and Actual Flow (GPM)	Headloss Across Pump (PSI)	Headloss Across Pump (FT)
							Pressure	Flow Rate	Pressure	Flow Rate			
Before	110	6	0.6	449	0	93.5	0	0	0	0	0	16.5	38.115
8:30	105	11	1.1	823	374	93.2	6	410	6	410	36	11.8	27.258
	103	12	1.2	898	449	92.8	9	500	9	500	51	10.2	23.562
	102	14	1.4	1,047	598	92.1	13	605	13	605	7	9.9	22.869
	101	16	1.6	1,197	748	91.9	18	710	18	710	-38	9.1	21.021
	100	17	1.7	1,272	823	91.7	23	805	23	805	-18	8.3	19.173
	99	18	1.8	1,346	898	91.1	29	905	29	905	7	7.9	18.249
	98	19	1.9	1,421	972	90.5	36	1010	36	1010	38	7.5	17.325
	96	20	2	1,496	1,047	89.7	43	1100	43	1100	53	6.3	14.553
9:40	92	22	2.2	1,646	1,197	89.2	50	1190	51	1200	-7	2.8	6.468
							X	X	60	1300			
							X	X	70	1405			
							X	X	80	1500			

2011 KSU ACCOUNTS WITH CONSUMPTION

CCF

SVC	CUS ID	LOC ID	NAME	MTR#	INS YY	SIZE	ST#	ST NAME	MO	CONSUMPTION
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	1	7.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	2	8.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	3	13.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	4	10.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	5	13.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	6	10.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	7	3.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	8	5.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	9	7.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	10	14.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	11	14.00
WA	6046	6047	KSU FOUNDATION	16570460		1 0100		1811 PLATT ST	12	11.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	1	6.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	2	27.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	3	1.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	4	0.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	5	0.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	6	0.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	7	0.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	8	0.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	9	0.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	10	0.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	11	1.00
WA	6046	8103	KSU FOUNDATION	35998257		10 0075		918 MANHATTAN AVE	12	0.00
WA	6046	8707	KSU FOUNDATION	19095048		81 0062		1226 THURSTON ST	7	0.00
WA	6046	8959	KSU FOUNDATION	98691785		99 0062		1120 MANHATTAN AVE	7	0.00
WA	6046	8959	KSU FOUNDATION	98691785		99 0062		1120 MANHATTAN AVE	8	0.00
WA	6046	8959	KSU FOUNDATION	98691785		99 0062		1120 MANHATTAN AVE	9	0.00
WA	6046	8959	KSU FOUNDATION	98691785		99 0062		1120 MANHATTAN AVE	10	0.00
WA	6046	8959	KSU FOUNDATION	98691785		99 0062		1120 MANHATTAN AVE	11	1.00
WA	6046	9929	KSU FOUNDATION	14021741		4 0062		1719 ANDERSON AVE	6	0.00
WA	6046	9941	KSU FOUNDATION	97694865		97 0062		1735 ANDERSON AVE	6	1.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	1	0.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	2	1.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	3	0.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	4	1.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	5	0.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	6	0.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	7	0.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	8	0.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	9	1.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	10	0.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	11	1.00
WA	8708	8101	KSU FOUNDATION	35419370		9 0062		914 MANHATTAN AVE	12	0.00
WA	8708	8707	KSU FOUNDATION	19095048		81 0062		1226 THURSTON ST	7	0.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	1	3.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	2	1.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	3	4.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	4	6.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	5	4.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	6	21.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	7	25.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	8	48.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	9	48.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	10	58.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	11	40.00
IR	8708	8709	KSU FOUNDATION	36042235		9 0100		1100 MANHATTAN AVE	12	32.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	1	3.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	2	1.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	3	4.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	4	6.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	5	4.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	6	21.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	7	25.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	8	48.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	9	48.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	10	58.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	11	40.00
WA	8708	8709	KSU FOUNDATION	33555374		8 0062		1100 MANHATTAN AVE	12	32.00
WA	8708	8959	KSU FOUNDATION	98691785		99 0062		1120 MANHATTAN AVE	7	0.00

WA	8708	8959 KSU FOUNDATION	98691785	99 0062	1120 MANHATTAN AVE	8	0.00
WA	8708	8959 KSU FOUNDATION	98691785	99 0062	1120 MANHATTAN AVE	9	0.00
WA	8708	8959 KSU FOUNDATION	98691785	99 0062	1120 MANHATTAN AVE	10	0.00
WA	8708	8959 KSU FOUNDATION	98691785	99 0062	1120 MANHATTAN AVE	11	1.00
WA	8708	9929 KSU FOUNDATION	14021741	4 0062	1719 ANDERSON AVE	6	0.00
WA	8708	9931 KSU FOUNDATION	14021766	4 0062	1721 ANDERSON AVE	7	10.00
WA	8708	9941 KSU FOUNDATION	97694865	97 0062	1735 ANDERSON AVE	6	1.00
WA	8708	9943 KSU FOUNDATION	28383499	4 0100	1741 ANDERSON AVE	6	0.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	1	23.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	2	19.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	3	26.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	4	21.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	5	29.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	6	25.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	7	19.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	8	33.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	9	27.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	10	29.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	11	26.00
WA	9922	9923 KSU DIVISION OF FACILITIES	51232756	2 0200	1615 ANDERSON AVE	12	25.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	1	0.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	2	0.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	3	0.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	4	0.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	5	9.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	6	8.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	7	67.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	8	378.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	9	194.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	10	163.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	11	141.00
IR	10064	10065 KSU DIVISION OF FACILITIES	35767103	11 0200	2323 ANDERSON AVE	12	0.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	1	146.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	2	178.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	3	176.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	4	107.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	5	141.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	6	115.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	7	235.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	8	134.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	9	271.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	10	230.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	11	206.00
WA	10066	10067 KSU DIVISION OF FACILITIES	35766913	11 0400	2323 ANDERSON AVE	12	191.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	1	58.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	2	3.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	3	8.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	4	8.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	5	6.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	6	11.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	7	2.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	8	14.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	9	6.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	10	6.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	11	6.00
WA	10896	10897 FORESTRY BLDG/KSU FACILITIES	31862852	93 0150	2610 CLAFLIN RD	12	7.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	1	2.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	2	3.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	3	4.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	4	4.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	5	4.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	6	4.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	7	4.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	8	5.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	9	4.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	10	4.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	11	3.00
WA	10898	10899 FORESTRY DEPT/KSU FACILITIES	35165695	8 0100	2610 CLAFLIN RD	12	3.00
WA	10900	10901 KSU DIVISION OF FACILITIES	22057315	75 0150	2610 CLAFLIN RD	1	46.00
WA	10900	10901 KSU DIVISION OF FACILITIES	22057315	75 0150	2610 CLAFLIN RD	2	36.00
WA	10900	10901 KSU DIVISION OF FACILITIES	22057315	75 0150	2610 CLAFLIN RD	3	45.00
WA	10900	10901 KSU DIVISION OF FACILITIES	22057315	75 0150	2610 CLAFLIN RD	4	66.00

