May 17, 2006

Mike Carney, P.E.
Water and Sewer Department
City Hall, 8th Floor
455 N. Main Street
Wichita, KS 67202

WICHITA
Water Master Plan
Final Report
Project Number 34007

Dear Mr. Carney:

According to the agreement dated June 3, 2003, please find six copies of the final *Water Master Plan* report and one CD for your use. This study includes the results of population and demand projections, new and modified pressure zones, hydraulic analysis of the water distribution system, and recommended improvements and their opinions of probable cost and implementation schedule to meet year 2025 demands.

We appreciate the opportunity to serve the City of Wichita on this Project and the assistance of City staff and look forward to the opportunity to assist the City in the implementation of the selected Plan. If you have any comments or questions, please do not hesitate to contact us.

Sincerely,

L. Jeffrey Klein, P.E.
Project Manager

City of Wichita, Kansas
Water Distribution System Master Plan
WICHITA 34007

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ENGINEERING CERTIFICATION

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Introduction

INTRODUCTION

A. PURPOSE

The purpose of this project is to complete an update of the water master plan for the City of Wichita, Kansas with the objective of developing a plan to meet projected year 2010 and year 2025 water demands.

B. SCOPE

This report includes the following tasks:

- Review and update the existing model:
  - Convert model to latest version of H2OMap.
  - Review system to ensure model is skelotonized.
  - Reallocate demands based on address data.
  - Develop diurnal curves and determine maximum day, minimum hour and peak hour factors.
  - Input EPS data into the model for future evaluation.
  - Confirm model calibration to field test conditions.
  - Provide training.
- Water Facilities Evaluation:
  - Review available water supply data to confirm if existing and proposed water sources are adequate to meet year 2025 water demands.
  - Review available reports and determine the adequacy of the existing and proposed treatment plants to meet year 2025 water demands.
  - Review the configuration of the current service areas boundaries and pressure zones and determine the need for an additional pressure zone(s).
  - Evaluate the adequacy of existing pumps, storage and pipelines.
  - Evaluate the relationship between existing pump and storage facilities.
  - Recommend improvements to meet year 2010 and year 2025 projected demands.
- Planning:
  - Based on the current comprehensive plan, recommend pipeline improvements for service areas of new development.
  - Project customers and demands through the year 2025.

- Address areas of concern with low pressure (<40 psi), high pressure (>100 psi), and low fire flows.
- Evaluate the need for a West Pressure Zone and potential location.
- Evaluate the ability of the East Pressure Zone to meet demand.
- Develop a capital improvement plan.

*****

Part I – Water Service Area and Demands

PART I – WATER SERVICE AREA AND DEMANDS

A. GENERAL

This section of the report discusses the anticipated city limits and water service area, historical population/customers and water use data, and projected population/customers and water use through the year 2025. Service area, City growth, and wholesale customers are based on Wichita's Comprehensive Plan dated 1999 and discussions with the Metropolitan Area Planning Department (MAPD) and City staff. The latest MAPD data was provided in May 2004.

B. SERVICE AREA

The City of Wichita provides potable water to over 410,000 people within its 186 square mile service area as shown in Figure I-1. The water service area population includes about 350,000 people served inside the City limits and about 60,000 people served outside the City limits as shown in Table I-1. Wichita's service area is expected to expand to serve smaller outlying areas because of the complexity and cost to meet future regulations of the Safe Drinking Water Act and encouragement by state and federal agencies for regionalization of water service. Projected growth is shown in Figure I-2 and is based on MAPD values for the City of Wichita and current and anticipated wholesale customers.

Water is provided to about 120,000 residential customers, 13,000 commercial customers, and over 20,000 customers outside the City limits as listed in Table I-2. Bentley buys untreated Equus Beds Well Field (EBWF) groundwater from Wichita and Valley Center buys potable water from Wichita, but Wichita can take up to 1.7 MGD (1,200 gpm) of raw water from Valley Center's wells to the Central Water Treatment Plant. Potential wholesale customers are listed in Table I-3.

In 2003, the City water use averaged about 56 MGD with a maximum day demand of 105 MGD. Residential was the largest water use classification with 50 percent while wholesale customers used about 4 percent as shown in the pie chart below:

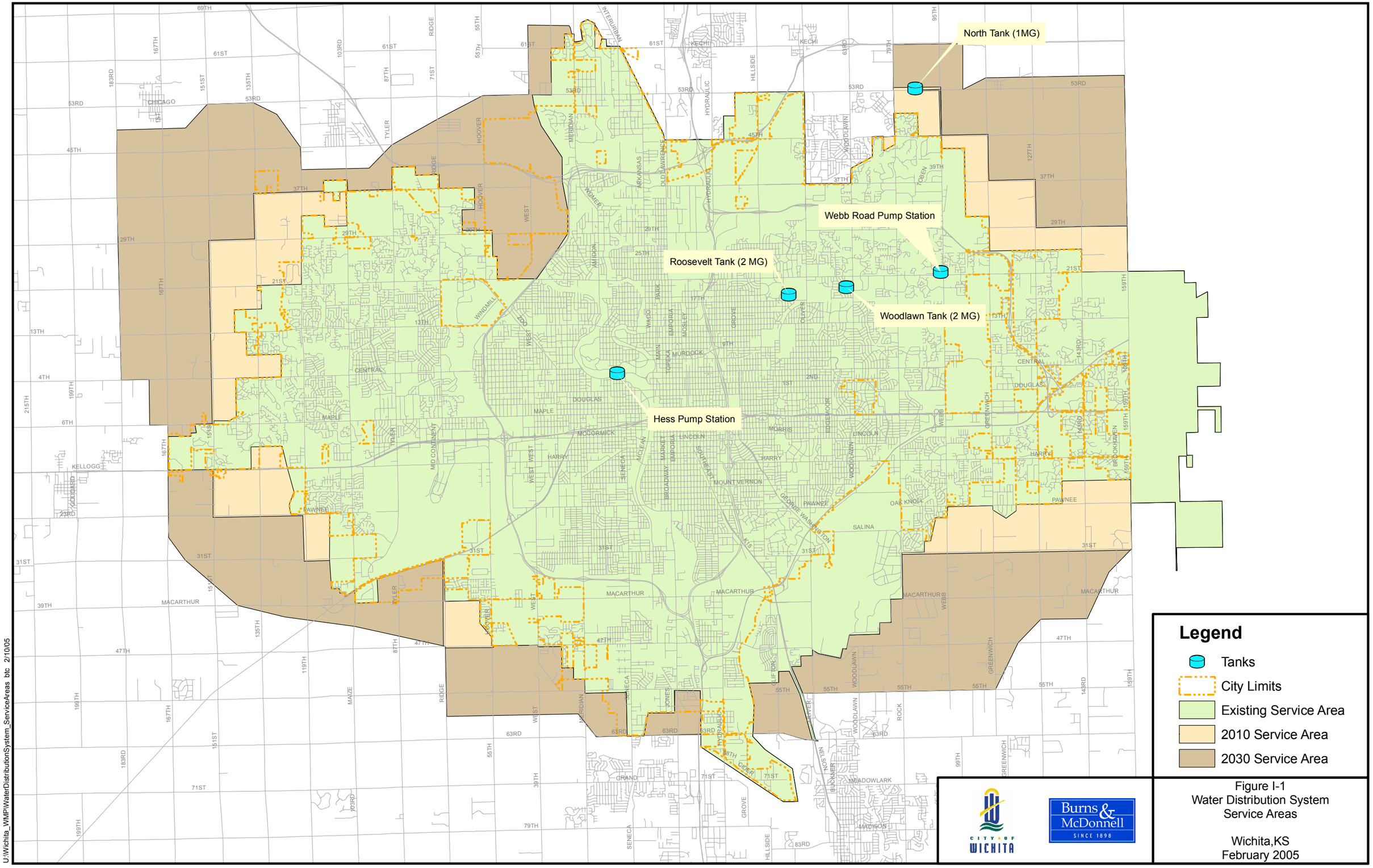

Figure I-1
Water Distribution System
Service Areas

Wichita,KS
February 2005

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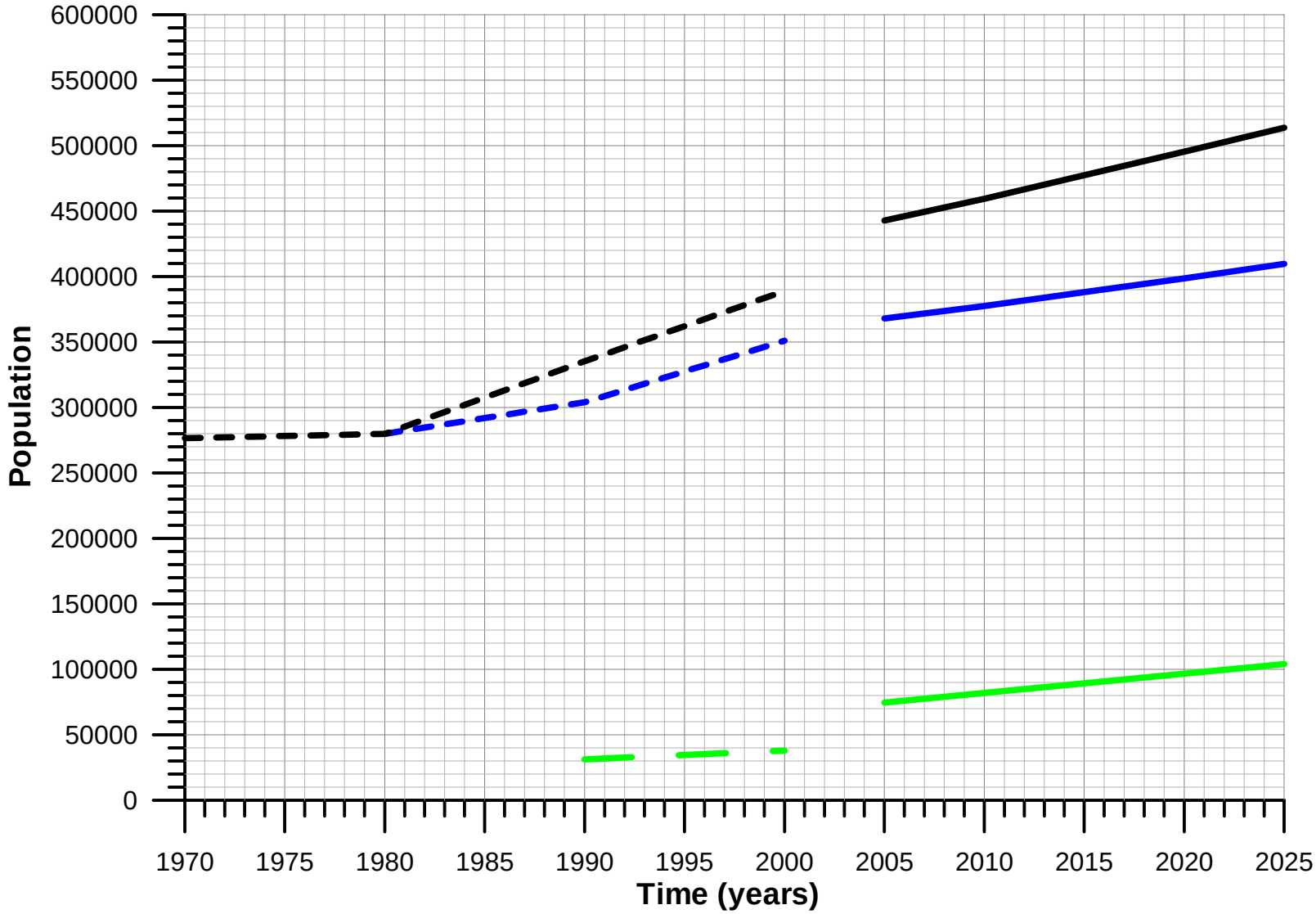
Table I-1

HISTORICAL AND PROJECTED POPULATION
DATA FOR WICHITA, KANSAS AND SURROUNDING AREA

Year	U.S. Census (1)		MAPD (2)		County: NPA Data Services (3)	B&V Water Master Plan (4)	Kansas Water Office (5)		Wholesale (6)	Service Area Populaton (7)	
	City	County	City	County			City	County		BMcD 1997 Study	2004 Master Plan
1900	24,671										24,671
1910	52,450										52,450
1920	72,217	92,234									72,217
1930	111,110	136,330									111,110
1940	114,966	143,311									114,966
1950	168,279	222,290									168,279
1960	254,698	343,231									254,698
1969											
1970	276,554	350,694			349,000						276,554
1973					-						
1978					-						
1980	279,272	366,531	279,855	367,670	369,000						279,855
1983											
1985					386,000						
1990	304,011	403,662	304,017	403,662	405,000		304,011	403,662	31,259	335,498	335,276
1991					409,000						
1995					423,000						
1997						368,433					
2000	344,284	452,869	351,028	452,869	434,000		338,518	444,654	37,965	385,694	388,993
2005			368,064	482,581	-				**74,676**		**442,740**
2010			377,474	497,595	452,000	450,400	366,769	483,922	**81,918**	445,652	**459,392**
2015			388,059	514,485					**89,298**		**477,357**
2020	363,935	485,274	398,645	531,375			399,023	523,189	**96,676**	484,825	**495,321**
2025			409,701	549,017					**104,070**	500,453	**513,771**

Notes:
(1) Historical and estimated U.S. Census Bureau Data for the City of Wichita and Sedgwick County.
(2) Wichita-Sedgwick County Metropolitan Area Planning Department, 2004.
(3) Key Indicators of County Growth, 1970 - 2010, NPS Data Services. 1991 edition.
(4) Water System Master Plan by B&V, November 1999, Service Area Projections.
(5) Kansas Water Office. January 7, 1997 for the County projection and in 2003 for the City projection..
(6) Includes wholesale customers, McConnell AFB, benefit districts, and individually metered customers outside the City limits. Projections by MAPD.
(7) Service area population based on MAPD projections for City of Wichita and wholesale customers.

wichita population



Legend

- MAPD Total
- MAPD City
- MAPD Wholesale

Burns & McDonnell

Figure I - 2
Wichita, KS
Historic and Projected Population

Table I-2

HISTORICAL & PROJECTED NUMBER OF METERS (1)

Year	Residential	Commercial	Contract (2)	Department No Charge (5)	Wholesale	Total Customers
1970	71,011	10,153				81,164
1971	71,448	10,092				81,540
1972	71,939	10,360				82,299
1973	73,115	10,071			1	83,187
1974	74,182	10,250			2	84,434
1975	75,513	10,407			2	85,922
1976	77,171	10,501			2	87,674
1977	78,368	10,574			3	88,945
1978	79,785	10,665			3	90,453
1979	82,203	10,746			3	92,952
1980	84,610	10,920			3	95,533
1981	86,571	11,007			3	97,581
1982	87,623	11,042			5	98,670
1983	89,039	11,258			5	100,302
1984	91,082	11,229			5	102,316
1985	92,105	11,387			5	103,497
1986	93,414	11,445			8	104,867
1987	95,469	11,450			10	106,929
1988	97,003	11,403			9	108,415
1989	98,220	11,393			10	109,623
1990	99,439	11,381			10	110,830
1991	100,580	11,358			10	111,948
1992	103,978	11,504		1	11	115,494
1993	104,090	12,127	165	1	11	116,394
1994	105,672	12,270	163	1	11	118,117
1995	106,767	12,422	225	1	11	119,426
1996	108,801	12,439	225	1	12	121,478
1997	110,725	12,650	222	1	12	123,610
1998	112,660	12,780	222	1	13	125,676
1999	113,280	12,731	219	1	10	126,241
2000	114,686	13,451	245	1	10	128,393
2001	115,299	13,342	249	1	10	128,901
2002	118,321	13,125	268	1	11	131,726
2003	119,747	13,322	376	1	11	133,457
2005	**122,649**	**13,350**	**335**	**1**	**11**	**136,347**
2010	**130,329**	**13,848**	**407**	**1**	**12**	**144,598**
2015	**138,009**	**14,346**	**479**	**1**	**12**	**152,848**
2020	**145,689**	**14,845**	**551**	**1**	**12**	**161,098**
2025	**153,369**	**15,343**	**623**	**1**	**12**	**169,348**

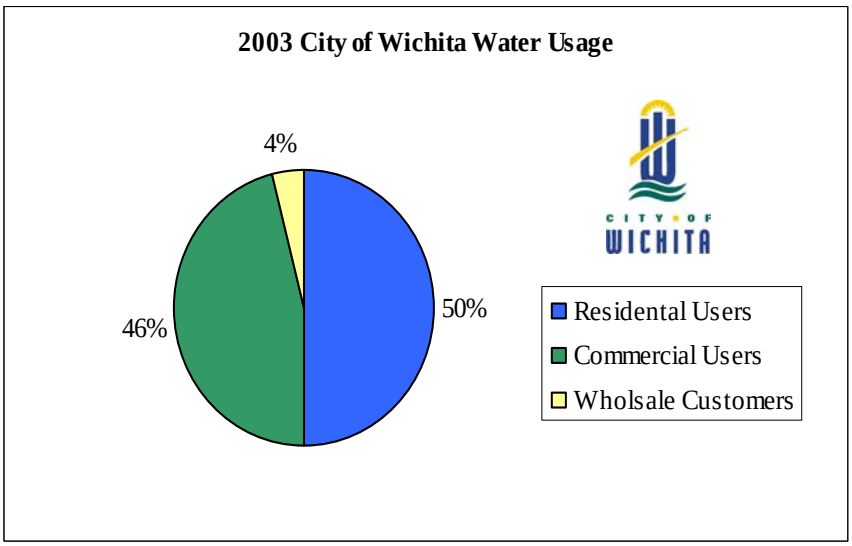
Notes:
(1) Historical data from Wichita Water and Sewer System Annual Reports, 1970 - 1991, and customer records from 1992 to 1996.
(2) The Contract classification was initiated in 1993 and includes large irrigators such as golf courses, home owners associations and the Parks Department.
(3) Classifications were modified for year 2002.
(4) Projected customers are based on linear regression analysis.
(5) "Department No Charge" is defined as water required to run day to day operations of the water system.

Table I-3

HISTORICAL AND PROJECTED POPULATION
DATA FOR PUBLIC WATER SUPPLIERS IN SEDGWICK COUNTY

Public Water Supplier	1990	2000	2005	2010	2015	2020	2025
1. Existing Wholesale -							
Individual Meters							
Andover	4,047	5,990	8,591	9,993	11,395	12,796	14,254
Eastborough	896	865	830	847	863	880	896
Oaklawn	3,240	3,950	4,155	4,360	4,590	4,820	4,945
Other Indiv Meters	4,500	4,870	5,075	5,280	5,500	5,720	5,955
Subtotal	**12,683**	**15,675**	**18,651**	**20,480**	**22,348**	**24,216**	**26,050**
2. Existing Wholesale -							
Master Meters							
Bel Aire	3,695	6,051	7,253	8,483	9,713	10,943	12,172
Bentley	360	428	449	490	537	584	632
Benton	669	820	899	958	1,026	1,093	1,163
Derby			20,927	23,028	25,129	27,230	29,331
Kechi	517	1,075	1,294	1,545	1,796	2,048	2,309
Park City	5,054	6,295	6,580	7,150	7,721	8,291	8,862
Rose Hill	2,338	2,850	4,112	4,460	4,852	5,243	5,652
Sedgwick RWD No. 1	755	755	755	755	755	755	755
Sedgwick RWD No. 3	1,172						
Sedgwick RWD No. 8	1,016	1,016	1,016	1,016	1,016	1,016	1,016
Valley Center			5,338	5,733	6,128	6,523	6,918
McConnell AFB	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Subtotal	**18,576**	**22,290**	**51,623**	**56,618**	**61,673**	**66,726**	**71,810**
3. Anticipated Customers							
By Year 2010							
Derby	14,699	20,449					
Colwich	1,091	1,289	1,336	1,444	1,552	1,661	1,773
Goddard	1,804	2,144	3,066	3,376	3,725	4,073	4,437
Valley Center	3,624	5,189					
Subtotal	**21,218**	**29,071**	**4,402**	**4,820**	**5,277**	**5,734**	**6,210**
Total	**31,259**	**37,965**	**74,676**	**81,918**	**89,298**	**96,676**	**104,070**
City of Wichita (1)	304,017	348,208	368,064	377,474	388,059	398,645	409,701
City Service Area	**335,276**	**400,709**	**442,740**	**459,392**	**477,357**	**495,321**	**513,771**
County Service Area	403,662	438,580	460,940	460,940	460,940	495,000	509,000

(1) MAPD Data provided in 2004 through 2030.



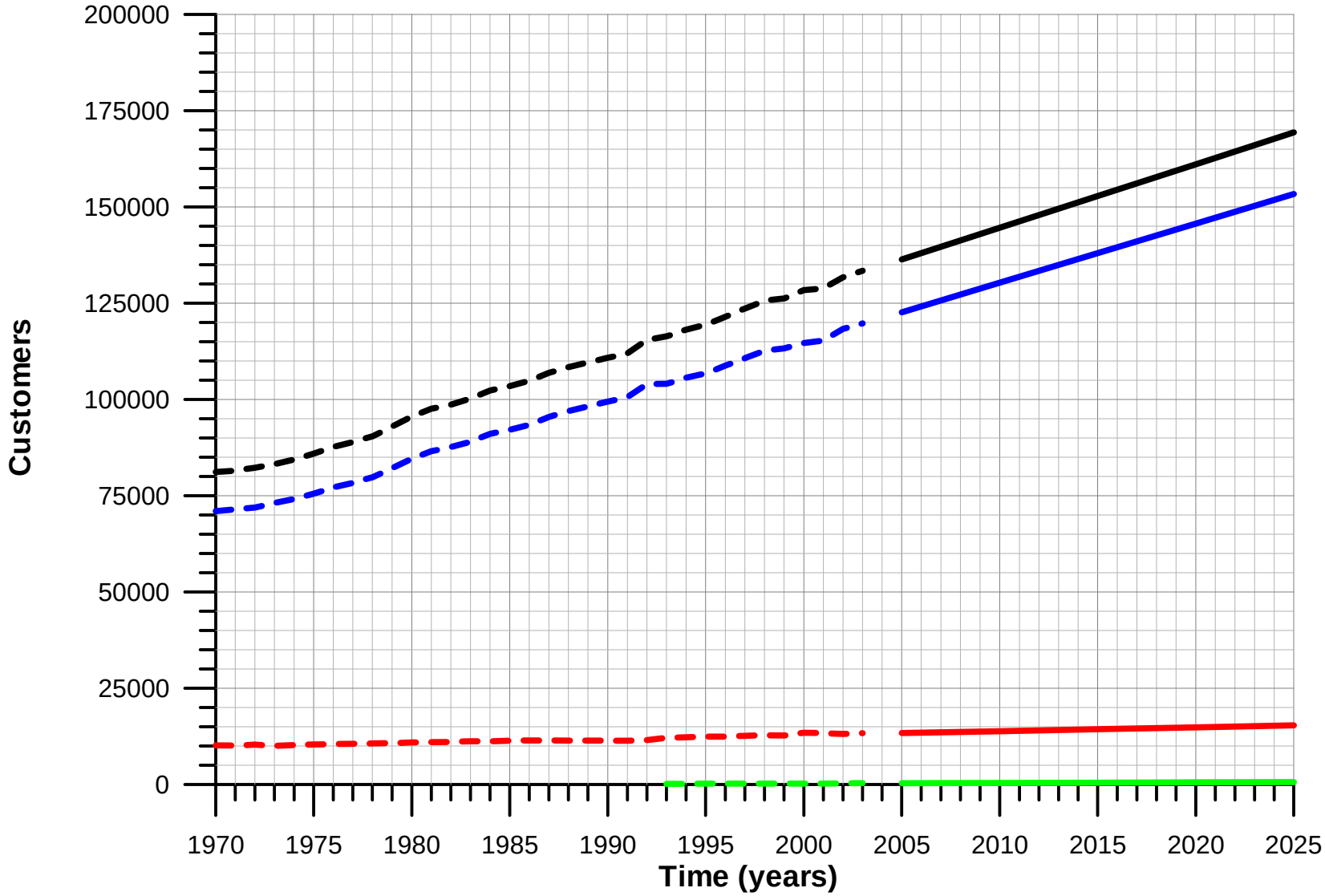
C. CUSTOMER PROJECTION

Customer projections are based Wichita's Comprehensive Plan through the year 2025 for each customer class. Wichita reclassified customer classes to five basic classifications in 2002. The Comprehensive Plan is used to determine additional customers by classification for each specified section of the service area based on rate of growth and existing or anticipated zoning. This is accomplished in 5-year increments from 2005 to 2025. Customers are projected with linear regression analysis as summarized in Figure I-3 and listed in Table I-2 for the following classifications:

- Residential
- Commercial
- Contract
- Department No Charge (water required for day to day operations of the City)
- Wholesale

Review of Tables I-2 and I-3 show the service area population is projected to increase from about 410,000 to nearly 514,000 in 2025. The 514,000 people equates to 2.67 people per household. Total customers are projected to increase from about 133,000 to nearly 170,000 in 2025.

wichita customers



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- Total
- Residential
- Commercial
- Contract

Burns & McDonnell

Figure I - 3
Wichita, KS
Historic and Projected Customers

D. WATER DEMAND PROJECTION

Average annual metered water use is projected for each of the five customer classes based on data from 1970 through 2003 as shown in Table I-4. Data is evaluated through a conservatively high extrapolation, to project water use without conservation, and linear regression. The linear regression projection is about 15 percent less than the extrapolated values. The projected total metered water demand is based on the extrapolated values and is the sum of the five customer classes reduced by 15 percent, to account for low range water conservation. Total pumpage is the result of total metered water demand plus 12 percent for non-revenue water. This results in a year 2005 average day projected demand of 69.7 MGD, which is about 14 percent higher than values experienced between years 2000 and 2003 and represents a drought-type demand.

Contract customer demand is projected with linear regression analysis and is anticipated to increase from 2.2 MGD in 2003 to 3.8 MGD in 2025. Department No Charge demand is not anticipated to change and is set at 1.0 MGD. Wholesale demand is projected based on MAPD population projections listed in Table I-3 and 150 gpcd; except for Valley Center and Derby where contract maximum demands are used. Bel Aire and Park City have been decreasing their use, but are included since their usage is relatively low. Wholesale water demand results are listed in Table I-5 and show average annual water use increasing to 15.2 MGD in 2025.

Residential and commercial classes use about 90 percent of the water and are evaluated by three methods to develop a range of values: linear regression, extrapolation, and projected population times gallons per capita day (gpcd). The results of the three methods are shown in Figure I-4 and listed in Table I-6. Linear regression yields a low residential projection and a decreasing commercial projection; the data appears reasonable for typical water years but is too low to use for dry year planning purposes. Extrapolation results in a more conservative projection that includes the impacts of dry weather. MAPD population projections are used with a typical gpcd value of 150 and a conservative value of 180. These gpcd values are based on historical data listed in Table I-7. The typical 150 gpcd value results in comparable values to the linear regression and the conservative 180 gpcd value results in a value slightly higher than the extrapolation approach. The extrapolation approach is used in the analysis because it plans for

Table I-4

HISTORICAL & PROJECTED AVERAGE DAY METERED WATER USE IN MGD (1)

Year	Residential	Commercial	Contract (4)	Department No Charge	Wholesale (5)	Total Metered Water (6)	Total Pumpage	UAF (7) (%)
1970	15.6	0.0		<0.05		15.6	37.7	58.6
1971	14.6	0.0		<0.05		14.6	37.2	60.8
1972	16.0	0.0		<0.05		16.0	38.2	58.1
1973	16.1	0.0		<0.05	<0.05	16.1	39.3	59.0
1974	16.0	0.0		<0.05	<0.05	16.0	39.5	59.5
1975	15.4	0.0		<0.05	0.2	15.6	39.1	60.1
1976	17.4	0.0		<0.05	0.1	17.5	39.9	56.1
1977	16.4	0.0		<0.05	0.2	16.6	40.6	59.1
1978	18.5	0.0		<0.05	0.2	18.7	45.3	58.7
1979	18.9	0.0		<0.05	0.2	19.1	47.9	60.1
1980	22.8	0.0		<0.05	0.3	23.1	53.2	56.6
1981	22.0	0.0		0.2	0.2	22.4	49.1	54.4
1982	20.5	0.0		0.2	0.3	21.0	48.6	56.8
1983	23.3	0.0		0.2	0.4	23.9	51.0	53.1
1984	23.8	0.0		0.1	0.5	24.4	51.7	52.8
1985	22.5	0.0		0.1	0.5	23.1	48.8	52.7
1986	21.9	0.0		0.2	0.6	22.7	48.1	52.8
1987	22.7	0.0		0.1	0.7	23.5	53.2	55.8
1988	25.0	0.0		<0.05	0.8	25.8	57.6	55.2
1989	25.0	0.0		<0.05	2.3	27.3	58.4	53.3
1990	26.3	0.0		<0.05	1.2	27.5	64.2	57.2
1991	27.2	0.0		<0.05	1.4	28.6	62.2	54.0
1992	22.8	0.0		0.3	1.2	24.3	55.5	56.1
1993	24.4	0.0	1.4	0.2	1.0	27.0	53.9	49.9
1994	25.1	0.0	2.4	0.2	1.3	29.0	56.9	49.0
1995	23.1	0.0	1.4	0.2	1.2	26.0	51.7	49.7
1996	24.3	0.0	2.0	0.5	1.3	28.0	53.9	48.1
1997	23.1	0.0	1.8	0.7	1.7	27.3	52.4	47.9
1998	28.0	0.0	2.1	1.0	1.5	32.6	60.1	45.7
1999	26.3	0.0	1.3	1.0	1.2	29.8	55.3	46.0
2000	32.0	0.0	2.2	0.8	2.0	37.0	61.2	39.6
2001	32.7	0.0	2.7	0.6	1.2	37.2	61.7	39.7
2002	29.0	0.0	2.3	1.0	2.1	34.5	58.0	40.6
2003	27.7	0.0	2.2	0.6	2.0	32.5	55.5	41.4
2005	**34.0**	**25.0**	**-**	**1.0**	**10.7**	**60.1**	**67.3**	**12**
2010	**36.0**	**26.0**	**-**	**1.0**	**11.8**	**63.6**	**71.2**	**12**
2015	**38.0**	**27.0**	**-**	**1.0**	**12.9**	**67.1**	**75.1**	**12**
2020	**40.0**	**28.0**	**-**	**1.0**	**14.0**	**70.6**	**79.1**	**12**
2025	**42.0**	**29.0**	**-**	**1.0**	**15.2**	**74.1**	**83.0**	**12**

Notes:
(1) Historical data from Wichita Water and Sewer System Annual Reports, 1970 - 2003, and customer records from 1992 to 2003.
(2) Classification started in 1976.
(3) Classification started in 1989.
(4) Classification started in 1993 and includes large irrigators such as golf courses, homeowners assoc. and the Parks.
(5) Classification started in 1973.
(6) Total metered water reduced 15% for additional conservation.
(7) UAF is accounted-for water. UAF values less than 7% appear to be questionable based on industry norms.

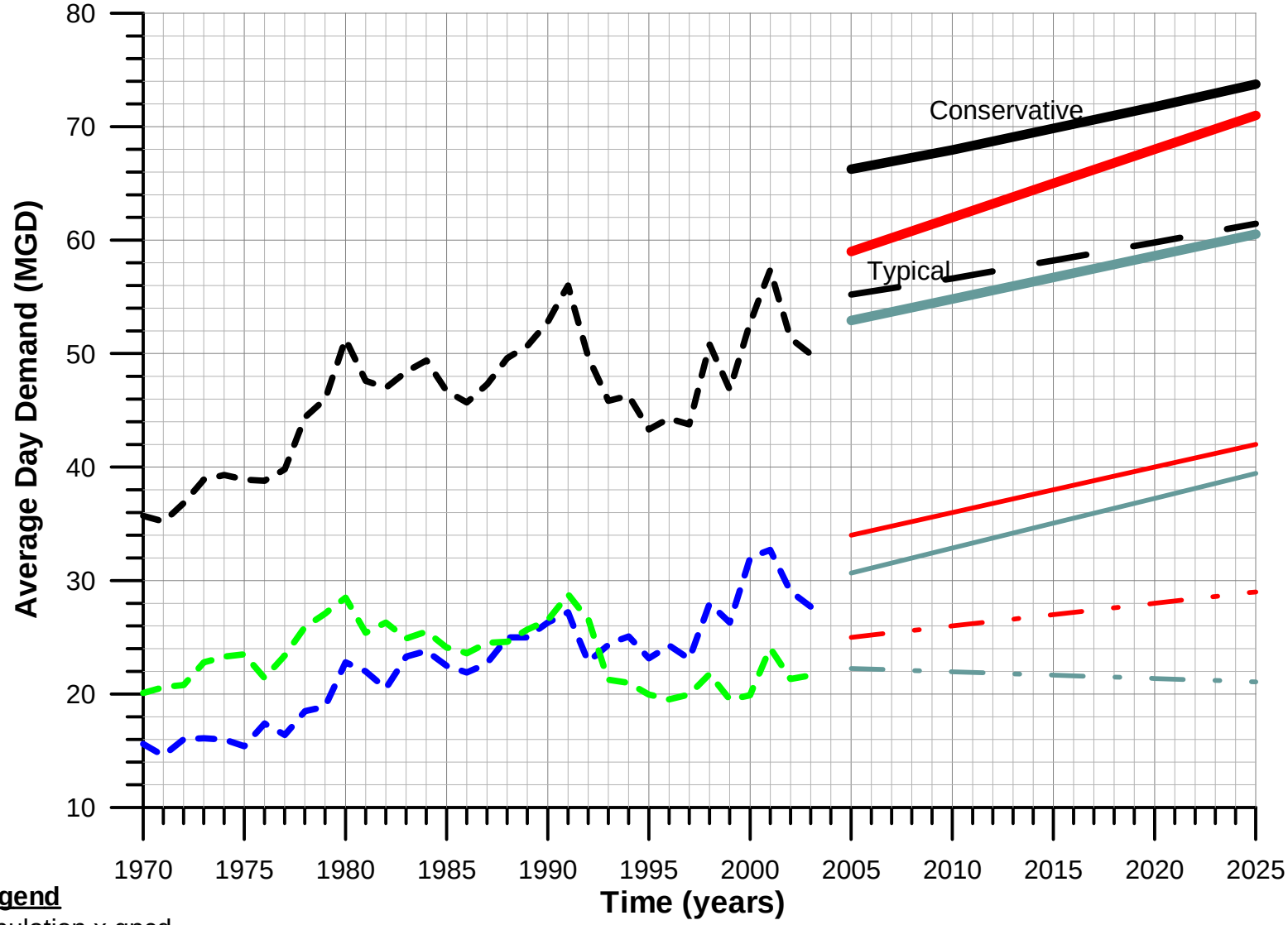
Table I-5

HISTORICAL AND PROJECTED AVERAGE ANNUAL DEMAND DATA FOR PUBLIC WATER SUPPLIERS IN SEDGWICK COUNTY (MGY)

Public Water Supplier	1990	2000	2005	2010	2015	2020	2025
1. Existing Wholesale -							
Individual Meters							
Andover	0.61	0.90	1.29	1.5	1.7	1.9	2.1
Eastborough(2)	0.13	0.13	0.12	0.1	0.1	0.1	0.1
Oaklawn (5)(6)	0.49	0.59	0.62	0.7	0.7	0.7	0.7
Other Indiv Meters (6)	0.68	0.73	0.76	0.8	0.8	0.9	0.9
Subtotal	**1.90**	**2.35**	**2.80**	**3.1**	**3.4**	**3.6**	**3.9**
2. Existing Wholesale -							
Master Meters							
Bel Aire (1)(2)	0.38	0.91	1.09	1.3	1.5	1.6	1.8
Bentley (2)	0.05	0.06	0.07	0.1	0.1	0.1	0.1
Benton (1)(2)	0.07	0.12	0.13	0.1	0.2	0.2	0.2
Derby (7)			2.39	2.6	2.8	3.0	3.3
Kechi (1)(2)	0.07	0.16	0.19	0.2	0.3	0.3	0.3
Park City (1)(2)	0.69	0.94	0.99	1.1	1.2	1.2	1.3
Rose Hill (1)	0.41	0.43	0.62	0.7	0.7	0.8	0.8
Sedgwick RWD No. 1	0.11	0.11	0.11	0.1	0.1	0.1	0.1
Sedgwick RWD No. 3 (3)	0.18	-	-	-	-	-	-
Sedgwick RWD No. 8	0.15	0.15	0.15	0.2	0.2	0.2	0.2
Valley Center (7)			1.09	1.3	1.4	1.6	1.8
McConnell AFB (5)	*0.35*	*0.45*	*0.45*	*0.5*	*0.5*	*0.5*	*0.5*
Subtotal	**2.47**	**3.34**	**7.28**	**8.0**	**8.8**	**9.5**	**10.4**
3. Anticipated Customers							
By Year 2010							
Derby (2)	2.20	3.07					
Colwich	0.16	0.19	0.20	0.2	0.2	0.2	0.3
Goddard (2)	0.27	0.32	0.46	0.5	0.6	0.6	0.7
Valley Center(2)	0.54	0.78					
Subtotal	**3.18**	**4.36**	**0.66**	**0.7**	**0.8**	**0.9**	**0.9**
Existing & Anticipated							
Wholesale Service Area	**4.37**	**5.69**	**10.74**	**11.8**	**12.9**	**14.0**	**15.2**
Total Wholesale Service Area	7.55	10.06	10.74	11.8	12.9	14.0	15.2

Notes:
(1) Based on contract maximums with Wchita.
(2) MAPD population data provided in 2004.
(3) Service with RWD No. 3 terminated in 1995. Thier service provided by El Dorado.
(4) Based on 150 gallons per capita day for residential and commercial usage.
(5) Not classified as a wholeale customer.
(6) Individually metered customers in Sedgwick County.
(7) Derby and Valley Center contract maximum values.

wichita demand comparison



Legend

- Population x gpcd
- Extrapolation
- Linear Regression
- Historic Residential
- Historic Commercial
- Historic Resid + Comm

Burns & McDonnell

Figure I - 4
Wichita, KS
Residential & Commercial
Demand Comparison

Table I-6

AVERAGE DAY DEMAND EVALUATION (MGD)

Year	Linear Regression			Extrapolation			Residential + Commercial (population x gpcd)	
	Residential	Commercial	Residential + Commercial	Residential	Commercial	Residential + Commercial	Conservative	Typical
2005	30.7	22.3	**52.9**	34.0	25.0	**59.0**	66.3	55.2
2010	32.9	22.0	**54.8**	36.0	26.0	**62.0**	67.9	56.6
2015	35.1	21.7	**56.7**	38.0	27.0	**65.0**	69.9	58.2
2020	37.3	21.4	**58.6**	40.0	28.0	**68.0**	71.8	59.8
2025	39.4	21.1	**60.5**	42.0	29.0	**71.0**	73.7	61.5

Notes:
1. Conservative gpcd is 180.
2. Typical gpcd is 150.

Table I-7

RATE OF AVERAGE DAY WATER USE COMPARISION

Year	Comm + Ind + Dept MGD	gpmd	gpcd
1970	35.7	503	168
1971	35.2	493	164
1972	36.8	512	171
1973	38.9	532	177
1974	39.3	530	177
1975	38.9	515	172
1976	38.8	503	168
1977	39.8	508	169
1978	44.4	556	185
1979	46.0	560	187
1980	51.3	606	202
1981	47.6	550	183
1982	47.0	536	179
1983	48.4	544	181
1984	49.4	542	181
1985	46.7	507	169
1986	45.7	489	163
1987	47.3	495	165
1988	49.6	511	170
1989	50.7	516	172
1990	52.8	531	177
1991	56.0	557	186
1992	49.7	478	159
1993	45.8	440	147
1994	46.3	438	146
1995	43.3	406	135
1996	44.3	407	136
1997	43.8	395	132
1998	50.8	451	150
1999	46.8	413	138
2000	52.7	459	153
2001	57.4	498	166
2002	51.4	434	145
2003	49.9	417	139

Note:
1. Assumes 3 people per meter based on historic population and customer data.
2. gpmd - gallons per meter day.
3. gpcd - gallons per capita day.

extended dry weather and results in a year 2025 residential projection of 42 MGD and a commercial projection of 29 MGD.

To verify the reasonableness of the projections, gallons per meter day (gpmd) use is determined by dividing demand by the number of customers for each customer class. These values are compared to the historic values as listed in Table I-8. Review of the projected gpmd values appears to be valid.

Based on the population/customer and gpcd/gpmd water use projections for each customer class, future average day demands are estimated as shown in Figure I-5 and listed in Table I-9. Review of the table shows the demand for each water class, total metered water, total pumpage and non-revenue through 2025. Total pumpage is projected to increase the average day from 55.5 MGD in 2003 to 69.7 MGD in 2005 to 86.6 MGD in 2025. These projected values reflect continued low range conservation efforts by the City.

Historical maximum day to average day factors are evaluated and projected to the year 2025 as shown in Figure I-6 and listed in Table I-10. Historic factors range from a low of 1.51 to a high of 2.07. Based on these values, a factor of 2.0 is used in the analysis. This is the same factor used in the 1993 Water Supply Study and 1999 Water Master Plan. The resulting maximum day demand increases from 105 MGD in 2003 to 173 MGD in 2025.

E. DEMAND MANAGEMENT

Demand management, or water conservation, can be used to reduce demand. Projections used in this study do not reflect any additional demand management activities beyond those currently in place. The primary area that should be maintained is Wichita's non-revenue water.

Typical recommended demand management activities (primary) include the following (per EPA Guidelines for Conservation Planning):

- Universal metering - meter all water users to provide a complete accounting of use.
- Control water loses – leak detection surveys and associated repairs.

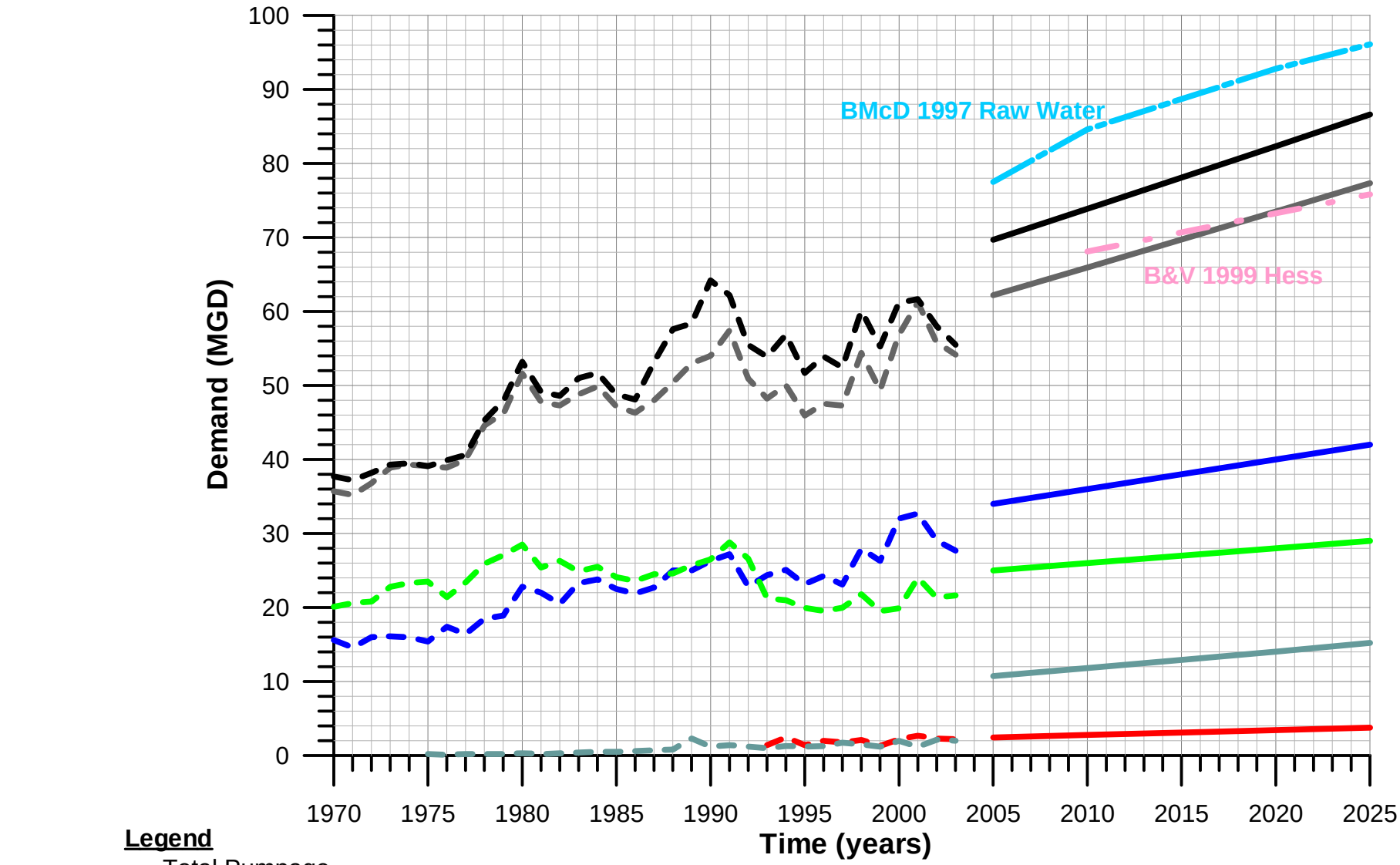
Table I-8

AVERAGE DAY GALLONS PER CUSTOMER

Year	Residential	Commercial	Contract (1)	Municipal	Wholesale	Metered Use/ Customer	Pumpage/ Customer
1970	220	1,980				440	464
1971	204	2,041				432	456
1972	222	2,008				447	464
1973	220	2,264				468	472
1974	216	2,273				465	468
1975	204	2,258			100,000	455	455
1976	225	2,038			50,000	444	455
1977	209	2,213			66,667	450	456
1978	232	2,429			66,667	493	501
1979	230	2,522			66,667	497	515
1980	269	2,610			100,000	540	557
1981	254	2,308			66,667	490	503
1982	234	2,382			60,000	479	493
1983	262	2,212			80,000	487	508
1984	261	2,271			100,000	488	505
1985	244	2,116			100,000	456	472
1986	234	2,062			75,000	442	459
1987	238	2,140			70,000	449	498
1988	258	2,157			88,889	465	531
1989	255	2,256			230,000	483	533
1990	264	2,328			120,000	487	579
1991	270	2,536			140,000	513	556
1992	220	2,312			110,087	441	480
1993	234	1,752	8,451	219,178	91,407	414	463
1994	237	1,710	14,997	227,397	116,065	423	482
1995	217	1,607	6,247	219,178	110,585	385	433
1996	223	1,570	8,840	473,973	104,795	391	444
1997	209	1,577	8,033	712,329	144,292	382	424
1998	248	1,705	9,459	1,032,877	115,490	433	478
1999	232	1,532	5,936	1,030,137	119,178	391	438
2000	279	1,479	9,025	780,822	198,356	443	477
2001	284	1,802	10,714	632,877	118,426	475	478
2002	245	1,625	8,561	991,085	195,019	424	440
2003	231	1,625	5,897	599,532	182,364	406	416
2005	**277**	**1,873**	**7,292**	**1,000,000**	**976,514**	**456**	**511**
2010	**276**	**1,877**	**6,813**	**1,000,000**	**984,463**	**456**	**511**
2015	**275**	**1,882**	**6,478**	**1,000,000**	**1,076,346**	**456**	**511**
2020	**275**	**1,886**	**6,231**	**1,000,000**	**1,169,871**	**456**	**511**
2025	**274**	**1,890**	**6,040**	**1,000,000**	**1,268,596**	**457**	**511**

Note:
(1) Based on 180 pumping days per year.

wichita demand



Legend

- Total Pumpage
- Metered Use
- Residential
- Commercial
- Contract
- Wholesale

Burns & McDonnell

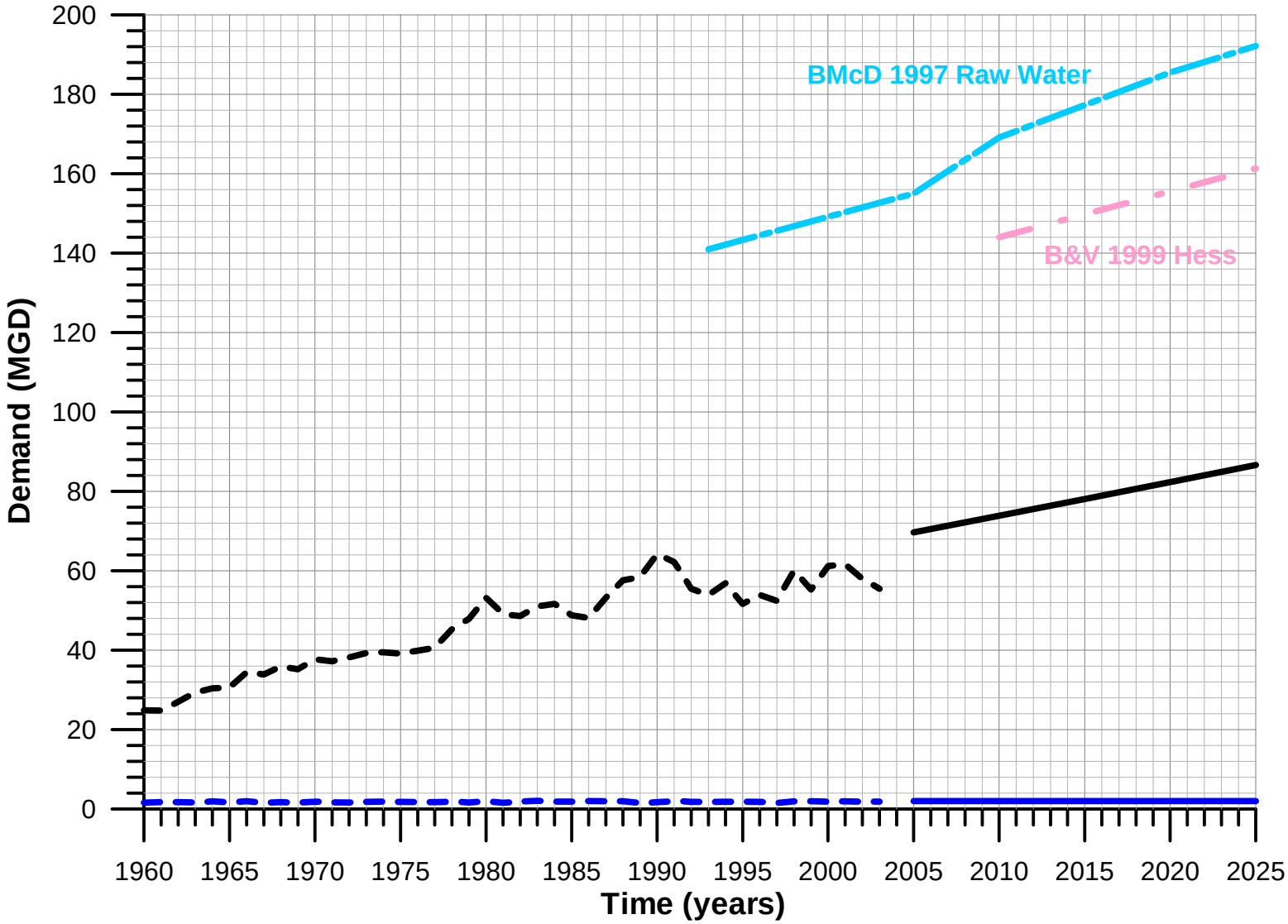
Figure I - 5
Wichita, KS
Historic and Projected
Average Day Demand

Table I-9

SUMMARY OF HISTORICAL AND PROJECTED CUSTOMER AND AVERAGE DAY DEMAND DATA

	Residential			Commercial			Contract			Departmant No Charge			Wholesale			Total Metered Water			Total Pumpage			UAF (%)
Year	Customers	Usage (mgd)	Gal/Cust	Customers	Usage (mgd)	Gal/Cust	Customers	Usage (mgd)	Gal/Cust	Customers	Usage (mgd)	Gal/Cust	Customers	Usage (mgd)	Gal/Cust	Customers	Usage (mgd)	Gal/Cust	Customers	Usage (mgd)	Gal/Cust	(mgd)
1970	71,011	15.6	220	10,153	20.1	1,980										81,164	35.7	440	81,164	37.7	464	5.3
1971	71,448	14.6	204	10,092	20.6	2,041										81,540	35.2	432	81,540	37.2	456	5.4
1972	71,939	16.0	222	10,360	20.8	2,008										82,299	36.8	447	82,299	38.2	464	3.7
1973	73,115	16.1	220	10,071	22.8	2,264										83,187	38.9	468	83,187	39.3	472	1.0
1974	74,182	16.0	216	10,250	23.3	2,273										84,434	39.3	465	84,434	39.5	468	0.5
1975	75,513	15.4	204	10,407	23.5	2,258							2	0.2	100,000	85,922	39.1	455	85,922	39.1	455	0.0
1976	77,171	17.4	225	10,501	21.4	2,038							2	0.1	50,000	87,674	38.9	444	87,674	39.9	455	2.5
1977	78,368	16.4	209	10,574	23.4	2,213							3	0.2	66,667	88,945	40.0	450	88,945	40.6	456	1.5
1978	79,785	18.5	232	10,665	25.9	2,429							3	0.2	66,667	90,453	44.6	493	90,453	45.3	501	1.5
1979	82,203	18.9	230	10,746	27.1	2,522							3	0.2	66,667	92,952	46.2	497	92,952	47.9	515	3.5
1980	84,610	22.8	269	10,920	28.5	2,610							3	0.3	100,000	95,533	51.6	540	95,533	53.2	557	3.0
1981	86,571	22.0	254	11,007	25.4	2,308							3	0.2	66,667	97,581	47.8	490	97,581	49.1	503	2.6
1982	87,623	20.5	234	11,042	26.3	2,382							5	0.3	60,000	98,670	47.3	479	98,670	48.6	493	2.7
1983	89,039	23.3	262	11,258	24.9	2,212							5	0.4	80,000	100,302	48.8	487	100,302	51.0	508	4.3
1984	91,082	23.8	261	11,229	25.5	2,271							5	0.5	100,000	102,316	49.9	488	102,316	51.7	505	3.5
1985	92,105	22.5	244	11,387	24.1	2,116							5	0.5	100,000	103,497	47.2	456	103,497	48.8	472	3.3
1986	93,414	21.9	234	11,445	23.6	2,062							8	0.6	75,000	104,867	46.3	442	104,867	48.1	459	3.7
1987	95,469	22.7	238	11,450	24.5	2,140							10	0.7	70,000	106,929	48.0	449	106,929	53.2	498	9.8
1988	97,003	25.0	258	11,403	24.6	2,157							9	0.8	88,889	108,415	50.4	465	108,415	57.6	531	12.5
1989	98,220	25.0	255	11,393	25.7	2,256							10	2.3	230,000	109,623	53.0	483	109,623	58.4	533	9.2
1990	99,439	26.3	264	11,381	26.5	2,328							10	1.2	120,000	110,830	54.0	487	110,830	64.2	579	15.9
1991	100,580	27.2	270	11,358	28.8	2,536							10	1.4	140,000	111,948	57.4	513	111,948	62.2	556	7.7
1992	103,978	22.8	220	11,504	26.6	2,312				1	0.3	282,192	11	1.2	110,087	115,494	50.9	441	115,494	55.5	480	8.2
1993	104,090	24.4	234	12,127	21.2	1,752	165	1.4	8,451	1	0.2	219,178	11	1.0	91,407	116,394	48.2	414	116,394	53.9	463	10.5
1994	105,672	25.1	237	12,270	21.0	1,710	163	2.4	14,997	1	0.2	227,397	11	1.3	116,065	118,117	50.0	423	118,117	56.9	482	12.1
1995	106,767	23.1	217	12,422	20.0	1,607	225	1.4	6,247	1	0.2	219,178	11	1.2	110,585	119,426	45.9	385	119,426	51.7	433	11.1
1996	108,801	24.3	223	12,439	19.5	1,570	225	2.0	8,840	1	0.5	473,973	12	1.3	104,795	121,478	47.5	391	121,478	53.9	444	11.8
1997	110,725	23.1	209	12,650	20.0	1,577	222	1.8	8,033	1	0.7	712,329	12	1.7	144,292	123,610	47.3	382	123,610	52.4	424	9.8
1998	112,660	28.0	248	12,780	21.8	1,705	222	2.1	9,459	1	1.0	1,032,877	13	1.5	115,490	125,676	54.4	433	125,676	60.1	478	9.4
1999	113,280	26.3	232	12,731	19.5	1,532	219	1.3	5,936	1	1.0	1,030,137	10	1.2	119,178	126,241	49.3	391	126,241	55.3	438	10.7
2000	114,686	32.0	279	13,451	19.9	1,479	245	2.2	9,025	1	0.8	780,822	10	2.0	198,356	128,393	56.9	443	128,393	61.2	477	7.1
2001	115,299	32.7	284	13,342	24.0	1,802	249	2.7	10,714	1	0.6	632,877	10	1.2	118,426	128,901	61.2	475	128,901	61.7	478	0.7
2002	118,321	29.0	245	13,125	21.3	1,625	268	2.3	8,561	1	1.0	991,085	11	2.1	195,019	131,726	55.8	424	131,726	58.0	440	3.8
2003	119,747	27.7	231	13,322	21.6	1,625	376	2.2	5,897	1	0.6	599,532	11	2.0	182,364	133,457	54.2	406	133,457	55.5	416	2.4
2005	**122,649**	**34.0**	**277**	**13,350**	**25.0**	**1,873**	**335**	**2.4**	**7,292**	**1**	**1.0**	**1,000,000**	**11**	**10.7**	**976,514**	**136,347**	**62.2**	**456**	**136,347**	**69.7**	**511**	**12.0**
2010	**130,329**	**36.0**	**276**	**13,848**	**26.0**	**1,877**	**407**	**2.8**	**6,813**	**1**	**1.0**	**1,000,000**	**12**	**11.8**	**984,463**	**144,598**	**65.9**	**456**	**144,598**	**73.9**	**511**	**12.0**
2015	**138,009**	**38.0**	**275**	**14,346**	**27.0**	**1,882**	**479**	**3.1**	**6,478**	**1**	**1.0**	**1,000,000**	**12**	**12.9**	**1,076,346**	**152,848**	**69.7**	**456**	**152,848**	**78.1**	**511**	**12.0**
2020	**145,689**	**40.0**	**275**	**14,845**	**28.0**	**1,886**	**551**	**3.4**	**6,231**	**1**	**1.0**	**1,000,000**	**12**	**14.0**	**1,169,871**	**161,098**	**73.5**	**456**	**161,098**	**82.3**	**511**	**12.0**
2025	**153,369**	**42.0**	**274**	**15,343**	**29.0**	**1,890**	**623**	**3.8**	**6,040**	**1**	**1.0**	**1,000,000**	**12**	**15.2**	**1,268,596**	**169,348**	**77.3**	**457**	**169,348**	**86.6**	**511**	**12.0**

wichita md



Legend

Maximum Day

Average Day

Burns & McDonnell

Figure I - 6
Wichita, KS
Historic and Projected
Maximum Day Demand

Table I-10

HISTORICAL & PROJECTED MAXIMUM DAY DEMAND

Year (2)	Annual Average Day (MGD)	Maximum Day/ Average Day Factor	Maximum Day (MGD)
1960	24.9	1.61	40.1
1961	24.8	1.71	42.5
1962	27.0	1.73	46.6
1963	29.3	1.67	48.8
1964	30.4	1.90	57.9
1965	30.6	1.70	52.1
1966	34.5	1.96	67.5
1967	33.9	1.58	53.5
1968	35.9	1.72	61.9
1969	35.2	1.62	57.1
1970	37.7	1.85	69.9
1971	37.2	1.70	63.3
1972	38.2	1.65	63.1
1973	39.3	1.80	70.8
1974	39.5	1.89	74.5
1975	39.1	1.78	69.7
1976	39.9	1.78	70.9
1977	40.6	1.72	70.0
1978	45.3	1.86	84.3
1979	47.9	1.66	79.5
1980	53.2	1.96	104.1
1981	49.1	1.55	76.3
1982	48.6	1.89	92.0
1983	51.0	2.07	105.5
1984	51.7	1.87	96.7
1985	48.8	1.88	91.6
1986	48.1	2.00	96.4
1987	53.2	1.95	104.0
1988	57.6	1.95	112.3
1989	58.4	1.56	90.9
1990	64.2	1.71	109.5
1991	62.2	2.02	125.7
1992	55.5	1.81	100.5
1993	53.9	1.78	96.0
1994	56.9	1.85	105.3
1995	51.7	1.83	94.4
1996	53.9	1.80	97.1
1997	52.4	1.51	79.1
1998	60.1	1.90	114.4
1999	55.3	1.97	108.8
2000	61.2	1.86	114.1
2001	61.7	1.94	119.4
2002	58.0	1.88	108.9
2003	55.5	1.89	104.7
2005	**69.7**	**2.0**	**139.3**
2010	**73.9**	**2.0**	**147.7**
2015	**78.1**	**2.0**	**156.2**
2020	**82.3**	**2.0**	**164.6**
2025	**86.6**	**2.0**	**173.2**

Note:
(1) Data for 1960 - 1985 collected from 1985 C & O report.
Data for 1986 - 1991 collected from Wichita Water and.
Sewer Annual Reports, 1986 - 2002.
Data from 1992 - 2002 collected from Wichita Water and
Sewer Department.
(2) The maximum day demands in 1990 and 1991 were artificially
controlled.
(3) Values are based on raw water pumpage in MGD.

- Costing – institute an inverted water rate to encourage the wise use of water. An inverted rate is a higher volume charge, usually 200 to 500 percent of the current volume charge for water use in excess of 110 to 125 percent of average winter use or average system winter use (whichever is higher).
- Distribute information and education material on water conservation with water bills, at schools, special city functions, etc.

Additional conservation measures include the following:

- Water-use audits – help customers realize how much water they are really using and where.
- Retrofits – provide plumbing retrofits kits to decrease water use from showers, toilet flushing, and faucets.
- Pressure management – lowering system pressure decreases the amount of water people can use in comparable time periods and reduces leakage.
- Xeriscape – plant water efficient trees, scrubs, flowers, and most importantly grass. Tall fescue, zoysia, bermuda, and buffalo grasses use much less water and chemicals than rye and blue grass varieties.

Wichita's demand management activities include all of the primary standards and some of the secondary standards.

The greatest seasonal misuse of water is usually lawn watering. Many people water at the wrong time of day and too often. Most grasses only need about 1 inch of water per week and need only be watered once or twice a week. This promotes a deeper root system and ultimately a stronger turf. Turf and lawn watering should be covered in the public education component of the City's demand management program.

*****

Part II – Existing Water System

PART II – EXISTING WATER SYSTEM

A. GENERAL

This section of the report discusses the existing raw water supply, treatment, and distribution system for Wichita, Kansas. The system is owned and operated by the City of Wichita and currently serves about 410,000 people including about 350,000 Wichita citizens and 60,000 people outside the City limits.

B. RAW WATER SUPPLY

1. General

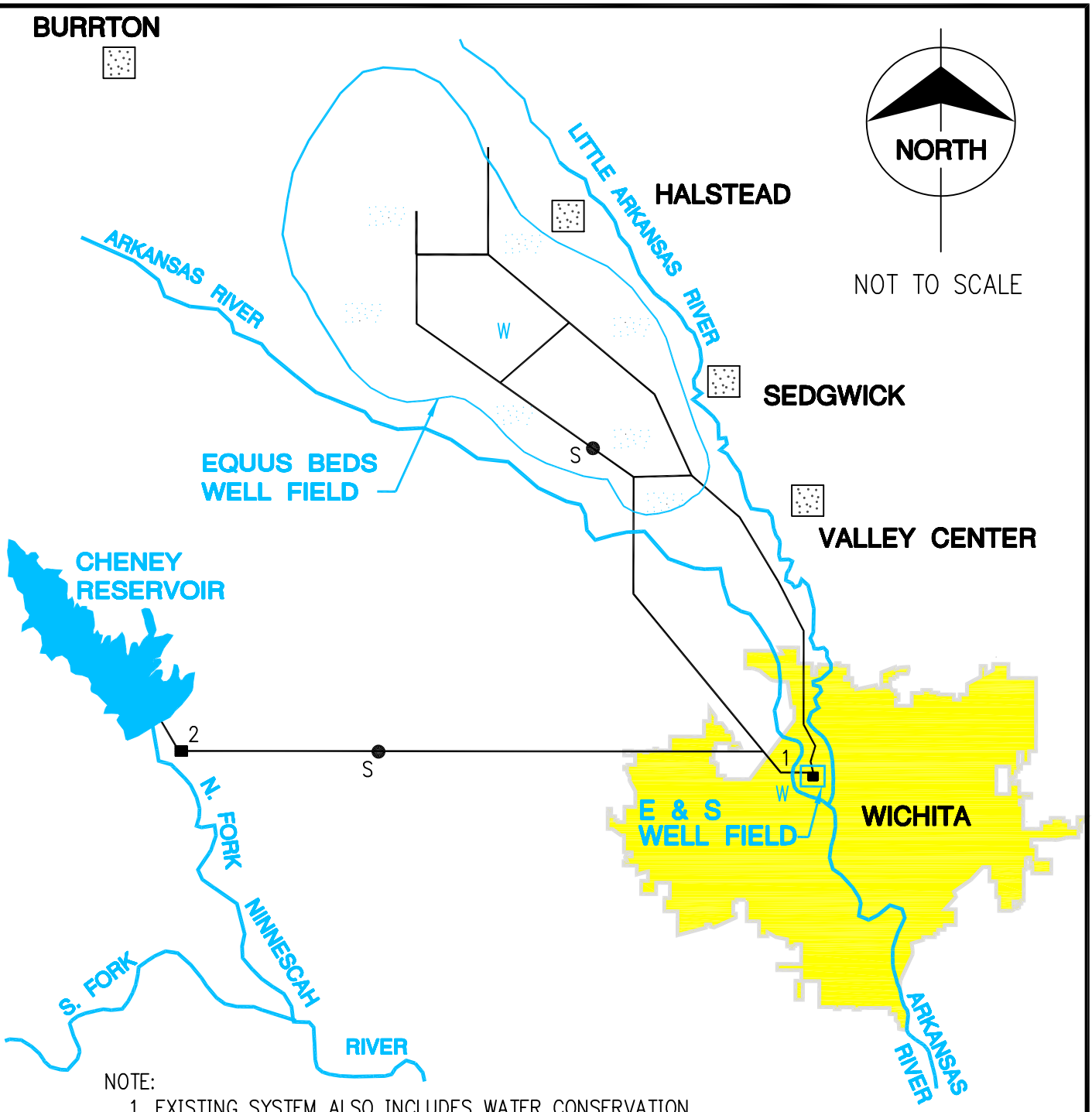
The City of Wichita has three sources of water supply as shown in Figure II-1. Cheney Reservoir is the primary water source and is located about 20 west of Wichita. The Equus Beds Well Field, EBWF, includes 55 wells located about 16 miles north of Wichita, was the City's primary water source until the City switched to Cheney as the primary source in 1994. Local wells, also known as the Emergency and Sim wells, surround the Central Water Plant and are the third water source. They are primarily used to meet peak water demands.

2. Cheney Reservoir

Cheney Reservoir was completed in 1965 and has a firm yield of about 49,000 acre-feet per year (AFY) or 43.7 million gallons per day (MGD). Cheney pump station has a firm pumping capacity of about 80 MGD. The reservoir has 151,780 acre-feet of storage capacity in the conservation pool.

Wichita has three water rights for Cheney Reservoir as detailed below.

- Water Right 05033 allows for 30,668 acre-feet per year of water (average day of 27.4 MGD and maximum day of 60 MGD). This is the original water right.
- Water Right 40126 allows an additional 21,973 acre-feet per year of water (average day of 19.6 MGD). This water right was issues in the early 1990's.
- These combined water rights limited Wichita to 52,641 acre-feet per year, an average day of 47 MGD, and a maximum withdrawal rate of 103 MGD.



NOTE:
1. EXISTING SYSTEM ALSO INCLUDES WATER CONSERVATION.
2. GENERALIZED LAYOUT OF PROPOSED FACILITIES DEPICTED.

LEGEND

- EXISTING RAW WATER PIPELINE
- RIVER AND LAKES
- S — SURGE TANK
- W — WELL FIELD
- 1 ■ — CENTRAL WATER TREATMENT PLANT
- 2 ■ — CHENEY RESERVOIR PUMP STATION

Burns & McDonnell SINCE 1898

Figure II–1

EXISTING SYSTEM SCHEMATIC

J:\WICHITA\34007_WATER_MASTER_PLAN\PROJECTIONS\FIG_II-1.DWG 05-31-2005 16:32 A_OLMOS

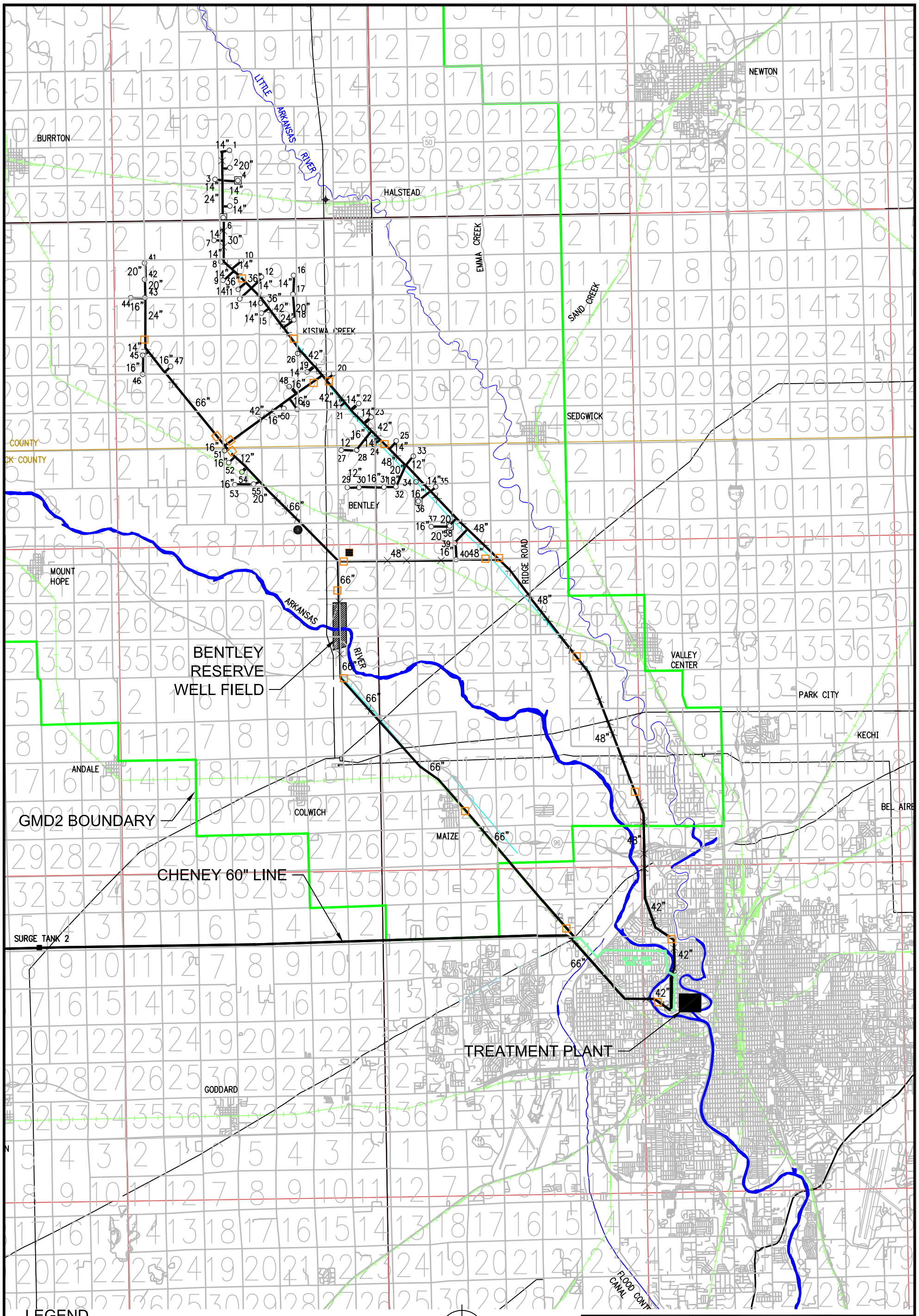
- In the late 1990's, Wichita received Water Right 42824 that changed the annual withdrawal to the summation of Cheney and the Equus Beds Well Field at 98,638 acre-feet per year or an average of 82.7 MGD. Maximum day pump rate was limited to 120 MGD. This water right allows the City to manage/optimize their water resources based on available flows and helps maintain water levels and protect the water quality in the Equus Beds well Field.

Algal blooms have been an operational issue with the reservoir since the early 1990's. Wichita initiated watershed protection in 1994. Implementation of best management practices substantially reduced the inflow of agricultural nitrogen and phosphorus discharges into the reservoir and the occurrence of algal blooms. Algal blooms periodically reoccurred in late 2002 through 2003 causing episodes of taste and odor in the potable water - the City initiated a taste and odor study in spring 2003 and is installing an ozone feed system in 2005.

3. Equus Beds Well Field

The EBWF was originally developed with 25 wells in 1939. The City added 10 wells in 1949 and another 20 wells in 1958 to its current 55 wells and over 69 miles of pipe as shown in Figure II-2. Since 1991, 18 wells have been redrilled. The EBWF has three water rights, HV006, 00388, and 1006, with a combined right of 40,000 acre-feet per year, an average of 35.8 MGD, and a maximum withdrawal rate of 78 MGD.

Over-development of the Equus Beds Aquifer by irrigators, industries and municipalities substantially lowered groundwater levels in the area. This allowed water with high natural chloride levels from the Arkansas River and man-made chloride contamination from the abandoned Burrton oil field to be pulled toward the EBWF at an accelerated rate and is causing the aquifer's water quality to degrade. Wichita's wells represent the vast majority of the original wells in the EBWF area; therefore, Wichita owns the bulk of the senior water rights in the EBWF area.



LEGEND

- PIPE
- GMD2 BOUNDARY
- TOWNSHIP LINE
- VALVE
- PIPE BREAK

N

0 6000' 12000'

SCALE IN FEET

Burns & McDonnell SINCE 1898

Figure II-2

EQUUS BEDS WELL FIELD SUPPLY

J:\WICHITA\34007_WATER _MASTER_PLAN\PROCWS\FIG_II_2_FEB_2005.DWG 02-08-2005 11:09 M_COCHRAN

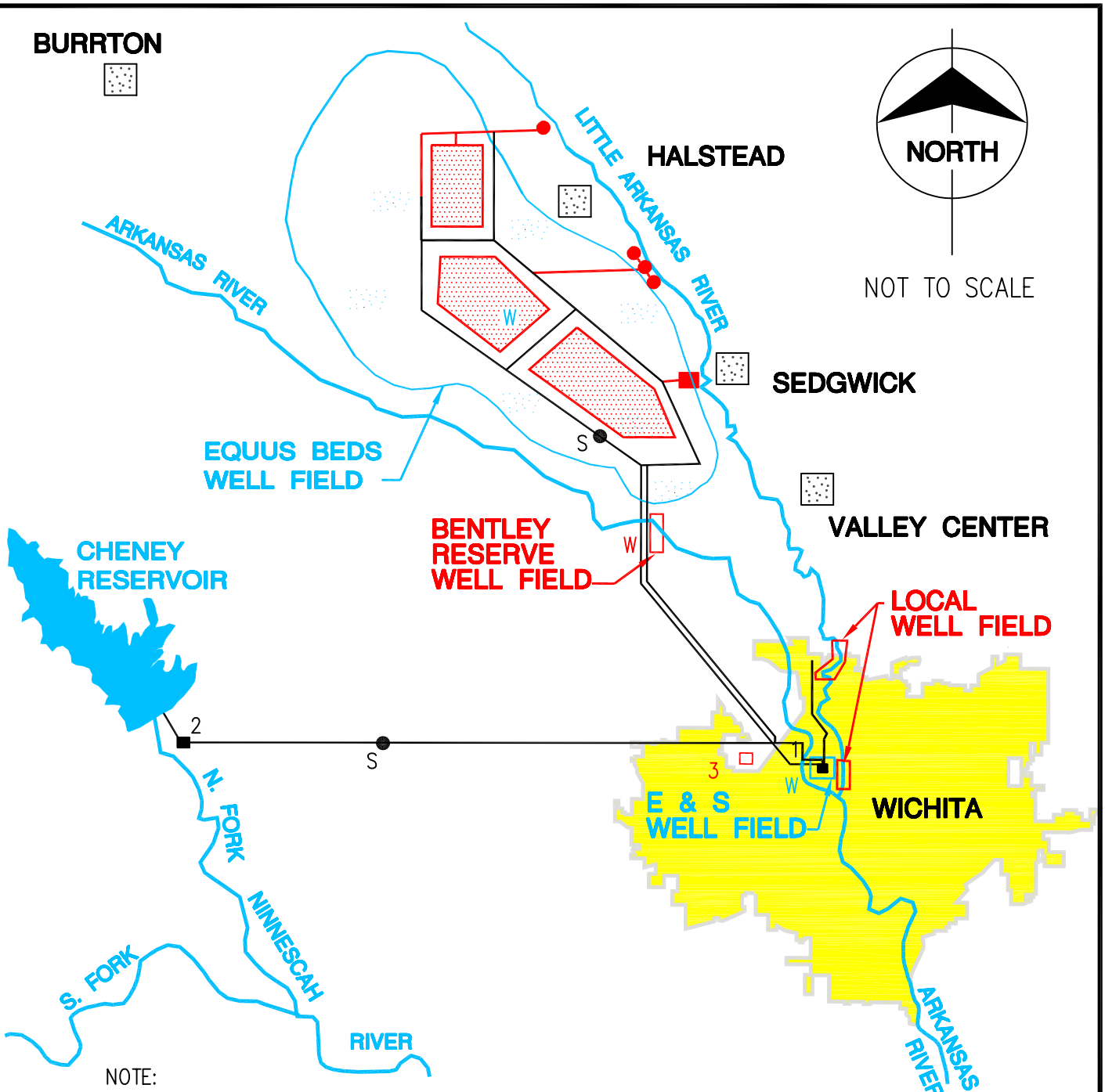
Water quality will continue to degrade causing chlorides to increase and render the water useless for irrigation and drinking water, without excessive water treatment, if no action is taken to protect this resource. City Council adopted the Integrated Local Water Supply Plan, ILWS Plan, in 1993 and has continued to work to implement the plan. The Plan includes the following components as shown in Figure II-3:

- Changed the preferred priority water source to Cheney Reservoir.
- Recharge the EBWF with above-base flow from the Little Arkansas River, on an as-available basis, and recover water during dry periods.
- Redevelop the Bentley Reserve Well Field.
- Expand the Local Well Field.
- Continue demand management practices.

The City is currently implementing Phase 1 of the aquifer storage and recovery project. This includes installation of 10 MGD of river diversion and recharge capacity in the northwest portion of the EBWF. The primary reason for this portion of the ASR Project is the development and maintenance of a hydraulic barrier between the EBWF and high chloride brine from the Burrton Oil Field.

A major portion of the EBWF pipelines and power lines are about 50 years old and need of replacement. Overall, 36-inch diameter and larger transmission mains, appear to be in adequate condition. All other mains will probably be replaced as part of the ASR Project. All of the old power lines and poles should be upgraded.

The two major repair issues are the 48-inch concrete waterline on the east side of the well field and the spurlines to the wells. The 48-inch has experienced an excessive number of breaks as shown in Figure II-2 and has been closed between the well field and the Big Ditch most of 2003 due to a break. A portion of the 48-inch has been slip-lined with a 42-inch steel main from the water plant to the Big Ditch. The City will complete a new 66-inch diameter transmission main from 21st and Zoo to the water plant; this will provide redundancy for the existing



NOTE:
1. PLAN ALSO INCLUDES WATER CONSERVATION.
2. GENERALIZED LAYOUT OF PROPOSED FACILITIES DEPICTED.

LEGEND

- EXISTING RAW WATER PIPELINE
- RIVER AND LAKES
- S — SURGE TANK
- W — WELL FIELD
- 1 ■ — CENTRAL WATER TREATMENT PLANT
- 2 ■ — CHENEY RESERVOIR PUMP STATION
- 3 □ — PROPOSED WATER TREATMENT PLANT
- PROPOSED PIPELINE
- PROPOSED SURFACE WATER INTAKE
- PROPOSED DIVERSION WELLS
- PROPOSED RECHARGE WELLS/ BASINS, RECOVERY WELLS

Burns & McDonnell SINCE 1898

Figure II-3

INTEGRATED LOCAL WATER SUPPLY PLAN SCHEMATIC

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66-inch main since the 48-inch is unreliable. Completion of the 66-inch from 21st and Zoo to the well field is part of the City's ILWS Plan.

Spurlines are the 12- and 14-inch raw water lines between the wells and the transmission mains. Most of these pipes have corroded and have relatively thin walls and are therefore unable to handle higher pressures. These spurlines and smaller transmission mains should be replaced as either part of the ASR Project or under a separate project by the City. This separate project could be completed over several years and could entail the following:

- Isolate a section of the well field for the winter.
- Remove the existing pipe and replace it, in the same trench, with a new larger diameter pipe.
- Test the new mains and put that section of the well field back in service for spring.

The power system is also about 50 years old and includes original poles, cables and other components. These improvements can be completed in phases in conjunction with the ASR Project.

4. Local Well Field (Emergency and Sim Well Fields)

The LWF includes 16 wells originally constructed in 1949 and expanded in 1953. Three wells were redrilled in 1997. The City is currently rehabilitating all the wells. These wells are located adjacent to the Central Water Plant between the Arkansas River and Little Arkansas River.

The existing LWF has five water rights. The first four water rights represent the S-wells and combine for 1,120.1 acre-feet per year. They include SG-1 at 1,120.1 acre-feet per year; 42879 at 42.82 acre-feet per year; 42880 at 42.39 acre-feet per year; 42881 at 42.39 acre-feet per year. The fifth is Water Right 540 and represents the E-wells at 5,357 acre-feet per year, which combines with the other rights for a total of 6,477.1 acre-feet per year. These wells allow for an average withdrawal of 16.1 MGD and a maximum withdrawal rate of 37 MGD.

Historical operation shows these wells can effectively pump about 30 MGD for a few weeks then aquifer yield decreases to a range of 15 to 18 MGD.

5. Total Supply Capacity

Wichita's current water rights total 99,115 acre-feet per year for the three existing water sources. This equates to an average day of 88.5 MGD and a maximum diversion rate of 213.8 MGD. Additional water supply and rights are required to meet demands through 2025.

Implementation of the ILWS Plan will provide the necessary water sources to meet projected average day demands of 112 MGD and maximum day demands of 225 MGD. System water rights for implementation of these sources without firm yields can be obtained from the State based on the resource management/optimization or conjunctive use approach.

C. TREATMENT

1. General

The City's water treatment plant is located on the north bank of the Arkansas River, southeast of Sim Park as shown in Figure II-3. The plant has a current capacity of 160 MGD. The plant can reportedly be expanded to 180 MGD; however, it may be difficult to meet future water quality regulation at this flow. A second water treatment plant is planned for the 21st and Zoo site.

2. Central Water Treatment Plant Process

Conventional water treatment processes are used at this surface water plant including aeration, chemical addition and rapid mixing, flocculation, sedimentation, filtration and disinfection. Settled water is recarbonated prior to filtration with carbon dioxide gas. Lime softening is accomplished as a single stage process for removal of carbonate hardness.

3. Regulatory

The City's water treatment plant meets all current drinking water regulations. Additionally, no problems are anticipated meeting pending or promulgated

regulations. The City is constructing an ozone facility at Cheney Reservoir to remove the periodic taste and odor issues.

D. DISTRIBUTION

1. General

The existing water distribution system includes the following major components as shown in Figure II-4:

- Three pressure zones.
- Hess Storage and Pump Station - five clearwells with a capacity of 35 MG and a 215 MGD high service pump station (firm capacity).
- Webb Road Booster Pump Station for the East Pressure Zone (EPZ) – 25 MGD (firm capacity).
- Webb Road Storage and Booster Pump Station for the Northeast Pressure Zone (NEPZ) – 10 MG clearwell with 8.0 MGD (firm capacity).
- Roosevelt Elevated Storage Tank – 2 MG.
- Woodlawn Elevated Storage Tank – 2 MG.
- North Tank – 1 MG.
- 37th Street Booster Pump Station – 2.4 MGD (firm capacity).

The system also includes the Lincoln Street and Murdock booster pump station/storage tank, which are not currently operated and are not included in the model. Both pump stations were constructed in 1946 and includes a 2 MG aboveground steel storage tank and three 5.0 MGD pumps.

The Roosevelt and Woodlawn elevated tanks are controlled by plant operation staff since they are typically submerged. Their ability to work with the future distribution system has been evaluated and is discussed in Part V of this Master Plan.

2. Pumping Stations

Pump station data is listed in Table II-1 and includes the name, designation, design flow and head, motor horsepower, and control feature for each pump station. Available pump curves are included in the Appendix C.

Draft

North Tank (1MG)

Webb Road Pump Station

Woodlawn Tank (2 MG)

Roosevelt Tank (2 MG)

Hess Pump Station

Legend

Modeled Pipes

- Existing Mains
- Tanks
- Junctions
- Pumps
- Existing Pressure Zones

Road Centerlines

- Minor Roads
- Major Roads

NORTH

3,000 0 3,000 6,000 9,000 Feet

Figure II-4

Existing Distribution System

Wichita, KS
February 2005

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Table II-1

Pump Summary

Name	Designation	Design Flow (MGD)	Design Head (feet)	Motor Hp	Control
Hess	1	28.5	300	1820	Note 1
	2	28.5	300	1820	
	3	35.7	264	1820	
	4 (VFD)	28.5	302	1855	
	5	25.0	264	1820	
	6	35.7	264	1820	
	7 (VFD)	25.7	264	1750	
	8	28.5	300	1820	
Webb Road	D2 (2001)	12.5	50	150	Note 1
EPZ	D3 (2001)	12.5	50	150	
All have VFDs	D4 (2001)	12.5	50	150	
Webb Road	D1/M1	5.0	192	250	Note 1
NEPZ	(2001)VFD				
	D2 (1982)	3.0	190	150	
	D3 (2001)	5.0	210	300	
37th Street	1 (VFD)	1.8	120	150	Note 1
NEPZ	2	0.6	120	30	
	3	2.1	120	75	

Note 1 – refer to City document on pump station control dated April 2003 by TEC Information Services.

3. Storage

Details of Wichita's storage tanks discussed above and listed in Table II-2 and include pressure zone served, capacity, base elevation, overflow elevation, and head range.

Table II-2

Storage Tank Summary

Name	Pressure Zone	Capacity (MG)	Ground El. (feet)	Overflow El. (Feet)	Head Range (feet)
Hess	Hess	35.1	1287	1302	15
Webb Road	Northeast	10.0	1375	1395	20
Woodlawn	Hess	2.0	1412	1517	35
Roosevelt	Hess	2.0	1402	1517	35

4. Operation

Operational parameters for the pump stations are listed in the TEC document dated April 2003. These parameters automatically control the activation and deactivation of pumps to maintain pressure at selected control points and minimize the opportunity of over-pressuring the system.

*****

Part III – Future Water Supply Facilities

PART III – FUTURE WATER SUPPLY FACILITIES

A. GENERAL

This section of the report discusses Wichita's plans for their future water supply. The City's Integrated Local water Supply (ILWS) Plan covers the raw water and proposed new water plant up to a projected maximum day demand of 223 MGD in year 2050. This report will evaluate and recommend distribution improvements necessary to meet the projected maximum day demands of about 173 MGD in year 2025.

B. RAW WATER SUPPLY SYSTEM

In 1993, a Water Supply Study was completed for the City of Wichita and adopted by City Council for implementation. This study evaluated about 30 water supply alternatives and recommended completion of the ILWS Plan. A current version of the ASR component of the Plan is shown in Figure III-1. The ILWS Plan takes a phased holistic approach to maximize use of local water sources and help protect the water quality in the EBWF from chloride contamination by raising the aquifer levels to near pre-development levels. To date, over 50 engineering, hydrogeological, environmental, and pilot/demonstration projects have been completed to prove the viability of the ILWS Plan and develop design criteria for implementation and permit acquisition. As a result, the Plan has been modified as additional information is collected and processed and includes the following projects:

- Continue demand management programs - ongoing.
- Switch primary water from EBWF to Cheney Reservoir - completed in 1994.
- 100 MGD ASR Project – ASR Phase 1, 10 MGD, is under design.
- Redevelopment of the Bentley Reserve Well Field – permitting is ongoing.
- Expansion of the Local Well Field – Phase I evaluation report will be completed in the first quarter of 2005.

Use of reverse osmosis (RO) treatment of Arkansas River water or other high chloride water was considered in 1992 and not part of the original Plan. Membrane technology has decreased substantially in capital and operations cost since 1992. The City reevaluated RO treatment in 2003 and 2004. RO increases the cost of the Plan compared to versions of the Plan with 75/25 or 40/60 ASR options, but the increase is not

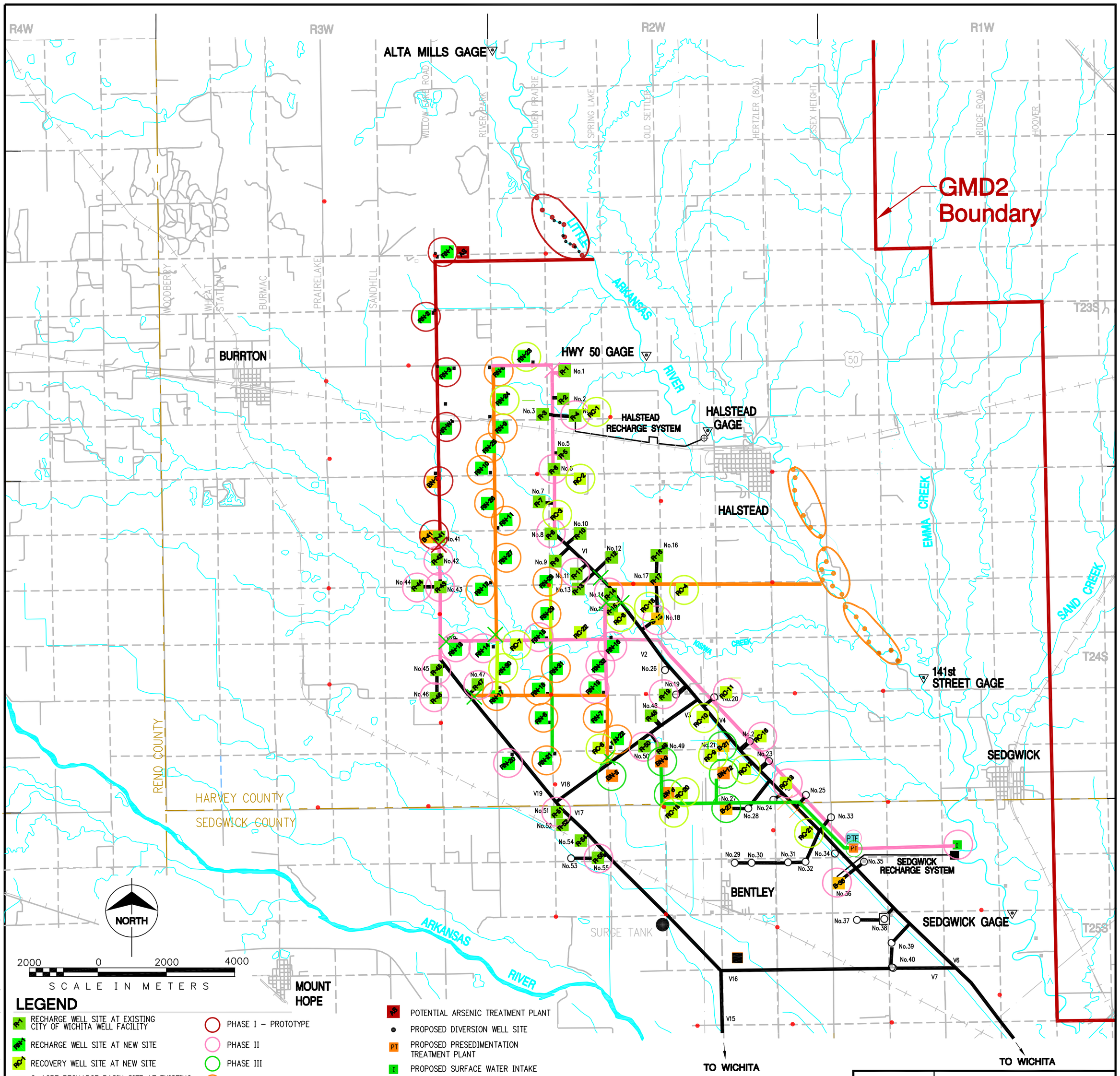

Figure III-1
40/60 ASR OPTION
FULL-SCALE CONCEPT LAYOUT

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substantial. RO will probably become a component of the City's future water supply.

The major component of the Plan is the ASR Project. In 1993, the EBWF storage was about 200,000 acre-feet (65 billion gallons) below the 1950's level. Declines in water levels took off in the 1970's when irrigation use dramatically increased. This decrease in groundwater level increases the rate at which high chloride water from the Arkansas River and Burrton Oil Field moved into the well field area. The ASR Project helps to refill the aquifer during wet periods for use during dry periods while helping to protect water quality of the EBWF from chloride contamination by maintaining higher groundwater levels.

Water rights for the Equus Beds Aquifer in the well field area are over-allocated; pumpage exceeds natural recharge. Therefore, few additional groundwater rights are available. Wichita will be able to recover water out of the aquifer based on the recharge water added to the aquifer by this Project and other management activities.

Review of Figure III-1 shows five phases of implementation for diversion and recharge facilities. Diversion facilities include 40 MGD of diversion wells located along the Little Arkansas River and a 60 MGD surface water diversion. Water from diversion wells is recharged though recharge basin or recharge wells. Recharge wells also provide a means to recover recharge water. Surface water is treated and recharged through basins. EBWF pipeline capacity needs to be expanded to recover and deliver 143 MGD of raw water to the City to meet year 2050 maximum day demands under dry conditions. These higher capacity well field pipelines also allow recharge water to be distributed through the well field. Additionally, the well field power system also needs to be updated and expanded.

C. PROPOSED WATER TREATMENT PLANT

Wichita purchased a site for the second water treatment plant at the 21st and Zoo site in the mid 1990's as shown in Figure II-3. This site will be developed with a 65 MGD water plant capable of supplying a year 2050 maximum day demand in conjunction with the 160 MGD Central Water Treatment Plant. The schedule for plant construction is based on the City's water service area exceeding the 160 MGD capacity of the existing

plant. Other issues including the need for redundancy, development of a West PZ, or other parameters could impact the schedule.

*****

Part IV – Model Conversion

PART IV – MODEL CONVERSION

A. GENERAL

This section of the report discusses the conversion of Wichita's water distribution system model to a GIS based model, reallocation of demand, field testing to develop model verification data, diurnal analysis for the entire system as well as the three pressure zones, and storage analysis. GIS linkage for model piping and demand allocation represent major advances included in this updated model. The existing water distribution system is shown in Figure II-4.

B. CONVERSION

As part of this study, the existing calibrated H2ONet model is converted from a stand-alone model to a GIS synchronized model. This is accomplished by utilizing the following data and results in an updated year 2003 model ready for verification:

- City provided AutoCAD file for the water distribution system piping.
- Use of available GIS themes for topographic information, roads, zoning, customer data, and parcels.
- Addition of C-values from the existing calibrated model.
- Addition of available electronic contour data for the junctions.
- Reallocation of average day demand based on electronic metered usage and electronic address data.
- Addition of pump station and storage facilities from the existing model with modifications to coordinate with current facilities.
- Skeletonization of the piping to 8-inch diameter and greater pipe as used in the existing model.

Demand allocation and field tests to develop verification data are discussed below in more detail. Model verification is also discussed below as well as the results of the GIS linked verified model of the existing system and the evaluation of improvements to meet year 2010 and year 2025 demands.