WA	11212	11213	KSU DIVISION OF FACILITIES	29800302	5 0200	0 KSU DENISON AT FOOTBALL	5	0.00
WA	11212	11213	KSU DIVISION OF FACILITIES	29800302	5 0200	0 KSU DENISON AT FOOTBALL	6	0.00
WA	11212	11213	KSU DIVISION OF FACILITIES	29800302	5 0200	0 KSU DENISON AT FOOTBALL	7	0.00
WA	11212	11213	KSU DIVISION OF FACILITIES	29800302	5 0200	0 KSU DENISON AT FOOTBALL	8	0.00
WA	11212	11213	KSU DIVISION OF FACILITIES	29800302	5 0200	0 KSU DENISON AT FOOTBALL	9	0.00
WA	11212	11213	KSU DIVISION OF FACILITIES	29800302	5 0200	0 KSU DENISON AT FOOTBALL	10	0.00
WA	11212	11213	KSU DIVISION OF FACILITIES	29800302	5 0200	0 KSU DENISON AT FOOTBALL	11	0.00
WA	11212	11213	KSU DIVISION OF FACILITIES	29800302	5 0200	0 KSU DENISON AT FOOTBALL	12	0.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	1	3.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	2	8.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	3	7.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	4	6.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	5	3.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	6	4.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	7	8.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	8	129.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	9	9.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	10	4.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	11	3.00
WA	11214	11215	KSU DIVISION OF FACILITIES	24777083	2 0200	810 DENISON AVE	12	57.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	1	215.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	2	130.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	3	385.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	4	184.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	5	276.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	6	255.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	7	112.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	8	234.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	9	276.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	10	568.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	11	487.00
WA	11500	11501	KSU HOUSING	63020117	3 0300	0 KSU PUTNAM HALL	12	347.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	1	230.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	2	83.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	3	359.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	4	255.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	5	306.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	6	185.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	7	26.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	8	40.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	9	79.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	10	334.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	11	326.00
WA	11504	11505	KSU HOUSING & DINING	35726419	9 0300	0 KSU VAN ZYLE HALL	12	278.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	1	48.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	2	30.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	3	72.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	4	51.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	5	60.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	6	42.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	7	6.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	8	47.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	9	57.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	10	75.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	11	82.00
WA	11514	11515	KSU HOUSING	8877523	96 0200	0 KSU SMURTHWAITE	12	46.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	1	0.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	2	0.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	3	0.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	4	0.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	5	3.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	6	12.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	7	42.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	8	124.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	9	119.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	10	67.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	11	38.00
WA	11872	11873	KSU HOUSING & DINING	31685365	91 0150	0 KSU VAN ZYLE & PUTNAM IRR	12	1.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	1	10.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	2	8.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	3	19.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	4	15.00

WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	5	31.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	6	448.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	7	513.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	8	3606.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	9	1306.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	10	2207.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	11	332.00
WA	12408	21897	KSU DIVISION OF FACILITIES	31928608	2 0600	1947 KIMBALL AVE	12	1087.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	1	22890.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	2	31830.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	3	33560.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	4	26400.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	5	40130.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	6	36730.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	7	52250.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	8	55010.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	9	54410.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	10	50750.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	11	37880.00
WA	12414	12415	KSU DIV OF FAC #1	25755854	10 1600	0 KSU HEAT & POWER BILL 1	12	27770.00
WA	26358	9943	KSU FOUNDATION	28383499	4 0100	1741 ANDERSON AVE	6	0.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	1	9.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	2	12.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	3	13.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	4	14.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	5	8.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	6	10.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	7	6.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	8	7.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	9	9.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	10	11.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	11	10.00
WA	26358	11231	KSU FOUNDATION	89805091	90 0100	1033 DENISON AVE	12	6.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	1	8.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	2	13.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	3	14.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	4	6.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	5	8.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	6	11.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	7	5.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	8	54.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	9	38.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	10	11.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	11	22.00
WA	54506	24545	KSU TESTING & RESEARCH LAB	19979188	99 0075	245 LEVEE DR	12	8.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	1	6.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	2	27.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	3	1.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	4	0.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	5	0.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	6	0.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	7	0.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	8	0.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	9	0.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	10	0.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	11	1.00
WA	58558	8103	KSU DIVISION OF FACILITIES	35998257	10 0075	918 MANHATTAN AVE	12	0.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	1	1508.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	2	1751.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	3	1882.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	4	1348.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	5	2195.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	6	2137.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	7	2127.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	8	4531.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	9	3904.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	10	3318.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	11	1798.00
WA	58558	26079	KSU DIVISION OF FACILITIES	18048608	3 0600	0 KSU FARM METER	12	1574.00
WA	58558	27775	KSU DIVISION OF FACILITIES	14249980	5 0062	0 C H TOWER & MARLATT AVE	1	0.00
WA	58558	27775	KSU DIVISION OF FACILITIES	14249980	5 0062	0 C H TOWER & MARLATT AVE	2	10.00
WA	58558	27775	KSU DIVISION OF FACILITIES	14249980	5 0062	0 C H TOWER & MARLATT AVE	3	30.00