C. DEMAND ALLOCATION

Three primary types of growth are addressed in this study as follows: 1) Existing Demand, 2) Existing Growth Areas, and 3) Undeveloped Growth Areas. Existing

demands cover current, year 2003, for the whole system. This includes areas that are completely developed to areas just starting to develop. Existing growth covers changes in sections of the City including areas that are partially developed or have planned redevelopment for model years 2010 and 2025. It also covers the impact of sprinkler system addition to established areas. Undeveloped growth covers planned and anticipated start-up development for model years 2010 and 2025.

The following demand discussions are coordinated with customer and demand projections detailed in Part I of this Master Plan. Allocation of projected demand takes the global overall demand projection and applies the demand to model nodes.

1. Existing Demand

Re-allocation of year 2003 demand is accomplished by linking the billing address data and Wichita Customer Information System (CIS) data through GIS to the model and assigning the average day metered water use plus non-revenue water to skeletonized nodes in the model. These average day metered use values represent a starting point for the model demand. Since the CIS bills customers on metered use, non-revenue is not included in the demands. Twelve percent is added to the reallocated model demands. These adjusted demand values are then used in the model, with global adjustments to match total demand, to verify the model as discussed later in this section.

Maximum day, peak hour and minimum hour demands for 2003 are developed for each node based on the 2003 adjusted average day demand and the associated diurnal factors for each pressure zone. The resulting maximum day, peak hour and minimum hour demands for 2003 evaluate the existing system and identify system strengths and weaknesses discussed later in this section. These factors are also projected for the years 2010 and 2025 hydraulic analyses.

2. Existing Growth Areas (Model Years 2010 and 2025)

The existing growth area category represents sections of the City that are partially developed or have planned redevelopment. Established areas that could be impacted by the installation of sprinkler systems are also considered in this category.

Areas with partial development or planned redevelopment are determined based on the City's Comprehensive Plan and discussion with staff. Associated percent build-out values for model years 2010 and 2025 are developed. In conjunction with zoning information, current or anticipated, determine the number and types of additional development or customer data. Typical water use values for that type of development are then applied as discussed in Part I.

3. Undeveloped Growth Areas

The undeveloped growth area category represents sections of the City that have initiated developed or are anticipated to develop by model years 2010 and 2025. Development areas are determined based on the City's Comprehensive Plan and discussion with staff as shown in Figure I-1. Associated percent build-out for model years 2010 and 2025 are developed in conjunction with zoning information, current or anticipated, determine the number and types of additional development or customer data. Typical water use values for that type of development are then applied as discussed in Part I.

D. FIELD TESTING

Daily continuous water system operating data was collected by several automatic means with City staff from August 11 through august 18, 2003. This data is used to verify the calibration of the year 2003 hydraulic model of the distribution system within 5 psi. City staff provided electronic data on pumps, storage and system pressure from their SCADA system and additional pressure recorders. Burns & McDonnell installed another ten pressure recorders to collect additional data. Data was obtained from the following locations:

- Storage:
  - Hess clearwell level
  - Webb Road clearwell level
  - Roosevelt tower level
  - Woodlawn tower level
- Pumps:
  - Pump status for all pumps
  - Hess north suction and discharge pressure and flow

- Hess south suction and discharge pressure and flow
- Webb EPZ suction and discharge pressure and flow
- Webb NEPZ suction and discharge pressure and flow
- 37th Street suction and discharge pressure and flow

- System Pressure:
  - 39th and Webb
  - 56th and Meridian
  - 21st and Zoo
  - 21st and Sun Ridge
  - 151st and Hendryx
  - Maple and Arapaho
  - Hoover and Oatville
  - 57th and Hydraulic
  - Pawnee and Ellis
  - Harry and Governeour – EPZ and HPZ
  - Mt. Vernon and Windsor
  - Central and Main
  - 13th and Tyler
  - Kellog and Webb
  - Seneca and MacArthur
  - 34th and Webb
  - 127th Street east and 21st Street north
  - 1500 North Spring
  - Linden and Central
  - 17th Street and Homestead
  - Goebel and Central
  - Wassel and Rock
  - Quail and Mountain
  - Flint Hills and Prairie Point

An hourly summary of the field data and continuous plots of flow and pressure are provided in the Field Test Data portion within Appendix D.

E. MODEL VERIFICATION

GIS is used to build the model as well as develop data in a format that will be useful to the City as they expand their water distribution system. Utilizing GIS as the foundation for the water distribution system study, not only allows for efficient completion of the study but allows the City to utilize the most current information available to them in the future. As a result of the modeling process, a cleaned and topologically correct set of GIS files are developed that represent the City's water distribution system. These files include the actual pipes in the distribution system, the valves, the hydrants, the pumps, the reservoirs, and the tanks. Each of these files is created in ArcView and are in the shapefile format. These files are readily usable by the City and also allow the City to simply import the information from a shapefile into a geodatabase in ArcGIS. The result is a readily updateable and completely open set of files that can be edited and adapted to the City's changing system and future needs.

H2OMAP Water 5.0 by MWH Soft, Inc. is used as the modeling software for this Project. Changes in H2OMAP and GIS are seamless; changes in the software are made immediately in the model.

Model inputs include the following:

- GIS file of the water pipe, valves, and fire hydrants.
- Pump station configuration, pump curves and storage tank data.
- Distribution of actual year 2002 average day demands across the system based on the City's electronic customer usage data sorted by address and assigned to the closest node as discussed above.
- Distribution of future water demand within the water service area boundary based on projections as discussed above.
- Elevation at each node and represents the intersection of two or more pipes. Elevations are based on USGS electronic contour maps available from the USGS.
- Control parameters for future EPS analysis.

Hazen Williams C-values represent the relative roughness of the pipes. Since the model calibration is adequate, C-values in the existing model are used for existing pipes. C-values for proposed pipes are used as follows:

- All PVC pipe at 140.

- All new ductile iron pipe 16-inch and larger at 130.
- All new ductile iron pipe 12-inch and smaller at 120.

Calibration of the model is based on the existing piping system. Elevations are not adjusted to verify model calibration, but demand distribution and primarily C-values are adjusted to achieve test results within about 5 psi at each node. During calibration, the model displayed consistently higher pressures than those recorded during the monitoring period in the East Pressure Zone, about 5 psi, as shown in Table IV-1. A global reduction of 10 for all C-values in the East Pressure Zone was integrated to achieve system pressures within 5 psi.

Verification of the model calibration data and results for the existing water distribution system are listed in Table IV-3. Review of Table IV-2 shows consistently high model discharge pressures at the north and south Hess booster pumps, about 100 psi at the pump discharge (pump elevation 1291 feet), versus recorded pressures of about 85 psi. In order to sustain system pressures at monitoring locations listed, more importantly at Central and Main, East Pressure Zone suction, and 37th Street Booster Station suction, the modeled discharge pressures at Hess Pump Station are ignored during calibration. A recorded pressure of 100 psi at the pump discharge equals a hydraulic grade line, HGL, of 1522 feet, which is above the system HGL at Central and Webb of 1511 feet. The elevation of the City's Hess discharge pressure transmitter is unknown.

Additionally, the Webb Road clearwell is not incorporated into the calibration model in order to accurately replicate discharges from Hess Pump Station, 37th Street Booster Station, and the northeast Webb Road Booster pumps. The Woodlawn and Roosevelt Storage Tanks were not in service; hence, they were not incorporated into the calibration model.

F. DIURNAL ANALYSIS

Pump flow and storage data for the field test period is evaluated to determine the daily variations in demand for the entire distribution system and the three pressure zones. Peak hour and minimum hour factors for the test period are summarized in Table IV-3. Review of the raw data shows the peak hour demand occurs between 6:00 and 8:00 a.m.

Table IV-1

WICHITA, KS WATER DISTRIBUTION SYSTEM
EAST PRESSURE ZONE CALIBRATION COMPARISON BETWEEN 1999 AND 2004 ROUGHNESS COEFFICIENTS

			Hess Pump Station			East Pressure Zone Webb Road BPS			East Pressure Zone Pressure Recorder and T-Log Locations						
Item	**Date**	**Time**	**N Discharge (psi)**	**S Discharge (psi)**	**Flow (MGD)**	**Suction (psi)**	**Discharge (psi)**	**Flow (MGD)**	**Goebel & Central (psi)**	**Wassel & Rock (psi)**	**Quail & Mountain (psi)**	**Flint Hills & Prairie Point (psi)**	***Kellog & Webb (psi)***	***Harry & Gov (psi)***	**127th St E & 21st N (psi)**
FIELD	**7/16/2004**	**12:00**	**80**	**81**	**90.2**	**49**	**63**	**13.3**	**58**	**47**	**55**	**69**	***57***	***71***	***67***
1999			99	99	90.1	46	64	13.3	63	52	68	79	63	72	66
2004			99	99	90.2	46	64	13.3	62	50	66	77	62	71	66
FIELD	**7/16/2004**	**18:00**	**84**	**84**	**112.3**	**52**	**58**	**12.1**	**52**	**42**	**54**	**65**	***54***	***67***	***58***
1999			107	107	112.5	53	60	12.1	61	50	66	72	61	71	62
2004			107	107	112.5	53	60	12.1	59	49	65	76	60	70	61
FIELD	**7/15/2004**	**6:00**	**85**	**86**	**135.4**	**45**	**54**	**19.1**	**40**	**29**	**38**	**51**	***41***	***54***	***53***
1999			106	106	135.4	41	54	19.0	45	25	42	52	40	46	54
2004			106	106	135.4	43	55	19.0	43	24	40	50	39	45	55
FIELD	**7/18/2004**	**0:00**	**83**	**83**	**65.4**	**55**	**66**	**8.9**	**66**	**62**	**72**	**82**	***67***	***83***	***70***
1999			104	104	65.5	56	67	8.9	70	63	79	90	72	83	69
2004			105	105	65.5	56	67	8.9	70	62	78	89	72	83	69
FIELD	**7/14/2004**	**18:00**	**83**	**83**	**105**	**53**	**54**	**11.2**	**50**	**42**	**53**	**64**	***52***	***66***	***55***
1999			103	103	105	50	50	11.2	52	42	58	70	53	63	52
2004			107	107	105	50	50	11.2	51	41	57	68	52	62	52

Notes:
1. This table is a comparison between modeled pressures with the 1999 and 2004 roughness coefficients in the East Pressure Zone.
2. The "FIELD" row consists of T-Log data from the City and field pressure recordings measured by Burns & McDonnell (bold type).
3. The "1999" calibration run includes all roughness coefficients from the 1999 Black & Veatch model (1999).
4. The "2004" calibration run incorporates a global reduction of 10 for all roughness coefficients in the East Pressure Zone (2004).
   Other changes include an increase in roughness coefficient on the Webb Road 20" transmission line from Central to Pawnee from 115 to 125.
5. Italicized locations indicate T-Log data provided by the City.

Table IV-2

WICHITA, KS WATER DISTRIBUTION SYSTEM
SUMMARY OF CALIBRATION/VERIFICATION

			Hess Pump Station			East Pressure Zone Webb Road BPS			NE Pressure Zone Webb Road BPS		37th Street BPS			515 39th & Webb (psi)	*510 34th & Webb (psi)*	3065 21st & Zoo (psi)	2572 Maple & Arapaho (psi)	*2676 13th & Tyler (psi)*	2797 151st & Hendryx (psi)	716 21st & Sun Ridge (psi)	2850 Hoover & Oatville (psi)	186 56th & Meridian (psi)	2383 57th & Hydraulic (psi)
Item	**Date**	**Time**	**N Discharge (psi)**	**S Discharge (psi)**	**Flow (MGD)**	**Suction (psi)**	**Discharge (psi)**	**Flow (MGD)**	**Discharge (psi)**	**Flow (MGD)**	**Suction (psi)**	**Discharge (psi)**	**Flow (MGD)**										
Field	7/16/2004	12:00	80	81	90.2	49	63	13.3	90	1.8	56	93	2.9	86	70	83	82	64	43	62	79	70	95
Model			99	99	90.2	46	64	13.3	90	1.7	53	97	2.9	80	74	79	83	60	37	62	82	67	99
Field	7/16/2004	18:00	84	84	112.3	52	58	12.1	90	3.9	57	90	1.2	84	68	85	80	63	40	60	80	70	95
Model			107	107	112.5	53	60	12.1	91	4.0	58	96	1.0	79	74	84	85	61	35	62	84	66	98
Field	7/15/2004	6:00	85	85	135.4	45	54	19.1	89	10.0	52	83	4.7	72	68	85	82	55	30	62	80	75	100
Model			106	106	135.4	43	55	19.0	83	10.0	45	81	4.4	63	58	82	83	58	31	59	81	60	97
Field	7/18/2004	0:00	83	83	65.4	55	66	8.9	77	0.04	58	84	5.0	64	57	85	84	71	52	73	87	74	105
Model			105	105	65.5	56	67	8.9	78	0.00	59	87	4.9	69	62	87	91	70	48	72	91	77	110
Field	7/14/2004	18:00	83	83	105	53	54	11.2	90	3.8	58	92	3.1	76	68	85	80	63	40	63	81	72	98
Model			107	107	105	50	50	11.2	94	4.0	53	99	2.7	83	77	81	83	60	34	61	82	65	97

Table IV-2

WICHITA, KS WATER DISTRIBUTION SYSTEM
SUMMARY OF CALIBRATION/VERIFICATION

Item	Date	Time	1381 Pawnee & Ellis (psi)	1219 Harry & Governeour (psi)	617 Mt. Vernon & Windsor (psi)	*2702 Central & Main (psi)*	*2420 Seneca & MacArthur (psi)*	*1219 Harry & Gov (psi)*	468 1500 N Spring (psi)	864 Linden & Central (psi)	1947 17th St & Homestead (psi)	987 Goebel & Central (psi)	1353 Wassel & Rock (psi)	7 Quail & Mountain (psi)	2775 Flint Hills & Prairie Point (psi)	*799 Kellog & Webb (psi)*	*1162 Harry & Gov (psi)*	1923 127th St E & 21st N (psi)
Field	7/16/2004	12:00	95	70	75	90	90	71	43	67	41	58	47	55	69	57	71	67
Model			90	70	78	92	92	70	44	67	41	62	50	66	77	62	71	66
Field	7/16/2004	18:00	95	75	75	93	87	75	41	65	39	52	42	54	65	54	67	58
Model			91	71	78	99	93	71	48	69	45	59	49	65	76	60	70	61
Field	7/15/2004	6:00	95	70	77	94	91	66	34	55	38	40	29	38	51	41	54	53
Model			86	64	72	97	88	64	37	60	33	43	24	40	50	39	45	55
Field	7/18/2004	0:00	95	80	83	94	99	77	47	70	43	66	62	72	82	67	83	70
Model			100	80	88	99	102	80	53	76	49	70	62	78	89	72	83	69
Field	7/14/2004	18:00	95	75	79	93	87	71	42	65	40	50	42	53	64	52	66	55
Model			90	69	77	95	91	69	44	67	41	51	41	57	68	52	62	52

and the minimum hour demand typically occurs between 1:00 and 4:00 a.m. The entire data set, in the form of a table and 32 daily graphs is included in Appendix D, Field Test Data.

Table IV-3

Peak Hour/Minimum Hour Factor Summary (%)

Date	Entire System	East PZ	Northeast PZ	Hess PZ
July 11, 2003	138/48	186/47	197/57	135/45
July 12, 2003	123/66	151/63	143/76	130/65
July 13, 2003	120/61	144/57	172/73	119/58
July 14, 2003	137/60	161/57	172/62	135/50
July 15, 2003	144/58	175/53	203/51	137/52
July 16, 2003	145/53	152/56	216/54	139/49
July 17, 2003	141/55	154/57	216/53	134/52
July 18, 2003	143/57	147/64	208/55	137/53

Review of Table IV-4 shows the EPZ has a peak hour factor 186 percent and a minimum hour factor of 47 percent. The NEPZ has a peak hour factor 216 percent and a minimum hour factor of 51 percent. The Hess PZ has a peak hour factor 139 percent and a minimum hour factor of 45 percent. Based on this data, the following factors will be used for model year 2010 and 2025 as listed in Table IV-4.

Table IV-4

Model Year 2010 and 2025

Peak Hour and Minimum Hour Diurnal Multipliers

Pressure Zone	Model Year 2010	Model Year 2025
East	1.8, 0.5	1.8, 0.5
Northeast	2.3, 0.5	2.3, 0.5
Hess	1.5, 0.5	1.5, 0.5

The 2010 and 2025 peak year multiplier for the East pressure zone is 1.8 because the EPZ boundary was moved from Webb Road to Edgemoor encompassing a large of amount of demand formerly in the HPZ. Since the peak hour multipliers for the HPZ and EPZ were

originally 2.0 and 1.5, respectively, the composite multiplier becomes 1.8 when demand from HPZ is incorporated with demand from the EPZ. This is discussed in further detail in Part V of this Master Plan.

Based on historical data, a maximum day to average day factor of 2.0 is used in this study. Details are discussed in Part I – Water Service Area and Demands section of this report.

Percent of water use in the system was also evaluated over the test period. The EPZ used 12 to 14 percent of the total demand. The NEPZ used 7 to 10 percent of the total demand. The Hess PZ used a total of 78 to 82 percent of the total demand, of which 70 percent was applied directly to the Hess PZ and 30 percent to the WPZ based on the model calibration.

Hydraulic analyses include the use of the computer model and engineering judgement to evaluate improvements and meet specific criteria for year 2010 and 2025 demand conditions. The following demand conditions are evaluated for the calibration, Year 2010, and Year 2025 model:

- Maximum day.
- Peak hour of the maximum day.
- Minimum hour plus tank replenishment.
- Maximum day plus fire flow.

Maximum day model runs reveal if the water source is sufficient and can be distributed throughout the system and maintain adequate pressures. Maximum day demand is 2.0 times the average day demand on a system wide basis. Peak hour runs test the adequacy of the storage facilities and the distribution system to supply temporary high rates of flow.

G. EQUALIZATION STORAGE

Total storage required in the water distribution system is the summation of equalization and fire storage. Equalization refers to water stored in tanks for use during peak periods or other periods where demand exceeds supply. Emergency storage refers to water for fires and system failures.

Equalization storage requirements are based on the maximum day demand. Calculations for equalization storage require the development of a diurnal curve, which requires continual source flow and tank level data over one or multiple 24-hour periods. Based on the diurnal data, equalization storage ranged from 8 to 11 percent of the daily demand for the entire system. Equalization storage ranged from 8 to 19 percent in the EPZ, from 4 to 17 percent in the NEPZ, and from 9 to 11 percent in the Hess PZ.

Based on this information, the total equalization storage required for year 2025 is 20 MG and fire flow storage is 0.63 MG, which equates to 3500 gpm for 3 hours. Total required storage equals about 21 MG, which is less than the 35 MG of storage at Hess. Therefore, no additional storage is required; however, elevated storage in a pressure zone provides a better control point and makes the pump stations easier to operate.

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Part V – Hydraulic Analyses and System Improvements

PART V – HYDRAULIC ANALYSES AND SYSTEM IMPROVEMENTS

A. GENERAL

This section of the report describes the results of the hydraulic analyses for Wichita's water distribution system. Analyses of water facilities are conducted to determine their capabilities to meet projected demand as well as their deficiencies with respect to supply, piping, storage, pumping, pressure, fire flow, and required improvements. The following guidelines are used to determine deficiencies:

- Distribution system pressure should be greater than 40 psi and less than 100 psi during all conditions.
- Distribution system pressure should be greater than 20 psi during a fire flow analysis.
- Pump stations should have firm capacity capable of pumping the peak hour demand on the maximum day at adequate pressure with the largest pump out of service in closed systems.
- Storage should be replenished completely over a 24-hour period and active storage replenished over an 8-hour period at night.
- Transmission pipeline velocities should be less than 5 feet per second and head loss less than 5 feet per 1,000 feet. Additional deficiencies such as insufficient fire flow, low pressure, or additional growth are typically required in addition to this guideline to justify pipe replacement.
- Evaluation of total head loss compared to the length of pipe.

System improvements for years 2010 and 2025 are coordinated with City staff known and anticipated replacement and development activities and the need to enhance system pressures and fire protection. These improvements are evaluated with the computer model and proposed improvements are recommended. If growth occurs faster than anticipated, implementation will need to be accelerated. If growth occurs at a slower rate, implementation can be delayed. The model should be used as a management tool to confirm implementation schedules in the future.

The skelotonized water distribution system has approximately 900 miles of pipe ranging from 4- to 120-inches in diameter. Future supply and transmission improvements will

alleviate City's low pressure and low fire flow issues in the West (WPZ) and East Pressure Zones (EPZ) and other areas with higher ground and small diameter pipe.

B. HYDRAULIC MODEL ANALYSIS

Three model scenarios including Calibration, Year 2010, and Year 2025, are evaluated for the following steady-state demand conditions to determine existing system capabilities, need, and location for additional supply, piping, storage, and pump stations:

- Maximum day.
- Peak hour of the maximum day.
- Minimum hour plus tank replenishment.
- Maximum day plus fire flow.

Distribution system improvement projects are verified with the computer simulations of the water system hydraulics and evaluation of the resulting flows, hydraulic grade lines, and pressures. Various combinations of improvements are analyzed to determine a means of meeting projected system growth and operating goals. Recommended improvements from the 1999 Water Master Plan were reviewed to ascertain their effectiveness, installation year, and physical placement in the model.

1. Calibration Model

The Calibration model, or existing system, was developed from the 1999 model. Roughness coefficients, or C values, were adopted from the 1999 hydraulic model. The main function of the Calibration model is to review pipe network connectivity, identify any orphan nodes or pipes imported from the GIS interface, and confirm the validity of the roughness coefficients.

The Hess (HPZ), EPZ, and Northeast (NEPZ) pressure zones are incorporated into the Calibration model. Maximum day, peak hour, and minimum hour demands are allotted to each pressure zone.

The Calibration model consists of the following:

- 4-inch – 2 miles
- 6-inch – 34 miles

- 8-inch – 365 miles
- 10-inch – 4 miles
- 12-inch – 232 miles
- 16-inch – 122 miles
- 20-inch – 56 miles
- 24-inch – 37 miles
- 30-inch – 7 miles
- 42-inch – 1 miles
- 48-inch – 11 miles
- Small segments of 60-, 72-, 84-, and 120-inch lines
- Hess Pump Station
- Webb Pump Station
- 37th Street Booster Pump Station (BPS)
- Woodlawn and Roosevelt Tanks (both out of service)

Model calibration is verified to City provided pressure recorder data collected in July 2003. Overall, the calibration is within 5 psi except in the southern portion of the EPZ, which is also an area that experiences low system pressure. C-values were decreased from several transmission mains to match recorded pressures within 5 psi. Furthermore, modeling shows the zone boundary pipe/valve at Harry and Governeour that separates the HPZ from the EPZ can be opened during the high demand season, mid-May through mid-September, to improve system pressures in the southwest portion of the existing EPZ.

2. Year 2010 Model

Proposed improvements in the Year 2010 model allow the City to provide a projected maximum day demand of 147.6 MGD (102,500 gpm). Low pressures between 10 and 20 psi occurred during maximum day and peak hour demands from Oliver to Webb and between 17th and Central, just south of the Woodlawn and Roosevelt tanks. Suction pressures at Webb Pump Station feeding the EPZ ranged from 28 to 31 psi. Therefore, the EPZ boundary is moved west from Webb Road to Edgemoor. The addition of the Southeast BPS and new HPZ

transmission mitigate low pressures in these areas, reduces the total demand in the HPZ, and increases suction pressure at Webb Pump Station to a normal operating range. Relocation of the EPZ boundary reduces the installation of new transmission mains about 23 miles, improves Webb suction pressures, and improves pressures to over 40 psi from Oliver to Webb and between 17th and Central.

As previously mentioned in Part IV, each pressure zone has its own demand and associated diurnal factors. When the EPZ was moved from Webb to Edgemoor, approximately 191 nodes from the HPZ were transferred to the EPZ. These nodes retained their respective demand and associated diurnal factors from the HPZ. By 2010, a total maximum day demand of 10.5 MGD is added to the EPZ for a total of 33 MGD and a peak hour demand of 57 MGD. As a result, the Southeast BPS and extensive transmission mains are required because Webb Road BPS (serving the EPZ) is only sized for 25 MGD and the Southeast BPS must supply the additional 32 MGD of year 2010 peak hour demand.

West and Far West Pressure Zones (WPZ, FWPZ) are incorporated in the 2010 model to sustain the increasing demand and growth occurring west of the "Big Ditch". The West and Far West BPS improve low pressures in these areas and prevent increased discharge pressure at the Hess BPS. Currently, the skelotonized model has approximately 6 locations where water is fed from the HPZ to the WPZ. During year 2010 peak hour demand, HPZ must deliver 20 MGD more than what it did in 2003 (33.7 MGD) through only two locations, the West BPS and the PRV Station. The large increase in demand and smaller number of entry points to the WPZ require a significant amount of transmission to the West BPS to meet high demands. This additional transmission is more cost effective than installing additional booster pump stations and eases operation.

Additional waterlines are in the planning, design, or installation process in 2004, primarily for new developments. City staff is in the process of planning or

installing new waterlines at the following locations to enhance pressures and fire flows:

- 1 MG Elevated Storage Tank in the NEPZ.
- 24-inch transmission line on 3rd Street, from about Broadway to Hydraulic (replacing an existing 16-inch).
- Replacing 4-inch lines across the City as apart of their Small Main Replacement Program.

Year 2010 system improvements, both internal and service area expansion, can be found in the Capital Improvements Program (CIP) found in Part VI of this Master Plan. Significant model improvements required by Year 2010 are listed below:

- Far West Pressure Zone:
    - Far West BPS – 3 MGD
- West Pressure Zone:
    - Pressure Reducing Station (PRV) at 21st and Zoo – shear head to about 66 psi.
    - 2 MG Elevated Storage Tank (West Tank, WPZ)
    - West BPS – 33.5 MGD
    - 30- and 36-inch transmission line from the West BPS to the Far West BPS.
- Hess Pressure Zone:
    - 24- and 36-inch transmission from the HPZ to the West BPS.
    - 30-, 36-, and 48-inch transmission from HPZ to the Southeast BPS.
- East Pressure Zone:
    - Southeast BPS – 36.0 MGD
    - 24-, 30-, 36-, and 42-inch transmission from the Southeast BPS into the EPZ.
- Northeast Pressure Zone:
    - New 37th Street BPS – 6.0 MGD

Efforts to incorporate the Woodlawn and Roosevelt Tanks were modeled. The tanks continued to stay submerged due to the high service pumps at Hess BPS. The only way to incorporate the tanks is to shut off pumps at Hess so the tanks are allowed to draft. This results in low suction pressures at Webb BPS, low pressure at Central and Main, low discharge pressures Hess BPS, system pressures in HPZ below 40 psi; therefore, both tanks are left out of service.

Modeling shows that the PRV Station must shear pressure to 66 psi (1478') (in the WPZ) during maximum day and peak hour demands. During the minimum hour demand, the PRV is closed because the downstream (WPZ) pressure is higher than the upstream (HPZ) pressure; this prevents reverse flow from occurring. In this scenario, only one pump at the West BPS is running and provides adequate system pressure for the entire WPZ.

Available fire flow for all nodes in the Calibrated and Year 2010 models are evaluated and flow contours are respectively shown in Figures V-1 and V-2. The Year 2010 model has 33 nodes with available fire flows less than 1,000 gpm, most of which are dead ends of small diameter pipe (4-, 6-, and 8-inch). There are 102 nodes with available fire flow between 1,000 and 1,500 gpm, and 141 nodes with fire flows between 1,500 and 2,000 gpm. This compares well to the Calibrated system which has 45 nodes with available fire flows less than 1,000 gpm, 99 nodes with available fire flow between 1,000 and 1,500 gpm, and 173 nodes with fire flows between 1,500 and 2,000 gpm. The low fire flows primarily occur on small diameter and dead-end mains.

3. Year 2025 Model

Proposed improvements in the Year 2025 model allow the City to provide a projected maximum day demand of 173.2 MGD (120,330 gpm) while improving pressures in low pressure areas, and increasing available fire flows in portions of the system near major improvements.

Significant Year 2025 model improvements include the following:

- Far West Pressure Zone:

Draft

North Tank (1MG)

Webb Road Pump Station

Woodlawn Tank (2 MG)

Roosevelt Tank (2 MG)

Hess Pump Station

Legend

Modeled Pipes

- Existing Mains; 2004
- Tanks
- Pumps
- Junctions
- Existing Pressure Zones
- 2010 - 2025 Pressure Zones

Road Centerlines

- Minor Roads
- Major Roads

Fire Flow Contours (GPM)

- 500
- 1000
- 1500
- 2000
- 2500
- 3000
- 3500
- 4000
- 4500
- 5000

NORTH

3,000 0 3,000 6,000 9,000 Feet

CITY OF WICHITA

Burns & McDonnell SINCE 1898

Figure V-1

2004 Fire Flow Contour Map

Wichita, KS
February 2005

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Draft

North Tank (1MG)

West Tank (2 MG)

PRV Station

Webb Road Pump Station

Woodlawn Tank (2 MG)

Roosevelt Tank (2 MG)

Hess Pump Station

West BPS

Far West BPS

Southeast BPS

Legend

Modeled Pipes

- Existing Mains
- Improvement Period 2010
- Tanks
- Junctions
- Pumps
- 2010 - 2025 Pressure Zones
- Existing Pressure Zones

Road Centerlines

- Minor Roads
- Major Roads

Fire Flow Contours (GPM)

- 500
- 1000
- 1500
- 2000
- 2500
- 3000
- 3500
- 4000
- 4500
- 5000

NORTH

3,000 0 3,000 6,000 9,000 Feet

Figure V-2

2010 Fire Flow Contour Map

Wichita, KS
February 2005

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    - Additional Far West booster pump station – total required capacity of 11.5 MGD.
- West Pressure Zone:
    - 30-MGD High Service Pump Capacity at 21st and Zoo (WTP 2).
    - Additional West booster pumps.
- Hess Pressure Zone:
    - Replace three pumps at Hess BPS.
    - 24- and 30-inch transmission to 37th BPS.
- East Pressure Zone:
    - Additional 37th Street booster pumps.
- Northeast Pressure Zone:
    - Additional Southeast booster pumps.

The PRV station should be reconfigured or adjusted to only supply emergency flow after the WPZ is fully developed and WTP 2 is constructed (about 2015). WTP 2 will mitigate the demand coming from Hess BPS and boost pressures in the HPZ.

Both Woodlawn and Roosevelt tanks are submerged. Other avenues to incorporate them into the 2025 model were explored but their use was limited to peak hour simulations. It is unlikely they will draft enough to maintain acceptable water quality. An extended period simulation can be performed to ascertain its real impact, good or bad, on the system.

Available fire flow for the Year 2025 model is evaluated and available fire flow contours developed as shown in Figure V-3. The Year 2025 model has 26 nodes with available fire flows less than 1,000 gpm, 72 nodes with available fire flow between 1,000 and 1,500 gpm, and 130 nodes with fire flows between 1,500 and 2,000 gpm. These values compare well the previously stated calibration model. By 2025, approximately 92% of the City (including service area expansion) can maintain fire flows above 2000 gpm.

Draft

North Tank (1MG)

West Tank (2 MG)

WTP2

Webb Road Pump Station

Woodlawn Tank (2 MG)

Roosevelt Tank (2 MG)

Hess Pump Station

West BPS

Far West BPS

Southeast BPS

Legend

Modeled Pipes

- Existing Mains
- Improvement Period 2010
- Improvement Period 2015
- Improvement Period 2025
- Tanks
- Junctions
- Pumps

Road Centerlines

- Minor Roads
- Major Roads
- Existing Pressure Zones
- 2010 - 2025 Pressure Zones

Fire Flow Contours (GPM)

- 500
- 1000
- 1500
- 2000
- 2500
- 3000
- 3500
- 4000
- 4500
- 5000

NORTH

3,000 0 3,000 6,000 9,000 Feet

CITY OF WICHITA

Burns & McDonnell SINCE 1898

Figure V-3

2025 Fire Flow Contour Map

Wichita, KS
February 2005

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C. SYSTEM IMPROVEMENTS

1. Supply

System improvements are developed for installation by years 2010 and 2025 as shown in Figure V-4. Primary improvements include transmission, pumping, and storage for installation by year 2010, 2015, or 2025 as shown in Figure V-4. Significant improvements are summarized above and discussed in more detail in Part VI of this Master Plan.

By the year 2025, maximum day and peak hour demands are approximately 1.3 and 1.7 (289.5 MGD) times that of the existing demands. The year 2025 peak hour demand of 289.5 MGD exceeds the 215 MGD capacity of Hess pump station. Even at full capacity, the existing high service pumps at Hess are not capable of producing sufficient pressures throughout the City. The 21st and Zoo WTP should be capable of producing at least 15 MGD and equipped with a high service pump station capable of delivering 30 MGD to the WPZ. This sustains pressure during maximum day and peak hour demands in the WPZ and FWPZ and provides ample fire flow in combination with other improvements.

2. Piping

The existing system performs adequately to meet most of the systems pressures and fire flows. However, the system is undersized to meet the extensive growth and projected demands for the service area, future EPZ, WPZ, and FWPZ. Incorporating a larger EPZ, a new WPZ, and a new FWPZ requires a significant amount of transmission during times of maximum and peak hour demands. New transmission lines alleviate large amounts of headloss and low pressures that occur in the system. Improvements within the City (internal) such as dedicated transmission to booster stations or parallel mains are a higher priority than new transmission (external) dedicated to future service area expansion. The internal improvements are required to provide water to the future service areas.

3. Storage

Wichita storage includes Woodlawn and Roosevelt 2-MG elevated storage tanks (not in service), clearwells with 35 MG capacity at Hess BPS, and a 10-MG

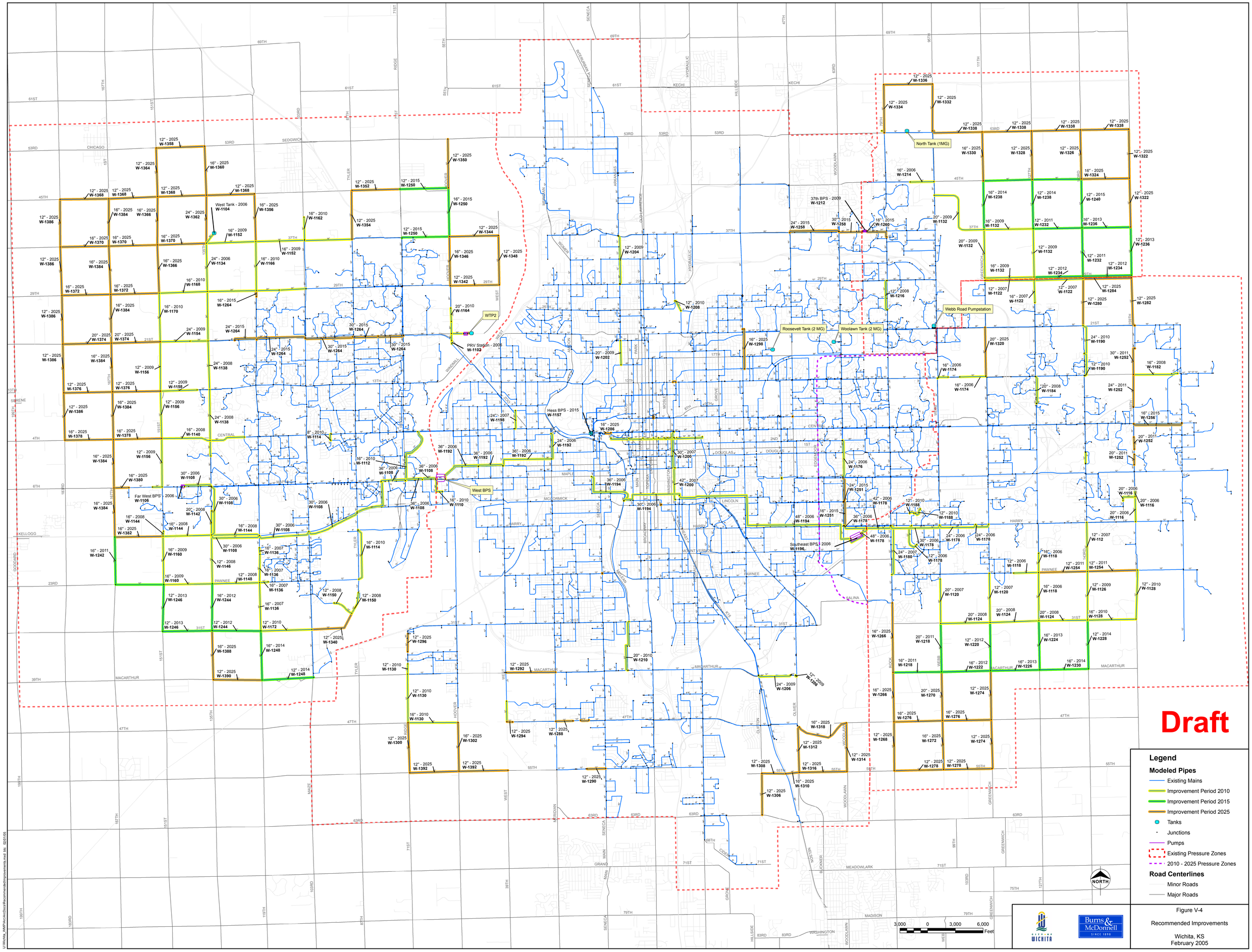

Figure V-4

Recommended Improvements

Wichita, KS
February 2005

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clearwell at Webb BPS. The City of Wichita is constructing a new 1-MG elevated storage tank in the NEPZ and is scheduled for completion in 2005. Projected increases in demand and population growth in the WPZ require a 2-MG elevated storage tank near 135th W. and 37th N.

All improvements are shown in Figure V-4. Construction of the proposed West tank is a priority and should be coordinated with the development of the WPZ. The hydraulic model recommends the following tank parameters:

- Installation of a new 2-MG elevated tank in the WPZ in 2007.
- Overflow elevation of about 1495 feet with a height of 126 feet (to overflow), and a head range of 40 feet.
- This tank is required to help meet the peak hour equalization flows of about 5,000 gpm modeled in year 2010 and improve fire flow reliability.

4. Pumping

Wichita's existing water system includes Hess, Webb, and the 37th Street Pump Station. The existing pumps at Webb Pump Station that serve the NEPZ and EPZ are capable of providing maximum day and peak hour flows through 2025. 37th Street and Hess pumps are not sufficient to meet future demands. 37th Street Pump Station is scheduled for replacement by 2009. Existing Hess pumps are incapable of sustaining adequate pressures, above 40 psi, in the HPZ during year 2025 maximum day and peak hour demands; therefore three pumps need to be replaced at Hess Pump Station, probably about year 2015 depending on the rate of growth and changes in water use trends.

New booster pump stations are required for the WPZ, FWPZ, and the Southeast BPS for the EPZ as shown in Figure V-4. The Far West BPS will be installed by summer 2005 to improve low summer peak hour pressure, about 25 psi, which were experienced in 2003 and 2004. The West BPS is required by 2007 to develop the WPZ and reduce discharge pressure requirements at Hess pump station. The Southeast BPS is required by 2006 to improve system pressures from Olive to Webb and between 17th and Central, which is currently in the HPZ.

The development of the new EPZ boundary (Edgemoor) will encompass this area.

5. Water Quality

Wichita's water distribution system has a number of dead-ends. Connection of these dead-ends improves system pressure, fire flow and water quality. Most of the dead-end mains are not connected with the improvements discussed above because of their low priority at this point. Periodic flushing of these dead-end mains may help maintain water quality.

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Part VI – Conclusions and Recommendations

PART VI – CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL

This section of the report discusses conclusions, opinions of probable cost, and schedule for recommended improvements to the Wichita water distribution system as shown in Figure V-4. Improvements are tagged for their desired year in service through 2015. Improvements required between year 2016 and 2025 are service area improvements (external) with the exception of additional pumps to be added at the Far West, West, Southeast, and 37th Street BPSs and replaced at Hess. Several key improvements are desired in the immediate future.

Recommend improvements are based on engineering need to meet year 2010 and 2025 projected demand. These improvements are allocated to complete major projects and assure water delivery. Due to the large number of significant improvements required to meet projected demands, especially peak hour, additional simulations are recommended for years 2006, 2007, 2008, and 2009 to optimize the CIP and determine what combination of pipes, pumps and storage were required to meet projected demand through 2010.

B. CONCLUSIONS

1. Supply

Wichita has a water supply capacity of 215 MGD at Hess Pump Station. This is adequate water supply to meet the year 2025 projected maximum day demand of 173 MGD, but is incapable of sustaining reasonable pressures throughout the distribution system or delivering the needed amount of water to the Southeast BPS, West BPS, or Webb BPS while maintaining the desired discharge pressure. Demands could be met at higher discharge pressures; however, this could lead to extensive breaks in the larger and older lines in the downtown area. This is more evident during peak hour simulations in which the system demand is 289 MGD which is much greater than the current water supply.

2. Pump Stations

Installation of the Far West BPS is scheduled for 2005. This will create the FWPZ and provide an expandable 2.3 MGD capacity BPS. The second priority is the Southeast BPS in 2006. Development of the WPZ is the next priority and includes the West BPS, West Tank (2 MG capacity), and PRV Station at 21st and Zoo (on the 36-inch dedicated transmission line from HPZ) and is scheduled in the CIP for year 2007.

The Central Water Plant has a maximum day capacity of 160 MGD. By 2015, a deficit in capacity is projected to occur. By 2025, the deficit is projected to be 13.4 MGD; therefore, a 15 MGD WTP at 21st and Zoo is recommended to be operational about year 2015. A 30-MGD high service pump station is proposed to meet the year 2025 peak hour demand of 289 MGD. When the high service pump station goes into service, the PRV Station should be modified for use during emergency service.

The 37th Street Booster pumps can remain on line until they are unable to deliver the required head and flow which is anticipated to occur before 2010. A new 6.0-MGD pump station will be required about 2009.

The above mentioned booster pump stations should be built with empty slots to accommodate future pumps between years 2016 and 2025. This will provide the system with an economical pump station that is easily accessed and can be connected to the existing SCADA system with similar monitoring practices such as the control point at Central and Main for Hess Pump Station.

3. Storage

Installation of the West elevated storage tank is a high priority and should be implemented with the development of the WPZ. The development of the WPZ is scheduled in the CIP for 2007.

4. Piping and Transmission

Due to the increasing demand in the WPZ and the expansion of the EPZ, new transmission lines within the HPZ leading to the Southeast and West BPSs are of the highest priority by the year 2010. Beyond that, transmission leading from the new booster stations is the next priority. Internal system and external service area improvements will follow the above mentioned piping improvements. These projects will improve system flow, available fire flow, and replace older pipelines. Pipelines could be installed in conjunction with road improvement projects.

C. OPINIONS OF PROBABLE COST

Opinions of project cost are based on construction and other cost allowances including contingency, engineering, surveying, legal and other related costs are summarized in Table VI-1. Unit cost data and component cost information for the proposed improvements are based on historical projects and vendor's cost information. Unit costs are based on an Engineering News Record Construction Cost Index of 7900.16 for Kansas City for January 2005.

Project costs include construction costs, contingencies, land, right-of-way, and other costs. The unit cost for pipeline projects is based on review of historical data and result in the following:

- Pipelines in city (internal) at $8.00 – $12.00 per inch diameter per lineal foot, includes removal and replacement.
- Cross-country pipelines (external, service area improvements) at $6.00 – $11.00 per inch diameter per lineal foot.
- Contractor cost is based on an 8-inch equivalent cost of $46.00 per lineal foot in 2005 including contingency, engineering, and other costs.
- Contingency of 25 percent.
- Engineering and other costs at 15 percent.
- CIP adjusted at an inflation of 4 percent per year.

Other costs accounts for technical, professional, and special services are required to execute the project. These include environmental, technical, and geotechnical studies;

land and right-of-way appraisals and negotiations, design and resident engineering fees, construction material testing, legal fees, project insurance, land surveying and legal descriptions, project design surveying, operation and maintenance manuals, and personnel training. Land and right-of-way costs for each improvement are not included in the cost opinions.

These order-of-magnitude cost opinions are based on experience and judgement as a professional consultant combined with information from past experience, vendors, and published sources, such as Means. Since Burns & McDonnell has no control over weather, cost and availability of labor, material and equipment, labor productivity, construction contractor's procedures and methods, unavoidable delays, construction contractor's method of pricing, economic conditions, government regulations and laws, competitive bidding or market conditions and other factors affecting such opinions or projection, Burns & McDonnell does not guarantee the actual rates, costs, etc. will not vary from the opinions and projections developed herein.

Review of Table VI-1 shows the following:

- Total Year 2010 cost of $120.4 million, $83.5 million for internal improvements, and $37.0 million for external improvements.
- Total Year 2015 cost of $46.3 million, $26.5 million for internal improvements, and $19.8 million for external improvements.
- Total Year 2025 cost of $19.3 million, $3.9 million for internal improvements, and $64.3 million for external improvements.

D. RECOMMENDATIONS

Recommended improvements are detailed in Part V of this report and are discussed above. Review of Table VI-1 (CIP) shows the following costs for improvements and schedule of the year by which improvements should be installed. Actual installation year can vary based on the developer, rate of growth, water use, weather conditions, and other factors. Major improvements by the year 2010, 2015, and 2025 per pressure zone are listed in the CIP.

Table VI-1

Water Master Plan
Capital Improvement Program

Wichita, Kansas

Year / Location[5]	CIP No. (W-)	Pressure Zone	Title	Type[1]	Pipe No.	Pipe Diameter (inch)	Length (LF)	Unit Cost	Base Cost	Specials	Cost of Specials	Contingency & Other Costs[4]	Opinion of Probable Cost	CIP Year	Adjusted CIP Opinion of Probable Cost[2]	Developer Portion[3]	City Portion
2010																	
Internal	**1116**	**E**	on 159th E., from Harry to existing 20" (P901) just south of Kellogg	R/P	P13931, P13929, P13930	20	5,319	160	850,000			374,000	**1,224,000**	**2006**	1,273,000	0	**1,273,000**
Internal	**1174**	**E**	on 13th E., from Webb to existing 16" (P4085) - from that line to Greenwich	R/P	P13840, P13837	16	4,004	140	560,000			246,000	**806,000**	**2006**	840,000	0	**840,000**
Internal	**1176**	**E**	on Woodlawn, from Kellogg to existing 12" (P1421) just south of Central	R/P	P13935	24	4,078	190	770,000			339,000	**1,109,000**	**2006**	1,150,000	0	**1,150,000**
Internal	**1178**	**E**	on Harry, from SE BPS to Woodlawn	R/P	463	36	2,646	310	820,000			361,000	**1,181,000**	**2006**	1,230,000	0	**1,230,000**
Internal	**1178**	**E**	on Harry, from SE BPS to Rock	R/P	307	42	2,780	370	1,030,000			453,000	**1,483,000**	**2006**	1,540,000	0	**1,540,000**
Internal	**1178**	**E**	SE BPS Discharge Line	R/P	465	48	928	470	440,000			194,000	**634,000**	**2006**	660,000	0	**660,000**
Internal	**1178**	**E**	on Harry, from Rock to Webb	R/P	309	30	5,634	230	1,300,000			572,000	**1,872,000**	**2006**	1,950,000	0	**1,950,000**
Internal	**1178**	**E**	on Harry, from Webb to Greenwich	R/P	311, 329	24	5,935	190	1,130,000			497,000	**1,627,000**	**2006**	1,690,000	0	**1,690,000**
Internal	**1180**	**E**	on Rock, from Harry to Pawnee	R/P	245	24	5,553	190	1,060,000			466,000	**1,526,000**	**2007**	1,650,000	0	**1,650,000**
Internal	**1182**	**E**	on 13th E., from 159th E. to Rose Hill Rd.	R/P	P13812	16	4,817	140	670,000			295,000	**965,000**	**2008**	1,090,000	0	**1,090,000**
Internal	**1184**	**E**	on 127th E., from 13th E. to existing 16" (P1325) just north of Central	R/P	P13938	20	2,973	160	480,000			211,000	**691,000**	**2008**	780,000	0	**780,000**
Internal	**1186**	**E**	between Webb and Rock and south of Harry	R/P	241	12	3,093	100	310,000			136,000	**446,000**	**2008**	500,000	0	**500,000**
Internal	**1188**	**E**	between Webb and Rock and north of Harry	R/P	247, 249	12	1,716	100	170,000			75,000	**245,000**	**2010**	300,000	0	**300,000**
Internal	**1190**	**E**	on 143rd, between 13th and 21st	R/P	403	24	3,400	190	650,000			286,000	**936,000**	**2010**	1,140,000	0	**1,140,000**
Internal	**1190**	**E**	on 143rd, between 13th and 21st	R/P	405	12	2,658	100	270,000			119,000	**389,000**	**2010**	470,000	0	**470,000**
Internal	**1192**	**H**	on Meridian, from existing 36" (P3772) just south of Central to existing 36" (Pipe 457 - 1st maybe)	R/P	189	24	2,928	190	560,000			246,000	**806,000**	**2006**	840,000	0	**840,000**
Internal	**1192**	**H**	on 1st (maybe), from Meridian to N. West	R/P	319	36	5,861	310	1,820,000			801,000	**2,621,000**	**2006**	2,730,000	0	**2,730,000**
Internal	**1192**	**H**	on Douglas (maybe), from West to existing 24" (P2682) just east of US 235	R/P	323	36	2,808	310	870,000			383,000	**1,253,000**	**2006**	1,300,000	0	**1,300,000**
Internal	**1192**	**H**	on Douglas (maybe), from existing 24" (P2681) to Maple BPS	R/P	181	36	4,554	310	1,410,000	river crossing	400,000	796,000	**2,606,000**	**2006**	2,710,000	0	**2,710,000**
Internal	**1193**	**H**	on 47th S., from West St. to Hoover	R/P	513	16	5,291	140	740,000	river crossing	400,000	502,000	**1,642,000**	**2006**	1,710,000	0	**1,710,000**
Internal	**1194**	**H**	Dedicated line to SE BPS	R/P	173	36	6,411	310	1,990,000			876,000	**2,866,000**	**2006**	2,980,000	0	**2,980,000**
Internal	**1194**	**H**	Dedicated line to SE BPS	R/P	385	30	6,817	230	1,570,000			691,000	**2,261,000**	**2006**	2,350,000	0	**2,350,000**
Internal	**1194**	**H**	Dedicated line to SE BPS	R/P	373	48	23,413	470	11,000,000	highway crossing	920,000	5,245,000	**17,165,000**	**2006**	17,850,000	0	**17,850,000**
Internal	**1196**	**H**	SE BPS	R/P	-	-	-						**3,620,000**	**2006**	3,760,000		
Internal	**1198**	**H**	on Kessler, from Zoo Blvd. to Central	R/P	461	24	1,995	190	380,000			167,000	**547,000**	**2007**	590,000	0	**590,000**
Internal	**1200**	**H**	from N158 to N1805	R/P	423	30	4,145	230	950,000			418,000	**1,368,000**	**2007**	1,480,000	0	**1,480,000**
Internal	**1200**	**H**	from N2038 to N2506	R/P	383	42	3,531	370	1,310,000			576,000	**1,886,000**	**2007**	2,040,000	0	**2,040,000**
Internal	**1202**	**H**	Southwest of 21st and Broadway	R/P	P13850	20	2,622	160	420,000			185,000	**605,000**	**2009**	710,000	0	**710,000**
Internal	**1204**	**H**	West of N. Broadway, from 29th N. to 37th N.	R/P	P13851	12	5,246	100	520,000			229,000	**749,000**	**2009**	880,000	0	**880,000**
Internal	**1206**	**H**	Line to Boeing Facility	R/P	195	24	3,525	190	670,000			295,000	**965,000**	**2009**	1,130,000	0	**1,130,000**
Internal	**1206**	**H**	Line to Boeing Facility	R/P	197	12	247	100	20,000			9,000	**29,000**	**2009**	34,000	0	**34,000**
Internal	**1208**	**H**	Southeast of 29th and Broadway	R/P	P13847	12	1,296	100	130,000			57,000	**187,000**	**2010**	230,000	0	**230,000**
Internal	**1210**	**H**	south of Broadway, from 31st S. half way to MacArthur	R/P	467	20	5,733	160	920,000			405,000	**1,325,000**	**2010**	1,610,000	0	**1,610,000**
Internal	**1214**	**NE**	on 45th N., from Webb to existing 16" (P3761) just East of Rock Rd.	R/P	P13835	16	2,583	140	360,000			158,000	**518,000**	**2006**	540,000	0	**540,000**

Table VI-1

Water Master Plan
Capital Improvement Program

Wichita, Kansas

Year / Location[5]	CIP No. (W-)	Pressure Zone	Title	Type[1]	Pipe No.	Pipe Diameter (inch)	Length (LF)	Unit Cost	Base Cost	Specials	Cost of Specials	Contingency & Other Costs[4]	Opinion of Probable Cost	CIP Year	Adjusted CIP Opinion of Probable Cost[2]	Developer Portion[3]	City Portion
Internal	**1216**	**NE**	on Rock, from 29th N. to existing 12" (P354) just north of 21st N.	R/P	223	12	3,325	100	330,000			145,000	**475,000**	**2008**	530,000	0	**530,000**
Internal	**1212**	**NE**	37th BPS	R/P	-								**1,540,000**	**2009**	1,800,000		
Internal	**1100**	**W**	Maple BPS	-	-								**2,770,000**	**2006**	2,880,000	0	**2,880,000**
Internal	**1102**	**W**	PRV Station	-	9007				50,000				**50,000**	**2006**	50,000	0	**50,000**
Internal	**1104**	**W**	West Tank	-	7002				3,000,000				**3,000,000**	**2006**	3,120,000	0	**3,120,000**
Internal	**1106**	**W**	Far West BPS	-	-								**600,000**	**2006**	620,000	0	**620,000**
Internal	**1108**	**W**	on Maple, Woodchuck and Kellogg, from Hoover St. to Tyler	R/P	315, 317, 325	36	12,045	310	3,730,000			1,641,000	**5,371,000**	**2006**	5,590,000	0	**5,590,000**
Internal	**1108**	**W**	on Kellogg, from Tyler to 135th	R/P	273, 431, 433	30	17,181	230	3,950,000			1,738,000	**5,688,000**	**2006**	5,920,000	0	**5,920,000**
Internal	**1108**	**W**	135th, from Kellogg to Maple	R/P	435	30	5,569	230	1,280,000			563,000	**1,843,000**	**2006**	1,920,000	0	**1,920,000**
Internal	**1108**	**W**	on Maple, from 135th to Kennedy	R/P	353	30	3,098	230	710,000			312,000	**1,022,000**	**2006**	1,060,000	0	**1,060,000**
Internal	**1110**	**W**	south of Maple BPS	R/P	327	16	1,999	140	280,000			123,000	**403,000**	**2010**	490,000	0	**490,000**
Internal	**1112**	**W**	on Ridge, from Maple to Central	R/P	277	16	6,567	140	920,000			405,000	**1,325,000**	**2010**	1,610,000	0	**1,610,000**
Internal	**1114**	**W**	on Tyler, from Harry to Pawnee	R/P	271	16	5,715	140	800,000			352,000	**1,152,000**	**2010**	1,400,000	0	**1,400,000**
Internal	**1114**	**W**	off Central between Tyler and Maize	R/P	355	8	797	80	60,000			26,000	**86,000**	**2010**	105,000	0	**105,000**
External	**1118**	**E**	on 127th E., from Pawnee to existing 16" (P3675)	New	P13923	16	2,075	110	230,000			101,000	**331,000**	**2006**	340,000	100,000	**240,000**
External	**1118**	**E**	on Pawnee, from existing 12" (P1687) to 127th E.	New	P13922	12	2,681	80	210,000			92,000	**302,000**	**2006**	310,000	130,000	**180,000**
External	**112**	**E**	on 143rd E., from Harry to 31st S.	New	P13925	12	5,295	80	420,000			185,000	**605,000**	**2007**	650,000	260,000	**390,000**
External	**1120**	**E**	on Greenwich, from Pawnee to 31st S.	New	P14043	12	5,317	80	430,000			189,000	**619,000**	**2007**	670,000	260,000	**410,000**
External	**1120**	**E**	on Webb, from Pawnee to 31st S.	New	P14042	20	4,805	130	620,000			273,000	**893,000**	**2007**	970,000	240,000	**730,000**
External	**1122**	**E**	on 29th N., from Greenwich to 143rd E.	New	P14074, P14073	12	10,636	80	850,000			374,000	**1,224,000**	**2007**	1,320,000	530,000	**790,000**
External	**1122**	**E**	on 127th E., from 29th N. to existing 16" (P1516) north of 21st E.	New	P14075	16	2,437	110	270,000			119,000	**389,000**	**2007**	420,000	120,000	**300,000**
External	**1124**	**E**	on 127th E., from 31st S. to Pawnee	New	P14044	16	5,223	110	570,000			251,000	**821,000**	**2008**	920,000	270,000	**650,000**
External	**1124**	**E**	on 31st S., from Webb to 143rd E.	New	P14045, P14046, P14050	20	15,910	130	2,070,000			911,000	**2,981,000**	**2008**	3,350,000	820,000	**2,530,000**
External	**1126**	**E**	on 143rd E., from Harry to 31st S.	New	P14053	12	5,277	80	420,000			185,000	**605,000**	**2009**	710,000	280,000	**430,000**
External	**1128**	**E**	on 159th E., from Pawnee to 31st S.	New	P14052	12	5,320	80	430,000			189,000	**619,000**	**2010**	750,000	300,000	**450,000**
External	**1128**	**E**	on 31st S., from 143rd E. to 159th E.	New	P14051	16	5,248	110	580,000			255,000	**835,000**	**2010**	1,020,000	290,000	**730,000**
External	**1130**	**H**	on Ridge, from 47st S. to existing 16" (P2205) just north of MacArthur	New	P13899, P14007	12	6,376	80	510,000			224,000	**734,000**	**2010**	890,000	360,000	**530,000**
External	**1130**	**H**	on 47th S., from Ridge to S. West	New	P14008	16	5,402	110	590,000			260,000	**850,000**	**2010**	1,030,000	300,000	**730,000**
External	**1132**	**NE**	Between 37th N. and 45th N. to 37th N. and Greenwich - south on Greenwich to 29th N.	New	501, P13831	20	13,904	130	1,810,000			796,000	**2,606,000**	**2009**	3,050,000	750,000	**2,300,000**
External	**1132**	**NE**	on 37th N., from Greenwich to 127th E.	New	P13822	16	5,332	110	590,000			260,000	**850,000**	**2009**	990,000	290,000	**700,000**
External	**1132**	**NE**	on 29th N., from Greenwich to 127th E.	New	P13825	16	5,338	110	590,000			260,000	**850,000**	**2009**	990,000	290,000	**700,000**
External	**1132**	**NE**	on 127th E., from 37th N. to 29th N.	New	P13829	12	5,245	80	420,000			185,000	**605,000**	**2009**	710,000	280,000	**430,000**
External	**1134**	**W**	on 135th W., from 29th N. to 37th N.	New	P13864	24	5,237	160	840,000			370,000	**1,210,000**	**2006**	1,260,000	250,000	**1,010,000**
External	**1136**	**W**	on 119th W., from 31st S. to existing 16" (P4217) just south of Kellogg (US 54)	New	P13890, P13889, P13891	16	4,712	110	520,000			229,000	**749,000**	**2007**	810,000	230,000	**580,000**
External	**1136**	**W**	on 119th W, from Pawnee to 31st S.	New	P14003	16	5,238	110	580,000			255,000	**835,000**	**2007**	900,000	260,000	**640,000**
External	**1138**	**W**	on 135th W., from 21st N. to Central W.	New	P13875, P13878	24	10,782	160	1,730,000			761,000	**2,491,000**	**2008**	2,800,000	560,000	**2,240,000**
External	**1140**	**W**	on Central, from 151st W. to 135th W	New	P13879	16	5,295	110	580,000			255,000	**835,000**	**2008**	940,000	270,000	**670,000**
External	**1142**	**W**	on 135th W., from Kellogg (US 54) to existing 16" (P3701)	New	P13882	20	2,604	130	340,000			150,000	**490,000**	**2008**	550,000	130,000	**420,000**

Table VI-1

Water Master Plan
Capital Improvement Program

Wichita, Kansas

Year / Location[5]	CIP No. (W-)	Pressure Zone	Title	Type[1]	Pipe No.	Pipe Diameter (inch)	Length (LF)	Unit Cost	Base Cost	Specials	Cost of Specials	Contingency & Other Costs[4]	Opinion of Probable Cost	CIP Year	Adjusted CIP Opinion of Probable Cost[2]	Developer Portion[3]	City Portion
External	**1144**	**W**	on Kellogg (US 54), from 135th W. to 119th W.	New	P13883, P13888, 107	16	11,041	110	1,210,000			532,000	**1,742,000**	**2008**	1,960,000	570,000	**1,390,000**
External	**1146**	**W**	on 135th W., from Kellogg (US 54) to Pawnee	New	P13887	12	5,268	80	420,000			185,000	**605,000**	**2008**	680,000	270,000	**410,000**
External	**1148**	**W**	on Pawnee, from 151st W. to existing 16" (P4070) just east of 119th W.	New	P13892	12	5,112	80	410,000			180,000	**590,000**	**2008**	660,000	260,000	**400,000**
External	**1150**	**W**	on S. Tyler, from existing 12" (P2494) to existing 12" (P2496) - just south of Pawnee	New	P13897, P13896	12	4,685	80	370,000			163,000	**533,000**	**2008**	600,000	240,000	**360,000**
External	**1152**	**W**	on 37th N., from 135th W. to Maize	New	P13856, P13857	16	10,638	110	1,170,000			515,000	**1,685,000**	**2009**	1,970,000	570,000	**1,400,000**
External	**1154**	**W**	on 21st N., from 151st W. to existing 24" (P4316)	New	P13870	24	3,232	160	520,000			229,000	**749,000**	**2009**	880,000	170,000	**710,000**
External	**1156**	**W**	on 151st W., from 21st N. to Maple	New	P13871, P13880, P13881	12	15,719	80	1,260,000			554,000	**1,814,000**	**2009**	2,120,000	850,000	**1,270,000**
External	**1158**	**W**	on 13th N., from 151st W. to existing 16" (P3904)	New	P13872	12	3,983	80	320,000			141,000	**461,000**	**2009**	540,000	210,000	**330,000**
External	**1160**	**W**	on 151st W., from Kellogg (US 54) to Pawnee	New	P13885, P13886	16	10,483	110	1,150,000			506,000	**1,656,000**	**2009**	1,940,000	560,000	**1,380,000**
External	**1162**	**W**	on Maize, 37th N.	New	P13941	16	2,437	110	270,000			119,000	**389,000**	**2010**	470,000	140,000	**330,000**
External	**1164**	**W**	on Hoover, north of 21st N.	New	P13852	20	1,442	130	190,000			84,000	**274,000**	**2010**	330,000	80,000	**250,000**
External	**1166**	**W**	on 119th W., from 29th N. to 37th N.	New	P13863	16	5,304	110	580,000			255,000	**835,000**	**2010**	1,020,000	300,000	**720,000**
External	**1168**	**W**	on 29th N., from 151st W. to 135th W.	New	P13977	16	5,226	110	570,000			251,000	**821,000**	**2010**	1,000,000	290,000	**710,000**
External	**1170**	**W**	on 151st W., from 29th N. to 21st N.	New	P13980	16	5,261	110	580,000			255,000	**835,000**	**2010**	1,020,000	290,000	**730,000**
External	**1172**	**W**	on 31st S., from 119th W. to Maize	New	P14004	12	5,534	80	440,000			194,000	**634,000**	**2010**	770,000	310,000	**460,000**
Internal Subtotal									**51,260,000**			**21,968,000**	**83,478,000**		**88,832,000**	**0**	**83,272,000**
External Subtotal									**25,660,000**			**11,292,000**	**36,952,000**		**42,310,000**	**12,680,000**	**29,630,000**
2010 Subtotal									**76,920,000**			**$33,260,000**	**$120,430,000**		**$131,142,000**	**$12,680,000**	**$112,902,000**
2015																	
Internal	**1252**	**E**	on 159th E., between 13th N and 21st N.	R/P	P13814	30	3,011	230	690,000			304,000	**994,000**	**2011**	1,260,000	0	**1,260,000**
Internal	**1252**	**E**	on 159th E., between 13th N and Central	R/P	P13813	24	3,494	190	660,000			290,000	**950,000**	**2011**	1,200,000	0	**1,200,000**
Internal	**1252**	**E**	on 159th E., between Central and Kellogg	R/P	P13932, P13933	20	2,443	160	390,000			172,000	**562,000**	**2011**	710,000	0	**710,000**
Internal	**1254**	**E**	on Pawnee, from 127th E. to 159th E.	R/P	P13924, P13928	12	10,732	100	1,070,000			471,000	**1,541,000**	**2011**	1,950,000	0	**1,950,000**
Internal	**1251**	**E**	on Woodlawn, from Harry to Lincoln	R/P	421	16	2,698	140	380,000			167,000	**547,000**	**2015**	810,000	0	**810,000**
Internal	**1251**	**E**	on Woodlawn, from Lincoln to Kellogg	R/P	P13936	24	2,715	190	520,000			229,000	**749,000**	**2015**	1,110,000	0	**1,110,000**
Internal	**1256**	**E**	on Central, from 159th E. to Rose Hill Rd.	R/P	P13934	16	5,370	140	750,000			330,000	**1,080,000**	**2015**	1,600,000	0	**1,600,000**
Internal	**1258**	**H**	on 37th N., from Oliver to Woodlawn	R/P	369	24	5,496	190	1,040,000			458,000	**1,498,000**	**2015**	2,220,000	0	**2,220,000**
Internal	**1258**	**H**	on 37th N., from Woodlawn to 37th BPS	R/P	215	30	2,683	230	620,000			273,000	**893,000**	**2015**	1,320,000	0	**1,320,000**
Internal	**1157**	**H**	Hess Booster Pumps	R/P	-	-	-						**6,610,000**				
Internal	**1260**	**NE**	on 37th N., from 37th BPS to Rock	R/P	217	16	2,827	140	400,000			176,000	**576,000**	**2015**	850,000	0	**850,000**
Internal	**1262**	**W**	WTP 2 30 MGD High Service Pump Station	-	7000	-	-						**4,590,000**	**2015**	6,790,000	0	**6,790,000**
Internal	**1264**	**W**	on 21st N., from Ridge to Maize	R/P	P13868, P13867, P13869	30	10,869	230	2,500,000			1,100,000	**3,600,000**	**2015**	5,330,000	0	**5,330,000**
Internal	**1264**	**W**	on 21st N., from Maize to existing 16" (P3905) just east of 119th W.	R/P	P13865, P13866	24	8,018	190	1,520,000			669,000	**2,189,000**	**2015**	3,240,000	0	**3,240,000**
Internal	**1264**	**W**	on 119th W., from 29th N. to existing 16" (P3771) north of 21st N	R/P	P13862	16	651	140	90,000			40,000	**130,000**	**2015**	192,000	0	**192,000**

Table VI-1

Water Master Plan
Capital Improvement Program

Wichita, Kansas

Year / Location[5]	CIP No. (W-)	Pressure Zone	Title	Type[1]	Pipe No.	Pipe Diameter (inch)	Length (LF)	Unit Cost	Base Cost	Specials	Cost of Specials	Contingency & Other Costs[4]	Opinion of Probable Cost	CIP Year	Adjusted CIP Opinion of Probable Cost[2]	Developer Portion[3]	City Portion
External	**1218**	**E**	on Webb, from 31st S. to MacArthur	New	P14038	20	5,248	130	680,000			299,000	**979,000**	**2011**	1,240,000	310,000	**930,000**
External	**1218**	**E**	on MacArthur, from Rock to 143rd E.	New	P14036	16	5,248	110	580,000			255,000	**835,000**	**2011**	1,060,000	310,000	**750,000**
External	**1220**	**E**	Greenwich, from 31st S. to MacArthur	New	P14040	12	5,215	80	420,000			185,000	**605,000**	**2012**	800,000	320,000	**480,000**
External	**1222**	**E**	on MacArthur, between Rock to 143rd E.	New	P14037	16	5,314	110	580,000			255,000	**835,000**	**2012**	1,100,000	320,000	**780,000**
External	**1224**	**E**	on 127th E., from 31st S. to MacArthur	New	P14047	16	5,314	110	580,000			255,000	**835,000**	**2013**	1,140,000	330,000	**810,000**
External	**1226**	**E**	on MacArthur, between Rock to 143rd E.	New	P14039	16	5,314	110	580,000			255,000	**835,000**	**2013**	1,140,000	330,000	**810,000**
External	**1228**	**E**	on 143rd E., from 31st S. to MacArthur	New	P14049	12	5,281	80	420,000			185,000	**605,000**	**2014**	860,000	350,000	**510,000**
External	**1230**	**E**	on MacArthur, between Rock to 143rd E.	New	P14048	16	5,281	110	580,000			255,000	**835,000**	**2014**	1,190,000	350,000	**840,000**
External	**1232**	**NE**	on 143rd E., from 29th N. to 37th N.	New	P13828	12	5,234	80	420,000			185,000	**605,000**	**2011**	770,000	300,000	**470,000**
External	**1232**	**NE**	on 37th N., from 127th E. to 143rd E.	New	P13824	12	5,293	80	420,000			185,000	**605,000**	**2011**	770,000	310,000	**460,000**
External	**1234**	**NE**	on 29th N., from 127th E. to 159th E.	New	P13827, P14076	12	10,546	80	840,000			370,000	**1,210,000**	**2012**	1,590,000	640,000	**950,000**
External	**1236**	**NE**	on 159th E., from 29th N. to 37th N.	New	P14055	12	5,216	80	420,000			185,000	**605,000**	**2013**	830,000	330,000	**500,000**
External	**1236**	**NE**	on 37th N., from 143rd E. to 159th E.	New	P14054	16	5,252	110	580,000			255,000	**835,000**	**2013**	1,140,000	330,000	**810,000**
External	**1238**	**NE**	on Greenwich, from 37th N. to 45th N.	New	P13833	16	5,273	110	580,000			255,000	**835,000**	**2014**	1,190,000	350,000	**840,000**
External	**1238**	**NE**	on 127th E., from 37th N. to 45th N.	New	P14060	12	5,322	80	430,000			189,000	**619,000**	**2014**	880,000	350,000	**530,000**
External	**1240**	**NE**	on 143rd E., from 37th N. to 45th N.	New	P14059	12	5,299	80	420,000			185,000	**605,000**	**2015**	900,000	360,000	**540,000**
External	**1242**	**W**	on 167th W., from Kellogg (US 54) to Pawnee	New	P13995	16	5,155	110	570,000			251,000	**821,000**	**2011**	1,040,000	300,000	**740,000**
External	**1242**	**W**	on Pawnee, from 167th W. to 151st W.	New	P13996	12	5,199	80	420,000			185,000	**605,000**	**2011**	770,000	300,000	**470,000**
External	**1244**	**W**	on 135th W., from Pawnee to 31st S.	New	P14005	16	5,081	110	560,000			246,000	**806,000**	**2012**	1,060,000	310,000	**750,000**
External	**1244**	**W**	on 31st S., between 151st W. to 119th W.	New	P14006	12	5,281	80	420,000			185,000	**605,000**	**2012**	800,000	320,000	**480,000**
External	**1246**	**W**	on 151st W., from Pawnee to 31st S.	New	P13997	12	5,060	80	400,000			176,000	**576,000**	**2013**	790,000	320,000	**470,000**
External	**1246**	**W**	on 31st S., between 151st W. to 119th W.	New	P13998	12	5,346	80	430,000			189,000	**619,000**	**2013**	850,000	340,000	**510,000**
External	**1248**	**W**	on 119th W., from 31st S. to MacArthur	New	P14002	16	5,314	110	580,000			255,000	**835,000**	**2014**	1,190,000	350,000	**840,000**
External	**1248**	**W**	on MacArthur, from 119th W. to Maize	New	P14001	12	5,587	80	450,000			198,000	**648,000**	**2014**	920,000	370,000	**550,000**
External	**1250**	**W**	on 37th N., from Ridge to Hoover	New	P13854	12	5,157	80	410,000			180,000	**590,000**	**2015**	870,000	350,000	**520,000**
External	**1250**	**W**	on 45th N., from Ridge to Hoover	New	P13947	12	5,249	80	420,000			185,000	**605,000**	**2015**	900,000	360,000	**540,000**
External	**1250**	**W**	on Hoover, from 37th N. to 45th N.	New	P13948	16	5,263	110	580,000			255,000	**835,000**	**2015**	1,240,000	360,000	**880,000**
Internal Subtotal									**10,630,000**			**4,679,000**	**26,509,000**		**28,582,000**	**0**	**28,582,000**
External Subtotal									**13,770,000**			**6,058,000**	**19,828,000**		**27,030,000**	**9,270,000**	**17,760,000**
2015 Subtotal									**24,400,000**			**$10,737,000**	**$46,337,000**		**$55,612,000**	**$9,270,000**	**$46,342,000**
2025																	
Internal			additional SE booster pumps	new									**1,140,000**	**-**	-	0	**1,140,000**
Internal			additional 37th booster pumps	new									**230,000**	**-**	-	0	**230,000**
Internal			additional Maple booster pumps	new									**550,000**	**-**	-	0	**550,000**
Internal			additional Far West booster Pumps	new									**1,970,000**	**-**	-	0	**1,970,000**
External	**1266**	**E**	on Rock, from 47th S. to existing 12" (P4155) just north of 31st S.	New	P14033, P14041	16	12,874	110	1,420,000			625,000	**2,045,000**	**-**	-	590,000	**1,455,000**
External	**1268**	**E**	on Rock, from 47th S. to 55th S.	New	P14031	12	5,289	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1270**	**E**	on Webb, from 47th S. to MacArthur	New	P14034	20	5,281	130	690,000			304,000	**994,000**	**-**	-	240,000	**754,000**
External	**1272**	**E**	on Webb, from 47th S. to 55th S.	New	P14032	16	5,296	110	580,000			255,000	**835,000**	**-**	-	240,000	**595,000**
External	**1274**	**E**	on Greenwich, from MacArthur to 55th S.	New	P14035, P14027	12	10,634	80	850,000			374,000	**1,224,000**	**-**	-	490,000	**734,000**
External	**1276**	**E**	on 47th S., from Rock to Greenwich	New	P14029, P14030	16	10,530	110	1,160,000			510,000	**1,670,000**	**-**	-	480,000	**1,190,000**
External	**1278**	**E**	on 55th S., from Rock to Greenwich	New	P14025, P14026	12	10,580	80	850,000			374,000	**1,224,000**	**-**	-	490,000	**734,000**

Table VI-1

Water Master Plan
Capital Improvement Program

Wichita, Kansas

Year / Location[5]	CIP No. (W-)	Pressure Zone	Title	Type[1]	Pipe No.	Pipe Diameter (inch)	Length (LF)	Unit Cost	Base Cost	Specials	Cost of Specials	Contingency & Other Costs[4]	Opinion of Probable Cost	CIP Year	Adjusted CIP Opinion of Probable Cost[2]	Developer Portion[3]	City Portion
External	**1280**	**E**	on 143rd E., from 29th N. to 21st N.	New	P13817	12	5,076	80	410,000			180,000	**590,000**	**-**	-	230,000	**360,000**
External	**1282**	**E**	on 159th E., from 29th N. to 21st N.	New	P13818	12	5,234	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1284**	**E**	on 29th N., from 143rd E. to 159th E.	New	P13819	12	5,235	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1286**	**H**	on Central, just east of Hess BPS	New	337	16	629	110	70,000			31,000	**101,000**	**-**	-	30,000	**71,000**
External	**1288**	**H**	on MacArthur, from Meridian to existing 12" (P1561, P4224) west of Seneca	New	P13904, 13940	12	2,779	80	220,000			97,000	**317,000**	**-**	-	130,000	**187,000**
External	**1290**	**H**	on 55th S., from Seneca to existing 12" (P460) east of Meridian	New	P13905	12	1,992	80	160,000			70,000	**230,000**	**-**	-	90,000	**140,000**
External	**1292**	**H**	on MacArthur, from West to Meridian	New	P13903	12	5,326	80	430,000			189,000	**619,000**	**-**	-	240,000	**379,000**
External	**1294**	**H**	on 47st. S., from West to existing 12" (P463) west of Meridian	New	P13902	12	630	80	50,000			22,000	**72,000**	**-**	-	30,000	**42,000**
External	**1296**	**H**	on Ridge just south of 31st S.	New	P13898	12	1,925	80	150,000			66,000	**216,000**	**-**	-	90,000	**126,000**
External	**1298**	**H**	on Hillside, from 21st N. to existing 48" (P1094) north of 13th N.	New	P13846	16	4,300	110	470,000			207,000	**677,000**	**-**	-	200,000	**477,000**
External	**1300**	**H**	on Ridge, from 55th S. to 47th S.	New	P14009	12	5,415	80	430,000			189,000	**619,000**	**-**	-	250,000	**369,000**
External	**1302**	**H**	on Hoover, from 55th S. to 47th S.	New	P14011	16	5,269	110	580,000			255,000	**835,000**	**-**	-	240,000	**595,000**
External	**1304**	**H**	on West, from 55th S. to 47th S.	New	P14013	12	5,265	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1306**	**H**	on Hillside, from 55th S. to 63rd S.	New	P14017	12	4,498	80	360,000			158,000	**518,000**	**-**	-	210,000	**308,000**
External	**1308**	**H**	on 55th, from Hillside to existing 36" (P3822) west of Oliver	New	P14018	12	2,591	80	210,000			92,000	**302,000**	**-**	-	120,000	**182,000**
External	**1310**	**H**	on 55th, from Oliver to existing 36" (P3822) west of Hillside	New	P14019	16	1,459	110	160,000			70,000	**230,000**	**-**	-	70,000	**160,000**
External	**1312**	**H**	on Oliver, from 47th S. to 55th S.	New	P14020	12	4,951	80	400,000			176,000	**576,000**	**-**	-	230,000	**346,000**
External	**1314**	**H**	on Woodlawn, from 47th S. to 55th S.	New	P14022	12	5,248	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1316**	**H**	on 55th S., from Oliver to Woodlawn	New	P14021	12	5,183	80	410,000			180,000	**590,000**	**-**	-	240,000	**350,000**
External	**1318**	**H**	on 47th S., from Oliver to Woodlawn	New	P14023	16	6,043	110	660,000			290,000	**950,000**	**-**	-	280,000	**670,000**
External	**1320**	**NE**	on Greenwich, from 21st N. to 13th N.	New	P13836	20	5,255	130	680,000			299,000	**979,000**	**-**	-	240,000	**739,000**
External	**1322**	**NE**	on 159th E., from 37th N. to 53rd N.	New	P14056, P14062	12	10,595	80	850,000			374,000	**1,224,000**	**-**	-	490,000	**734,000**
External	**1324**	**NE**	on 45th N., from 143rd E. to 159th E.	New	P14058	16	5,215	110	570,000			251,000	**821,000**	**-**	-	240,000	**581,000**
External	**1326**	**NE**	on143rd E., from 45th N. to 53rd N.	New	P14068	12	5,314	80	430,000			189,000	**619,000**	**-**	-	240,000	**379,000**
External	**1328**	**NE**	on 127th E, from 45th N. to 53rd N.	New	P14067	12	5,248	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1330**	**NE**	on Greenwich, from 45th N. to 53rd N.	New	P14066	16	5,288	110	580,000			255,000	**835,000**	**-**	-	240,000	**595,000**
External	**1332**	**NE**	on Webb, from 53rd N. to 61st N.	New	P14070	12	5,090	80	410,000			180,000	**590,000**	**-**	-	230,000	**360,000**
External	**1334**	**NE**	on Rock, from 53rd N. to 61st N.	New	P14072	12	5,201	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1336**	**NE**	on 61st N., from Rock to Webb	New	P14071	12	5,280	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1338**	**NE**	on 53rd N., from Webb to 159th E.	New	P14069, P14065, P14064, P14063	12	21,500	80	1,720,000			757,000	**2,477,000**	**-**	-	990,000	**1,487,000**
External	**1340**	**W**	on 31st S., from Maize to Tyler	New	P13895	12	5,271	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1342**	**W**	on 29th N., from Hoover to West	New	P13950	12	5,313	80	430,000			189,000	**619,000**	**-**	-	240,000	**379,000**
External	**1344**	**W**	on 37th N., from Hoover to West	New	P13952	12	5,319	80	430,000			189,000	**619,000**	**-**	-	240,000	**379,000**
External	**1346**	**W**	on Hoover, from 29th N. to 37th N.	New	P13853	16	5,314	110	580,000			255,000	**835,000**	**-**	-	240,000	**595,000**
External	**1348**	**W**	on West, from 29th N. to 37th N.	New	P13951	12	5,346	80	430,000			189,000	**619,000**	**-**	-	250,000	**369,000**
External	**1350**	**W**	on Hoover, from 45th N. to 53rd N.	New	P13949	12	5,280	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1352**	**W**	on 45th N., from Tyler to Ridge	New	P13944	12	5,193	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1354**	**W**	on Tyler, from 45 N. to 37th N.	New	P13943	12	5,327	80	430,000			189,000	**619,000**	**-**	-	250,000	**369,000**
External	**1356**	**W**	on 119th W., from 37th N. to 45th N.	New	P13953	16	5,154	110	570,000			251,000	**821,000**	**-**	-	240,000	**581,000**
External	**1358**	**W**	on 53rd N., from 151st W. to 135th W.	New	P13970	12	5,251	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1360**	**W**	on 135th W., from 45th N. to 53rd N.	New	P13971	16	5,300	110	580,000			255,000	**835,000**	**-**	-	240,000	**595,000**
External	**1362**	**W**	on 135th W., from 37th N. to 45th N.	New	P13955	24	5,195	160	830,000			365,000	**1,195,000**	**-**	-	240,000	**955,000**

Table VI-1

Water Master Plan
Capital Improvement Program

Wichita, Kansas

Year / Location[5]	CIP No. (W-)	Pressure Zone	Title	Type[1]	Pipe No.	Pipe Diameter (inch)	Length (LF)	Unit Cost	Base Cost	Specials	Cost of Specials	Contingency & Other Costs[4]	Opinion of Probable Cost	CIP Year	Adjusted CIP Opinion of Probable Cost[2]	Developer Portion[3]	City Portion
External	**1364**	**W**	on 151st W., from 45th N. to 53rd N.	New	P13969	12	5,266	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1366**	**W**	on 151st W. from 45th N. to 29th N.	New	P13967, P13976	16	10,450	110	1,150,000			506,000	**1,656,000**	**-**	-	480,000	**1,176,000**
External	**1368**	**W**	on 45th N., from 119th W. to 183rd W.	New	P13954, P13961, P13962, P13960	12	21,039	80	1,680,000			739,000	**2,419,000**	**-**	-	970,000	**1,449,000**
External	**1370**	**W**	on 37th N., from 135th W. to 183rd W.	New	P13965, P13966, P13964	16	15,819	110	1,740,000			766,000	**2,506,000**	**-**	-	730,000	**1,776,000**
External	**1372**	**W**	on 29th N., from 151st W. to 183rd W.	New	P13975, P13973	16	10,530	110	1,160,000			510,000	**1,670,000**	**-**	-	480,000	**1,190,000**
External	**1374**	**W**	on 21st N., from 151st W. to 183rd W.	New	P13982, P13981	20	10,559	130	1,370,000			603,000	**1,973,000**	**-**	-	490,000	**1,483,000**
External	**1376**	**W**	on 13th N., from 151st W. to 183rd W.	New	P13991, P13990	12	10,477	80	840,000			370,000	**1,210,000**	**-**	-	480,000	**730,000**
External	**1378**	**W**	on Central, from 151st W. to 183rd W.	New	P13987, P13986	16	10,493	110	1,150,000			506,000	**1,656,000**	**-**	-	480,000	**1,176,000**
External	**1380**	**W**	on Maple, from 167th W. to existing 16" (55) east of 151st W.	New	P13993	16	1,621	110	180,000			79,000	**259,000**	**-**	-	70,000	**189,000**
External	**1382**	**W**	on Kellogg, from 167th W. to 151st W.	New	P13884	16	5,214	110	570,000			251,000	**821,000**	**-**	-	240,000	**581,000**
External	**1384**	**W**	on 167th W., from 45th N. to Kellogg	New	P13994, P13992, P13988, P13989, P13979, P13974, P13968	16	36,628	110	4,030,000			1,773,000	**5,803,000**	**-**	-	1,680,000	**4,123,000**
External	**1386**	**W**	on 183rd W., from 45th N. to Central	New	P13985, P13984, P13978, P13972, P13958	12	26,078	80	2,090,000			920,000	**3,010,000**	**-**	-	1,200,000	**1,810,000**
External	**1388**	**W**	on 135th W., from 31st S. to MacArthur	New	P13999	16	5,314	110	580,000			255,000	**835,000**	**-**	-	240,000	**595,000**
External	**1390**	**W**	on MacArthur, from 135th W. to 119th W.	New	P14000	12	5,280	80	420,000			185,000	**605,000**	**-**	-	240,000	**365,000**
External	**1392**	**W**	on 55th S., from Ridge to Meridian	New	P14010, P14012, P14014	12	15,929	80	1,270,000			559,000	**1,829,000**	**-**	-	730,000	**1,099,000**
Internal Subtotal									**0**			**0**	**3,890,000**			**0**	**3,890,000**
External Subtotal									**43,930,000**			**19,328,000**	**63,258,000**			**21,450,000**	**41,808,000**
2025 Subtotal									**43,930,000**			**$19,328,000**	**$67,148,000**			**$21,450,000**	**$45,698,000**
Total									**$145,250,000**			**$63,325,000**	**$233,915,000**		**$186,754,000**	**$43,400,000**	**$204,942,000**

1. Type refers to Replacement/Parallel water main or New area water main.
2. CIP adjusted at an inflation rate of 4 percent per year.
3. Contractor cost is based on an 8-inch equivalent costs of $46/LF in year 2005.
4. Contingencies and other costs were included for all BPSs.
5. Internal refers to improvements to the existing service area and external refers to future service area.
6. Year 2025 improvements are not inflated.

Since there are a number of major projects required between years 2005 and 2010, additional hydraulic analysis of years 2006, 2007, 2008, and 2009 is recommended to optimize the CIP. Furthermore, due to financial considerations and status, the City can elect to push up or delay proposed improvements, both internal and external, as is appropriate. The CIP contained in this Master Plan is a summation of the total improvements required by 2025 to meet projected demands. The CIP Year is the best estimate on the time frame in which they should be completed.

*****

Appendices

Appendix A

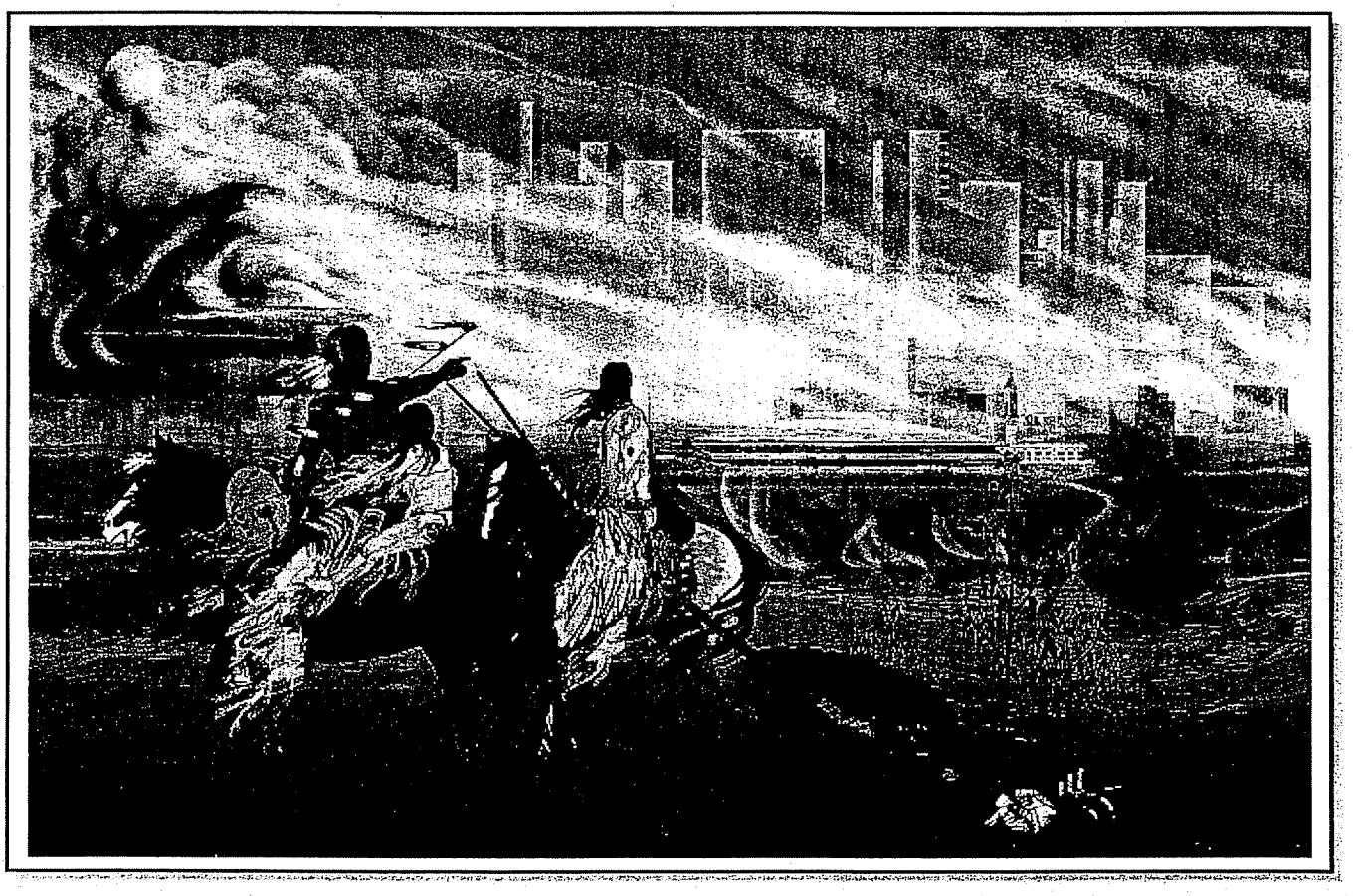
Update to Comprehensive Plan

CITY OF WICHITA

SEDGWICK COUNTY KANSAS

1999 Update to The Wichita-Sedgwick County Comprehensive Plan

Preparing for Change



Section 3. Wichita Land Use & Sedgwick County Development Guides

The Wichita Land Use and Sedgwick County Development Guides consist of maps with associated text ~~which describes~~ *describing* anticipated growth patterns, land use categories and location*al* ~~criteria~~ *guidelines* ~~(see expanded text on pages 111-124 of the Comprehensive Plan)~~. These guides are intended to *visually portray* ~~represent graphically~~ the land use, development and public improvement goals and policies of the Comprehensive Plan; and, to guide rezoning and development decisions in the future. ~~The~~ *These* guides should be used with a sense of flexibility. Development proposals that do not exactly match these guides but reflect market place demands should be given reasonable consideration, *if* ~~so long as~~ they do not present extra-ordinary new public service burdens on the community.

1. Land Use Categories

~~**AGRICULTURAL** (20 acre minimum lot size): The agricultural category has the intent of protecting agricultural resources and is meant to accommodate agricultural operations on substantial acreage. The category can allow other uses common in rural areas, which are no more offensive than normal agricultural uses. Subdivision into multiple lots less than 20 acres in size generally should be developed through cluster provisions that reserve land for agricultural uses or open space, thus preserving the rural flavor of the County.~~

~~**SUBURBAN** (1 acre minimum lot size): The suburban category provides for large-lot residential living areas where the full range of municipal services including public water and sewer systems is not available or planned. Such areas are characterized by residential lots in the range of 1 to 20 acres, and are generally located in areas which are not prime agricultural resources.~~

RURAL: *This category encompasses land outside the 30 year Wichita urban service boundary and the small city growth areas. This category is intended to accommodate agricultural uses, rural based uses that are no more offensive than normal agricultural uses, and large lot residential subdivisions with provisions for future water and sewer services.*

SMALL CITIES *FUTURE* GROWTH ~~AREAS~~: The area designated for the small cities' future growth is generally located adjacent to their existing municipal boundaries, and indicates the direction and magnitude of growth these communities can expect to experience over the next ~~20~~ *30* years. The determination of the direction and amount of growth is based upon anticipated population growth, current infrastructure limitations and environmental factors.

2010 URBAN SERVICE AREA: *This category identifies Wichita's urban fringe areas that are partially developed or have the potential to be developed by the year 2010, based upon population growth projections and current market trends. This is the area in which*

City expansion and extension of municipal services and infrastructure should be focused over the next ten years.

***2030 URBAN SERVICE AREA**: This category identifies Wichita's urban fringe areas that are presently undeveloped but have the potential to be developed by the year 2030, based upon population growth projections and current market trends. This is the area in which City expansion and extension of municipal services and infrastructure should be focused during the period from 2010 to 2030.*

LOW DENSITY RESIDENTIAL (1 to 6 dwelling units per acre): This residential category provides for the lowest density of urban residential land use and consists of ~~traditional~~ single-family detached homes, zero lot line units, ~~and~~ cluster subdivisions *and planned developments with a mix of housing types that may include townhouse and multi-family units.* ~~as well as~~ Schools, churches and other similar uses *are also* found in *this category* ~~such areas.~~

MEDIUM DENSITY RESIDENTIAL (6 to 10 dwelling units per acre): ~~The~~ *This* medium density residential category includes semi-detached dwelling units such as duplexes, ~~and~~ townhomes and mobile home parks. Although mapped together with other housing types on the "Wichita Land Use Guide", mobile home parks may not be appropriate in all locations designated for medium density housing.

HIGH DENSITY RESIDENTIAL (11 plus dwelling units per acre): This category includes densities in excess of 10 units per acre, such as garden apartments, condominiums and special residential accommodations for the elderly (*assisted living*, congregate care and nursing homes).

PUBLIC/INSTITUTIONAL: Public land uses include government employment centers or facilities, *libraries* and educational facilities. ~~The semi-public part of this category includes~~ Institutional uses ~~such as~~ *include* churches, hospitals, ~~and~~ private schools and ~~and libraries, as well as~~ cemeteries.

COMMERCIAL: The "Wichita Land Use Guide" suggests the following principles to guide future commercial zoning and development:

Convenience centers; generally ranging from 2-4 acres in size, typically anchored by a mini-market with several other small-scale tenants, and containing up to ~~about~~ 40,000 square feet of floor area. Convenience centers would typically be expected to develop at one or more corners of arterial intersections. ~~However,~~ They could also be appropriately located at the intersection of an arterial and collector street, where proper turn lanes are in place or planned, in order to be more accessible to the residents of the immediate neighborhood served by the collector street.

Neighborhood centers; generally ranging from 4-15 acres in size, typically anchored by a supermarket with a variety of other tenants, and containing up to ~~about~~ 200,000 square feet of floor area. These centers would be permitted at one or two corners of any arterial

intersection. This would allow for market competition, but avoid excessive concentration of commercial development and consequent traffic congestion at the intersection.

Large-scale retail *areas*; ~~uses should~~ generally ~~be~~ restricted to frontage along Kellogg and near key interchanges of other highways. On the east side, the 21st Street North/Greenwich/*K-96* interchange area and the 127th Street East/K-96/I-35/Kellogg interchange area appear most appropriate for these uses. On the west side, there appears to be considerable zoning already available within the existing city limits for these uses, in areas such as Kellogg/Ridge Road and 21st Street North/Maize Road. *New major commercial activity nodes appear likely in the future near the intersections of Ridge/K-96 and Colwich Road/Kellogg.*

OFFICE: The office category provides for office developments that furnish business, finance, insurance, real estate, medical and other professional services usually permitted in office, office park and CBD zoning districts. It is anticipated that neighborhood-oriented office developments will take place as part of the planned commercial centers, while some new office developments may *continue to* be *attracted* ~~guided~~ towards Wichita's downtown area.