University Billed

Units: CCF

Read Date	Year	Month	Boyd-Wtr	Davenport-Wtr	Derby-Wtr	Goodnow-Wtr	Kramer-Wtr	Marlatt-Wtr	Pittman-Wtr	West-Wtr	Jardine Terrace W0450	Jardine Terrace W0455	Edwards Hall W0025-high	Edwards Hall W0025-low	Rec Complex	Rec Complex-Handball Crt
1/13/2009	2009	1	0	7	1415	101	114	74	7	65						
2/12/2009	2009	2	0	10	4181	695	725	515	6	413						
3/17/2009	2009	3	0	12	4404	718	715	578	8	436						
4/15/2009	2009	4	0	11	3793	547	525	528	2	343						
5/20/2009	2009	5	22	14	5215	759	747	662	17	441						
6/17/2009	2009	6	163	11	2687	149	229	560	8	98						
7/17/2009	2009	7	189	11.5	2712	95	139.5	454	16.5	59.5						
8/18/2009	2009	8	215	12	2737	41	50	348	25	21						
9/15/2009	2009	9	394	11	4907	602	732	67	3	132	0	1655	-3	-11	-389	-5
10/14/2009	2009	10	372	14	4997	791	789	507	0	684	0	1711	-4	-14	-312	-5
11/18/2009	2009	11	402	16	5996	1006	1009	1380	11	568	0	2011	-5	-19	-243	-3
12/17/2009	2009	12	242	11	4171	601	1190	2015	8	389	0	1669	-4	-18	-142	0
1/21/2010	2010	1	89	13	2531	225	697	227	8	187	0	1748	-3	-13	-124	0
2/17/2010	2010	2	253	12	4201	639	0	0	8	584	0	1574	-4	-15	-220	0
3/17/2010	2010	3	217	14	3936	572	211	1039	8	177	0	1629	-3	-12	-203	0
4/15/2010	2010	4	218	13	4141	632	401	622	9	364	0	1686	-4	-15	-212	-2
5/13/2010	2010	5	304	13	4241	773	582	793	10	399	0	1648	-3	-13	-376	-2
6/10/2010	2010	6	54	20	1244	301	143	267	3	102	0	1628	-3	-15	-397	-2
7/15/2010	2010	7	248	16	1979	289	143	314	21	53	0	1979	-4	-17	-593	-2
8/18/2010	2010	8	175	31	2198	505	157	168	13	34	0	1737	-4	-18	-608	-4
9/16/2010	2010	9	411	15	3964	903	405	0	13	366	0	1748	-4	-18	-608	-2
10/14/2010	2010	10	431	21	3847	928	773	0	12	416	0	686	-2	-9	0	0
11/18/2010	2010	11	518	16	5324	1046	750	1062	13	510	0	3111	-5	-27	0	-8
12/16/2010	2010	12	210	11	3011	454	516	1003	10	279	0	1622	-3	-12	0	0
1/19/2011	2011	1	59	12	1576	122	118	174	0	98	0	1924	-4	-26	0	0
2/17/2011	2011	2	337	11	3907	681	774	1016	0	407	0	1692	-3	-16	0	0
3/17/2011	2011	3	338	13	3865	666	758	975	24	407	0	1626	-3	-14	0	0
4/20/2011	2011	4	302	13	4069	607	644	921	12	365	0	1980	-4	-18	0	0
5/12/2011	2011	5	295	10	3483	590	574	820	10	308	0	1313	-3	-12	0	0
6/15/2011	2011	6	77	14	2648	315	299	398	16	54	0	2009	-5	-16	0	-6
7/14/2011	2011	7	362	13	2696	741	552	857	11	113	0	1778	-3	-12	0	0
8/11/2011	2011	8	354	11	2940	787	298	957	12	0	0	1727	-3	-12	0	0
9/15/2011	2011	9	554	14	5282	1366	741	634	16	360	0	2170	-2	-12	0	-6
10/13/2011	2011	10	612	12	4795	1054	878	1540	7	428	0	1718	-5	-13	0	-4
11/18/2011	2011	11	527	17	5642	908	857	2658	12	537	0	2180	-5	-16	0	-6
12/15/2011	2011	12	242	11	1638	472	434	678	7	276	0	1600	-3	-9	0	0
1/12/2012	2012	1	27	10	925	50	50	108	6	48	0	1570	-3	-8	0	0
2/16/2012	2012	2	384	17	1462	834	785	1122	10	484	0	2127	-4	-15	0	0
3/15/2012	2012	3	324	13	1157	759	674	959	9	428	0	1719	-3	-11	0	0

The Rec Complex and Handball Court were all measured through a meter that also measured Jardine Terrace, so were credited back to Housing.

The Rec Complex has been expanded and water lines changed, so these water meters (Rec Complex and Handball Court) are likely no longer active.

Jardine Terrace was not part of the ESPC project, so although I track all bills as a service to the Customer, I don't question them. Don't know where W0450 is or why it is zero. W0455 is by the gas meter across the street from Jardine.