INDUSTRIAL: While the City/County zoning districts distinguish ~~light~~ *limited* from ~~heavy~~ *unlimited* industrial uses, the "Wichita Land Use Guide" makes no such distinction. ~~The characteristics of the~~ *The primary location determinants are the characteristics of the* individual use, *nature of any emissions*, the surrounding uses and zoning districts, and the degree ~~to which the specific use would clash with adjacent uses will be the primary location determinant.~~ of compatibility with adjacent uses. ~~Areas shown for future industrial land use have also been determined by the prevalence of other existing industrial uses, transportation facilities and geographical of fixed boundaries such as railroad lines, which are constraints to other land uses.~~ *New industrial development is anticipated along segments of K-96, from Tyler Road on the west to Kellogg/Turnpike/K-96 interchange area on the east.*

TRANSPORATION/UTILITIES: This ~~land use~~ category ~~is used to~~ designates areas such as airports, landfills and sewer and water plants. These types of uses generally require large amounts of land and generate specific conflicts associated with noise, odor and safety.

PARKLAND/OPEN SPACE: ~~Public parks and open space make up this category. Although not shown on the"Wichita Land Use Guide", future recreational corridors which can include various kinds of linear parks from bikeways to river corridors open space may follow drainageways, roadways, abandoned rail lines or utility easements, and are intended to connect activity areas throughout the community.~~ *This category includes parks, open space and various recreational corridors (natural drainage channels, roadways, easements, abandoned rail lines, etc.)*. More detailed maps and policies are contained in the ~~new~~ Parks and Open Space Plan, adopted ~~by the governing bodies~~ in 1996.

DOWNTOWN PLAN: ~~In June of 1989, the Metropolitan Area Planning Commission formally adopted the"Development Plan for Downtown Wichita", produced by RTKL Associates for WI/SE, as a conceptual guide for the development of downtown Wichita.~~ *The "Development Plan for Downtown Wichita" was formally adopted in 1989 by the Metropolitan Area Planning Commission. This Plan is a conceptual guide for the downtown area.* Since that time, other proposals, such as the "DeBoer Plan", were considered. The Wichita City Council has subsequently evaluated specific project proposals contained in both plans, and has adopted a list of preferred projects generally referred to as the "core area initiative~~s~~". Work on these projects is in various stages of implementation. Since the downtown/core area has already received much detailed study from groups specifically established to study the downtown, this Comprehensive Plan does not address the downtown core in specific detail.

~~**NEW GROWTH AREAS:** Wichita urban fringe areas which are partially developed or have the potential of being economically developed by the year 2001 are identified in this category. The goal here is to identify an adequate amount of land to accommodate projected new urban-density development of Wichita over that time. These areas are readily accessible, and growth patterns would be cost-effective from the standpoint of community facility and service provision. Stimulation of new construction is the key objective, through the timely provision of capital improvements, community service extensions, and land use regulations that encourage higher density, and more compact development.~~

~~**URBAN RESERVE AREAS:** These are areas where urban development due to the expansion of Wichita is likely to occur by 2010, based on current growth trends, but the land does not appear to be necessary for development within the next ten years. Services may be extended into urban reserve areas when growth demands justify additional landneeds. Until urban density development occurs, only typical rural densities would be encouraged in these areas.~~

While the growth and development of the City of Wichita plays a major role in the transformation of Sedgwick County, from rural to urban, it is important that the integrity of the County is not lost to such growth. The rural, suburban and urban residents of Sedgwick County create a diverse and interdependent community. Each of these sets of residents is best served by coordinated planning and development activities undertaken by a cooperative partnership of public and private entities. These guides and the recommendations within the Comprehensive Plan are intended to promote that cooperative and coordinated environment.

Appendix B

Water Use/Demand Data

WHOLESALE WATER SALES AGREEMENT

THIS AGREEMENT is made and entered into this 5th day of June, 2001, by and between:

THE CITY OF WICHITA, SEDGWICK COUNTY, KANSAS, hereinafter referred to as "Wichita";

EL PASO WATER COMPANY, INC., a Kansas corporation hereinafter referred to as "El Paso; and

THE CITY OF DERBY, SEDGWICK COUNTY, KANSAS, hereinafter sometimes referred to as "Derby."

WITNESSETH:

WHEREAS, Wichita owns and operates the Wichita Water Utility, which produces an adequate supply of water by means of using reservoirs and deep well water; and

WHEREAS, the water produced by Wichita has been approved by the Kansas Department of Health and Environment for domestic use; and

WHEREAS, El Paso operates and maintains a system of water pumps, mains, storage facilities and distribution lines (the "Existing Distribution System") within and in the vicinity of the corporate limits of the City of Derby, Kansas; and

WHEREAS, the quantity of water presently available to the El Paso through its own appropriations is insufficient to meet the needs of the community; and

WHEREAS, Wichita will at its sole expense construct a water transmission line to a point in the vicinity of the intersection of K-15 highway and 63rd Street South, and at El Paso's sole expense install appropriate metering equipment at such point for the purpose of supplying water to El Paso for further distribution within and in the vicinity of Derby; and

WHEREAS, it is the intent and purpose of this Agreement for Wichita to provide a supply of potable water in sufficient quantity and at adequate pressure to meet the needs of El Paso's existing and future customers within Derby and the service area hereinafter defined;

NOW THEREFORE, in view of the premises aforesaid and in consideration of the mutual covenants and promises herein contained, the parties hereto agree as follows:

Article 1
Permission to Connect and Right to Receive Water Services

1.1 Wichita hereby grants permission to El Paso to connect one or more water lines to the Wichita water system at one or more points in the vicinity of the intersection of K-15 highway and 63rd Street South.

1.2 Forthwith upon execution of this Agreement by both parties, Wichita shall commence at its sole expense such modifications and extensions of its water distribution system as are necessary to supply water to El Paso as provided in this Agreement. Such modifications and extensions shall be accomplished as expeditiously as possible, it being the intent of the parties to commence operations hereunder within 12 months following the date of this Agreement.

1.3 Connection to the Wichita water system shall be accomplished by El Paso at its own expense; provided, that Wichita shall pay all costs associated with enhancements to and extension of its water system necessary in order to supply water to El Paso at a mutually agreed upon connection point at or near the intersection of K-15 highway and 63rd Street South. All water sold to El Paso shall be measured by a master meter(s) installed in a meter vault. Said vault and contents shall be approved by the City of Wichita and paid for and constructed by El Paso. The said vault and contents shall be located at a mutually agreed upon location and be equipped with a bypass valve for emergency service and any appropriate backflow prevention device(s). Ownership of said vault, meter(s) and contents shall be transferred to and maintained by Wichita. Derby may connect to and receive data from any flow control or monitoring devices installed by the City of Wichita within said vault, or may install and receive data from flow control or monitoring devices installed by El Paso at its own expense; provided that any such device shall be approved by the City of Wichita.

1.4 Wichita agrees to grant permission to El Paso to connect to the Wichita water system at one or more other points at such time as requested by El Paso; provided, that any such additional connection shall be made only after mutual agreement on the terms and conditions therefor.

Article 2
Water Metering and Flow

2.1 All water sold to El Paso hereunder shall be measured by one or more master meters installed in a meter vault. Ownership of such vault, meters, valves and other equipment located therein shall remain with Wichita.

2.2 Wichita shall have the right at any time to test the master meter(s). If El Paso requests a meter test, the test shall be conducted by Wichita at El Paso's expense. If upon such examination and test conducted in the presence of a representative of El Paso a meter is found to be inaccurate according to the standards of the American Water Works Association, the meter will be repaired or another meter will be substituted therefor and the water bill for the immediately preceding billing period will be adjusted to include a credit for the meter test charge. Whenever Wichita finds the meter to be malfunctioning, an adjustment of charges for the immediately preceding billing period shall be made by averaging the water used for the corresponding billing

period for each of the three prior years or, if such records are not extant, the best practical alternative for determining the estimate shall be used.

2.3 In the event it is necessary for Wichita to temporarily stop the flow of water into El Paso's lines due to the need of El Paso to make repairs to such lines, authorized representatives of El Paso shall be permitted to shut off the water supply by use of the valve located outside of the meter vault. In the event that such discontinuance of service is necessary, El Paso shall promptly notify Wichita that the water supply was discontinued and the purpose of such discontinuance. Whenever possible, advance notice of such discontinuance shall be given to Wichita.

Article 3
Covenant to Purchase Water and Terms of Purchase

3.1 El Paso agrees to take and pay for or to pay for as tendered, and Wichita agrees to supply, on an annual basis 100% of the potable water supplied by El Paso to its domestic, commercial and industrial customers through its Existing Distribution System and all extensions thereof, and including such quantities as may be lost due to leakage in El Paso's distribution system. Except as provided in §3.2 hereof, Wichita agrees to furnish and sell to El Paso a quantity of potable water necessary to meet 100% of such demand. The 100% demand levels projected on an annual basis over the twenty (20) year life of the contract shall be as defined in the Schedule of Projected Water Usage (the "Usage Schedule") which appears as Attachment 1 to this Agreement. It is anticipated that the supply needs of El Paso will not exceed the amounts shown in the Usage Schedule. However, if water consumption in any two consecutive years exceeds the amount agreed to for such two year period as shown in the Usage Schedule, or past consumption records indicate to Wichita that consumption for any such two year period will exceed the amount agreed to for such period, Wichita and El Paso shall negotiate in good faith to agree upon a revised Usage Schedule mutually satisfactory to both parties. If the parties fail to reach an agreement to amend the Usage Schedule for the remaining term of the Agreement, and water consumption in any one year exceeds 115% of the level as defined in the Usage Schedule for such year, there shall be a ten percent 10% surcharge paid by El Paso to Wichita on that portion of overall water consumption above the 115% level. For each year thereafter with respect to which the parties have not reached agreement on a revised Usage Schedule and during which overall consumption exceeds one hundred percent (100%) of the level established by the Usage Schedule, a surcharge of ten percent (10%) shall be paid by El Paso to Wichita on that portion of overall consumption in excess of the yearly allowable limits as stated in the Usage Schedule. Surcharges payable hereunder shall be calculated on the basis of the average volume rate charged to El Paso in the year in which the excess occurred.

3.2 Subject only to Article 9 hereof authorizing interruption or curtailment of water service in case of emergency, Wichita agrees to furnish up to two and one-half (2 ½) times the pro rata daily portion of the annual contract volume of water during any one day, based on the quantity supplied by Wichita or produced by El Paso, as the case may be, during the immediately preceding calendar year. Such water shall be supplied at the point of El Paso's connection to the Wichita water supply system in the vicinity of the intersection of K-15 highway and 63rd Street South.

3.3 The obligation of El Paso to take and pay for 100% of the quantities of water supplied to it for sale to its customers through its Existing Distribution System and any extension thereof shall be unconditional throughout the duration of this Agreement.

3.4 El Paso shall not introduce any water, other than water supplied by Wichita pursuant to this Agreement, into its Existing Distribution System or any extension thereof.

3.5 Wichita may audit El Paso's water transmission and distribution system at any time, but not more frequently than once each year, to assure that no water other than water supplied pursuant to this Agreement is being supplied to El Paso customers through its Existing Distribution System or any extension thereof. If the quantity of water delivered to El Paso in any year is less than 100% of the water being supplied to El Paso customers through its Existing Distribution System or any extension thereof, El Paso shall pay for the difference at the rate or rates specified in this Agreement and shall immediately cease introduction of water other than water supplied pursuant to this Agreement into its Existing Distribution System or any extension thereof.

3.6 Wichita shall not be responsible for any losses of El Paso resulting from resale of water supplied to it pursuant to this Agreement.

3.7 A. Nothing in this Agreement shall be construed to prohibit El Paso from selling water not supplied pursuant to this Agreement to the following classes of customers --

1. Outside of El Paso Service Area: commercial or industrial retail customers for other than domestic use, and wholesale customers, located outside of the Service Area Boundaries for El Paso as established pursuant to Article 6 of this Agreement and outside of Wichita's service area as defined in Wichita's Water Master Plan, a diagram of which appears as Attachment 2 to this Agreement, and as such Plan may be hereafter amended or supplemented from time to time; and

2. Inside of El Paso Service Area: commercial or industrial customers for use in industrial or commercial processes or irrigation, and institutional customers located within the service area boundaries for El Paso/Derby, for use in public swimming pools and irrigation of property owned, controlled or used by a public agency, including but not limited to golf courses, parks, athletic fields, and school grounds and public buildings;

provided, that no such water shall be supplied through El Paso's Existing Distribution System or any extension thereof.

B. Notwithstanding any other provision of this section 3.7, El Paso shall make no sales of water to any commercial or industrial customer that has relocated from the Wichita service area during the term of this agreement without first obtaining prior consent for such sales from Wichita.

Article 4
Discontinuance of Water Service

4.1 Wichita may refuse to deliver water to El Paso if it is determined by the Kansas State Board of Health or by the Wichita-Sedgwick County Health Department that conditions exist which might lead to contamination of the public water supply, and may continue to refuse such delivery of water to El Paso until such condition is remedied to the satisfaction of either aforementioned public health authority.

Article 5
Conditions of Water Service to Customers of El Paso

5.1 El Paso agrees to have in effect for all its customers a water conservation plan within six (6) months of the effective date of this Agreement. Such conservation plan shall be submitted to and approved by Wichita prior to delivery of water to El Paso. Future changes in such plan shall be submitted to Wichita for approval.

5.2 El Paso further agrees to modify its water conservation plan within thirty (30) days to reflect any changes Wichita makes to its own program, upon written notification thereof by Wichita.

5.3 El Paso agrees that all water service connections will be individually metered and billed no less frequently than bimonthly.

5.4 El Paso agrees to institute for its customers any water restrictions imposed by Wichita on its customers within fifteen (15) days of written notice of promulgation of such restrictions from Wichita.

5.5 El Paso agrees to recommend to Derby that it adopt an ordinance requiring that any new plumbing fixtures be of a low water use type to the same extent as is required by the ordinances of Wichita, as they may from time to time be amended.

Article 6
El Paso Service Area

6.1 El Paso agrees to provide only water supplied by Wichita pursuant to this Agreement to customers connected to El Paso's Existing Distribution System or any extension thereof and located within the service area described as follows:

> All of the following lands located in Sedgwick County, Kansas, east of the 6th Principal Meridian:
>
> The following sections or portions thereof in Township 28 South, Range 1 East: section 25; that portion of section 26 lying east of highway K-15 and that portion of section 26 lying south of 63rd Street South; that portion of section 27 lying south of 63rd Street South and north and east of the Arkansas River; that portion of section 34 lying north and east of the Arkansas River; that portion of section 35 lying north and east of the Arkansas River; and section 36;
>
> The following sections or portions thereof in Township 28 South, Range 2 East: Southwest ¼ of section 27; section 28; section 29; section 30; section 31; section 32; section 33; and section 34;
>
> The following sections or portions thereof in Township 29 South, Range 1 East: section 1; that portion of section 2 lying north and east of the Arkansas River; East

½ of section 10; section 11; section 12; section 13; section 14; East ½ of section 15; E ½ of section 22; section 23, and that portion of section 24 lying north of the Arkansas River; and

The following sections in Township 29 South, Range 2 East: section 3; section 4; section 5; section 6; section 7; section 8; section 9; section 10; section 15; section 16; section 17; and section 18.

6.2 The service area boundaries are further delineated on a map which appears as Attachment "2" to this Contract as the "El Paso Service Area Boundaries." In the event of a conflict between the legal description hereinabove contained and the map designated as Attachment "2" hereto, the legal description contained in §6.1 shall control.

6.3 El Paso agrees that water received from Wichita shall not be sold to other incorporated cities, improvement districts, or any other customers located outside of the "El Paso Service Area" as delineated in §6.1 of this Contract without the express written approval of Wichita.

6.4 It is agreed that in the event water from Wichita is sold or otherwise furnished to unauthorized customers, Wichita shall give El Paso written notice of the breach of the terms of this Agreement and, if El Paso does not discontinue the act or acts constituting said breach within ten (10) days from the date of such notice, Wichita may discontinue water service to El Paso.

6.5 The Service Area Boundaries described in §6.1 are subject to renegotiation by the parties at any time after ten (10) years have elapsed from the date this Agreement is executed by both parties. Renegotiation of boundaries may be commenced by either party notifying the other party of its desire to renegotiate the boundaries at least forty-five (45) days in advance of the anniversary date of the ten-year period. Either party reserves the right to refuse to agree to a boundary change request. Regardless of whether or not agreement is reached by and between Wichita and El Paso on any proposed changes to the boundaries which are set forth initially in this Agreement, the obligation of El Paso to take and pay for 100% of the annual demand as delineated in the Schedule of Projected Water Usage shall be required throughout the tenure of this Agreement.

Article 7
System Equity Fees

7.1 El Paso agrees to pay Wichita an equity fee of $30,000 for each of three (3) meters installed to measure water delivered to El Paso for the value of treatment plant and distribution system capacity reserved for use by El Paso.

7.2 El Paso agrees to pay Wichita at least one-half of the total system equity fee upon its connection to Wichita's water system. The remainder shall be paid no later than 180 days following initiation of water service to El Paso. Any unpaid balance still outstanding at the expiration of the 180-day period will be subject to a one and one-half per cent (1 ½%) penalty charge for each month any unpaid balance is left outstanding.

Article 8
Rates for Water Service

8.1 The rate charged El Paso for water service shall be in accordance with the rates established and amended from time to time by Wichita ordinance for wholesale customers; provided, that the charge for water which El Paso is obligated to pay for hereunder but which is not taken shall be calculated on the basis of the average volume rate charged to El Paso in the year in which such shortfall occurred.

8.2 El Paso shall be considered by Wichita as one customer for computation of water charges. The water volume charges for treated water shall be based on actual metered water consumption at the rate for wholesale service under the terms of applicable rates as provided in §8.1 of this Agreement.

8.3 El Paso will be billed monthly at the rates established by the provisions of this Agreement and by Wichita ordinances. If said bill is not paid within twenty-five (25) days after Wichita mails said bill, interest will be charged and El Paso agrees to pay such interest in accordance with the ordinances of Wichita, as the same may exist from time to time.

Article 9
Emergency Curtailment or Interruption of Service

9.1 Wichita hereby agrees to make every reasonable effort to provide adequate water service and pressure at all times pursuant to the terms of this Agreement. However, it is understood and agreed by the parties hereto that operation of Wichita's water system might, by reason of unforeseen catastrophe or disaster (commonly called acts of God) or shortage of water, be temporarily curtailed or interrupted.

9.2 Curtailment or interruption of service to El Paso under such conditions or as a result of pipeline failures shall not give rise to any claim on the part of El Paso, or customers of El Paso, against Wichita or its water utility. In such cases, Wichita will make good faith efforts to restore normal water service without unreasonable delay.

9.3. Wichita agrees that it will not restrict or curtail water service to El Paso pursuant to this Agreement by reason of a shortage of water unless service to its retail water customers is subject to identical limitations.

9.4 Notwithstanding any other provision of this Agreement, El Paso may introduce water not supplied by Wichita pursuant to this Agreement into El Paso's Existing Distribution System or any extension thereof when water service from Wichita has been interrupted for an extended period of time pursuant to this Article 9 hereof, or when necessary for fire suppression in case of an extreme emergency. Under such circumstances, El Paso shall immediately notify Wichita and either El Paso or Wichita may act to isolate their respective distribution systems or take such other action as may be necessary to avoid contamination of Wichita's distribution system; provided, that El Paso shall not take any action contrary to a directive from Wichita.

Article 10
Operation and Maintenance

10.1 El Paso shall be fully responsible for the operation and maintenance of the water distribution system owned by El Paso, except as otherwise provided herein, and El Paso agrees to indemnify and hold Wichita harmless of and from any claim or legal action against Wichita or El Paso arising from the operation or maintenance by El Paso of water systems owned by El Paso, or any part or extension thereof.

Article 11
Agreement Term and Renewal

11.1 The term of this Agreement shall commence upon its execution and terminate twenty (20) years after the date water is first furnished to El Paso hereunder. Upon mutual agreement between El Paso and Wichita, this Agreement may be extended for an additional period of up to ten (10) years under the same terms and conditions as contained herein.

11.2 El Paso shall notify Wichita before the end of the sixteenth (16th) year of this Agreement as to whether El Paso wishes to extend this Agreement.

11.3 If Wichita and El Paso fail to agree on an extension of this Agreement before the end of the seventeenth (17th) year of this Agreement, this Agreement shall terminate at the end of the twentieth (20th) year.

11.4 In the event this Agreement terminates, El Paso shall disconnect its water distribution system from Wichita's supply connection no later than one (1) year following expiration of this Agreement.

11.5 In the event this Agreement expires as provided in §11.3 above, the parties hereto agree that the provisions of this Agreement shall remain in full force and effect until El Paso has actually disconnected from Wichita's water system and El Paso has paid all amounts due Wichita under the terms of this Agreement or any amendments thereto.

Article 12
Assignment and Guaranty of Agreement

12.1 The parties acknowledge that El Paso's primary function is to provide potable water to residents of the City of Derby, Kansas, and its environs, and that Derby, in cooperation with the City of Mulvane, Kansas, and Rural Water District #3 of Sedgwick County has formed Public Wholesale Water Supply District #22 (PWWSD #22). Through PWWSD #22, its member jurisdictions will explore water supply and distribution alternatives beneficial to all of them. In the event these member jurisdictions determine to cooperate, through PWWSD #22, to create a common public water supply system or contract for a common water supply, El Paso may assign its rights and duties under this Agreement to PWWSD #22; provided, that any such assignment shall be contingent upon prior written consent of Wichita and upon the guarantee by Derby, in a manner reasonably satisfactory to Wichita, of the obligations of El Paso under this Agreement; and provided further, that no such assignment shall have the purpose or effect of obligating Wichita to

furnish water for resale to customers located outside of El Paso's service area as established by this Agreement or any modification thereof.

12.2. In the event that El Paso ceases to exist as an entity capable of performing the obligations of El Paso under this Agreement, or El Paso assigns its obligations and duties under this Agreement, Derby guarantees the full performance of the obligations of this Agreement on behalf of El Paso. Upon the request of El Paso or Derby for good cause shown, Wichita may waive the requirements of this paragraph without further amendment of the Agreement.

Article 13
Notices and Mediation

13.1 All notices required to be given herein shall be in writing and shall be delivered in person or mailed by certified mail to the following addresses:

(a) All notices (including emergencies) to Wichita:

City Clerk
City Hall – 12th Floor
455 North Main
Wichita, KS 67202
Phone: 316-268-4515
Fax: 316-268-4514

Director of Water & Sewer Department
City Hall – 8th Floor
455 North Main
Wichita, KS 67202

(b) All notices to El Paso:

President, El Paso Water Company, Inc.
611 Mulberry
Derby, KS 67037
Phone: 316-788-3132
Fax: 316-788-6067

13.2 In the event negotiation of any terms or conditions takes place between the parties as called for and defined in this Agreement, and if no agreement is reached as a result of such negotiation, the parties hereto agree to attempt mediation. Such mediation shall take place by appointment of an individual mediator chosen from a list of names to be submitted to both parties from the League of Kansas Municipalities or other such entity as may be mutually agreed upon by the parties hereto. Such mediation shall be undertaken by the parties hereto in good faith, but the same shall be non-binding.

IN WITNESS WHEREOF, the parties hereto have hereunto caused this Agreement to be signed by their respective officer duly authorized so to do.

THIS AGREEMENT SHALL BE EFFECTIVE on the date first above written and upon execution of each party hereto.

EL PASO WATER COMPANY, INC.

Richard D. Standrich, Chairman

ATTEST:

Jean Epperson, Secretary

APPROVED AS TO FORM:

Philip H. Alexander, Corporate Counsel

CITY OF WICHITA, KANSAS

Chris Cherches
City Manager

ATTEST:

Pat Burnett, City Clerk

APPROVED AS TO FORM:

Gary E. Rebensdorf, Director of Law

CITY OF DERBY, KANSAS

Richard D. Standrich, Mayor

ATTEST:

Jean Epperson, City Clerk

APPROVED AS TO FORM:

Philip H. Alexander, City Attorney

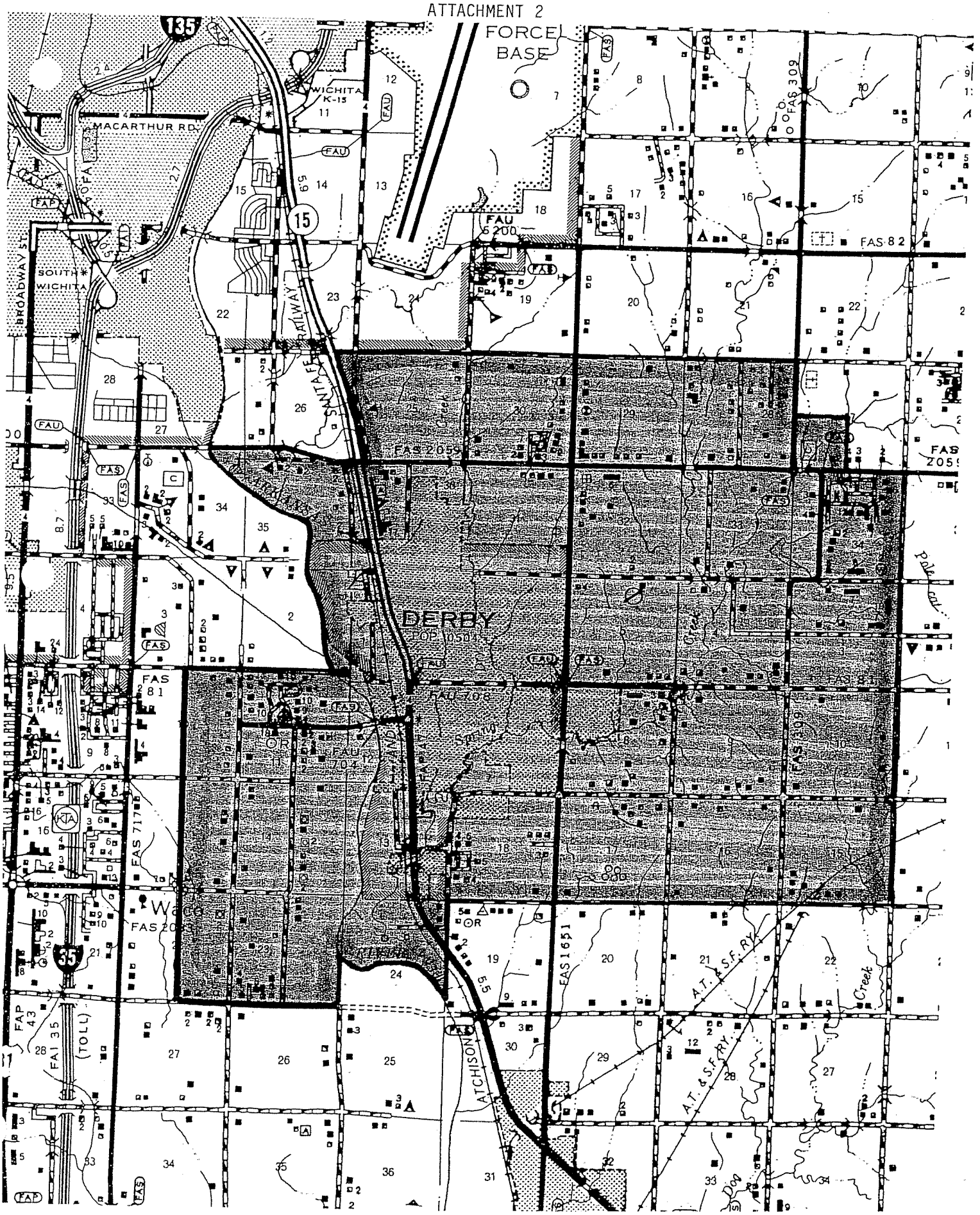
Attachments

1. Schedule of Projected Water Usage
2. El Paso Service Area
3. Wichita Water Master Plan Service Area

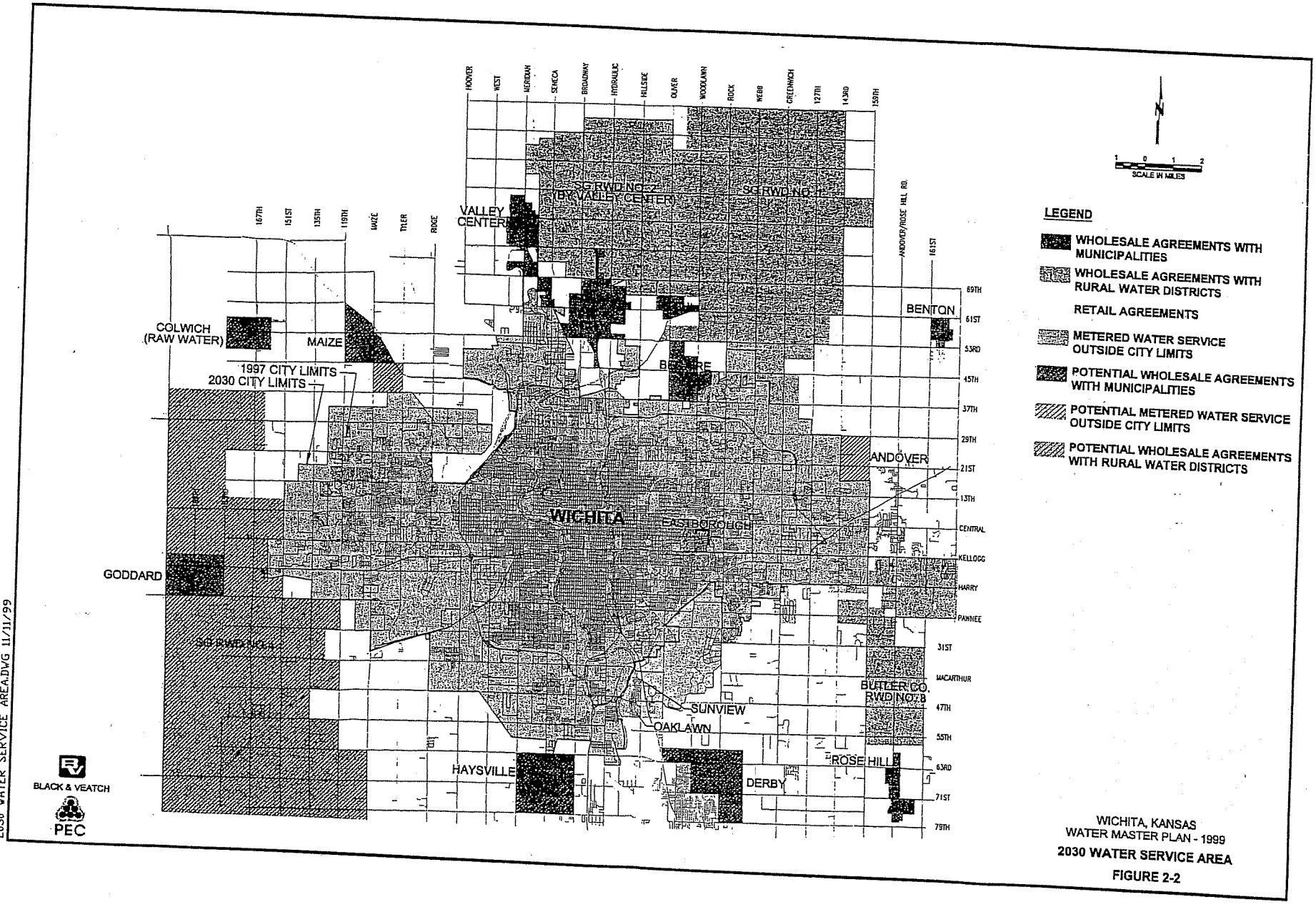
El Paso Water Co./City of Wichita
Attachment 1
Schedule of Projected Water Usage

Year	Annual Water Use MGY	
2002	835	
2003	848	
2004	860	
2005	873	2.39
2006	886	
2007	900	
2008	913	
2009	927	
2010	941	2.58
2011	955	
2012	969	
2013	984	
2014	998	
2015	1,013	2.77
2016	1,029	
2017	1,044	
2018	1,060	
2019	1,075	
2020	1,092	
2021	1,108	
2022	1,125	3.0

ATTACHMENT 2



ATTACHMENT 3



KEELING DISK693 WICHITA 59131.106
2030 WATER SERVICE AREA.DWG 11/11/99

WICHITA, KANSAS
WATER MASTER PLAN - 1999
2030 WATER SERVICE AREA
FIGURE 2-2

AGREEMENT
FOR
WHOLESALE WATER SERVICES
BETWEEN
VALLEY CENTER, KANSAS AND WICHITA, KANSAS

THIS AGREEMENT FOR WHOLESALE WATER SERVICE made and entered into this _____ OCT 29 1997, 1997, by and between THE CITY OF WICHITA, SEDGWICK COUNTY, KANSAS, hereinafter called "WICHITA", and THE CITY OF VALLEY CENTER, SEDGWICK COUNTY, KANSAS, hereinafter called "VALLEY CENTER":

WITNESSETH:

WHEREAS, Wichita owns and operates the Wichita Water Utility, which among other things provides water services; and,

WHEREAS, Valley Center owns and operates the Valley Center Utility and,

WHEREAS, Valley Center expects to construct, operate and maintain a water distribution system from Valley Center's point of connection to Wichita's water system; and,

WHEREAS, it is the intent and purpose of this Agreement for Wichita to provide wholesale water service to Valley Center at the rate(s) and under the conditions set forth in the provisions of this Agreement.

NOW THEREFORE, in view of the premises aforesaid and in consideration of the mutual covenants and good and valuable considerations herein contained, it is agreed by and between the parties as follows:

ARTICLE I

Permission to Connect and Right to Receive Water Services

1.1 The City of Wichita hereby grants permission to the City of Valley Center to connect a water line to the City of Wichita, and the City of Valley Center has the right to receive water therefrom.

1.2 Connection to the City of Wichita water system shall be done by the City of Valley Center, and the cost of connecting will be paid by the City of Valley Center.

1.3 The City of Valley Center shall file a complete set of plans and specifications of the Valley Center transmission line with the City of Wichita for approval prior to construction.

ARTICLE II

Water Metering and Terms of Service

2.1 All water sold to the City of Valley Center shall be measured by a master meter installed in a meter vault. Said vault and contents shall be approved by the City of Wichita and constructed and installed by the City of Valley Center. The said vault and contents shall be located at a mutually agreed upon location south of the river and be equipped with a bypass valve for emergency service. Ownership of said vault, meter and contents shall be transferred to and maintained by the City of Wichita.

2.2 The Wichita Water Utility shall have the right at any time to test the master meter. If the City of Valley Center requests a meter test, the test shall be conducted by the City of Wichita at the City of Valley Center's expense. If upon such examination and test conducted in the presence of a representative of the City of Valley Center, the meter is found to be inaccurate according to the standards of the American Water Works Association, either the meter will be repaired or a meter will be substituted at the expense of the City of Wichita and the adjustment of the water bill for the preceding billing period shall include a credit for the charge of the meter test. Whenever the City of Wichita finds the meter to be malfunctioning, an

adjustment of the charge for the preceding period shall be made by averaging the the water used for the corresponding billing period of the prior three years, or if such records are not extant, the best practical alternative for determining the estimate shall be used.

2.3 The City of Wichita does not guarantee to maintain any specific pressure for its service, and no complaint concerning the pressure shall give any right of claim against the City of Wichita or the Wichita Water Utility.

2.4 In the event that it is necessary to temporarily stop the flow of water into the City of Valley Center's line(s) due to the need of the City of Valley Center to make repairs on said lines, authorized representatives of the City of Valley Center shall be permitted to shut off the water supply by use of the valve located outside the meter vault. In the event that such discontinuance of service is necessary, the City of Valley Center shall notify the City of Wichita in advance of the period during which the water supply was discontinued and the purpose for said discontinuance.

2.5 Valley Center shall install an approved backflow prevention device at the point of connection with Wichita's system.

ARTICLE III

Covenant to Purchase Water and Terms of Purchase

3.1 The City of Valley Center agrees to take and pay for, or pay for

as tendered, on an annual basis, at least one-half of the volumes of water as specified in the Schedule of Projected Water Usage, as contained in Article VI of this contract.

3.2 The City of Wichita is not obligated to deliver more than two and one-half (2-1/2) times the daily portion of the annual contract volume as specified in Article VI during any given day.

3.3 The City of Wichita is not to be responsible for any losses of the City of Valley Center as a result of this take or pay contract provision.

3.4 The obligation of the City of Valley Center to take and pay for the quantities of water specified herein shall be unconditional throughout the duration of the contract.

3.5 The City of Wichita shall review the City of Valley Center's annual consumption at the end of each calendar year to determine whether the City of Valley Center has met its obligation to take at least one-half (1/2) of the annual contract volume as specified in Article VI. If actual consumption for the City of Valley Center is below one-half(1/2) of the annual contract volume, the City of Wichita shall render a bill to the City of Valley Center for the additional water which was tendered but not used.

ARTICLE IV

Discontinuance of Water Service

4.1 The City of Wichita and the Wichita Water Utility may refuse to deliver water to the City of Valley Center if it is determined by the Kansas State Board of Health or by the Wichita-Sedgwick County Health Department that conditions exist which might lead to contamination of the public water supply and may continue to refuse such delivery of water to the City of Valley Center until such condition is remedied to the satisfaction of either aforementioned public health authority.

ARTICLE V

Conditions of Water Service to Customers of Valley Center

5.1 It is anticipated that the supply needs of Valley Center will not exceed the amounts shown in the Schedule of Projected Water Usage as contained in Article VI of this contract. Therefore, Wichita agrees only to supply Valley Center with the quantities of water which are specified in the Schedule. If water consumption in any year exceeds the amount projected for that year as shown in the Schedule, or if past consumption records indicate to Wichita that consumption for any year will exceed the amount agreed to for that year, Wichita and Valley Center shall attempt to revise the Schedule. Failure to agree upon a new Schedule acceptable to both Valley Center and Wichita shall be cause for the termination of this contract twelve (12) months after one or both parties have declared an impasse and so notified the other

party in writing.

5.2 The City of Valley Center may request that the Schedule of Projected Water Usage be reduced if water consumption for any consecutive two year annual period falls twenty-five (25) percent below the annual amount of gallons of use set forth in the schedule of projected water usage set out in Article VI. The City of Wichita may, upon receiving a request for a reduction of water usage, reduce the Schedule of Projected Water Usage an appropriate amount as agreed to by the City of Valley Center. The reduction shall be a percentage reduction that applies to each of the remaining years left in this contract in the same percentage as that granted for the year the initial request is granted for.

5.3 Valley Center agrees to have in effect for all its customers a water conservation plan within six(6) months of the effective date of this contract. Said program must be submitted to and approved by Wichita prior to the delivery of water to Valley Center and any future changes to said program must be submitted to Wichita for approval.

Valley Center further agrees to modify its water conservation program within thirty (30) days to model any changes Wichita makes to its own program, upon written notification by Wichita.

Valley Center agrees that all water service connections will be individually metered and billed for such readings on at least a bimonthly schedule.

Valley Center agrees to institute for its customers any water

restrictions imposed by Wichita on its customers within fifteen (15) days of written notice from Wichita of such restrictions being promulgated by Wichita.

Valley Center agrees to adopt an ordinance within thirty (30) days of the execution of this Contract that shall require any new plumbing fixture(s) to be low water use type as required by the plumbing code of Wichita, as the same may exist from time to time.

ARTICLE VI

Schedule of Projected Water Usage

6.1 Total annual treated water delivered to Valley Center by Wichita in any one year shall not exceed the volumes specified below:

Projected Annual Volumes of Treated Water Projected to be Consumed by Valley Center:

CITY OF VALLEY CENTER

Year	Gallons	Year	Gallons
1997	233,800,000	2007	422,700,000
1998	266,600,000	2008	435,600,000
1999	299,500,000	2009	448,500,000
2000	322,400,000	2010	461,400,000
2001	345,300,000	2011	474,300,000
2002	358,200,000	2012	487,200,000
2003	371,100,000	2013	500,100,000
2004	384,000,000	2014	513,100,000
2005	396,900,000	2015	526,000,000

2006	409,800,000	2016	539,000,000

ARTICLE VII

Valley Center Service Area

7.1 Valley Center agrees to provide water service from Wichita only to customers within the area defined by the boundaries of the service area indicated as follows and designated by the following legal description:

Commencing at the Northwest Corner of Section 19, Township 25 south, Range 1 East of the 6th P.M. Thence south along the west line of said Section 19 to the south right-of-way line of 101st Street North. Said point being the point of beginning. Thence east along the south right-of-way line of 101st Street North thru Sections 19, 20 and that part of Section 21 to the westerly right-of-way line of Interstate Highway 135; thence south along the westerly right-of-way line of said Interstate Highway 135 thru said Section 21 and that part of Section 28 to the south line of the northwest quarter of Section 28; thence west along the south line of the northwest quarter of Section 28 to the west line of said Section 28; thence continuing west to the west right-of-way line of Old U.S. 81 Highway; thence south along the westerly right-of-way line of said Old U.S. 81 Highway thru the south half of Section 29 and Section 32 to the north right-of-way line of 77th Street North; thence west along the north right-of-way line of said 77th street North to the west line of southeast quarter of Section 32; thence south to the north line of Section 5, Township 26

South, Range 1 East of the 6th P.M. Thence continuing south along the east line of the west half of said Section 5 to the north right-of-way line of 69th Street North; thence west along the north right-of-way line of said 69th Street North to the west line of Section 5; thence continuing west to the westerly right-of-way line of Seneca Street; thence south along the west right-of-way line of said Seneca Street to the north line of south half of the southeast quarter Section 7 ; thence east along north line of said south half to the west line of Section 8; thence continuing east along the north line of the south half of the southwest quarter of Section 8, a distance of 546.8 feet; thence south parallel to the west line of the Southwest Quarter to a point 60 feet north of the south line of the Southwest Quarter; thence west parallel to the south line of said Southwest Quarter to the easterly right-of-way line of Burlington Northern Railroad; thence southeasterly along said easterly right-of way line to the south line of Section 8; thence west along said south line of Section 8 to the southeast corner of Section 7; thence continuing west along south line of Section 7 to the centerline of the Little Arkansas River; thence northerly continuing along the centerline of the Little Arkansas River to the east line of Section 12, Township 26 South, Range 1 West of the 6th P.M.; thence north along said east line of Section 12 to the north line of the Southeast Quarter of the Southeast Quarter; thence west along said north line to the west line of Section 11; thence north along the west line of said Section 11 to the southeast corner of Section 3; thence west along the south line of Section 3 to the easterly right-of-way line of the Wichita-Valley Center Floodway; thence northeasterly along the easterly right-of-way line of said Wichita-Valley Center Floodway across Section 3 to the south line of Section 34, Township 25 South, Range 1 West of the 6th P.M.; thence

continuing northeasterly along said easterly right-of-way line of Wichita-Valley Center Floodway across Sections 34,35,26, and the southeast corner of Section 23 to the east right-of-way of 39th Street West; thence north along the east right-of-way of said 39th Street West to the south right-of-way line of 101st Street North; thence east along the south right-of-way line of said 101st Street North to the point of beginning.

The service area boundaries are further delineated on the map which appears as Attachment "A" of this agreement as the "Water District Boundaries." In the event of a conflict between the legal description as cited above and the map of the service area boundaries cited as Attachment "A," the legal description contained in Section 7.1 shall control.

Wichita shall not obstruct or oppose in any manner the acquisition of right of way by Valley Center for the purpose of constructing distribution main in the area north of 61st St. N. to the southern boundary of the service area extending between Meridian on the East to 55th St. W. on the West. Distribution systems for either Wichita or Valley Center may share right of way.

7.2 The City of Valley Center agrees that water received from the City of Wichita shall not be sold to other incorporated cities, improvement districts, users outside the incorporated boundaries of the City of Valley Center, or any other similar users outside of the "Valley Center Service Area" as delineated in Section 7.1 of this Contract without the express written approval of the City of Wichita,

except for the following: (1) The City of Valley Center shall be allowed to continue water service to those customers outside the "Valley Center Service Area" which are served by the City of Valley Center at the time this contract has been approved by both governing bodies.

7.3 Valley Center particularly agrees to abide by the provisions concerning what customers may be connected to the system originally and in the future. It is agreed that if any unauthorized customers are connected or permitted to be connected to a Valley Center customer or to Valley Center itself, Wichita shall give Valley Center written notice of the breach of the terms of this Contract and, if Valley Center does not discontinue the act or acts constituting said breach within ten(10) days from the date of said notice, Wichita may discontinue water service to Valley Center.

7.4 The boundary areas described in paragraph 7.1 are subject to renegotiation by the parties at any time after ten years have elapsed from the date of agreement is executed by both parties. Renegotiation of boundaries may be commenced by either party notifying the other party of its desire to renegotiate the boundaries at least forty-five days in advance of the anniversary date of the ten year period. Either party reserves the right to refuse to a boundary change request. The City of Valley Center may terminate this agreement if the City of Wichita refuses a boundary change request by providing ninety days advance written notice of such termination within thirty days of the City of Valley Center receiving notice that the City of Wichita is not approving a requested change in boundaries.

ARTICLE VIII

System Equity Fees

8.1 Valley Center agrees to pay Wichita an equity fee equal to the cost of a water system equity fee for the applicable service connection size at the rates in effect at the time of the execution of this Contract to provide for the value of treatment plant and distribution system capacity reserved for use by Valley Center.

8.2 Valley Center agrees to pay to Wichita at least one half of the total system equity fee not later than thirty (30) days prior to Valley Center initiating connection to Wichita's water system. The remainder shall be paid no later than 180 days following initiation of water service to Valley Center. Any unpaid balance still outstanding at the expiration of the 180 day period will be subject to a one and one half percent penalty charge for each month any unpaid balance is left outstanding.

ARTICLE IX

Rates for Water Service

9.1 The rate charged Valley Center for water service shall be in accordance with the rates established and amended from time to time by Wichita ordinance for wholesale customers.

9.2 Valley Center shall be considered by Wichita as one customer for computation of water charges. The water volume charge for treated

water shall be based on actual metered water consumption at the rate for wholesale service under the terms of applicable rates as cited in Section 9.1 of this Agreement.

9.3 Valley Center will be billed monthly at the rates established by the provisions of this Agreement and by Wichita ordinances. If said bill is not paid within twenty-five (25) days after Wichita mails said billing, interest will be charged, and Valley Center agrees to pay such interest, in accordance with the ordinances of Wichita, as the same may exist from time to time.

ARTICLE X

Emergency Termination of Water Supply

10.1 Wichita hereby agrees to make every reasonable effort to provide adequate water service at all times pursuant to the terms of this Agreement; however, it is understood and realized by the parties hereto that Wichita's water system might, by reason of unforeseen catastrophe or disaster, commonly called acts of God, be temporarily suspended.

10.2 Interruptions of service under such conditions or pipeline failures shall not give rise to any claim on the part of Valley Center, or customers of Valley Center, against Wichita or its Water Utility. In such cases, Wichita will make good faith efforts to restore water service without unreasonable delay.

ARTICLE XI

Operation and Maintenance

11.1 Valley Center shall be fully responsible for the operation and maintenance of the water facilities owned by Valley Center, except as noted otherwise herein, and Valley Center agrees to indemnify and hold Wichita harmless of and from any claim or legal action against Wichita or Valley Center arising from the operation and/or maintenance by Valley Center of water systems owned by Valley Center or any part thereof.

ARTICLE XII

Usage of Right of Way and Paving of Streets

12.1 Either party to this agreement may request that the other party enter into an interlocal agreement for purposes of paving any street that is a boundary between the corporate limits of the parties. The two parties should act in good faith as to negotiating the terms and conditions of such an interlocal agreement. Any interlocal agreement that is entered into shall provide that assessments for property located in both cities shall be made in a manner that results in the imposition of assessments so that substantial equal burdens or shares of costs are assessed against all property that is similarly benefited. Assessment for boundary streets shall be made in accordance with that section of the City of Wichita's arterial street assessment policy and the method of assessment used shall be the value

of the land without regard for the improvements thereon. The at large share of cost, over and above the amount to be paid by benefit districts, are subject to good faith negotiations between the two cities prior to paving.

ARTICLE XIII

Agreement Term and Renewal

13.1 The term of this Agreement shall be twenty (20) years. Upon mutual agreement between the City of Valley Center and the City of Wichita, this Agreement may be extended for an additional period of up to ten (10) years under the same terms as contained herein. Approval of the extension shall require the update of the Schedule of Projected Water Usage as contained in Article VI.

13.2 Valley Center shall notify Wichita before the end of the sixteenth (16th) year of this Agreement if Valley Center wishes to extend this Contract.

13.3 If Wichita and Valley Center fail to agree on an extension of this Contract before the end of the seventeenth (17th) year of this Contract, this Contract shall terminate at the end of the twentieth (20th) year.

13.4 In the event the Agreement terminates, Valley Center shall disconnect its water distribution system from Wichita's water supply connection no later than one year following expiration of this Contract.

13.5 In the event the Contract expires as provided in Section 13.3 above, the parties hereto agree that the provisions of this Contract shall remain in full force and effect until Valley Center has actually disconnected from Wichita's water system and Valley Center has paid all amounts due Wichita under terms of this Contract or any amendments thereto.

ARTICLE XIV

Purchase of Raw Water from Valley Center

14.1 Wichita and Valley Center hereby agree to the sale from Valley Center to Wichita of water from Valley Center's current and/or future municipal water supply sources in volumes equal to the amounts of treated water purchased by Valley Center unless Wichita specifically requests and Valley Center concurs with a request to purchase an additional amount(s). The rate paid for said raw water purchased shall be in an amount not to exceed thirty-one cents ($0.31) per thousand gallons. Volumes sold to Wichita shall be determined on the basis of metering equipment installed and maintained by Wichita. Point(s) of connection and any other issues relating to the sale of this raw water supply to Wichita in full compliance with all applicable regulatory requirements shall be negotiated as part of an agreement separate from this Contract.

ARTICLE XV

Notices and Mediation

15.1 All notices required to be given herein, shall be in writing and shall be delivered in person or mailed by certified mail to the following addresses:

(a) All Notices (including emergencies) to the City of Wichita:

City Clerk
City Hall - 12th Floor
455 North Main
Wichita, Kansas 67202
And
Director of Water & Sewer Department
City Hall - 8th Floor
455 North Main
Wichita, Kansas 67202
Phone 316-268-4515
FAX 316-268-4514

(b) Notice to the City of Valley Center:

City Clerk
City of Valley Center
116 South Park
Valley Center, Kansas 67147

15.2 In the event that negotiation of any terms and conditions takes place between the parties as called for and defined in this Contract, if no agreement can be reached as a result of such negotiation the parties hereto agree to attempt mediation. Such mediation to take place by the appointment of an individual mediator chosen from a list of names to be submitted to both parties from the Kansas League of Municipalities or other such entity as may be mutually agreed to by the parties hereto. Such mediation shall be undertaken by the parties hereto in good faith, but the same shall be non binding.

IN WITNESS WHEREOF, the parties hereto have hereunto caused this Agreement to be signed by their respective officers duly authorized on the dates listed below.

This agreement shall be effective on the date first written above upon execution of each party hereto.

CITY OF VALLEY CENTER, KANSAS

Mayor

Date: 10-8-97

ATTEST:

LYNN E. IRELAND, City Clerk

City of Valley Center, Kansas

APPROVED AS TO FORM:

City Attorney

City of Valley Center, Kansas

CITY OF WICHITA, KANSAS

BOB KNIGHT, Mayor

Date: OCT 28 1997

THE CITY OF WICHITA SEDGWICK COUNTY, KANSAS

ATTEST:

Pat Burnett, ~~Deputy~~ City Clerk

City of Wichita, Kansas

APPROVED AS TO FORM:

Director of Law,

City of Wichita, Kansas

ATTACHMENT E

CONTRACT

THIS CONTRACT, made and entered into this 19TH day of MARCH 1985, by and between THE CITY OF WICHITA, SEDGWICK COUNTY, KANSAS, hereinafter called the City of Wichita, and THE CITY OF PARK CITY, SEDGWICK COUNTY, KANSAS, hereinafter called the City of Park City:

WITNESSETH:

WHEREAS, the City of Wichita owns and operates the Wichita Water Department, which produces an adequate supply of water by means of using reservoirs and deep well water; and

WHEREAS, the water produced by the Wichita Water Department has been approved by the Kansas State Board of Health for domestic use; and

WHEREAS, the City of Park City operates and maintains a system of water mains and distribution lines within its own corporate limits, and

WHEREAS, the quality of the present source of water for the City of Park City is considered to be unreliable and the quantity is not adequate, and

WHEREAS, the City of Park City will construct a water transmission line from the City of Park City water distribution system to a point near the existing City of Wichita water system, hereinafter referred to as the Park City transmission line, and

WHEREAS, it is the intent and purpose of this contract for the City of Wichita to provide a supply of potable water in sufficient quantities to the City of Park City,

THEREFORE, in view of the premises aforesaid and in consideration of the mutual covenants and promises herein contained, it is agreed by and between the parties as follows:

SECTION 1: Permission to Connect and Right to Receive Water. The City of Park City shall design and construct the water transmission line from 37th Street North and Hillside to the City of Park City. Connection to the City of Wichita main shall be done by the City of Wichita.

That portion of the water transmission line from 37th Street North and Hillside to a point 10 feet north of the south property line of 45th Street North shall be 20 inches in diameter and shall be designed and constructed in accordance with the specifications and standards of the City of Wichita. The City of Wichita shall have the exclusive right to operate and maintain this portion of the transmission line and said portion of the water transmission line shall become the property of the City of Wichita at such time as the bonds issued by the City of Park City to finance the project are retired.

No later than 14 days after the start of construction the City of Wichita shall transfer to the City of Park City the sum of $ 58,420.00 as its contribution in the construction of the 20-inch line.

The City of Park City shall file a complete set of plans and specifications of the water main between the City of Wichita and the City of Park City with the City of Wichita for approval prior to construction. The location of the Park City transmission line must be approved by the City of Wichita.

SECTION 2: Metering. All water sold to the City of

Park City shall be measured by a master meter installed in a meter vault. Said vault and contents shall be constructed and installed by the City of Park City, located at a mutually agreed-upon point where the Park City transmission line connects with the City of Wichita water distribution system and equipped with a bypass valve for emergency service. Said vault and contents shall be owned and maintained by the City of Wichita.

The City of Wichita reserves the right to move the master meter if the water distribution system of the City of Wichita is extended toward the City of Park City, and to remove the City of Park City's lines from conflict with future streets and utility easements in those areas which have been annexed by the City of Wichita; provided, the City of Wichita will bear the expense of said moves and removals.

The Wichita Water Department shall have the right at any time to test the master meter. If the City of Park City requests a meter test, the test shall be conducted by said Department at the City of Park City's expense. If upon such examination and test conducted in the presence of a representative of the City of Park City, the meter is found to be inaccurate according to the standards of the American Water Works Association, either the meter will be repaired or a meter will be substituted and the adjustment of the water bill for the preceding billing period shall include a credit for the charge for the meter test. Whenever the Wichita Water Department finds the meter to be inoperative, an adjustment of charge for the preceding period shall be made by averaging the water used for the corresponding billing period of the three prior years; or if such records are not extant, the best other method practical. Whenever the Wichita Water Department shall find

the meter not measuring accurately according to standards of the American Waterworks Association, an adjustment of charges for the preceding billing period shall be made.

SECTION 3: City of Wichita Not Liable for Failure to Maintain Pressure. The City of Wichita does not guarantee to maintain any specific pressure for its service, and no complaint concerning the pressure shall give any right of claim against the City of Wichita or the Wichita Water Department.

SECTION 4: Operation and Maintenance. The City of Park City shall be fully responsible for operation and maintenance of the facilities owned by the City of Park City, and the City of Park City agrees to hold the City of Wichita harmless of and from any claim or legal action against the City of Wichita or the City of Park City arising from the operation and/or maintenance by the City of Park City of the water system owned by the City of Park City or any part thereof.

In the event that it is necessary to temporarily stop the flow of water into the City of Park City's lines due to the need of the City of Park City to make repairs on said lines, authorized representatives of the City of Park City shall be permitted to shut off the water supply by use of the valve located outside the meter vault. In the event that such discontinuance of service is necessary, the City of Park City shall notify the Wichita Water Department of the period during which the water supply was discontinued and the purpose for said discontinuance.

SECTION 5: Water Rates. The rate charged for water sold to the City of Park City by the City of Wichita shall

be in accordance with the rates established by the City of Wichita by ordinance for a similar class of users. Sections of the ordinance which prescribe the rates are attached to this contract.

It is further agreed that the rate may be changed by amendment of said ordinance provided, that the rate charged to the City of Park City shall be equal to the rate charged to similar customers outside of the corporate limits of Wichita.

The City of Park City agrees to pay to the Wichita Water Department an amount to be computed at the then existing rate established by ordinance of the City of Wichita within twenty-five (25) days after receipt of billing for the water supplied under this contract during the preceding month. Interest of 1 1/2% per month will be added to all bills not paid within twenty-five (25) days.

SECTION 6: Emergency Termination of Water Supply. The City of Wichita hereby agrees to make every reasonable effort to provide an adequate supply of water at all times pursuant to the terms of this contract; however, it is understood and realized by the parties hereto that the Wichita, Kansas, water supply might, by reason of unforseen catastrophe or disaster commonly called acts of God, be temporarily suspended.

Interruptions of service under such conditions or pipeline failure shall not give rise to any claim on the part of the City of Park City or customers of the City of Park City against the Wichita Water Department or the City of Wichita.

SECTION 7: Discontinuance of Service. The City of Wichita and the Water Department may refuse to deliver

water to the City of Park City if it is determined by the Kansas State Board of Health or by the Wichita-Sedgwick County Health Department that conditions exist which might lead to contamination of the public water supply and may continue to refuse such delivery of water to the City of Park City until such condition is remedied to the satisfaction of either said State Board or said Wichita-Sedgwick County Department.

SECTION 8: Service to Customers of Park City. The City of Park City agrees that water received from the City of Wichita shall not be sold to other incorporated cities, improvement districts, rural water districts, users outside the incorporated boundary of the City of Park City, or any other similar users without the approval of the City of Wichita, except that the City of Park City shall be allowed to continue service to those incorporated cities, improvement districts, rural water districts, and other customers outside the incorporated boundary of the City of Park City which are served by the City of Park City at the time this contract is signed.

It is anticipated that the needs of the City of Park City will not exceed the amounts of water shown in the Schedule of Projected Water Usage, Section 10 of this contract. Therefore, the City of Wichita agrees only to supply to the City of Park City those quantities of water which are specified in the Schedule. If water consumption in any year exceeds the amount projected for that year as shown in the Schedule, or if past consumption records indicate to the Wichita Water Department that consumption for any year will exceed the amount agreed to for that year, said Department and the City of Park City shall reevaluate the Schedule. Failure to agree upon a new Schedule accept-

able to both the City of Park City and the City of Wichita shall be cause for the termination of this contract. The City of Park City agrees to have in effect for all of its customers a water conservation program. Said program must be approved by the City of Wichita prior to the delivery of water to the City of Park City, and any future changes to said program must be submitted to the City of Wichita for approval.

It is agreed that existing single-family dwellings which lie along the route of the Park City transmission line at the time of the execution of this contract can be served from said line; provided, however, that such water service will be established only for residential use and will be provided only to those residences designated in the set of plans and specifications of said line filed with the City of Wichita prior to construction. The City of Park City agrees to provide service to no other establishment, or for any purpose other than residential use, along the transmission line, or any extension therefrom, outside the corporate limits of the City of Park City without the approval of the City of Wichita.

The City of Park City particularly agrees to abide by the provisions concerning what customers may be connected to the system originally and in the future. It is agreed that if any unauthorized customers are connected or permitted to be connected by the City of Park City's customers or the City of Park City itself, the City of Wichita shall give the City of Park City written notice of the breach of the terms of this contract and, if the City of Park City does not discontinue the act or acts constituting said breach within ten (10) days from the date of said notice, the City of Wichita may discontinue service to the City of Park City.

SECTION 9: Contract Term and Renewal. The term of this contract shall be for forty (40) years. The City of Park City shall notify the City of Wichita before the end of the thirty-fifth year of this contract if it wishes to extend this contract. If the City of Wichita and the City of Park City fail to agree on an extension of this contract before the end of the thirty-seventh year of this contract, this contract shall terminate at the end of the fortieth year.

SECTION 10: Schedule of Projected Water Usage.

YEAR	GALLONS	YEAR	GALLONS
1985	212,430,000	2005	425,316,000
1986	220,484,400	2006	441,419,600
1987	228,538,800	2007	457,523,200
1988	236,593,200	2008	473,626,800
1989	244,647,600	2009	489,730,400
1990	252,702,000	2010	505,834,000
1991	262,291,000	2011	524,966,600
1992	271,880,000	2012	544,099,200
1993	281,469,000	2013	563,231,800
1994	291,058,000	2014	582,364,400
1995	300,647,000	2015	601,497,000
1996	312,037,800	2016	624,237,200
1997	323,428,600	2017	646,977,400
1998	334,819,400	2018	669,717,600
1999	346,210,200	2019	692,457,000
2000	357,601,000	2020	715,198,000
2001	371,144,000	2021	742,141,700
2002	384,687,000	2022	769,085,500
2003	398,230,000	2023	796,029,200
2004	411,773,000	2024	822,973,000

IN WITNESS WHEREOF, the parties hereto have hereunto caused this contract to be signed by their respective officers duly authorized this 20th day of March, 1985.

Mayor, City of Park City

Mayor, City of Wichita
ROBERT G. KNIGHT

ATTEST:

City Clerk, City of Park City

ATTEST:

City Clerk, City of Wichita
DONALD C. GISICK

APPROVED AS TO FORM:

John Defoher 4TRP
Director of Law,
City of Wichita

CITIES OF WICHITA AND BEL AIRE

WATER AND SEWER SERVICE CONTRACT

THIS CONTRACT, made and entered into this 26TH day of APRIL 1988, by and between THE CITY OF WICHITA, SEDGWICK COUNTY, KANSAS, hereinafter called the City of Wichita, and THE CITY OF BEL AIRE, SEDGWICK COUNTY, KANSAS, hereinafter called the City of Bel Aire:

WITNESSETH:

WHEREAS, the City of Wichita owns and operates the Wichita Water Utility, which produces an adequate supply of water by means of using reservoirs and deep well water; and

WHEREAS, the water produced by the City of Wichita has been approved by the Kansas Department of Health and Environment for domestic use; and

WHEREAS, the City of Bel Aire operates and maintains a system of water mains and distribution lines within its own corporate limits, and

WHEREAS, the quantity of the present source of water for the City of Bel Aire is considered to be unreliable and the quantity is not adequate; and

WHEREAS, the City of Bel Aire will construct a water transmission line from the City of Bel Aire water distribution system to a point or points near the existing City of Wichita water system, hereinafter referred to as the Bel Aire transmission line, and

WHEREAS, the City of Wichita owns and operates the Wichita Sewer Utility, which provides adequate sanitary sewage treatment services; and

WHEREAS, the City of Bel Aire operates and maintains a system of sewer mains and collection lines within its own corporate limits; and

WHEREAS, the City of Bel Aire currently receives sewage treatment services from the City of Wichita under an existing contract; and

WHEREAS, it is the intent and purpose of this contract for the City of Wichita to provide a supply of potable water in sufficient quantities and adequate sewer treatment services to the City of Bel Aire;

NOW, THEREFORE, in view of the premises aforesaid and in consideration of the mutual covenants and promises herein contained, it is agreed by and between the parties as follows:

ARTICLE I

Permission to Connect and Right to Receive Water Services

1.1 The City of Wichita hereby grants permission to the City of Bel Aire to connect a water line to the City of Wichita water system at a point designated by the City of Wichita, and the City of Bel Aire has the right to receive water therefrom.

1.2 Connection to the City of Wichita water system shall be done by the City of Bel Aire, and the cost of connecting will be paid by the City of Bel Aire.

1.3 The City of Bel Aire shall file a complete set of plans and specifications of the Bel Aire transmission line with the City of Wichita for approval prior to construction.

1.4 The City of Wichita agrees to grant permission to the City of Bel Aire to connect to the City of Wichita water system at a second point at 37th Street and Oliver Street at such time as requested by the City of Bel Aire. Such connection to be made under the same terms and conditions as required for the initial connection.

ARTICLE II

Water Metering And Flow

2.1. All water sold to the City of Bel Aire shall be measured by a master meter installed in a meter vault. Said vault and contents shall be approved by

the City of Wichita and constructed and installed by the City of Bel Aire. The said vault and contents shall be located near the intersection of 37th Street North and Woodlawn and equipped with a bypass valve for emergency service. Ownership of said vault, meter and contents shall be transferred to and maintained by the City of Wichita.

2.2. The Wichita Water Utility shall have the right at any time to test the master meter. If the City of Bel Aire requests a meter test, the test shall be conducted by the City of Wichita at the City of Bel Aire's expense. If upon such examination and test conducted in the presence of a representative of the City of Bel Aire, the meter is found to be inaccurate according to the standards of the American Water Works Association, either the meter will be repaired or a meter will be substituted and the adjustment of the water bill for the preceding billing period shall include a credit for the charge for the meter test. Whenever the City of Wichita finds the meter to be inoperative, an adjustment of charge for the preceding period shall be made by averaging the water used for the corresponding billing period of the three prior years; or if such records are not extant, the best other method practical. Whenever the City of Wichita shall find the meter not measuring accurately according to the standards of the American Waterworks Association, an adjustment of charges for the preceding billing period shall be made.

2.3. The City of Wichita does not guarantee to maintain any specific pressure for its service, and no complaint concerning the pressure shall give any right of claim against the City of Wichita or the Wichita Water Utility.

2.4. In the event that it is necessary to temporarily stop the flow of water into the City of Bel Aire's lines due to the need of the City of Bel Aire to make repairs on said lines, authorized representatives of the City of Bel Aire shall be permitted to shut off the water supply by use of the valve located outside the meter vault. In the event that such discontinuance of service

is necessary, the City of Bel Aire shall notify the City of Wichita in advance of the period during which the water supply was discontinued and the purpose for said discontinuance.

ARTICLE III

Covenant To Purchase Water And Terms Of Purchase

3.1. The City of Bel Aire agrees to take and pay for, or pay for as tendered, on an annual basis at least one-half of the yearly contract volume of water as specified in the Schedule of Projected Water Usage, ARTICLE VI, of this contract.

3.2. The City of Wichita is not obligated to deliver more than two and one-half (2-1/2) times the daily portion of the annual contract volume during any given day.

3.3. The City of Wichita is not to be responsible for any loss of take or pay for water of the City of Bel Aire as a result of this contract provision.

3.4. The obligation of the City of Bel Aire to take and pay for the quantities of water specified herein shall be unconditional throughout the duration of the contract.

3.5. The City of Wichita shall review the City of Bel Aire's annual consumption at the end of each calendar year to determine whether the City of Bel Aire has met its obligation to take at least one-half (1/2) the annual contract volume. If actual consumption for the City of Bel Aire is below one-half (1/2) the annual contract volume, the City of Wichita shall render a bill to the City of Bel Aire for the additional water which was tendered but not used.

ARTICLE IV

Discontinuance of Water Service

4.1. The City of Wichita and the Water Utility may refuse to deliver water to the City of Bel Aire if it is determined by the Kansas State Board of Health or by the Wichita-Sedgwick County Health Department that conditions

exist which might lead to contamination of the public water supply and may continue to refuse such delivery of water to the City of Bel Aire until such condition is remedied to the satisfaction of either said State Board or said Wichita-Sedgwick County Department.

ARTICLE V

Conditions of Water Service to Customers of Bel Aire

5.1. The City of Bel Aire agrees to serve water only to customers within the boundaries specified in the Bel Aire Service Area, ARTICLE XI, of this contract.

5.2. It is anticipated that the water needs of the City of Bel Aire will not exceed the amounts of water shown in the Schedule of Projected Water Usage, ARTICLE VI, of this contract. Therefore, the City of Wichita agrees only to supply to the City of Bel Aire those quantities of water which are specified in the Schedule. If water consumption in any year exceeds the amount projected for that year as shown in the Schedule, or if past consumption records indicate to the City of Wichita that consumption for any year will exceed the amount agreed to for that year, the City of Wichita and the City of Bel Aire shall reevaluate the Schedule. Failure to agree upon a new Schedule acceptable to both the City of Bel Aire and the City of Wichita shall be cause for the termination of this contract.

5.3. The City of Bel Aire may request that the Schedule of Projected Water Usage be reduced if water consumption for any consecutive two year annual period falls twenty-five percent (25%) below the annual amount of gallons of use set forth in the schedule of projected water usage set out at ARTICLE VI. The City of Wichita may, upon receiving a request for reduction of water usage, reduce the Schedule of Projected Water Usage an appropriate amount as agreed to by the City of Bel Aire. The reduction shall be a percentage reduction that applies to each of the remaining years left in this contract in the same per-

centage as that granted for the year the initial request is made for.

5.4. The City of Bel Aire agrees to have in effect for all of its customers a water conservation program. Said program must be approved by the City of Wichita prior to the delivery of water to the City of Bel Aire, and any future changes to said program must be submitted to the City of Wichita for approval.

ARTICLE VI

Schedule of Projected Water Usage

YEAR	GALLONS	YEAR	GALLONS
1988	134,000,000	1998	161,000,000
1989	137,000,000	1999	163,000,000
1990	139,000,000	2000	166,000,000
1991	142,000,000	2001	169,000,000
1992	144,000,000	2002	172,000,000
1993	147,000,000	2003	175,000,000
1994	149,000,000	2004	178,000,000
1995	152,000,000	2005	182,000,000
1996	155,000,000	2006	185,000,000
1997	158,000,000	2007	188,000,000
		2008	192,000,000

ARTICLE VII

Permission to Connect and Right to Deliver Sewage

7.1. The City of Wichita hereby grants the City of Bel Aire permission to continue its present connections to the City of Wichita sewer system and pump sewage into said system for sewage treatment.

ARTICLE VIII

Type of Sewer Connections and Sewage Accepted

8.1. The City of Bel Aire agrees that service shall not be provided to any industrial customer. The City of Bel Aire shall discharge into the City of Wichita sewer system only ordinary sanitary wastes and to discharge no toxic or hazardous pollutants, radioactive materials, corrosive, or abrasive matter, air conditioning water, surface or building drainage, any sewage prohibited by City of Wichita ordinance, or any sewage other than that being discharged at the time of this agreement, without prior written consent of the City of Wichita. If, however, a prohibited discharge does occur, the City of Bel Aire shall be responsible for the cost of any clean-up in or without the city limits of Bel Aire that may be necessary due to the nature and volume of the material discharged.

ARTICLE IX

Conditions of Sewer Service to Customers of Bel Aire

9.1. The City of Bel Aire agrees to serve sewer service only to customers within the boundaries specified in the Bel Aire Service Area, ARTICLE XI, of this contract.

9.2. It is anticipated that the sewer needs of the City of Bel Aire will eventually exceed the sanitary discharge rates shown in the Limits On Sewage Delivery, Article X, of this contract. However, the City of Wichita agrees to provide to the City of Bel Aire only sanitary discharge up to the limits agreed to in this contract. If City of Bel Aire sanitary discharge in any year meets or exceeds the limits agreed to, or if past discharge records indicate to the City of Wichita that sanitary discharge for any year will meet or exceed the amounts agreed to, the City of Wichita and the City of Bel Aire shall reevaluate the discharge limits.

9.3. Design and construction of any addition to the present City of Bel

Aire sewer system shall conform to the standards and ordinances of the City of Wichita.

9.4. Plans and specifications shall be submitted to the Wichita City Engineer for approval prior to advertising for bids for construction.

9.5. The City of Wichita will inspect the sewer system, including air-testing and television.

9.6. The City of Bel Aire shall not accept the sewer system from the construction contractor until the City of Wichita has determined that it meets the necessary standards.

9.7. Charges for review and testing services will be the same as charged within the City of Wichita.

9.8. Before any user is allowed to connect to the City of Bel Aire sewer system, a permit must be obtained from the City of Wichita, and all requirements pertaining thereto by Wichita City ordinance must be met.

9.9. Additional sewer mains may be installed within the City of Bel Aire and transported to the City's sewer collection system, providing sufficient capacity exists within the City's system to accept the additional loading.

ARTICLE X

Limits on Sewage Delivery.

10.1. Maximum sanitary sewer discharge at peak dry weather flow: Twelve (12) inch outfall sewer line - 0.89 cubic feet per second (C.F.S.) or a maximum of 625 standard single-family sewer service connections; Eighteen (18) inch outfall sewer line - 3.2 cubic feet per second (C.F.S.) or a maximum of 2,298 standard single-family sewer service connections. The above service connection numbers serve as a guideline only. Flow limitations shall be based upon the actual maximum allowable flows in the two outfall sewer lines, as measured in the field, by the City of Wichita.

ARTICLE XI

Bel Aire Service Area

11.1 Only customers within the following boundaries shall be served water or sewer service from the city of Bel Aire:

"Starting at the intersection of Oliver and 37th Street North, thence east along 37th Street North to Woodlawn and 37th Street North; thence north along Woodlawn to the Missouri Railroad; thence northeast along the Missouri Railroad to the half section line of Section 30, T26S, R2E; thence north along the half section line to 45th Street North; thence east along 45th Street North to the 1/4 section line of Section 30, T26S, R2E; thence south along said 1/4 section line to the Missouri Railroad; thence northeast along the Missouri Railroad to Rock Road; Thence north along Rock Road to 45th Street North; Thence west to the 1/4 section line; thence north along 1/4 section line to 53rd Street North; thence westerly along 53rd Street North to Oliver; thence south along Oliver to the point of beginning." (As shown in Exhibit A)

11.2. The City of Bel Aire agrees that water received from the City of Wichita shall not be sold to other incorporated cities, improvement districts, rural water districts, users outside the incorporated boundary of the City of Bel Aire, or any other similar users without the approval of the City of Wichita, except for the following: (1) The City of Bel Aire shall be allowed to continue water and sewer service to those customers outside the incorporated boundary of the City of Bel Aire which are served by the City of Bel Aire at the time this contract has been approved by both governing bodies. (2) The City of Bel Aire may provide all properties owned by the Catholic Diocese located east of Woodlawn and north of 45th Street North with water and sewer service.

11.3 The City of Bel Aire particularly agrees to abide by the provisions concerning what water or sewer customers may be connected to the system originally and in the future. It is agreed that if any unauthorized customers are connected or permitted to be connected by the City of Bel Aire's customers or the City of Bel Aire itself, the City of Wichita shall give the City of Bel Aire written notice of the breach of the terms of this contract and, if the City of Bel Aire does not discontinue the act or acts constituting said breach within ten (10) days from the date of said notice, the City of Wichita may discontinue services to the City of Bel Aire.

11.4. The boundary areas described in paragraph 11.1 are subject to renegotiation by the parties at the end of ten years from the date this agreement is executed by the parties. Renegotiation of boundaries may be commenced by either party notifying the other party of its desire to renegotiate boundaries at least forty-five days in advance of the anniversary date of the ten year period. Either party reserves the right to refuse to agree to a boundary change request. The City of Bel Aire may terminate this agreement if the City of Wichita refuses a boundary change request by providing ninety days advance written notice of such termination within thirty days of the City of Bel Aire receiving notice that the City of Wichita is not approving a requested change in boundaries.

ARTICLE XII

Purchase Price For Water And Sewer Services

12.1 The rate charged to Bel Aire for water delivered or tendered and sewer services connected shall be in accordance with the rates established by the City of Wichita ordinance for a similar class of users.

12.2 Each Bel Aire sewer service connection shall be considered as one flat rate customer for computation of sewer charges. In computing sewer service connections, each household unit or commercial unit, whether singly attached or not, shall be considered as a connection. A household unit is a single-family living area, and a commercial unit is a single business.

12.3. It is further agreed that the rates may be changed by amendment of said ordinances provided, that the rates charged to the City of Bel Aire shall be equal to the rates charged to similar customers outside of the corporate limits of Wichita. Sections of the ordinances which prescribe the rates are attached to this contract.

12.4. The City of Bel Aire agrees to pay to the City of Wichita an amount to be computed at the then existing rates established by ordinances of the City

of Wichita within twenty-five (25) days after receipt of billing for water services specified under this contract during the preceding month. Interest per month in accordance to rate ordinances will be added to all bills not paid within twenty-five (25) days.

ARTICLE XIII

Emergency Termination of Water or Sewer Services

13.1. The City of Wichita hereby agrees to make every reasonable effort to provide an adequate supply of water and sewage treatment service at all times pursuant to the terms of this contract; however, it is understood and realized by the parties hereto that the Wichita water supply or sewage treatment system might, by reason of unforeseen catastrophe or disaster, commonly called acts of God, be temporarily suspended.

13.2. Interruptions of service under such conditions or pipeline failure shall not give rise to any claim on the part of the City of Bel Aire or customers of the City of Bel Aire against the City of Wichita or the Wichita Water or Sewer Utility.

ARTICLE XIV

Usage of Right-of-Way And Paving of Streets.

14.1. The City of Bel Aire agrees upon the request of the City of Wichita to provide the City of Wichita the legal right to construct and maintain utilities within street right-of-way on 45th Street North from Rock Road on the north to City of Wichita's Willowbend, 6th Addition on the south. The City of Wichita agrees that the City of Bel Aire shall retain the exclusive right to serve property located adjacent to 45th Street North that is within the City of Bel Aire with sewer and water. The City of Wichita shall not have the right and shall not be obligated to serve property located within the City of Bel Aire with sewer or water from lines installed in 45th Street North between Rock Road and Willowbend 6th Addition.

14.2. The City of Bel Aire agrees, that at the request of the City of Wichita, to enter into an interlocal agreement that provides authority to the City of Wichita to pave 45th Street North between Rock Road on the east and Willowbend 6th Addition on the west. It is agreed by the parties that such interlocal agreement shall provide for the creation of a benefit district that is within the City of Wichita and within the City of Bel Aire that includes all property benefited from such street improvement. The paving of said street shall be done in conformance with City of Wichita specifications for two lane arterial or residential streets as determined by the City of Wichita. The street shall be located in right of way as depicted in Exhibit B. The assessment of property against property benefited from the project shall also be made in conformance with City of Wichita policy. Any assessments that are spread shall result in substantially equal burdens or share of cost being assessed against property that is similarly benefited.

14.3. Either party to this agreement may request that the other party enter into an interlocal agreement for purposes of paving any street that is a boundary between the corporate limits of the parties. The two parties should act in good faith as to negotiating the terms and conditions of such an interlocal agreement. Any interlocal agreement that is entered into shall provide that assessments for property located in both cities shall be made in a manner that results in the imposition of assessments so that substantial equal burdens or shares of costs are assessed against all property that is similarly benefited. Assessment for boundary streets shall be made in accordance with that section of the City of Wichita's arterial street assessment policy and the method of assessment used shall be the value of the land without regard for the improvements there on. The at large share of cost, over and above the amount to be paid by benefit districts, are subject to good faith negotiations between the two cities prior to paving.

ARTICLE XV

Operation and Maintenance

15.1. The City of Bel Aire shall be fully responsible for operation and maintenance of the water and sewer facilities owned by the City of Bel Aire, and the City of Bel Aire agrees to hold the City of Wichita harmless of and from any claim or legal action against the City of Wichita or the City of Bel Aire arising from the operation and/or maintenance by the City of Bel Aire of the water or sewer systems owned by the City of Bel Aire or any part thereof.

15.2. The City of Bel Aire shall maintain in good repair all sewer lines and connections to the City of Bel Aire sanitary sewer system, including City of Bel Aire connections to the City of Wichita sewer system, throughout the life of this agreement. The City of Wichita will not be responsible for maintaining any sewer facilities in the City of Bel Aire service area.

ARTICLE XVI

Contract Term and Renewal

16.1. The term of this contract shall be for twenty (20) years.

16.2. The City of Bel Aire shall notify the City of Wichita before the end of the eighteenth year of this contract if it wishes to extend this contract.

16.3. If the City of Wichita and the City of Bel Aire fail to agree on an extension of this contract before the end of the nineteenth year of this contract, this contract shall terminate at the end of the twentieth year.

ARTICLE XVII

Notices

17.1 All notices required to be given hereunder, shall be in writing and shall be delivered in person or shall be mailed by registered mail to the following addresses:

(a) Notice to the City of Wichita

City Clerk

City Hall

455 N. Main

Wichita, Kansas 67202

(b) Notice to the City of Bel Aire

City Clerk

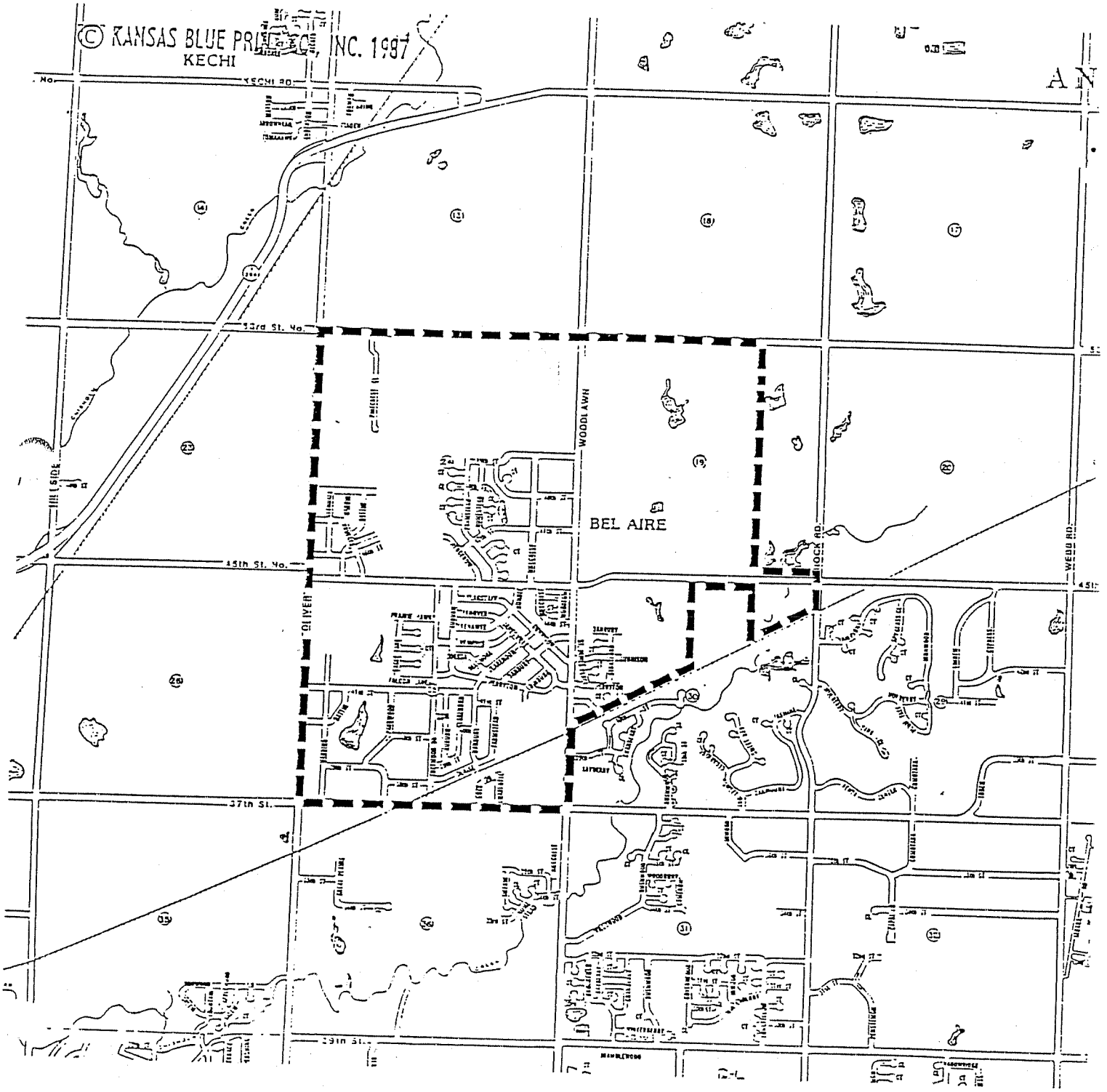
City Hall

4551 N. Auburn

Wichita, Kansas 67226

EXHIBIT "A"

BEL AIRE WATER AND SEWER SERVICE AREA



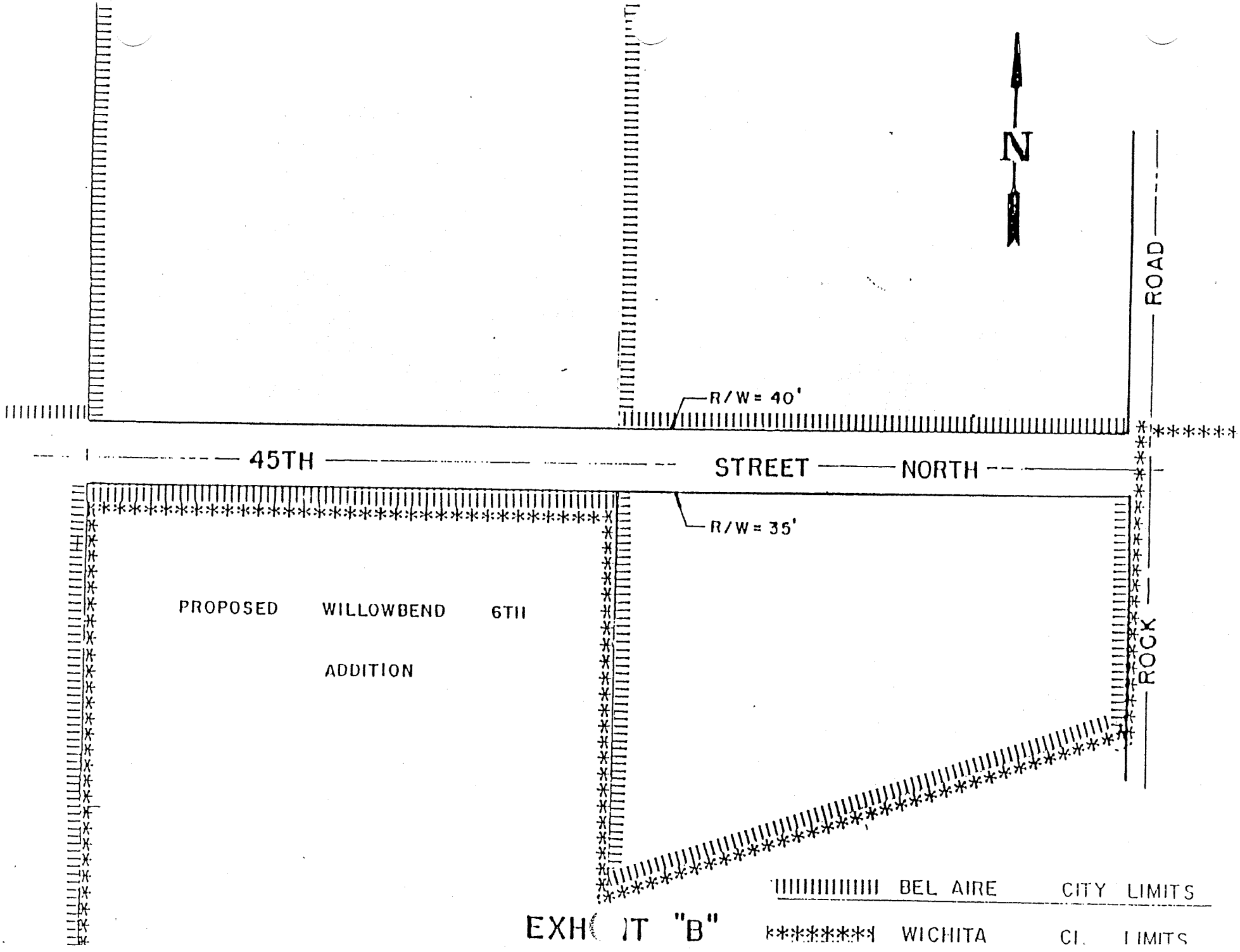

N
ROAD
R/W = 40'
45TH
STREET
NORTH
R/W = 35'
PROPOSED WILLOWBEND 6TH
ADDITION
ROCK
BEL AIRE CITY LIMITS
WICHITA CI. LIMITS

EXHIBIT "B"

IN WITNESS WHEREOF, the parties hereto have hereunto caused this contract to be signed by their respective officers duly authorized this 26th day of APRIL, 1988.

Mayor, City of Bel Aire

Mayor, City of Wichita

ATTEST:

City Clerk, City of Bel Aire

ATTEST:

City Clerk, City of Wichita

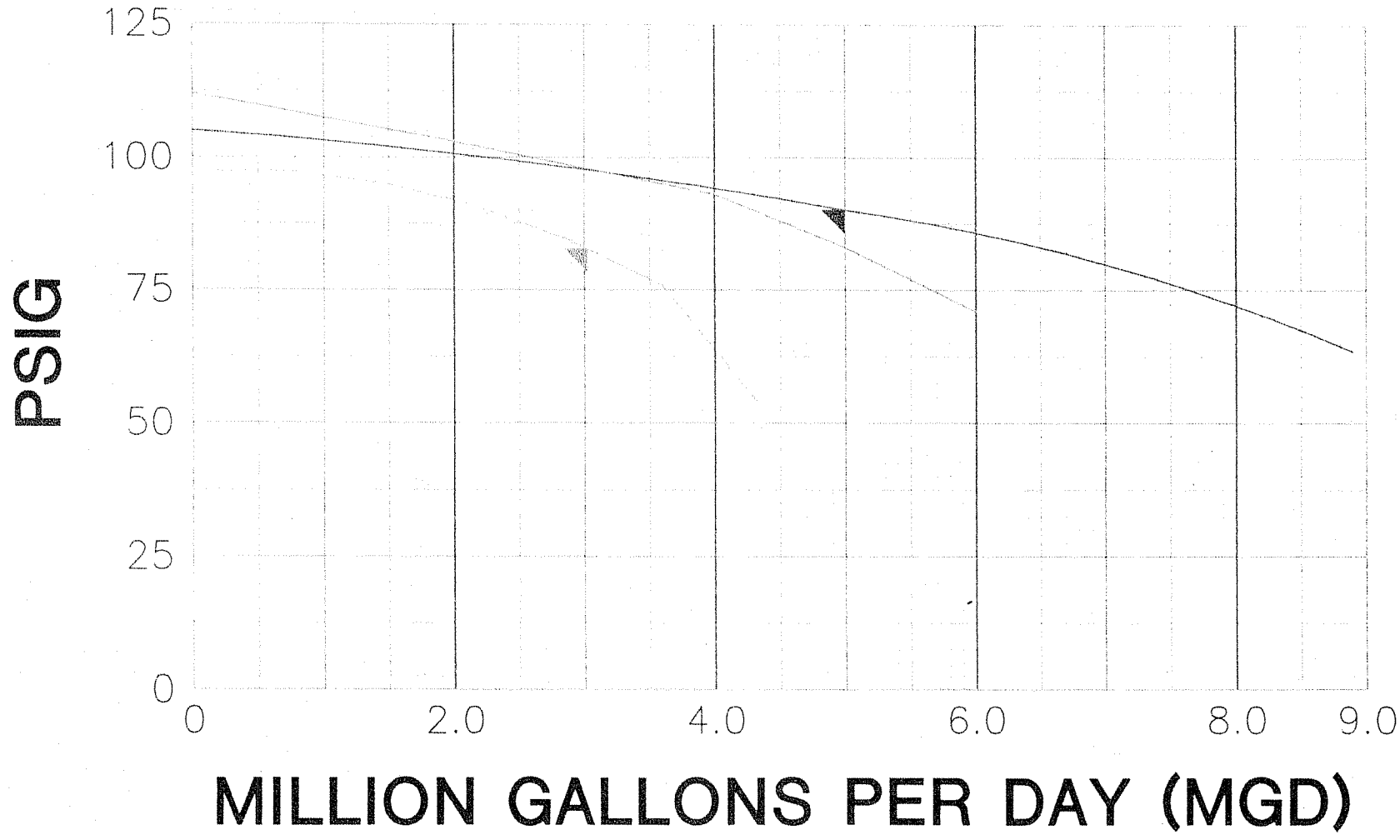
APPROVED AS TO FORM:

Director of Law,
City of Wichita

Appendix C

Pumps

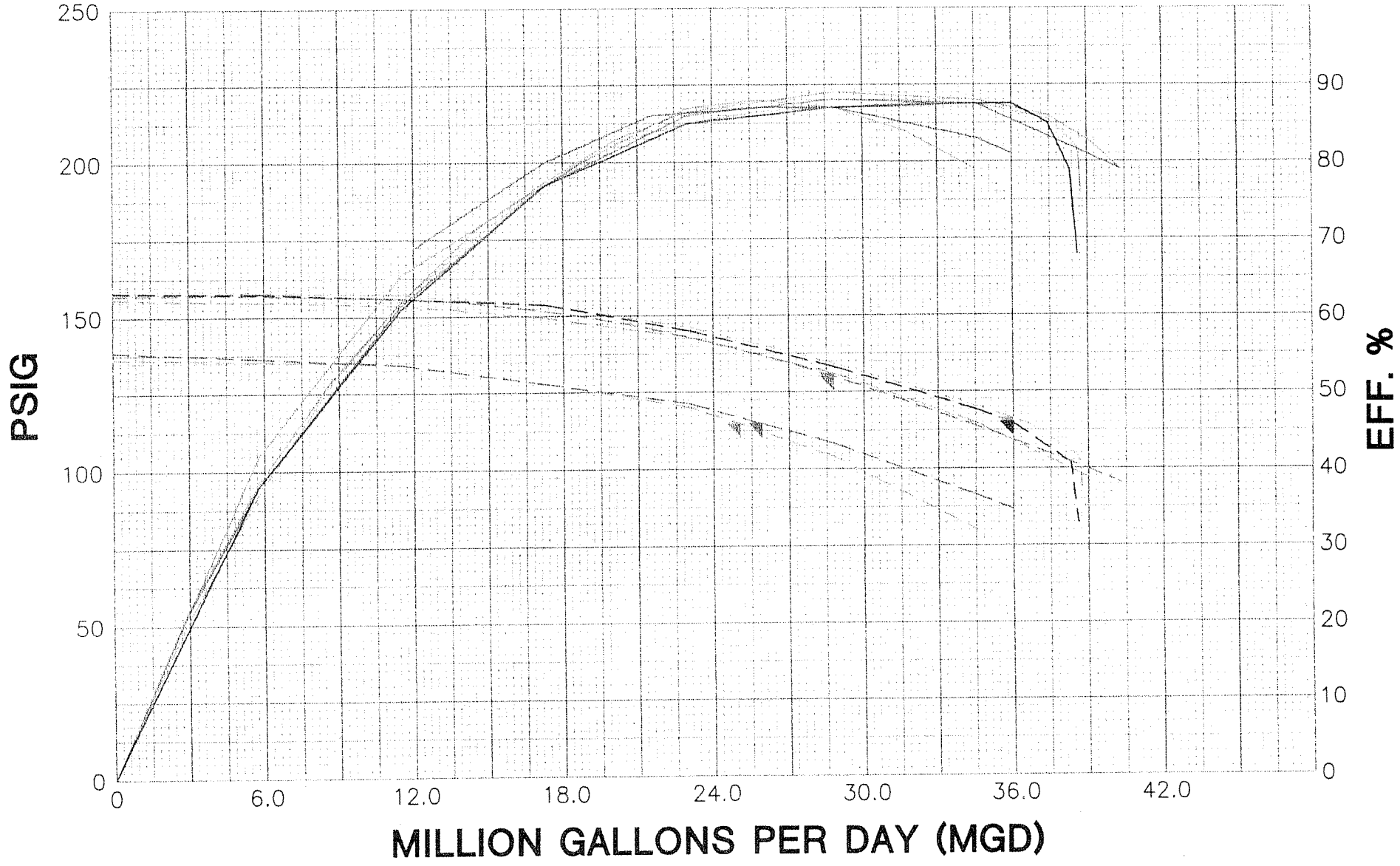
WEBB ROAD PUMP STATION



LEGEND

- PUMP BDP-2
- PUMP BDP-3 (FULLSPEED)
- PUMP MLP-1

HESS PUMP STATION

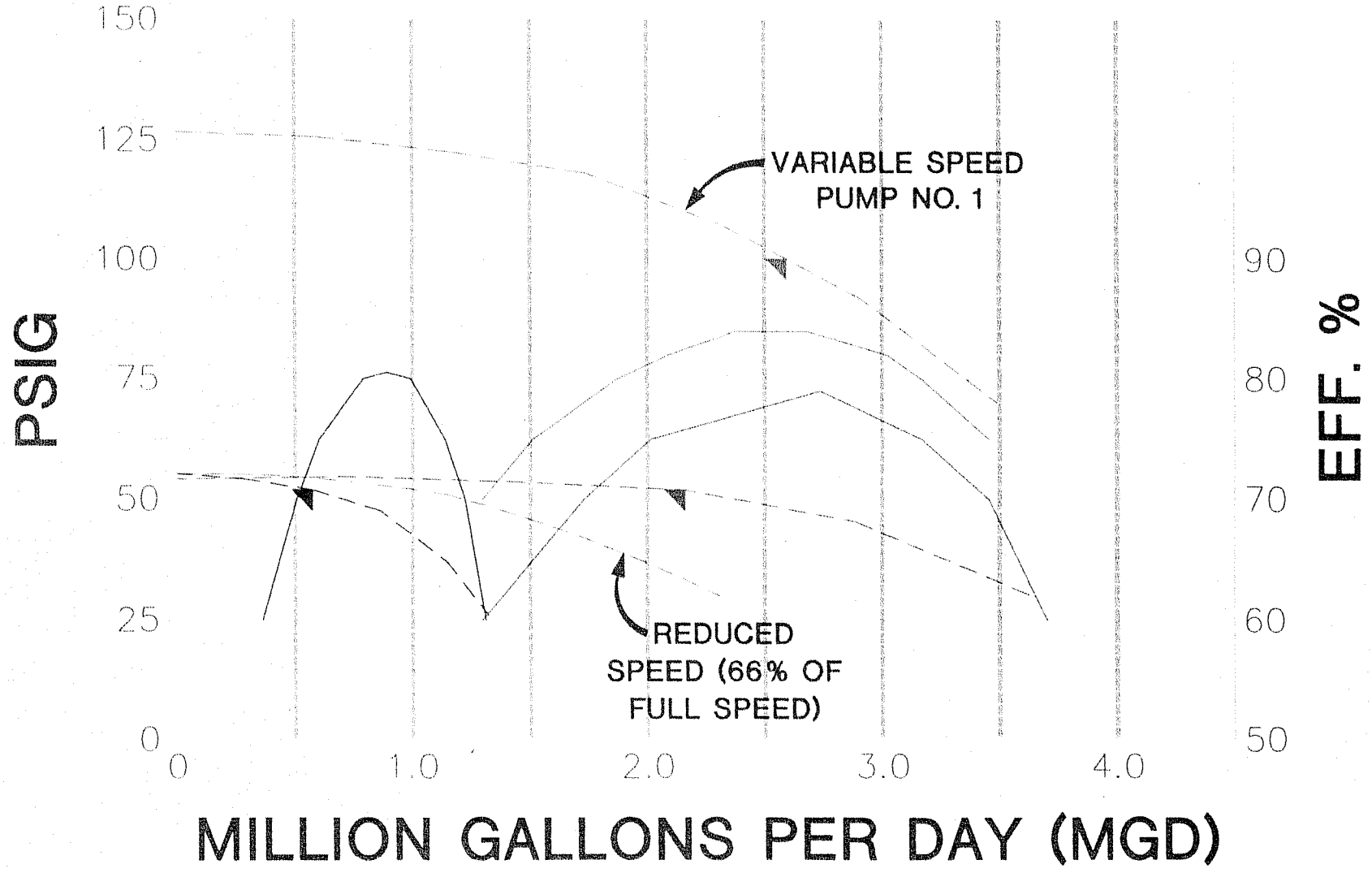


LEGEND

- PUMPS 1,2,& 8
- PUMP 3
- PUMP 4
- PUMP 5
- PUMP 6
- PUMP 7

37TH STREET PUMP STATION

ALL PUMPS ARE BOOSTER PUMPS



LEGEND

- PUMP 1
- PUMP 2
- PUMP 3

PATTERSON PUMP COMPANY
A SUBSIDIARY OF THE GORMAN-RUPP CO.