City of Manhattan

Units: CCF

Read Date	Putnam-Wtr	Read Date	Van Zile-Wtr	Read Date	Smurthwaite-Wtr
1/27/2009	183	1/27/2009	293	1/27/2009	29
2/25/2009	315	2/25/2009	286	2/27/2009	73
3/27/2009	280	3/27/2009	389	3/26/2009	55
4/21/2009	301	4/21/2009	370	4/21/2009	65
5/27/2009	216	5/27/2009	285	5/28/2009	38
6/26/2009	158	6/26/2009	165	6/29/2009	5
7/24/2009	176	7/24/2009	99	7/27/2009	3
8/27/2009	256	8/21/2009	227	8/21/2009	17
9/28/2009	524	9/27/2009	403	9/24/2009	67
10/28/2009	436	10/26/2009	428	10/28/2009	46
11/24/2009	248	11/23/2009	352	11/24/2009	43
12/28/2009	215	12/22/2009	298	12/24/2009	29
1/27/2010	115	1/27/2010	240	1/27/2010	25
2/26/2010	273	2/25/2010	392	2/26/2010	53
3/29/2010	180	3/23/2010	361	3/29/2010	40
4/28/2010	248	4/22/2010	436	4/28/2010	54
5/27/2010	188	5/23/2010	297	5/27/2010	32
6/25/2010	102	6/23/2010	68	6/25/2010	1
7/28/2010	133	7/25/2010	102	7/29/2010	3
8/27/2010	372	8/25/2010	198	8/26/2010	29
9/27/2010	407	9/26/2010	456	9/27/2010	78
10/27/2010	395	10/26/2010	416	10/26/2010	71
11/23/2010	262	11/22/2010	323	11/23/2010	63
12/28/2010	215	12/22/2010	230	12/28/2010	48
1/27/2011	130	1/23/2011	83	1/27/2011	30
2/28/2011	385	2/23/2011	359	2/28/2011	72
3/29/2011	184	3/27/2011	255	3/29/2011	51
4/25/2011	276	4/26/2011	309	4/27/2011	60
5/31/2011	255	5/26/2011	197	5/31/2011	42
6/24/2011	112	6/26/2011	68	6/28/2011	6
7/25/2011	234	7/26/2011	164	7/28/2011	47
8/24/2011	276	8/24/2011	148	8/30/2011	57
9/26/2011	568	9/25/2011	401	9/27/2011	75
10/25/2011	487	10/25/2011	364	10/31/2011	82
11/22/2011	347	11/22/2011	279	11/30/2011	46
12/23/2011	258	12/22/2011	227	12/28/2011	35
1/25/2012	131	1/24/2012	142	1/30/2012	42
2/24/2012	389	2/22/2012	325	2/28/2012	66
3/27/2012	320	3/26/2012	280	3/29/2012	46

Account Name	Account #
KSU Putnam Hall	11500-11501
KSU Van Zyle Hall	11504-11505
KSU Van Zyle & Putnam Irr	11872-11873
KSU Smurthwaite	11514-11515

Meters have been combined in tracking under "Van Zile-Water"

Edwards_Water1	2011	September	131	100	38	35	28	128	107	111	100	28	21	142	125	121	163	111	66	35	107	97	138	114	83	28	24	107	135	131	111	149	2,813		
		October	48	17	131	104	121	90	100	62	28	138	125	97	93	24	24	114	170	104	111	111	104	17	42	121	121	138	118	142	76	28	111	2,820	
		November	118	118	180	135	42	38	125	104	111	138	135	45	149	114	152	93	121	21	21	125	4,775	73	6,761	7,427	7,464	2,522	121	128	145	31,575			
	December	118	159	52	17	114	107	90	118	121	17	14	90	111	104	111	83	10	24	114	97	149	66	83	14	21	21	52	62	52	48	14	2,253		
	2011 Total	526	505	523	439	401	408	540	581	481	436	582	498	588	547	433	398	637	543	446	644	5,118	408	7,065	7,755	7,931	2,955	602	588	519	298	43,888			
	2012	January	14	14	83	166	128	152	17	28	114	104	76	80	87	24	21	21	111	107	93	100	31	42	107	87	93	107	87	24	17	104	87	2,325	
		February	90	100	114	28	28	111	204	153	90	111	28	28	97	73	97	83	118	38	38	80	118	107	138	121	28	42	97	131	80	80	2,568		
		March	107	83	28	35	90	107	93	107	76	31	42	131	111	111	73	97	87	24	42	97	77	97	80	21	38	111	100	76	87	142	28	2,451	
		April	45	121	97	90	118	76	21	35	93	83	93	93	121	31	42	87	87	97	73	73	21	21	87	121	38	73	59	45	21	59	2,118		
		May	100	90	121	93	21	31	97	107	76	86	87	42	42	100	90	97	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,370
	2012 Total	356	408	443	412	384	478	433	430	450	415	325	374	457	339	336	384	429	284	301	349	247	266	412	349	197	332	343	277	204	304	114	10,833		
	Edwards_Water1 Total	882	913	966	851	785	886	972	1,010	931	896	761	965	955	927	882	817	827	920	844	796	890	5,384	820	7,415	7,953	8,263	3,298	879	792	824	412	54,720		
Edwards_Water2	2011	July	278	311	270	260	205	68	48	148	78	162	251	259	88	57	205	264	274	317	189	14	33	112	272	267	263	265	51	126	323	203	238	5,573	
		August	281	262	114	111	64	253	228	272	278	168	57	319	287	309	401	378	290	162	308	308	340	264	273	48	60	286	228	266	282	293	7,192		
		September	105	72	336	242	282	218	254	89	71	310	203	302	322	270	44	103	263	247	220	366	242	67	102	268	334	312	332	133	90	306	6,829		
	October	352	356	320	306	137	100	345	295	274	340	189	177	98	288	277	174	-	-	232	102	124	208	381	175	454	550	790	22	5	316	321	7,710		
	November	287	285	64	73	279	266	232	258	259	40	47	322	233	183	256	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,090	
	December	1,305	1,285	1,104	992	967	959	1,343	1,361	1,004	1,086	916	1,688	1,278	1,390	1,487	1,034	943	1,230	1,116	1,115	1,067	1,559	905	1,088	1,305	1,937	882	1,034	1,306	995	613	36,293		
	2011 Total	1,305	1,285	1,104	992	967	959	1,343	1,361	1,004	1,160	1,148	1,937	1,508	1,421	1,511	1,095	1,227	1,689	1,677	1,793	1,281	1,938	1,584	1,643	1,930	2,447	1,411	1,145	1,400	1,166	613	6,752		
	2012	January	-	-	-	-	-	-	-	-	-	75	232	249	230	31	25	60	283	307	279	291	95	91	287	288	281	271	268	52	-	-	-	-	3,696
		February	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		March	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		April	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012 Total	-	-	-	-	-	-	-	-	-	-	75	232	249	230	31	25	60	283	307	279	291	95	91	287	288	281	271	268	52	-	-	-	-	3,057	
Edwards_Water2 Total	1,305	1,285	1,104	992	967	959	1,343	1,361	1,004	1,160	1,148	1,937	1,508	1,421	1,511	1,095	1,227	1,689	1,677	1,793	1,281	1,938	1,584	1,643	1,930	2,447	1,411	1,145	1,400	1,166	613	43,045			
Eisenhower_DomWater25	2012	May	400	1,800	1,700	1,200	-	-	1,100	1,000	1,800	1,524	1,076	400	300	1,100	900	1,100	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15,500	
	2012 Total	400	1,800	1,700	1,200	-	-	1,100	1,000	1,800	1,524	1,076	400	300	1,100	900	1,100	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15,500	
Fairchild_DomWater27	2012	May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,800	
	2012 Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,800	
Fairchild_DomWater27 Total	2012	May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,800	
		May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,800	
		May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,800
Fiedler_DomWater22	2012	March	1,000	2,800	5,300	3,500	3,400	2,300	900	900	2,800	7,300	3,100	6,900	3,400	800	3,100	4,900	5,267	3,700	1,800	4,000	500	3,400	5,300	3,600	4,667	7,100	500	2,700	3,200	1,000	12,300		
		April	4,100	3,100	6,400	3,700	900	1,440	2,760	4,100	2,800	4,586	1,814	800	400	1,900	4,200	5,100	6,300	3,280	10	-	-	-	-	-	-	-	-	-	-	-	-	-	99,033
		May	5,100	5,900	11,700	7,200	4,300	3,740	3,660	5,000	5,600	11,886	4,914	7,700	3,800	2,700	5,100	8,200	11,200	5,267	3,700	1,800	4,000	500	3,400	5,300	3,600	4,667	7,100	1,300	8,700	7,700	1,000	165,733	
Fiedler_DomWater22 Total	2012 Total	5,100	5,900	11,700	7,200	4,300	3,740	3,660	5,000	5,600	11,886	4,914	7,700	3,800	2,700	5,100	8,200	11,200	5,267	3,700	1,800	4,000	500	3,400	5,300	3,600	4,667	7,100	1,300	8,700	7,700	1,000	165,733		
Hale_DomWater30	2012	April	11,360	12,480	10,730	8,120	4,740	10,060	16,320	15,980	13,980	11,029	4,831	800	570	2,280	3,080	3,060	3,280	10	-	-	-	-	-	-	-	-	-	-	-	-	-	5,850	
	2012 Total	11,360	12,480	10,730	8,120	4,740	10,060	16,320	15,980	13,980	11,029	4,831	800	570	2,280	3,080	3,060	3,280	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,850	
Hale_DomWater30 Total	2012 Total	11,360	12,480	10,730	8,120	4,740	10,060	16,320	15,980	13,980	11,029	4,831	800	570	2,280	3,080	3,060	3,280	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,850	
Holton_DomWater32	2012	May	-	600	600	500	100	-	500	600	2,300	601	300	-	-	400	400	400	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,701	
	2012 Total	-	600	600	500	100	-	500	600	2,300	601	300	-	-	400	400	400	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,701	
Holton_DomWater32 Total	2012 Total	-	600	600	500	100	-	500	600	2,300	601	300	-	-	400	400	400	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,701	
Jardine_Water1_Submeter	2011	July	2,952	3,448	3,556	3,685	4,030	172	366	3,426	2,564	2,457	1,487	4,224	582	776	1,616	4,008	5,021	4,525	2,026	323	2,370	4,698	6,099	3,577	4,288	474	237	3,642	3,556	4,159	87,062		
		August	3,836	3,103	970	215	215	3,362	3,383	4,375	4,676	280	388	3,750	3,469	3,750	3,469	4,741	3,599	1,056	259	3,750	3,707	4,181	3,707	3,297	431	302	3,039	3,577	3,944	3,965	3,168	82,493	
		September	1,099	237	4,267	4,763	4,870	4,461	6,530	991	560	4,353	4,590	4,525	5,043	4,375	388	194	5,000	4,849	4,676	3,383	496	345	3,319	3,685	3,793	4,655	4,547	970	302	4,956	101,220		
		October	3,771	4,741	4,590	4,784	733	237	4,073	5,194	4,504	4,827	3,728	1,099	237	5,150	4,224	4,806	4,763	4,719	409	302	2,715	428,035	3,771	856,776	433,112	698,055	217,095	5,538	5,258	5,000	259	2,722,247	
		November																																	