REF.

CURVE NO.

PUMP # 1, 2 & 8

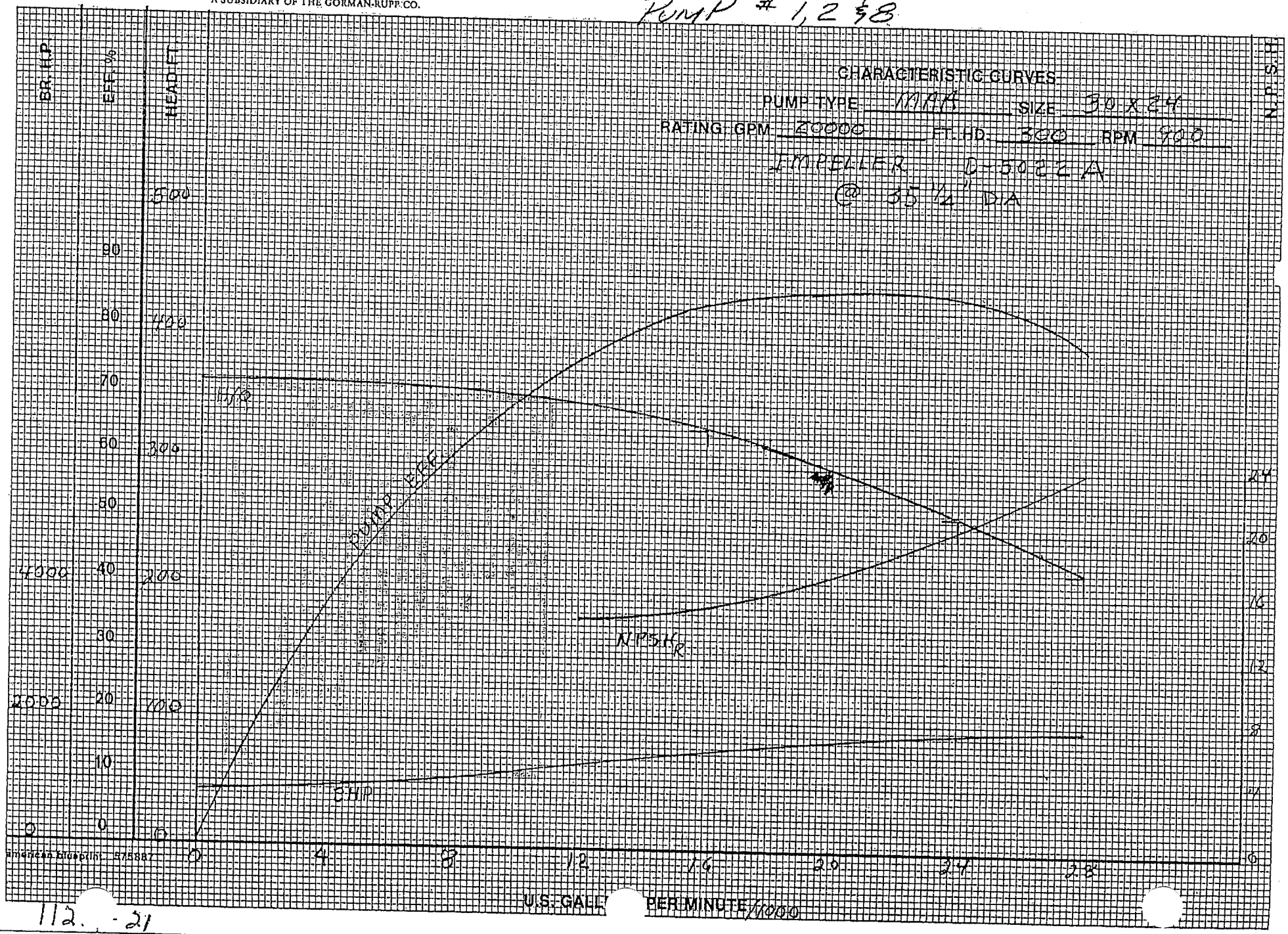
CHARACTERISTIC CURVES

PUMP TYPE MMA SIZE 30 X 24

RATING: GPM 20000 FT. HD. 300 RPM 900

IMPELLER D-5022 A

@ 35 1/4" DIA



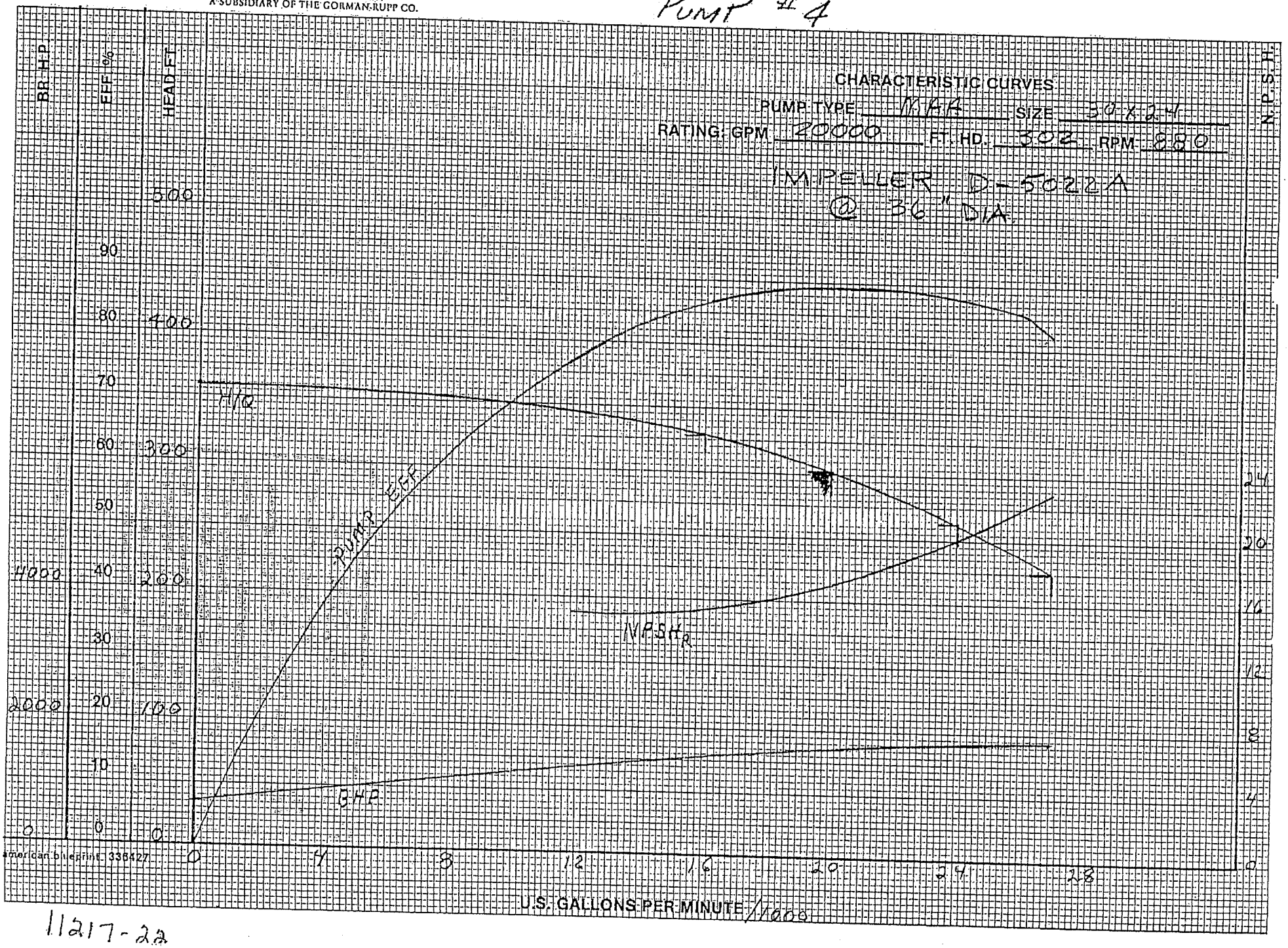
112 - 21

REF.

PATTERSON PUMP COMPANY
A SUBSIDIARY OF THE GORMAN-RUPP CO.

CURVE NO.

PUMP #4



11217-22

CURVE NO.

PATTERSON PUMP COMPANY
A SUBSIDIARY OF THE GORMAN-RUPP CO.

REF.

CURVE NO.

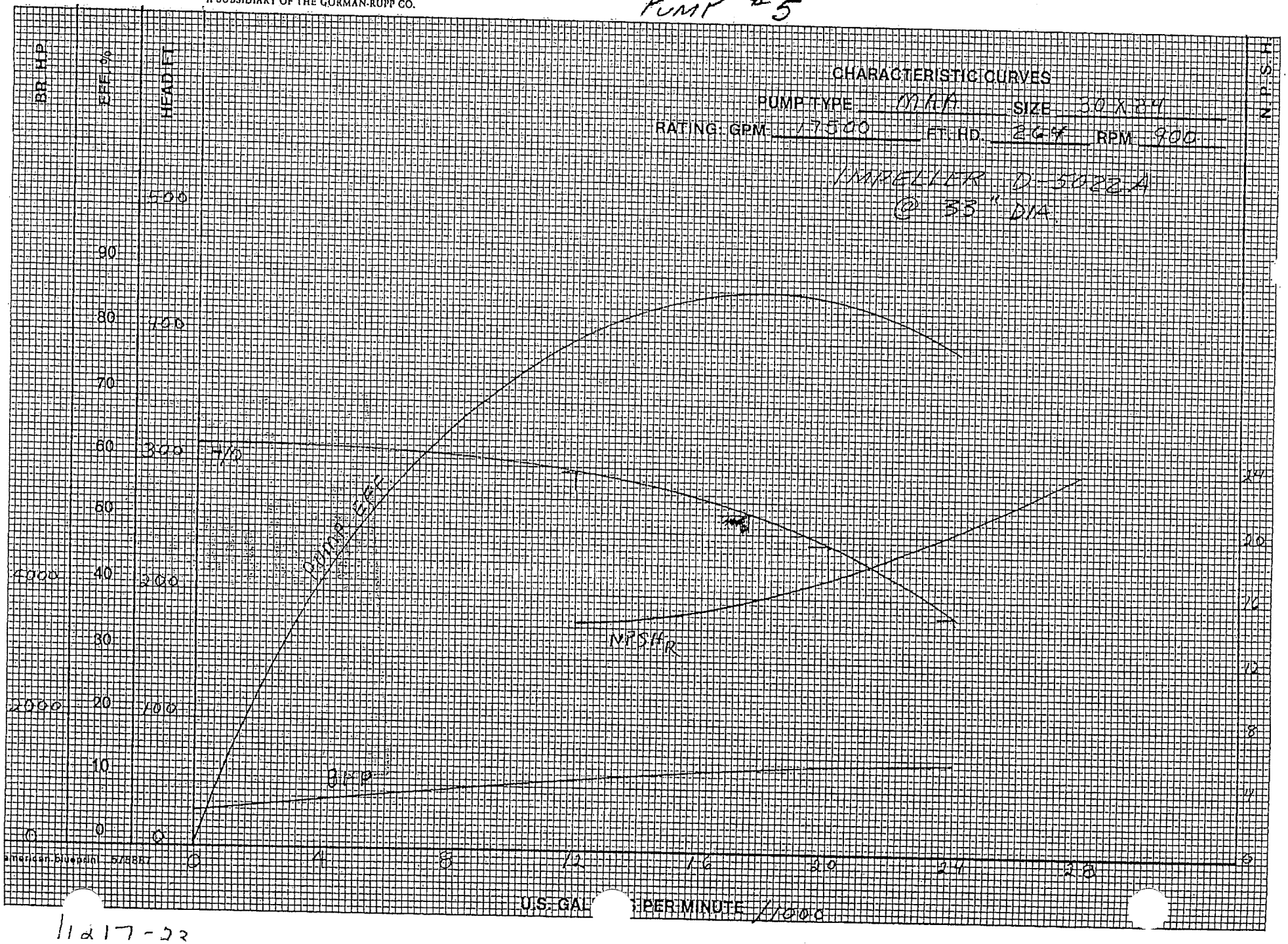
PUMP #5

CHARACTERISTIC CURVES

PUMP TYPE MKA SIZE 30 X 24

RATING: GPM 17500 FT. HD. 26.4 RPM 900

IMPELLER D-5022-A @ 33" DIA



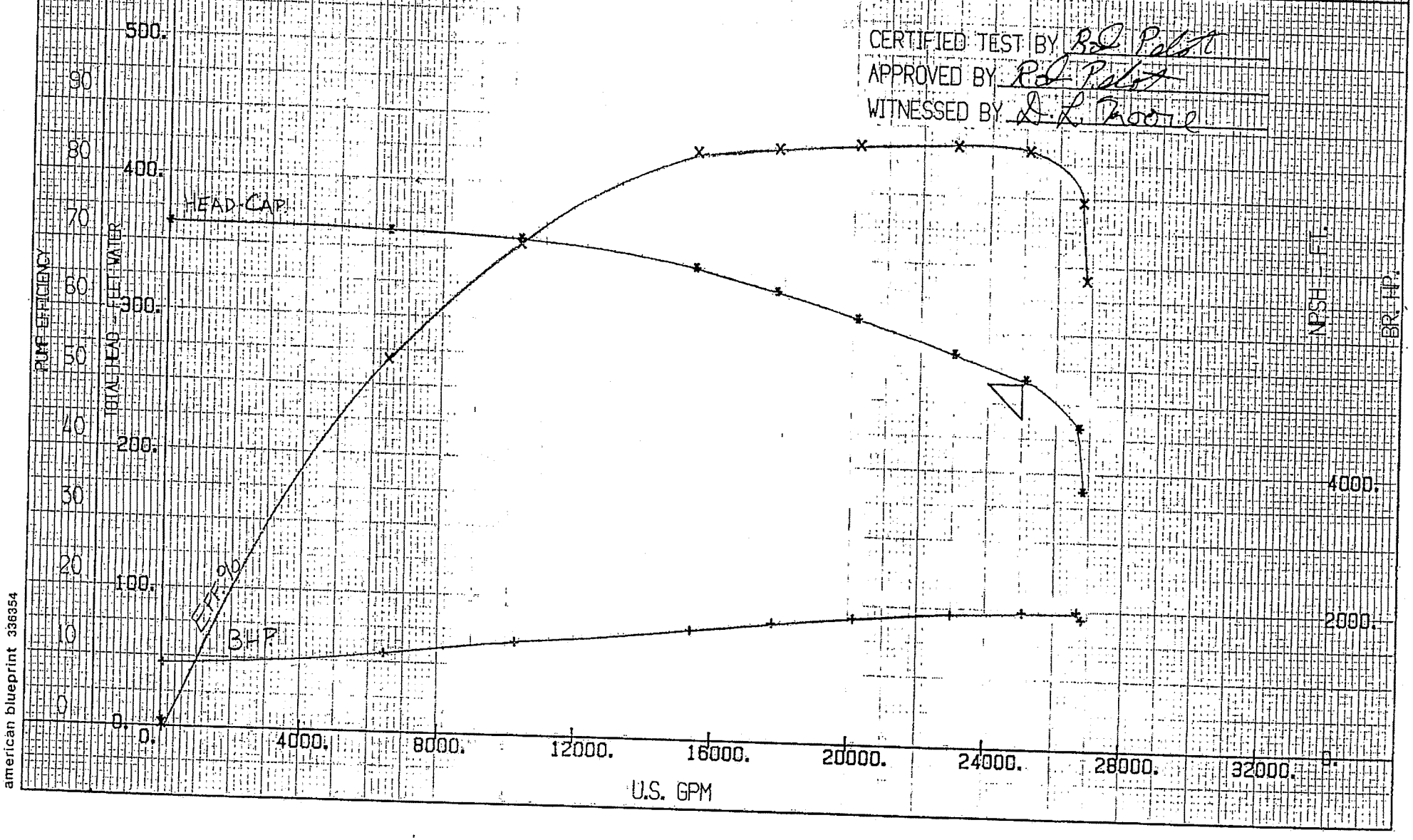
11217-22

PATTERSON PUMP COMPANY
A SUBSIDIARY OF THE GORMAN-RUPP CO.

Pump #6 Factory Test

SOLD TO : CITY OF WICHITA		SERIAL NO. : SC-C1454-02 (20153)	
JOB DRIVER 1855 HP G.E.	GPM 25000	IMP. PATT. D-5022	PUMP TYPE MAA
TEST DRIVER 1855 HP G.E.	FT. HD. 264.0	IMP. DIA. 35.500 5/8" TIPS	SIZE 30x24
MOTOR EFF'Y 96.4% TEST SPEED 900	RATED SPEED 900	NO. STAGES 1 TEST NO. 1W	DATE 10-3-95

CERTIFIED TEST BY R.D. Pabst
APPROVED BY R.D. Pabst
WITNESSED BY D.L. Moore

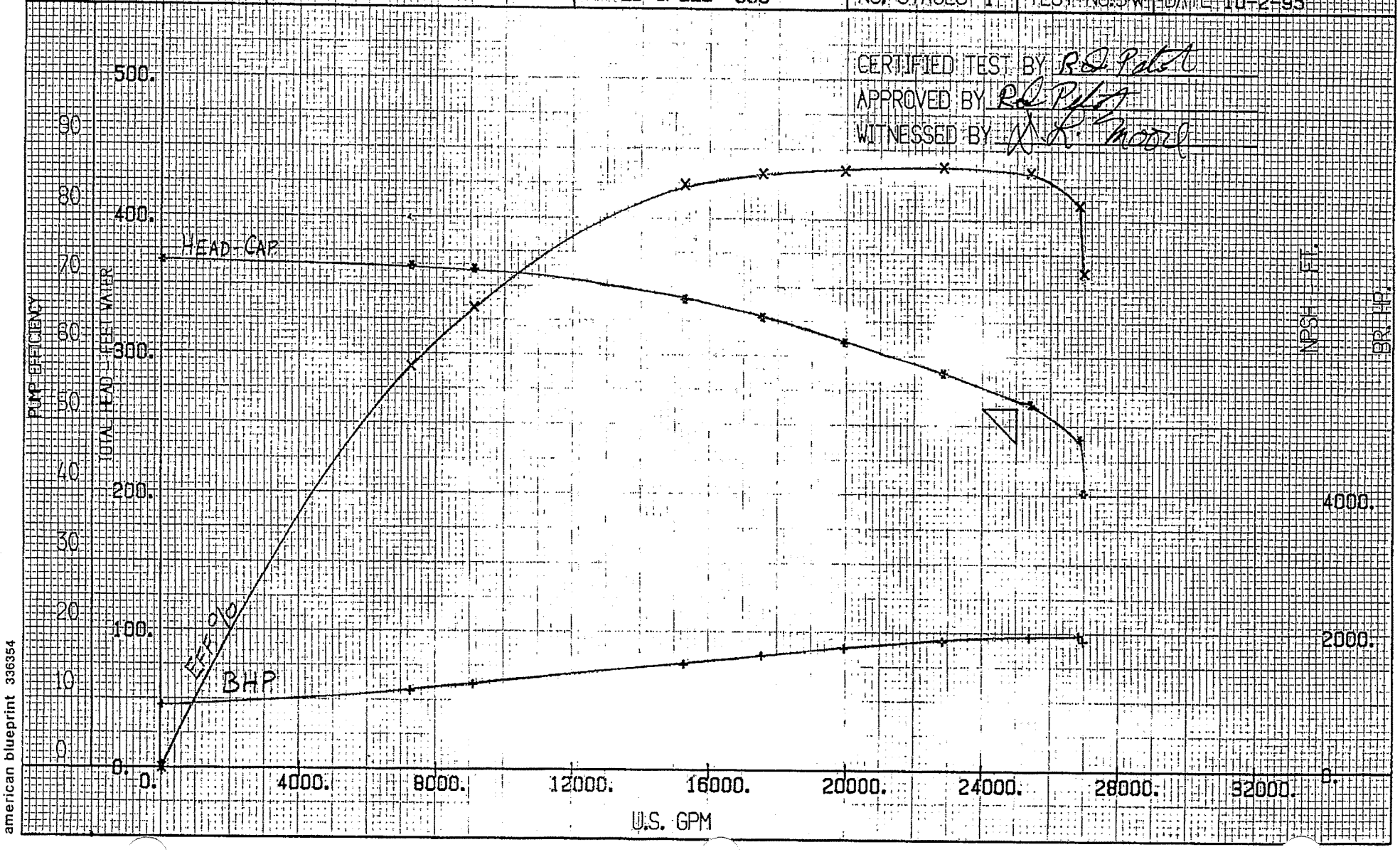


american blueprint 336354

PATTERSON PUMP COMPANY
A SUBSIDIARY OF THE GORMAN-RUPP CO.

SOLD TO : CITY OF WICHITA		SERIAL NO. : SC-C1454-01(20153)	
JOB DRIVER 1855 HP G.E.	GPM 25000	IMP. PATT. D-5022	PUMP TYPE MAA
TEST DRIVER 1855 HP G.E.	FT. HD. 264.0	IMP. DIA. 35.500 5/8" TIPS	SIZE 30x24
MOTOR EFF'Y 96.4% TEST SPEED 900	RATED SPEED 900	NO. STAGES 1 TEST NO. 3W	DATE 10-2-95

CERTIFIED TEST BY R.D. Patel
APPROVED BY R.D. Patel
WITNESSED BY W.R. Moore



american blueprint 336354

PUMPING EQUIPMENT
Project: WEBB ROAD, 5 MGD PUMP
By: CRAIG STEFFEN

H2Optimize ver: 5.03
File: (untitled)
Jan 16, 19101

PUMP DATA SHEET
AURORA PUMP

CURVE: PC120356B

Catalog: AURORA60 v. 1.2

TYPE - SPEED: 410-HSC - 1800

PUMP Size: 8x10x15B

Speed: 1750 rpm
Imp dia: 15.375 in

Max Temperature: - °F
Max Pressure: - psi_g

Max Sphere Size: - in

Specific Speed Ns: -
Suction Nss: -

Suction size: 10 in
Discharge size: 8 in

FLUID Water tmp: 60 °F
SG: 1
vsc: 1.122 cP
vapor: 0.2568 psi
atm: 14.7 psi

NPSHa: - ft

PIPING Pressure: - psi
Suction elev: - ft
size: - in
Discharge size: - in.

WEBB ROAD
BPS
DI/MI
2001
250 HP
NO VFD

DESIGN POINT

Flow: 3475 gpm
Head: 192 ft

DATA POINT

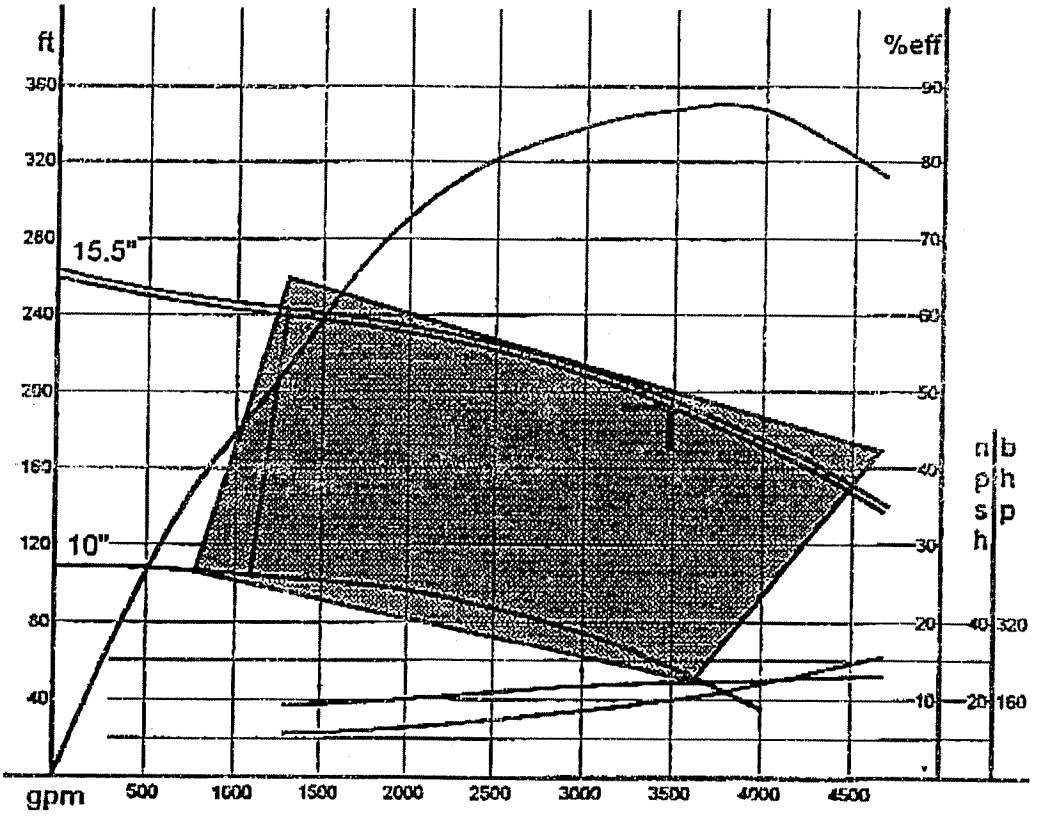
Flow: 3475 gpm
Head: 192 ft
Eff: 87 %
Power: 194 bhp
NPSHr: 19.8 ft

DESIGN CURVE

Shutoff Head: 259 ft
Pressure: 112 psi_g
Min Flow: 1299 gpm
BEP: 88 %eff @ 3710
Max: 207 bhp @ 4666

MAX DIAMETER

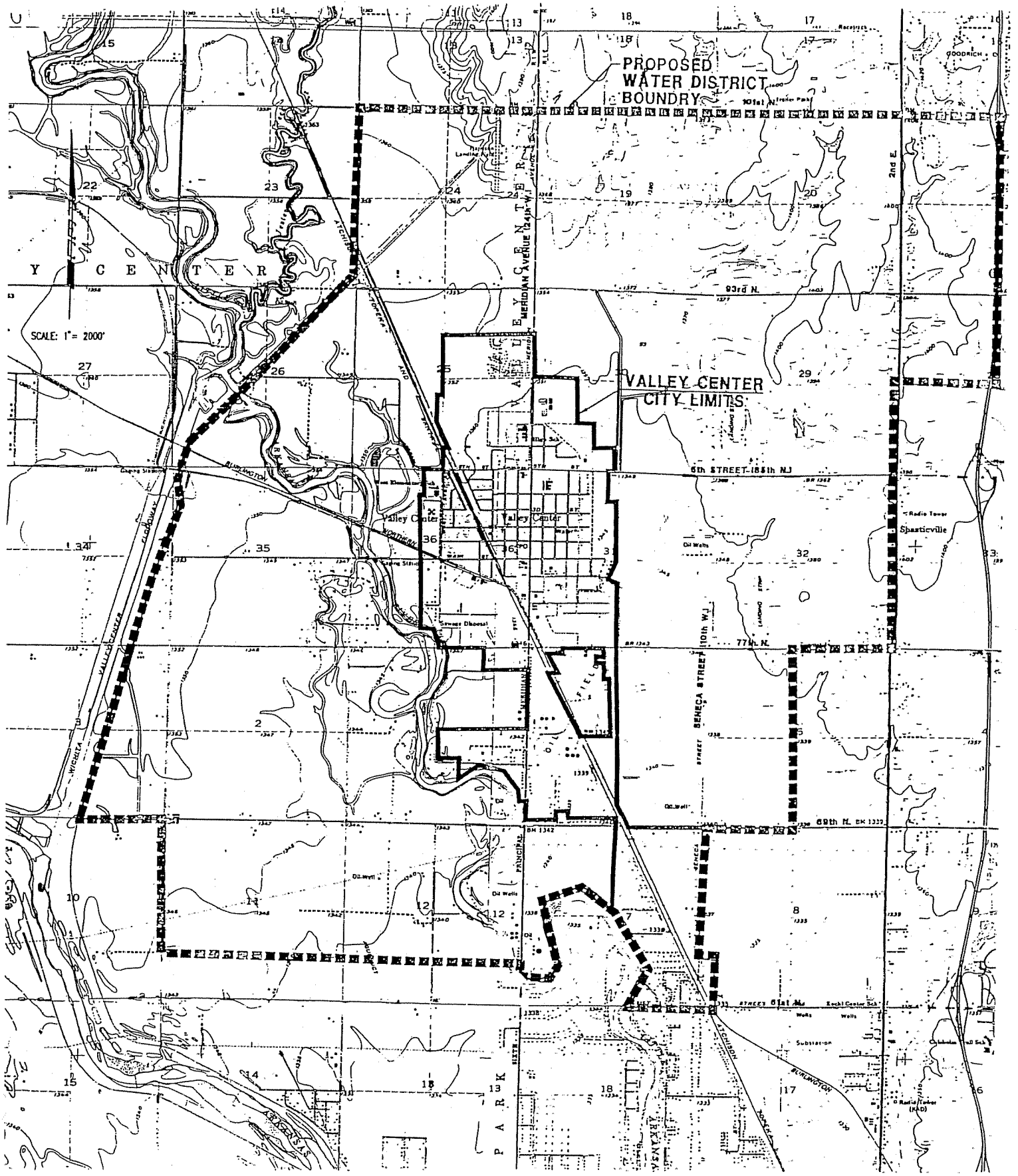
Max: 213 bhp @ 4690

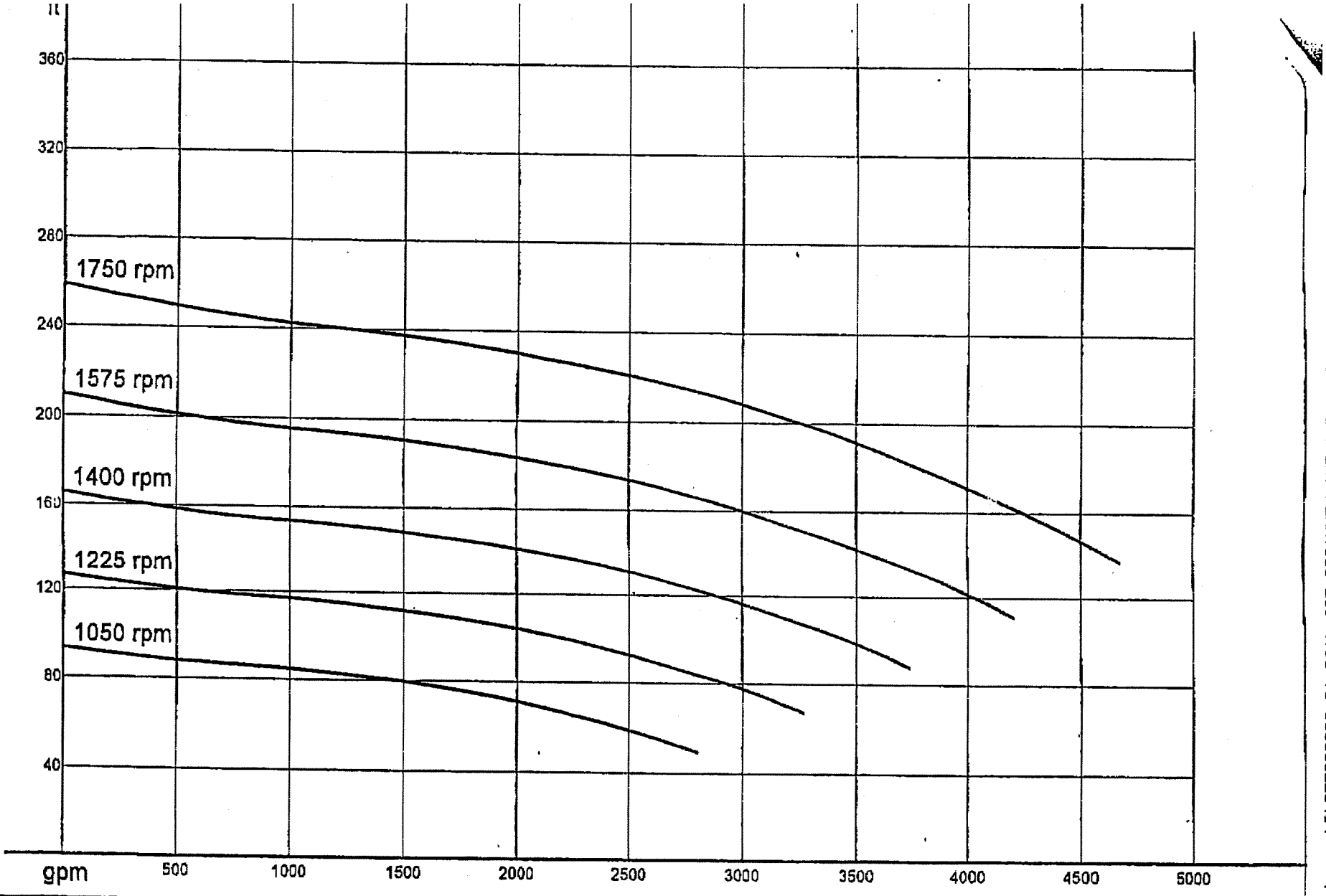


PERFORMANCE EVALUATION

Flow gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Power kW	Hrs/yr	Cost
4170	1750	163	85	202	25.8				
3475	1750	192	87	194	19.8				
2780	1750	212	81	184	16.4				
2085	1750	227	72	166	13.4				
390	1750	238	56	149	11.3				

ATTACHMENT "A"





ASC PUMPING EQUIPMENT WEBB ROAD, 5 MGD PUMP Date: 01/16/101 File:	AURORA PUMP Catalog: AURORA60 ver 1.2 Curve: PC120356B	Type: 410-HSC Size: 8x10x15B Impeller: 15.375

ASC PUMPING EQUIPMENT
Project: WEBB ROAD, 12.5 MGD PUMP
by: CRAIG STEFFEN

H2Optimize ver: 5.03
File: (untitled)
Jan 16, 19101

PUMP DATA SHEET
AURORA PUMP

CURVE: PC150836

Catalog: AURORA60 v. 1.2

TYPE - SPEED: 410-HSC - 900

PUMP Size: 14x16x18

Speed: 885 rpm
Imp dia: 16.9375 in

Max Temperature: - °F
Max Pressure: - psi_g

Max Sphere Size: - in

Specific Speed Ns: -
Suction Nss: -

Suction size: 16 in
Discharge size: 14 in

FLUID Water tmp: 60 °F
SG: 1
vsc: 1.122 cP
vapor: 0.2568 psi
atm: 14.7 psi

NPSHa: - ft

PIPING Pressure: - psi
Suction elev: - ft
size: - in
Discharge size: - in

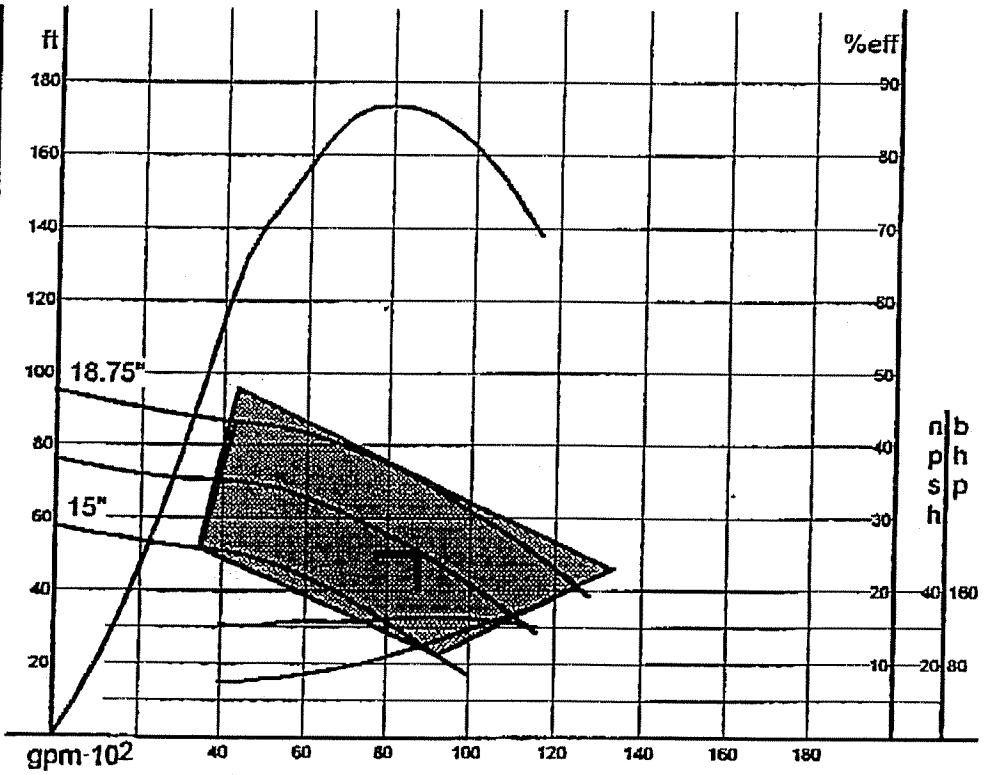
WEBB ROAD
BPS
EPZ
M2
M3
M4
2001
150 HP
VFD

DESIGN POINT
Flow: 8750 gpm
Head: 50 ft

DATA POINT
Flow: 8750 gpm
Head: 50.8 ft
Eff: 86 %
Power: 130 bhp
NPSHr: 24.7 ft

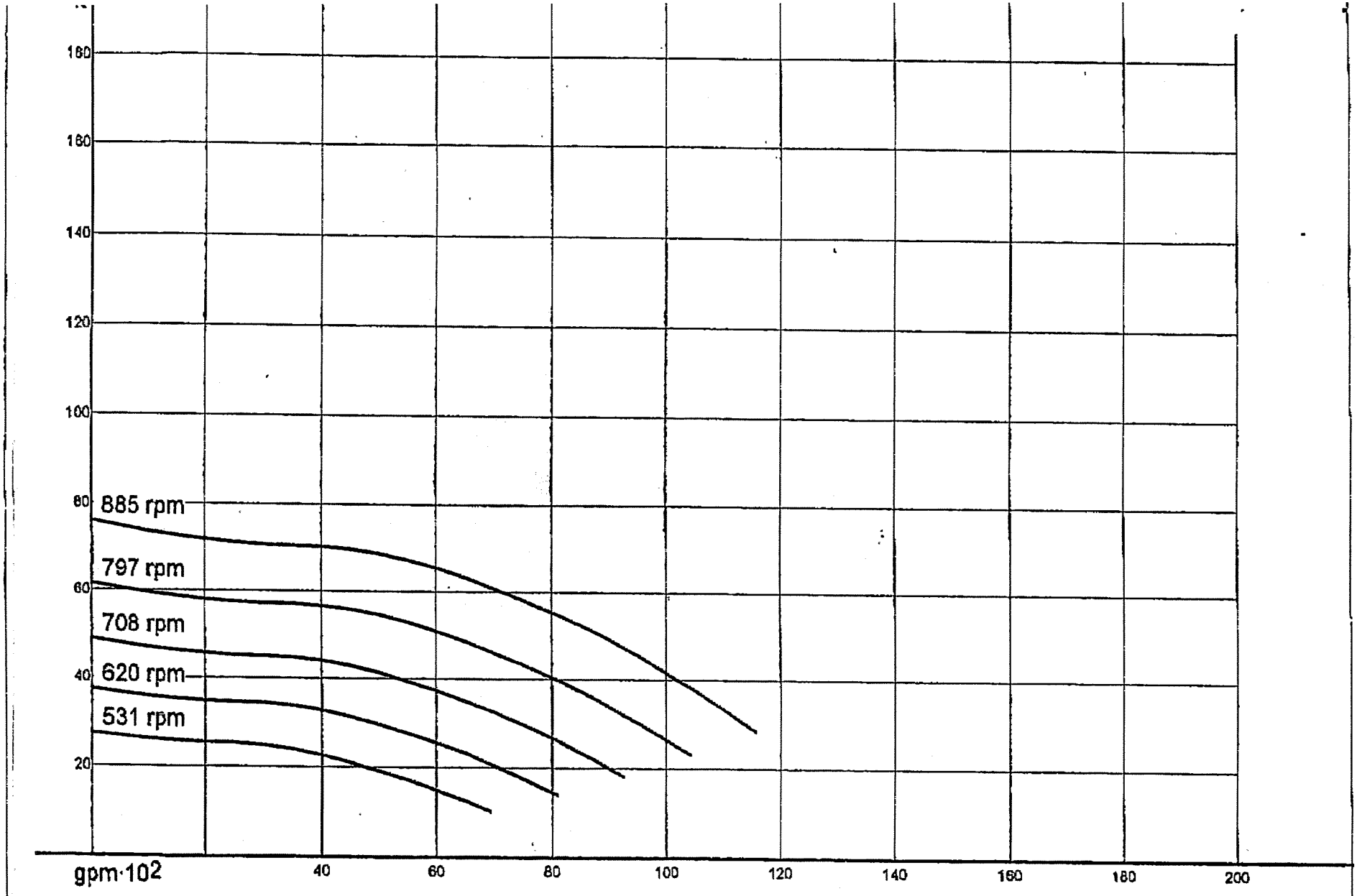
DESIGN CURVE
Shutoff Head: 76.0 ft
Pressure: 32.9 psi_g
Min Flow: 3979 gpm
BEP: 87 %eff @ 8120
Max: 144 bhp @ 610

MAX DIAMETER
Max: 184 bhp @ 10848



PERFORMANCE EVALUATION

Flow gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Power kW	Hrs/yr	Cost
10500	885	37.3	77	129	31.5				
8750	885	50.8	86	130	24.7				
7000	885	60.8	85	126	19.0				
5250	885	67.7	72	125	16.0				
3500	Flow Rate is Out of Range for this Pump								



ASC PUMPING EQUIPMENT WEBB ROAD, 12.5 MGD PUMP Date: 01/16/101 File:	AURORA PUMP Catalog: AURORA60 ver 1.2 Curve: PC150836	Type: 410-HSC Size: 14x16x18 Impeller: 16.9375

Burns & McDonnell
SINCE 1898

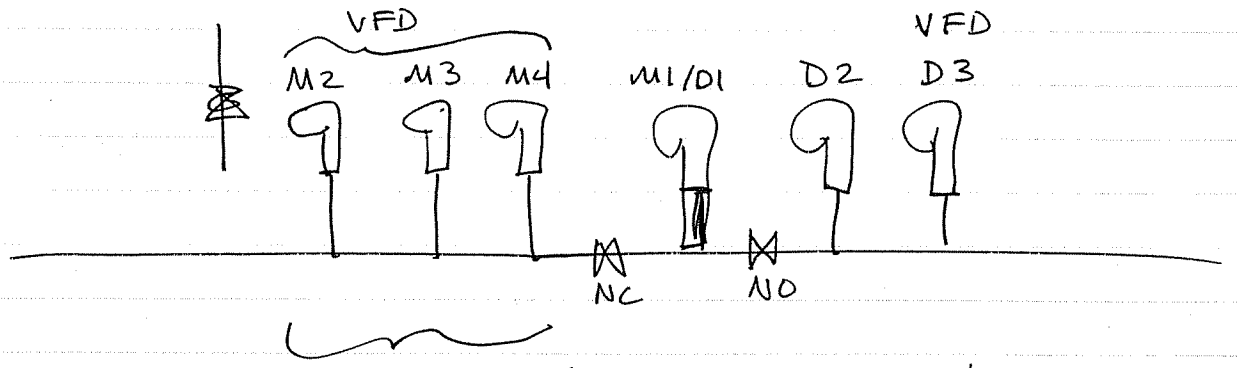
122199 Form GCO-28

Client WICHITA Page 1 of 1

Project 34007 Date 8/6/03 Made By JK

Webb Road BPS Checked By

Preliminary Final



150 HP
8750 gpm @ 50'
2001

250 HP
3475 gpm @ 192'
2001

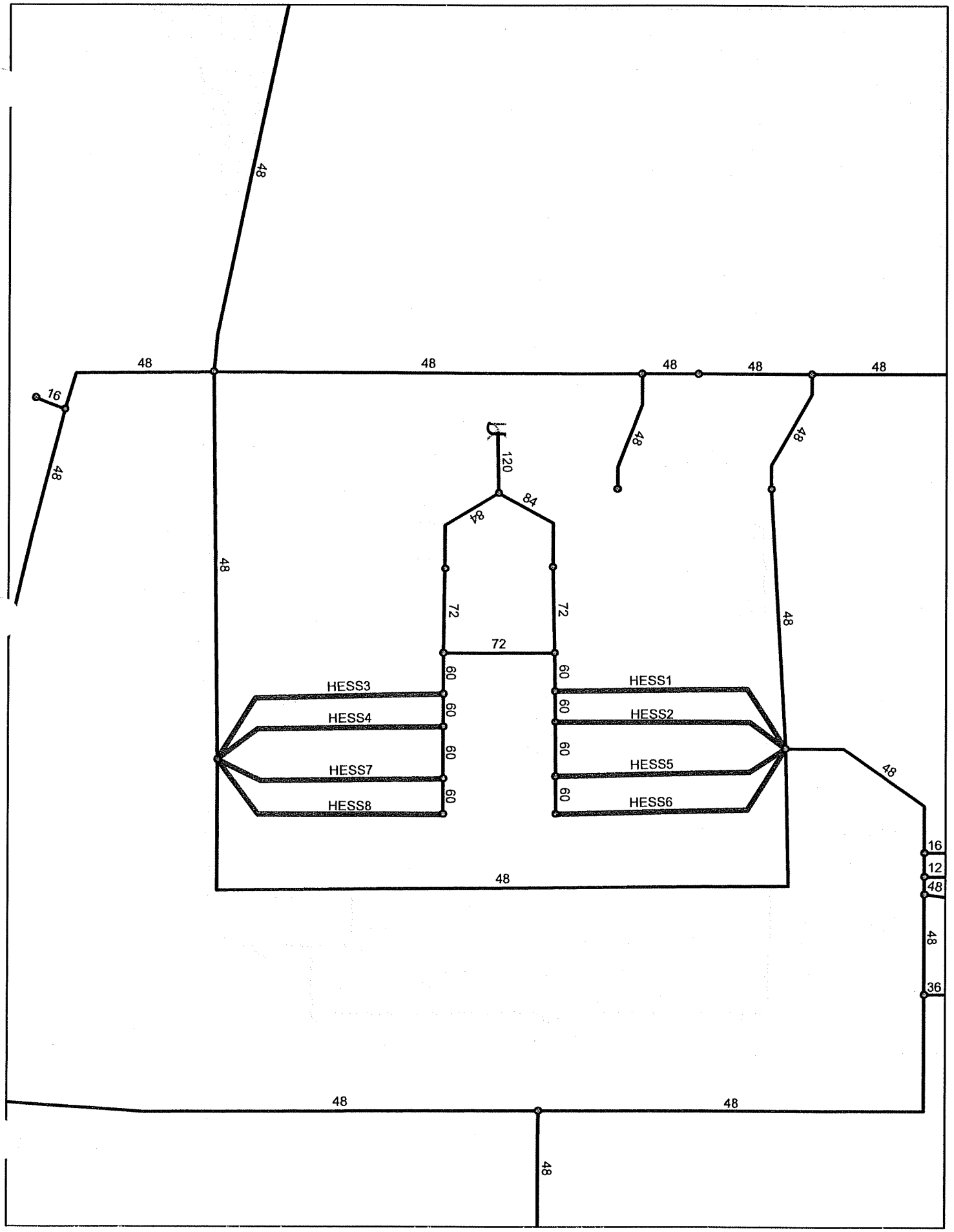
150 Hp
1982
2100 gpm @ 190'

300 HP
3500 gpm @ 210'
2001

EPZ

NEPZ

Larry Ward 316-337-9177
9178 (office)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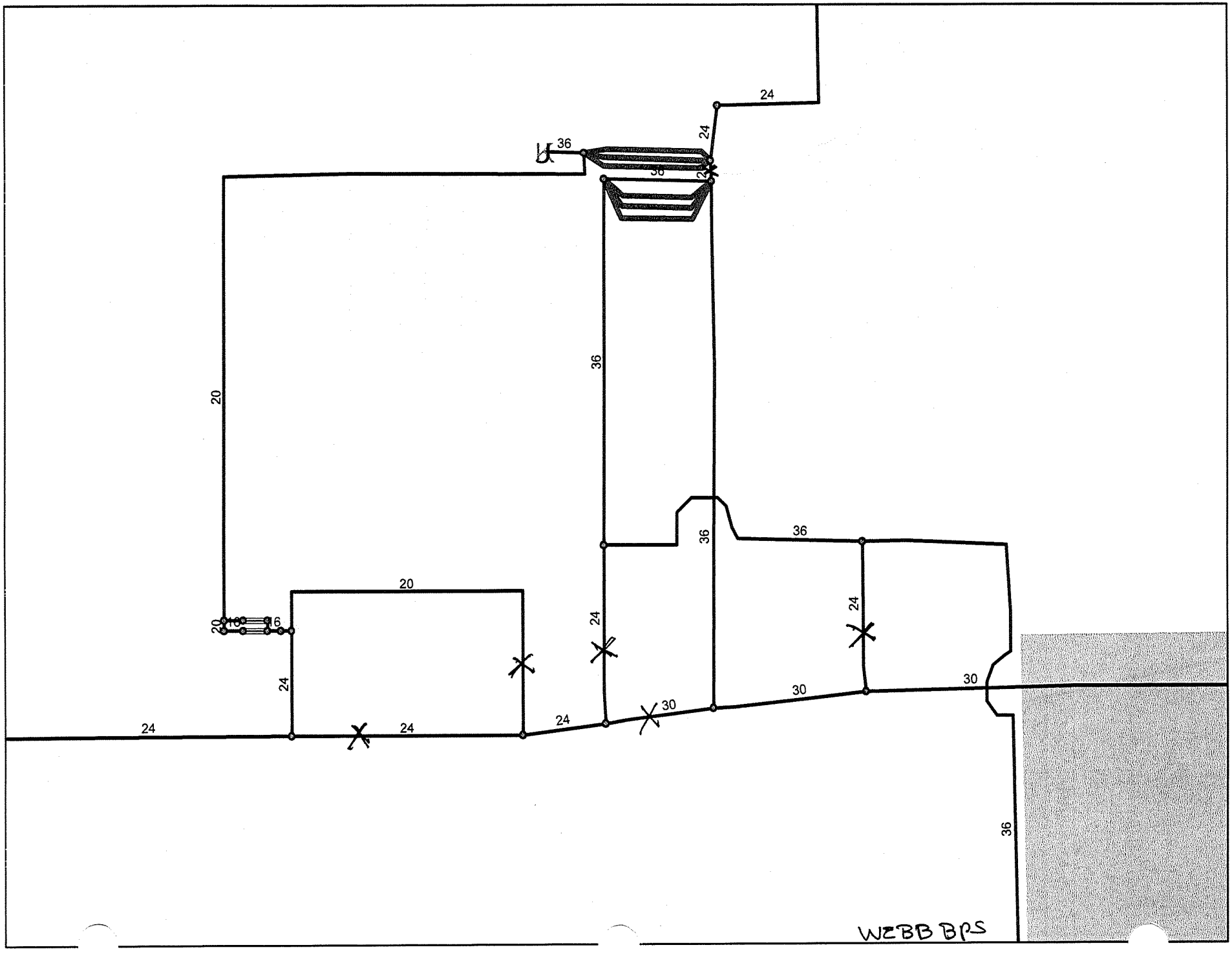
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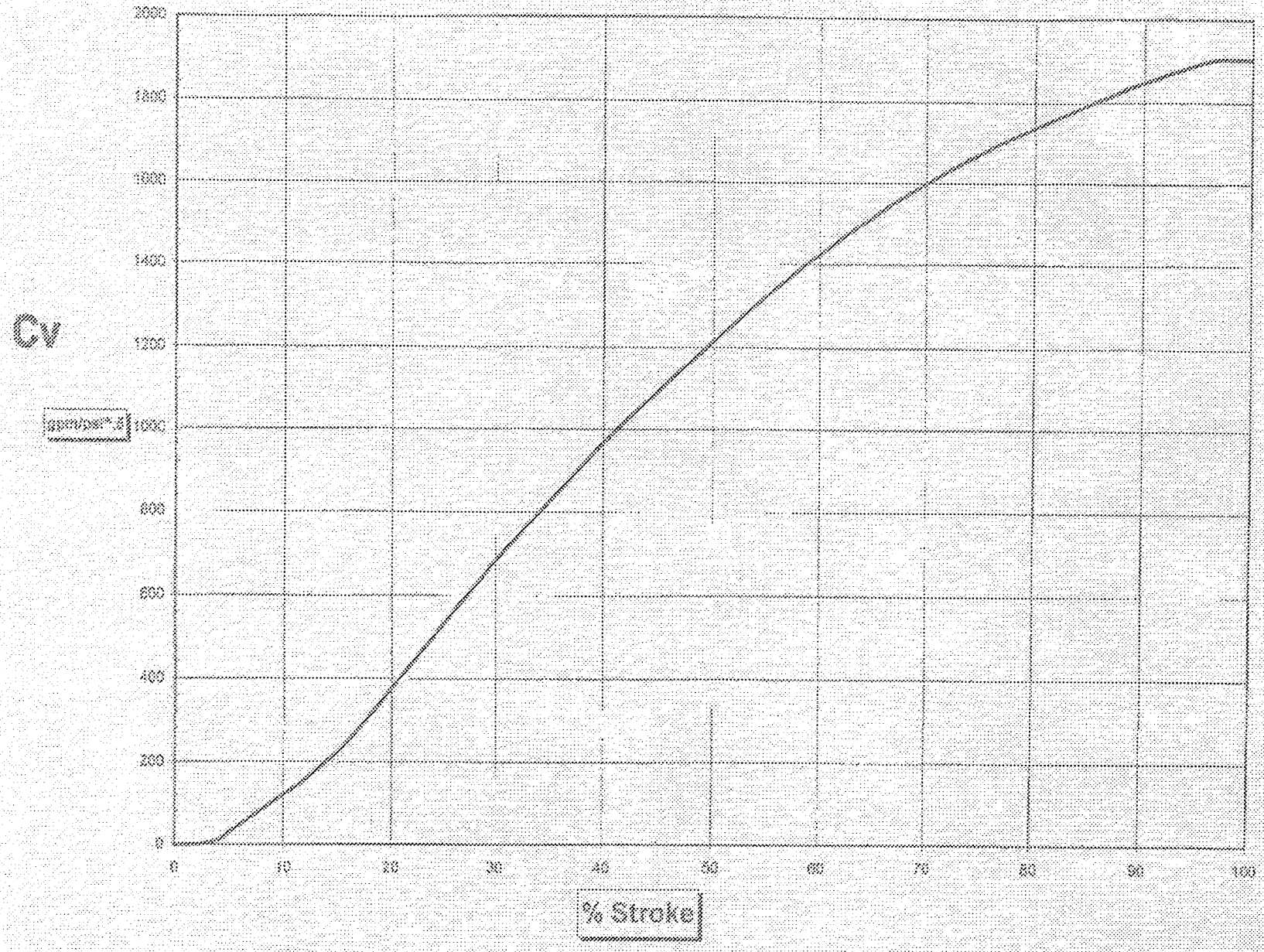
WEBB BPS

Cv versus Stroke Data
for Y-Pattern Sleeve Valve
12" Class 150#FF Bailey Polyjet Model 305



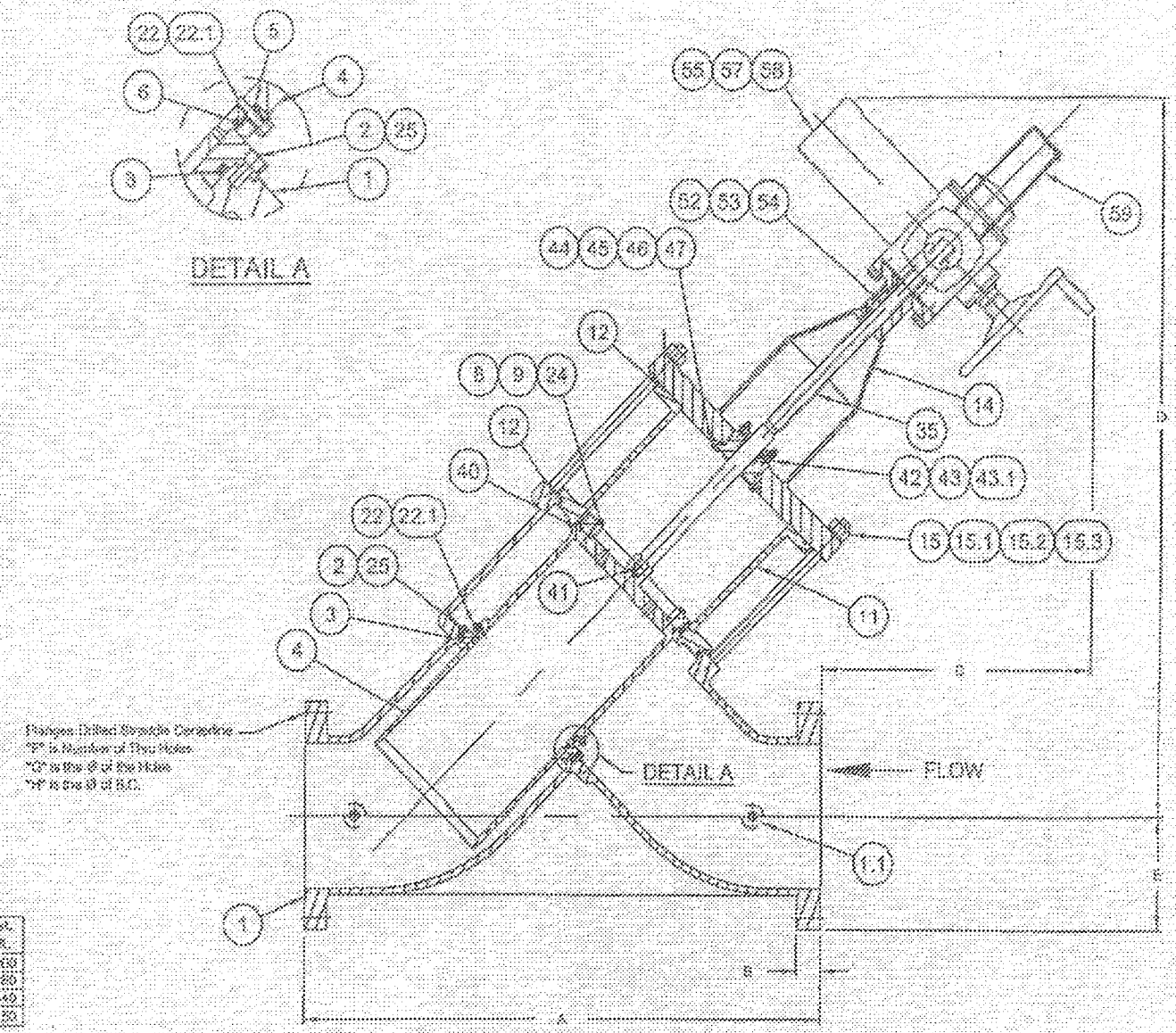
Bill of Material 90085090
Sales Order 800090

Prepared 1-24-2002

~PARTS LIST~

ITEM	DESCRIPTION	QTY	MATERIAL
1	BODY	1	DUCTILE IRON
2	PIPE PLUG	4	STEEL
3	SEAT RING	1	STAIN STEEL
4	O-RING	1	BUNA-N
5	SLEEVE	1	STAIN STEEL
6	SEAT HOLDER	1	STAIN STEEL
9	SEAT SEAL	1	BUNA-N
8	PISTON UPPER	1	BRONZE
9	POLYPAK SEAL	1	MOCY FIAME
11	CHANGER	1	STAIN STEEL
12	O-RING	2	BUNA-N
14	STEM HOUSING	1	STEEL
15	STUD	* 20	STEEL
15.1	NUT	* 20	STEEL
15.2	WASHER FLAT	* 16	STEEL
15.3	LIFT STRAP	2	STEEL
22	CAP SCREW-CHILLED	12	STAIN STEEL
22.1	WASHER FLAT	12	STAIN STEEL
24	CAP SCREW-CHILLED	12	STAIN STEEL
25	PLAN SCREW	12	STAIN STEEL
26	STEM	1	STAIN STEEL
40	O-RING	1	BUNA-N
41	PIN	1	YELLOW BRASS
42	GLAND	1	PYROX BRZ
43	STUD	4	STAIN STEEL
43.1	NUT	4	STAIN STEEL
44	STUFFING BOX	1	BRONZE
45	CAP SCREW-CHILLED	4	STAIN STEEL
46	O-RING	1	BUNA-N
47	PACKING	1	STAIN CON MINE
52	KEY	1	BRASS
53	LUBE FITTING	1	-
54	CAP SCREW	2	STAIN STEEL
55	CAP SCREW	4	STEEL
57	OPERATOR	1	-
58	STEM NUT	1	BRONZE
59	STEM COVER	1	STEEL

* QUANTITIES ARE FOR A "A" MODEL



Valve Size	Flange Class	Dimensions in Inches A	B	C	D	E	F	G	H	Est. Wt.
10"	150# FF	36.00	1.00	22.50	37.25	1.00	12	1.00	28.50	1,400
	300# FF	36.00	1.00	22.50	37.50	1.125	16	1.00	31.00	1,460
12"	150# FF	40.00	1.00	24.25	40.50	1.00	12	1.00	31.00	1,540
	300# FF	44.00	1.00	24.00	46.00	1.125	16	1.25	37.75	1,420

NOTES:

1. TEMPERATURE RANGE: 32°F-100°F
2. MAXIMUM WORKING PRESSURE: 150 psig - Class 150 Flanges
   300 psig - Class 300 Flanges.

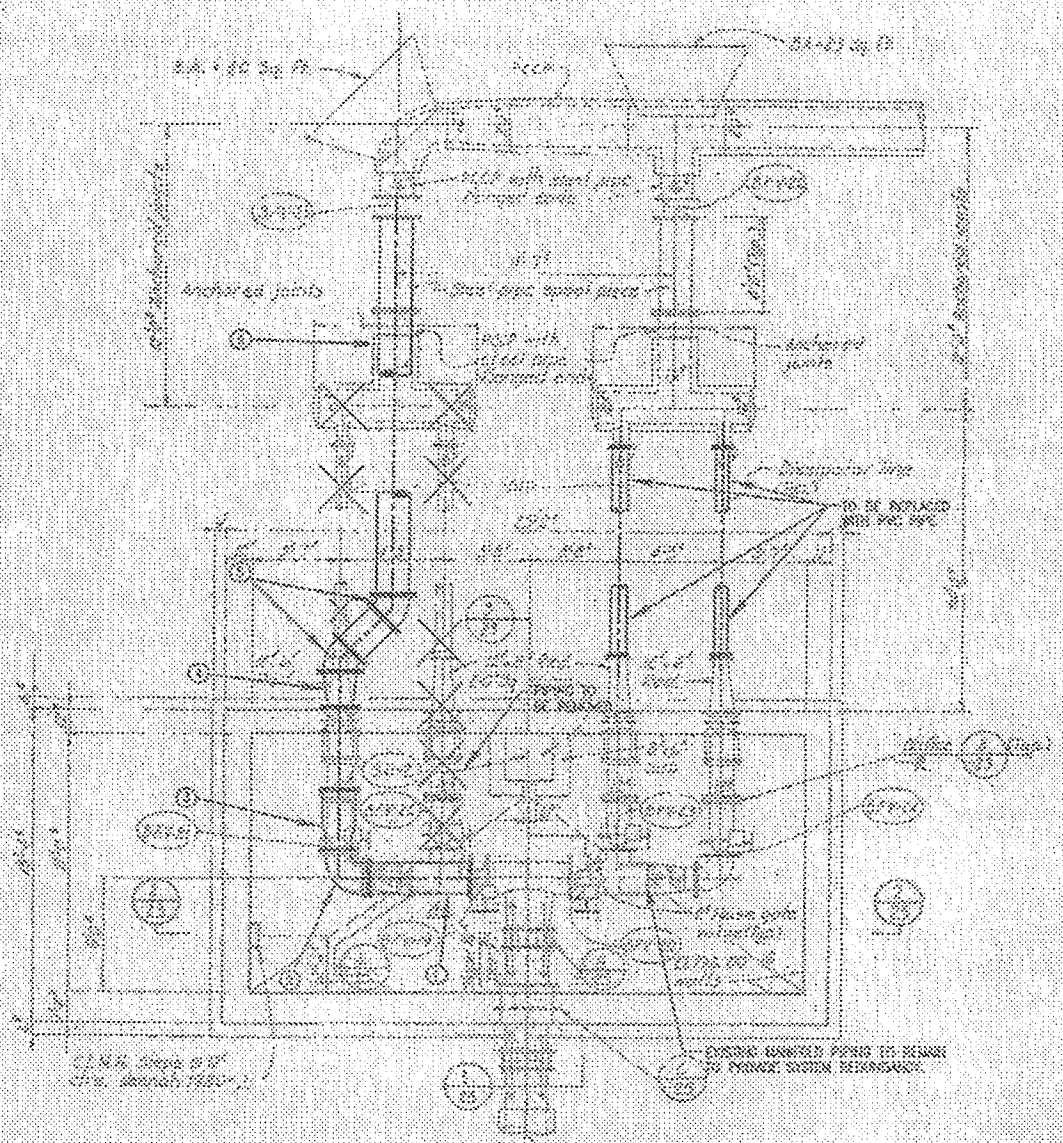
C					
B					
A					
REV	DATE	BY	CHK	REVISION	

POLYJET ASSEMBLY

NOTED

4810

WILSON & COMPANY BASE PROPOSAL



SECTIONAL PLAN

MANIFOLD VALVE STRUCTURE

NOTES:

1. 16" SPOOL
2. 16"x12" REDUCING 90°
3. 12" GLOBE VALVE
4. 12x12 SCL. WSH RESTRAINED 90
5. 16" 45° BEND WSH RESTRAINED 90
6. 16" PVC PIPE

SYSTEM MANIFOLD PERFORM
ASSUMED DESIGN CONDITIONS

MAX. DESIGN FLOW: 6000 gpm (10MGD)
MIN. MANIFOLD INLET PRESSURE: 60 psi
VELOCITY IN 12" PIPE @ MAX. DESIGN FLOW: 11.87 fps
VELOCITY IN 12" PIPE (TYPICAL) @ MAX. DESIGN FLOW: 19.02 fps

CMB Industries, Inc.
A United Dominion Company
Fluid Control Division

P.O. Box 8070 Fresno, CA 93747-8070
1550 North Peach Fresno, CA 93727
Ph:(209) 252-0791 Fax: (209) 453-0030

BAILEY POLYJET VALVES

Engineering Specification

Part No90086090 Rev. A
B-CD-86090
ECN:

Certified Submittal Data Sheet and Certificate of Compliance

PREP. BY: bp DATE: 1/30/02
APPD BY: DATE:
Page 1

CUSTOMER DATA/INFORMATION

Customer: Wildcat Cont. Co
4421 West Harry
Wichita, KS 67277

Customer P.O. 6791-2317

PROJECT SPECIFIC DATA/INFORMATION

Job Name: Webb Road P.S. **Engrg Firm:**
Proj. Engr.:

Valve Desc.: Sleeve Valve

SLEEVE VALVE PRODUCT DATA/INFORMATION

Valve Size: 12"
Catalog No.: 305 **Manufacturer:** SPX Valves & Controls
End Conn.: Inlet Flange & Outlet Flange 12" Class 150
Design W. P.: 150psi
Assembly Dwg.: D4410

SLEEVE VALVE PRODUCT OPERATOR DETAILS/DATA

Type: Limitorque Electric Motor Operator
Model: L120-20 **Voltage:** 208VAC/3PH/60HZ with VFD
Wiring Diagram: 14-499-0001
Outline Drawing: 03-612-0004-1
Opening Time: 3.66 MIN

VALVE PAINT/COATING DETAILS

Valve Exterior: Fusion Epoxy - 10 Mils Morton Int'l Corvel Gray.
Valve Interior: Fusion Epoxy - 10 Mils Morton Int'l Corvel Gray.

This submittal has been prepared in accordance with the contract documents, except as noted below:

END OF SECTION

OPTION #2

Appendix D

Field Test Data

Jeff Klein - McConnell Flow Test

From: "Carney, Michael" <MCarney@wichita.gov>
To: "Jeff Klein PE (E-mail)" <jklein@burnsmcd.com>
Date: 08/27/2003 10:12 AM
Subject: McConnell Flow Test

Jeff:

See the attached flow test sheet from near McConnell AFB. Notice the residual pressure. Apparently demands in the E pressure zone are causing a control valve in the area to open and allow flow in from Hess.

Just another piece of the puzzle.
<<McConnell Flow Test.pdf>>

Map Page M-17

FLOW TEST REPORT

Location Rock & Wassal

Date 8/19/03

Test Made By SKSchowalter

Time 0830 AM PM

Witness J. Doctorman

Representative of Boeing Fire Dept

State Purpose of Test 2800 N Rock

If pumps affect test, indicate pumps operating

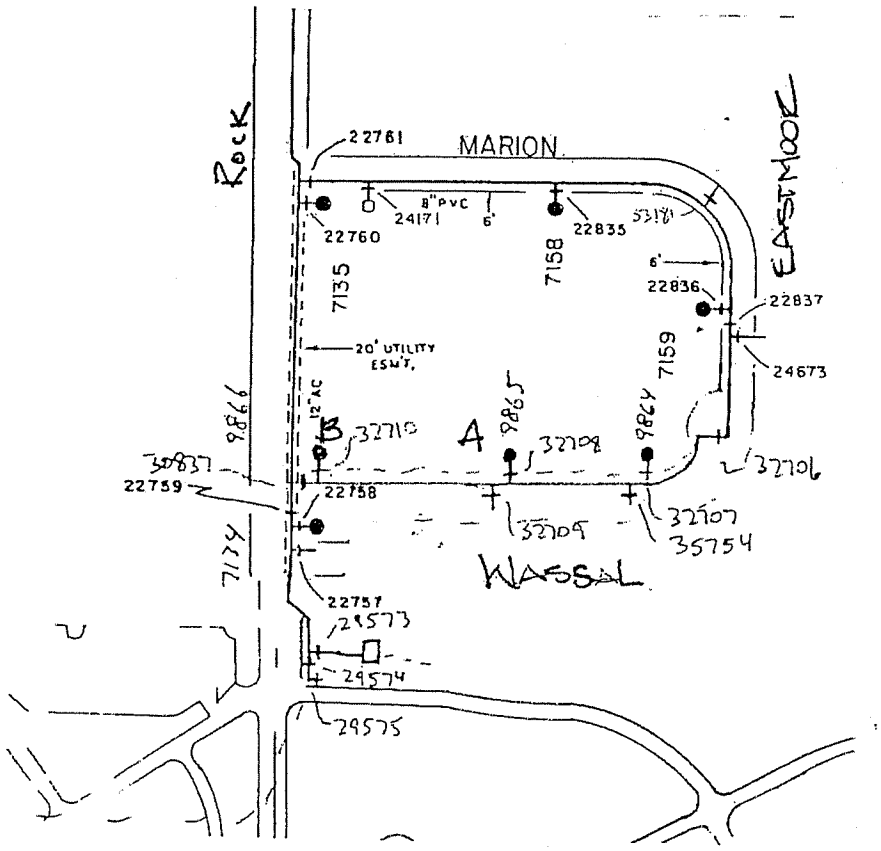
Flow Hydrants	A1	A2	A3
Size Nozzle	2¼		
Pitot Reading	23		
GPM	580		

Total GPM 580

Static B 40 psi Residual B 45 psi or @ ____ psi Residual ____ gpm

Location Map: Show line sizes and distance to next cross connected line.
Indicate North: Show flowing hydrants - Label
Show location of Static and Residual - Label B

Indicate B: Hydrants X Sprinkler ____ Other (identify) ____



Table

WICHITA, KANSAS – WATER DISTRIBUTION SYSTEM
DIURNAL DATA

		Central WTP Clearwell (35 MG)		Webb Road Clearwell (10 MG)		Roosevelt Tower (2 MG)		Woodlawn Tower (2 MG)		Hess Pump Station		East Pressure Zone Webb Road BPS		NE Pressure Zone Webb Road BPS		NE Pressure Zone 37th Street BPS		Entire System Tot Demand	Entire System Equalization Storage		Entire System Equalization Factor	Entire System Diurnal	East Pressure Zone Tot Demand	East Pressure Zone Equalization Storage		East Pressure Zone Equalization Factor	East Pressure Zone Diurnal	Northeast Pressure Zone Tot Demand	Northeast Pressure Zone Equalization Storage		Northeast Pressure Zone Equalization Factor	Northeast Pressure Zone Diurnal	Hess Pressure Zone Tot Demand	Hess Pressure Zone Equalization Storage		Hess Pressure Zone Equalization Factor	Hess Pressure Zone Diurnal
Date	Time	Elevation (feet)	Volume (MG)	Elevation (feet)	Volume (MG)	Elevation (feet)	Volume (MG)	Elevation (feet)	Volume (MG)	Rate (MG)	Volume (MG)	Rate (MG)	Volume (MG)	Rate (MG)	Volume (MG)	Rate (MG)	Volume (MG)	Rate (MGD)	Fill (MG)	Draft (MG)	Factor (%)	(%)	Rate (MGD)	Fill (MG)	Draft (MG)	Factor (%)	(%)	Rate (MGD)	Fill (MG)	Draft (MG)	Factor (%)	(%)	Rate (MGD)	Fill (MG)	Draft (MG)	Factor (%)	(%)
07/11/2003	Midnight	8.9								42.4		5.5		2.4		1.4						100					100					100					100
	1:00	9.3	(0.92)		-		-		-	38.9	42	5.0	6	3.5	2	1.4	1	42	37			53	6	5			53	4	3			57	33	29			53
	2:00	9.7	(0.98)		-		-		-	38.4	39	4.9	5	4.2	4	1.4	1	39	41			49	5	5			48	5	2			73	29	34			46
	3:00	9.8	(0.33)		-		-		-	44.6	38	6.0	5	4.8	4	1.4	1	38	41			48	5	5			47	6	1			82	28	35			45
	4:00	10.3	(1.21)		-		-		-	62.5	45	10.8	6	7.4	5	2.1	1	45	35			56	6	4			58	6	1			92	32	30			52
	5:00	10.3	(0.06)		-		-		-	86.8	62	16.9	11	9.6	7	2.1	2	62	17			78	11			(0)	104	9			(3)	141	42	20			68
	6:00	9.8	1.26		-		-		-	106.8	87	19.3	17	9.0	10	4.3	2	87		(7)		109	17			(6)	162	12			(5)	173	58	4			93
	7:00	9.4	1.08		-		-		-	109.6	107	17.5	19	7.0	9	3.5	4	107		(27)		134	19			(9)	186	13			(7)	197	74		(12)		119
	8:00	9.0	0.98		-		-		-	106.1	110	14.0	17	4.4	7	3.0	3	110		(30)		138	17			(7)	168	10			(4)	155	82		(19)		131
	9:00	8.8	0.56		-		-		-	96.9	106	10.8	14	2.3	4	3.1	3	106		(26)		133	14			(4)	135	7			(1)	110	85		(22)		135
	10:00	8.6	0.44		-		-		-	90.2	97	8.8	11	2.5	2	2.1	3	97		(17)		122	11			(0)	104	5	1			80	81		(18)		129
	11:00	8.2	0.83		-		-		-	83.4	90	8.7	9	2.6	2	1.7	2	90		(11)		113	9	2			85	5	2			68	77		(14)		123
	12:00	8.2	-		-		-		-	79.9	83	8.7	9	2.6	3	1.5	2	83		(4)		105	9	2			84	4	2			64	70		(8)		113
	13:00	8.2	0.14		-		-		-	83.1	80	8.4	9	2.6	3	1.2	1	80		(0)		100	9	2			84	4	3			61	67		(5)		107
	14:00	8.1	0.20	12.7	-	33.4	(1.91)	29.6	(1.69)	85.6	83	8.9	8	3.9	3	2.0	1	79	0			100	8	2			80	4	3			56	67		(5)		108
	15:00	8.1	0.01	12.7	-	33.4	-	29.6	-	73.6	86	8.0	9	4.3	4	1.9	2	86		(6)		107	9	2			85	6	1			88	71		(8)		113
	16:00	8.1	-	12.7	-	33.4	-	29.6	-	72.9	74	8.2	8	4.2	4	1.9	2	74	6			92	8	2			77	6	1			91	59	3			95
	17:00	8.1	-	12.7	-	33.4	-	28.7	0.05	79.1	72	8.6	8	4.5	4	1.9	2	72	7			91	8	2			79	6	1			91	58	4			93
	18:00	8.1	-	12.7	-	33.4	-	27.9	0.05	83.9	79	10.6	9	4.8	4	1.9	2	79	1			99	9	2			82	6	0			94	64		(2)		103
	19:00	8.1	-	12.2	0.27	32.3	0.06	26.7	0.07	90.1	84	12.4	11	4.8	5	1.9	2	84		(4)		106	11			(0)	102	7	0			98	67		(4)		107
	20:00	8.1	-	12.2	0.01	29.5	0.16	27.2	(0.03)	95.7	90	12.8	12	5.2	5	2.2	2	90		(11)		113	12			(2)	119	7	0			98	71		(9)		114
	21:00	7.9	0.63	11.4	0.37	27.7	0.10	27.3	(0.00)	99.5	96	12.7	13	5.4	5	2.4	2	96		(16)		120	13			(2)	123	7			(1)	111	76		(13)		121
	22:00	7.6	0.63	11.4	0.01	29.4	(0.10)	29.2	(0.11)	92.4	100	12.0	13	5.2	5	2.4	2	99		(20)		125	13			(2)	122	8			(1)	115	79		(16)		126
	23:00	7.7	(0.15)	11.4	-	32.1	(0.15)	32.2	(0.17)	73.3	92	10.0	12	4.4	5	1.9	2	92		(12)		116	12			(2)	115	8			(1)	112	73		(10)		116
	0:00	8.1	(1.11)	11.4	-	32.2	(0.01)	32.3	(0.01)		73		10		4		2	73	6			92	10	0			96	6	0			94	57	6			91
											79.8		10.4		4.7		2.1	80	192	(192)	10	100	10	35	(35)	14	100	7	21	(21)	13	100	62	165	(165)	11	100
07/12/2003	Midnight	8.1		11.4		32.2		32.3		62.2		9.2		3.1		2.9						92					96					94					91
	1:00	8.5	(1.03)	12.1	(0.35)	32.2	-	32.3	-	55.8	62	7.3	9	2.8	3	3.2	3	62	21			75	9	1			90	6	2			79	47	18			72
	2:00	9.1	(1.38)	12.1	(0.01)	32.2	-	32.3	-	54.8	56	6.4	7	3.0	3	3.2	3	56	27			67	7	3			72	6	2			79	43	23			65
	3:00	9.5	(1.08)	12.1	-	32.2	-	32.3	-	57.2	55	6.5	6	4.2	3	3.4	3	55	28			66	6	4			63	6	1			83	42	23			65
	4:00	9.9	(0.89)	12.1	-	32.2	-	32.3	-	65.1	57	10.8	6	6.2	4	3.7	3	57	26			69	6	4			64	8		(0)		101	43	22			66
	5:00	10.2	(0.75)	12.1	-	29.5	0.16	28.7	0.21	84.1	65	14.1	11	7.0	6	3.8	4	65	18			79	11		(1)		106	10		(2)		131	45	21			68
	6:00	10.2	-	12.1	-	29.4	0.01	27.6	0.10	95.1	84	15.3	14	7.0	7	3.8	4	84		(1)		101	14		(4)		140	11		(3)		143	59	6			91
	7:00	10.2	-	12.1	-	29.4	-	27.6	(0.04)	96.0	95	14.1	15	6.6	7	3.8	4	95		(12)		114	15		(5)		151	11		(3)		143	69		(4)		106
	8:00	10.2	-	12.1	-	27.9	0.08	26.4	0.07	96.9	96	12.8	14	5.7	7	3.7	4	96		(13)		116	14		(4)		139	10		(3)		138	72		(6)		110
	9:00	10.1	0.04	12.1	-	26.5	0.08	24.5	0.10	97.6	97	11.4	13	5.0	6	2.9	4	97		(14)		117	13		(3)		126	9		(2)		124	75		(9)		114
	10:00	9.7	1.22	12.1	-	25.1	0.07	23.2	0.08	97.7	98	10.9	11	4.9	5	2.3	3	98		(15)		118	11		(1)		113	8		(0)		105	78		(13)		120
	11:00	9.7	-	12.1	-	24.5	0.04	22.5	0.04	102.5	98	10.3	11	4.5	5	2.3	2	98		(15)		118	11		(1)		108	7	0			95	80		(14)		122
	12:00	9.7	-	12.1	-	27.5	(0.17)	25.0	(0.14)	100.4	103	10.3	10	4.2	4	2.3	2	102		(19)		123	10		(0)		102	7	1			89	85		(20)		130
	13:00	9.7	-	12.1	-	30.2	(0.16)	27.3	(0.13)	89.8	100	9.9	10	3.8	4	2.3	2	100		(17)		120	10		(0)		101	6	1			86	83		(18)		127
	14:00	9.7	-	12.1	-	30.3	(0.01)	28.0	(0.04)	68.2	90	9.8	10	4.1	4	1.6	2	90		(7)		108	10	0			98	6	1			81	74		(8)		113
	15:00	9.7	-	12.1	-	31.5	(0.06)	29.5	(0.08)	86.6	88	9.2	10	5.0	4	1.2	2	88		(5)		106	10	0			97	6	2			76	73		(7)		111
	16:00	9.7	-	12.1	-	32.8	(0.08)	29.6	(0.00)	82.8	67	9.1	9	4.4	5	2.0	1	67		(3)		104	9	1			90	6	1			81	71		(6)		109
	17:00	9.7	-	12.1	-	30.8	0.12	29.6	-	84.0	83	9.1	9	4.4	4	2.0	2	83	0			100	9	1			90	6	1			85	67		(2)		103
	18:00	9.7	-	12.1	-	30.1	0.04	29.6	-	90.1	84	9.5	9	4.9	4	2.0	2	84		(1)		101	9	1			90	6	1			85	69		(3)		105
	19:00	9.7	-	12.1	-	31.3	(0.07)	29.6	-	92.4	90	10.1	9	5.4	5	2.0	2	90		(7)		108	9	1			94	7	1			91	74		(8)		113
	20:00	9.7	-	12.1	-	31.3	(0.00)	29.6	-	96.8	92	10.6	10	5.4	5	2.5	2	92		(8)		111	10	0			100	7	0			97	75		(9)		114
	21:00	9.7	-	12.1	-	31.9	(0.03)	28.9	0.04	82.4	97	10.1	11	5.4	5	2.5	3	97		(14)		116	11		(1)		105	8		(0)		106	78		(13)		119
	22:00	9.7	-	12.1	-	30.8	0.07	27.9	0.06	74.8	82	8.9	10	4.9	5	2.5	3	83	1			99	10	0			100	8		(0)		105	65	1			99
	23:00	9.7	-	12.1	-	32.1	(0.08)	29.6	(0.06)	61.4	75	7.7	9	4.9	5	2.5	3	75	8			90	9	1			88	7	0			99	58	7			85
	0:00	10.1	(1.09)	12.1	-	32.1	(0.00)	29.0	(0.00)	54.8	61	7.2	8	4.8	5	2.5	3	61	22			74	8	2			76	7	0			98	46	19			71
											83.1		10.1		4.9		2.7	83	151	(151)	8	100	10	19	(19)	8	100	8	15	(15)	8	100	65	141	(141)	9	100
07/13/2003	Midnight	10.1		12.1		32.1		29.0		54.8		7.2		4.8		2.5						74					76					98					71
	1:00	10.2	(0.30)	12.1	-	30.5	0.09	29.0	-	58.7	55	6.9	7	4.9	5	2.5	3	55	35			61	7	5			60	7	0			94	40	30			58
	2:00	10.7	(1.21)	12.1	-	31.2	(0.04)	29.0	-	54.8	59	6.8	7	5.0	5	2.5	3	59	31			65	7	5			58	7	0			95	44	26			63
	3:00	11.1	(1.06)	12.1	-	31.3	(0.00)	29.0	-	60.3	55	7.5	7	6.2	5	2.3	3	55	35			61	7	5			57	8	0			96	40	29			58
	4:00	11.2	(0.21)	12.1	-	30.4	0.05	27.9	0.06	71.8	60	9.6	8	8.7	6	2.0	2	60	29			67	8	4			63	9		(1)		108	44	26			63
	5:00	11.2	-	12.1	-	28.0	0.13	27.9	0.00	81.6	72	10.9	10	9.6	9	2.9	2	72	18			80	10	2			81	11		(3)		136	52	18			74
	6:00	11.2	-	12.1	-	26.5	0.09	27.9	-	93.4	82	17.2	11	9.7	10	3.9	3	82	8			91	11	1			91	13		(5)		160	58	12			83
	7:00	11.2	-	12.1	-	24.6	0.11	27.9	-	97.9	93	17.2	17	8.2	10	3.3	4	94		(4)		104	17		(5)		144	14		(6)		172	63	7			90
	8:00	11.2	0.11	11.3	0.40	22.9	0.10	27.9	-	107.8	98	15.8	17	6.5	8	3.1	3	98		(8)		109	17		(5)		144	12		(4)		146	69	1			99
	9:00	10.7	1.18	11.3	0.01	25.1	(0.12)	27.9	-	101.1	108	13.9	16	5.1	7	2.9	3	108		(18)		120	16		(4)		133	10		(2)		122	82		(12)		118
	10:00	10.7	-	10.8	0.27	24.6	0.03	27.9	-	98.5	101	12.4	14	4.1	5	3.1	3	101		(12)		113	14		(2)		117	8		(0)		102	79		(9)		113
	11:00	10.3	0.88	10.7	0.01	23.5	0.06	27.9	-	101.7	98	12.3	12	3.4	4	3.1	3	99		(9)		110	12		(0)		104	7	1			91	79		(9)		113
	12:00	10.2	0.41	10.7	-	25.7	(0.12)	27.9	-	96.5	102	12.6	12	3.5	3	3.1	3	102		(12)		113	12		(0)		103	7	1			83	83		(13)		119
	13:00	10.2	-	10.7	-	25.7	(0.00)	27.9	-	95.4	97	12.5	13	3.2	3	3.1	3	97		(7)		108	13		(1)		106	7	1			83	77		(8)		111
	14:00	10.2	-	10.7	-	25.7	-	27.9	-	93.1	95	12.5	13	2.8	3	3.0	3	95		(6)		106	13		(1)		105	6	2			80	77		(7)		110
	15:00	10.2	-	10.2	0.25	26.8	(0.06)	27.9	-	90.2	93	12.1	12	2.7	3	3.1	3	93		(3)		104	12		(1)		105	6	2			73	75		(5)		107
	16:00	9.8	0.99	10.2	0.01	26.8	(0.00)	27.9	-	90.1	90	12.0	12	2.9	3	3.1	3	90		(1)		101	12		(0)		102	6	2			73	72		(2)		103
	17:00	9.7	0.28	10.2	-	27.5	(0.04)	27.9	-	93.4	90	12.5	12	3.3	3	3.1	3	90		(0)		100	12		(0)		101	6	2			76	72		(2)		103
	18:00	9.7	-	10.2	-	26.9	0.03	27.9	-	104.0	93	12.3	13	0.4	3	5.2	3	93		(4)		104	13		(1)		105	6	2			80	75		(5)		107
	19:00	9.2	1.05	10.2	-	26.9	0.00	27.9	-	113.1	104	13.0	12	0.0	0	6.0	5	104		(14)		116	12		(0)		103	6	2			72	86		(16)		123
	20:00	8.6	1.03	11.0	(0.40)	26.9	-	27.9	-	120.1	113	13.9	13	1.6	0	5.9	6	113		(23)		126	13		(1)		109	6	2			77	94		(24)		135
	21:00	8.7	0.44	11.1	(0.01)	26.9	-	27.9	-	110.6	120	13.6	14	4.2	2	4.2	6	120		(30)		134	14		(2)		117	7	0			95	99		(29)		141
	22:00	8.7	-	11.6	(0.25)	28.2	(0.08)	27.9	-	90.2	111	11.7	14	3.9	4	3.6	4	111		(21)		124	14		(2)		114	8		(1)		106	89		(19)		127
	23:00	8.7	-	11.6	(0.01)	29.7	(0.08)	27.9	-	71.9	90	9.5	12	2.9	4	3.6	4	90		(0)		100	12	0			98	8	0			98	71		(1)		101
	0:00	9.0	(0.84)	12.5	(0.47)	32.1	(0.14)	27.9	-		72		9		3		4	72	18			80	9	2			79	7	1			83	56	14			80
											89.6		11.9		4.5		3.4	90	173	(173)	8	100	12	25	(25)	9	100	8	20	(20)	11	100	70	162	(162)	10	100