Umberger_DomWater52			2012 Total	1,000	1,100	900	1,200	900	700	1,000	2,300	2,800	1,650	1,650	800	900	700	1,200	1,600	1,800	2,000	600	400	-	-	300	500	400	1,267	400	100	-	750	-	28,916	
Umberger_DomWater52 Total				1,000	1,100	900	1,200	900	700	1,000	2,300	2,800	1,650	1,650	800	900	700	1,200	1,600	1,800	2,000	600	400	-	-	300	500	400	1,267	400	100	-	750	-	28,916	
Union_Water1	2011	July August September October November December	2011 Total	13,300	6,900	4,200	5,800	4,000	4,100	-	-	-	81,300	-	-	84,600	-	-	-	38,900	5,700	6,500	6,800	5,800	300	200	4,000	6,100	7,300	7,600	6,000	200	600	270,000		
			2011 Total	40,000	40,100	18,000	5,000	2,800	28,800	30,500	32,000	29,800	6,800	4,500	31,500	33,600	34,600	37,700	35,100	18,100	8,500	34,700	35,900	36,600	5,600	28,100	40,900	43,300	43,200	39,300	14,600	10,700	40,200	40,600	42,500	813,711
			2011 Total	18,200	4,600	37,000	36,400	39,900	41,500	39,700	10,000	12,500	39,700	44,200	49,800	48,500	44,300	24,700	8,800	34,200	41,800	43,100	42,400	39,900	13,700	16,100	46,100	42,900	43,400	41,600	42,800	17,500	5,500	34,700	1,005,518	
			2011 Total	32,600	36,600	34,900	31,300	13,300	34,000	41,500	35,200	38,100	45,700	9,000	5,100	28,400	28,900	27,300	30,800	33,600	5,900	3,200	4,600	5,584,299	2,900	8,257,035	6,419,593	9,049,623	2,814,701	18,000	15,100	25,300	34,700	389,299	32,708,066	
			2011 Total	24,800	25,100	10,500	14,400	31,300	27,900	29,200	26,300	20,600	5,600	28,500	30,200	28,800	24,600	20,700	1,200	200	2,000	2,100	3,400	5,671,599	99,600	8,361,435	6,513,393	9,170,523	2,915,501	116,900	115,000	106,100	77,900	35,667,092	35,667,092	
	2012	January February March April May	2012 Total	128,900	113,300	104,600	92,900	95,900	109,400	132,000	114,300	106,500	191,000	105,200	121,300	203,400	135,200	118,500	104,400	99,100	137,400	110,600	98,400	96,900	5,671,599	99,600	8,361,435	6,513,393	9,170,523	2,915,501	116,900	115,000	106,100	77,900	35,667,092	
			2012 Total	100	200	2,300	2,636	4,800	6,100	700	400	8,100	11,400	8,600	6,600	1,200	-	-	-	-	-	-	-	-	100,000	-	-	-	-	-	-	-	-	-	270,436	
			2012 Total	3,600	8,200	4,900	11,100	8,800	7,800	8,600	9,800	9,300	11,200	14,700	13,700	13,300	10,700	7,900	7,600	5,100	6,400	4,300	7,300	7,300	3,200	7,200	6,800	8,900	106,400	4,500	3,600	2,600	3,100	1,500	230,499	
			2012 Total	5,500	9,100	9,400	3,000	3,600	-	2,500	6,700	5,000	4,600	4,200	700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54,300
			2012 Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2012 Total	9,200	17,500	16,600	16,736	17,200	13,900	11,800	16,900	22,400	27,300	27,500	21,500	14,500	10,700	7,900	7,600	5,100	6,400	4,300	7,300	7,300	3,200	7,200	6,800	8,900	106,400	11,900	10,100	3,100	1,500	555,835	555,835			
	Union_Water1 Total			138,100	130,800	121,200	109,636	113,100	123,300	143,800	131,200	128,900	218,300	132,700	142,800	217,900	145,900	126,400	112,000	104,200	143,800	114,900	205,700	104,200	5,674,799	106,800	8,368,235	6,522,293	9,276,923	2,927,401	124,000	125,100	109,200	79,400	36,222,926	
Union_Water2	2011	July August September October November December	2011 Total	5,183	6,089	7,422	7,336	6,322	8,649	11,667	5,866	5,759	4,716	5,429	6,031	8,796	9,490	4,339	3,705	4,122	4,319	5,365	7,511	9,830	2,511	1,392	1,146	2,171	2,106	7,690	9,848	2,363	1,720	1,848	162,879	
			2011 Total	1,665	2,510	6,531	12,014	12,320	4,007	4,355	5,304	5,062	10,677	11,766	4,441	4,281	4,265	3,649	4,084	7,647	10,374	4,037	3,296	2,996	3,549	3,514	8,098	11,787	4,272	3,447	3,393	3,520	4,215	11,571	170,741	
			2011 Total	8,378	11,865	3,834	3,769	3,224	3,501	3,326	10,158	8,318	3,676	2,831	161	170	1,002	2,680	7,915	1,642	1,477	1,273	1,770	7,622	5,434	1,066	394	559	654	605	5,281	8,956	1,149	116,010		
			2011 Total	1,093	816	1,892	3,001	6,715	8,688	2,787	1,071	2,054	1,273	666	4,858	5,272	2,537	1,917	2,328	2,599	2,893	10,758	12,445	11,357	70,679	12,390	158,099	131,556	153,448	14,655	3,957	3,086	3,889	3,889	636,780	
			2011 Total	3,321	4,903	9,117	6,367	4,575	4,810	4,959	4,221	3,603	2,901	10,735	4,391	3,469	2,912	3,968	5,081	11,381	12,548	8,141	9,570	9,405	9,513	9,919	12,593	12,281	11,508	11,634	11,625	12,117	11,915	12,451	245,934	
	2012	January February March April May	2012 Total	19,640	26,183	28,796	32,487	33,175	29,676	27,094	28,620	27,796	25,000	33,428	20,882	27,566	26,208	23,558	33,118	39,070	38,385	36,930	40,315	42,652	101,788	44,449	191,580	165,570	177,460	44,600	35,884	33,997	42,493	27,019	1,505,419	
			2012 Total	12,740	11,566	9,183	9,046	9,014	9,855	11,946	11,656	8,477	8,066	8,575	8,097	7,663	9,003	11,002	9,002	6,000	5,002	6,002	5,000	9,004	10,004	5,001	6,001	5,001	4,833	5,000	10,000	11,000	4,000	3,000	249,738	
			2012 Total	3,000	4,000	5,000	10,000	12,000	4,000	5,000	6,000	5,000	5,000	7,000	11,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	175,000
			2012 Total	4,000	4,000	9,000	9,000	5,000	4,000	3,000	4,000	5,000	11,000	8,000	4,000	4,000	3,000	1,000	4,000	10,000	10,000	8,000	8,000	8,000	7,000	6,000	6,000	8,000	7,000	2,000	1,000	3,000	3,000	3,000	3,000	167,000
			2012 Total	7,000	3,000	2,000	2,000	2,000	3,000	9,000	5,000	5,000	1,000	1,333	3,000	3,000	3,000	8,000	5,000	5,000	3,000	3,000	3,000	1,000	2,000	12,000	2,000	49,000	1,000	2,000	2,000	13,000	14,000	14,000	187,000	
	2012 Total	29,740	25,566	26,183	30,046	29,014	22,855	29,946	24,477	25,399	27,242	28,097	24,663	29,003	27,002	28,002	28,000	29,002	26,002	20,000	31,004	22,004	27,001	20,001	21,001	65,833	12,000	19,000	32,000	21,000	6,000	819,738	819,738			
	Union_Water2 Total			49,380	51,749	54,979	62,533	62,189	52,531	57,040	61,276	52,273	50,399	60,670	48,979	52,229	55,211	50,560	61,120	67,070	67,387	62,932	60,315	73,656	123,792	71,450	211,581	186,571	243,293	56,600	54,884	65,997	63,493	33,019	2,325,157	
Ward_DomWater55	2012	April	200	300	200	200	100	-	300	500	300	250	150	100	-	600	200	300	200	300	300	2,100	100	100	300	100	400	1,100	200	-	100	200	9,800			
	2012 Total	May	200	300	200	200	100	-	300	500	300	250	150	100	-	600	200	300	200	300	300	2,100	100	100	300	100	400	1,100	200	-	100	200	9,800			
Ward_DomWater55 Total			200	300	200	200	100	-	300	500	300	250	150	100	-	600	200	300	200	300	300	2,100	100	100	300	100	400	1,100	200	-	100	200	9,800			
West_Water	2011	July August September October November December	2011 Total	-	-	-	-	111,790	-	13,527	-	-	-	-	111,790	-	-	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	2,137,648	
			2011 Total	111,790	111,790	111,790	-	111,790	111,790	223,580	111,790	111,902	111,790	111,902	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	3,465,936
			2011 Total	111,790	111,901	111,790	-	111,790	111,790	111,790	111,790	111,902	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	3,465,936
			2011 Total	223,580	111,790	111,790	111,790	111,790	111,790	111,790	223,580	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	3,465,936
			2011 Total	223,580	111,790	111,790	111,790	111,790	111,790	111,790	223,580	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	111,790	3,465,936
	2012	January February March April May	2012 Total	447,160	447,271	447,160	223,580	447,160	558,950	572,476	430,951	335,482	447,384	558,950	559,062	558,950	447,383	558,950	670,740	447,271	469,965	335,370	447,160	14,321,777	369,466	17,105,320	11,725,092	19,369,803	6,148,895	559,174	558,950	600,685	335,370			