Table

WICHITA, KANSAS – WATER DISTRIBUTION SYSTEM
DIURNAL DATA

Date	Time	Central WTP Clearwell (35 MG) Elevation (feet)	Central WTP Clearwell (35 MG) Volume (MG)	Webb Road Clearwell (10 MG) Elevation (feet)	Webb Road Clearwell (10 MG) Volume (MG)	Roosevelt Tower (2 MG) Elevation (feet)	Roosevelt Tower (2 MG) Volume (MG)	Woodlawn Tower (2 MG) Elevation (feet)	Woodlawn Tower (2 MG) Volume (MG)	Hess Pump Station Rate (MG)	Hess Pump Station Volume (MG)	East Pressure Zone Webb Road BPS Rate (MG)	East Pressure Zone Webb Road BPS Volume (MG)	NE Pressure Zone Webb Road BPS Rate (MG)	NE Pressure Zone Webb Road BPS Volume (MG)	NE Pressure Zone 37th Street BPS Rate (MG)	NE Pressure Zone 37th Street BPS Volume (MG)
07/14/2003	Midnight	9.0		12.5		32.1		27.9		58.8		7.1		3.0		3.6	
	1:00	9.5	(1.29)	13.0	(0.27)	32.2	(0.00)	27.9	-	57.4	59	7.2	7	3.7	3	3.6	4
	2:00	10	(1.23)	9	2.02	28	0.24	23	0.28	60	57	8.1	7	4.4	4	3.5	4
	3:00	10.6	(1.40)	6.2	1.42	24.3	0.21	19.7	0.19	61.7	60	10.6	8	7.6	4	4.3	4
	4:00	10.7	(0.37)	14.1	(3.97)	32.6	(0.47)	27.8	(0.46)	75.9	62	17.2	11	9.9	8	4.6	4
	5:00	10.7	-	14.1	-	29.5	0.17	27.8	-	101.3	76	20.2	17	10.2	10	4.7	5
	6:00	10.5	0.44	14.1	-	26.2	0.19	26.0	0.10	126.5	101	20.0	20	9.9	10	4.4	5
	7:00	10.0	1.33	13.1	0.51	25.0	0.07	23.6	0.14	132.8	126	18.3	20	8.1	10	3.5	4
	8:00	9.4	1.39	12.4	0.32	25.0	0.00	22.1	0.08	126.6	133	16.4	18	6.3	8	2.9	3
	9:00	9.2	0.73	12.4	0.01	25.0	-	22.1	0.00	120.3	127	14.2	16	4.2	6	3.0	3
	10:00	8.7	1.23	11.7	0.36	27.0	(0.12)	23.8	(0.10)	111.9	120	11.5	14	3.5	4	3.1	3
	11:00	8.7	-	11.7	0.01	29.1	(0.12)	24.9	(0.06)	94.5	112	11.1	12	3.1	3	3.1	3
	12:00	8.7	-	11.7	-	27.5	0.10	24.9	(0.00)	92.6	94	11.2	11	2.7	3	3.1	3
	13:00	8.7	-	11.7	-	27.4	0.00	25.9	(0.06)	92.7	93	10.4	11	2.3	3	3.1	3
	14:00	8.7	-	11.7	-	27.9	(0.03)	25.9	(0.00)	92.1	93	10.1	10	2.7	2	3.1	3
	15:00	8.7	-	12.3	(0.31)	29.0	(0.06)	25.0	0.05	91.7	92	9.5	10	2.7	3	3.1	3
	16:00	8.7	-	12.3	(0.01)	30.0	(0.05)	25.0	0.00	92.2	92	10.2	10	3.0	3	3.1	3
	17:00	8.7	-	13.0	(0.36)	30.0	(0.00)	25.0	-	96.5	92	11.2	10	3.8	3	3.1	3
	18:00	8.7	-	13.0	(0.01)	30.0	-	26.6	(0.09)	105.0	97	13.2	11	4.9	4	3.6	3
	19:00	8.3	0.90	13.0	-	28.7	0.07	27.7	(0.06)	115.8	105	16.0	13	6.6	5	3.4	4
	20:00	7.9	1.12	12.4	0.34	27.4	0.08	26.8	0.05	132.8	116	15.4	16	6.7	7	3.3	3
	21:00	7.3	1.48	12.3	0.01	26.8	0.04	26.1	0.04	125.7	133	12.9	15	5.8	7	3.5	3
	22:00	7.1	0.29	11.4	0.49	27.4	(0.04)	26.1	0.00	97.7	126	9.2	13	4.8	6	3.0	4
	23:00	7.4	(0.69)	11.3	0.02	28.2	(0.05)	24.5	0.09	73.4	98	9.3	9	4.8	5	3.0	3
	0:00	8.1	(1.62)	11.8	(0.26)	28.8	(0.03)	24.5	0.00		73		9		5		3
											97.3		12.5		5.2		3.5
07/15/2003	Midnight	8.1		11.8		28.8		24.5		65.3		7.4		5.0		2.1	
	1:00	8.6	(1.40)	11.9	(0.01)	28.8	(0.00)	24.5	-	60.9	65	7.1	7	5.1	5	1.9	2
	2:00	9.4	(2.04)	12.5	(0.34)	28.8	-	24.5	-	57.5	61	7.6	7	5.2	5	1.9	2
	3:00	10.0	(1.39)	12.6	(0.01)	28.8	-	24.5	-	64.3	57	8.1	8	5.5	5	2.9	2
	4:00	10.4	(1.05)	12.6	-	28.8	-	24.5	-	83.4	64	12.3	8	7.1	6	4.1	3
	5:00	10.8	(0.86)	13.1	(0.27)	27.7	0.06	24.5	-	103.0	83	16.2	12	8.4	7	5.0	4
	6:00	10.6	0.35	13.1	(0.01)	25.1	0.15	24.5	-	135.4	103	19.1	16	10.0	8	4.7	5
	7:00	10.1	1.20	13.1	-	25.0	0.00	24.5	-	143.5	135	19.1	19	8.7	10	3.9	5
	8:00	9.7	1.04	13.1	-	26.1	(0.06)	24.5	-	137.2	144	18.0	19	6.2	9	3.6	4
	9:00	9.5	0.57	13.1	-	27.4	(0.07)	24.5	-	120.7	137	14.4	18	3.6	6	3.6	4
	10:00	9.2	0.69	13.1	-	27.4	(0.00)	24.5	-	115.7	121	10.0	14	2.1	4	3.1	4
	11:00	9.2	-	13.1	-	28.4	(0.06)	24.5	-	107.1	116	6.5	10	1.6	2	3.0	3
	12:00	9.2	-	14.0	(0.44)	28.5	(0.00)	24.5	-	100.7	107	6.3	6	1.2	2	2.7	3
	13:00	9.3	(0.26)	14.7	(0.35)	28.5	-	24.5	-	98.3	101	6.1	6	0.7	1	2.8	3
	14:00	9.7	(1.03)	15.4	(0.36)	30.1	(0.10)	24.5	-	92.4	98	5.8	6	2.6	1	1.1	3
	15:00	9.7	-	16.0	(0.28)	32.0	(0.11)	24.5	-	91.5	92	6.0	6	4.4	3	-0.1	1
	16:00	10.3	(1.28)	16.0	(0.01)	32.1	(0.00)	27.7	(0.19)	92.8	91	5.7	6	4.4	4	-0.1	(0)
	17:00	10.3	-	16.0	-	32.1	-	31.1	(0.19)	96.0	93	6.3	6	4.6	4	-0.1	(0)
	18:00	10.3	-	16.0	-	32.1	-	31.2	(0.01)	105.7	96	9.3	6	4.2	5	0.9	(0)
	19:00	10.2	0.10	16.0	-	32.1	-	30.3	0.05	117.9	106	13.6	9	5.2	4	1.6	1
	20:00	9.7	1.17	16.0	-	30.8	0.07	30.6	(0.03)	128.9	118	17.0	14	6.6	5	1.6	2
	21:00	9.2	1.27	15.5	0.25	30.8	0.00	30.4	0.03	118.8	129	16.4	17	6.9	7	1.4	2
	22:00	9.2	-	15.5	0.01	30.8	-	30.4	0.00	88.4	119	13.2	16	4.9	7	1.9	1
	23:00	9.4	(0.41)	14.7	0.39	30.8	-	30.4	-	67.9	88	10.0	13	3.2	5	1.9	2
	0:00	10.0	(1.49)	14.7	0.01	31.4	(0.04)	31.2	(0.04)	52.6	68		10		3		2
											99.7		10.9		4.9		2.3
07/16/2003	Midnight	10.0		14.7		31.4		31.2		52.6		8.0		4.0		1.7	
	1:00	10.5	(1.37)	14.7	-	29.6	0.10	30.1	0.06	55.0	53	7.4	8	4.9	4	1.7	2
	2:00	11.0	(1.18)	14.0	0.32	30.1	(0.03)	31.0	(0.05)	60.5	55	7.5	7	5.1	5	1.7	2
	3:00	11.4	(0.85)	14.0	0.01	31.1	(0.06)	29.3	0.10	67.7	60	8.8	8	5.5	5	1.7	2
	4:00	11.9	(1.28)	14.7	(0.34)	29.6	0.09	27.4	0.11	88.1	68	14.7	9	8.8	5	2.2	2
	5:00	11.6	0.65	14.7	(0.01)	29.5	0.00	26.6	0.04	108.7	88	19.8	15	10.0	9	4.5	2
	6:00	11.0	1.52	13.8	0.45	27.2	0.13	24.6	0.11	137.5	109	20.2	20	10.3	10	5.3	5
	7:00	10.3	1.82	13.0	0.40	26.6	0.04	24.1	0.04	144.5	137	20.2	20	9.5	10	4.8	5
	8:00	9.6	1.75	12.3	0.35	27.6	(0.06)	24.1	0.00	137.6	144	19.1	20	6.6	9	3.8	5
	9:00	9.2	0.81	12.3	0.01	30.4	(0.16)	24.1	-	117.6	138	15.1	19	3.8	6	3.7	4
	10:00	8.8	1.13	12.3	-	30.5	(0.01)	24.1	-	104.3	118	14.5	15	2.8	4	3.3	4
	11:00	8.7	0.13	12.3	-	28.2	0.13	24.1	-	94.6	104	13.7	14	2.1	3	2.9	3
	12:00	8.7	-	12.3	-	25.2	0.17	24.1	-	90.2	95	13.3	14	1.8	2	2.9	3
	13:00	8.7	-	12.3	-	23.5	0.10	24.1	-	89.4	90	11.9	13	2.3	2	2.0	3
	14:00	8.9	(0.44)	12.3	-	22.8	0.04	24.1	-	87.4	89	10.4	12	2.6	2	1.5	2
	15:00	9.3	(0.84)	-2.8	7.54	7.0	0.90	8.3	0.90	88.4	87	10.7	10	2.6	3	1.3	2
	16:00	9.3	(0.03)	12.6	(7.79)	23.2	(0.93)	24.1	(0.90)	88.7	88	9.9	11	3.3	3	1.2	1
	17:00	9.3	-	12.6	-	23.2	(0.00)	24.1	-	99.0	89	11.0	10	3.4	3	1.2	1
	18:00	9.3	-	13.4	(0.33)	23.2	-	24.1	-	112.3	99	12.1	11	3.9	3	1.2	1
	19:00	9.2	0.27	13.5	(0.01)	25.5	(0.13)	24.1	-	123.9	112	14.1	12	4.5	4	1.2	1
	20:00	8.7	1.28	13.5	-	26.2	(0.04)	24.1	-	135.3	124	16.0	14	5.0	4	1.7	1
	21:00	8.3	0.96	13.5	-	25.6	0.03	24.1	-	128.6	135	15.8	16	5.0	5	1.7	2
	22:00	8.0	0.61	13.5	-	27.1	(0.09)	24.1	-	99.3	129	13.8	16	4.7	5	1.7	2
	23:00	8.1	(0.18)	13.5	-	29.7	(0.15)	26.8	(0.15)	75.2	99	10.5	14	4.2	5	1.7	2
	0:00	8.6	(1.22)	13.5	-	31.8	(0.12)	29.6	(0.16)		75		11		4		2
											99.5		13.3		4.8		2.4

Date	Time	Entire System Tot Demand Rate (MGD)	Entire System Equalization Storage Fill (MG)	Entire System Equalization Storage Draft (MG)	Entire System Equalization Factor (%)	Entire System Diurnal (%)	East Pressure Zone Tot Demand Rate (MGD)	East Pressure Zone Equalization Storage Fill (MG)	East Pressure Zone Equalization Storage Draft (MG)	East Pressure Zone Equalization Factor (%)	East Pressure Zone Diurnal (%)	Northeast Pressure Zone Tot Demand Rate (MGD)	Northeast Pressure Zone Equalization Storage Fill (MG)	Northeast Pressure Zone Equalization Storage Draft (MG)	Northeast Pressure Zone Equalization Factor (%)	Northeast Pressure Zone Diurnal (%)	Hess Pressure Zone Tot Demand Rate (MGD)	Hess Pressure Zone Equalization Storage Fill (MG)	Hess Pressure Zone Equalization Storage Draft (MG)	Hess Pressure Zone Equalization Factor (%)	Hess Pressure Zone Diurnal (%)
07/14/2003	Midnight					80					79					83					80
	1:00	59	39			60	7	5			57	7	2			76	45	31			59
	2:00	58	39			60	7	5			57	7	1			85	43	33			57
	3:00	60	37			62	8	4			65	8	0			95	44	32			58
	4:00	61	37			62	11	2			85	12		(3)		137	38	38			50
	5:00	76	21			78	17		(5)		137	15		(6)		168	44	32			58
	6:00	102		(4)		104	20		(8)		161	15		(6)		172	66	10			87
	7:00	127		(29)		130	20		(7)		160	14		(6)		165	92		(16)		121
	8:00	133		(36)		137	18		(6)		146	12		(3)		134	103		(27)		135
	9:00	127		(29)		130	16		(4)		131	9		(1)		106	101		(25)		133
	10:00	120		(23)		123	14		(2)		113	7	1			83	99		(23)		130
	11:00	112		(14)		115	12	1			92	7	2			76	94		(17)		123
	12:00	95	3			97	11	1			88	6	2			72	77		(1)		101
	13:00	93	5			95	11	1			89	6	3			67	76	1			99
	14:00	93	5			95	10	2			83	5	3			62	77		(1)		101
	15:00	92	5			95	10	2			81	6	3			67	76		(0)		100
	16:00	92	6			94	10	3			76	6	3			67	76		(0)		100
	17:00	92	5			95	10	2			82	6	3			71	76	0			100
	18:00	96	1			99	11	1			89	7	2			79	78		(2)		103
	19:00	105		(8)		108	13		(1)		105	9	0			99	83		(7)		109
	20:00	116		(19)		119	16		(3)		128	10		(1)		115	90		(14)		118
	21:00	133		(35)		136	15		(3)		123	10		(1)		115	107		(31)		141
	22:00	126		(28)		129	13		(0)		103	9		(1)		107	104		(27)		136
	23:00	98		(0)		100	9	3			74	8	1			90	81		(4)		106
	0:00	73	24			75	9	3			74	8	1			90	56	20			74
		97	226	(226)	10	100	13	39	(39)	13	100	9	28	(28)	13	100	76	196	(196)	11	100
07/15/2003	Midnight					75					74					90					74
	1:00	65	34			65	7	3			68	7	0			99	51	31			62
	2:00	61	39			61	7	4			65	7	0			97	47	35			57
	3:00	57	42			58	8	3			69	7	0			99	43	39			52
	4:00	64	35			65	8	3			75	8		(1)		117	48	34			59
	5:00	83	16			84	12		(1)		113	11		(4)		155	60	22			74
	6:00	103		(3)		103	16		(5)		149	13		(6)		186	74	8			90
	7:00	135		(36)		136	19		(8)		175	15		(7)		203	102		(20)		125
	8:00	143		(44)		144	19		(8)		175	13		(5)		175	112		(30)		137
	9:00	137		(37)		138	18		(7)		165	10		(3)		136	109		(28)		134
	10:00	121		(21)		121	14		(3)		132	7		(0)		101	99		(17)		121
	11:00	116		(16)		116	10	1			92	5	2			72	100		(19)		123
	12:00	107		(7)		107	6	4			59	5	3			63	96		(14)		118
	13:00	101		(1)		101	6	5			57	4	3			54	91		(9)		111
	14:00	98	2			98	6	5			56	3	4			48	89		(7)		109
	15:00	92	7			93	6	5			54	4	4			51	83		(1)		101
	16:00	91	8			92	6	5			55	4	3			60	81	1			99
	17:00	93	7			93	6	5			53	4	3			60	83		(1)		101
	18:00	96	4			96	6	5			57	5	3			63	85		(4)		104
	19:00	106		(6)		106	9	2			86	5	2			72	91		(10)		112
	20:00	118		(18)		118	14		(3)		125	7	0			95	97		(16)		119
	21:00	129		(29)		129	17		(6)		156	8		(1)		114	104		(22)		127
	22:00	119		(19)		119	16		(5)		150	8		(1)		116	94		(19)		115
	23:00	89	11			89	13		(2)		121	7	0			93	68	13			84
	0:00	68	32			68	10	1			92	5	2			72	53	29			64
		100	238	(238)	10	100	11	50	(50)	19	100	7	29	(29)	17	100	82	211	(211)	11	100
07/16/2003	Midnight					68					92					72					64
	1:00	53	47			53	8	5			60	6	2			79	39	40			49
	2:00	55	45			55	7	6			56	7	1			91	41	38			52
	3:00	61	39			61	8	6			57	7	0			93	46	33			59
	4:00	68	32			68	9	5			66	7	0			100	52	27			66
	5:00	89	11			89	15		(1)		111	11		(4)		152	62	16			79
	6:00	110		(10)		110	20		(7)		149	14		(7)		201	75	4			95
	7:00	138		(38)		138	20		(7)		152	16		(6)		216	102		(23)		129
	8:00	145		(45)		145	20		(7)		152	14		(7)		198	110		(31)		139
	9:00	138		(38)		138	19		(6)		144	10		(3)		143	108		(29)		137
	10:00	118		(18)		118	15		(2)		114	8		(0)		105	95		(16)		120
	11:00	105		(5)		105	14		(1)		109	6	1			85	84		(5)		106
	12:00	96	4			96	14		(0)		103	5	2			69	76	3			97
	13:00	91	9			91	13		(0)		100	5	3			65	72	7			92
	14:00	90	10			90	12	1			90	4	3			60	73	6			93
	15:00	89	10			90	10	3			78	4	3			57	75	4			95
	16:00	87	13			87	11	3			80	4	3			54	72	7			91
	17:00	89	11			89	10	3			75	4	3			62	74	5			94
	18:00	99	0			100	11	2			83	5	3			64	83		(4)		106
	19:00	112		(13)		113	12	1			91	5	2			71	95		(16)		120
	20:00	124		(24)		125	14		(1)		106	6	2			79	104		(25)		132
	21:00	135		(36)		136	16		(3)		120	7	0			93	113		(34)		143
	22:00	129		(29)		129	16		(3)		119	7	0			94	106		(27)		134
	23:00	99	0			100	14		(1)		104	6	1			90	79	0			100
	0:00	75	24			75	11	3			79	6	1			82	59	20			74
		99	256	(256)	11	100	13	38	(38)	12	100	7	30	(30)	17	100	79	210	(210)	11	100

Table

WICHITA, KANSAS -- WATER DISTRIBUTION SYSTEM
DIURNAL DATA

Date	Time	Central WTP Clearwell (35 MG) Elevation (feet)	Central WTP Clearwell (35 MG) Volume (MG)	Webb Road Clearwell (10 MG) Elevation (feet)	Webb Road Clearwell (10 MG) Volume (MG)	Roosevelt Tower (2 MG) Elevation (feet)	Roosevelt Tower (2 MG) Volume (MG)	Woodlawn Tower (2 MG) Elevation (feet)	Woodlawn Tower (2 MG) Volume (MG)	Hess Pump Station Rate (MG)	Hess Pump Station Volume (MG)	East Pressure Zone Webb Road BPS Rate (MG)	East Pressure Zone Webb Road BPS Volume (MG)	NE Pressure Zone Webb Road BPS Rate (MG)	NE Pressure Zone Webb Road BPS Volume (MG)	NE Pressure Zone 37th Street BPS Rate (MG)	NE Pressure Zone 37th Street BPS Volume (MG)
07/17/2003	Midnight	8.6		13.5		31.8		29.6		63.3		7.7		4.0		1.7	
	1:00	9.2	(1.47)	13.5	-	32.5	(0.04)	31.4	(0.10)	55.6	63	7.7	8	3.9	4	1.7	2
	2:00	9.8	(1.66)	12.9	0.28	32.5	(0.00)	31.4	(0.00)	62.6	56	7.4	8	4.1	4	1.7	2
	3:00	10.1	(0.74)	12.9	0.00	32.5	-	31.4	-	70.6	63	7.9	7	4.3	4	1.9	2
	4:00	10.4	(0.71)	14.0	(0.56)	32.5	-	31.4	-	89.1	71	11.1	8	6.2	4	3.0	2
	5:00	10.4	-	14.5	(0.27)	32.5	-	31.4	-	112.9	89	16.3	11	6.9	6	5.3	3
	6:00	10.0	1.07	14.5	(0.00)	32.5	-	31.4	-	133.3	113	20.1	16	9.5	7	5.3	5
	7:00	9.3	1.62	14.0	0.25	29.2	0.19	31.4	-	142.5	133	20.0	20	8.2	9	4.7	5
	8:00	8.9	1.18	13.5	0.29	30.4	(0.07)	31.4	-	130.7	143	18.1	20	6.4	8	3.9	5
	9:00	8.4	1.17	13.4	0.01	29.8	0.03	31.4	-	116.4	131	15.3	18	3.6	6	3.5	4
	10:00	8.4	0.11	12.8	0.34	29.8	0.00	31.4	-	108.7	116	14.4	15	2.0	4	3.7	4
	11:00	8.4	-	12.7	0.01	30.5	(0.04)	31.4	-	100.5	109	13.7	14	1.5	2	3.4	4
	12:00	8.4	-	12.7	-	30.5	(0.00)	31.4	-	94.6	101	12.9	14	1.3	2	3.1	3
	13:00	8.4	-	12.7	-	29.4	0.06	31.4	-	91.5	95	11.4	13	0.7	1	3.4	3
	14:00	8.4	-	12.7	-	29.4	0.00	31.4	-	86.2	91	9.3	11	0.0	1	3.6	3
	15:00	8.4	-	12.7	-	30.2	(0.05)	31.4	-	85.5	86	9.6	9	0.0	0	3.8	4
	16:00	8.8	(1.14)	12.7	-	30.2	(0.00)	31.4	-	88.8	86	9.7	10	0.0	0	4.1	4
	17:00	8.9	(0.15)	12.7	-	30.2	-	31.4	-	96.0	89	10.3	10	0.0	0	4.5	4
	18:00	8.9	-	12.7	-	30.2	-	30.3	0.07	113.1	96	12.9	10	0.0	0	4.7	5
	19:00	8.4	1.19	12.7	-	28.2	0.12	29.5	0.04	130.7	113	16.0	13	0.0	0	5.8	5
	20:00	7.7	1.64	13.7	(0.46)	26.5	0.10	29.5	0.00	141.7	131	17.7	16	3.5	0	4.5	6
	21:00	7.1	1.56	13.7	(0.02)	24.8	0.10	29.5	-	133.0	142	17.4	18	4.1	3	3.6	5
	22:00	6.8	0.71	14.4	(0.36)	24.8	0.00	29.5	-	104.9	133	14.6	17	3.6	4	3.2	4
	23:00	6.9	(0.06)	14.4	(0.01)	27.4	(0.15)	29.5	-	79.4	105	12.1	15	0.8	4	4.3	3
	0:00	7.4	(1.29)	15.0	(0.27)	29.7	(0.13)	29.5	-		79		12		1		4
											101.3		13.1		3.1		3.7
07/18/2003	Midnight	7.4		15.0		29.7		29.5		65.4		8.9		0.0		5.0	
	1:00	7.8	(1.18)	15.0	(0.01)	31.1	(0.08)	30.7	(0.07)	60.8	65	8.9	9	1.8	0	4.6	5
	2:00	8.4	(1.28)	15.0	-	31.7	(0.03)	31.4	(0.04)	58.5	61	9.0	9	3.2	2	3.6	5
	3:00	8.9	(1.25)	15.0	-	31.7	(0.00)	31.4	(0.00)	63.0	58	10.0	9	3.9	3	3.5	4
	4:00	9.3	(1.23)	14.4	0.30	31.7	-	31.4	-	78.5	63	14.9	10	5.4	4	5.4	4
	5:00	9.4	(0.04)	14.4	0.01	28.4	0.19	27.4	0.23	105.7	78	20.0	15	6.7	5	6.5	5
	6:00	8.9	1.08	13.5	0.44	25.5	0.17	23.6	0.22	138.3	106	20.3	20	9.8	7	5.5	6
	7:00	8.2	1.74	12.6	0.33	23.7	0.10	22.9	0.04	145.6	138	20.2	20	9.5	10	4.6	5
	8:00	7.8	1.15	12.3	0.30	23.7	0.00	22.9	0.00	136.0	146	17.7	20	7.3	9	3.8	5
	9:00	7.3	1.13	12.2	0.01	25.1	(0.08)	22.9	-	124.2	136	15.2	18	4.3	7	3.3	4
	10:00	7.3	-	11.7	0.28	27.2	(0.12)	22.9	-	116.2	124	14.3	15	2.8	4	3.1	3
	11:00	7.2	0.42	3.9	3.91	19.7	0.43	14.9	0.46	104.3	116	12.2	14	1.2	3	3.7	3
	12:00	7.2	(0.05)	11.7	(3.90)	27.8	(0.46)	22.9	(0.46)	101.9	104	11.6	12	1.2	1	3.5	4
	13:00	7.2	-	11.7	-	28.7	(0.05)	22.9	-	101.9	102	11.8	12	1.7	1	2.6	3
	14:00	7.2	-	12.4	(0.36)	28.7	(0.00)	22.9	-	96.4	102	11.3	12	1.5	2	2.6	3
	15:00	7.6	(1.14)	12.4	(0.01)	28.7	-	22.9	-	83.0	96	10.9	11	1.4	1	2.6	3
	16:00	8.1	(1.15)	12.4	-	25.4	0.19	22.9	-	91.8	83	11.4	11	1.9	1	2.8	3
	17:00	8.2	(0.28)	13.0	(0.30)	23.8	0.09	22.9	-	100.3	92	12.9	11	2.3	2	2.9	3
	18:00	8.2	-	13.0	(0.01)	22.1	0.09	22.9	-	108.8	100	14.2	13	2.6	2	2.9	3
	19:00	8.2	-	13.0	-	22.1	0.00	22.9	-	117.3	109	15.1	14	3.5	3	3.0	3
	20:00	7.7	1.17	13.0	-	22.1	-	22.9	-	127.1	117	17.5	15	4.1	4	3.0	3
	21:00	7.7	0.08	13.0	-	22.1	-	22.9	-	123.3	127	17.4	18	4.2	4	3.6	3
	22:00	7.3	1.11	13.0	-	22.7	(0.04)	23.6	(0.04)	113.9	123	14.9	17	3.1	4	3.9	4
	23:00	7.4	(0.44)	12.3	0.35	28.0	(0.30)	28.6	(0.29)	87.9	114	11.5	15	2.3	3	3.9	4
	0:00	7.9	(1.17)	12.3	0.00	32.0	(0.23)	31.6	(0.17)	76.3	88	10.1	12	2.3	2	3.8	4
											102.1		13.8		3.6		3.7

Date	Time	Entire System Tot Demand Rate (MGD)	Entire System Equalization Storage Fill (MG)	Entire System Equalization Storage Draft (MG)	Entire System Equalization Factor (%)	Entire System Diurnal (%)	East Pressure Zone Tot Demand Rate (MGD)	East Pressure Zone Equalization Storage Fill (MG)	East Pressure Zone Equalization Storage Draft (MG)	East Pressure Zone Equalization Factor (%)	East Pressure Zone Diurnal (%)	Northeast Pressure Zone Tot Demand Rate (MGD)	Northeast Pressure Zone Equalization Storage Fill (MG)	Northeast Pressure Zone Equalization Storage Draft (MG)	Northeast Pressure Zone Equalization Factor (%)	Northeast Pressure Zone Diurnal (%)	Hess Pressure Zone Tot Demand Rate (MGD)	Hess Pressure Zone Equalization Storage Fill (MG)	Hess Pressure Zone Equalization Storage Draft (MG)	Hess Pressure Zone Equalization Factor (%)	Hess Pressure Zone Diurnal (%)
07/17/2003	Midnight					75					79					82					74
	1:00	63	38			62	8	5			59	6	1			84	50	32			61
	2:00	56	46			55	8	5			59	6	1			82	42	39			52
	3:00	63	39			62	7	6			57	6	1			86	49	32			61
	4:00	71	31			70	8	5			60	6	1			91	57	25			69
	5:00	89	12			88	11	2			85	9		(2)		136	69	13			84
	6:00	113		(12)		111	16		(3)		125	12		(5)		179	84		(3)		104
	7:00	134		(32)		132	20		(7)		154	15		(8)		216	99		(17)		121
	8:00	142		(41)		141	20		(7)		153	13		(6)		190	110		(28)		134
	9:00	131		(29)		129	18		(5)		138	10		(3)		151	102		(21)		126
	10:00	116		(15)		115	15		(2)		117	7		(0)		104	94		(13)		115
	11:00	109		(7)		107	14		(1)		110	6	1			83	89		(7)		109
	12:00	101	1			99	14		(1)		105	5	2			71	82		(1)		101
	13:00	95	7			93	13	0			99	4	2			65	77	4			95
	14:00	91	10			90	11	2			87	4	3			61	76	5			93
	15:00	86	15			85	9	4			71	4	3			53	73	8			90
	16:00	86	16			84	10	3			73	4	3			57	72	9			88
	17:00	89	13			88	10	3			74	4	3			61	75	6			92
	18:00	96	5			95	10	3			79	5	2			67	81	0			100
	19:00	113		(12)		112	13	0			99	5	2			70	96		(14)		117
	20:00	131		(29)		129	16		(3)		123	6	1			86	109		(27)		134
	21:00	142		(40)		140	18		(5)		136	8		(1)		118	116		(35)		142
	22:00	133		(32)		131	17		(4)		133	8		(1)		113	108		(26)		133
	23:00	105		(3)		103	15		(2)		112	7	0			100	83		(2)		102
	0:00	79	22			78	12	1			93	5	2			75	62	19			76
		101	254	(254)	10	100	13	40	(40)	13	100	7	28	(28)	17	100	81	194	(194)	10	100
07/18/2003	Midnight					78					93					75					76
	1:00	65	37			64	9	5			65	5	2			69	51	30			63
	2:00	61	41			59	9	5			64	6	1			88	45	35			56
	3:00	58	44			57	9	5			65	7	1			92	43	38			53
	4:00	63	39			62	10	4			72	7		(0)		101	46	35			56
	5:00	79	23			77	15		(1)		107	11		(3)		148	53	28			66
	6:00	106		(4)		104	20		(6)		145	13		(6)		180	73	8			90
	7:00	138		(36)		136	20		(6)		147	15		(8)		208	103		(22)		127
	8:00	146		(43)		143	20		(6)		146	14		(7)		193	111		(30)		137
	9:00	136		(34)		133	18		(4)		128	11		(4)		152	107		(26)		132
	10:00	124		(22)		122	15		(1)		110	8		(0)		105	101		(20)		125
	11:00	117		(15)		115	14		(0)		104	6	1			80	97		(16)		120
	12:00	103				101	12	2			88	5	2			67	86		(5)		107
	13:00	102	0			100	12	2			84	5	3			64	86		(5)		106
	14:00	102	0			100	12	2			85	4	3			59	86		(5)		106
	15:00	96	6			94	11	3			82	4	3			56	81	0			100
	16:00	83	19			81	11	3			79	4	3			55	68	13			84
	17:00	92	10			90	11	2			82	5	3			65	76	5			94
	18:00	100	2			98	13	1			93	5	2			70	82		(1)		102
	19:00	109		(7)		107	14		(0)		103	5	2			75	89		(8)		110
	20:00	117		(15)		115	15		(1)		109	7	1			90	96		(15)		118
	21:00	127		(25)		125	18		(4)		126	7	0			96	103		(22)		127
	22:00	123		(21)		121	17		(4)		126	8		(0)		106	98		(17)		121
	23:00	113		(11)		111	15		(1)		108	7	0			96	91		(11)		113
	0:00	88	15			86	12	2			83	6	1			84	70	11			86
		102	235	(234)	10	100	14	36	(36)	11	100	7	29	(29)	16	100	81	203	(203)	10	100

Table

Wichita Water Master Plan
Wichita, Kansas

Summary of Operations Database Files

TagID	Alt. TagName Used	Name or Description	Units	Use for Calibration	Use for Diurnal	Requires Continuous Trend Chart	Comments
252	TKLWD	WOODLAWN_MBR_LEVEL_CURRENT	FT	Yes	Yes	Yes	
255	TKLRS	ROOSEVELT_MBR_LEVEL_CURRENT	FT	Yes	Yes	Yes	
258	RLVWB	WEBBROAD_MBR-LEVEL_CURRENT	FT	Yes	Yes	Yes	
265	NA	RESLV_FB	FT	Yes	Yes	Yes	Hess/Clearwell
266	NA	TFHPS_FB	MG	Yes	Yes	Yes	Hess Total Q
417	PH1RD	PMP_HESS_PUMP01_RUNTIME_FB	HRS	Yes	No	Yes	
418	PH2RD	PMP_HESS_PUMP02_RUNTIME_FB	HRS	Yes	No	Yes	
419	PH3RD	PMP_HESS_PUMP03_RUNTIME_FB	HRS	Yes	No	Yes	
420	PH4RD	PMP_HESS_PUMP04_RUNTIME_FB	HRS	Yes	No	Yes	
421	P5RD	PMP_HESS_PUMP05_RUNTIME_FB	HRS	Yes	No	Yes	
422	PH6RD	PMP_HESS_PUMP06_RUNTIME_FB	HRS	Yes	No	Yes	
423	PH7RD	PMP_HESS_PUMP07_RUNTIME_FB	HRS	Yes	No	Yes	
424	PH8RD	PMP_HESS_PUMP08_RUNTIME_FB	HRS	Yes	No	Yes	
425	No Trend	PMP_HESS_NSUCTHDR_PRESSURE	PSI	Yes	No	Yes	Hess north suction pressure
426	NDHPS	PMP_HESS_NDSCHGHDR_PRESSURE	PSI	Yes	No	Yes	Hess north discharge pressure
427	No Trend	PMP_HESS_SSUCTHDR_PRESSURE	PSI	Yes	No	Yes	Hess south suction pressure
428	SDHPS	PMP_HESS_SDSCHGHDR_PRESSURE	PSI	Yes	No	Yes	Hess sourth discharge pressure
431	NA	DTNPS	PSI	Yes	No	Yes	Central and Main
432	NA	TYLPS	PSI	Yes	No	Yes	13th & Tyler
433	NA	KELPS	PSI	Yes	No	Yes	Kellog & Webb
434	NA	SENPS	PSI	Yes	No	Yes	Seneca & MacArthur
435	MLR01	WEBBROAD PUMP M1 RUNTIME	HRS	Yes	No	No	
436	MLR02	WEBBROAD PUMP M2 RUNTIME	HRS	Yes	No	No	
437	MLR03	WEBBROAD PUMP M3 RUNTIME	HRS	Yes	No	No	
438	MLR04	WEBBROAD PUMP M4 RUNTIME	HRS	Yes	No	No	
439	MLR01	WEBBROAD PUMP B1 RUNTIME	HRS	Yes	No	No	
440	BPR02	WEBBROAD PUMP B2 RUNTIME	HRS	Yes	No	No	
441	BDP3RUN	WEBBROAD PUMP B3 RUNTIME	HRS	Yes	No	No	
442	NA	BFRWB	MGD	Yes	Yes	Yes	Webb Road Booster Q (NEPZ)
443	NA	MFRWB	MGD	Yes	Yes	Yes	Webb Road Main Q (EPZ)
446	NA	DPBWB	PSI	Yes	No	Yes	Webb Road Booster Discharge (NEPZ)
447	NA	NE37_FLOWRATE	MGD	Yes	Yes	Yes	37th Street BPS Q
448	NA	NE37TH_SUCTION_PRESS	PSI	Yes	No	Yes	
449	NA	NE37TH_DISCHARGE_PRESS	PSI	Yes	No	Yes	
450	PR137	NE37TH PUMP1 RUNTIME	HRS	Yes	No	No	
451	PR237	NE37TH PUMP2 RUNTIME	HRS	Yes	No	No	
452	PR337	NE37TH PUMP3 RUNTIME	HRS	Yes	No	No	
453	NA	34PSI	PSI	Yes	No	Yes	34th & Webb
455	NA	EAST_SUCTION_PRES	PSI	Yes	No	Yes	Webb Road BPS (HPZ)
456	NA	EAST_DISCHARGE_PRES	PSI	Yes	No	Yes	Webb Road BPS (EPZ)
457	NA	HGEPS	PSI	Yes	No	Yes	Harry & Gov.(EPZ)
458	KELPS	KEL_SYSTEM_PRESSURE	PSI	Yes	No	Yes	Kellog & Webb
463	NA	HGHPS	PSI	Yes	No	Yes	Harry & Gov. (HPZ)
444	NA	RLVWB					Webb Rd. Reservoir Level

Notes:
1. Webb Road Main is East Pressure Zone
2. Webb Road Booster in Northeast Pressure Zone.
3. FB means data is transmitted through fiber on 10 second intervals.
4. MBR means data is transmitted via radio.

Table

CITY OF WICHITA, KANSAS
PRESSURE RECORDER DATA SUMMARY

		Hess Pump Station						East Pressure Zone Webb Road BPS			NE Pressure Zone Webb Road BPS			37th Street BPS			Roosevelt Tank		Woodlawn Tank						
Date	Time	Clearwell N (ft of head)	N Suction N (psi)	N Discharge N (psi)	S Suction N (psi)	S Discharge N (psi)	Flow N (MGD)	Suction N (psi)	Discharge N (psi)	Flow N (MGD)	Suction N (ft of head)	Discharge N (psi)	Flow N (MGD)	Suction N (psi)	Discharge N (psi)	Flow N (MGD)	Level N (feet)	Pressure N (psi)	Level N (feet)	Pressure N (psi)	39th & Webb N (psi)	56th & Meridian N (psi)	21st & Zoo N (psi)	21st & Sun Ridge N (psi)	151st & Hendryx N (psi)
07/11/2003	0:00	8.9	21	81	21	82	42.4	57	69	5.5		90	2.4	61	89	1.4									
	1:00	9.3	22	81	22	82	38.9	57	61	5.0		90	3.5	61	89	1.4									
	2:00	9.7	22	81	22	82	38.4	57	56	4.9		90	4.2	61	89	1.4									
	3:00	9.8	22	81	22	82	44.6	56	55	6.0		89	4.8	61	88	1.4									
	4:00	10.3	23	80	23	81	62.5	52	59	10.8		91	7.4	58	86	2.1									
	5:00	10.3	23	83	22	83	86.8	49	71	16.9		88	9.6	58	84	2.1									
	6:00	9.8	22	82	22	82	106.8	46	70	19.3		90	9.0	56	84	4.3									
	7:00	9.4	22	83	21	83	109.6	48	71	17.5		92	7.0	57	89	3.5									
	8:00	9.0	21	84	21	85	106.1	52	70	14.0		93	4.4	58	93	3.0					78				
	9:00	8.8	21	85	21	86	96.9	55	66	10.8		90	2.3	59	93	3.1					78	80	85	64	
	10:00	8.6	21	85	21	85	90.2	56	59	8.8		90	2.5	60	91	2.1					78	76	85	64	44
	11:00	8.2	21	85	21	85	83.4	56	55	8.7		90	2.6	60	91	1.7					78	88	85	66	50
	12:00	8.2	21	82	21	83	79.9	54	53	8.7		90	2.6	58	91	1.5					78	80	85	68	50
	13:00	8.2	21	81	20	82	83.1	53	52	8.4		90	2.6	56	90	1.2					78	72	83	64	48
	14:00	8.1	21	84	20	84	85.6	55	54	8.9	12.7	90	3.9	58	86	2.0	33.42		29.56		77	74	85	68	48
	15:00	8.1	21	81	20	81	73.6	54	53	8.0	12.7	88	4.3	58	87	1.9	33.42		29.56		71	76	85	62	50
	16:00	8.1	21	81	20	81	72.3	54	53	8.2	12.7	88	4.2	59	87	1.9	33.42		29.56		72	72	85	62	42
	17:00	8.1	21	81	20	81	79.1	53	52	8.6	12.7	87	4.5	59	87	1.9	33.42		28.71		71	70	85	61	43
	18:00	8.1	21	80	20	81	83.9	52	57	10.6	12.7	87	4.8	58	86	1.9	33.42		27.88		71	70	80	62	42
	19:00	8.1	21	81	20	82	90.1	52	64	12.4	12.2	86	4.8	58	85	1.9	32.31		26.70		70	70	83	60	40
	20:00	8.1	21	81	20	82	95.7	51	62	12.8	12.2	84	5.2	58	84	2.2	29.48		27.24		70	70	80	50	38
	21:00	7.9	20	83	20	84	99.5	53	65	12.7	11.4	85	5.4	59	83	2.4	27.68		27.26		69	72	83	52	
	22:00	7.6	20	89	20	90	92.4	59	71	12.0	11.4	87	5.2	62	84	2.4	29.43		29.15		70	89	87	50	
	23:00	7.7	20	83	20	84	73.3	54	65	10.0	11.4	87	4.4	55	85	1.9	32.14		32.15		70	80	95	54	
07/12/2003	0:00	8.1	20	84	20	84	62.2	57	65	9.2	11.4	75	3.1	60	75	2.9	32.23		32.26		70	76	85		51
	1:00	8.5	21	83	21	84	55.8	58	61	7.3	12.1	72	2.8	60	75	3.2	32.23		32.26		73	74	92		53
	2:00	9.1	21	80	21	81	54.8	54	53	6.4	12.1	68	3.0	57	71	3.2	32.23		32.26		74	80	86		49
	3:00	9.5	22	81	22	81	57.2	54	53	6.5	12.1	77	4.2	57	76	3.4	32.23		32.26		72	79	87		48
	4:00	9.9	22	80	22	80	65.1	51	65	10.8	12.1	79	6.2	55	80	3.7	32.23		32.26		76	78	80		46
	5:00	10.2	23	83	22	83	84.1	50	58	14.1	12.1	72	7.0	56	74	3.8	29.46		28.66		73	73	77		42
	6:00	10.2	23	83	22	84	95.1	50	56	15.3	12.1	70	7.0	57	72	3.8	29.37		26.97		73	69	82		
	7:00	10.2	23	83	22	83	96.0	51	60	14.1	12.1	76	6.6	57	76	3.8	29.37		27.64		75	72	81		
	8:00	10.2	22	81	22	82	96.9	51	63	12.8	12.1	82	5.7	56	82	3.7	27.91		26.36		77	71	80	56	34
	9:00	10.1	22	81	22	81	97.6	51	71	11.4	12.1	87	5.0	56	86	2.9	26.45		24.54		80	70	80	53	36
	10:00	9.7	22	81	22	81	97.7	51	71	10.9	12.1	89	4.9	56	88	2.3	25.15		23.20		79	68	80	53	36
	11:00	9.7	22	84	22	85	102.5	54	71	10.3	12.1	90	4.5	58	90	2.3	24.49		22.47		78	72	80	60	37
	12:00	9.7	22	84	22	85	100.4	55	71	10.3	12.1	90	4.2	59	90	2.3	27.45		24.97		79	73	85	60	42
	13:00	9.7	22	83	21	83	89.8	54	71	9.9	12.1	90	3.8	59	90	2.3	30.24		27.32		79	72	85	60	42
	14:00	9.7	22	83	21	84	88.2	55	71	9.8	12.1	90	4.1	60	89	1.6	30.33		28.03		79	73	85	60	43
	15:00	9.7	22	84	21	85	86.6	56	57	9.2	12.1	90	5.0	61	85	1.2	31.47		29.51		73	79	85	63	46
	16:00	9.7	22	82	21	83	82.8	54	53	9.1	12.1	87	4.4	59	87	2.0	32.81		29.56		75	74	85	60	44
	17:00	9.7	22	82	21	83	84.0	54	53	9.1	12.1	88	4.4	59	87	2.0	30.75		29.56		76	71	85	60	44
	18:00	9.7	22	83	21	84	90.1	55	54	9.5	12.1	89	4.9	60	88	2.0	30.11		29.56		78	71	85	60	45
	19:00	9.7	22	83	21	84	92.4	54	53	10.1	12.1	88	5.4	59	87	2.0	31.30		29.56		76	77	85	60	42
	20:00	9.7	22	84	21	85	96.8	54	53	10.6	12.1	88	5.4	59	87	2.5	31.34		29.56		76	76	85	59	42
	21:00	9.7	22	82	21	83	82.4	54	53	10.1	12.1	88	5.4	58	87	2.5	31.94		28.89		74	73	85	60	42
	22:00	9.7	22	83	22	84	74.8	56	54	8.9	12.1	89	4.9	59	88	2.5	30.76		27.89		76	72	85	64	48
	23:00	9.7	22	82	22	83	61.4	56	55	7.7	12.1	90	4.9	60	89	2.5	32.10		29.00		76	79	85	67	50

Table

CITY OF WICHITA, KANSAS
PRESSURE RECORDER DATA SUMMARY

		Hess Pump Station						East Pressure Zone Webb Road BPS			NE Pressure Zone Webb Road BPS			37th Street BPS			Roosevelt Tank		Woodlawn Tank						
Date	Time	Clearwell N (ft of head)	N Suction N (psi)	N Discharge N (psi)	S Suction N (psi)	S Discharge N (psi)	Flow N (MGD)	Suction N (psi)	Discharge N (psi)	Flow N (MGD)	Suction N (ft of head)	Discharge N (psi)	Flow N (MGD)	Suction N (psi)	Discharge N (psi)	Flow N (MGD)	Level N (feet)	Pressure N (psi)	Level N (feet)	Pressure N (psi)	39th & Webb N (psi)	56th & Meridian N (psi)	21st & Zoo N (psi)	21st & Sun Ridge N (psi)	151st & Hendryx N (psi)
07/13/2003	0:00	10.1	22	82	22	82	54.8	55	54	7.2	12.1	89	4.8	59	89	2.5	32.14		29.04		77	78	85	66	50
	1:00	10.2	23	82	23	83	58.7	56	55	6.9	12.1	88	4.9	59	88	2.5	30.50		29.04		73	78	85	66	50
	2:00	10.7	23	82	23	83	54.8	56	55	6.8	12.1	87	5.0	60	88	2.5	31.24		29.04		73	74	85	67	51
	3:00	11.1	23	83	23	83	60.3	55	54	7.5	12.1	91	6.2	57	88	2.3	31.27		29.04		72	72	85	68	51
	4:00	11.2	24	81	23	82	71.8	51	50	9.6	12.1	92	8.7	53	88	2.0	30.36		27.92		66	70	85	64	47
	5:00	11.2	24	81	23	82	81.6	50	49	10.9	12.1	91	9.6	54	86	2.9	28.04		27.88		68	54	85	57	43
	6:00	11.2	24	81	23	82	93.4	46	67	17.2	12.1	90	9.7	55	87	3.9	26.46		27.88		68	71	80	54	36
	7:00	11.2	24	81	23	82	97.9	46	71	17.2	12.1	91	8.2	55	88	3.3	24.58		27.88		68	72	80	53	36
	8:00	11.2	23	83	23	84	107.8	49	71	15.8	11.3	93	6.5	57	91	3.1	22.91		27.88		74		83	52	34
	9:00	10.7	23	82	22	82	101.1	50	70	13.9	11.3	92	5.1	57	92	2.9	25.08		27.88		79		85	62	40
	10:00	10.7	23	80	22	81	98.5	50	68	12.4	10.8	90	4.1	56	92	3.1	24.58		27.88		80		80	58	39
	11:00	10.3	23	83	22	84	101.7	53	70	12.3	10.7	90	3.4	58	92	3.1	23.48		27.88		80	70	85	60	39
	12:00	10.2	23	82	22	82	96.5	51	69	12.6	10.7	90	3.5	57	92	3.1	25.67		27.88		80	70	83	62	41
	13:00	10.2	22	82	22	83	95.4	51	69	12.5	10.7	90	3.2	57	92	3.1	25.74		27.88		80	70	83	63	41
	14:00	10.2	22	82	22	82	93.1	52	70	12.5	10.7	90	2.8	57	92	3.0	25.74		27.88		80	70	83	63	42
	15:00	10.2	22	82	22	82	90.2	52	71	12.1	10.2	90	2.7	58	92	3.1	26.77		27.88		80	70	85	63	42
	16:00	9.8	22	82	22	82	90.1	52	71	12.0	10.2	90	2.9	58	92	3.1	26.81		27.88		80	71	85	66	46
	17:00	9.7	22	82	22	82	93.4	52	70	12.5	10.2	90	3.3	57	92	3.1	27.53		27.88		80	71	85	67	
	18:00	9.7	22	83	22	83	104.0	51	62	12.3	10.2	76	0.4	53	81	5.2	26.93		27.88		80	70	80	66	
	19:00	9.2	21	84	21	84	113.1	51	59	13.0	10.2	69	0.0	52	79	6.0	26.91		27.88		62	73	85	62	42
	20:00	8.8	21	84	20	84	120.1	50	56	13.9	11.0	70	1.6	51	76	5.9	26.91		27.88		56	72	85	58	37
	21:00	8.7	21	84	20	85	110.8	51	58	13.6	11.1	83	4.2	54	86	4.2	26.91		27.88		70	75	83	56	36
	22:00	8.7	21	83	20	84	90.2	53	64	11.7	11.6	85	3.9	55	87	3.8	28.25		27.88		72	78	85	66	44
	23:00	8.7	21	84	21	85	71.9	56	65	9.5	11.6	88	2.9	57	90	3.6	29.66		27.88		74	78	85	70	52
07/14/2003	0:00	9.0	21	83	21	83	58.8	56	55	7.1	12.5	88	3.0	57	91	3.6	32.12		27.88		76	72	85	75	
	1:00	9.5	22	82	22	83	57.4	55	54	7.2	13.0	86	3.7	56	89	3.6	32.21		27.88			72	85	72	
	2:00	*10*	*23*	*81*	*23*	*82*	*58*	*53*	*52*	*8.0*	*9.0*	*84*	*4.0*	*55*	*87*	*3.7*	*28*		*24*		72	78	85	72	52
	3:00	10.6	23	81	23	82	61.7	53	52	8.1	6.2	84	4.4	55	87	3.9	24.28		19.71		68	78	85	72	52
	4:00	10.7	23	81	23	82	75.9	51	49	10.6	14.1	86	7.6	54	85	4.3	32.56		27.79		70	74	85	70	47
	5:00	10.7	23	82	23	82	101.3	45	55	17.2	14.1	84	9.9	51	82	4.6	29.50		27.79		66	78	85	60	42
	6:00	10.5	22	83	22	84	126.5	43	65	20.2	14.1	86	10.2	53	82	4.7	26.22		25.98		62	76	85	48	32
	7:00	10.0	22	84	21	85	132.8	45	68	20.0	13.1	89	9.9	53	84	4.4	25.01		23.59			68	85	47	26
	8:00	9.4	22	84	21	85	126.6	46	71	18.3	12.4	91	8.1	54	88	3.5	24.97		22.14		72	68	85	54	32
	9:00	9.2	21	85	21	86	120.3	49	71	16.4	12.4	94	6.3	56	92	2.9	24.97		22.09		74	69	85	60	38
	10:00	8.7	21	85	20	86	111.9	52	64	14.2	11.7	91	4.2	57	92	3.0	27.00		23.80		76	70	85	64	44
	11:00	8.7	21	82	20	82	94.5	52	56	11.5	11.7	90	3.5	57	92	3.1	29.15		24.87		77	71	85	66	46
	12:00	8.7	21	82	20	83	92.6	53	57	11.1	11.7	90	3.1	57	92	3.1	27.47		24.91		77	70	85	66	46
	13:00	8.7	21	83	20	83	92.7	53	57	11.2	11.7	90	2.7	58	93	3.1	27.41		25.87		77	71	85	67	47
	14:00	8.7	21	83	20	84	92.1	54	60	10.4	11.7	90	2.3	57	93	3.1	27.95		25.91		77	71	85	68	48
	15:00	8.7	21	84	20	84	91.7	54	59	10.1	12.3	90	2.7	57	93	3.1	29.02		25.00		77	79	88	70	
	16:00	8.7	21	83	20	84	92.2	54	59	9.5	12.3	90	2.7	57	93	3.1	29.95		24.97		77	74	88	68	48
	17:00	8.7	21	83	20	84	96.5	54	57	10.2	13.0	90	3.0	58	92	3.1	29.98		24.97			73	85	65	48
	18:00	8.7	21	83	20	83	105.0	53	54	11.2	13.0	90	3.8	58	92	3.1	29.98		26.62		76	72	85	63	42
	19:00	8.3	20	82	20	83	115.8	51	55	13.2	13.0	87	4.9	57	89	3.6	28.74		27.71		72	70	83	55	38
	20:00	7.9	20	84	19	84	132.8	49	61	16.0	12.4	90	6.5	57	89	3.4	27.41		26.80		72	68	83	50	31
	21:00	7.3	19	84	19	85	125.7	50	62	15.4	12.3	90	6.7	57	89	3.3	26.76		26.13		72	68	83	46	28
	22:00	7.1	19	83	19	84	97.7	52	64	12.9	11.4	89	5.8	56	89	3.5	27.41		26.11		71	69	85	58	40
	23:00	7.4	20	82	20	82	73.4	54	60	9.2	11.3	91	4.8	56	88	3.0	28.22		24.55			70	85	65	46

Table

CITY OF WICHITA, KANSAS
PRESSURE RECORDER DATA SUMMARY

		Hess Pump Station						East Pressure Zone Webb Road BPS			NE Pressure Zone Webb Road BPS			37th Street BPS			Roosevelt Tank		Woodlawn Tank		39th & Webb	56th & Meridian	21st & Zoo	21st & Sun Ridge	151st & Hendryx
Date	Time	Clearwell N (ft of head)	N Suction N (psi)	N Discharge N (psi)	S Suction N (psi)	S Discharge N (psi)	Flow N (MGD)	Suction N (psi)	Discharge N (psi)	Flow N (MGD)	Suction N (ft of head)	Discharge N (psi)	Flow N (MGD)	Suction N (psi)	Discharge N (psi)	Flow N (MGD)	Level N (feet)	Pressure N (psi)	Level N (feet)	Pressure N (psi)	N (psi)	N (psi)	N (psi)	N (psi)	N (psi)
07/15/2003	0:00	8.1	20	82	20	82	65.3	55	54	7.4	11.8	88	5.0	57	86	2.1	28.78		24.49			72	85	70	50
	1:00	8.6	21	82	21	82	60.9	55	54	7.1	11.9	88	5.1	58	86	1.9	28.79		24.49		80	74	85	69	50
	2:00	9.4	22	81	22	82	57.5	54	53	7.6	12.5	86	5.2	58	86	1.9	28.79		24.49		80	79	83	69	50
	3:00	10.0	22	82	22	82	64.3	54	53	8.1	12.6	87	5.5	56	85	2.9	28.79		24.49		79	80	85	70	50
	4:00	10.4	23	83	22	84	83.4	51	60	12.3	12.6	86	7.1	53	87	4.1	28.79		24.49		81	79	85	70	48
	5:00	10.8	23	82	22	82	103.0	46	57	16.2	13.1	80	8.4	48	82	5.0	27.69		24.49		78	72	85	60	38
	6:00	10.6	22	85	22	86	135.4	45	54	19.1	13.1	89	10.0	52	83	4.7	25.13		24.49		72	75	85	50	30
	7:00	10.1	22	86	22	87	143.5	46	63	19.1	13.1	92	8.7	55	88	3.9	25.04		24.49		76	70	83	46	26
	8:00	9.7	22	86	21	87	137.2	48	74	18.0	13.1	91	6.2	56	91	3.6	26.07		24.49		84	66	85	50	30
	9:00	9.5	21	85	21	85	120.7	51	68	14.4	13.1	90	3.6	56	92	3.6	27.36		24.49			68	85	58	38
	10:00	9.2	21	84	21	85	115.7	53	62	10.0	13.1	90	2.1	56	93	3.1	27.41		24.49		86	70	83	62	40
	11:00	9.2	21	84	21	85	107.1	54	53	6.5	13.1	90	1.6	54	93	3.0	28.42		24.49		87	61	88	68	42
	12:00	9.2	21	83	22	84	100.7	54	53	6.3	14.0	90	1.2	55	93	2.7	28.46		24.49		87	77	85	68	42
	13:00	9.3	21	84	22	85	98.3	55	54	6.1	14.7	90	0.7	56	93	2.8	28.46		24.49		88	75	88	70	48
	14:00	9.7	22	85	22	86	92.4	56	55	5.8	15.4	94	2.6	58	93	1.1	30.14		24.49		90	75	88	73	50
	15:00	9.7	22	87	22	87	91.5	58	57	6.0	16.0	94	4.4	60	93	-0.1	32.03		24.49		90	82	90	75	50
	16:00	10.3	22	86	22	87	92.8	58	57	5.7	16.0	95	4.4	61	94	-0.1	32.09		27.74		90	84	90	76	52
	17:00	10.3	22	84	23	84	96.0	55	54	6.3	16.0	92	4.6	61	91	-0.1	32.09		31.08		86	76	88	72	48
	18:00	10.3	22	83	23	84	105.7	53	55	9.3	16.0	90	4.2	60	86	0.9	32.09		31.19		80	74	85	68	42
	19:00	10.2	22	84	22	85	117.9	53	56	13.6	16.0	88	5.2	60	88	1.6	32.09		30.35		80	71	85	60	38
	20:00	9.7	22	85	22	85	128.9	50	62	17.0	16.0	92	6.6	60	89	1.6	30.81		30.93		84	75	85	57	33
	21:00	9.2	21	84	21	85	118.8	51	66	16.4	15.5	92	6.9	60	90	1.4	30.77		30.42		84	72	85		31
	22:00	9.2	21	83	21	83	88.4	53	64	13.2	15.5	88	4.9	60	87	1.9	30.77		30.41		86	60	85		41
	23:00	9.4	22	83	22	83	67.9	55	59	10.0	14.7	88	3.2	60	87	1.9	30.77		30.41		80	80	85		49
07/16/2003	0:00	10.0	22	81	22	81	52.6	55	54	8.0	14.7	87	4.0	60	89	1.7	31.41		31.18		81	80	85		50
	1:00	10.5	23	82	23	82	55.0	55	54	7.4	14.7	87	4.9	60	87	1.7	29.58		30.08		81	80	85		49
	2:00	11.0	23	83	23	83	60.5	56	54	7.5	14.0	87	5.1	60	87	1.7	30.10		31.03		80	80	85		50
	3:00	11.4	24	82	24	83	67.7	54	53	8.8	14.0	86	5.5	56	86	1.7	31.13		29.32		78	80	88		50
	4:00	11.9	24	83	24	84	88.1	50	62	14.7	14.7	91	8.8	56	87	2.2	29.57		27.42		66	80	85		46
	5:00	11.6	24	84	24	84	108.7	45	66	19.8	14.7	87	10.0	54	86	4.5	29.52		26.78		68	80	82		37
	6:00	11.0	23	85	23	86	137.5	43	64	20.2	13.8	84	10.3	53	84	5.3	27.23		24.86		72	76	81		26
	7:00	10.3	22	87	22	88	144.5	45	67	20.2	13.0	87	9.5	54	85	4.8	26.58		24.12		78	68	83	42	27
	8:00	9.6	21	88	21	89	137.6	49	74	19.1	12.3	91	6.5	57	91	3.8	27.62		24.09		83	70	87	50	31
	9:00	9.2	21	86	21	86	117.6	52	70	15.1	12.3	90	3.8	57	92	3.7	30.37		24.09		85	79	81	60	40
	10:00	8.8	21	83	21	83	104.3	50	67	14.5	12.3	90	2.8	55	92	3.3	30.47		24.09		86	70	82	60	41
	11:00	8.7	21	80	21	81	94.8	49	63	13.7	12.3	90	2.1	55	93	2.9	28.20		24.09		86	70	83	60	41
	12:00	8.7	21	80	21	81	90.2	49	63	13.3	12.3	90	1.8	56	93	2.9	25.23		24.09		87	70	83	62	45
	13:00	8.7	21	80	21	81	89.4	50	64	11.9	12.3	90	2.3	56	90	2.0	23.54		24.09		86	70	83	62	45
	14:00	8.9	21	80	21	81	87.4	51	62	10.4	12.3	90	2.6	56	92	1.5	22.78		24.09		86	70	83	62	45
	15:00	9.3	21	80	21	81	88.4	51	65	10.7	-2.8	90	2.6	56	91	1.3	7.00		8.32		86	70	83	62	46
	16:00	9.3	22	80	21	81	88.7	51	59	9.9	12.8	89	3.3	56	90	1.2	23.19		24.09		84	76	83	62	42
	17:00	9.3	22	81	21	82	99.0	51	59	11.0	12.8	89	3.4	56	89	1.2	23.21		24.09		84	74	83	60	42
	18:00	9.3	22	84	21	84	112.3	52	58	12.1	13.4	90	3.9	57	90	1.2	23.21		24.09		84	70	85	60	40
	19:00	9.2	21	84	21	84	123.9	50	60	14.1	13.5	87	4.5	57	88	1.2	25.47		24.09		82	71	85	57	38
	20:00	8.7	21	84	20	84	135.3	48	62	16.0	13.5	86	5.0	56	86	1.7	26.21		24.09		80	70	83	46	32
	21:00	8.3	20	85	20	85	128.6	50	65	15.8	13.5	86	5.0	57	85	1.7	25.62		24.09		80	69	83	46	
	22:00	8.0	20	85	20	86	99.3	53	70	13.8	13.5	89	4.7	59	87	1.7	27.13		24.09		83	60	85	60	42
	23:00	8.1	20	84	20	84	75.2	55	68	10.5	13.5	91	4.2	60	89	1.7	29.75		26.76		85	80	88	68	50

Table

CITY OF WICHITA, KANSAS
PRESSURE RECORDER DATA SUMMARY

		Hess Pump Station						East Pressure Zone Webb Road BPS			NE Pressure Zone Webb Road BPS			37th Street BPS			Roosevelt Tank		Woodlawn Tank		39th & Webb	56th & Meridian	21st & Zoo	21st & Sun Ridge	151st & Hendryx
Date	Time	Clearwell N (ft of head)	N Suction N (psi)	N Discharge N (psi)	S Suction N (psi)	S Discharge N (psi)	Flow N (MGD)	Suction N (psi)	Discharge N (psi)	Flow N (MGD)	Suction N (ft of head)	Discharge N (psi)	Flow N (MGD)	Suction N (psi)	Discharge N (psi)	Flow N (MGD)	Level N (feet)	Pressure N (psi)	Level N (feet)	Pressure N (psi)	N (psi)	N (psi)	N (psi)	N (psi)	N (psi)
07/17/2003	0:00	8.6	21	83	21	84	63.3	57	65	7.7	13.5	87	4.0	61	88	1.7	31.82		29.61		81	76	88	70	52
	1:00	9.2	22	82	22	82	55.6	56	64	7.7	13.5	87	3.9	60	87	1.7	32.48		31.38		64	74	85	68	51
	2:00	9.8	22	82	22	82	62.6	55	63	7.4	12.9	85	4.1	56	87	1.7	32.49		31.41		73	71	85	68	51
	3:00	10.1	22	83	22	84	70.6	55	63	7.9	12.9	82	4.3	53	84	1.9	32.49		31.41		72	76	85	71	50
	4:00	10.4	23	84	22	84	89.1	52	58	11.1	14.0	74	6.2	51	75	3.0	32.49		31.41		68	70	85	70	50
	5:00	10.4	23	86	22	86	112.9	49	56	16.3	14.5	78	6.9	49	80	5.3	32.49		31.41		52	74	85	62	46
	6:00	10.0	22	86	21	86	133.3	45	67	20.1	14.5	84	9.5	52	83	5.3	32.49		31.41		61	76	84	47	34
	7:00	9.3	21	88	21	89	142.5	47	71	20.0	14.0	87	8.2	55	86	4.7	29.17		31.41		75	72	82	46	25
	8:00	8.9	20	86	20	87	130.7	49	75	18.1	13.5	91	6.4	56	90	3.9	30.35		31.41		72	70	87	56	33
	9:00	8.4	20	84	20	85	116.4	51	73	15.3	13.4	89	3.6	57	92	3.5	29.77		31.41		78	70	84	59	38
	10:00	8.4	20	85	20	85	108.7	53	72	14.4	12.8	91	2.0	59	93	3.7	29.76		31.41		79	71	85	62	41
	11:00	8.4	20	84	20	84	100.5	53	72	13.7	12.7	92	1.5	60	95	3.4	30.48		31.41		80	72	88	70	46
	12:00	8.4	20	83	20	83	94.6	53	70	12.9	12.7	92	1.3	59	95	3.1	30.49		31.41		81	73	85	70	46
	13:00	8.4	20	83	20	83	91.5	54	63	11.4	12.7	91	0.7	59	94	3.4	29.42		31.41		81	74	85	71	48
	14:00	8.4	20	83	20	83	86.2	55	54	9.3	12.7	89	0.0	59	93	3.6	29.41		31.41		78	79	85	71	49
	15:00	8.4	21	83	21	83	85.5	55	53	9.6	12.7	87	0.0	59	92	3.8	30.22		31.41		78	80	85	72	50
	16:00	8.8	21	83	21	83	88.8	54	53	9.7	12.7	86	0.0	59	91	4.1	30.23		31.41		75	79	85	72	50
	17:00	8.9	21	83	21	83	96.0	54	53	10.3	12.7	82	0.0	58	89	4.5	30.23		31.41		72	68	85	70	
	18:00	8.9	21	83	21	84	113.1	51	59	12.9	12.7	79	0.0	54	85	4.7	30.23		30.26		70	69	85	67	
	19:00	8.4	20	84	20	85	130.7	48	65	16.0	12.7	69	0.0	50	79	5.8	28.19		29.48		60	71	85	64	
	20:00	7.7	20	84	19	85	141.7	46	63	17.7	13.7	83	3.5	51	83	4.5	26.52		29.47		72	73	85	56	
	21:00	7.1	19	84	19	85	133.0	47	63	17.4	13.7	85	4.1	52	87	3.6	24.83		29.47		70	73	83	52	
	22:00	6.8	19	84	18	85	104.9	51	67	14.6	14.4	87	3.6	56	90	3.2	24.81		29.47		73	74	83	62	
	23:00	6.9	19	83	19	84	79.4	54	69	12.1	14.4	82	0.8	58	86	4.3	27.36		29.47		77	73	85	70	
07/18/2003	0:00	7.4	20	83	20	83	65.4	55	66	8.9	15.0	77	0.0	58	84	5.0	29.67		29.47		64	74	85	73	52
	1:00	7.8	20	83	20	83	60.8	56	65	8.9	15.0	84	1.8	59	85	4.6	31.13		30.66		64	74	85	74	52
	2:00	8.4	21	81	21	81	58.5	53	62	9.0	15.0	88	3.2	58	90	3.6	31.68		31.43		75	71	84	76	
	3:00	8.9	21	79	21	79	63.0	50	57	10.0	15.0	85	3.9	54	88	3.5	31.69		31.44		73	66	80	72	
	4:00	9.3	21	81	22	81	78.5	49	60	14.9	14.4	78	5.4	53	83	5.4	31.69		31.44		67	69	85	70	48
	5:00	9.4	21	82	22	82	105.7	44	61	20.0	14.4	67	6.7	50	75	6.5	28.44		27.45		52	74	81	65	37
	6:00	8.9	21	84	20	85	138.3	41	57	20.3	13.5	80	9.8	49	79	5.5	25.50		23.60		62	72	80	50	25
	7:00	8.2	20	85	20	86	145.6	43	59	20.2	12.8	87	9.5	51	84	4.6	23.71		22.93				80		20
	8:00	7.8	20	85	19	86	136.0	47	59	17.7	12.3	89	7.3	54	88	3.8	23.68		22.92				83		
	9:00	7.3	19	85	19	86	124.2	51	61	15.2	12.2	92	4.3	57	92	3.3	25.13		22.92				85		
	10:00	7.3	19	85	19	86	116.2	52	62	14.3	11.7	92	2.8	59	94	3.1	27.25		22.92						
	11:00	7.2	19	83	19	83	104.3	52	56	12.2	3.9	83	1.2	56	88	3.7	19.71		14.92						
	12:00	7.2	19	84	19	84	101.9	53	56	11.6	11.7	86	1.2	57	89	3.5	27.81		22.93						
	13:00	7.2	19	84	19	84	101.9	53	61	11.8	11.7	90	1.7	57	92	2.6	28.65		22.93						
	14:00	7.2	20	83	19	83	96.4	53	61	11.3	12.4	90	1.5	57	93	2.6	28.68		22.93						
	15:00	7.6	20	79	20	80	83.0	50	61	10.9	12.4	90	1.4	56	92	2.6	28.68		22.93						
	16:00	8.1	20	80	20	81	91.8	50	61	11.4	12.4	90	1.9	55	92	2.8	25.42		22.93						
	17:00	8.2	20	81	20	81	100.3	49	61	12.9	13.0	90	2.3	54	93	2.9	23.80		22.93						
	18:00	8.2	20	83	20	83	108.8	50	61	14.2	13.0	90	2.6	57	93	2.9	22.15		22.93						
	19:00	8.2	20	84	20	85	117.3	51	62	15.1	13.0	90	3.5	59	93	3.0	22.09		22.93						
	20:00	7.7	20	81	20	82	127.1	44	68	17.5	13.0	89	4.1	53	91	3.0	22.09		22.93						
	21:00	7.7	19	84	19	84	123.3	48	71	17.4	13.0	89	4.2	56	90	3.6	22.09		22.93						
	22:00	7.3	19	88	19	89	113.9	54	70	14.9	13.0	90	3.1	59	92	3.9	22.71		23.56						
	23:00	7.4	20	87	20	87	87.9	57	63	11.5	12.3	90	2.3	60	93	3.9	27.98		28.58						
	0:00																								

Table

CITY OF WICHITA, KANSAS
PRESSURE RECORDER DATA SUMMARY

Date	Time	Pressure (psi)																				
		Maple & Arapaho N (psi)	Hoover & Oatville N (psi)	57th & Hydraulic N (psi)	Pawnee & Ellis N (psi)	Harry & Governeour N (psi)	Mt. Vernon & Windsor N (psi)	*Central & Main N (psi)*	*13th & Tyler N (psi)*	*Kellog & Webb N (psi)*	*Seneca & MacArthur N (psi)*	*34th & Webb N (psi)*	*EPZ Harry & Gov N (psi)*	*HPZ Harry & Gov N (psi)*	H#9344 127th St E & 21st N N (psi)	H#3498 1500 N Spring N (psi)	H#3492 Linden & Central N (psi)	H#5274 17th St & Homestead N (psi)	H#6580 Goebel & Central N (psi)	H#9866 Wassel & Rock N (psi)	H#9495 Quail & Mountain N (psi)	H#10632 Flint Hills & Prairie Point N (psi)
07/11/2003	0:00							93	70	74	98	70	90	78	70	47	70	43	69	67	77	90
	1:00							93	70	67	99	69	83	79	68	47	71	43	68	65	76	89
	2:00							92	70	62	99	69	78	78	57	47	70	44	57	55	65	79
	3:00							92	69	60	99	67	76	77	56	46	69	43	55	53	63	76
	4:00							92	66	59	97	66	74	74	53	43	66	42	50	46	56	69
	5:00							93	62	62	96	62	76	72	71	40	62	41	62	54	62	77
	6:00							91	53	57	91	65	70	67	69	36	57	41	56	45	53	68
	7:00							93	56	61	92	69	74	71	71	38	60	41	59	49	58	72
	8:00							95	62	64	95	71	79	74	72	42	64	41	63	55	64	75
	9:00							96	67	65	97	70	80	77	66	46	69	42	61	55	65	76
	10:00	85						95	68	61	96	69	76	77	68	46	69	42	64	59	70	80
	11:00	82	80	105				95	69	56	97	69	71	78	53	45	68	40	50	42	57	68
	12:00	81	80	105	98	78	80	93	68	54	95	69	69	76	54	46	69	40	51	44	56	68
	13:00	78	79	105	87	75	78	91	66	53	93	69	69	74	51	43	66	37	48	43	55	66
	14:00	80	80	100	93	78	80	94	69	55	96	68	70	77	53	45	69	39	51	44	57	68
	15:00	80	84	100	95	78	82	91	66	54	93	66	69	74	52	43	67	37	50	44	56	67
	16:00	79	78	100	95	75	80	91	65	54	92	66	69	74	53	44	68	41	51	43	57	68
	17:00	78	78	100	95	75	80	91	64	53	91	65	68	73	52	43	67	40	50	43	55	67
	18:00	77	76	100	95	75	78	90	62	56	89	65	70	72	51	41	65	39	48	41	53	65
	19:00	75	74	99	95	75	78	91	61	60	89	63	73	72	64	43	67	40	58	47	61	73
	20:00	74	72	98	95	75	77	91	60	57	87	62	70	72	62	41	65	40	56	45	59	71
	21:00	75	72	100	95	75	78	93	64	60	92	62	74	74	63	44	67	41	56	46	60	72
	22:00	84	71	107	95	80	82	101	75	68	103	65	81	83	71	50	73	45	65	53	69	82
	23:00	80	95	117	95	90	92	95	71	65	99	65	79	78	63	45	69	37	59	48	65	74
07/12/2003	0:00	83	84	110	95	80	84	95	72	66	101	54	80	80	65	48	72	43	61	52	68	77
	1:00	84	86	110	95	80	82	95	72	65	101	52	80	79	72	54	78	49	70	64	77	86
	2:00	80	80	105	95	78	82	91	68	58	97	48	74	75	54	43	66	40	53	50	61	72
	3:00	79	80	105	95	78	82	92	69	58	98	55	74	74	54	42	65	40	53	50	60	72
	4:00	80	80	100	95	78	82	91	66	66	96	56	81	72	70	42	64	42	67	63	73	86
	5:00	82	80	103	95	78	80	93	65	54	98	49	69	72	58	36	58	38	52	46	55	69
	6:00	79	80	107	95	75	78	94	62	50	97	47	65	72	54	40	62	41	46	38	48	62
	7:00	78	79	105	95	75	76	93	60	56	94	53	70	72	59	41	63	41	52	45	56	69
	8:00	76	75	100	95	75	74	92	59	60	91	60	74	71	62	40	63	40	54	48	58	71
	9:00	78	74	100	95	73	76	91	59	69	90	65	83	71	72	41	63	40	66	60	71	84
	10:00	78	77	100	95	75	76	91	59	70	88	67	84	71	72	41	64	39	66	60	71	84
	11:00	82	78	100	95	73	76	95	64	70	93	68	85	75	72	45	68	41	67	61	72	86
	12:00	82	80	105	95	78	80	95	65	70	93	68	84	76	71	45	68	41	66	59	70	80
	13:00	80	82	105	95	78	80	93	64	70	93	69	85	75	71	45	68	41	67	61	71	81
	14:00	81	82	105	95	75	80	94	66	70	94	69	84	76	71	45	68	41	67	60	71	80
	15:00	82	84	105	95	80	82	95	67	56	95	67	71	76	56	46	70	44	51	43	56	67
	16:00	80	84	105	95	78	82	93	65	53	93	65	67	75	53	44	67	40	50	43	55	66
	17:00	80	82	100	95	78	80	93	65	53	93	66	67	75	53	44	68	41	50	43	54	66
	18:00	81	82	100	95	78	80	94	66	53	94	67	67	76	54	45	69	42	50	42	54	65
	19:00	81	82	100	95	78	80	93	64	51	92	65	66	74	53	45	68	42	49	42	53	64
	20:00	80	80	100	95	80	81	94	65	51	93	66	65	76	53	45	68	42	48	42	53	64
	21:00	80	81	100	95	78	80	93	66	51	94	66	66	76	55	47	70	42	51	45	57	68
	22:00	82	84	105	95	80	80	95	69	55	98	67	70	78	56	48	71	43	53	46	60	71
	23:00	84	88	105	95	80	84	94	70	57	98	68	72	78	56	47	70	42	53	47	61	72

Table

CITY OF WICHITA, KANSAS
PRESSURE RECORDER DATA SUMMARY

Date	Time	Pressure (psi)																					
		Maple & Arapaho N (psi)	Hoover & Oatville N (psi)	57th & Hydraulic N (psi)	Pawnee & Ellis N (psi)	Harry & Governeour N (psi)	Mt. Vernon & Windsor N (psi)	*Central & Main N (psi)*	*13th & Tyler N (psi)*	*Kellog & Webb N (psi)*	*Seneca & MacArthur N (psi)*	*34th & Webb N (psi)*	*EPZ Harry & Gov N (psi)*	*HPZ Harry & Gov N (psi)*	H#9344 127th St E & 21st N N (psi)	H#3498 1500 N Spring N (psi)	H#3492 Linden & Central N (psi)	H#5274 17th St & Homestead N (psi)	H#6580 Goebel & Central N (psi)	H#9866 Wassel & Rock N (psi)	H#9495 Quail & Mountaln N (psi)	H#10632 Flint Hills & Prairie Point N (psi)
07/13/2003	0:00	84	86	105	95	80	83	93	70	57	98	67	72	77	56	45	68	42	54	47	62	74
	1:00	84	86	105	95	77	82	94	71	58	99	66	74	77	56	46	69	43	55	48	62	75
	2:00	84	88	110	95	80	82	94	71	58	100	65	74	77	56	45	68	42	54	47	61	74
	3:00	84	88	110	95	79	82	94	71	57	100	68	72	77	50	41	63	35	47	42	53	66
	4:00	81	86	105	95	80	82	92	67	51	97	67	66	74	49	39	61	37	44	39	48	62
	5:00	80	84	105	95	75	80	92	63	47	96	65	62	72	70	38	60	37	58	44	56	70
	6:00	79	82	103	95	75	78	92	60	57	95	64	69	70	71	39	61	39	60	47	61	74
	7:00	78	80	103	95	73	75	91	58	60	93	67	73	70	71	39	62	41	61	48	61	74
	8:00	78	78	100	95	72	74	94	60	61	93	70	73	71	71	41	64	42	63	49	65	77
	9:00	82	81	103	95	75	77	92	60	63	90	70	75	70	68	40	63	39	61	48	63	76
	10:00	78	72	92	90	72	77	90	59	63	88	69	76	69	72	44	67	43	65	52	69	81
	11:00	78	78	92	90	70	74	94	64	65	92	69	78	73	69	42	66	40	61	48	64	73
	12:00	80	74	95	95	75	76	92	63	63	90	69	76	72	70	43	66	40	63	50	65	74
	13:00	80	78	95	95	75	76	91	64	64	91	69	76	72	70	43	66	40	63	50	66	75
	14:00	80	78	95	95	73	77	92	64	64	92	69	77	73	71	43	66	40	64	51	66	76
	15:00	80	78	97	95	75	77	92	65	65	92	69	78	73	71	43	67	40	64	50	66	76
	16:00	80	78	98	95	75	78	92	65	65	92	69	78	74	70	42	66	40	63	50	66	75
	17:00	80	78	98	95	75	78	92	64	64	91	69	77	73	57	40	64	36	52	40	54	64
	18:00	80	72	95	95	73	76	92	63	56	90	56	70	72	59	42	66	38	51	42	53	64
	19:00	80	78	95	95	73	77	93	61	53	87	50	66	72	56	41	64	38	47	38	47	60
	20:00	82	70	90	95	70	76	93	58	49	86	50	62	71	56	42	65	38	48	39	49	61
	21:00	82	72	90	95	70	76	94	62	52	91	62	66	73	65	46	69	41	59	48	62	72
	22:00	82	80	100	95	75	80	94	68	61	96	64	75	76	70	48	71	41	65	54	71	80
	23:00	83	84	103	95	75	81	95	72	65	100	67	79	79	55	47	71	40	53	45	60	71
07/14/2003	0:00	84	83	107	95	80	85	94	71	58	100	67	73	78	55	46	69	40	53	46	60	71
	1:00	84	83	105	95	78	80	93	71	57	99	65	73	77	55	45	68	40	53	47	61	73
	2:00	84	83	105	95	78	81	*92*	*69*	*55*	*98*	*63*	*70*	*75*	53	43	66	39	51	46	58	71
	3:00	84	82	105	95	78	81	92	69	55	98	63	70	75	50	40	62	39	45	39	49	63
	4:00	81	80	105	95	75	80	92	66	48	96	62	63	71	52	35	56	36	42	34	42	57
	5:00	79	76	105	95	72	76	91	59	45	93	58	59	67	62	32	53	38	45	31	38	53
	6:00	76	70	100	95	72	74	93	52	46	90	58	58	64	65	32	53	38	50	37	46	60
	7:00	76	72	95	95	65	70	93	54	52	89	62	64	64	71	35	56	38	58	44	56	70
	8:00	77	75	95	95	65	70	94	59	58	90	67	70	67	71	38	61	39	62	48	63	77
	9:00	80	82	95	95	70	73	94	64	63	92	71	76	70	71	44	67	41	64	51	68	79
	10:00	82	86	100	95	73	77	95	67	60	93	70	73	73	57	41	64	39	52	44	57	67
	11:00	82	86	100	95	75	78	92	65	54	91	69	68	71	56	42	66	39	52	45	55	67
	12:00	81	80	100	95	75	78	92	67	55	92	69	70	72	57	43	66	40	53	45	55	67
	13:00	81	82	100	95	75	78	93	68	56	92	69	70	73	60	44	68	39	56	47	61	71
	14:00	81	82	100	95	75	80	93	69	59	94	70	73	74	60	44	67	40	56	47	60	71
	15:00	82	84	105	95	75	81	94	69	59	94	69	73	75	59	44	68	40	56	47	61	71
	16:00	83	86	100	95	75	80	93	68	59	92	69	73	74	57	43	67	39	53	45	58	68
	17:00	82	84	100	95	75	80	93	66	56	90	69	70	73	55	42	65	40	50	42	53	64
	18:00	80	81	98	95	75	79	93	63	52	87	68	66	71	51	39	61	39	45	37	47	59
	19:00	76	76	95	95	75	76	91	58	49	82	65	63	68	60	38	60	40	49	37	47	60
	20:00	74	72	90	95	70	76	92	54	48	79	66	60	66	61	39	61	40	50	38	47	60
	21:00	72	71	90	95	68	72	93	57	52	84	66	64	69	64	42	65	40	56	45	58	69
	22:00	79	83	100	95	73	77	93	65	59	93	67	73	74	59	45	69	38	55	46	60	71
	23:00	81	87	105	95	80	81	93	69	60	97	69	74	77	55	47	70	41	53	46	60	71

Table

CITY OF WICHITA, KANSAS
PRESSURE RECORDER DATA SUMMARY

Date	Time	Pressure (psi)																				
		Maple & Arapaho N (psi)	Hoover & Oatville N (psi)	57th & Hydraulic N (psi)	Pawnee & Ellis N (psi)	Harry & Governeour N (psi)	Mt. Vernon & Windsor N (psi)	*Central & Main N (psi)*	*13th & Tyler N (psi)*	*Kellog & Webb N (psi)*	*Seneca & MacArthur N (psi)*	*34th & Webb N (psi)*	*EPZ Harry & Gov N (psi)*	*HPZ Harry & Gov N (psi)*	H#9344 127th St E & 21st N N (psi)	H#3498 1500 N Spring N (psi)	H#3492 Linden & Central N (psi)	H#5274 17th St & Homestead N (psi)	H#6580 Goebel & Central N (psi)	H#9866 Wassel & Rock N (psi)	H#9495 Quail & Mountain N (psi)	H#10632 Flint Hills & Prairie Point N (psi)
07/15/2003	0:00	83	89	107	95	77	85	93	70	57	98	65	72	77	55	45	68	39	53	48	61	71
	1:00	83	89	108	95	76	84	93	70	57	99	65	73	76	54	43	66	40	52	46	60	70
	2:00	82	87	105	95	77	82	92	70	56	98	63	72	75	54	43	65	41	51	45	58	69
	3:00	84	89	107	95	77	84	93	70	55	99	64	70	75	56	42	64	39	52	45	57	70
	4:00	84	89	108	95	77	82	94	69	58	99	62	72	74	59	37	58	35	50	41	50	64
	5:00	78	84	103	95	70	80	92	61	49	93	56	63	69	53	34	55	38	40	29	38	51
	6:00	78	80	100	95	70	77	94	55	41	91	62	54	66	56	33	54	39	42	32	41	55
	7:00	76	77	95	95	68	72	96	55	49	90	67	61	65	73	36	57	40	60	46	56	71
	8:00	78	79	98	95	68	72	95	59	59	90	68	71	67	67	38	60	39	58	46	60	72
	9:00	86	78	100	95	70	74	94	62	60	90	69	73	69	70	40	63	39	62	49	66	78
	10:00	83	78	93	95	75	74	94	65	58	91	70	72	71	53	43	65	39	48	41	53	64
	11:00	88	82	95	105	75	76	94	66	52	92	70	67	73	53	42	66	38	49	43	54	66
	12:00	86	80	95	105	75	78	93	66	53	93	70	67	73	54	45	68	39	50	44	56	67
	13:00	89	82	95	105	75	80	94	69	54	94	70	69	75	55	46	69	40	52	45	58	68
	14:00	90	82	100	105	80	82	95	71	56	96	73	71	77	57	48	71	42	54	46	60	70
	15:00	91	84	100	105	80	84	97	73	57	98	72	72	79	57	48	71	43	54	46	60	70
	16:00	92	88	100	108	83	85	97	72	57	97	73	72	78	55	45	68	42	52	44	57	67
	17:00	91	83	96	108	80	82	94	67	53	92	70	68	74	52	41	64	41	47	40	50	61
	18:00	86	78	90	108	75	78	93	63	51	88	68	65	71	57	41	64	42	49	40	49	62
	19:00	84	76	90	108	75	77	94	60	49	84	65	62	70	64	40	63	42	50	38	47	59
	20:00	82	70	90	108	70	74	94	57	47	82	68	60	68	65	41	64	42	52	40	49	61
	21:00	82	72	87	108	70	74	94	60	53	87	69	66	71	69	44	67	42	60	48	61	71
	22:00	84	80	95	108	70	78	93	67	58	94	67	72	74	65	47	70	43	59	49	64	74
	23:00	88	86	100	105	78	82	94	70	59	98	67	73	77	55	46	69	43	53	47	59	70
07/16/2003	0:00	89	88	100	105	78	82	92	69	56	97	66	71	76	55	45	68	42	53	50	60	71
	1:00	87	84	100	105	75	80	93	70	58	98	66	74	76	56	44	67	43	53	50	60	72
	2:00	88	84	102	105	75	81	93	71	58	99	65	74	76	54	43	65	41	51	47	57	68
	3:00	89	84	102	105	75	81	93	70	55	99	64	70	74	55	40	62	37	49	42	51	64
	4:00	89	84	100	105	75	80	94	67	56	98	66	70	72	68	35	55	40	53	42	48	64
	5:00	85	78	97	105	72	75	94	60	50	94	62	64	67	62	32	52	40	44	30	36	51
	6:00	82	74	94	105	68	74	95	52	44	90	58	56	63	65	33	53	40	47	33	38	54
	7:00	82	74	94	105	65	70	96	54	48	90	63	60	64	72	38	59	43	56	44	51	66
	8:00	80	80	100	105	70	73	98	61	59	92	69	71	69	69	42	65	44	59	49	58	73
	9:00	84	82	100	105	75	75	96	64	62	92	69	75	71	69	42	64	40	60	47	62	75
	10:00	82	80	95	100	75	76	93	65	59	90	70	72	71	64	40	63	38	54	43	50	62
	11:00	80	78	95	98	70	73	89	64	56	89	70	70	70	67	43	67	41	58	47	55	69
	12:00	82	79	95	95	70	75	90	64	57	90	70	71	71	68	41	65	38	60	48	62	73
	13:00	82	79	95	95	75	75	90	65	60	90	70	74	71	62	41	64	37	58	48	62	72
	14:00	80	79	95	95	75	76	90	65	60	91	69	74	72	68	42	66	37	62	49	66	74
	15:00	80	79	100	95	75	76	90	65	63	91	69	76	72	59	41	65	37	55	46	60	70
	16:00	80	80	95	95	75	77	90	64	58	90	68	72	72	59	42	66	38	54	46	59	69
	17:00	80	78	95	95	75	75	91	64	57	88	68	70	71	58	41	65	39	52	42	54	65
	18:00	80	78	95	95	75	75	93	63	54	87	68	67	71	60	40	63	38	51	40	51	63
	19:00	79	74	90	95	75	74	93	59	51	84	65	64	69	63	39	61	39	51	39	49	61
	20:00	76	70	85	95	75	72	92	55	50	80	64	62	67	64	40	62	39	51	40	50	62
	21:00	76	68	90	95	80	71	94	59	54	86	64	66	70	69	45	68	41	60	47	61	71
	22:00	82	80	100	95	80	78	95	68	63	96	67	76	76	73	46	70	42	68	54	72	81
	23:00	84	84	102	95	80	80	94	71	67	99	69	81	78	68	50	73	44	65	62	72	82

Table

CITY OF WICHITA, KANSAS
PRESSURE RECORDER DATA SUMMARY

Date	Time	Pressure (psi)																				
		Maple & Arapaho N (psi)	Hoover & Oatville N (psi)	57th & Hydraulic N (psi)	Pawnee & Ellis N (psi)	Harry & Governeour N (psi)	Mt. Vernon & Windsor N (psi)	*Central & Main N (psi)*	*13th & Tyler N (psi)*	*Kellog & Webb N (psi)*	*Seneca & MacArthur N (psi)*	*34th & Webb N (psi)*	*EPZ Harry & Gov N (psi)*	*HPZ Harry & Gov N (psi)*	H#9344 127th St E & 21st N N (psi)	H#3498 1500 N Spring N (psi)	H#3492 Linden & Central N (psi)	H#5274 17th St & Homestead N (psi)	H#6580 Goebel & Central N (psi)	H#9866 Wassel & Rock N (psi)	H#9495 Quail & Mountain N (psi)	H#10632 Flint Hills & Prairie Point N (psi)
07/17/2003	0:00	86	86	105	95	80	83	94	72	68	100	66	84	78	65	45	69	43	63	61	71	81
	1:00	85	85	105	95	80	81	93	70	68	98	66	84	77	63	45	68	39	61	57	68	79
	2:00	85	85	100	95	80	82	93	70	67	99	64	83	76	65	45	67	39	63	60	70	83
	3:00	86	87	105	95	80	82	95	72	66	101	61	82	77	62	42	64	37	58	53	64	77
	4:00	86	85	105	95	80	82	94	69	58	99	52	73	74	59	40	61	38	50	43	50	65
	5:00	84	84	105	95	75	79	96	64	48	98	55	63	72	66	36	57	40	50	36	44	59
	6:00	80	77	100	95	75	77	95	54	49	92	59	61	67	68	35	56	41	52	39	45	61
	7:00	77	75	95	95	70	70	97	56	53	91	63	65	67	76	38	59	44	61	46	58	72
	8:00	79	80	95	95	70	72	95	59	61	91	68	73	68	71	39	61	41	62	48	63	77
	9:00	79	78	95	98	75	75	94	62	64	91	68	76	70	73	42	65	42	63	51	65	79
	10:00	81	79	95	98	75	76	94	66	64	92	70	77	72	74	44	68	44	65	50	66	76
	11:00	84	80	97	98	75	78	94	67	65	92	72	78	73	70	43	66	41	63	51	65	75
	12:00	82	80	97	95	75	79	93	67	65	92	72	78	73	71	43	66	41	64	51	66	76
	13:00	82	81	97	95	75	80	93	68	60	92	71	73	73	54	44	68	42	50	45	55	67
	14:00	82	82	100	95	75	80	93	68	53	93	69	68	74	54	44	67	42	50	44	54	66
	15:00	82	82	100	95	75	80	93	68	53	92	67	68	74	53	44	67	41	49	41	52	63
	16:00	82	80	95	95	75	79	93	67	52	92	66	67	73	52	43	66	41	48	41	51	63
	17:00	82	79	95	95	75	78	93	65	51	90	63	65	72	61	40	63	39	53	43	53	64
	18:00	80	78	90	95	75	77	92	63	53	87	59	66	70	67	40	62	36	56	43	53	66
	19:00	79	76	90	95	72	76	93	60	53	84	49	65	68	64	37	60	36	50	37	46	59
	20:00	76	72	85	95	70	75	93	55	48	79	62	60	66	62	38	60	36	48	34	43	56
	21:00	75	70	85	95	70	72	93	58	50	85	63	62	68	67	43	66	39	56	45	57	68
	22:00	81	80	100	95	75	78	94	67	59	94	66	72	74	70	47	70	44	64	52	68	78
	23:00	84	86	105	95	80	82	94	71	66	99	62	79	77	70	47	70	43	66	62	72	82
07/18/2003	0:00	84	87	105	95	80	83	94	71	67	99	57	83	77	65	45	69	43	62	59	69	79
	1:00	84	87	102	95	80	83	94	71	67	99	64	83	77	63	43	65	41	60	57	66	78
	2:00	82	84	100	95	80	83	92	69	64	97	67	80	74	58	39	61	38	54	50	59	71
	3:00	80	82	100	95	77	80	90	66	58	95	64	74	71	61	39	61	41	54	47	55	70
	4:00	80	82	100	95	75	78	91	64	54	95	57	68	70	62	34	54	39	48	37	42	58
	5:00	78	80	98	95	74	77	92	58	46	92	45	59	65	55	30	50	37	38	25	29	46
	6:00	74	73	95	95	70	70	93	49	38	87	55	50	61	57	31	52	37	40	27	32	48
	7:00	73	71	90	95	65	69	94	51	40	87	61	53	62	58	34	55	37	46	34	41	56
	8:00						69	94	56	46	89	66	59	65	60	38	60	41	50	41	47	64
	9:00							95	62	52	89	71	65	69	62	40	63	39	53	43	53	65
	10:00							95	64	55	91	71	68	71	56	40	63	38	49	41	52	64
	11:00							92	65	53	88	63	67	70	59	43	66	42	53	44	56	67
	12:00							93	67	54	92	66	68	73	62	43	66	39	55	45	57	68
	13:00							93	67	58	92	70	72	73	62	44	67	40	56	46	58	69
	14:00							93	67	59	92	70	73	73	61	40	63	36	57	46	61	70
	15:00							89	63	59	89	70	73	70	61	42	66	39	56	46	60	70
	16:00							90	64	59	89	70	72	71	61	39	63	36	54	43	56	67
	17:00							90	62	56	88	70	69	69	61	39	62	37	53	43	53	64
	18:00							92	63	54	88	70	67	70	61	41	65	41	52	42	52	63
	19:00							94	62	53	87	69	65	70	67	36	59	36	54	42	51	63
	20:00							89	55	53	80	67	65	65	70	37	59	37	56	42	52	64
	21:00							93	60	56	87	67	68	70	71	45	68	42	61	47	61	71
	22:00							98	72	62	99	70	74	78	65	46	69	43	59	49	62	73
	23:00							97	74	60	101	70	74	79	61	48	71	43	57	49	62	73
	0:00																					

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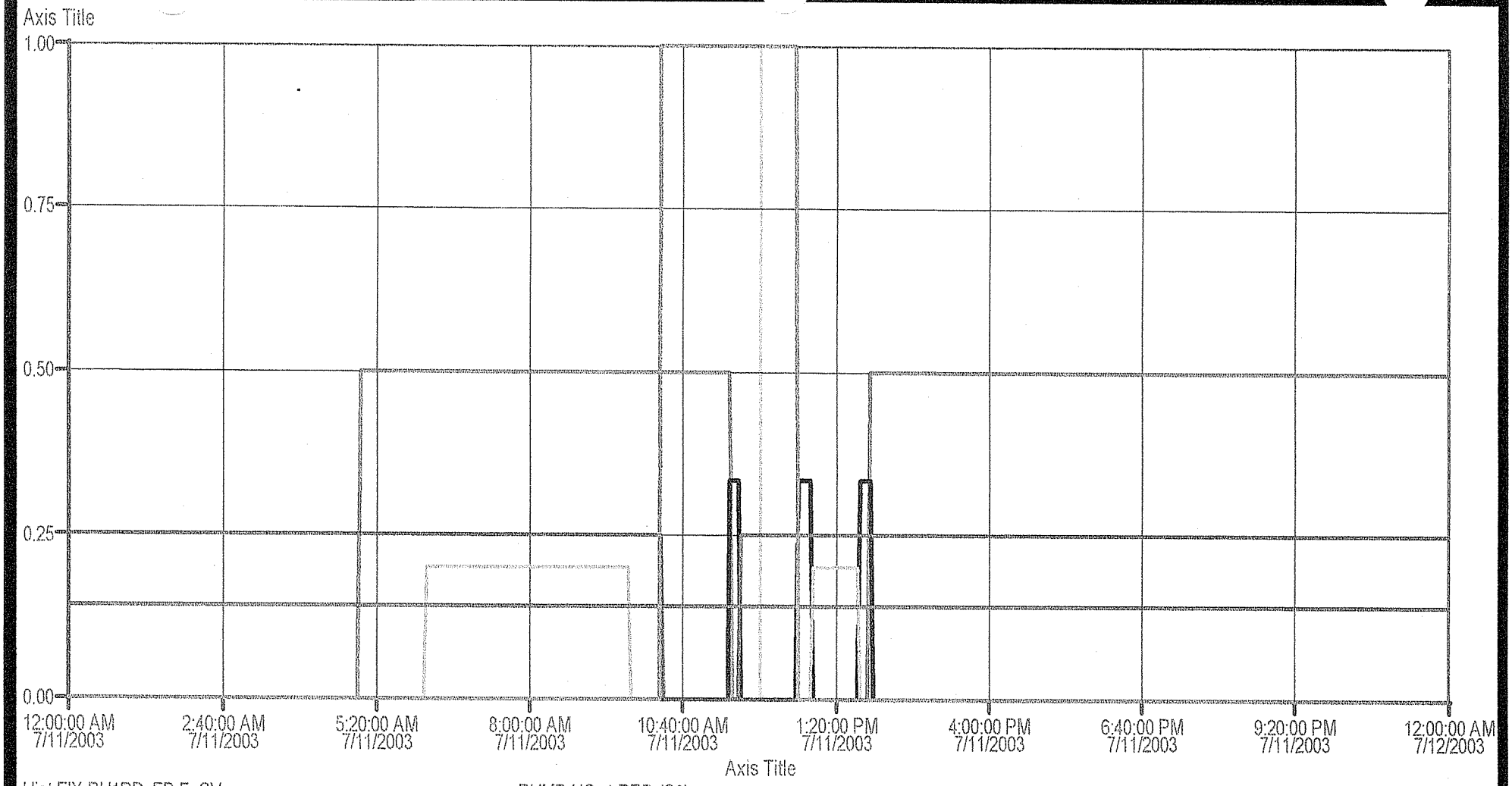
Water Master Plan information for Burns and Mc Item #7

SCADA Information: Continuously recorded distribution data.