HOUSING WATER METERS, MAY 7-11, 2012
READINGS

		X	PAGE	19-Apr	7-May	8-May	9-May	10-May	11-May
REC COMPLEX	W0210	0.1337	21	702341	702341	702342	702342	702342	702342
REC COMPLEX, HANDBA	W0220	1	21	164	167	168	168	168	168
EDWARDS	W0025,HIGH	0.1337	21	3542	3557	3558	3559	3560	3560
EDWARDS	W0025,LOW	0.01337	21	135730	136366	136411	136457	136497	136538
DAVENPORT	W0415	1	29	5444	5452	5452	5453	5454	5454
JARDINE	W0450	1	30	41533	41533	41533	41533	41533	41533
JARDINE	W0455	1	30	9197	327	389	452	515	579
PITTMAN, IRRIGATION	W0460	0.1337	30	102150	102158	102158	102158	102158	102158
PITTMAN	W0430	1	30	26467	26474	26474	26475	26475	26476
MARLATT	W0425	1.337	31	10983	11521	11571	11623	11678	11693
KRAMER	W0420	1	32	32779	33210	33244	33279	33309	33341
GOODNOW	W0410	1	33	84757	85324	85382	85440	85514	85539
DERBY	W0405	0.1337	34	26382	48006	49040	50099	51155	52048
WEST	W0445	1	34	296480	296739	296752	296768	296781	296793
BOYD	W0400	1	36	10355	10616	10628	10650	10660	10680
VAN ZILE	W0440	0.1	37	6580	6805	6820	6834	6847	6860
PUTNAM	W0435	0.1	37	41136	n/a	n/a	43924	n/a	n/a
SMURTHWAITE	NOT THRU FACILITIES								