1. Tanks: Woodlawn & Roosevelt
    a. Elevation
    b. Demand (MGD)
2. 37th St. Pump Station & Webb Rd. Booster (North East Zone)
    a. Hourly Max and Min; Rate (Flow), Suction (PSI), & Discharge (PSI).
    b. Pump Run Times
    c. Total Flow (MGD)
    d. Webb Rd. reservoir level, suction, and demand.
    e. Total flow
3. System Pressure Sites: Hourly Max and Min
    a. East Zone; Webb Rd. discharge, Harry & Governor, Kellogg & Webb
    b. North East Zone; 34th & Webb, Webb booster discharge, 37th St. P.S. discharge.
    c. Hess Zone; Central & Main, Seneca & Macarthur, 13th St. & Tyler, Harry & Governor, Hess North & South headers.
4. Webb Rd. East Zone
    a. Hourly Max and Min; Rate (Flow), Suction (PSI), & Discharge (PSI).
    b. Pump Run Times
    c. Total flow
    d. Discharge and suction pressure.
5. Hess P.S. Zone
    a. Hourly Max and Min; Rate (Flow), System Demand, Header suctions, Header discharge,
    b. Reservoir level
    c. Total Flow Demand
    d. Pump Run Times

Trends | Hess Zone Screens | Hess Zone



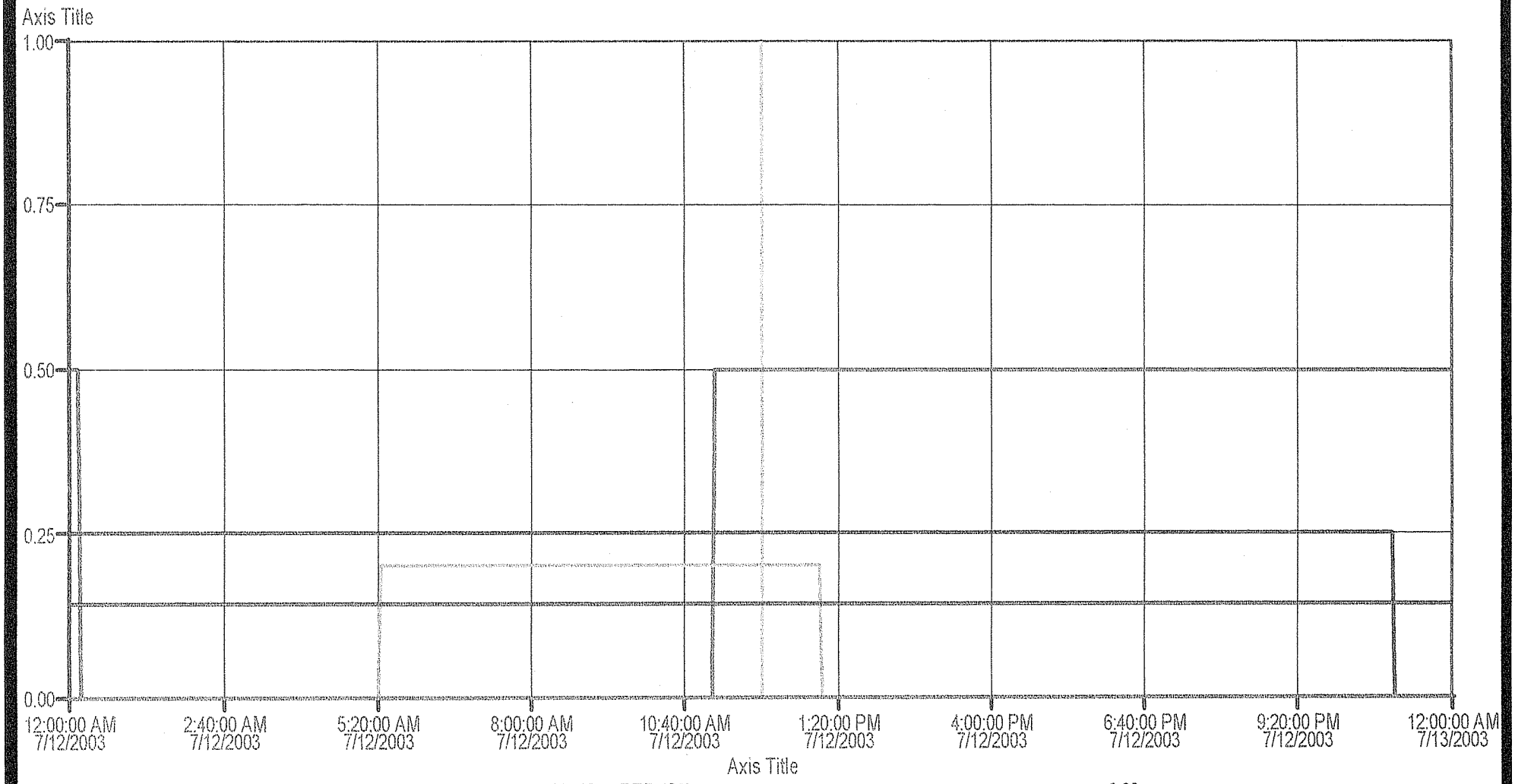
Hist.FIX.PH1RD_FB.F_CV	PUMP NO. 1 RED (S3)	1.00
Hist.FIX.PH2RD_FB.F_CV	PUMP NO. 2 RED (S6)	0.00
Hist.FIX.PH3RD_FB.F_CV	**PUMP NO. 3 RED (S9)**	**0.00**
Hist.FIX.PH4RD_FB.F_CV	PUMP NO. 4 RED (S12)	1.00
Hist.FIX.PH5RD_FB.F_CV	PUMP NO. 5 RED (S15)	0.00
Hist.FIX.PH6RD_FB.F_CV	PUMP NO. 6 RED (S18)	0.00
Hist.FIX.PH7RD_FB.F_CV	PUMP NO. 7 RED (S21)	1.00
Hist.FIX.PH8RD_FB.F_CV	PUMP NO. 8 RED (S24)	0.00

Enter New Date/Time | Enter New Time Span

HIGH = ON LOW = OFF

Trends | Hess Zone Screens

Hess Zone



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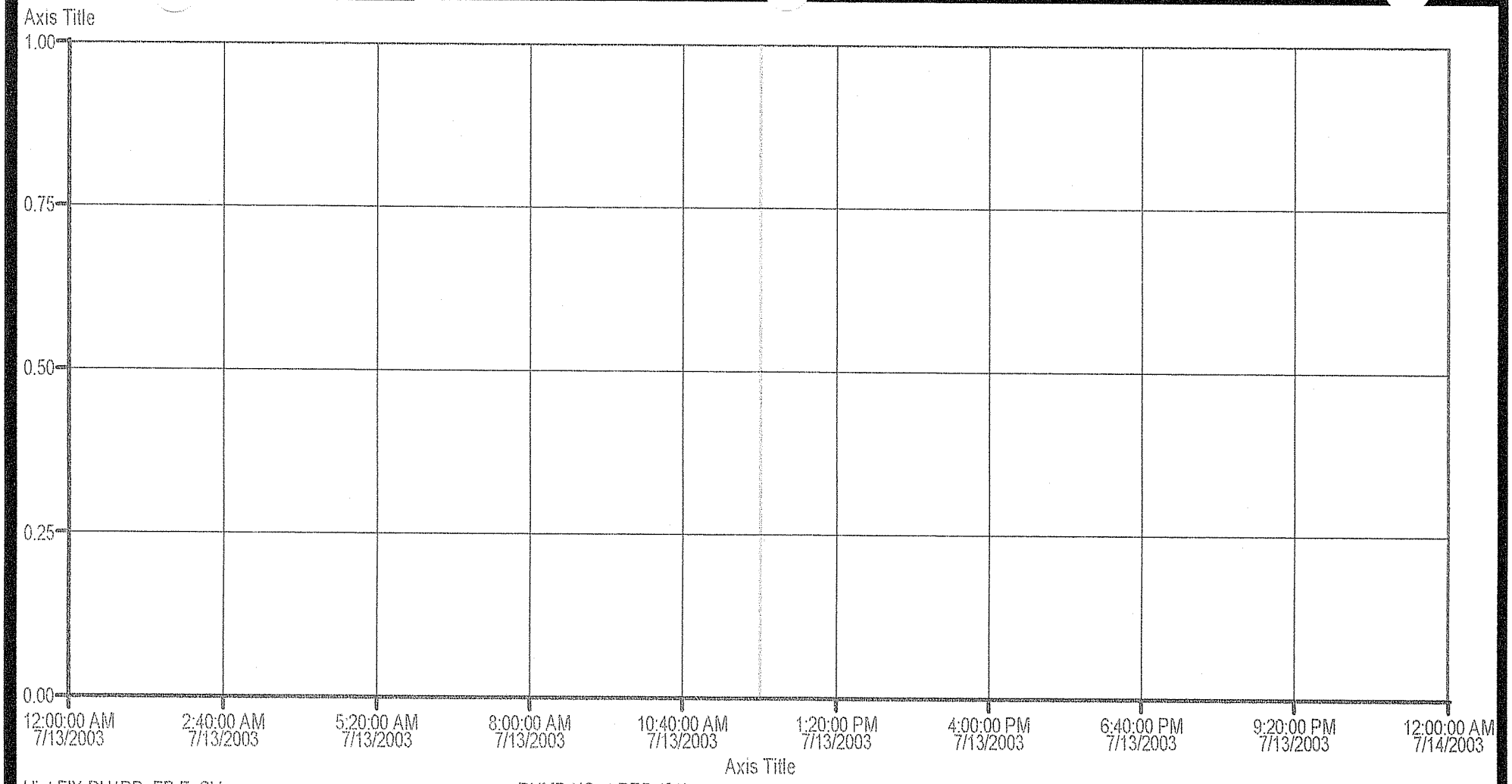
Hist.FIX.PH2RD_FB.F_CV	PUMP NO. 2 RED (S6)	1.00
Hist.FIX.PH3RD_FB.F_CV	**PUMP NO. 3 RED (S9)**	**0.00**
Hist.FIX.PH4RD_FB.F_CV	PUMP NO. 4 RED (S12)	1.00
Hist.FIX.PH5RD_FB.F_CV	PUMP NO. 5 RED (S15)	1.00
Hist.FIX.PH6RD_FB.F_CV	PUMP NO. 6 RED (S18)	0.00
Hist.FIX.PH7RD_FB.F_CV	PUMP NO. 7 RED (S21)	1.00
Hist.FIX.PH8RD_FB.F_CV	PUMP NO. 8 RED (S24)	0.00

Enter New Date/Time | Enter New Time Span

Trends | Hess Zone Screens | Hess Zone

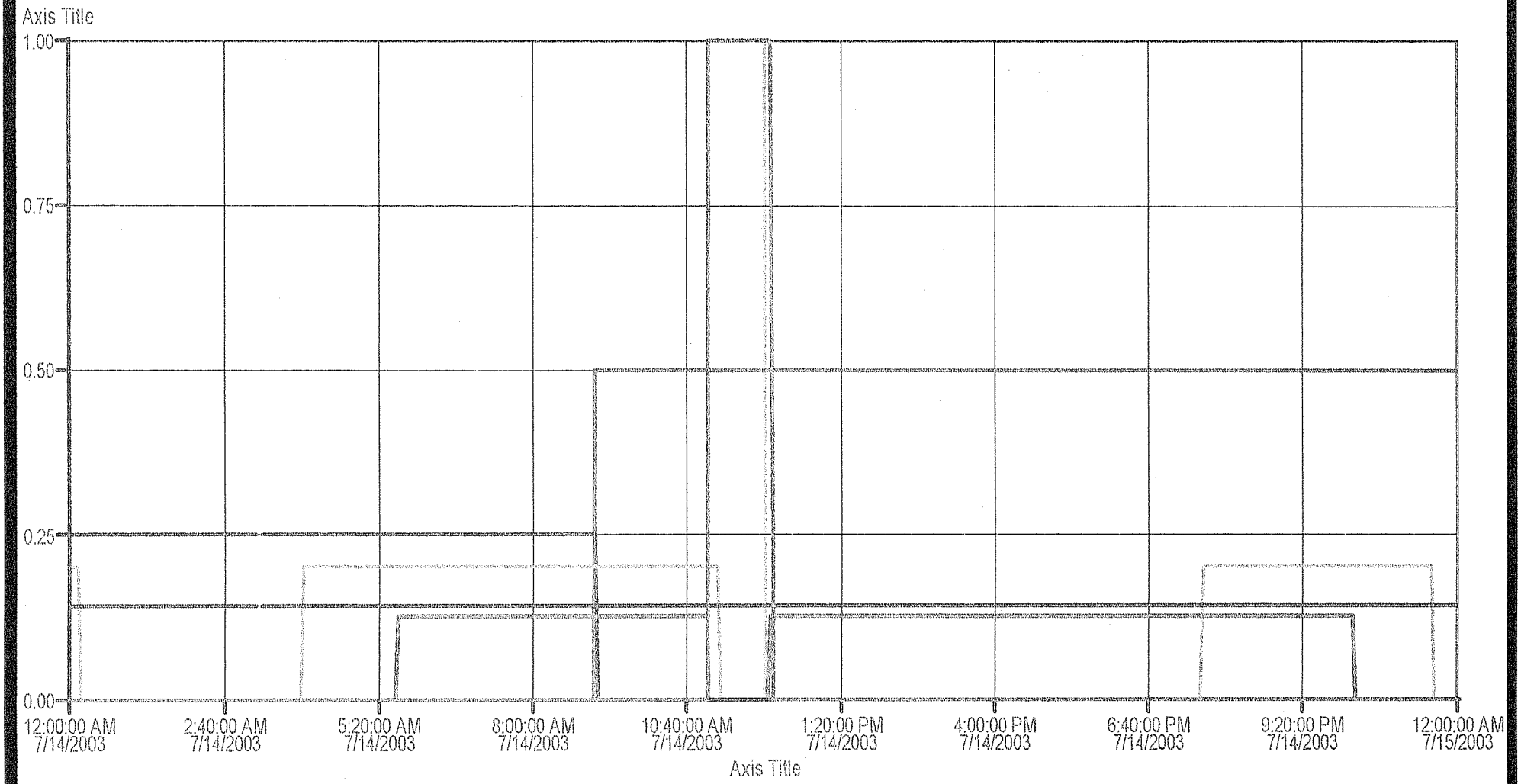


Hist.FIX.PH1RD_FB.F_CV	PUMP NO. 1 RED (S3)	0.00
Hist.FIX.PH2RD_FB.F_CV	PUMP NO. 2 RED (S6)	1.00
Hist.FIX.PH3RD_FB.F_CV	**PUMP NO. 3 RED (S9)**	**0.00**
Hist.FIX.PH4RD_FB.F_CV	PUMP NO. 4 RED (S12)	1.00
Hist.FIX.PH5RD_FB.F_CV	PUMP NO. 5 RED (S15)	1.00
Hist.FIX.PH6RD_FB.F_CV	PUMP NO. 6 RED (S18)	0.00
Hist.FIX.PH7RD_FB.F_CV	PUMP NO. 7 RED (S21)	1.00
Hist.FIX.PH8RD_FB.F_CV	PUMP NO. 8 RED (S24)	0.00

Enter New Date/Time | Enter New Time Span

Trends | Hess Zone Screens

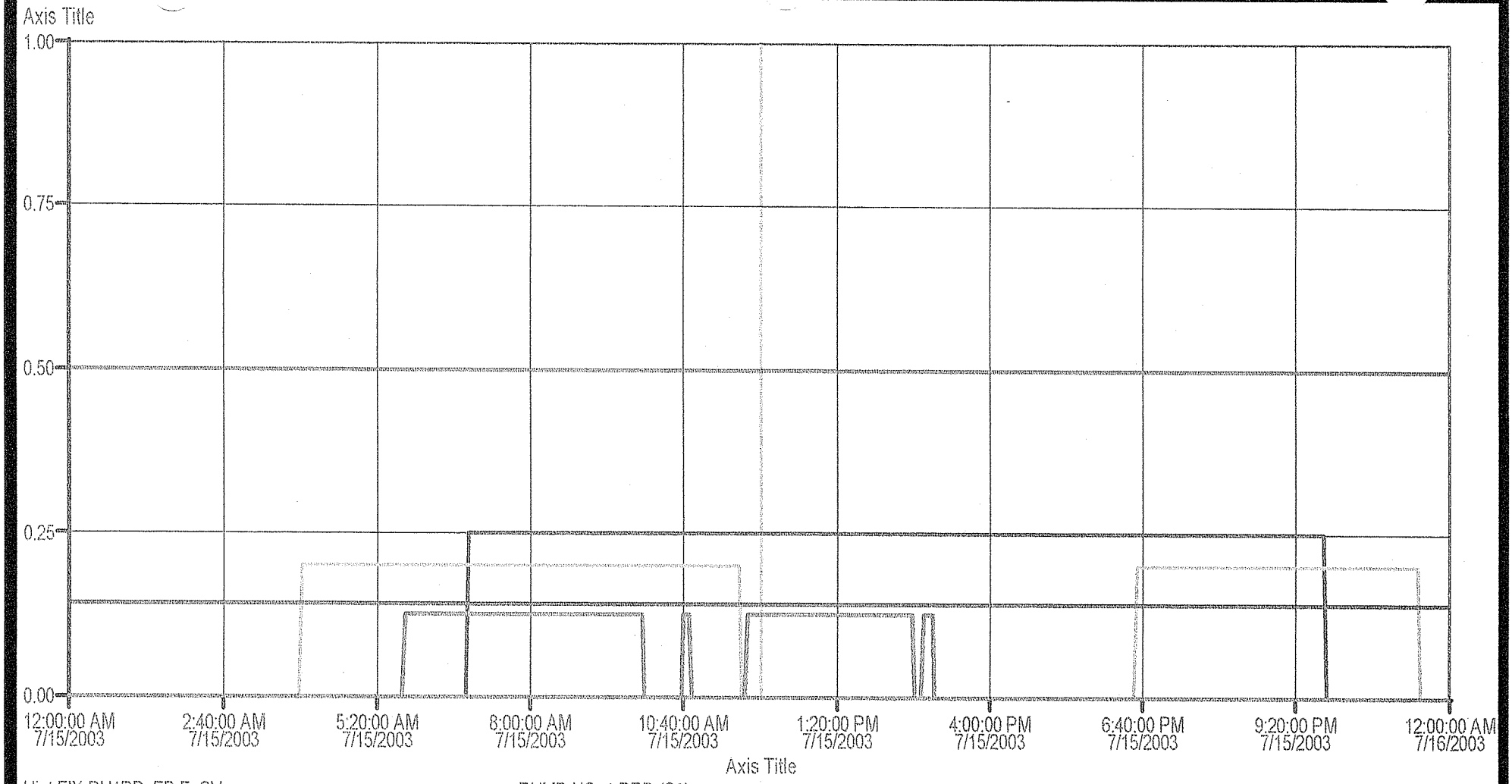
Hess Zone



Hist.FIX.PH1RD_FB.F_CV	PUMP NO. 1 RED (S3)	1.00
Hist.FIX.PH2RD_FB.F_CV	PUMP NO. 2 RED (S6)	1.00
Hist.FIX.PH3RD_FB.F_CV	**PUMP NO. 3 RED (S9)**	**0.00**
Hist.FIX.PH4RD_FB.F_CV	PUMP NO. 4 RED (S12)	0.00
Hist.FIX.PH5RD_FB.F_CV	PUMP NO. 5 RED (S15)	0.00
Hist.FIX.PH6RD_FB.F_CV	PUMP NO. 6 RED (S18)	0.00
Hist.FIX.PH7RD_FB.F_CV	PUMP NO. 7 RED (S21)	1.00
Hist.FIX.PH8RD_FB.F_CV	PUMP NO. 8 RED (S24)	0.00

Enter New Date/Time | Enter New Time Span

Trends | Hess Zone Screens | Hess Zone

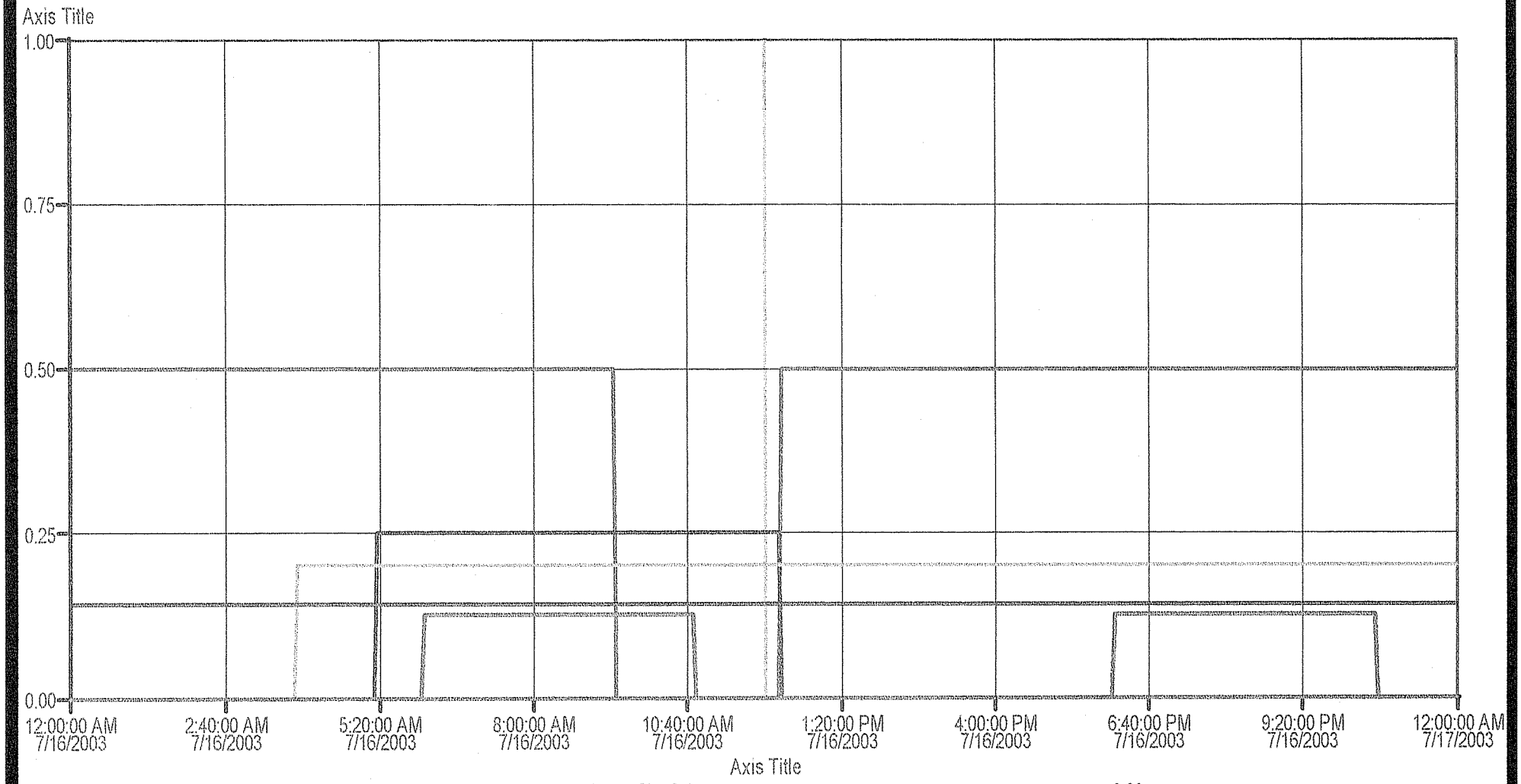


Hist.FIX.PH1RD_FB.F_CV	PUMP NO. 1 RED (S3)	0.00
Hist.FIX.PH2RD_FB.F_CV	PUMP NO. 2 RED (S6)	1.00
Hist.FIX.PH3RD_FB.F_CV	**PUMP NO. 3 RED (S9)**	**0.00**
Hist.FIX.PH4RD_FB.F_CV	PUMP NO. 4 RED (S12)	1.00
Hist.FIX.PH5RD_FB.F_CV	PUMP NO. 5 RED (S15)	0.00
Hist.FIX.PH6RD_FB.F_CV	PUMP NO. 6 RED (S18)	0.00
Hist.FIX.PH7RD_FB.F_CV	PUMP NO. 7 RED (S21)	1.00
Hist.FIX.PH8RD_FB.F_CV	PUMP NO. 8 RED (S24)	1.00

Enter New Date/Time | Enter New Time Span

Trends | Hess Zone Screens

Hess Zone



Hist.FIX.PH1RD_FB.F_CV	PUMP NO. 1 RED (S3)	0.00
Hist.FIX.PH2RD_FB.F_CV	PUMP NO. 2 RED (S6)	0.00
Hist.FIX.PH3RD_FB.F_CV	**PUMP NO. 3 RED (S9)**	**0.00**
Hist.FIX.PH4RD_FB.F_CV	PUMP NO. 4 RED (S12)	1.00
Hist.FIX.PH5RD_FB.F_CV	PUMP NO. 5 RED (S15)	1.00
Hist.FIX.PH6RD_FB.F_CV	PUMP NO. 6 RED (S18)	0.00
Hist.FIX.PH7RD_FB.F_CV	PUMP NO. 7 RED (S21)	1.00
Hist.FIX.PH8RD_FB.F_CV	PUMP NO. 8 RED (S24)	0.00

Enter New Date/Time | Enter New Time Span

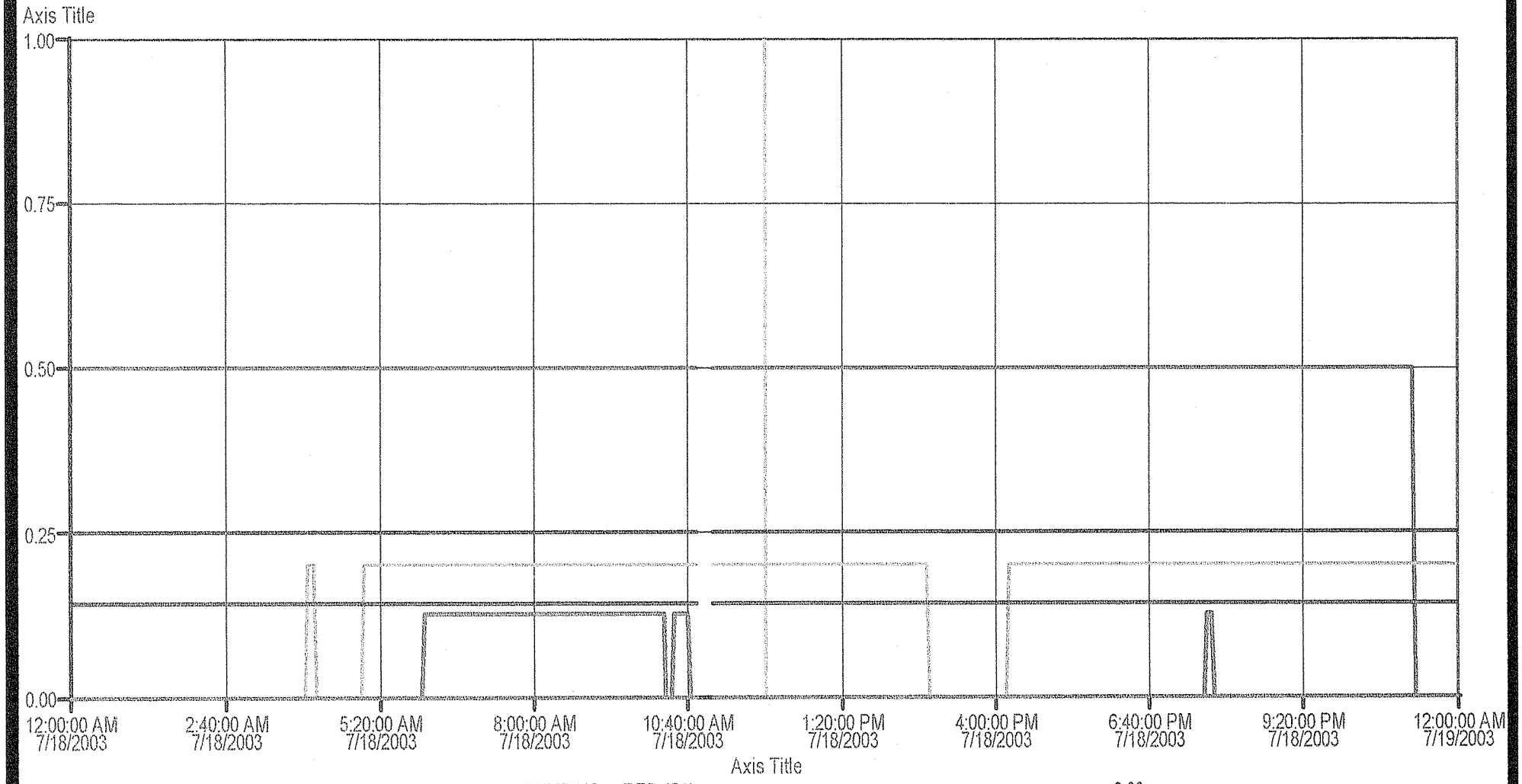
Trends | Hess Zone Screens | Hess Zone

Hist.FIX.PH1RD_FB.F_CV	PUMP NO. 1 RED (S3)	0.00
Hist.FIX.PH2RD_FB.F_CV	PUMP NO. 2 RED (S6)	1.00
Hist.FIX.PH3RD_FB.F_CV	**PUMP NO. 3 RED (S9)**	**0.00**
Hist.FIX.PH4RD_FB.F_CV	PUMP NO. 4 RED (S12)	0.00
Hist.FIX.PH5RD_FB.F_CV	PUMP NO. 5 RED (S15)	1.00
Hist.FIX.PH6RD_FB.F_CV	PUMP NO. 6 RED (S18)	0.00
Hist.FIX.PH7RD_FB.F_CV	PUMP NO. 7 RED (S21)	1.00
Hist.FIX.PH8RD_FB.F_CV	PUMP NO. 8 RED (S24)	0.00

◀◀ ◀ Enter New Date/Time Enter New Time Span ▶ ▶▶

Trends | Hess Zone Screens

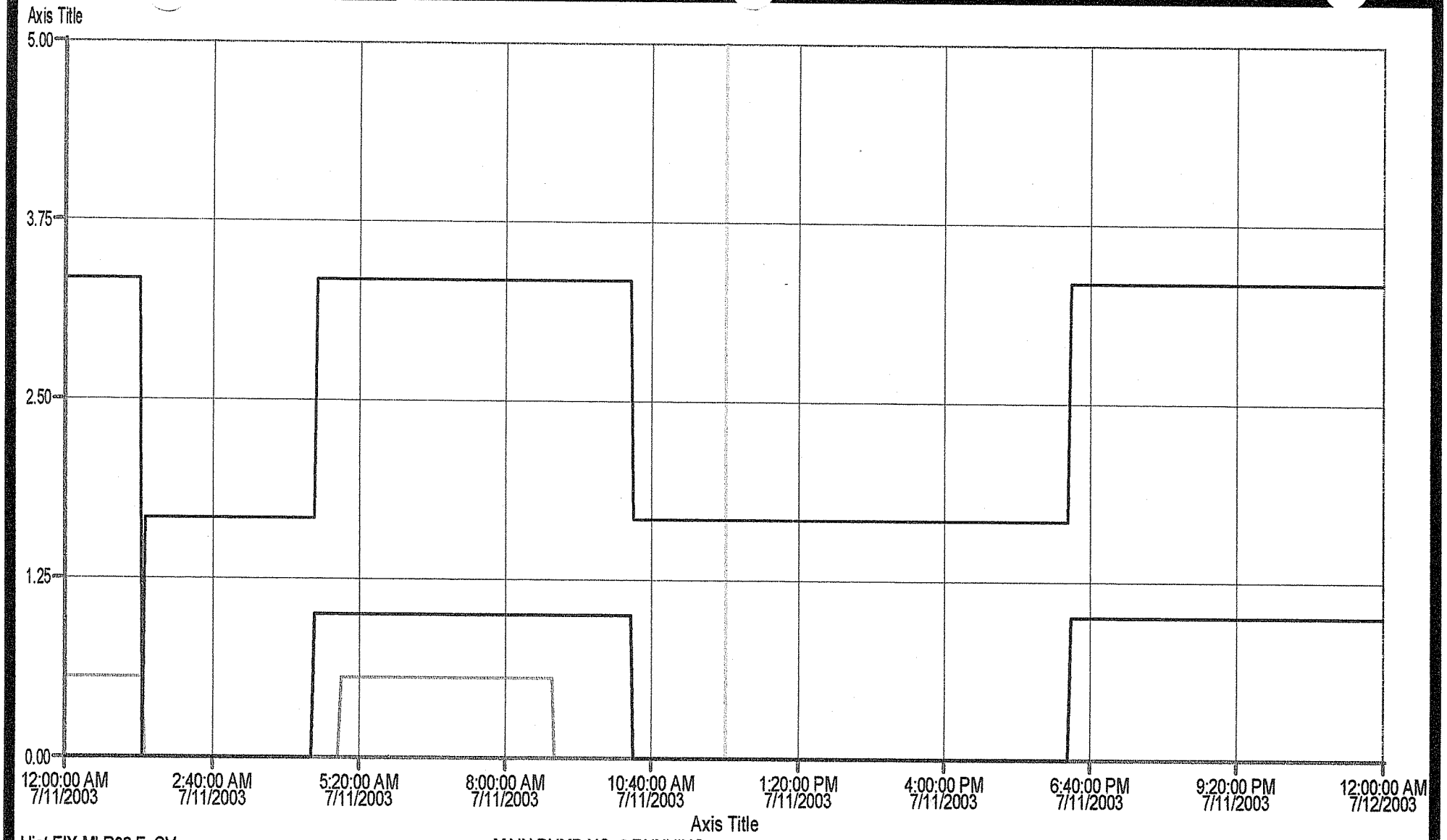
Hess Zone



Hist.FIX.PH1RD_FB.F_CV	PUMP NO. 1 RED (S3)	0.00
Hist.FIX.PH2RD_FB.F_CV	PUMP NO. 2 RED (S6)	1.00
Hist.FIX.PH3RD_FB.F_CV	**PUMP NO. 3 RED (S9)**	**0.00**
Hist.FIX.PH4RD_FB.F_CV	PUMP NO. 4 RED (S12)	1.00
Hist.FIX.PH5RD_FB.F_CV	PUMP NO. 5 RED (S15)	1.00
Hist.FIX.PH6RD_FB.F_CV	PUMP NO. 6 RED (S18)	0.00
Hist.FIX.PH7RD_FB.F_CV	PUMP NO. 7 RED (S21)	1.00
Hist.FIX.PH8RD_FB.F_CV	PUMP NO. 8 RED (S24)	0.00

◀◀ ◀ Enter New Date/Time Enter New Time Span ▶ ▶▶

Trends | East Zone Screens | Webb Road East Zone



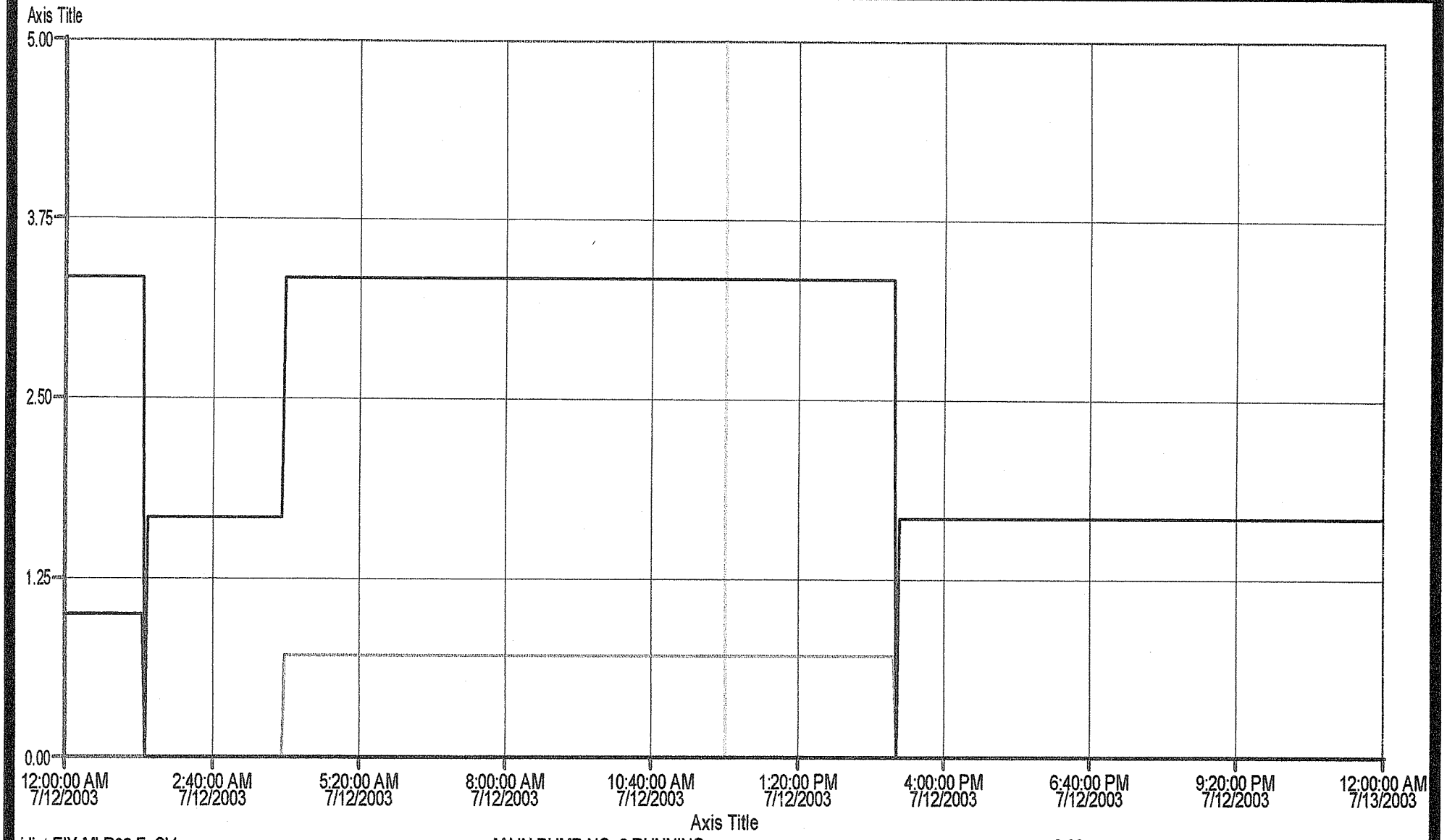
Hist.FIX.MLR02.F_CV	MAIN PUMP NO. 2 RUNNING	0.00
Hist.FIX.MLR03.F_CV	MAIN PUMP NO. 3 RUNNING	0.00
Hist.FIX.MLR04.F_CV	MAIN PUMP NO. 4 RUNNING	0.00
Hist.FIX.BFV52_VALVE_STATUS.F_CV	BFV52 WEBB RD BYPASS VALVE	1.00

Enter New Date/Time | Enter New Time Span

Pumps HIGH = ON ~~OPEN~~ LOW = OFF ~~CLOSED~~ BFV52 HIGH = CLOSED LOW = OPEN

Trends | East Zone Screens

Webb Road East Zone

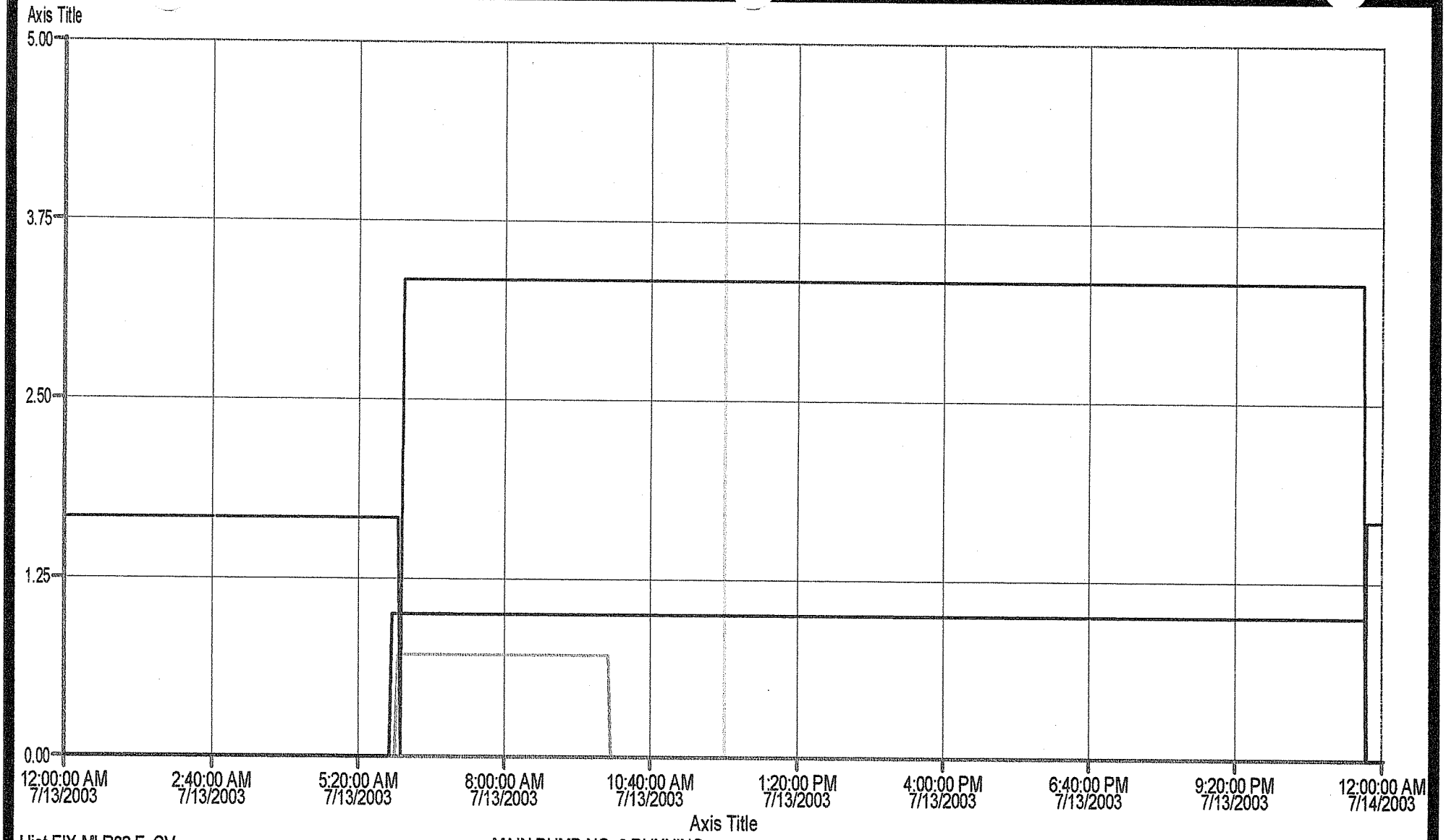


Hist.FIX.MLR02.F_CV	MAIN PUMP NO. 2 RUNNING	0.00
Hist.FIX.MLR03.F_CV	MAIN PUMP NO. 3 RUNNING	1.00
Hist.FIX.MLR04.F_CV	MAIN PUMP NO. 4 RUNNING	0.00
Hist.FIX.BFV52_VALVE_STATUS.F_CV	BFV52 WEBB RD BYPASS VALVE	2.00

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

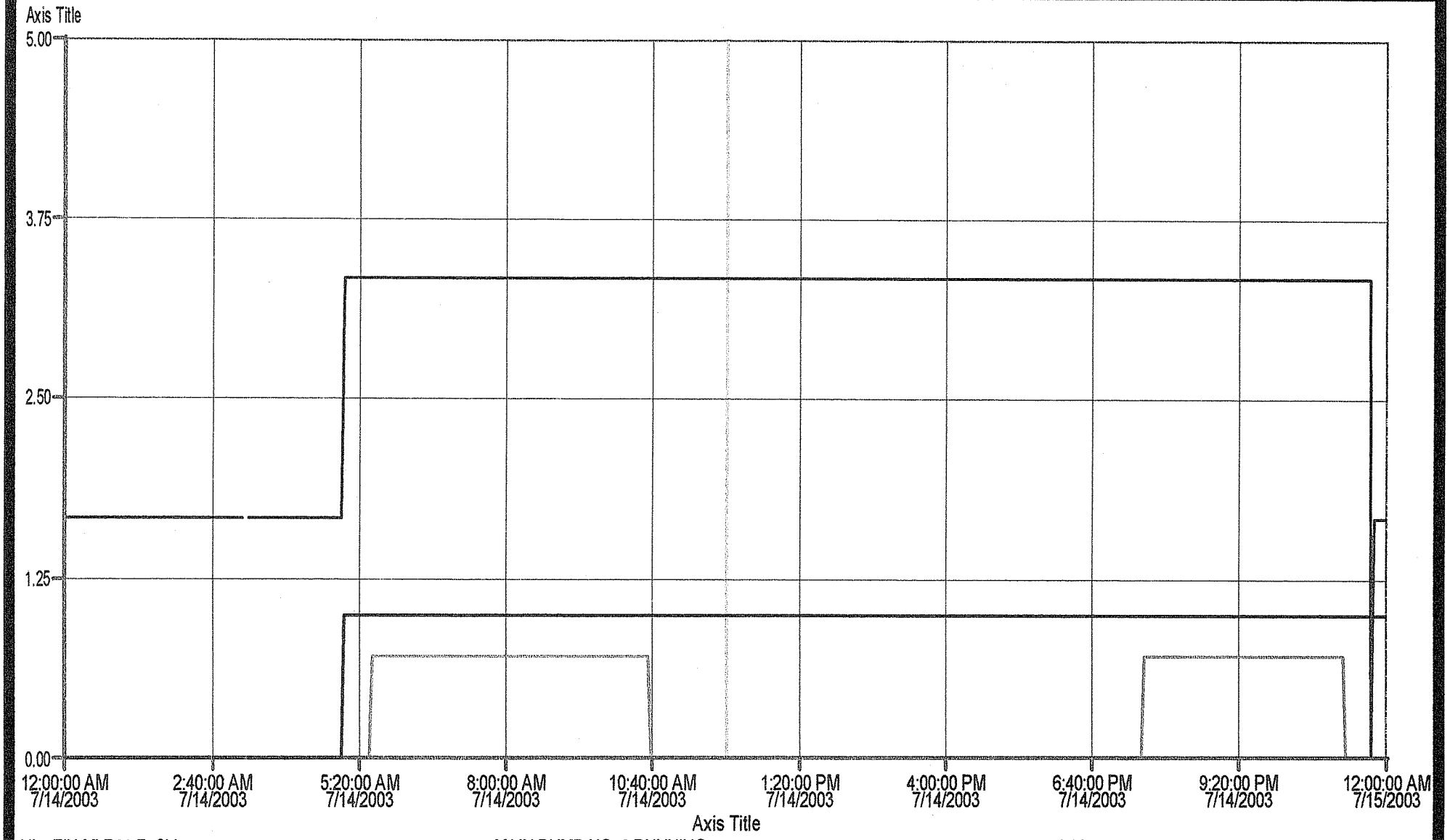


Hist.FIX.MLR02.F_CV	MAIN PUMP NO. 2 RUNNING	1.00
Hist.FIX.MLR03.F_CV	MAIN PUMP NO. 3 RUNNING	0.00
Hist.FIX.MLR04.F_CV	MAIN PUMP NO. 4 RUNNING	0.00
Hist.FIX.BFV52_VALVE_STATUS.F_CV	BFV52 WEBB RD BYPASS VALVE	2.00

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

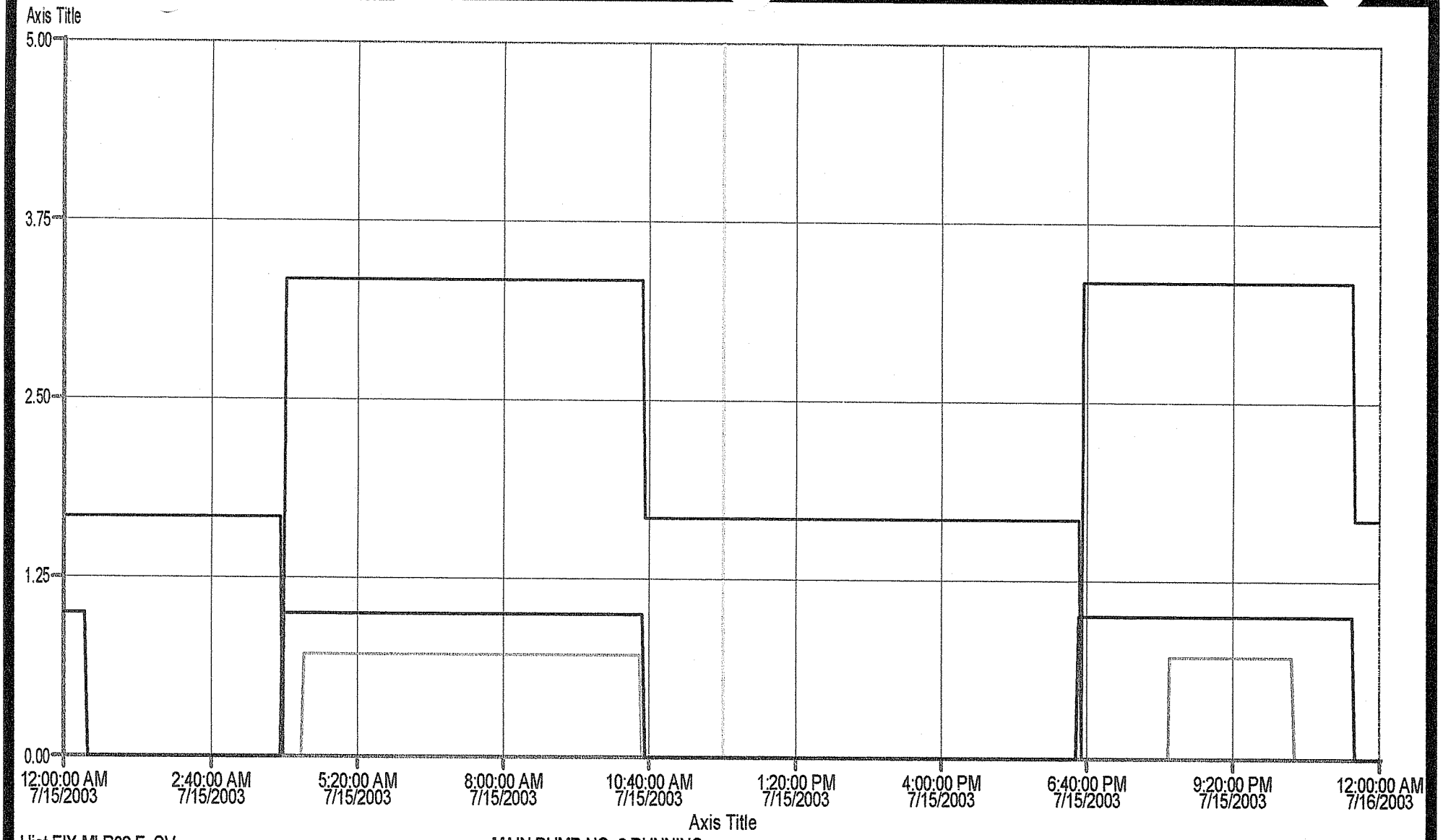


Hist.FIX.MLR02.F_CV	MAIN PUMP NO. 2 RUNNING	1.00
Hist.FIX.MLR03.F_CV	MAIN PUMP NO. 3 RUNNING	0.00
Hist.FIX.MLR04.F_CV	MAIN PUMP NO. 4 RUNNING	0.00
Hist.FIX.BFV52_VALVE_STATUS.F_CV	BFV52 WEBB RD BYPASS VALVE	2.00

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

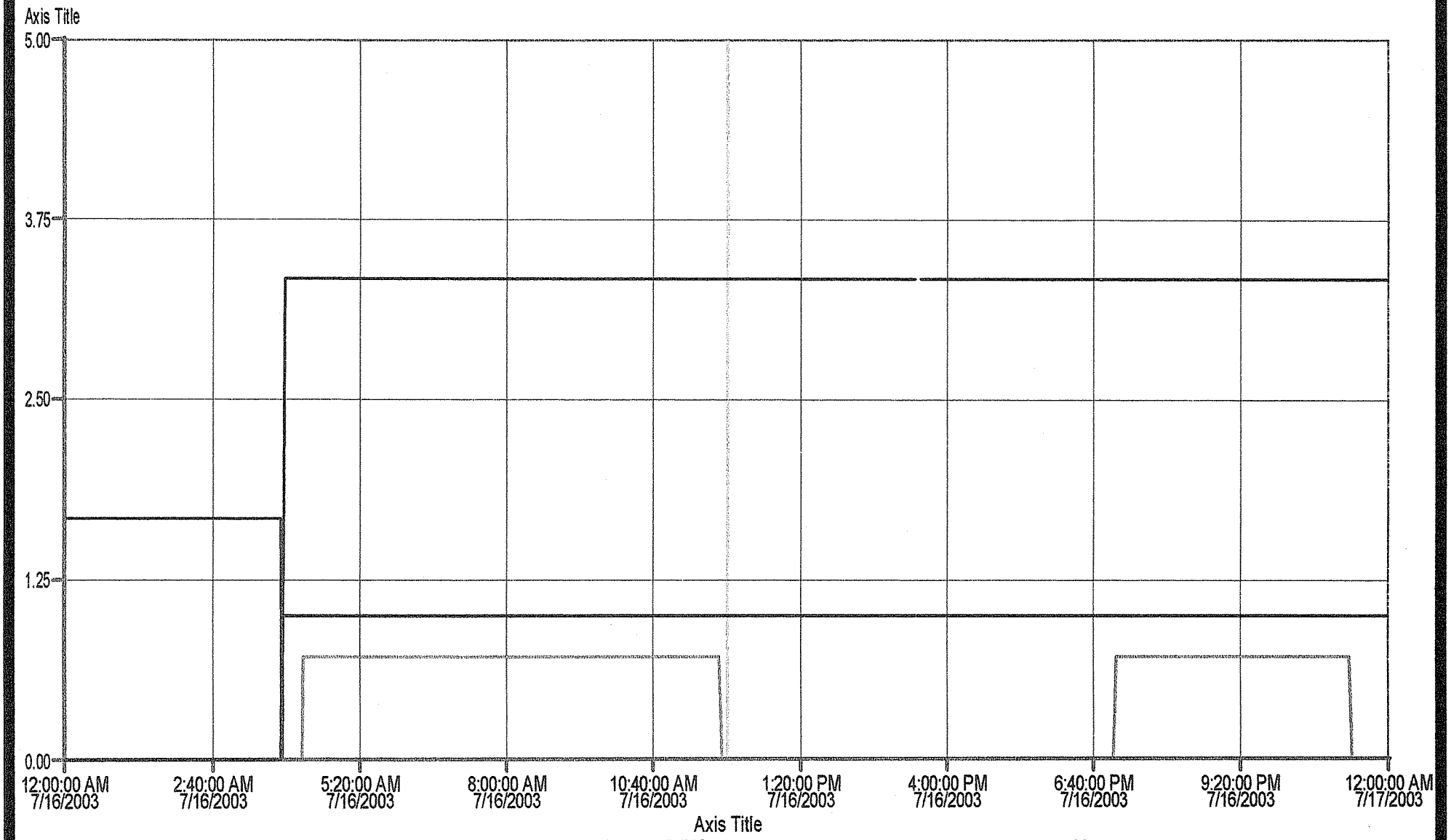


Hist.FIX.MLR02.F_CV	MAIN PUMP NO. 2 RUNNING	0.00
Hist.FIX.MLR03.F_CV	MAIN PUMP NO. 3 RUNNING	0.00
Hist.FIX.MLR04.F_CV	MAIN PUMP NO. 4 RUNNING	0.00
Hist.FIX.BFV52_VALVE_STATUS.F_CV	BFV52 WEBB RD BYPASS VALVE	1.00

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

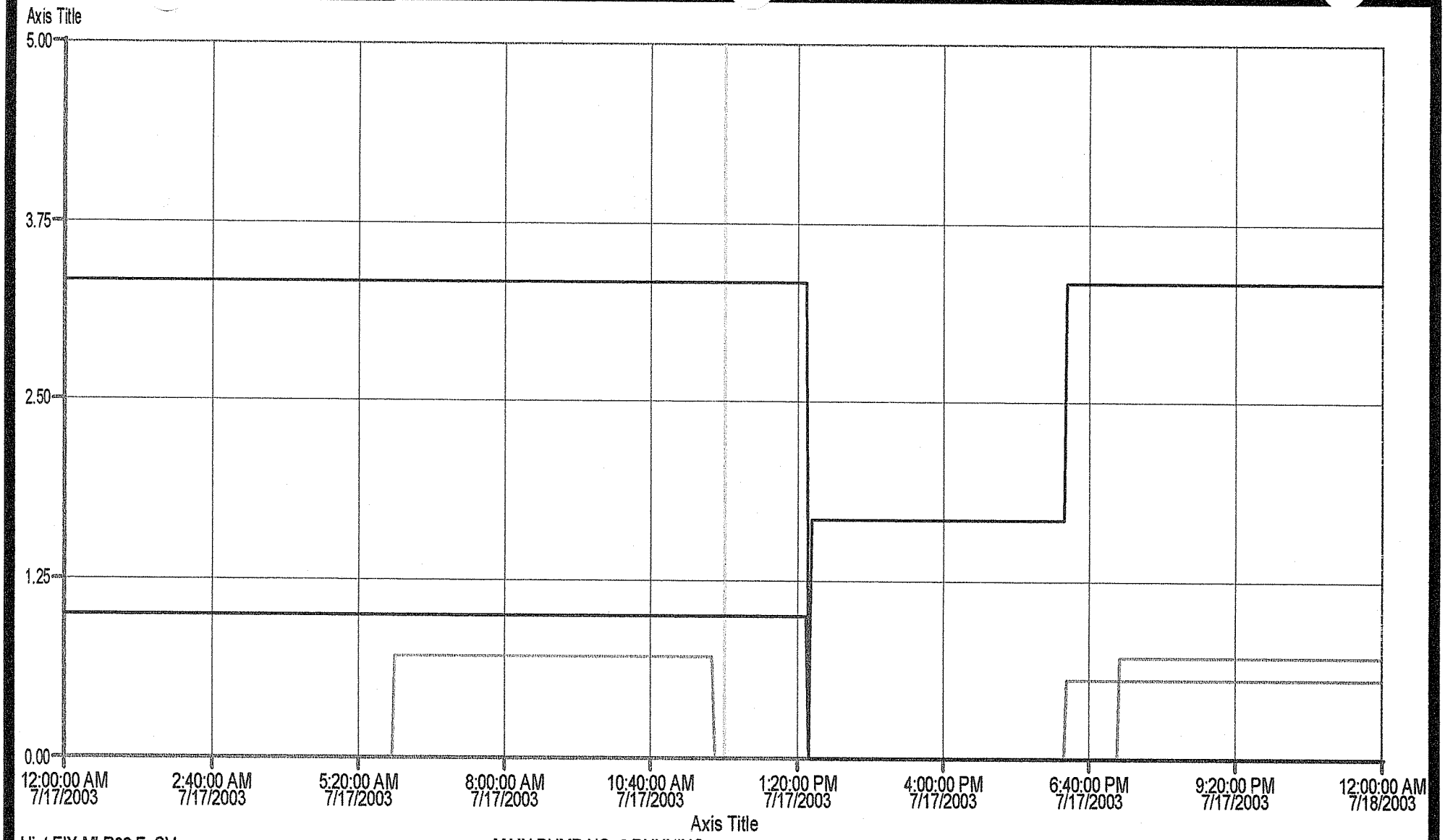


Hist.FIX.MLR02.F_CV	MAIN PUMP NO. 2 RUNNING	1.00
Hist.FIX.MLR03.F_CV	MAIN PUMP NO. 3 RUNNING	0.00
Hist.FIX.MLR04.F_CV	MAIN PUMP NO. 4 RUNNING	0.00
Hist.FIX.BFV52_VALVE_STATUS.F_CV	BFV52 WEBB RD BYPASS VALVE	2.00

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

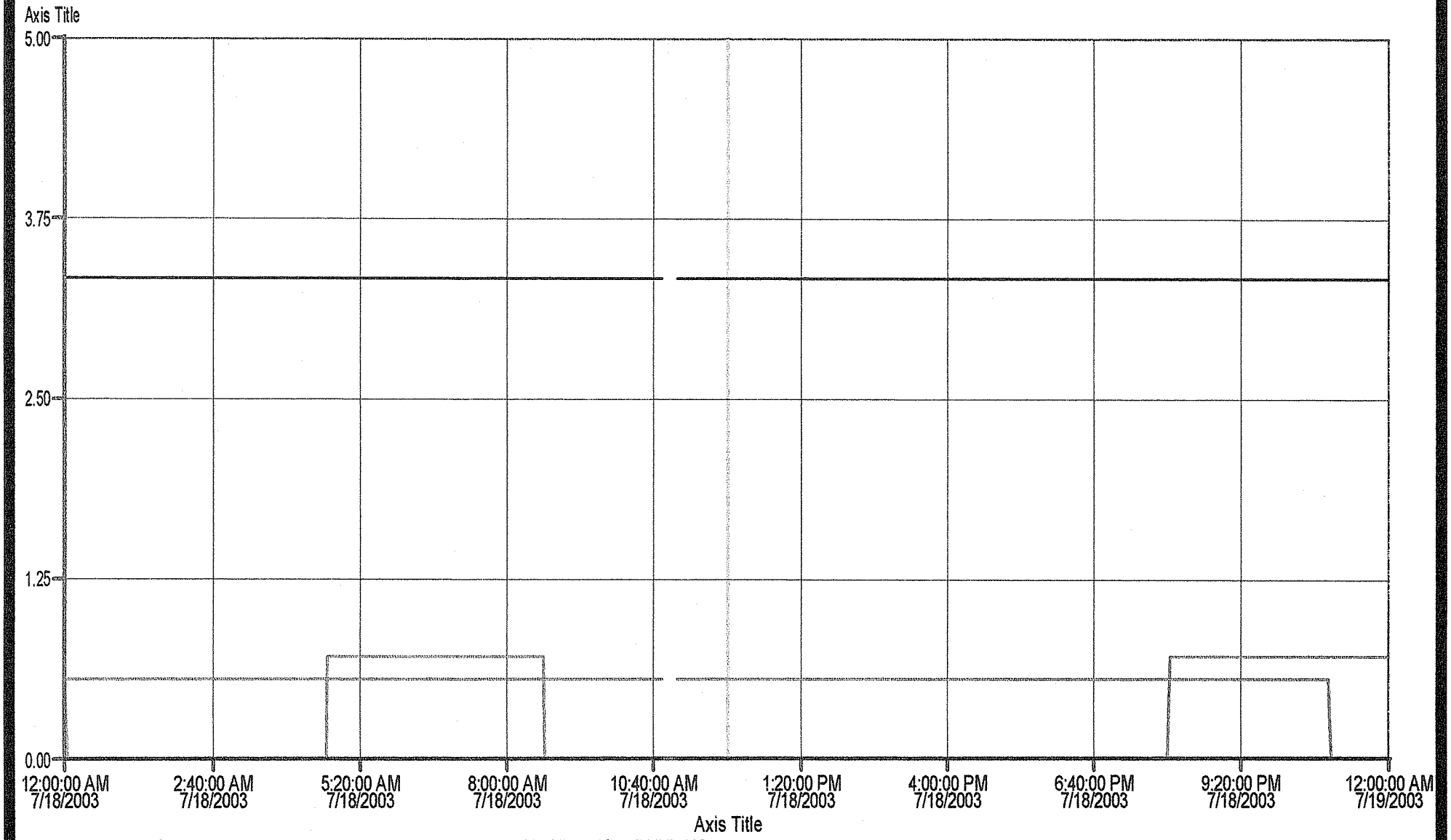


Hist.FIX.MLR02.F_CV	MAIN PUMP NO. 2 RUNNING	1.00
Hist.FIX.MLR03.F_CV	MAIN PUMP NO. 3 RUNNING	0.00
Hist.FIX.MLR04.F_CV	MAIN PUMP NO. 4 RUNNING	0.00
Hist.FIX.BFV52_VALVE_STATUS.F_CV	BFV52 WEBB RD BYPASS VALVE	2.00

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

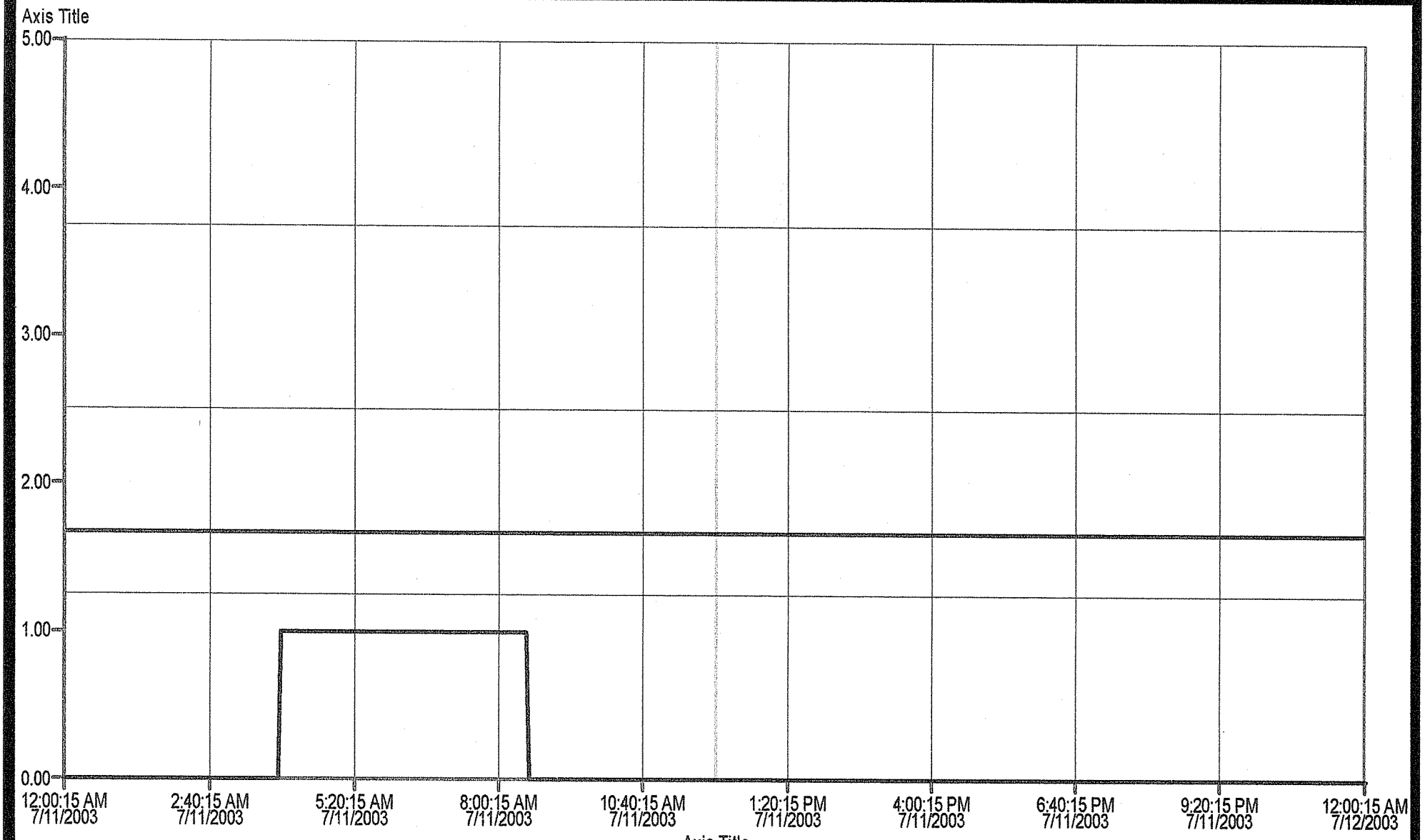


Hist.FIX.MLR02.F_CV	MAIN PUMP NO. 2 RUNNING	0.00
Hist.FIX.MLR03.F_CV	MAIN PUMP NO. 3 RUNNING	0.00
Hist.FIX.MLR04.F_CV	MAIN PUMP NO. 4 RUNNING	1.00
Hist.FIX.BFV52_VALVE_STATUS.F_CV	BFV52 WEBB RD BYPASS VALVE	2.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - Webb Road



Hist.FIX.MLR01.F_CV	MAIN PUMP NO. 1 RUNNING	0.00
Hist.FIX.BPR02.F_CV	BOOSTER PUMP NO. 2 RUNNING	0.00
Hist.FIX.BDP3RUN.F_CV	WEBB RD booster dist pump #3	1.00

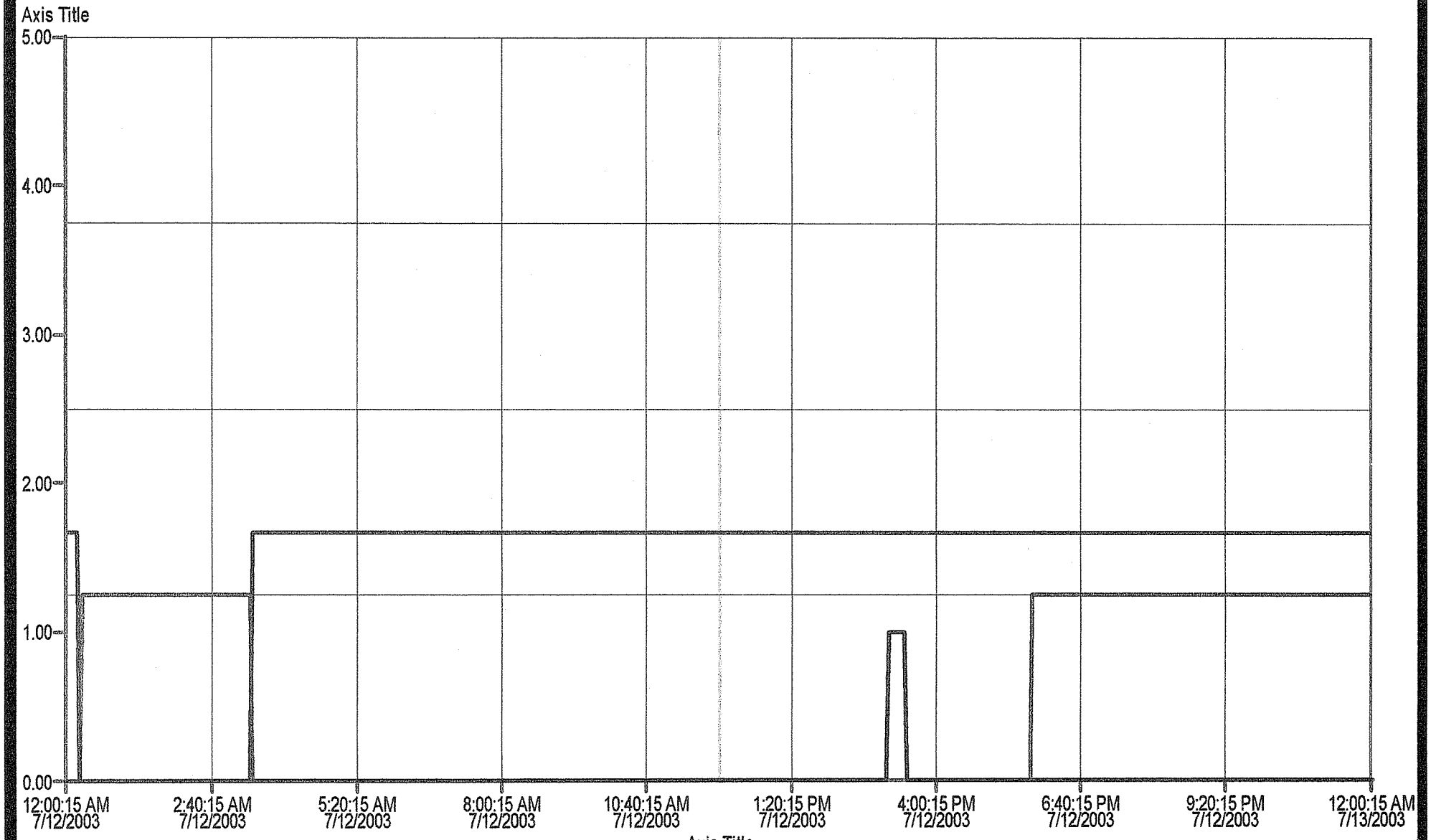
Enter New Date/Time | Enter New Time Span

HIGH = ON

LOW = OFF

Trends | NorthEast Zone Screens

NorthEast Zone - Webb Road

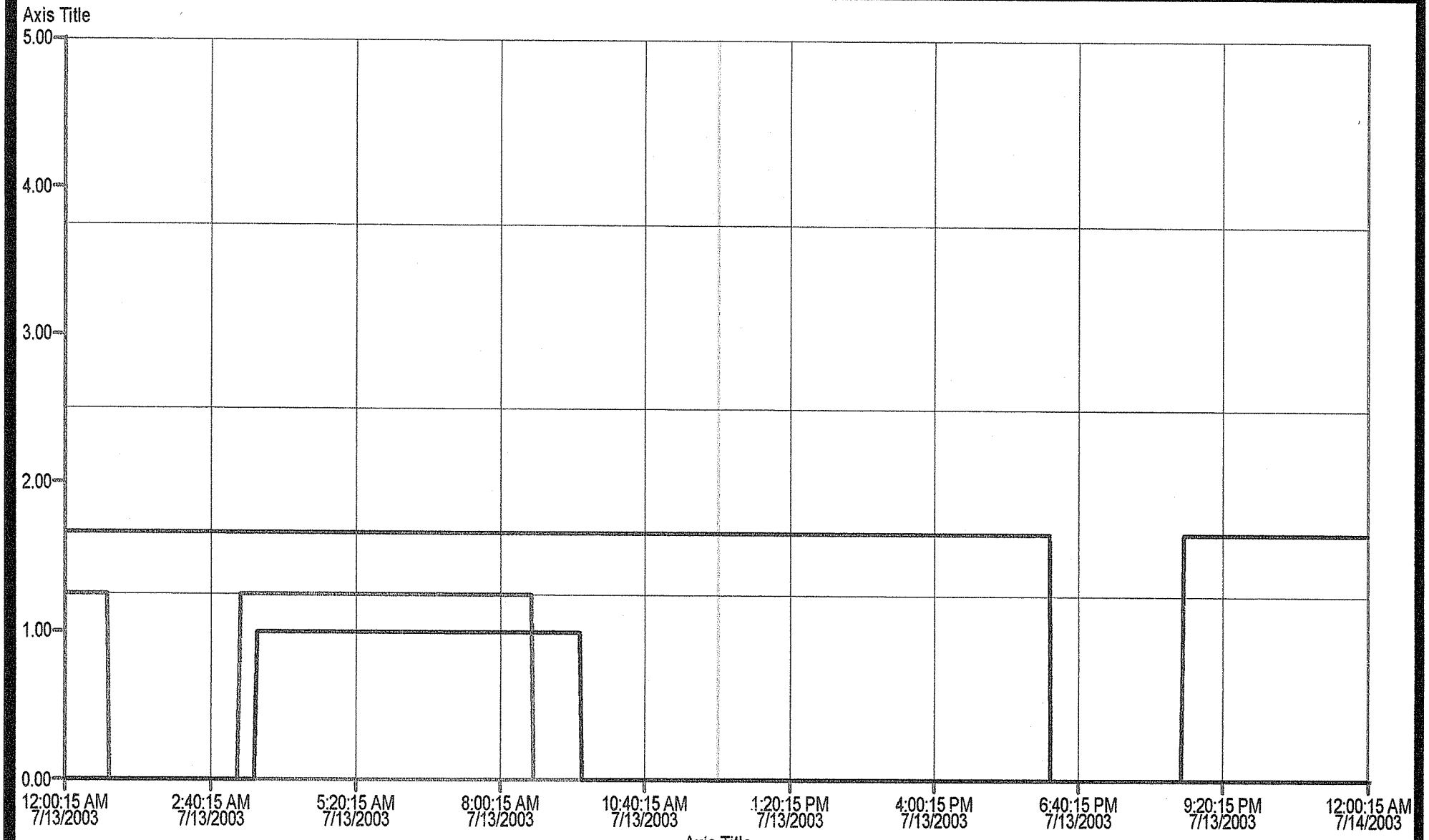


Hist.FIX.MLR01.F_CV	MAIN PUMP NO. 1 RUNNING	0.00
Hist.FIX.BPR02.F_CV	BOOSTER PUMP NO. 2 RUNNING	0.00
Hist.FIX.BDP3RUN.F_CV	WEBB RD booster dist pump #3	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - Webb Road

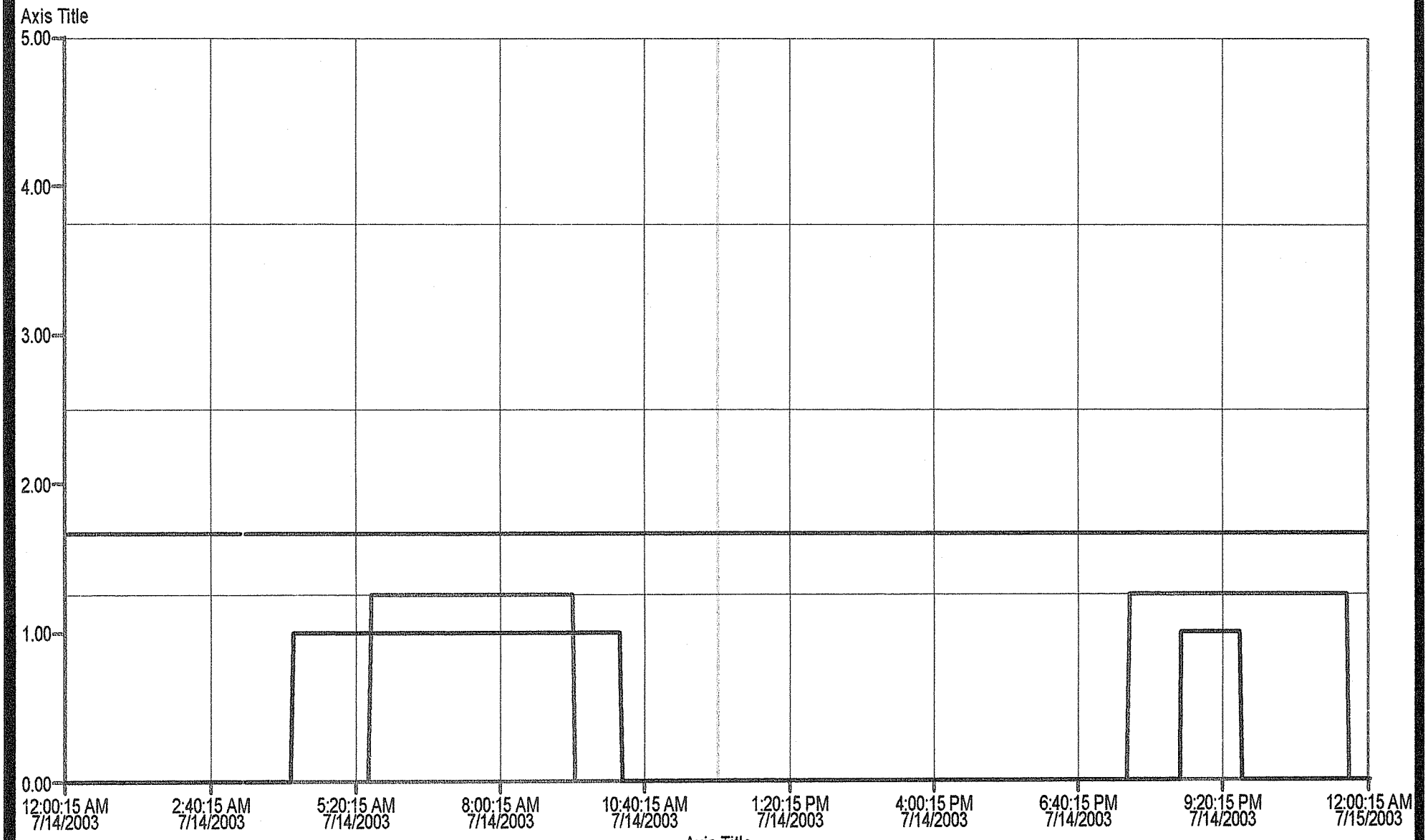


Hist.FIX.MLR01.F_CV	MAIN PUMP NO. 1 RUNNING	0.00
Hist.FIX.BPR02.F_CV	BOOSTER PUMP NO. 2 RUNNING	0.00
Hist.FIX.BDP3RUN.F_CV	WEBB RD booster dist pump #3	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - Webb Road

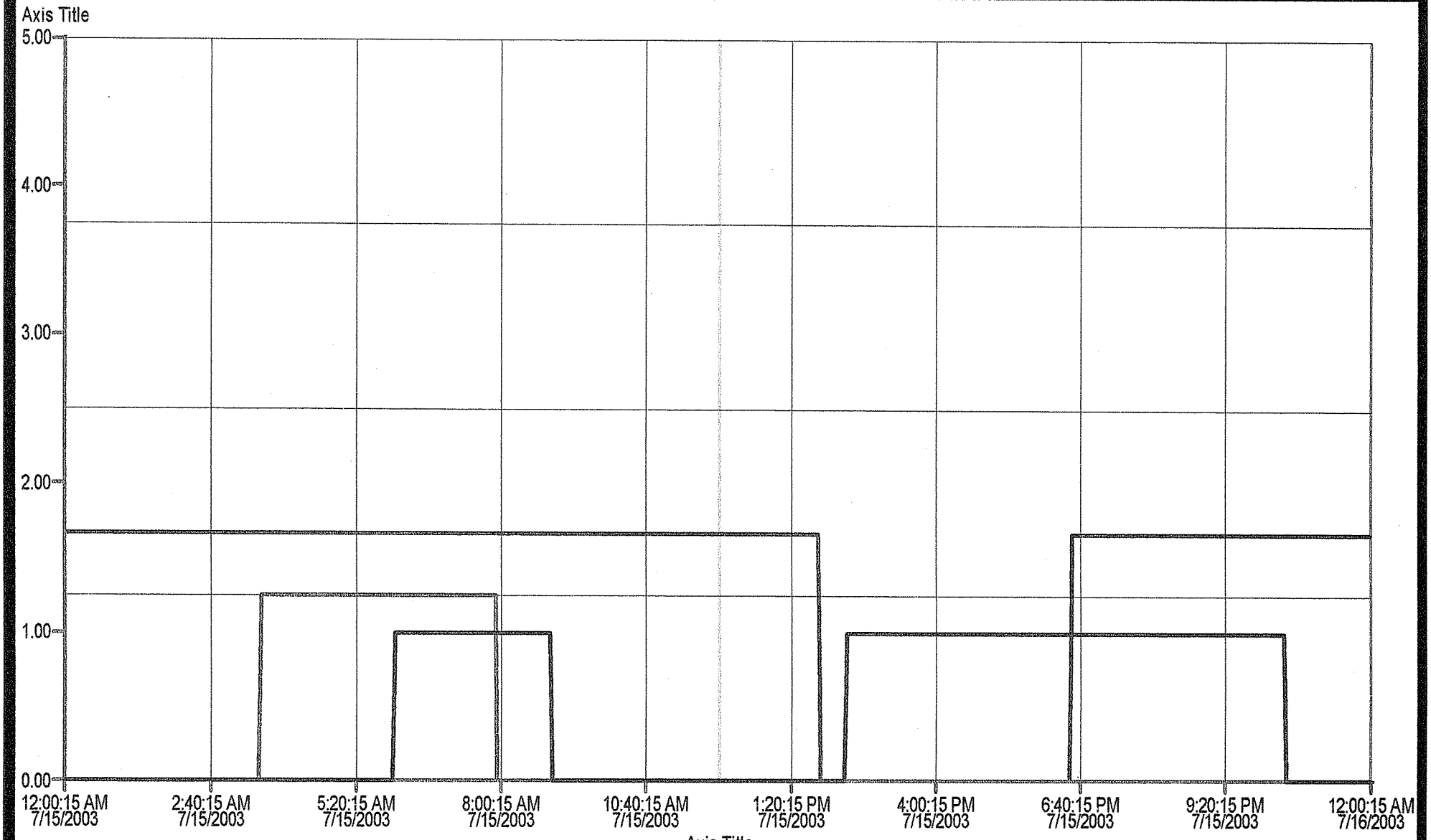


Hist.FIX.MLR01.F_CV	MAIN PUMP NO. 1 RUNNING	0.00
Hist.FIX.BPR02.F_CV	BOOSTER PUMP NO. 2 RUNNING	0.00
Hist.FIX.BDP3RUN.F_CV	WEBB RD booster dist pump #3	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - Webb Road

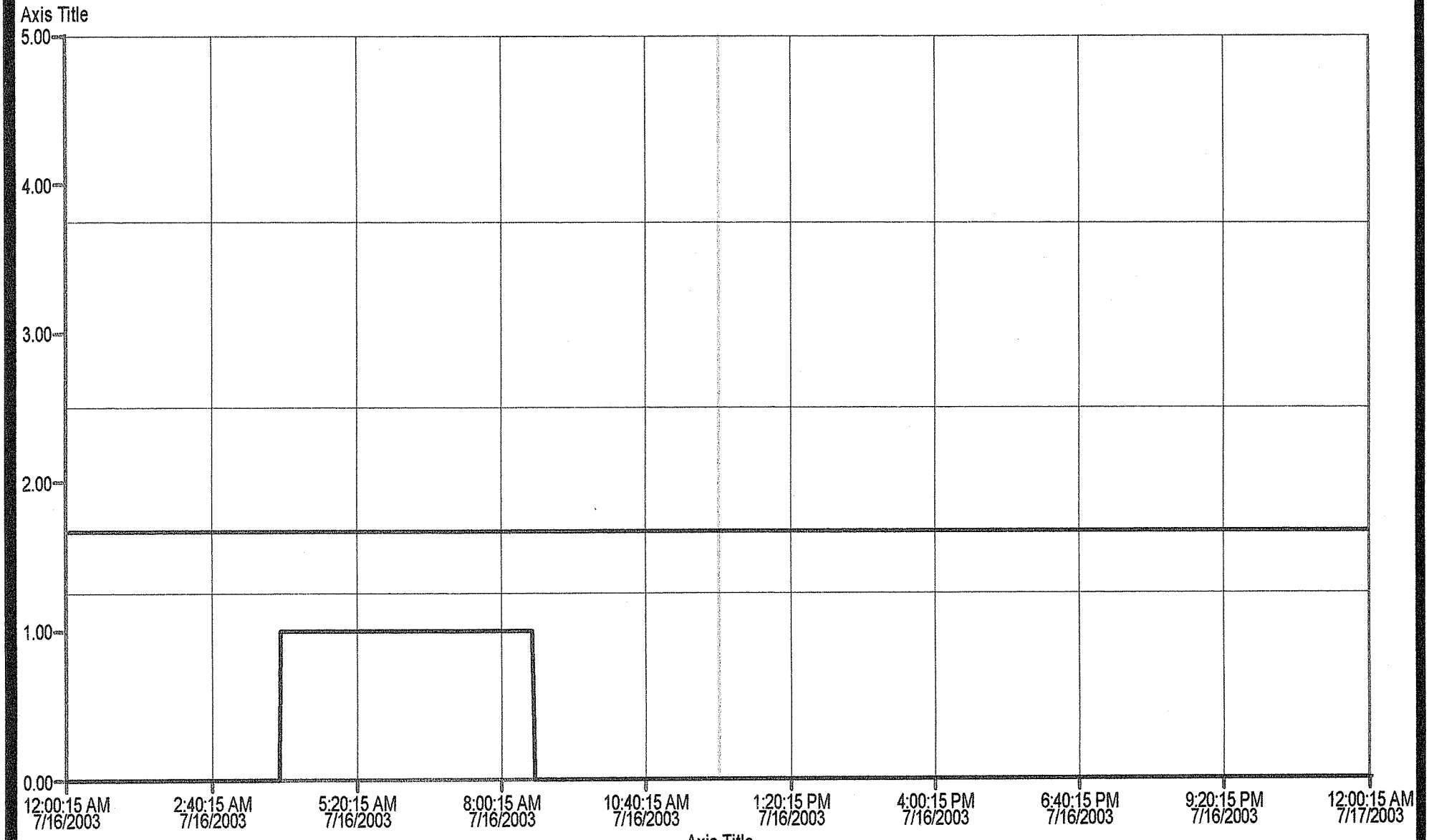


Hist.FIX.MLR01.F_CV	MAIN PUMP NO. 1 RUNNING	0.00
Hist.FIX.BPR02.F_CV	BOOSTER PUMP NO. 2 RUNNING	0.00
Hist.FIX.BDP3RUN.F_CV	WEBB RD booster dist pump #3	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - Webb Road

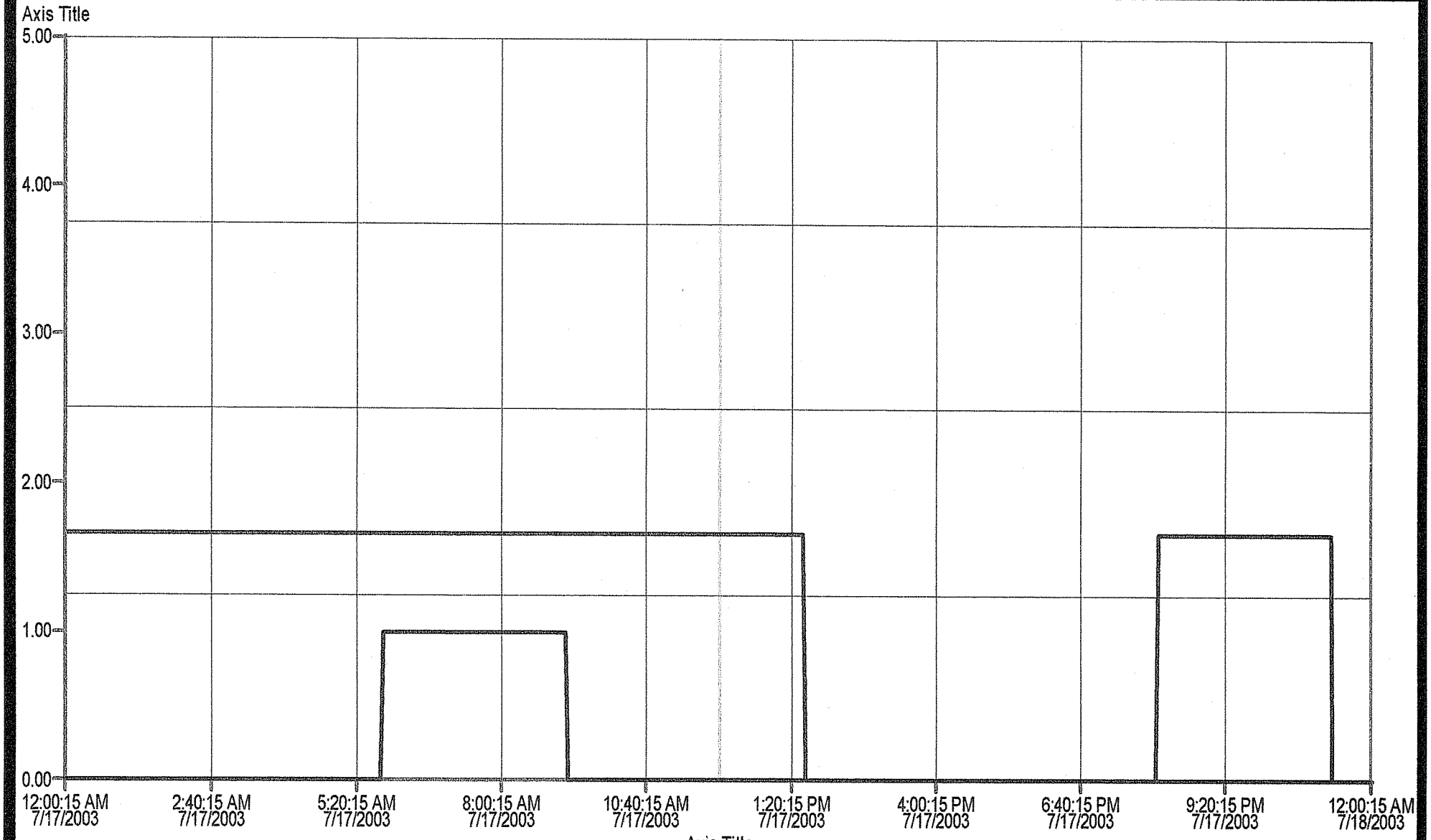


Hist.FIX.MLR01.F_CV	MAIN PUMP NO. 1 RUNNING	0.00
Hist.FIX.BPR02.F_CV	BOOSTER PUMP NO. 2 RUNNING	0.00
Hist.FIX.BDP3RUN.F_CV	WEBB RD booster dist pump #3	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - Webb Road

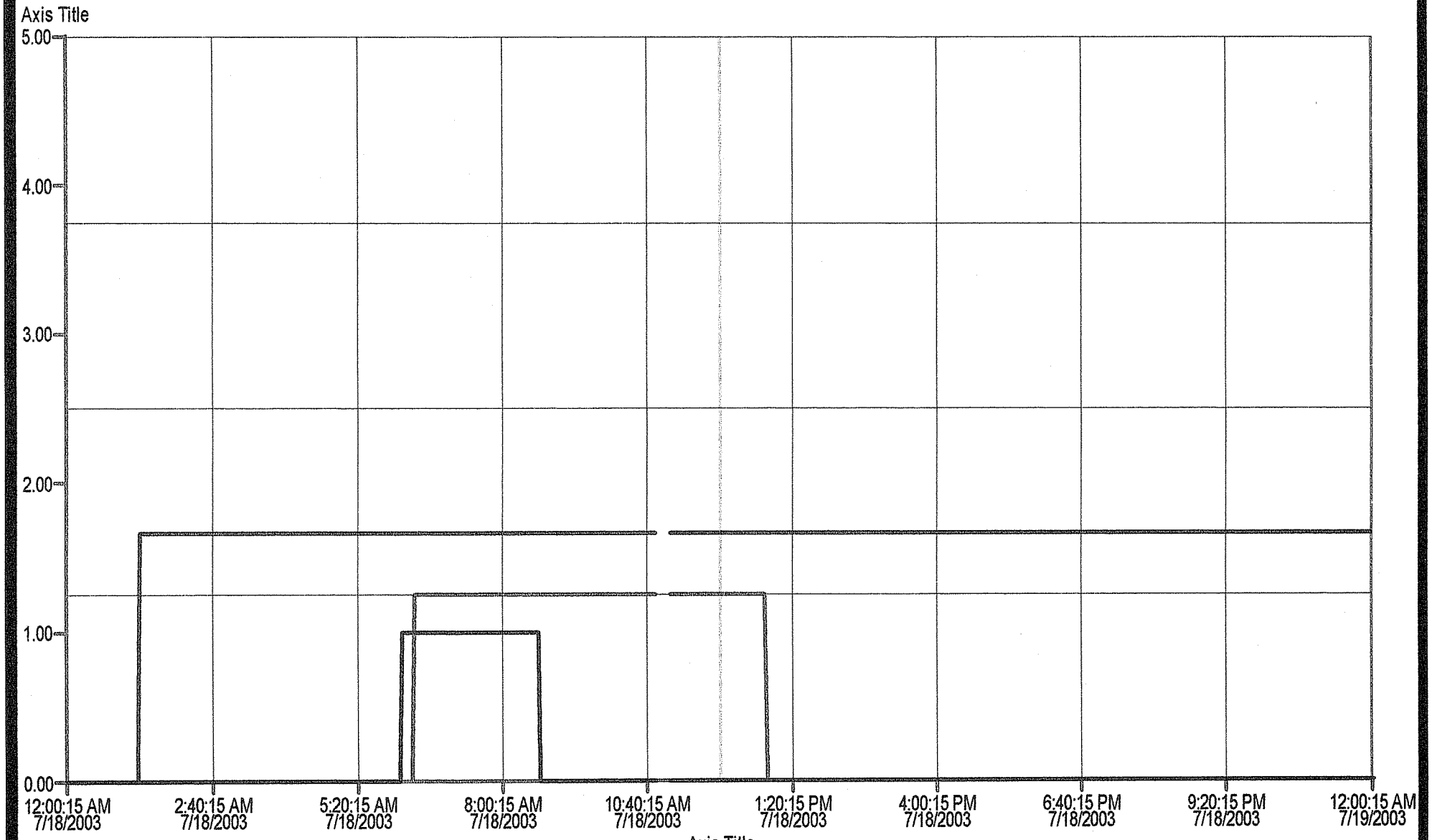


Hist.FIX.MLR01.F_CV	MAIN PUMP NO. 1 RUNNING	0.00
Hist.FIX.BPR02.F_CV	BOOSTER PUMP NO. 2 RUNNING	0.00
Hist.FIX.BDP3RUN.F_CV	WEBB RD booster dist pump #3	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - Webb Road



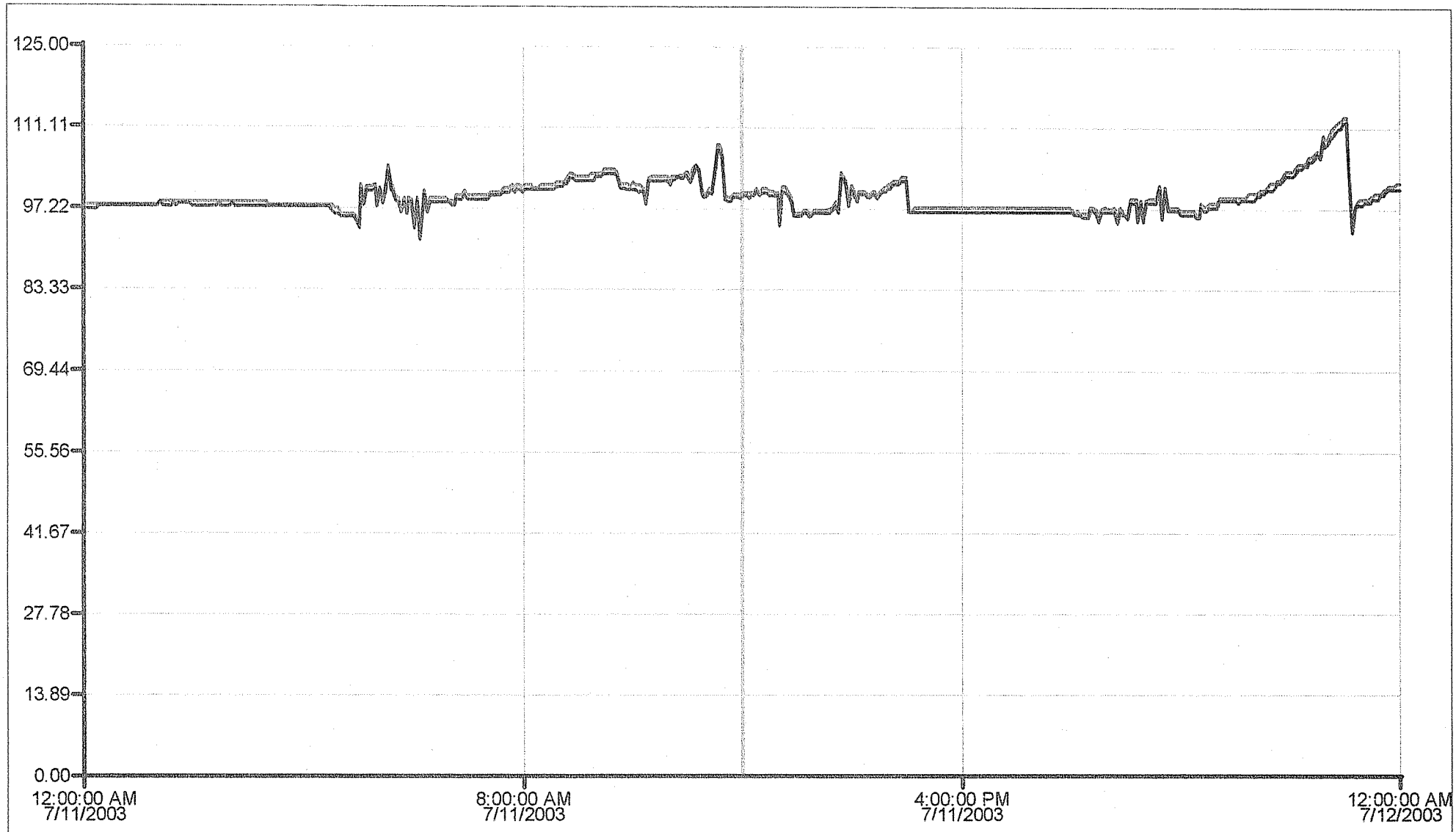
Hist.FIX.MLR01.F_CV	MAIN PUMP NO. 1 RUNNING	0.00
Hist.FIX.BPR02.F_CV	BOOSTER PUMP NO. 2 RUNNING	1.00
Hist.FIX.BDP3RUN.F_CV	WEBB RD booster dist pump #3	1.00

Enter New Date/Time | Enter New Time Span

SCADA MENU

Hess Pressures and Level

Switch to Hess PLC Fiber Optic



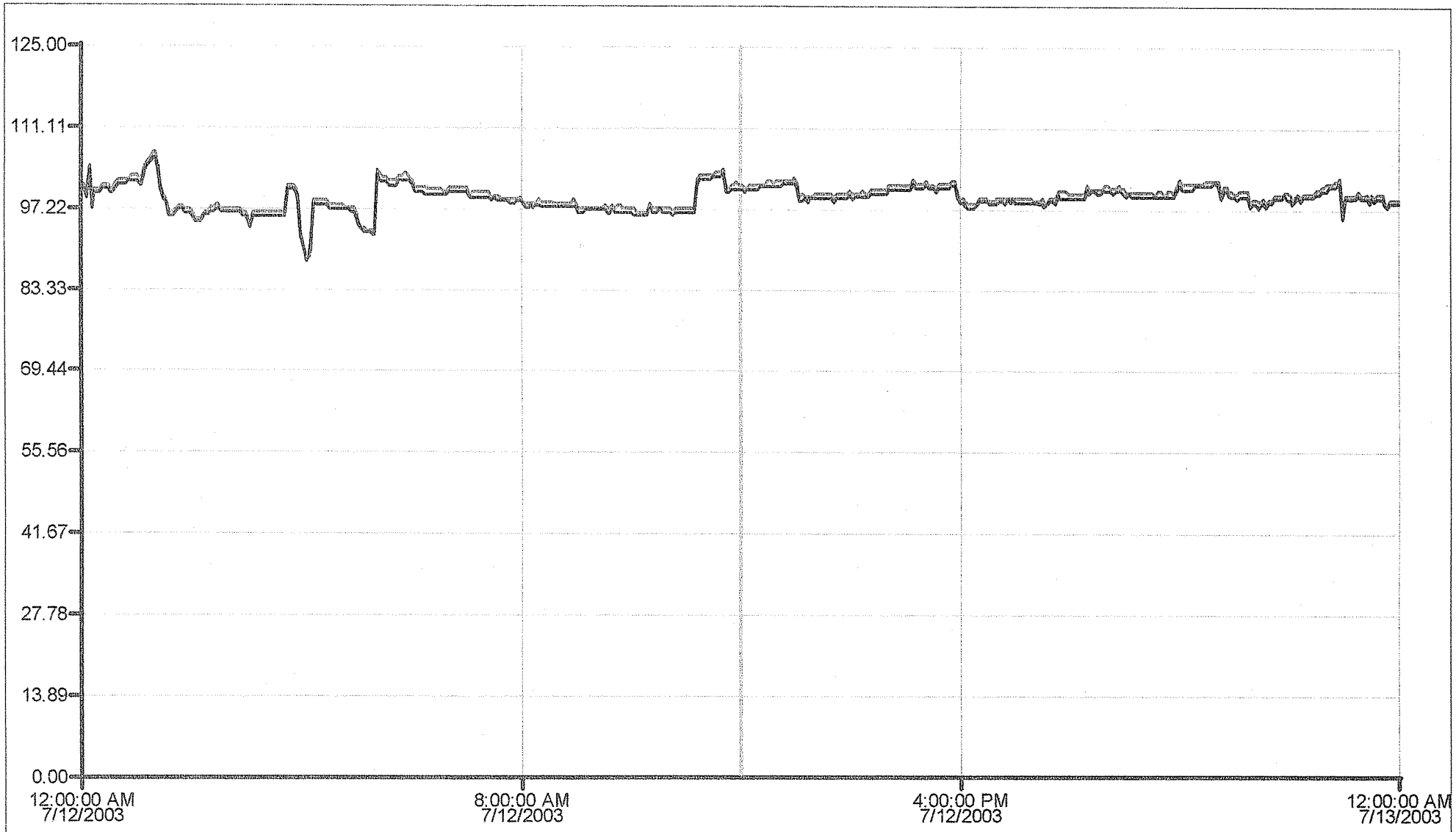
Hist.FIX.NDHPS.F_CV	N. DISCHARGE HEADER PRESSURE	99.33	PSI
Hist.FIX.SDHPS.F_CV	S. DISCHARGE HEADER PRESSURE	99.91	PSI

THERE ARE NO South & North SUCTION TRENDS

SCADA MENU

Hess Pressures and Level

Switch to Hess PLC Fiber Optic

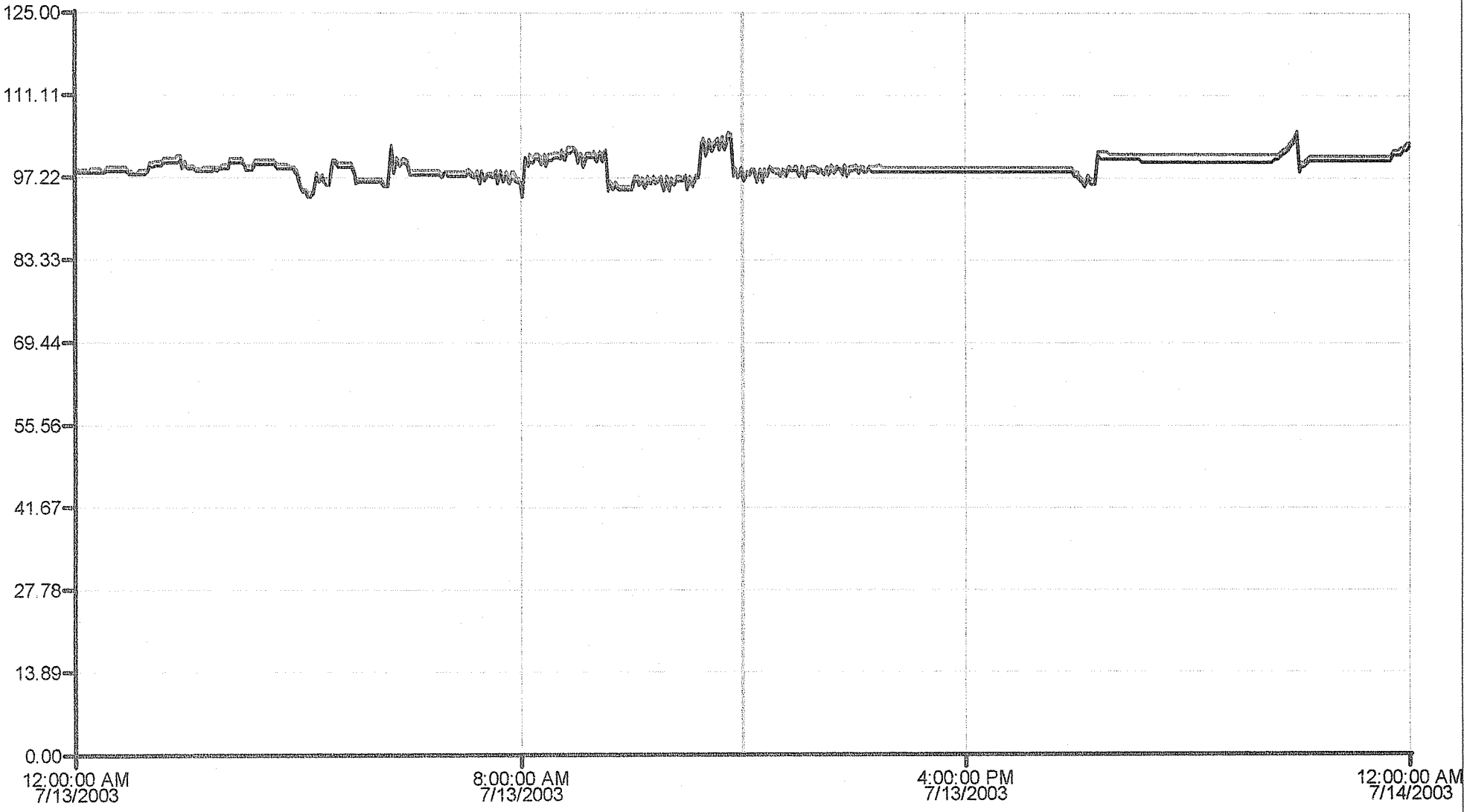


Hist.FIXNDHPS.F_CV	N. DISCHARGE HEADER PRESSURE	100.83	PSI
Hist.FIXSDHPS.F_CV	S. DISCHARGE HEADER PRESSURE	101.54	PSI

SCADA MENU

Hess Pressures and Level

Switch to Hess PLC Fiber Optic Link

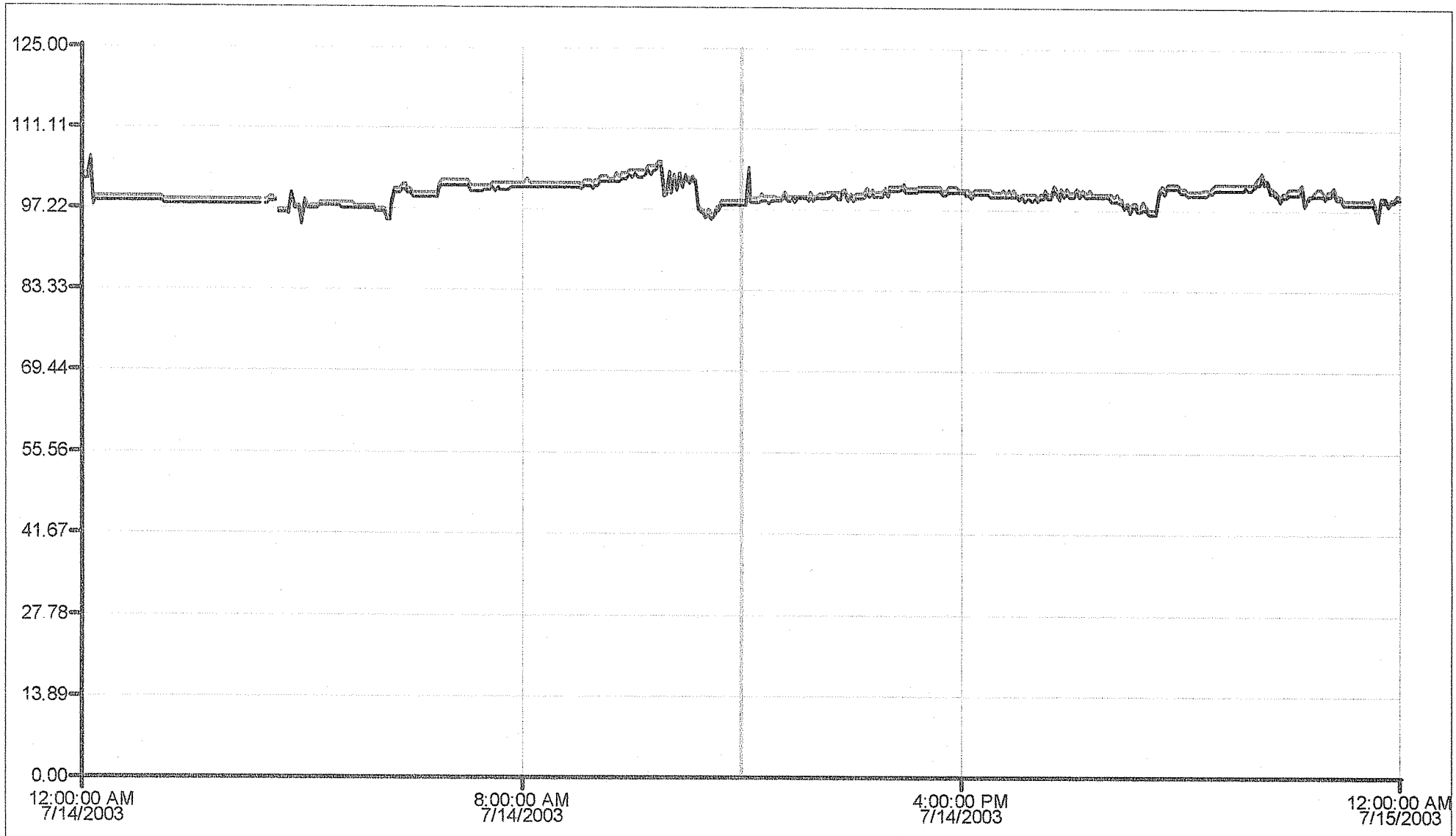


Hist.FIXNDHPS.F_CV	N. DISCHARGE HEADER PRESSURE	97.13	PSI
Hist.FIXSDHPS.F_CV	S. DISCHARGE HEADER PRESSURE	97.82	PSI

SCADA MENU

Hess Pressures and Level

Switch to Hess PLC Fiber Optic

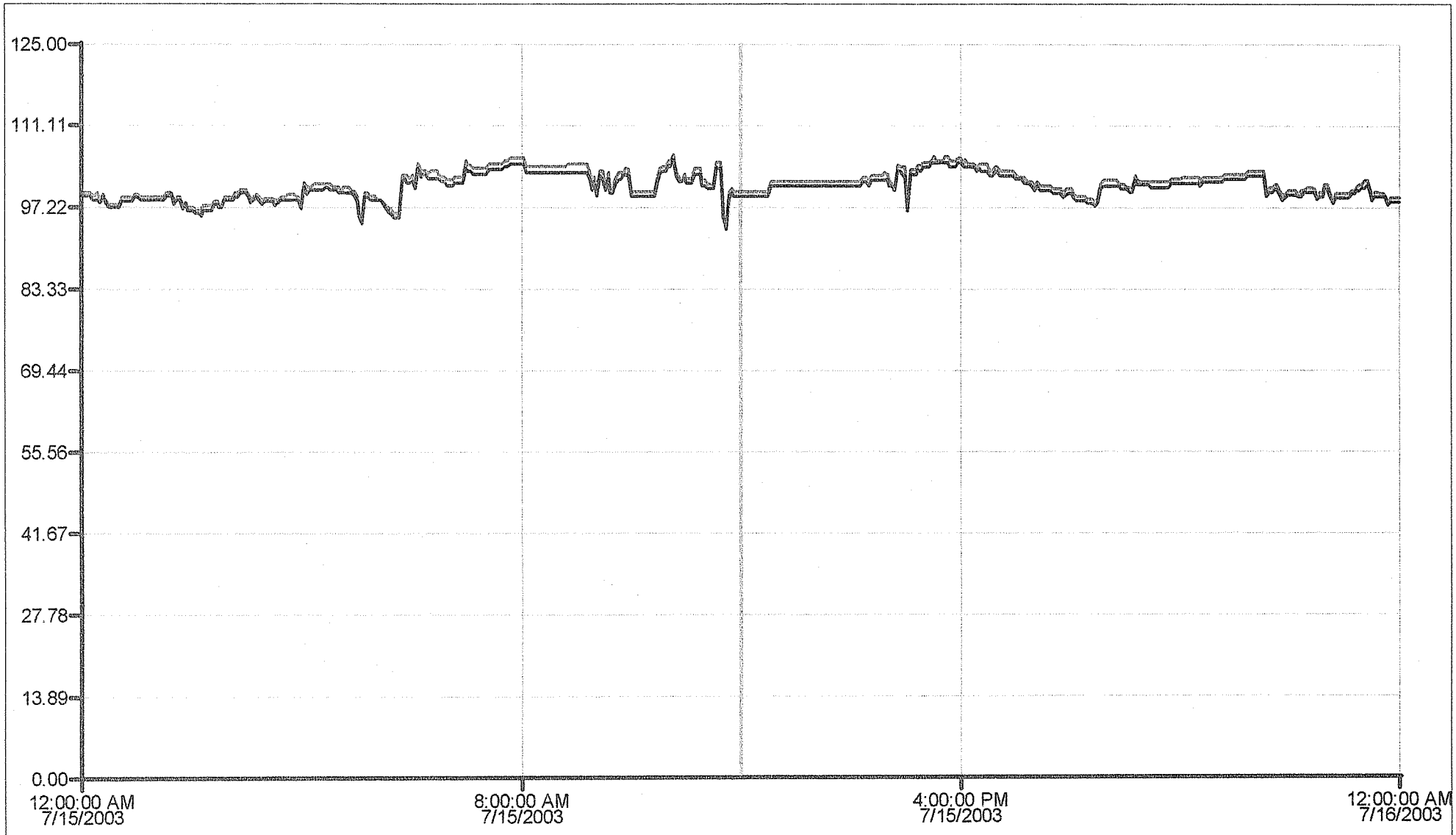


Hist.FIX.NDHPS.F_CV	N. DISCHARGE HEADER PRESSURE	98.11	PSI
Hist.FIX.SDHPS.F_CV	S. DISCHARGE HEADER PRESSURE	98.82	PSI

SCADA MENU

Hess Pressures and Level

Switch to Hess PLC Fiber Optic Link

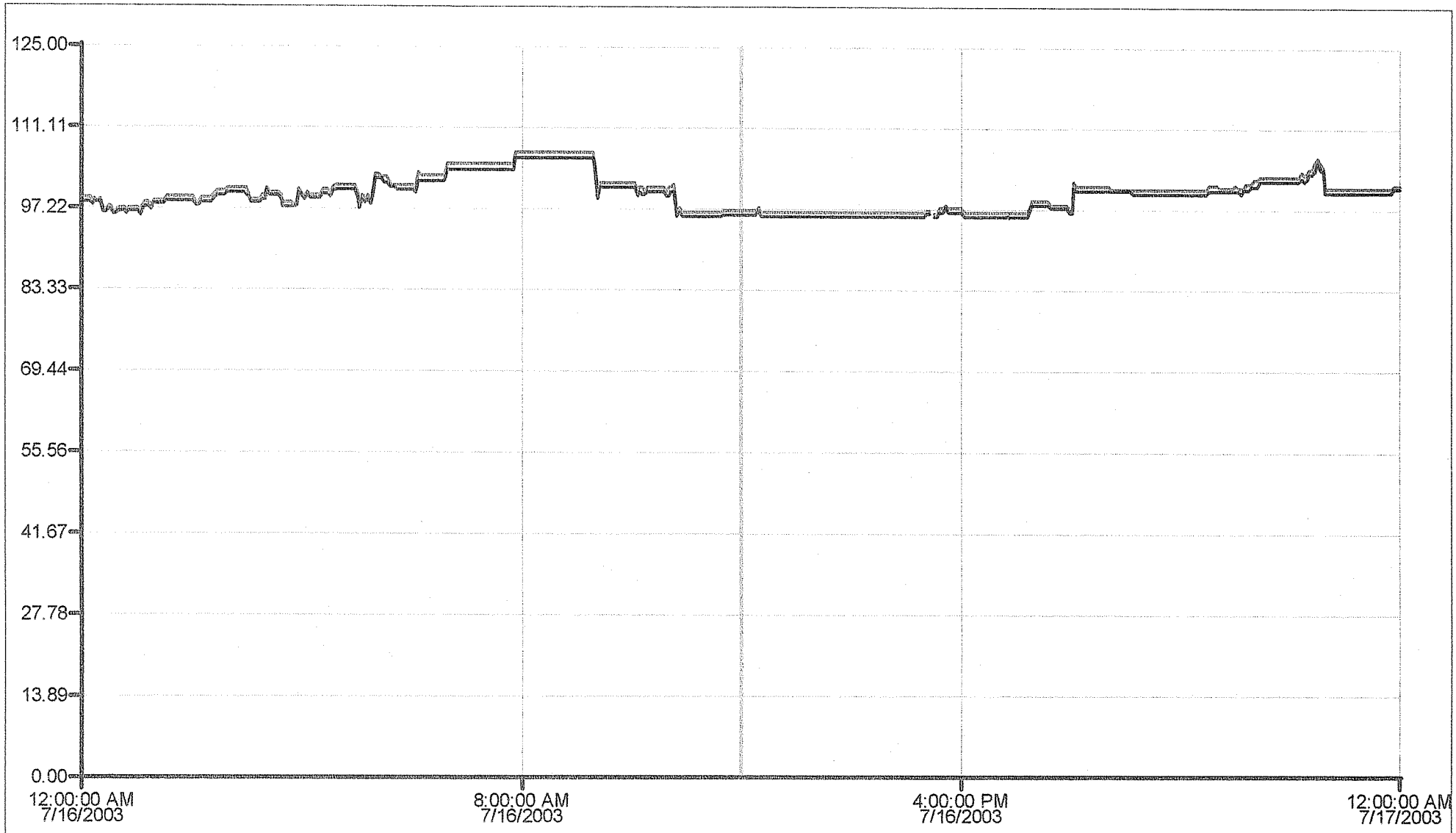


Hist.FIX.NDHPS.F_CV	N. DISCHARGE HEADER PRESSURE	99.19	PSI
Hist.FIX.SDHPS.F_CV	S. DISCHARGE HEADER PRESSURE	100.04	PSI

SCADA MENU

Hess Pressures and Level

Switch to Hess PLC Fiber Optic

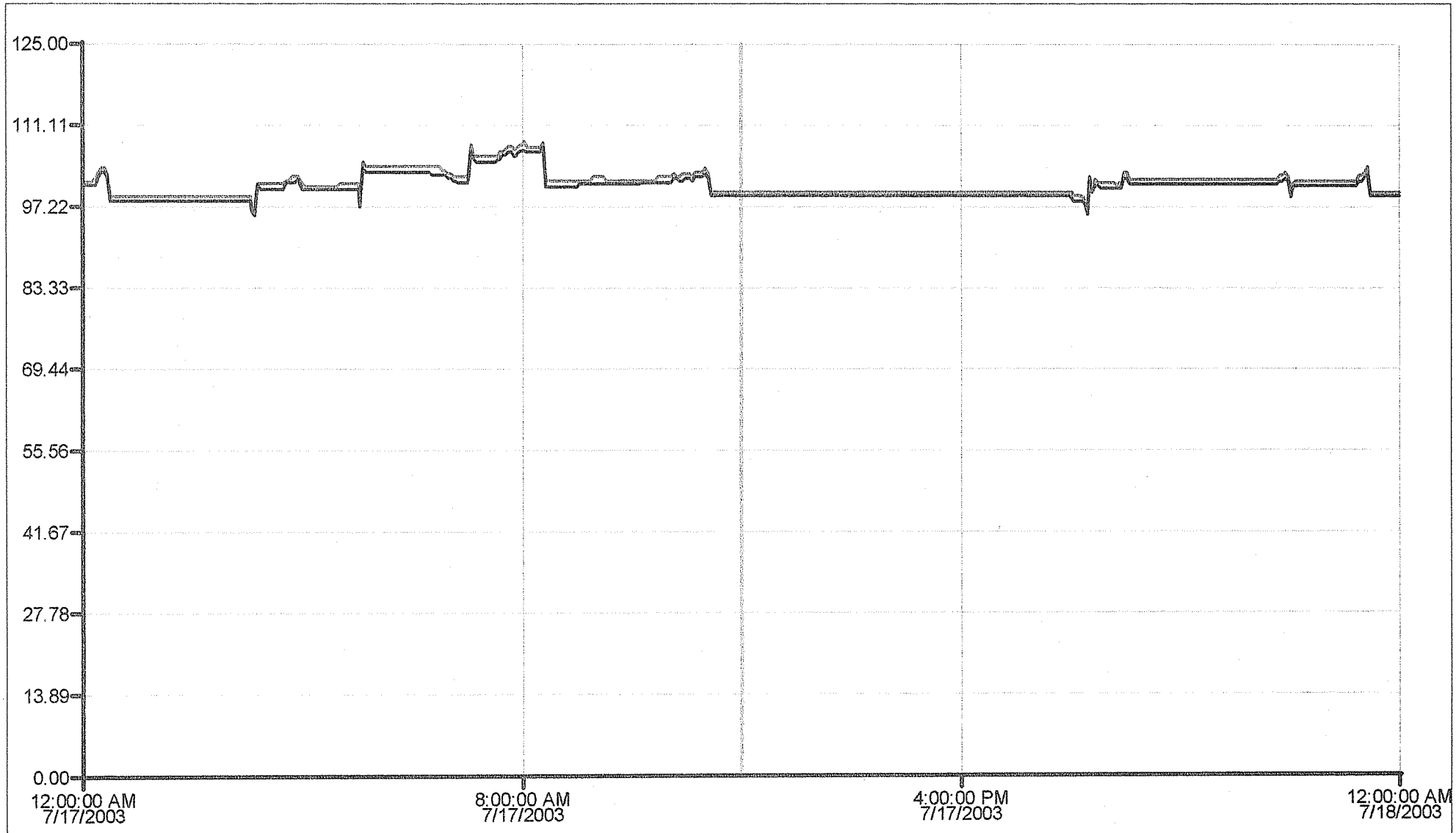


Hist.FIX.NDHPS.F_CV	N. DISCHARGE HEADER PRESSURE	96.33	PSI
Hist.FIX.SDHPS.F_CV	S. DISCHARGE HEADER PRESSURE	96.99	PSI

SCADA MENU

Hess Pressures and Level

Switch to Hess PLC Fiber Optic Link

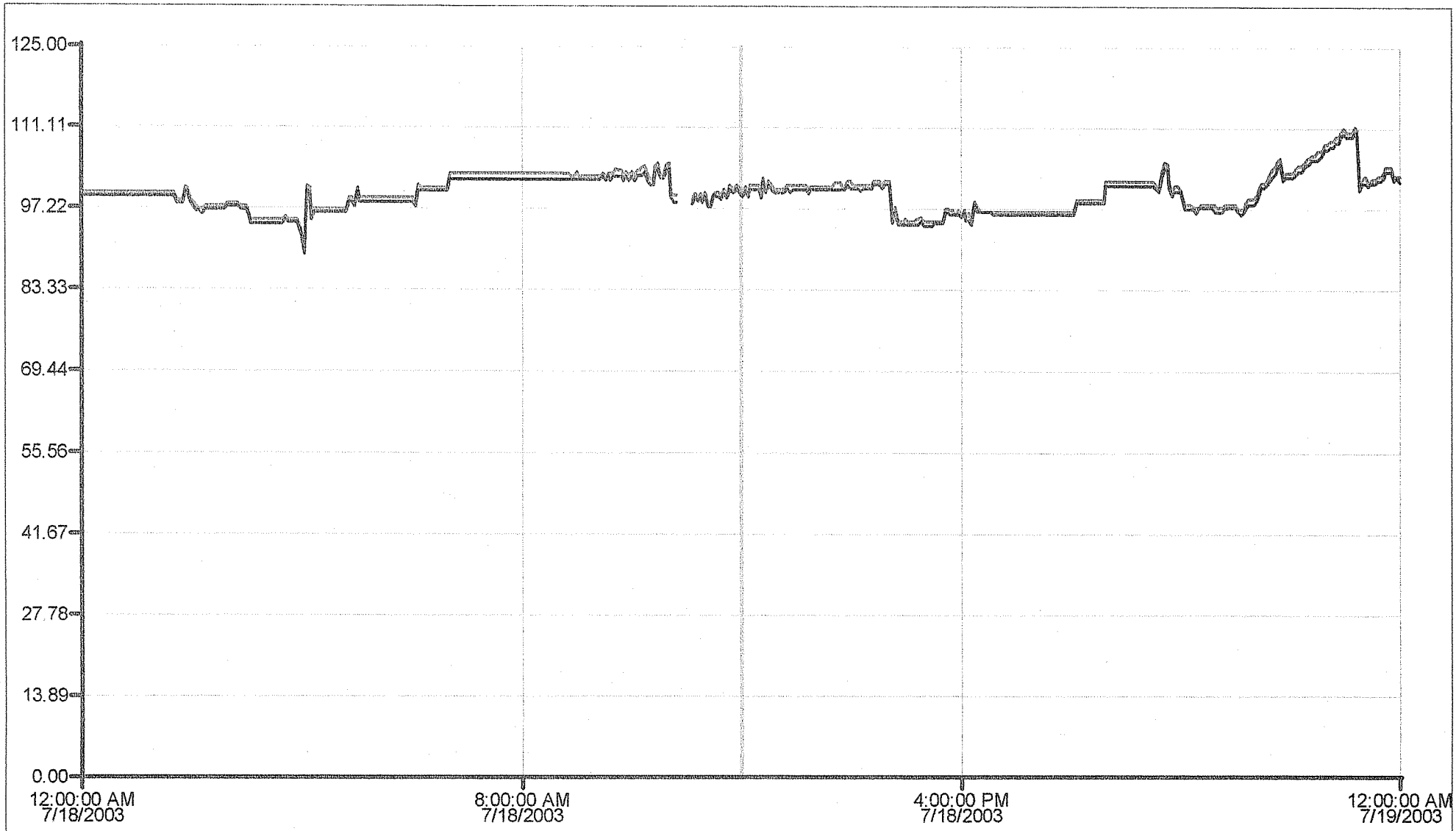


Hist.FIX.NDHPS.F_CV	N. DISCHARGE HEADER PRESSURE	99.38	PSI
Hist.FIX.SDHPS.F_CV	S. DISCHARGE HEADER PRESSURE	99.85	PSI

SCADA MENU

Hess Pressures and Level

Switch to Hess PLC Fiber Optic

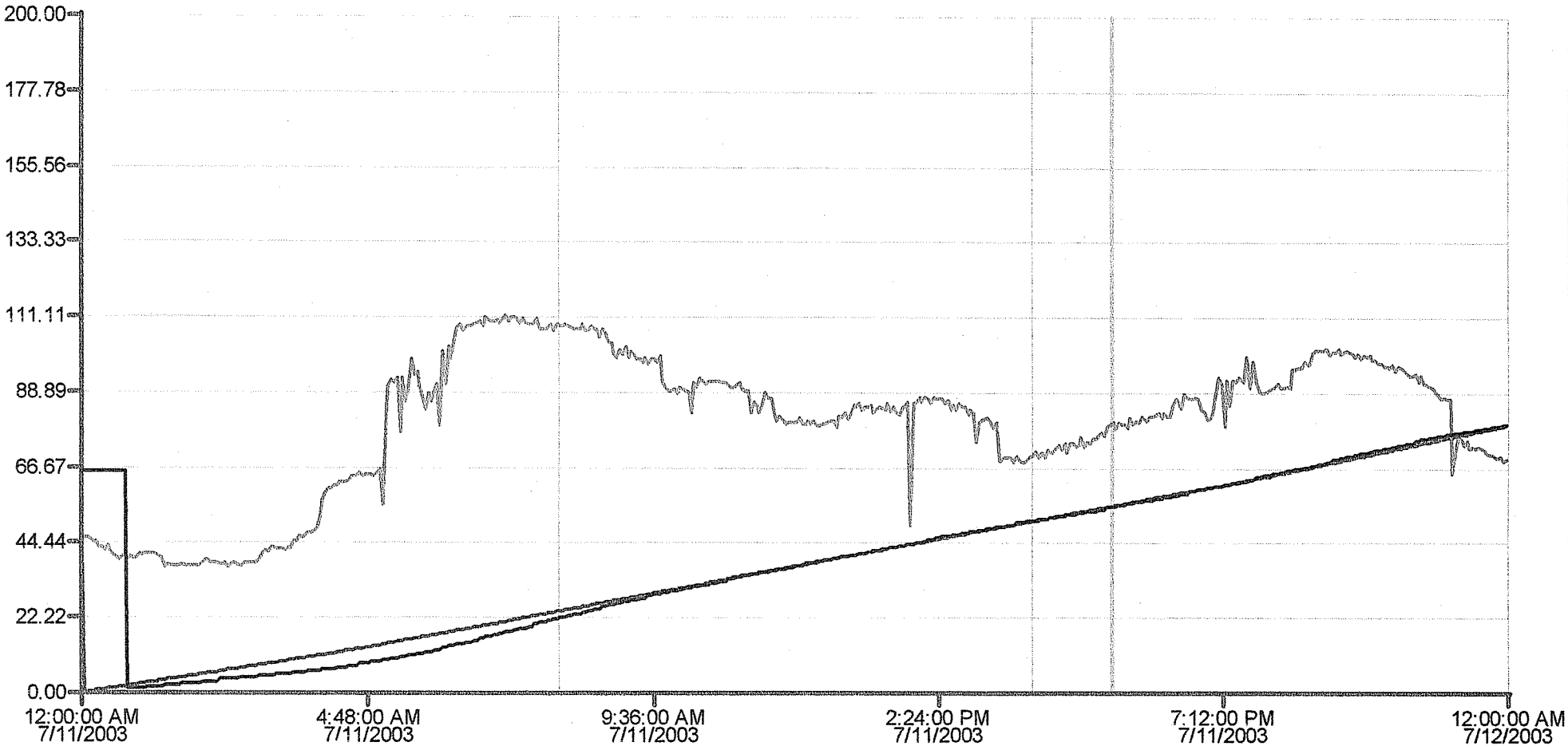


Hist.FIX.NDHPS.F_CV	N. DISCHARGE HEADER PRESSURE	99.47	PSI
Hist.FIX.SDHPS.F_CV	S. DISCHARGE HEADER PRESSURE	100.18	PSI

SCADA Menu

HESS TOTALIZER AND TOTAL LANT FLOWS

Switch to Hess PLC Fiber Op. Link

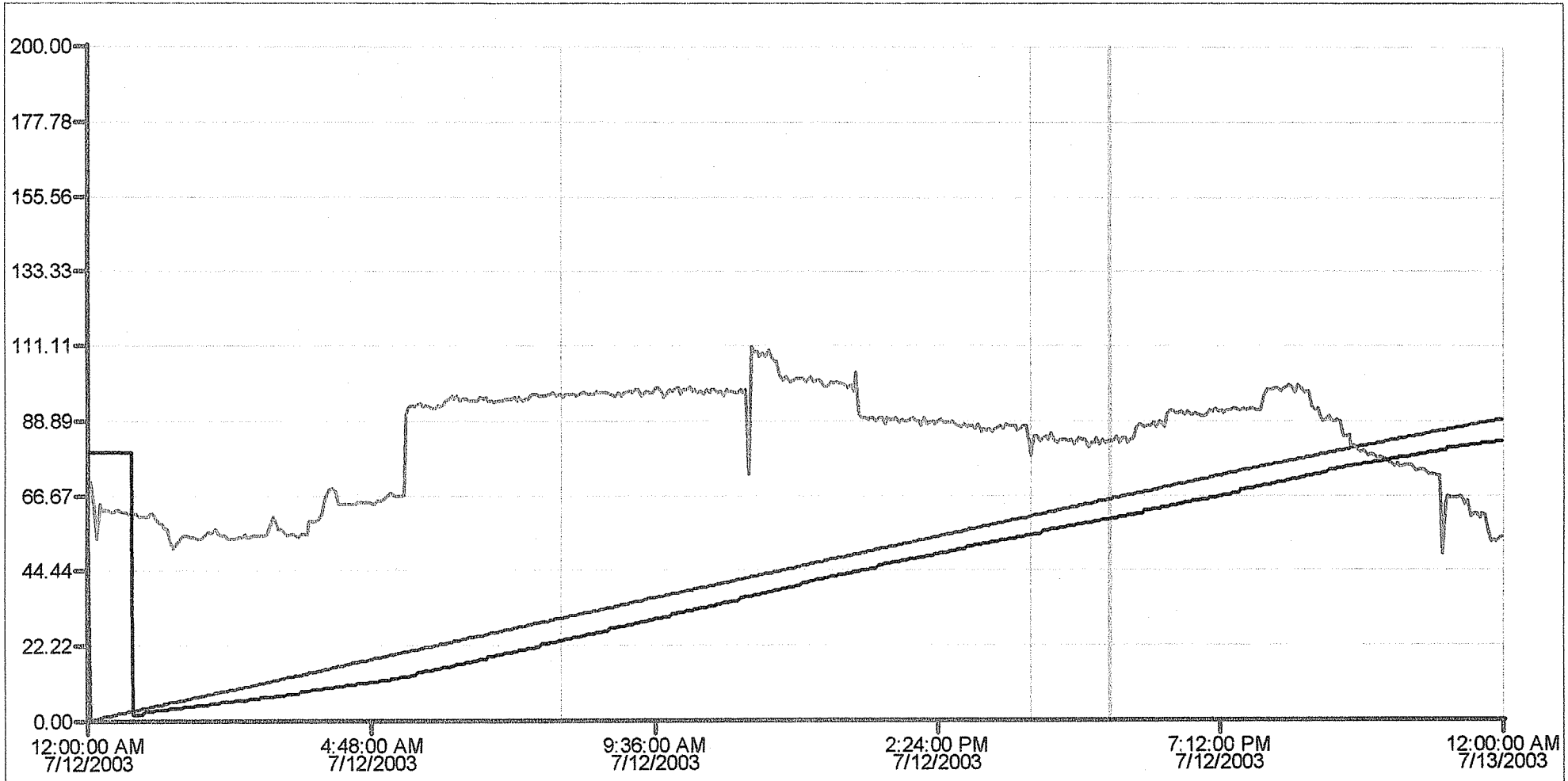


Hist.FIX.TFHPST.F_CV	HESS PUMP STA. TOTALIZER(macro)	55.10	mgd
Hist.FIX.'LP1A:TOTLPLNT.CURTDY.'.F_CV		55.39	
Hist.FIX.TFHPS.F_CV	TOTAL FLOW HESS	79.83	MGD

SCADA Menu

HESS TOTALIZER AND TOTAL PLANT FLOWS

Switch to Hess PLC Fiber Optic Link

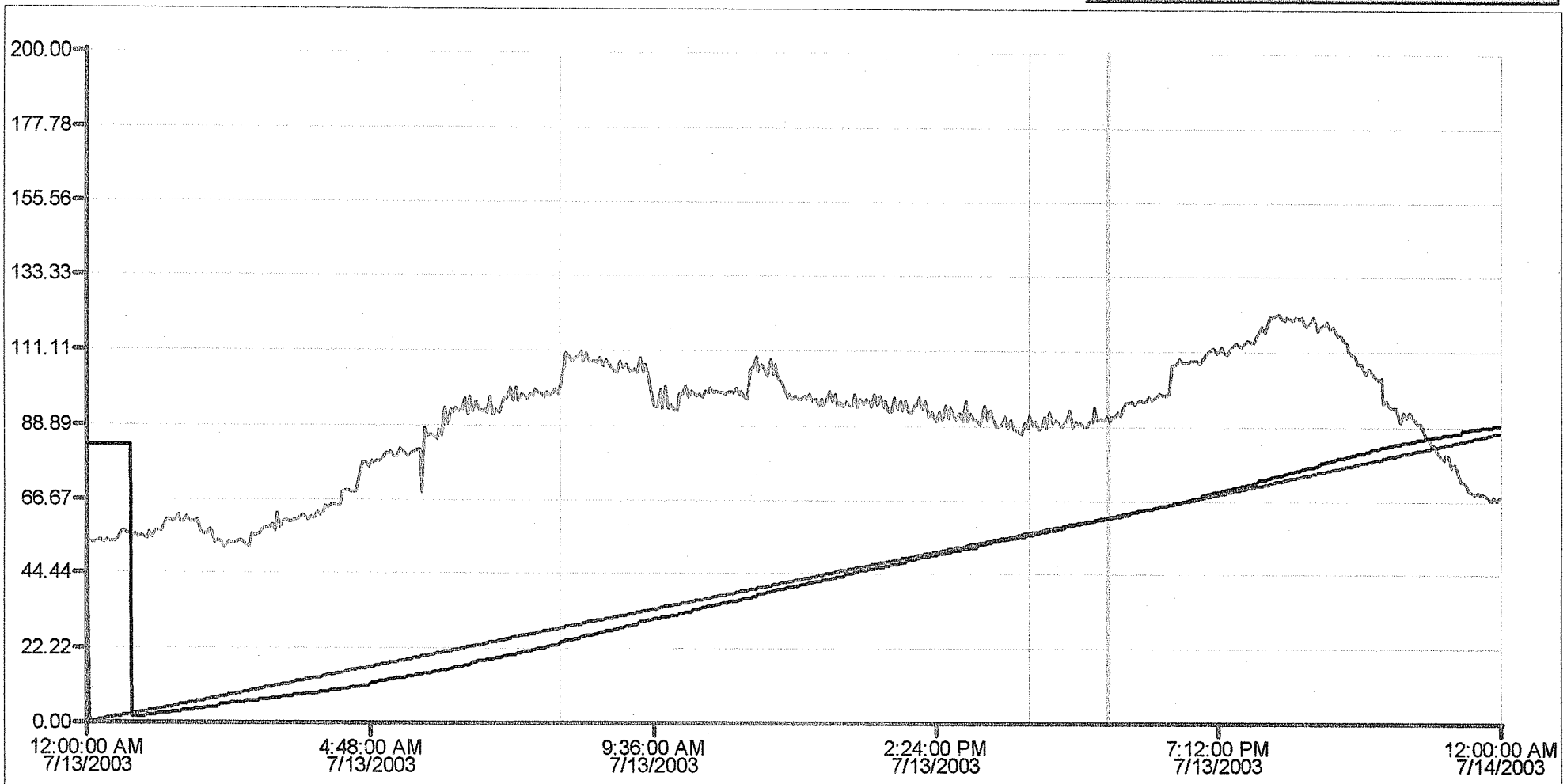


Hist.FIX.TFHPST.F_CV	HESS PUMP STA. TOTALIZER(macro)	59.79	mgd
Hist.FIX.'LP1A:TOTLPLNT.CURTDY.'.F_CV		65.53	
Hist.FIX.TFHPS.F_CV	TOTAL FLOW HESS	82.84	MGD

SCADA Menu

HESS TOTALIZER AND TOTAL LANT FLOWS

Switch to Hess PLC Fiber Op. Link

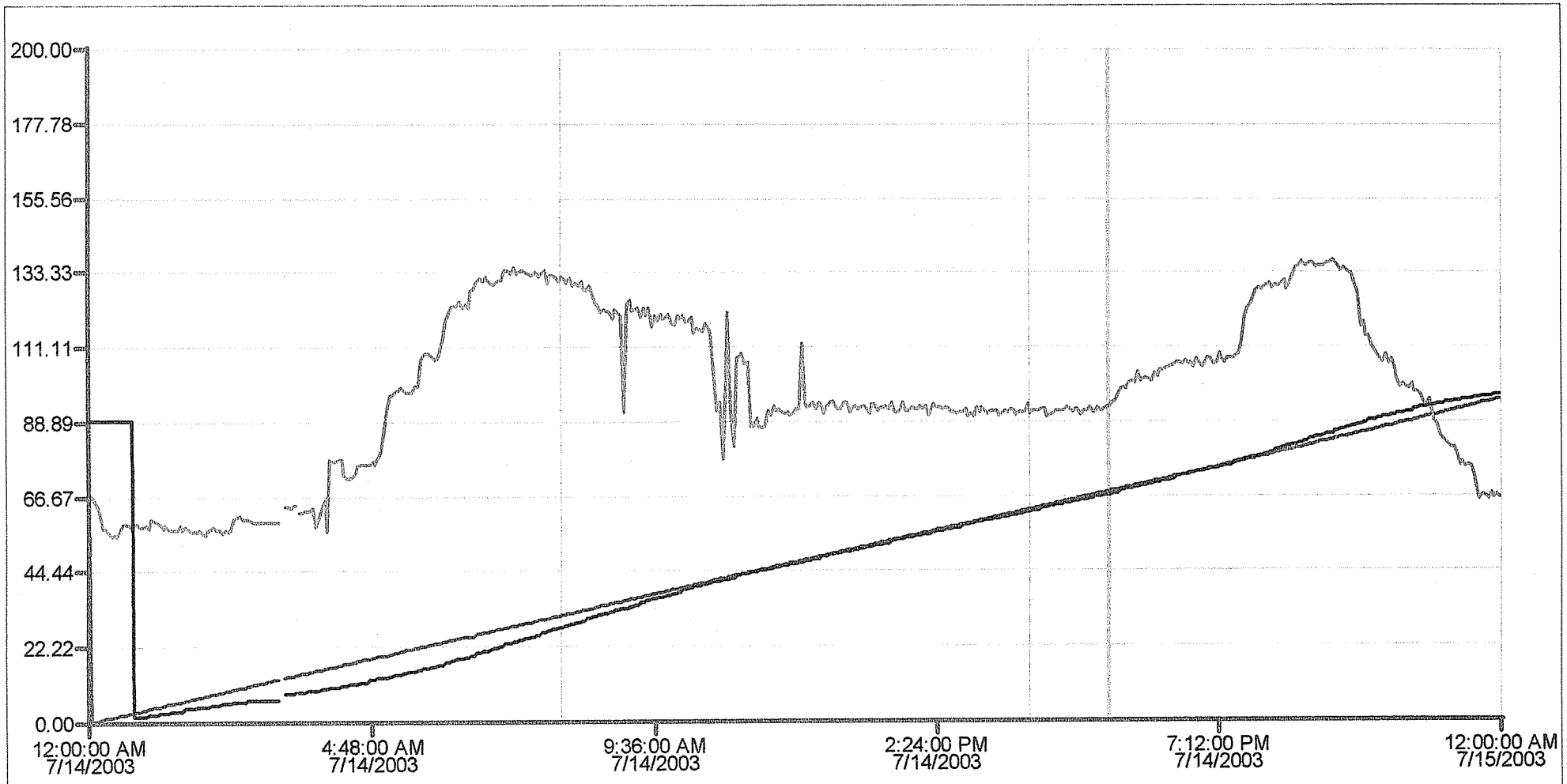


Hist.FIX.TFHPST.F_CV	HESS PUMP STA. TOTALIZER(macro)	61.46	mgd
Hist.FIX.'LP1A:TOTLPLNT.CURTDY.'.F_CV		61.60	
Hist.FIX.TFHPS.F_CV	TOTAL FLOW HESS	90.87	MGD

SCADA Menu

HESS TOTALIZER AND TOTAL PLANT FLOWS

Switch to Hess PLC Fiber Optic Link

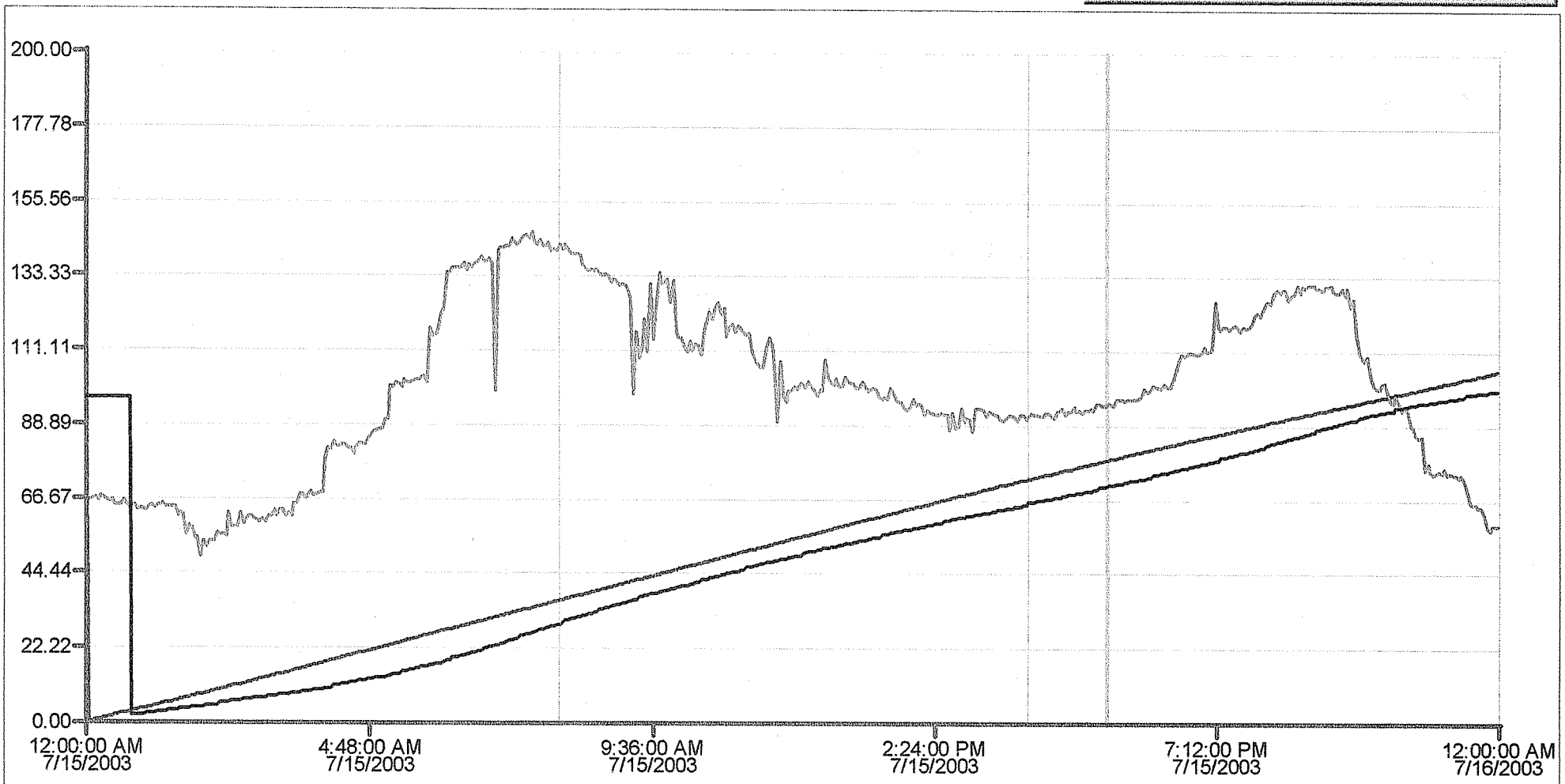


Hist.FIX.TFHPST.F_CV	HESS PUMP STA. TOTALIZER(macro)	67.13	mgd
Hist.FIX.'LP1A:TOTLPLNT.CURTDY.'.F_CV		67.87	
Hist.FIX.TFHPS.F_CV	TOTAL FLOW HESS	93.32	MGD

SCADA Menu

HESS TOTALIZER AND TOTAL LANT FLOWS

Switch to Hess PLC Fiber Op. Link

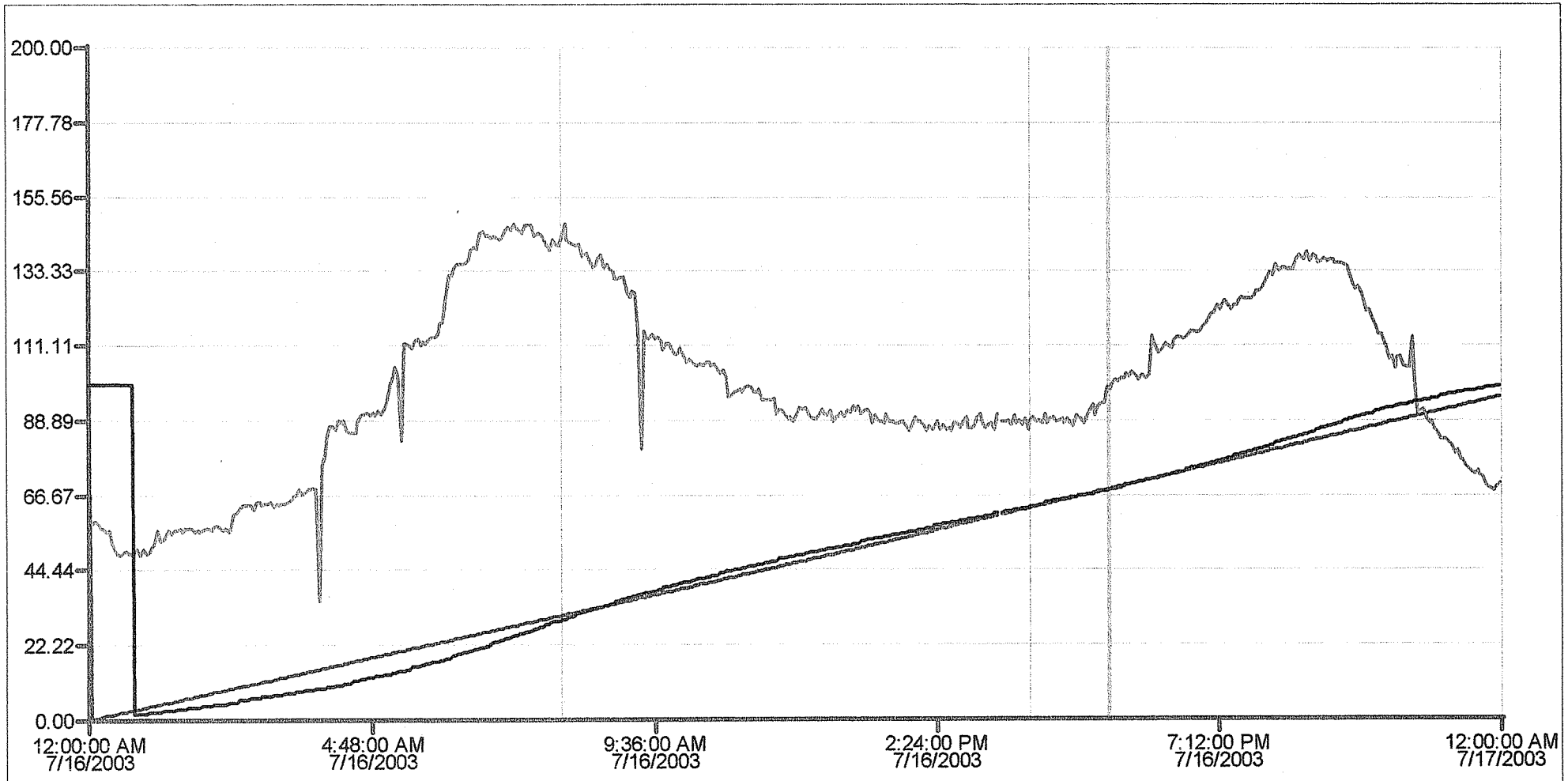


Hist.FIX.TFHPST.F_CV	HESS PUMP STA. TOTALIZER(macro)	70.70	mgd
Hist.FIX.'LP1A:TOTLPLNT.CURTDY.'.F_CV		78.57	
Hist.FIX.TFHPS.F_CV	TOTAL FLOW HESS	95.26	MGD

SCADA Menu

HESS TOTALIZER AND TOTAL PLANT FLOWS

Switch to Hess PLC Fiber Optic Link

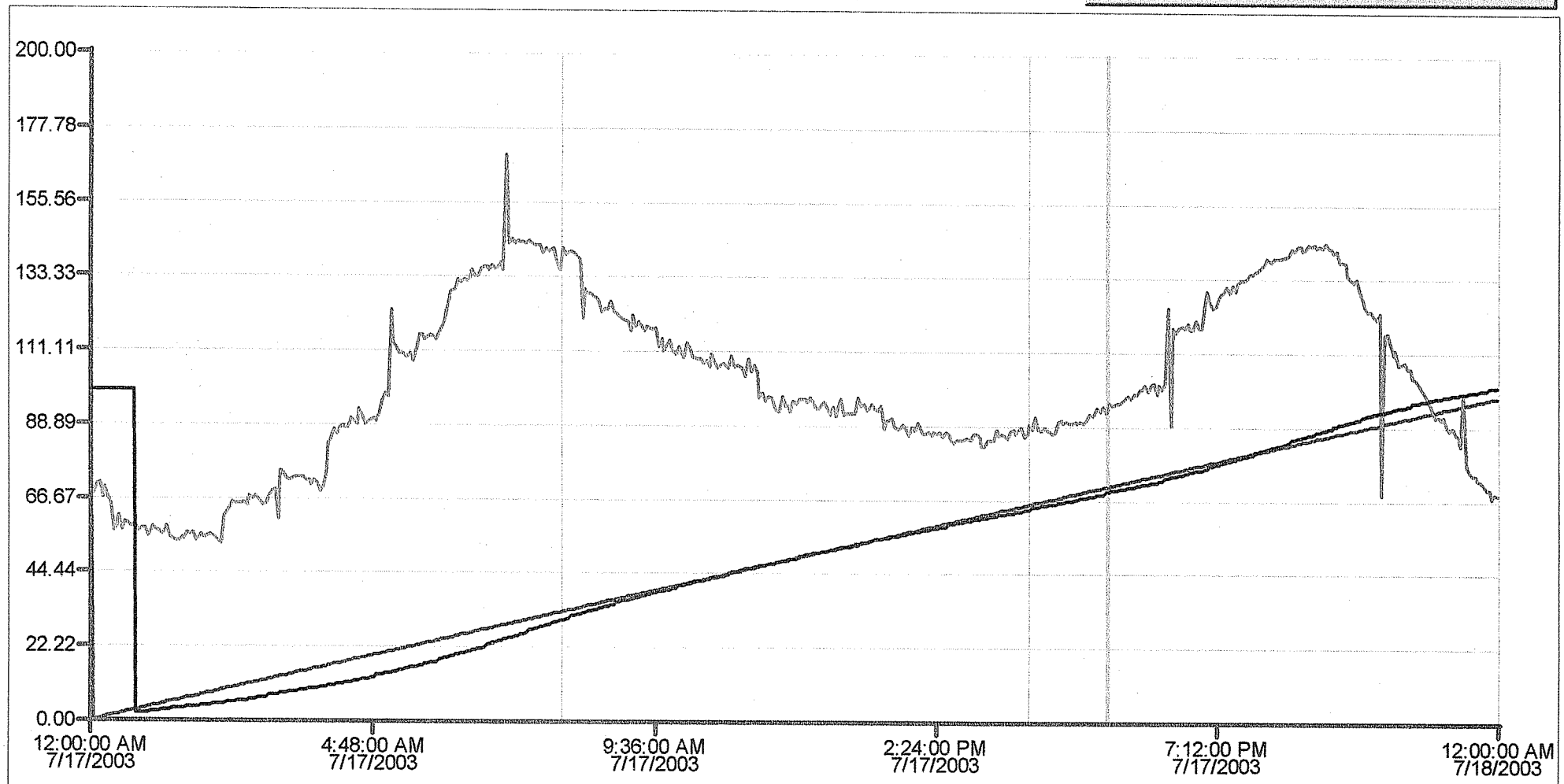


Hist.FIX.TFHPST.F_CV	HESS PUMP STA. TOTALIZER(macro)	68.20	mgd
Hist.FIX.'LP1A:TOTLPLNT.CURTDY.'.F_CV		68.38	
Hist.FIX.TFHPS.F_CV	TOTAL FLOW HESS	98.37	MGD

SCADA Menu

HESS TOTALIZER AND TOTAL LANT FLOWS

Switch to Hess PLC Fiber Op Link

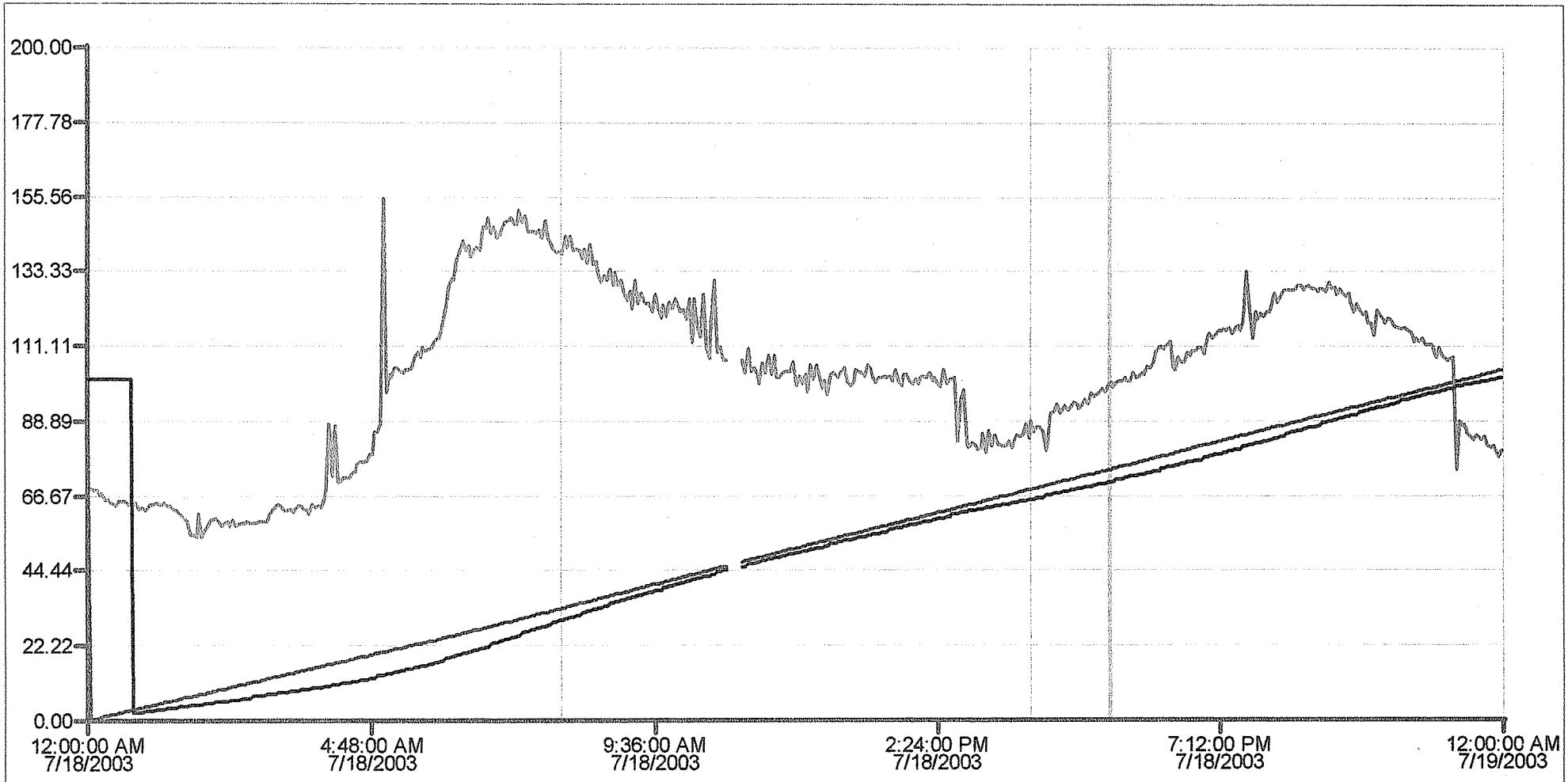


Hist.FIX.TFHPST.F_CV	HESS PUMP STA. TOTALIZER(macro)	69.05	mgd
Hist.FIX.'LP1A:TOTLPLNT.CURTDY.'.F_CV		70.79	
Hist.FIX.TFHPS.F_CV	TOTAL FLOW HESS	94.24	MGD

SCADA Menu

HESS TOTALIZER AND TOTAL PLANT FLOWS

Switch to Hess PLC Fiber Optic Link



Hist.FIX.TFHPST.F_CV	HESS PUMP STA. TOTALIZER(macro)	70.85	mgd
Hist.FIX.'LP1A:TOTLPLNT.CURTDY.'.F_CV		74.38	
Hist.FIX.TFHPS.F_CV	TOTAL FLOW HESS	99.83	MGD

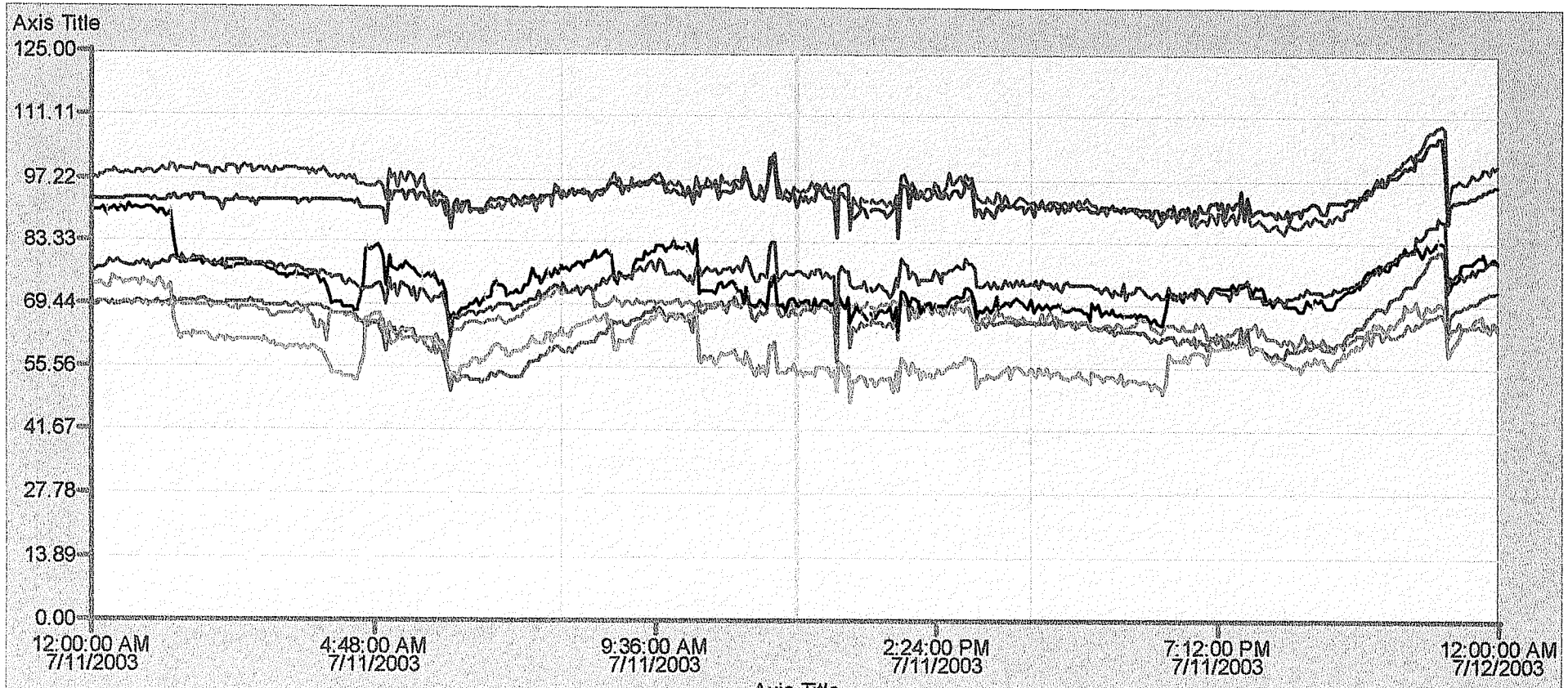
SCADA Menu

System Pressures

37TH ST PS

WEBB RD PS

Central and Main	13th & Tyler	Kellog & Webb	Sen & Mac	34TH ST & WEBB RD	Harry & Gov East	Harry & Gov Hess
89.9	65.4	63.2	90.6	73.3	76.9	73.1



Hist.FIX.DTNPS.F_CV	SYSTEM PRESSURE CENTRAL & MAIN	91.91	
Hist.FIX.tylps.F_CV	SYSTEM PRESSURE 13TH & TYLER	67.44	PSI
Hist.FIX.kelps.F_CV	SYSTEM PRESSURE KELLOGG & WEBB	54.76	PSI
Hist.FIX.senps.F_CV	SYSTEM PRESSURE SENECA & MACARTHUR	95.17	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	68.78	PSI
Hist.FIX.HGEPS.F_CV	SYSTEM PRESSURE HARRY & GOV EAST	69.68	PSI
Hist.FIX.HGHPS.F_CV	SYSTEM PRESSURE HARRY & GOV HESS	76.69	PSI

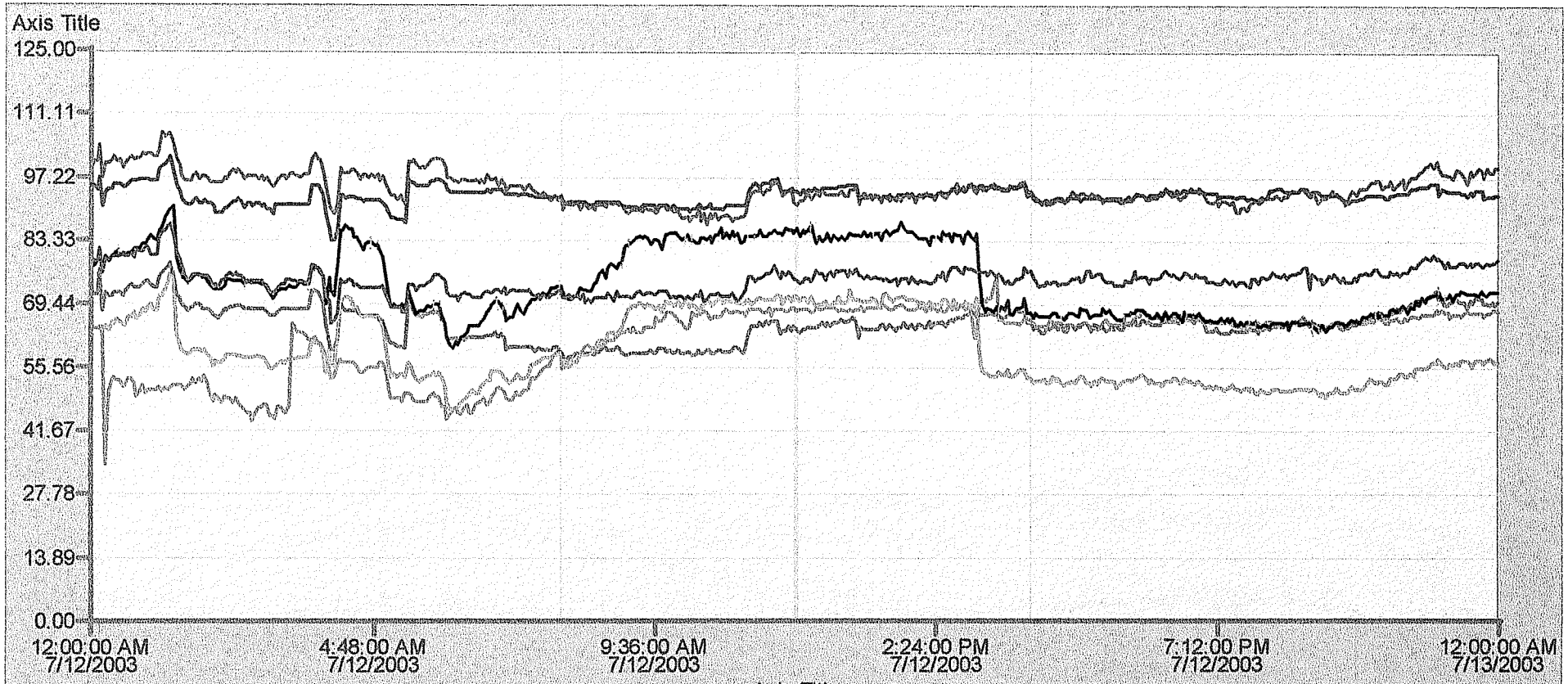
SCADA Menu

System Pressures

37TH ST PS

WEBB RD PS

Central and Main	13th & Tyler	Kellog & Webb	Sen & Mac	34TH ST & WEBB RD	Harry & Gov East	Harry & Gov Hess
88.9	65.8	62.8	90.0	73.7	77.0	72.6



Hist.FIX.DTNPS.F_CV	SYSTEM PRESSURE CENTRAL & MAIN	94.41	
Hist.FIX.tylps.F_CV	SYSTEM PRESSURE 13TH & TYLER	64.24	PSI
Hist.FIX.kelps.F_CV	SYSTEM PRESSURE KELLOGG & WEBB	71.23	PSI
Hist.FIX.senps.F_CV	SYSTEM PRESSURE SENECA & MACARTHUR	91.39	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	68.16	PSI
Hist.FIX.HGEPS.F_CV	SYSTEM PRESSURE HARRY & GOV EAST	85.71	PSI
Hist.FIX.HGHPS.F_CV	SYSTEM PRESSURE HARRY & GOV HESS	74.92	PSI

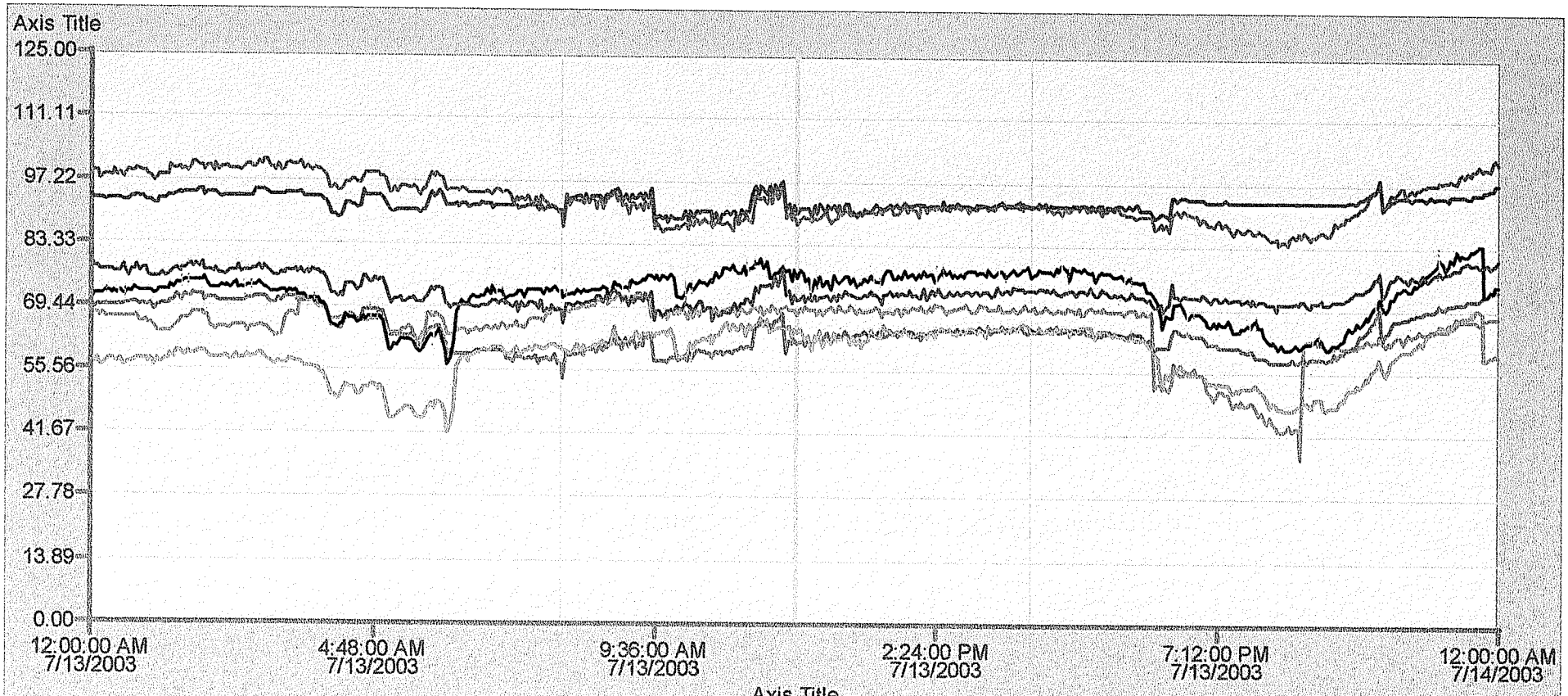
SCADA Menu

System Pressures

37TH ST P

WEBB RD PS

Central and Main	13th & Tyler	Kellog & Webb	Sen & Mac	34TH ST & WEBB RD	Harry & Gov East	Harry & Gov Hess
88.9	65.7	62.7	90.7	73.9	77.0	72.9



Hist.FIX.DTNPS.F_CV	SYSTEM PRESSURE CENTRAL & MAIN	90.92	
Hist.FIX.tylps.F_CV	SYSTEM PRESSURE 13TH & TYLER	61.87	PSI
Hist.FIX.kelps.F_CV	SYSTEM PRESSURE KELLOGG & WEBB	64.34	PSI
Hist.FIX.senps.F_CV	SYSTEM PRESSURE SENECA & MACARTHUR	88.45	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	68.30	PSI
Hist.FIX.HGEPS.F_CV	SYSTEM PRESSURE HARRY & GOV EAST	76.70	PSI
Hist.FIX.HGHPS.F_CV	SYSTEM PRESSURE HARRY & GOV HESS	71.40	PSI

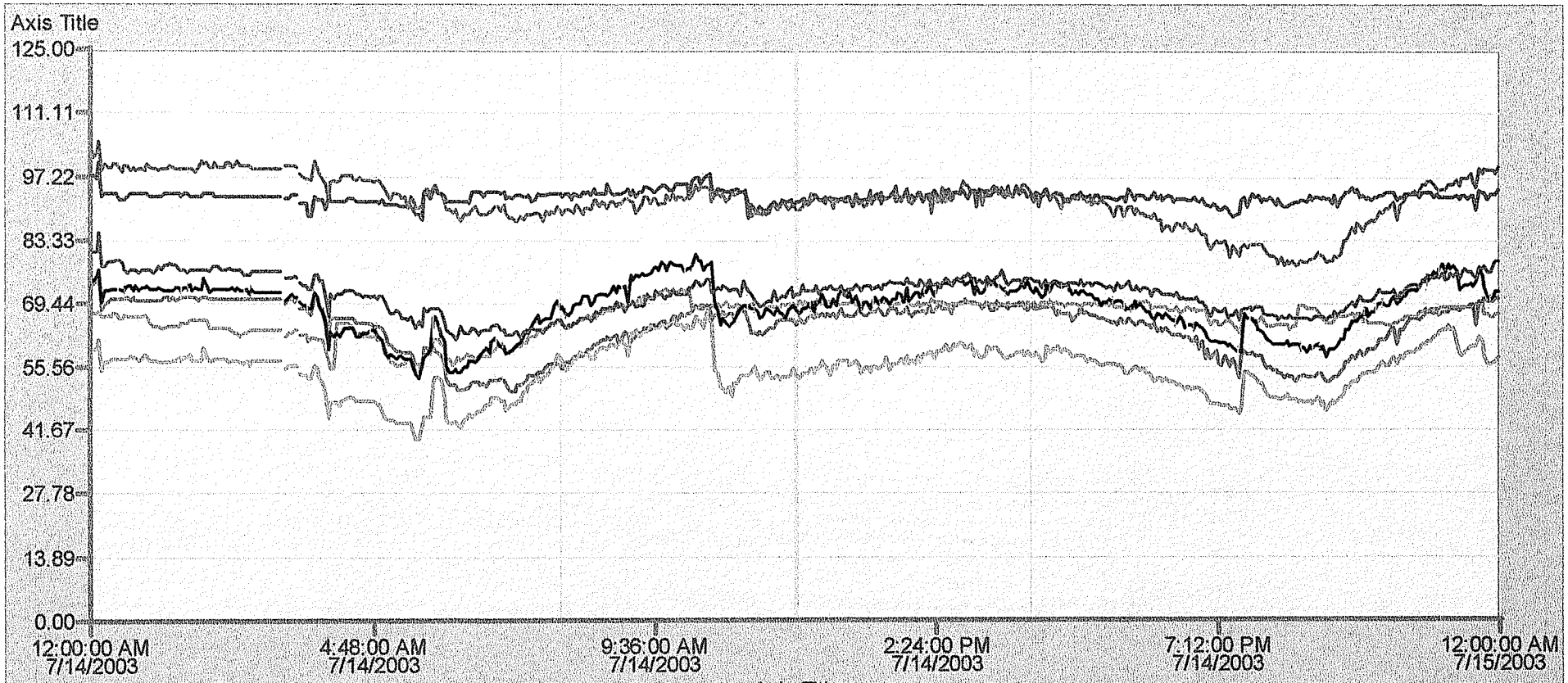
SCADA Menu

System Pressures

37TH ST PS

WEBB RD PS

Central and Main	13th & Tyler	Kellog & Webb	Sen & Mac	34TH ST & WEBB RD	Harry & Gov East	Harry & Gov Hess
89.1	65.7	63.8	90.8	74.0	76.7	72.0



Hist.FIX.DTNPS.F_CV	SYSTEM PRESSURE CENTRAL & MAIN	91.51	
Hist.FIX.tylps.F_CV	SYSTEM PRESSURE 13TH & TYLER	65.17	PSI
Hist.FIX.kelps.F_CV	SYSTEM PRESSURE KELLOGG & WEBB	54.25	PSI
Hist.FIX.senps.F_CV	SYSTEM PRESSURE SENECA & MACARTHUR	90.30	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	68.95	PSI
Hist.FIX.HGEPS.F_CV	SYSTEM PRESSURE HARRY & GOV EAST	68.25	PSI
Hist.FIX.HGHPS.F_CV	SYSTEM PRESSURE HARRY & GOV HESS	71.42	PSI

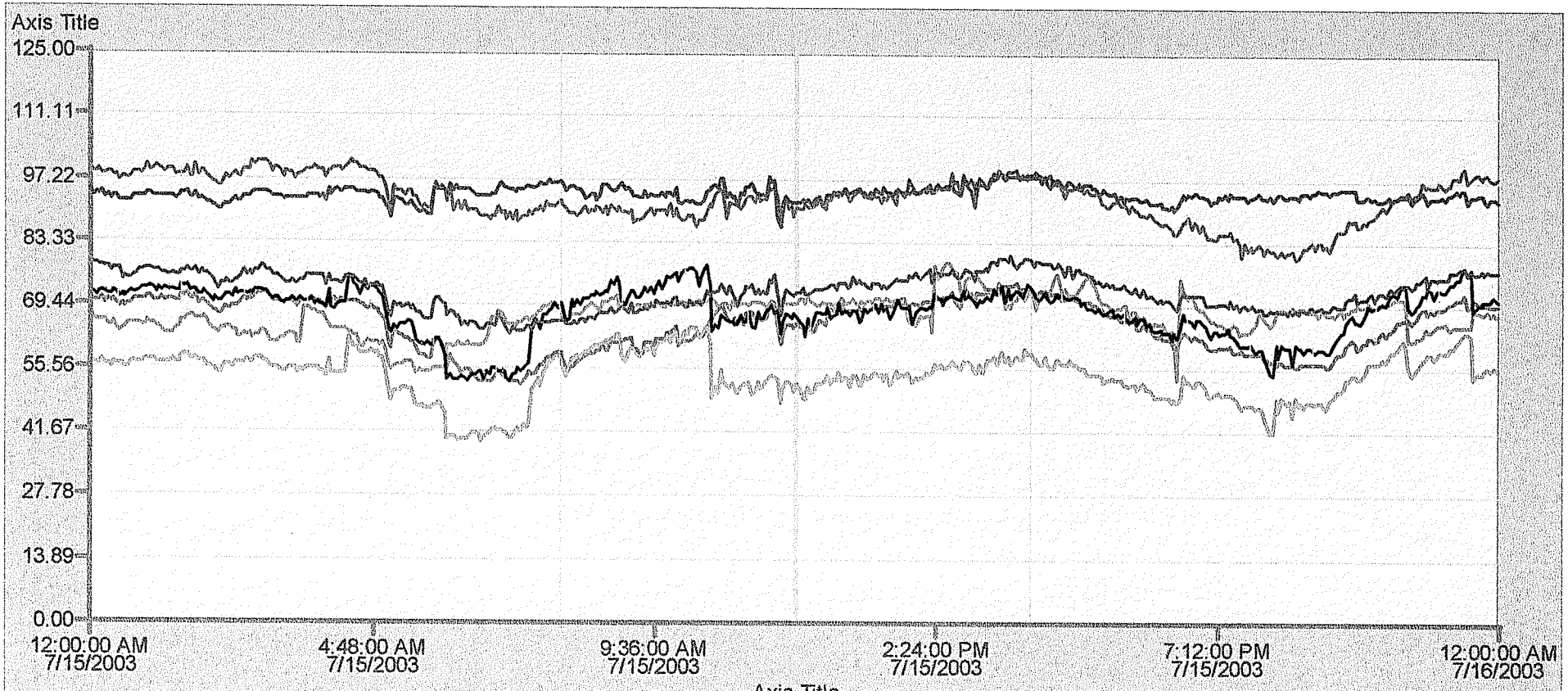
SCADA Menu

System Pressures

37TH ST P

WEBB RD PS

Central and Main	13th & Tyler	Kellog & Webb	Sen & Mac	34TH ST & WEBB RD	Harry & Gov East	Harry & Gov Hess
90.8	65.9	63.2	91.3	73.5	77.3	71.9



Hist.FIX.DTNPS.F_CV	SYSTEM PRESSURE CENTRAL & MAIN	92.19	
Hist.FIX.tylps.F_CV	SYSTEM PRESSURE 13TH & TYLER	65.17	PSI
Hist.FIX.kelps.F_CV	SYSTEM PRESSURE KELLOGG & WEBB	52.00	PSI
Hist.FIX.senps.F_CV	SYSTEM PRESSURE SENECA & MACARTHUR	90.46	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	69.96	PSI
Hist.FIX.HGEPS.F_CV	SYSTEM PRESSURE HARRY & GOV EAST	67.21	PSI
Hist.FIX.HGHPS.F_CV	SYSTEM PRESSURE HARRY & GOV HESS	72.03	PSI

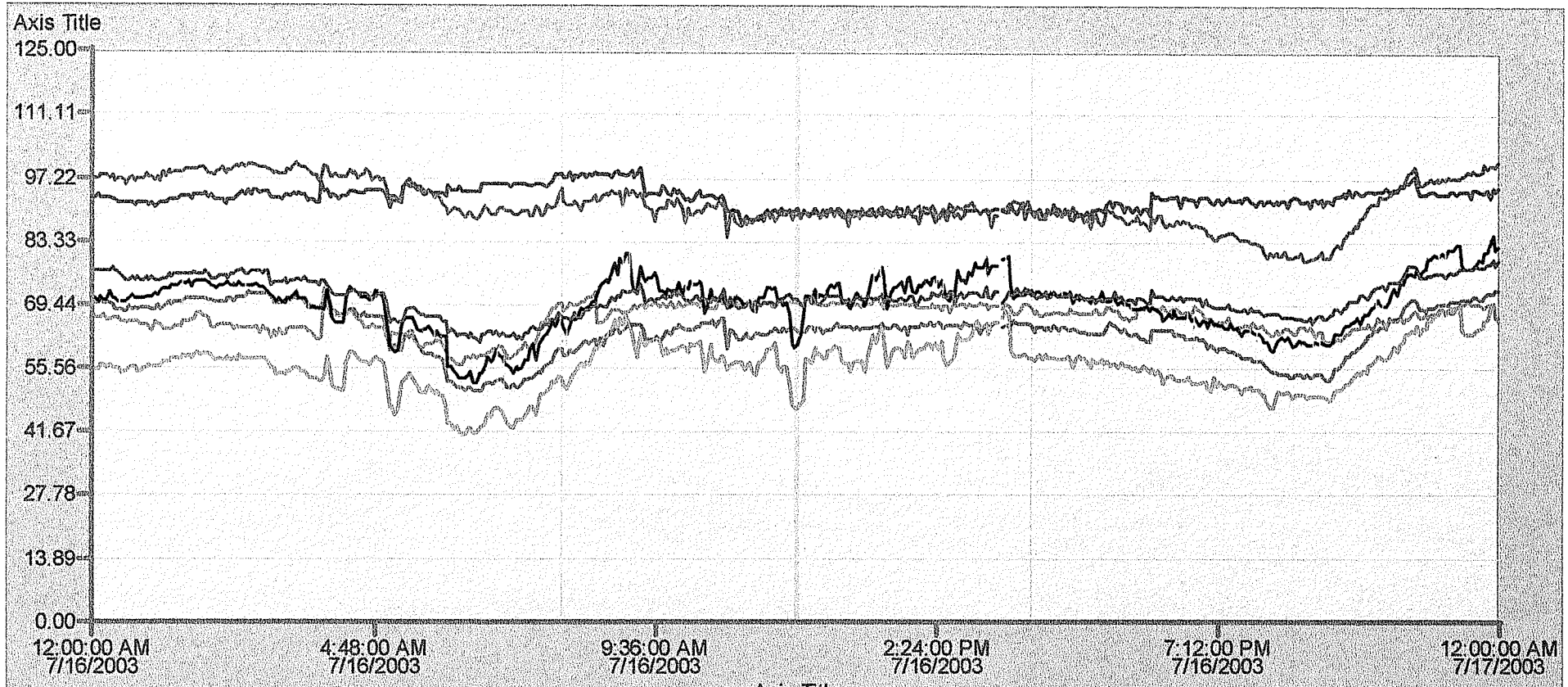
SCADA Menu

System Pressures

37TH ST PS

WEBB RD PS

Central and Main	13th & Tyler	Kellog & Webb	Sen & Mac	34TH ST & WEBB RD	Harry & Gov East	Harry & Gov Hess
89.9	67.0	63.0	90.0	74.2	77.1	73.9



Hist.FIX.DTNPS.F_CV	SYSTEM PRESSURE CENTRAL & MAIN	90.52	
Hist.FIX.tylps.F_CV	SYSTEM PRESSURE 13TH & TYLER	64.00	PSI
Hist.FIX.keips.F_CV	SYSTEM PRESSURE KELLOGG & WEBB	46.77	PSI
Hist.FIX.senps.F_CV	SYSTEM PRESSURE SENECA & MACARTHUR	89.41	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	70.18	PSI
Hist.FIX.HGEPS.F_CV	SYSTEM PRESSURE HARRY & GOV EAST	60.71	PSI
Hist.FIX.HGHPS.F_CV	SYSTEM PRESSURE HARRY & GOV HESS	70.73	PSI

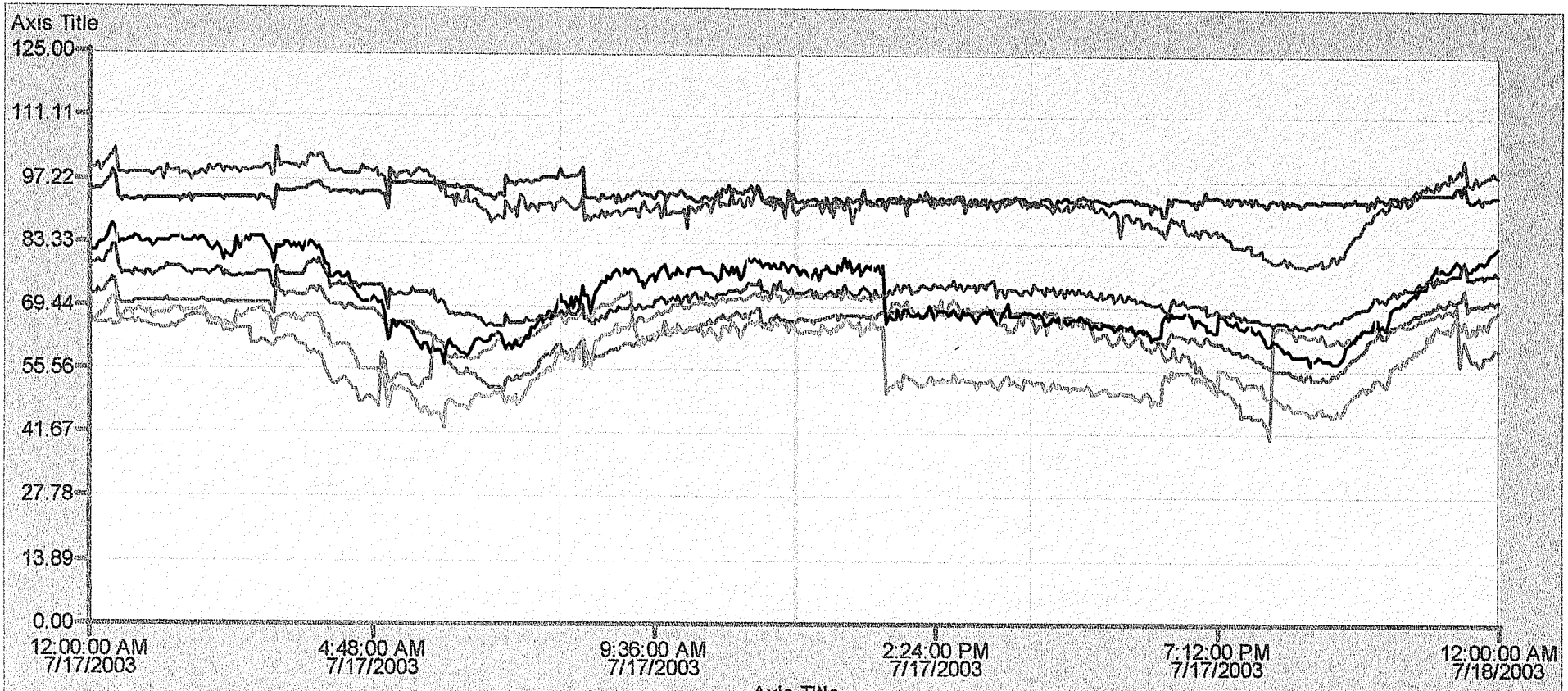
SCADA Menu

System Pressures

37TH ST P

WEBB RD PS

Central and Main	13th & Tyler	Kellog & Webb	Sen & Mac	34TH ST & WEBB RD	Harry & Gov East	Harry & Gov Hess
90.9	64.7	63.9	91.3	73.1	77.2	71.7