HOUSING WATER METERS, MAY 7-11, 2012
USAGE in CCF

		X	PAGE	19-Apr	18 days use 7-May	8-May	9-May	10-May	11-May
REC COMPLEX	W0210	0.1337	21		0	0	0	0	0
REC COMPLEX, HANDBA	W0220	1	21		3	1	0	0	0
EDWARDS	W0025,HIGH	0.1337	21		2	0	0	0	0
EDWARDS	W0025,LOW	0.01337	21		9	1	1	1	1
DAVENPORT	W0415	1	29		8	0	1	1	0
JARDINE	W0450	1	30		0	0	0	0	0
JARDINE	W0455	1	30		1130	62	63	63	64
PITTMAN, IRRIGATION	W0460	0.1337	30		1	0	0	0	0
PITTMAN	W0430	1	30		7	0	1	0	1
MARLATT	W0425	1.337	31		719	67	70	74	20
KRAMER	W0420	1	32		431	34	35	30	32
GOODNOW	W0410	1	33		567	58	58	74	25
DERBY	W0405	0.1337	34		2891	138	142	141	119
WEST	W0445	1	34		259	13	16	13	12
BOYD	W0400	1	36		261	12	22	10	20
VAN ZILE	W0440	0.1	37		23	2	1	1	1
PUTNAM	W0435	0.1	37		n/a	n/a	279	n/a	n/a
SMURTHWAITE	NOT THRU FACILITIES						20 Days use		

Kansas State University
 2025 University Master Plan Update
 Water Distribution System
 BG Project # 10-1078M July 5, 2012

Table A.1 - Available Fire Hydrant Flow Rates

	0-499	500-999	1000-1499	1500+
Fire Hydrant Number	Flow Rate (GPM)		Additional Flow w/10" Connection Open	
	Existing Conditions			
	10" Open	10" Closed		
1	699	699	0	
2	3488	3488	0	
3	1721	536	1185	
4	1729	535	1194	
5	1740	528	1212	
6	1703	538	1165	
7	1739	534	1205	
8	1515	534	981	
9	962	529	433	
10	791	531	260	
11	912	529	383	
12	1537	542	995	
13	538	395	143	
14	1736	527	1209	
15	1756	519	1237	
17	1490	549	941	
18	1570	549	1021	
19	341	274	67	
20	720	523	197	
21	1755	549	1206	
22	1644	541	1103	
23	778	517	261	
24	1080	548	532	
25	291	232	59	
26	1587	556	1031	
27	1762	553	1209	
28	880	553	327	
29	856	511	345	
30	1769	497	1272	
31	1272	548	724	
32	1584	553	1031	
33	234	188	46	
34	607	428	179	
35	1648	520	1128	
36	1633	501	1132	
37	1774	493	1281	
38	1154	487	667	
39	1778	487	1291	
40	1791	472	1319	
41	2811	2811	0	
42	5000	3422	1578	

Kansas State University
 2025 University Master Plan Update
 Water Distribution System
 BG Project # 10-1078M July 5, 2012

Table A.1 - Available Fire Hydrant Flow Rates

	0-499	500-999	1000-1499	1500+
Fire Hydrant Number	Flow Rate (GPM)		Additional Flow w/10" Connection Open	
	Existing Conditions			
	10" Open	10" Closed		
43	5000	3217	1783	
44	512	384	128	
45	920	483	437	
46	1782	452	1330	
47	841	474	367	
48	1219	435	784	
49	1180	446	734	
50	1679	420	1259	
51	1429	421	1008	
52	331	260	71	
53	1510	342	1168	
54	2155	2119	36	
55	336	334	2	
56	266	173	93	
58	1426	1406	20	
59	1435	1415	20	
60	1562	1538	24	
61	1587	1563	24	
62	1652	1625	27	
63	177	176	1	
64	177	176	1	
65	1726	1698	28	
66	1771	1741	30	
67	2052	2014	38	
69	991	989	2	
70	1329	1310	19	
71	1474	1452	22	
72	1530	1507	23	
73	1616	1591	25	
74	1723	1694	29	
75	1764	1734	30	
76	1802	1771	31	
77	2025	1996	29	
78	1017	1008	9	
79	318	181	137	
80	1982	249	1733	
81	1045	1044	1	
82	1144	1142	2	
83	1238	1236	2	
84	1049	1038	11	
85	1071	1059	12	

Kansas State University
2025 University Master Plan Update
Water Distribution System
 BG Project # 10-1078M July 5, 2012

Table A.1 - Available Fire Hydrant Flow Rates

	0-499	500-999	1000-1499	1500+
Fire Hydrant Number	Flow Rate (GPM)		Additional Flow w/10" Connection Open	
	Existing Conditions			
	10" Open	10" Closed		
86	3992	3953	39	
87	759	752	7	
88	2612	2595	17	
89	4128	4091	37	
90	4775	4727	48	
91	1965	1961	4	
92	1475	1473	2	
93	1779	1776	3	
94	579	578	1	
95	2176	2172	4	
96	2441	2436	5	
97	1705	1703	2	
98	1959	1956	3	
99	1944	1941	3	
100	2014	2011	3	
101	1995	1992	3	
102	452	448	4	
105	768	768	0	
106	409	408	1	
107	396	396	0	
108	396	396	0	
109	394	394	0	
110	382	381	1	
111	394	394	0	
112	383	382	1	
113	1703	532	1171	
114	1730	525	1205	
115	575	425	150	
116	1404	1404	0	
117	1646	1619	27	
118	1756	518	1238	
119	972	456	516	