Hist.FIX.DTNPS.F_CV	SYSTEM PRESSURE CENTRAL & MAIN	92.98	
Hist.FIX.tylps.F_CV	SYSTEM PRESSURE 13TH & TYLER	66.33	PSI
Hist.FIX.kelps.F_CV	SYSTEM PRESSURE KELLOGG & WEBB	64.69	PSI
Hist.FIX.senps.F_CV	SYSTEM PRESSURE SENECA & MACARTHUR	89.94	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	72.05	PSI
Hist.FIX.HGEPS.F_CV	SYSTEM PRESSURE HARRY & GOV EAST	78.35	PSI
Hist.FIX.HGHPS.F_CV	SYSTEM PRESSURE HARRY & GOV HESS	72.65	PSI

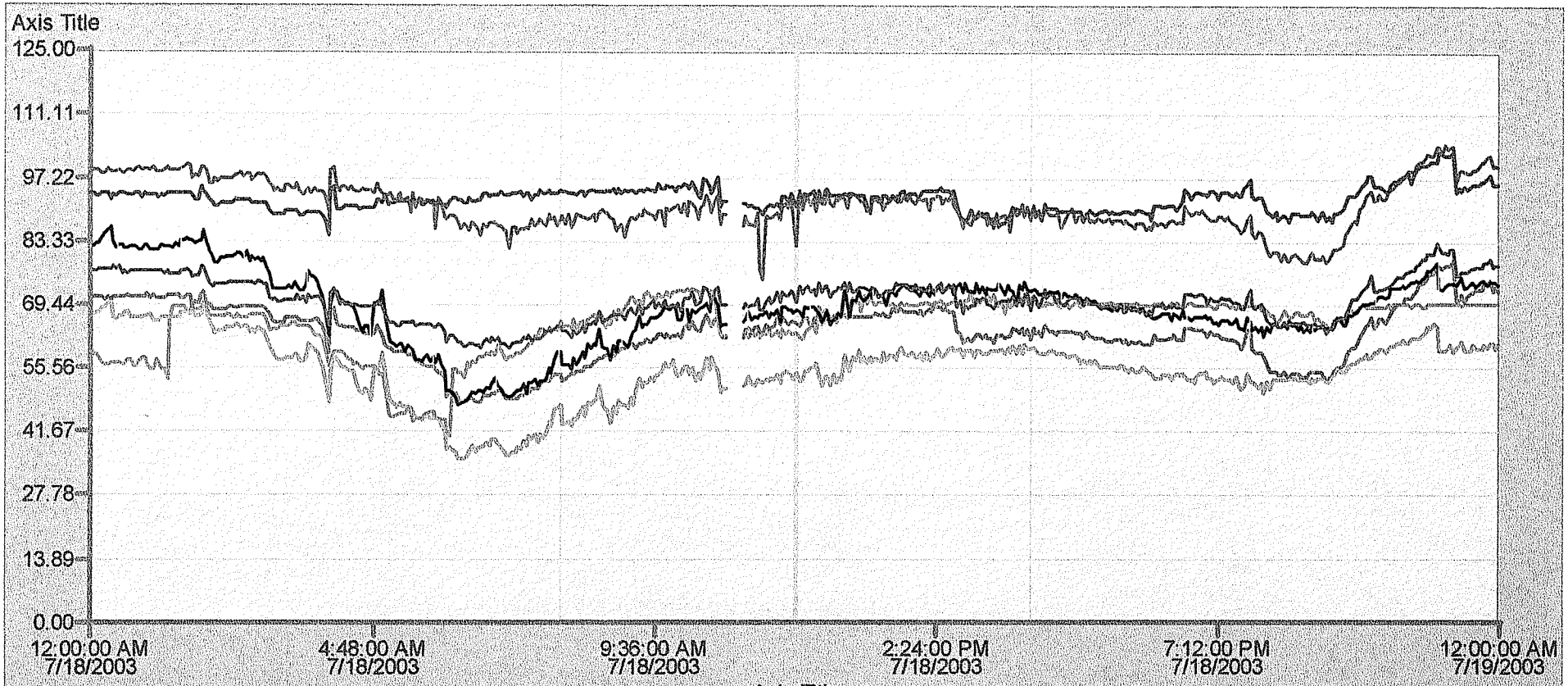
SCADA Menu

System Pressures

37TH ST PS

WEBB RD PS

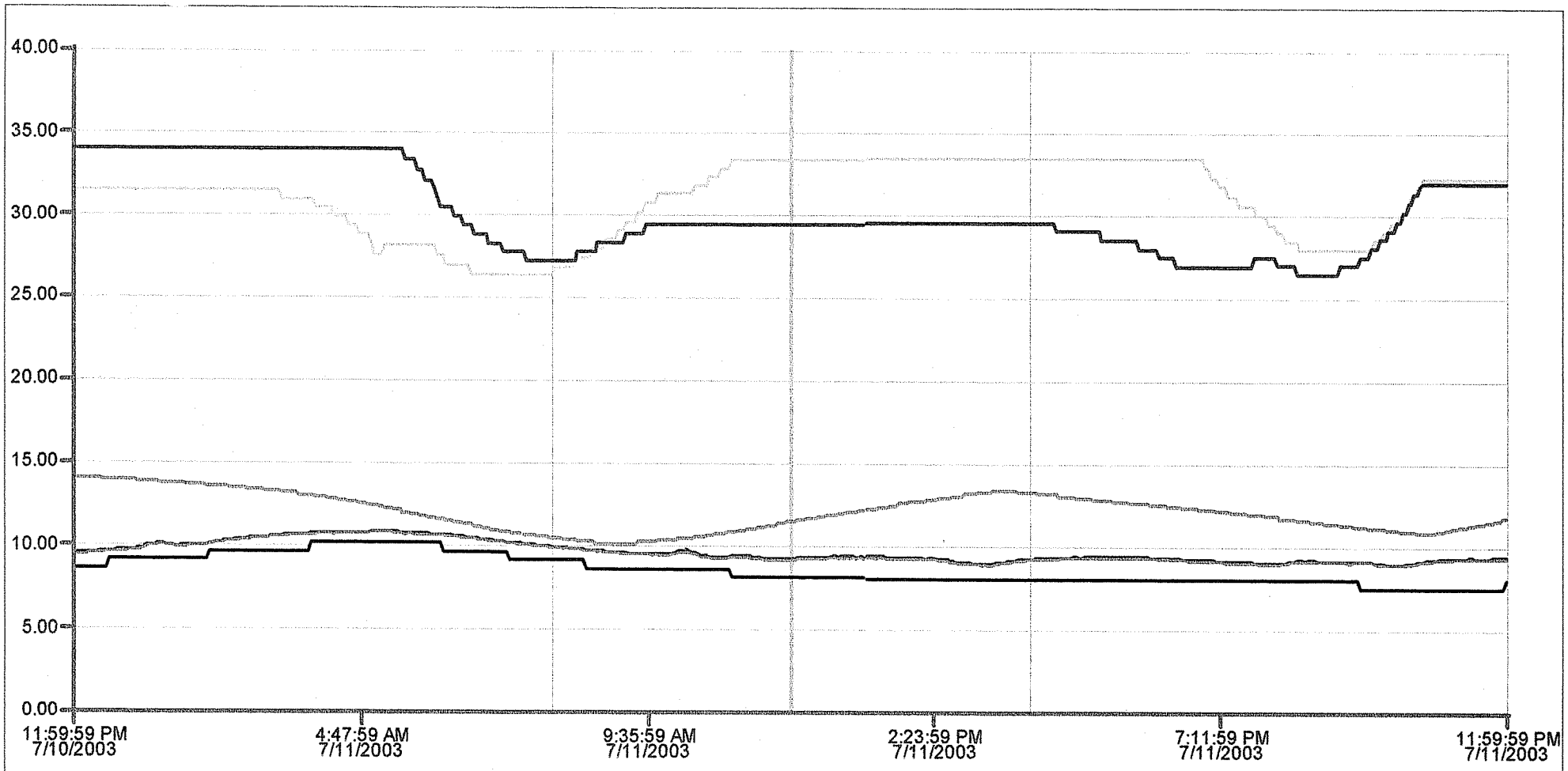
Central and Main	13th & Tyler	Kellog & Webb	Sen & Mac	34TH ST & WEBB RD	Harry & Gov East	Harry & Gov Hess
90.3	65.8	63.4	89.9	73.2	77.1	72.3



Hist.FIX.DTNPS.F_CV	SYSTEM PRESSURE CENTRAL & MAIN	91.51	
Hist.FIX.tylps.F_CV	SYSTEM PRESSURE 13TH & TYLER	65.63	PSI
Hist.FIX.kelps.F_CV	SYSTEM PRESSURE KELLOGG & WEBB	54.06	PSI
Hist.FIX.senps.F_CV	SYSTEM PRESSURE SENECA & MACARTHUR	84.22	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	63.44	PSI
Hist.FIX.HGEPS.F_CV	SYSTEM PRESSURE HARRY & GOV EAST	68.14	PSI
Hist.FIX.HGHPS.F_CV	SYSTEM PRESSURE HARRY & GOV HESS	70.72	PSI

TREND MENU

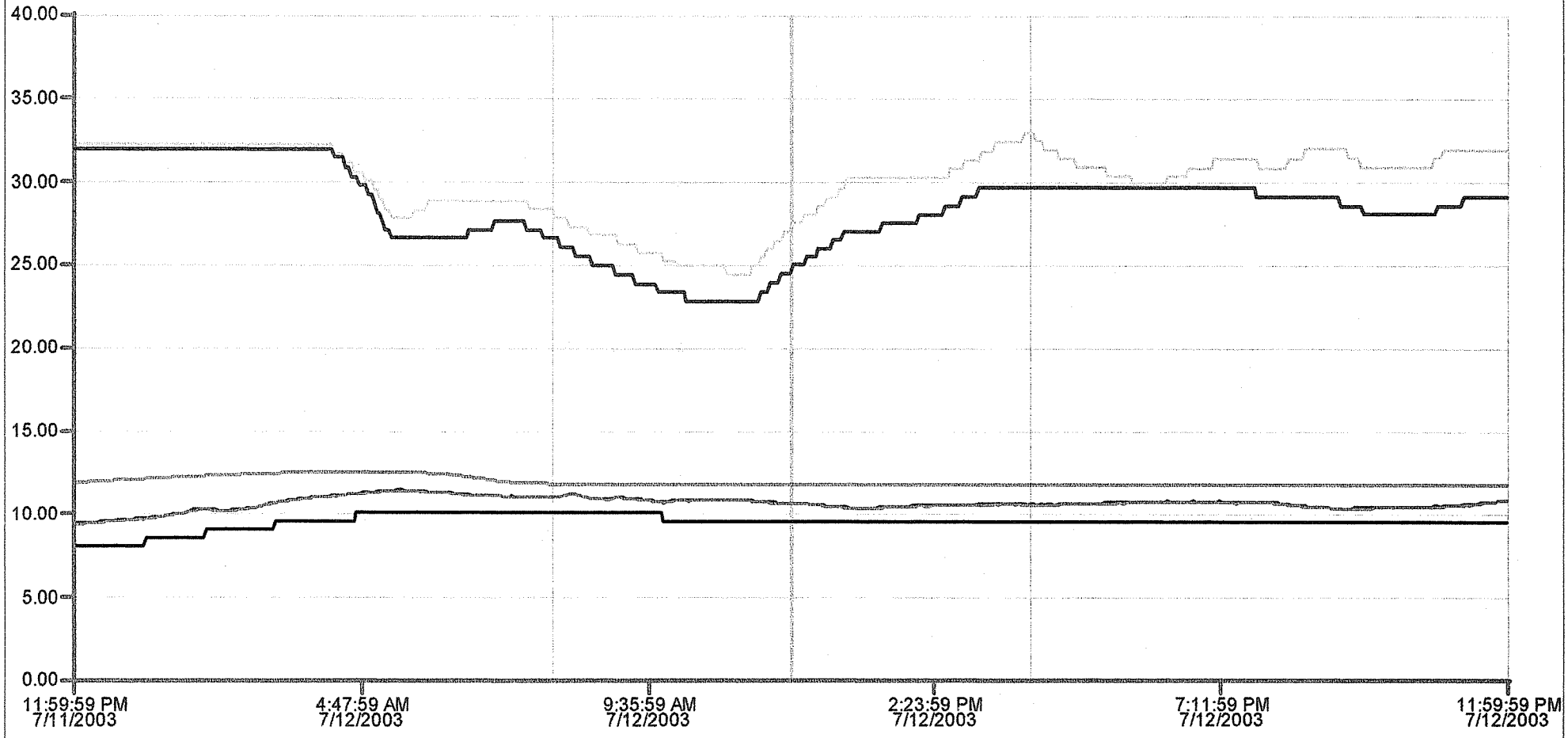
RADIO SYSTEM LEVELS



Hist.FIX.TKLWD.F_CV	Woodlawn Tank Level	29.44	FT
Hist.FIX.TKLRS.F_CV	Roosevelt Tank Level	33.38	FT
Hist.FIX.RLWWB.F_CV	Webb Road Reservoir Level	11.49	FT
Hist.FIX.'LP4A:LIT0417A.LEVEL.417'.F_CV	East Plant Clearwell	9.28	FT
Hist.FIX.'LP4A:LIT0417B.LEVEL.417'.F_CV	Central Plant Clearwell	9.18	FT
Hist.FIX.RESLV_FB.F_CV	Hess PS Reservoir Level	8.14	FT

TREND MENU

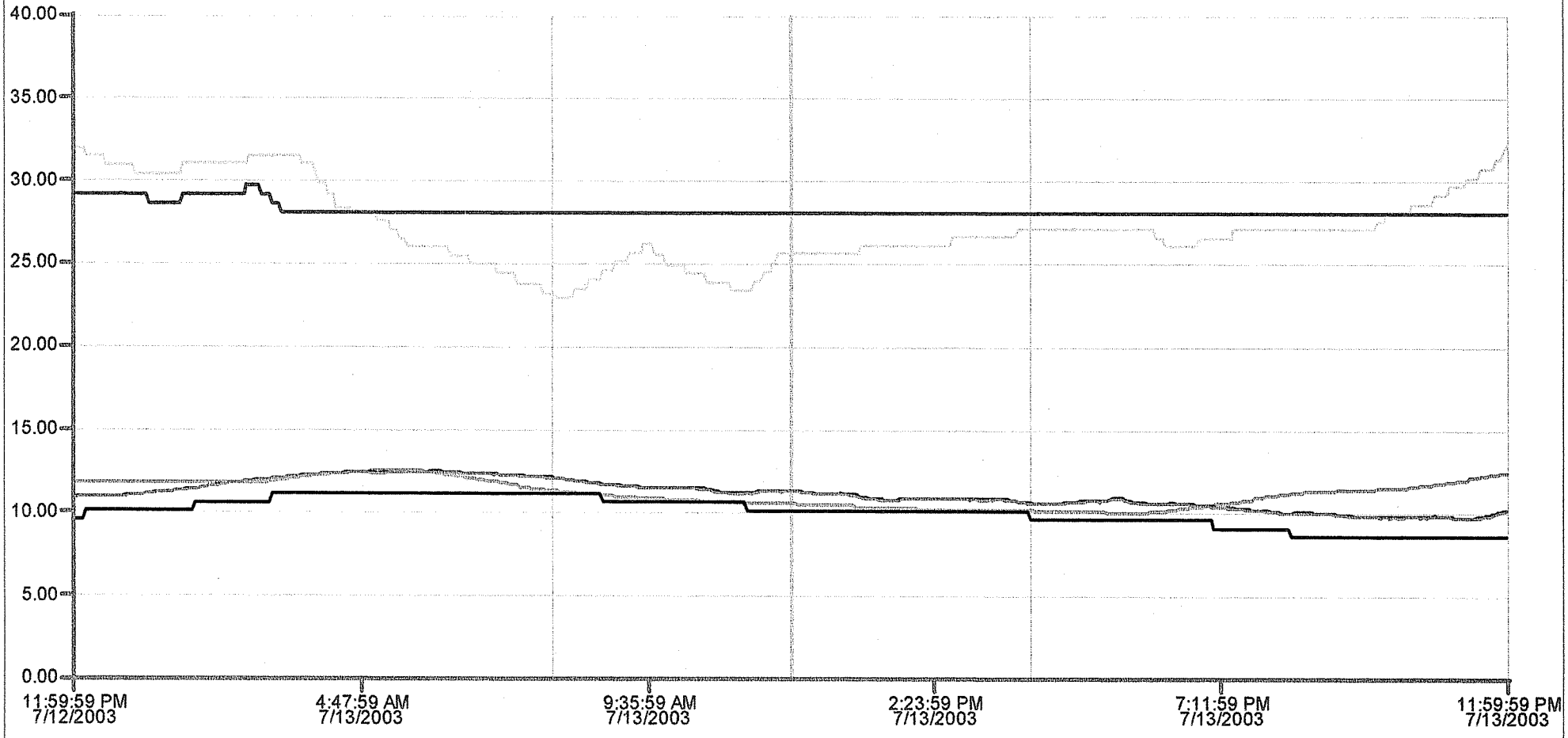
RADIO SYSTEM LEVELS



Hist.FIX.TKLWD.F_CV	Woodlawn Tank Level	24.92	FT
Hist.FIX.TKLRS.F_CV	Roosevelt Tank Level	27.41	FT
Hist.FIX.RLVWB.F_CV	Webb Road Reservoir Level	11.76	FT
Hist.FIX.'LP4A:LIT0417A.LEVEL.417'.F_CV	East Plant Clearwell	10.72	FT
Hist.FIX.'LP4A:LIT0417B.LEVEL.417'.F_CV	Central Plant Clearwell	10.70	FT
Hist.FIX.RESLV_FB.F_CV	Hess PS Reservoir Level	9.62	FT

TREND MENU

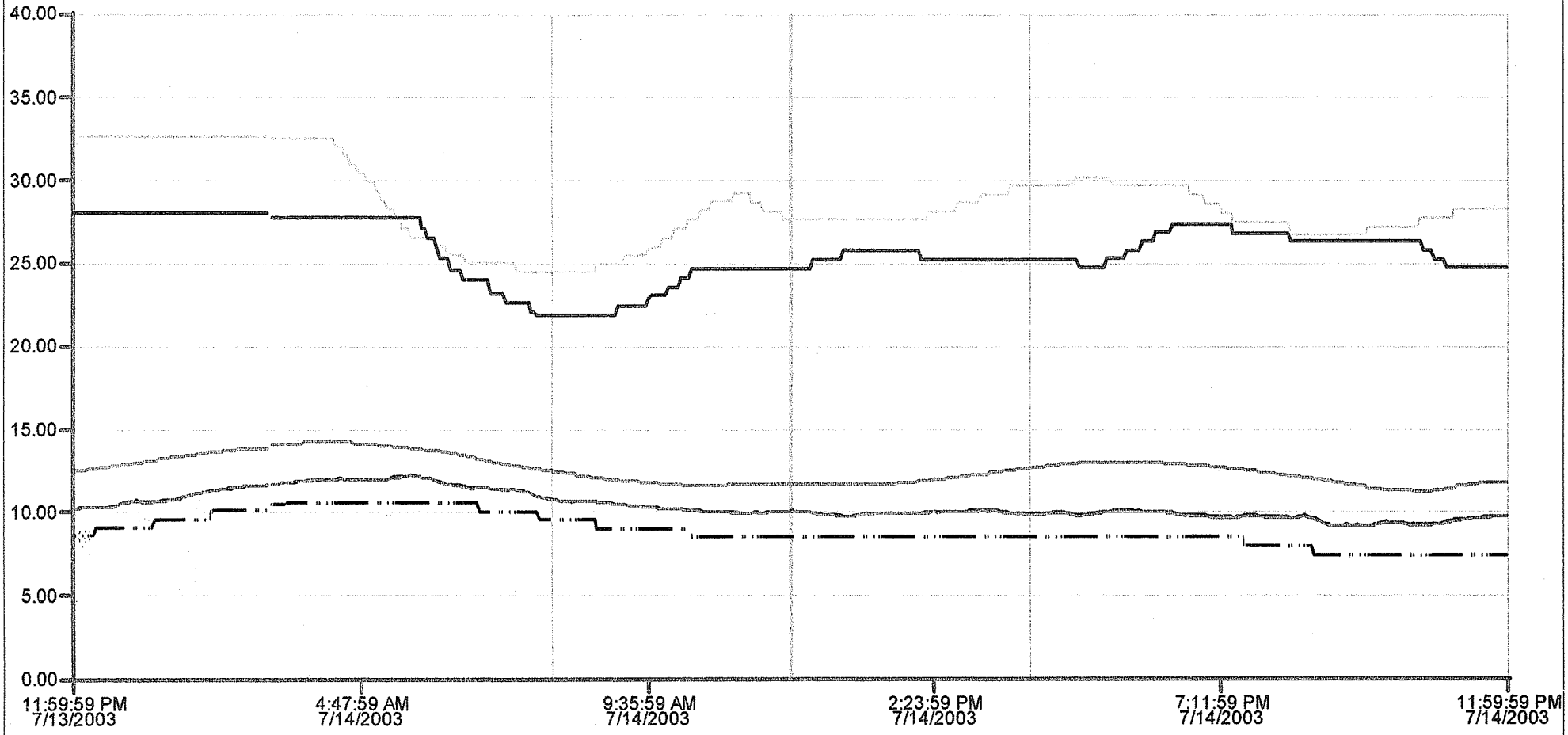
RADIO SYSTEM LEVELS



Hist.FIX.TKLWD.F_CV	Woodlawn Tank Level	28.11	FT
Hist.FIX.TKLRS.F_CV	Roosevelt Tank Level	25.62	FT
Hist.FIX.RLVWB.F_CV	Webb Road Reservoir Level	10.56	FT
Hist.FIX.'LP4A:LIT0417A.LEVEL.417'.F_CV	East Plant Clearwell	11.35	FT
Hist.FIX.'LP4A:LIT0417B.LEVEL.417'.F_CV	Central Plant Clearwell	11.31	FT
Hist.FIX.RESLV_FB.F_CV	Hess PS Reservoir Level	10.16	FT

TREND MENU

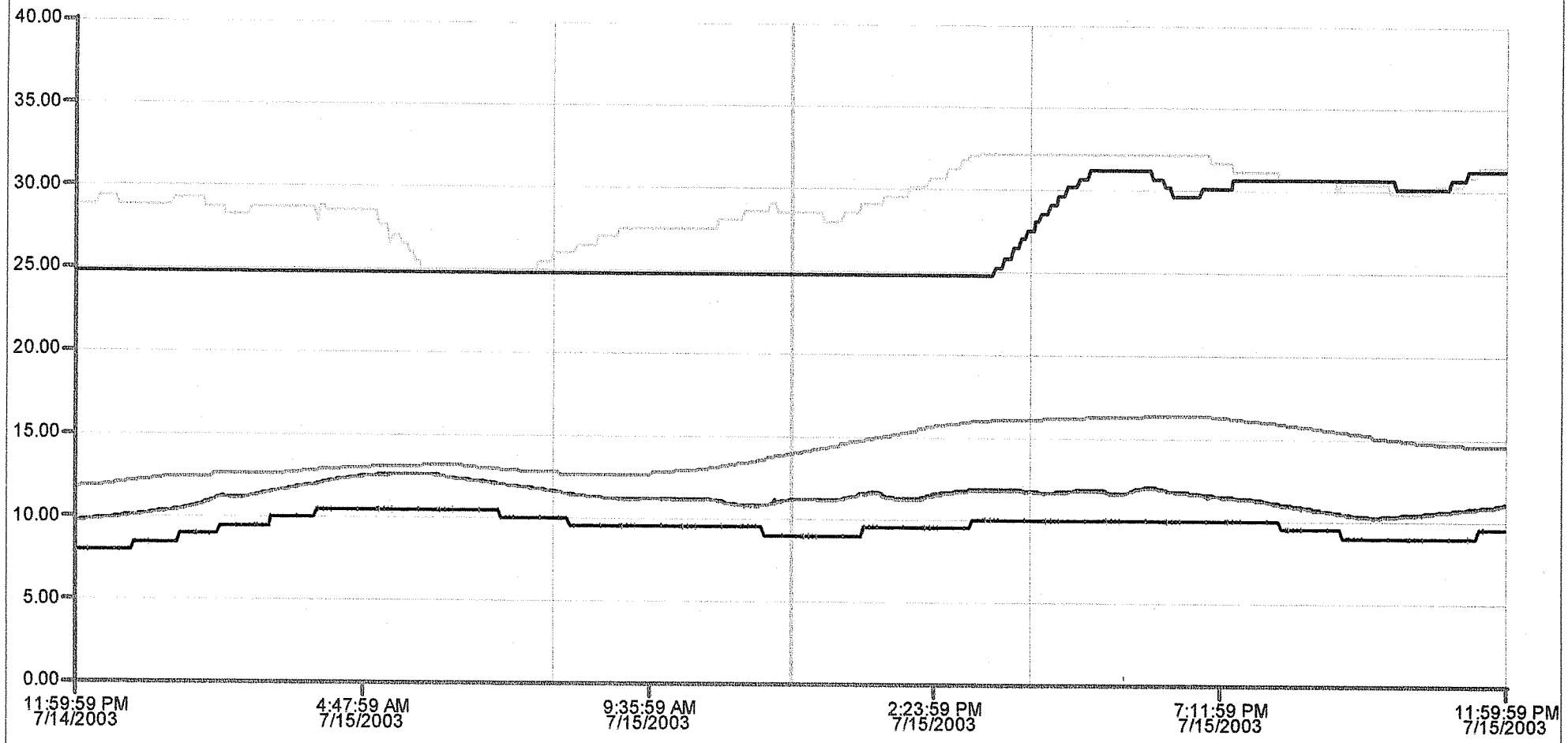
RADIO SYSTEM LEVELS



Hist.FIX.TKLWD.F_CV	Woodlawn Tank Level	24.71	FT
Hist.FIX.TKLRS.F_CV	Roosevelt Tank Level	27.66	FT
Hist.FIX.RLWWB.F_CV	Webb Road Reservoir Level	11.71	FT
Hist.FIX.'LP4A:LIT0417A.LEVEL.417'.F_CV	East Plant Clearwell	10.08	FT
Hist.FIX.'LP4A:LIT0417B.LEVEL.417'.F_CV	Central Plant Clearwell	10.06	FT
Hist.FIX.RESL[illegible]_FB.F_CV	Ross P[illegible] Reservoir Level	11.51	FT

TREND MENU

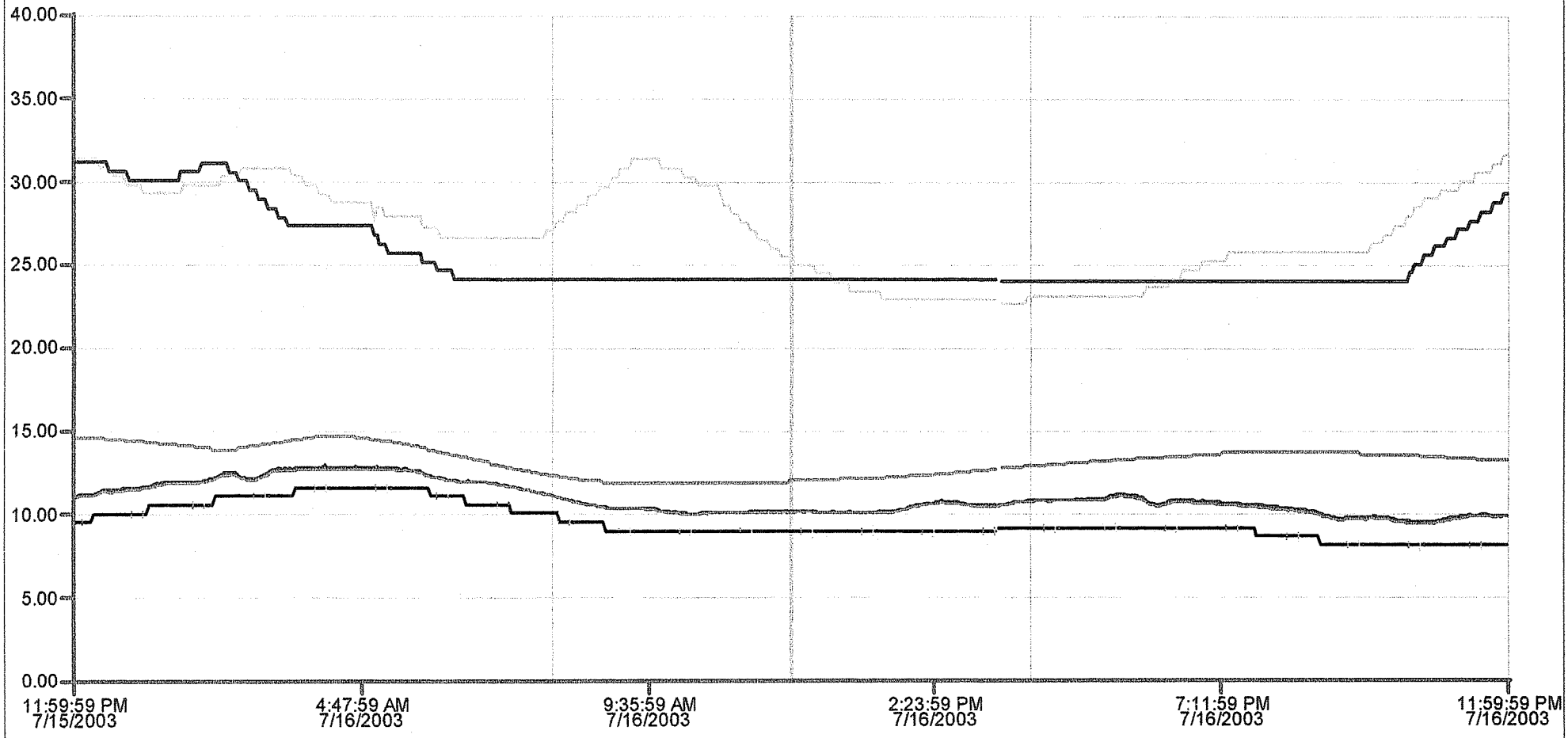
RADIO SYSTEM LEVELS



Hist.FIX.TKLWD.F_CV	Woodlawn Tank Level	24.77	FT
Hist.FIX.TKLRS.F_CV	Roosevelt Tank Level	28.51	FT
Hist.FIX.RLWWB.F_CV	Webb Road Reservoir Level	13.93	FT
Hist.FIX.'LP4A:LIT0417A.LEVEL.417'.F_CV	East Plant Clearwell	11.23	FT
Hist.FIX.'LP4A:LIT0417B.LEVEL.417'.F_CV	Central Plant Clearwell	11.18	FT
Hist.FIX.RESLV_FB.F_CV	Hess PS Reservoir Level	9.01	FT

TREND MENU

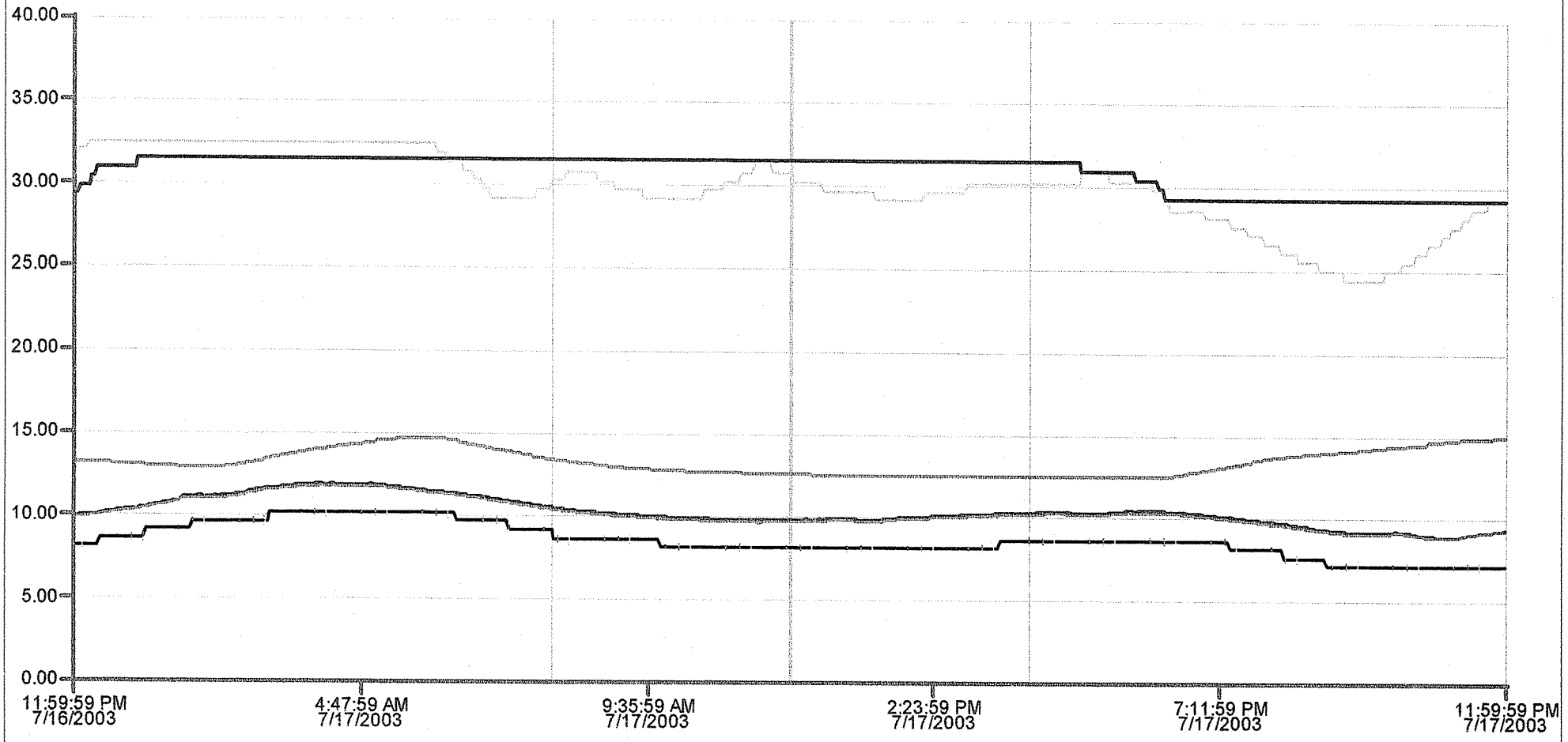
RADIO SYSTEM LEVELS



Hist.FIX.TKLWD.F_CV	**Woodlawn Tank Level**	24.15	FT
Hist.FIX.TKLRS.F_CV	Roosevelt Tank Level	25.52	FT
Hist.FIX.RLVWB.F_CV	Webb Road Reservoir Level	12.04	FT
Hist.FIX.'LP4A:LIT0417A.LEVEL.417'.F_CV	**East Plant Clearwell**	10.19	FT
Hist.FIX.'LP4A:LIT0417B.LEVEL.417'.F_CV	Central Plant Clearwell	10.16	FT
Hist.FIX.RESLV_FB.F_CV	**Hess PS Reservoir Level**	9.05	FT

TREND MENU

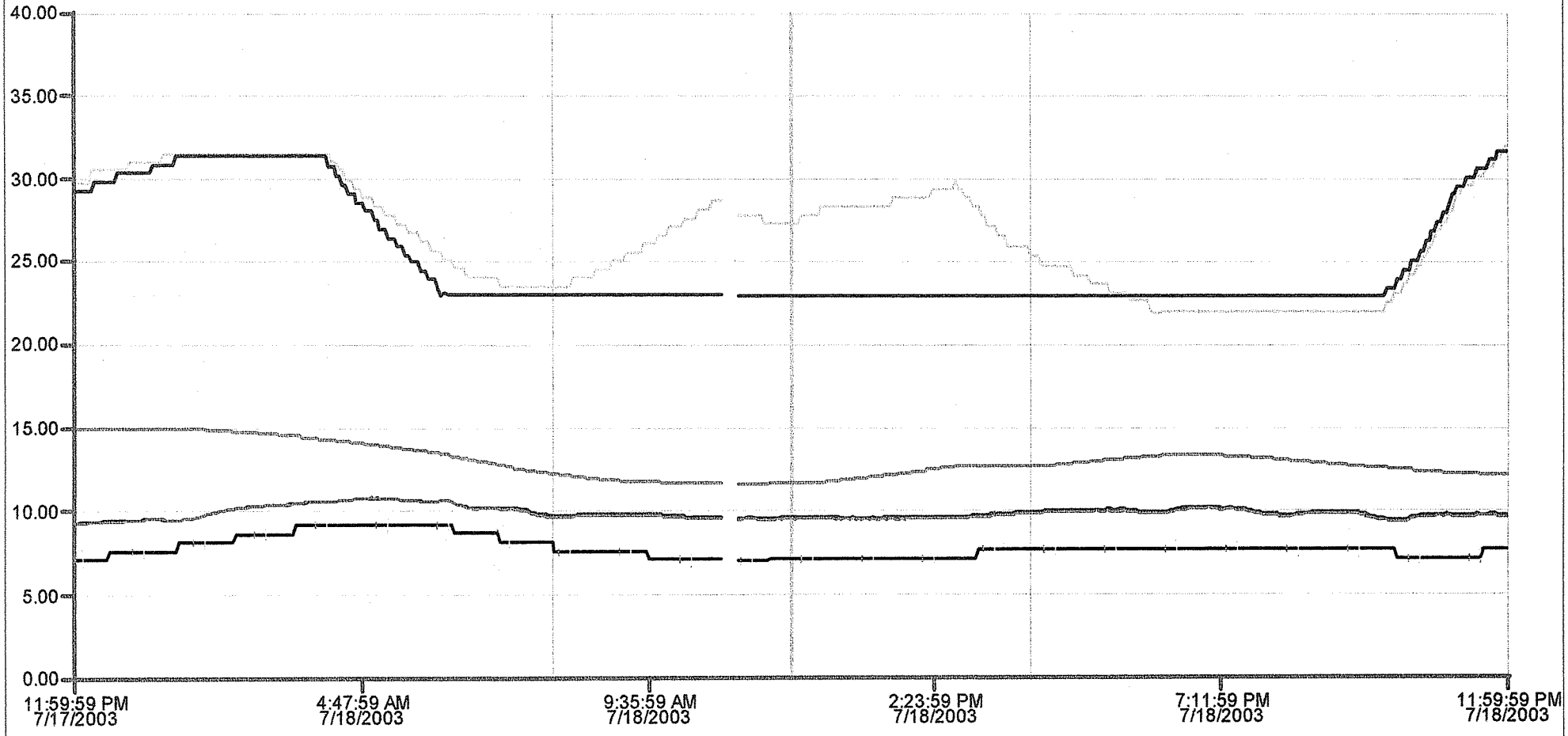
RADIO SYSTEM LEVELS



Hist.FIX.TKLWD.F_CV	Woodlawn Tank Level	31.46	FT
Hist.FIX.TKLRS.F_CV	Roosevelt Tank Level	30.36	FT
Hist.FIX.RLVWB.F_CV	Webb Road Reservoir Level	12.60	FT
Hist.FIX.'LP4A:LIT0417A.LEVEL.417'.F_CV	East Plant Clearwell	9.85	FT
Hist.FIX.'LP4A:LIT0417B.LEVEL.417'.F_CV	Central Plant Clearwell	9.74	FT
Hist.FIX.RESLV_FB.F_CV	Hess PS Reservoir Level	8.16	FT

TREND MENU

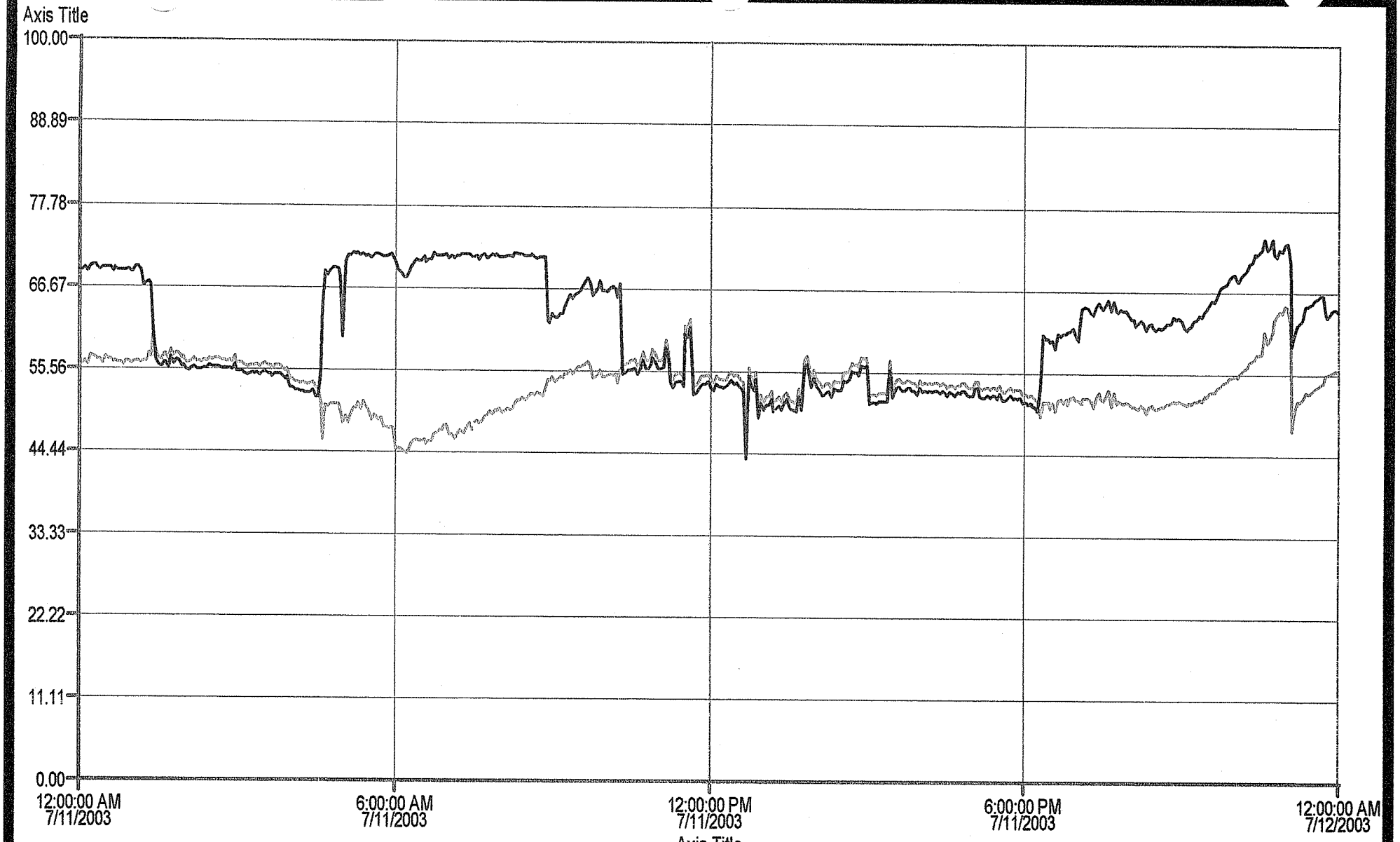
RADIO SYSTEM LEVELS



Hist.FIX.TKLWD.F_CV	**Woodlawn Tank Level**	22.92	FT
Hist.FIX.TKLRS.F_CV	Roosevelt Tank Level	27.30	FT
Hist.FIX.RLVWB.F_CV	Webb Road Reservoir Level	11.69	FT
Hist.FIX.'LP4A:LIT0417A.LEVEL.417'.F_CV	**East Plant Clearwell**	9.63	FT
Hist.FIX.'LP4A:LIT0417B.LEVEL.417'.F_CV	Central Plant Clearwell	9.54	FT
Hist.FIX.RESLV_FB.F_CV	**Hess PS Reservoir Level**	7.17	FT

Trends | East Zone Screens

Webb Road East Zone

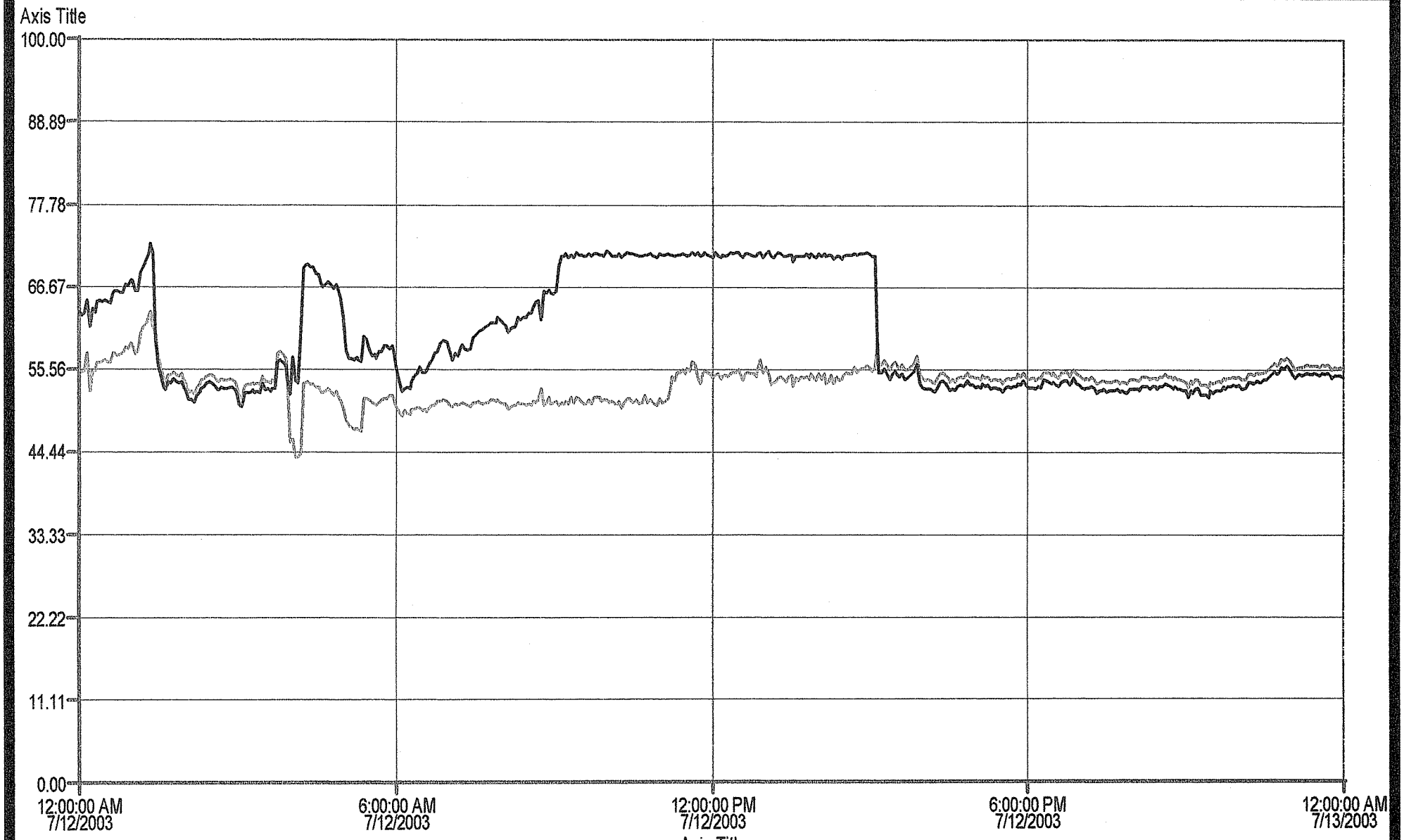


Hist.FIX.EAST_DISCHARGE_PRES.F_CV	WEBB EAST DISCHARGE PRESSURE #2	53.53	PSI
Hist.FIX.EAST_SUCTION_PRES.F_CV	WEBB EAST SUCTION PRESSURE #2	54.63	PSI

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

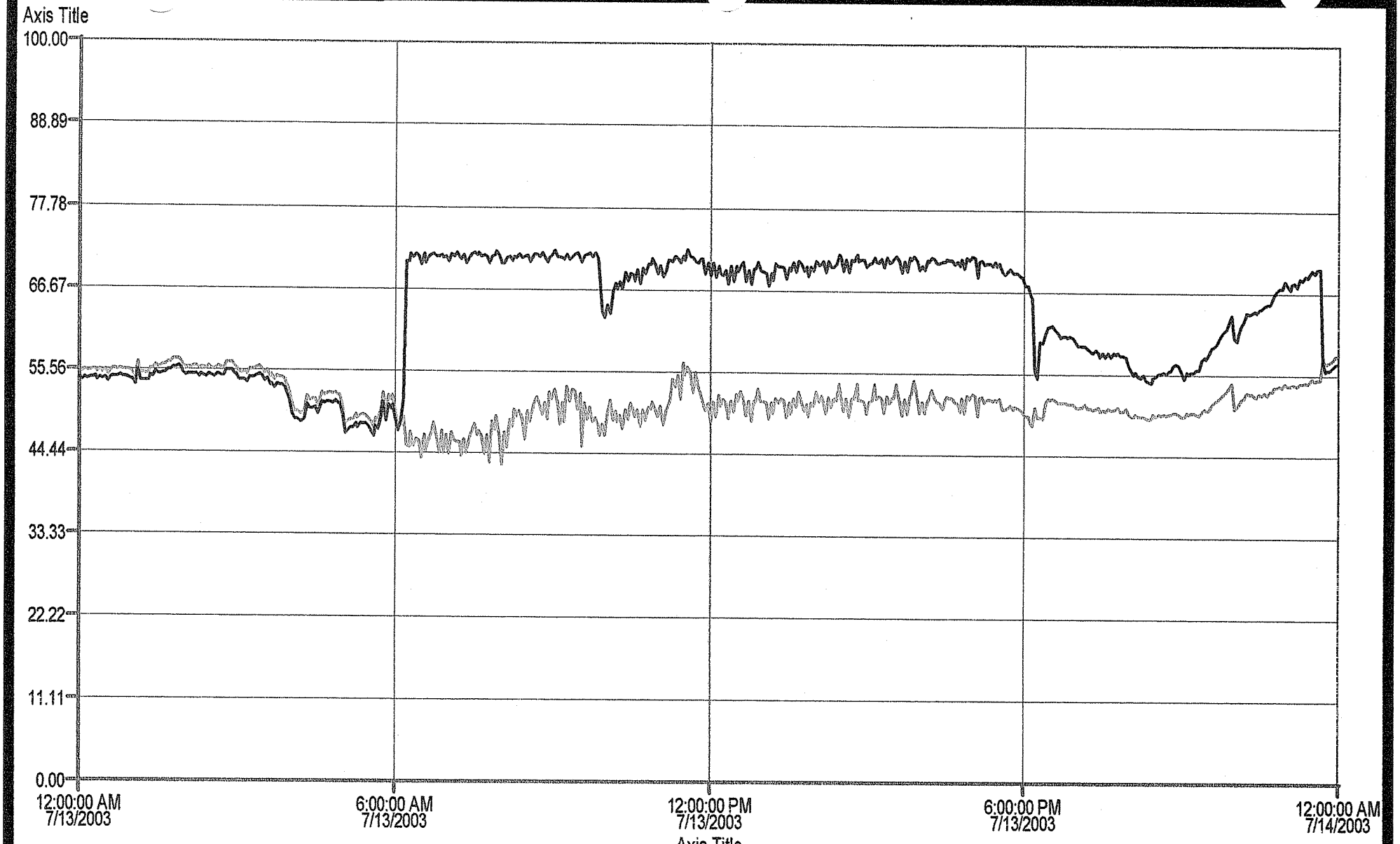


Hist.FIX.EAST_DISCHARGE_PRES.F_CV	WEBB EAST DISCHARGE PRESSURE #2	70.73	PSI
Hist.FIX.EAST_SUCTION_PRES.F_CV	WEBB EAST SUCTION PRESSURE #2	54.53	PSI

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

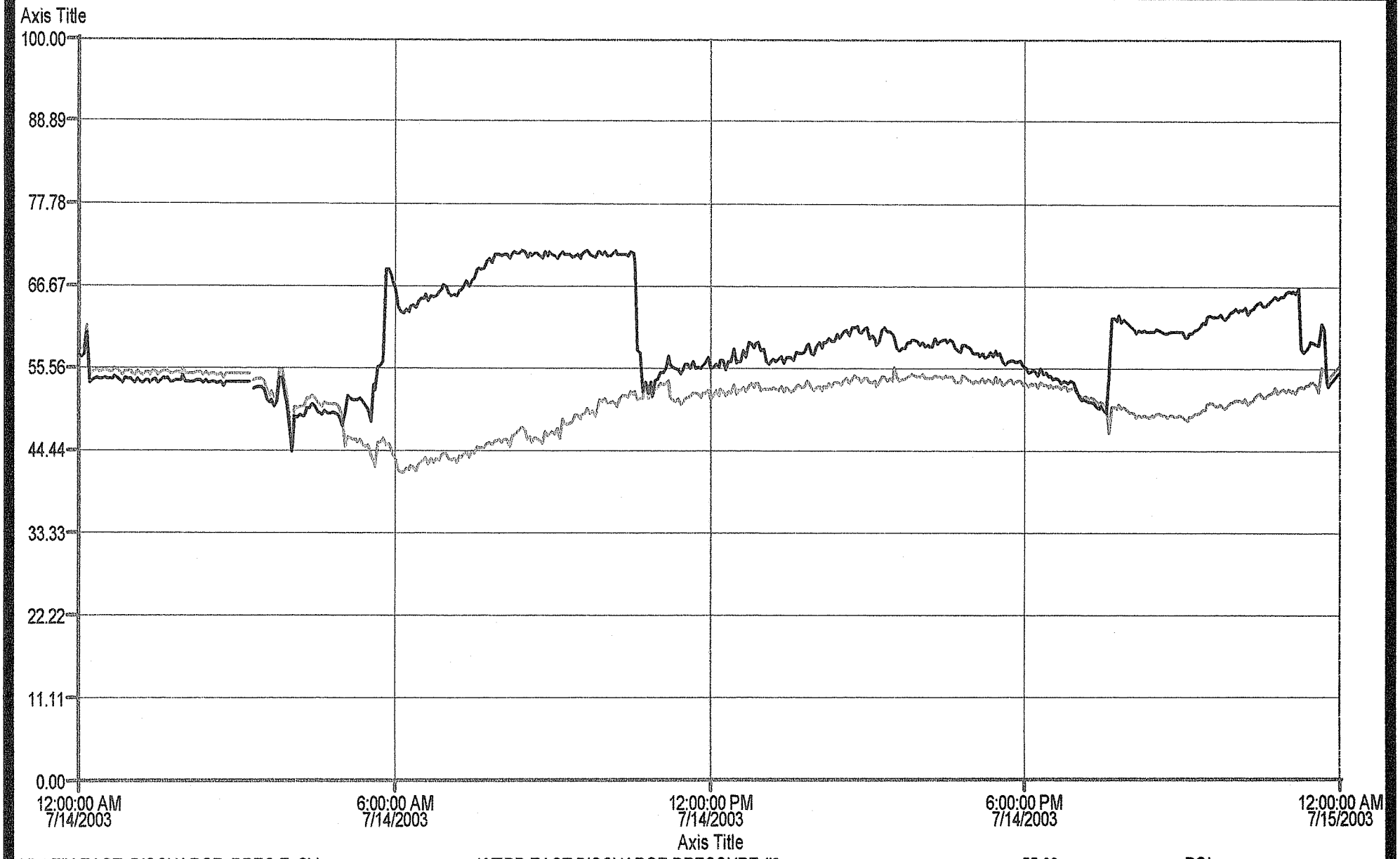


Hist.FIX.EAST_DISCHARGE_PRES.F_CV	WEBB EAST DISCHARGE PRESSURE #2	69.09	PSI
Hist.FIX.EAST_SUCTION_PRES.F_CV	WEBB EAST SUCTION PRESSURE #2	49.60	PSI

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

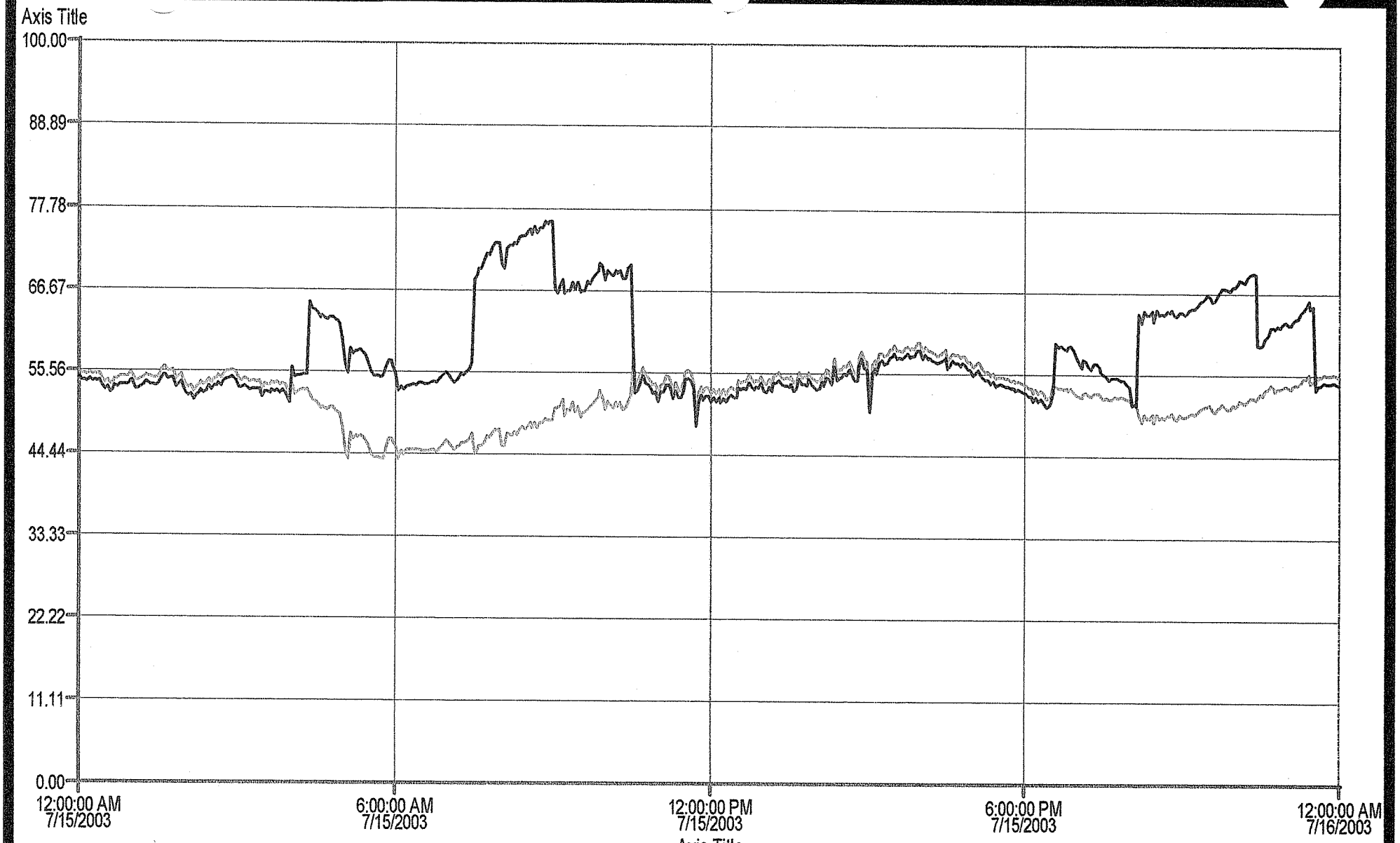


Hist.FIX.EAST_DISCHARGE_PRES.F_CV	WEBB EAST DISCHARGE PRESSURE #2	55.88	PSI
Hist.FIX.EAST_SUCTION_PRES.F_CV	WEBB EAST SUCTION PRESSURE #2	51.74	PSI

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

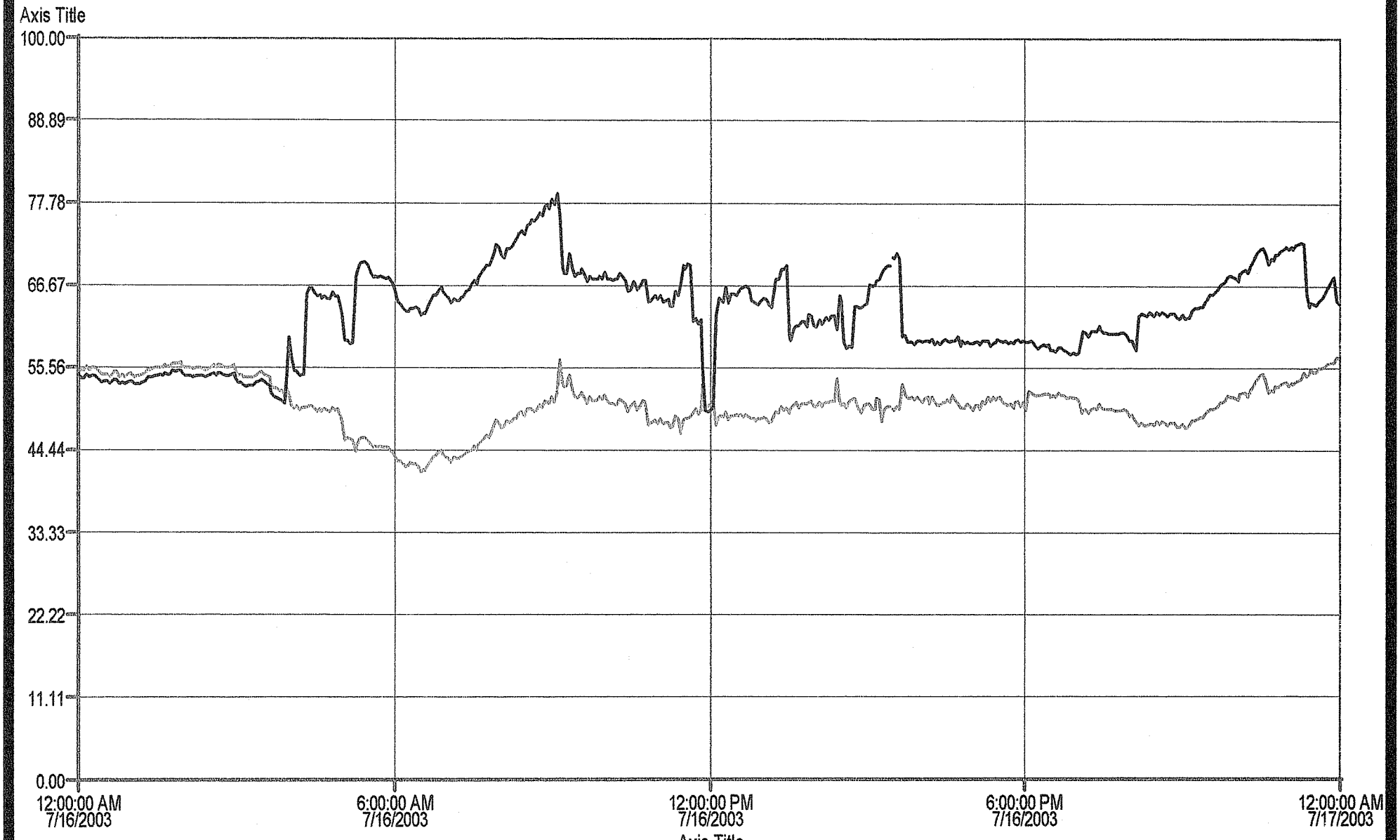


Hist.FIX.EAST_DISCHARGE_PRES.F_CV	WEBB EAST DISCHARGE PRESSURE #2	51.91	PSI
Hist.FIX.EAST_SUCTION_PRES.F_CV	WEBB EAST SUCTION PRESSURE #2	52.94	PSI

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

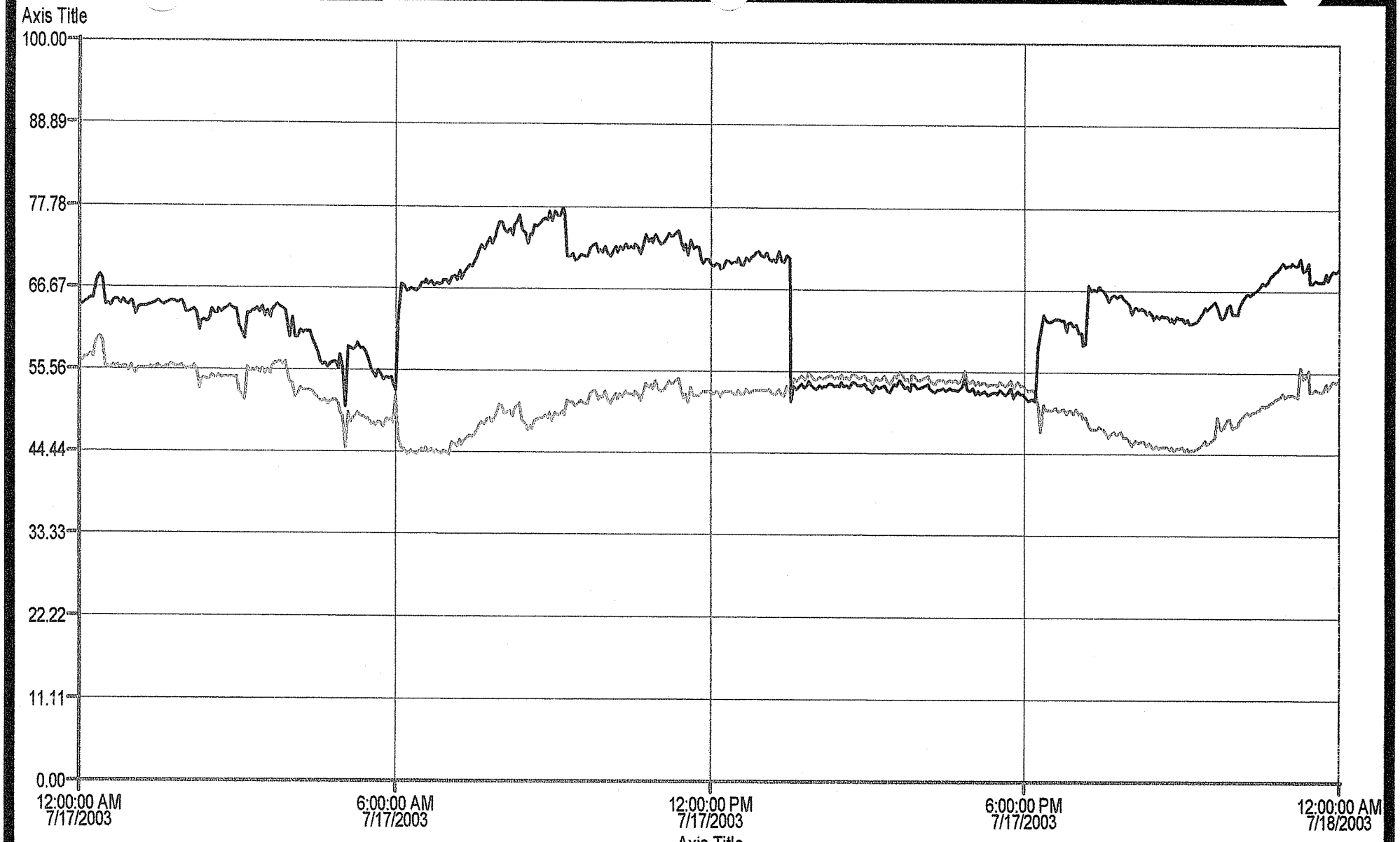


Hist.FIX.EAST_DISCHARGE_PRES.F_CV	WEBB EAST DISCHARGE PRESSURE #2	49.67	PSI
Hist.FIX.EAST_SUCTION_PRES.F_CV	WEBB EAST SUCTION PRESSURE #2	50.45	PSI

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

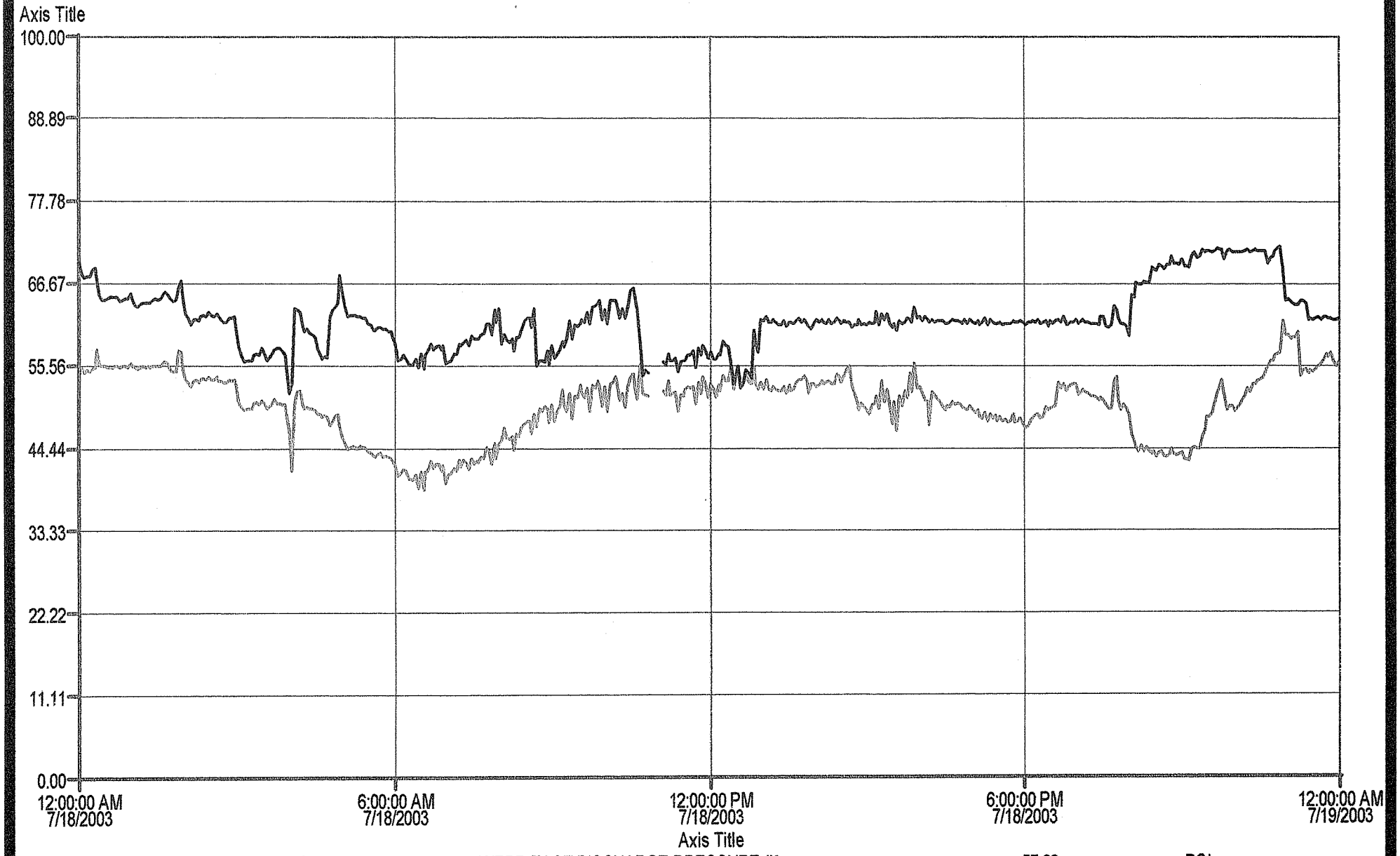


Hist.FIX.EAST_DISCHARGE_PRES.F_CV	WEBB EAST DISCHARGE PRESSURE #2	70.09	PSI
Hist.FIX.EAST_SUCTION_PRES.F_CV	WEBB EAST SUCTION PRESSURE #2	52.71	PSI

Enter New Date/Time | Enter New Time Span

Trends | East Zone Screens

Webb Road East Zone

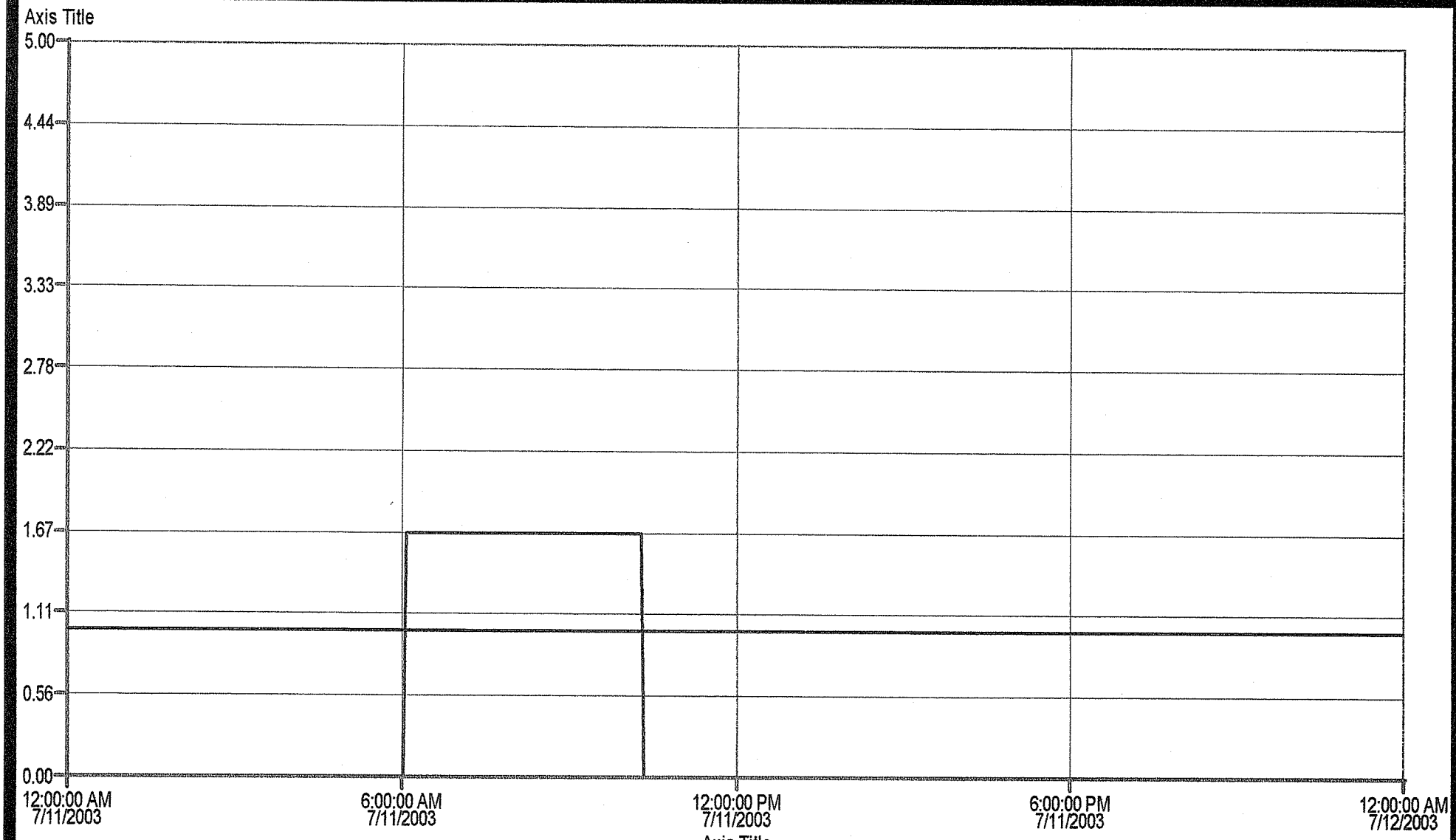


Hist.FIX.EAST_DISCHARGE_PRES.F_CV	WEBB EAST DISCHARGE PRESSURE #2	57.22	PSI
Hist.FIX.EAST_SUCTION_PRES.F_CV	WEBB EAST SUCTION PRESSURE #2	52.39	PSI

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - 37th Street



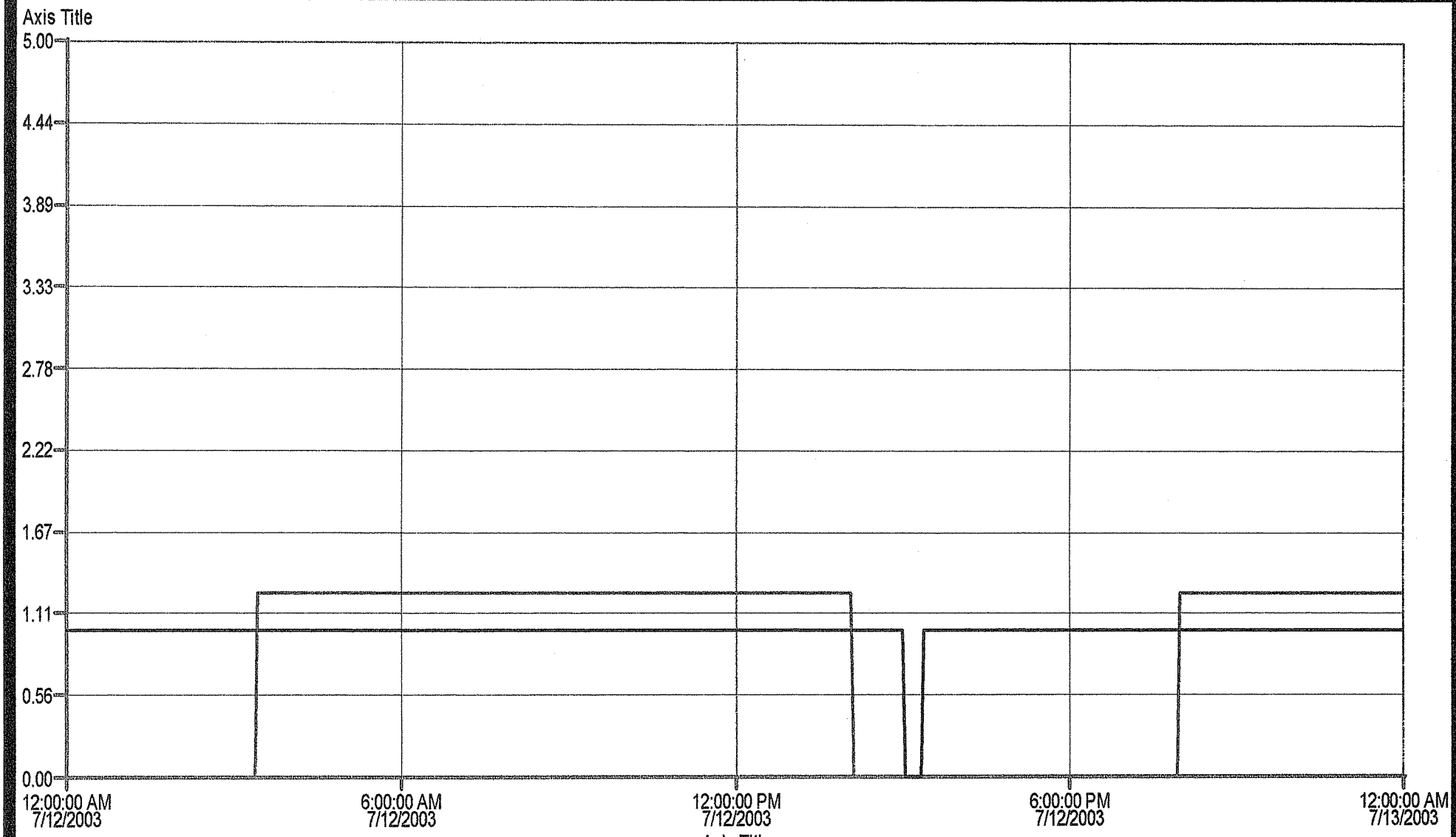
Hist.FIX.PR137.F_CV	PUMP NO. 1 STATUS	1.00
Hist.FIX.PR237.F_CV	PUMP NO. 2 STATUS	0.00
Hist.FIX.PR337.F_CV	PUMP NO. 3 STATUS	0.00

Enter New Date/Time | Enter New Time Span

HIGH = ON LOW = OFF

Trends | NorthEast Zone Screens

NorthEast Zone - 37th Street

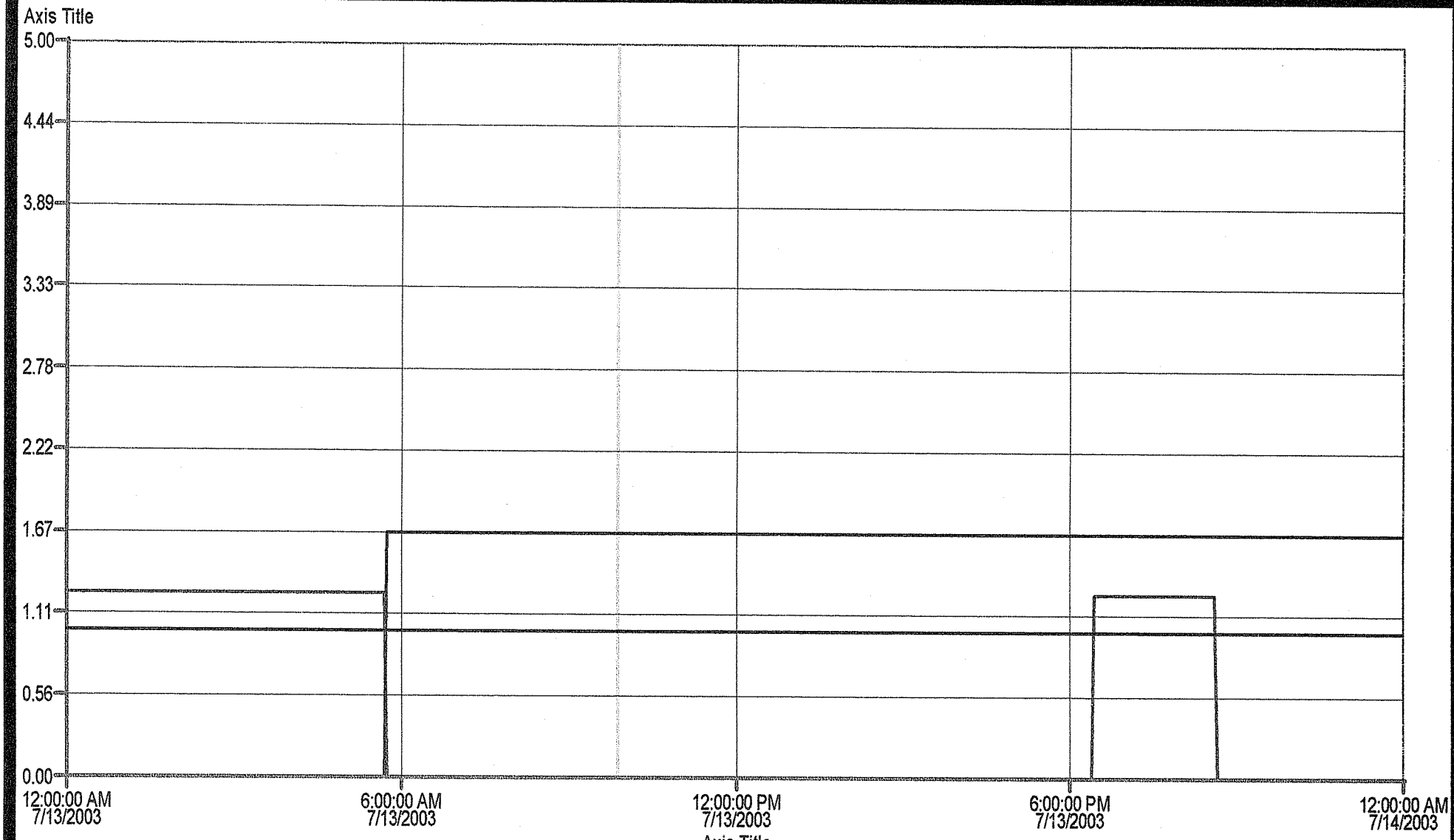


Hist.FIX.PR137.F_CV	PUMP NO. 1 STATUS	1.00
Hist.FIX.PR237.F_CV	PUMP NO. 2 STATUS	1.00
Hist.FIX.PR337.F_CV	PUMP NO. 3 STATUS	0.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - 37th Street

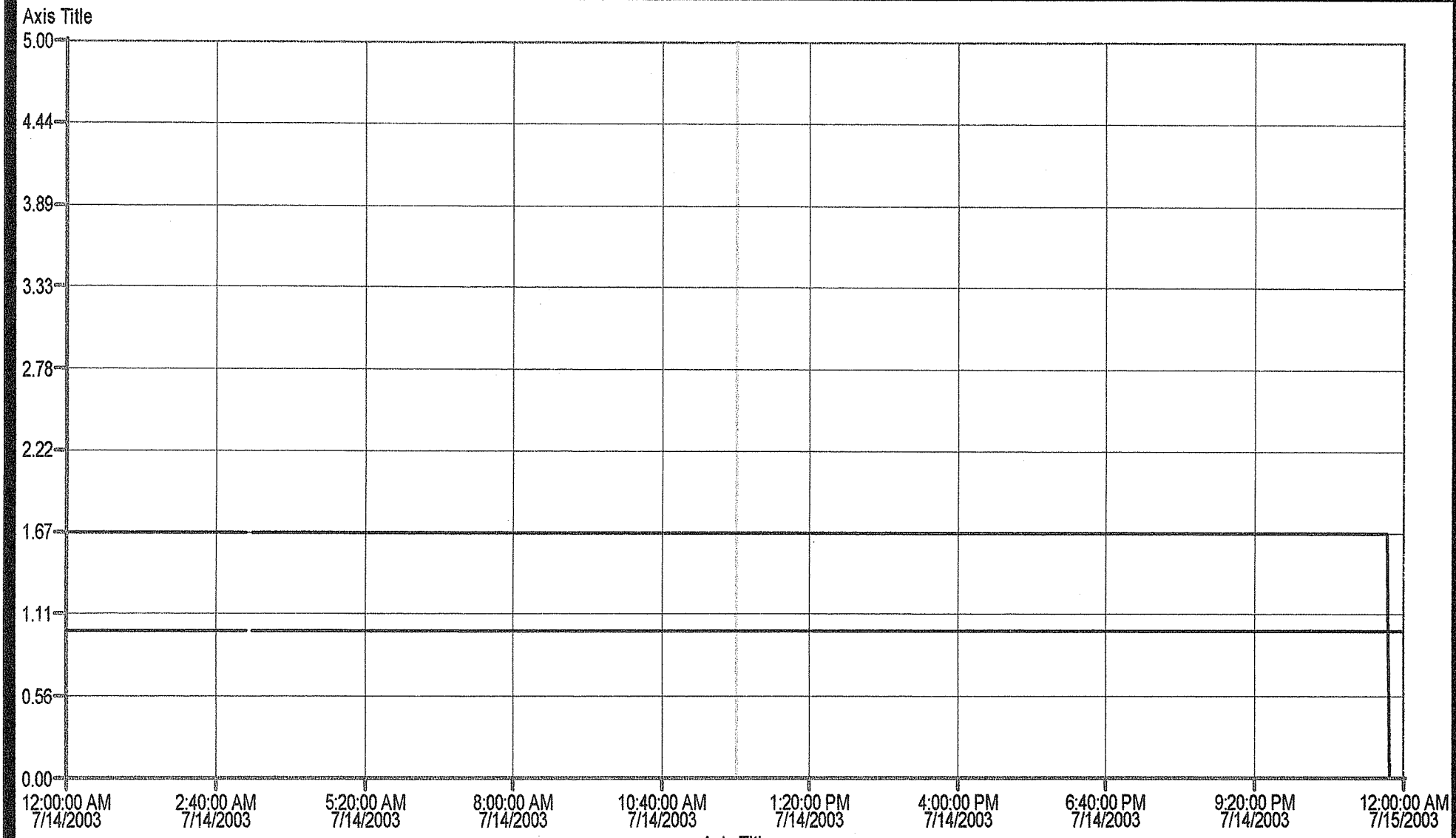


Hist.FIX.PR137.F_CV	PUMP NO. 1 STATUS	1.00
Hist.FIX.PR237.F_CV	PUMP NO. 2 STATUS	0.00
Hist.FIX.PR337.F_CV	PUMP NO. 3 STATUS	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - 37th Street

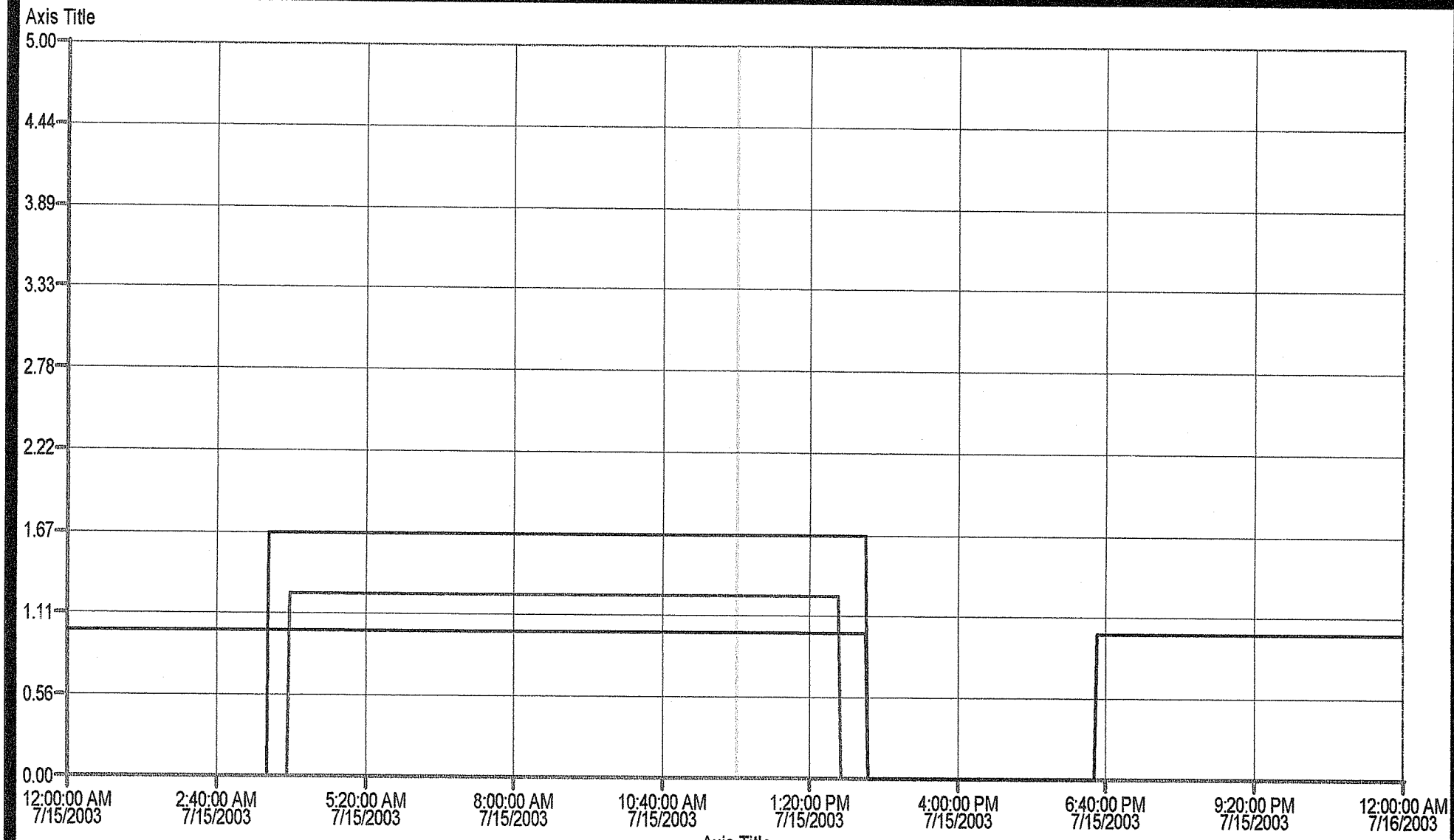


Hist.FIX.PR137.F_CV	PUMP NO. 1 STATUS	1.00
Hist.FIX.PR237.F_CV	PUMP NO. 2 STATUS	0.00
Hist.FIX.PR337.F_CV	PUMP NO. 3 STATUS	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - 37th Street

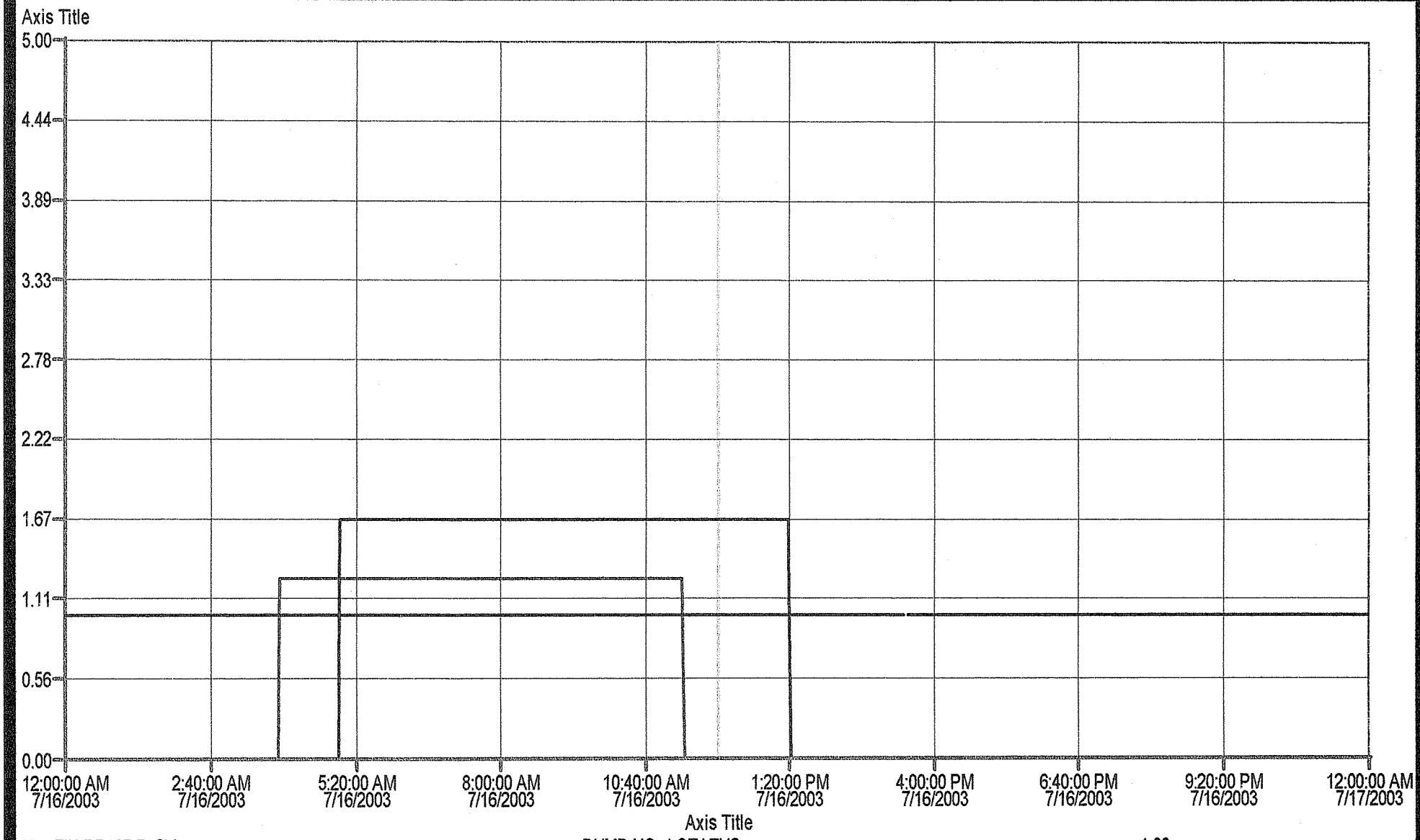


Hist.FIX.PR137.F_CV	PUMP NO. 1 STATUS	1.00
Hist.FIX.PR237.F_CV	PUMP NO. 2 STATUS	1.00
Hist.FIX.PR337.F_CV	PUMP NO. 3 STATUS	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - 37th Street

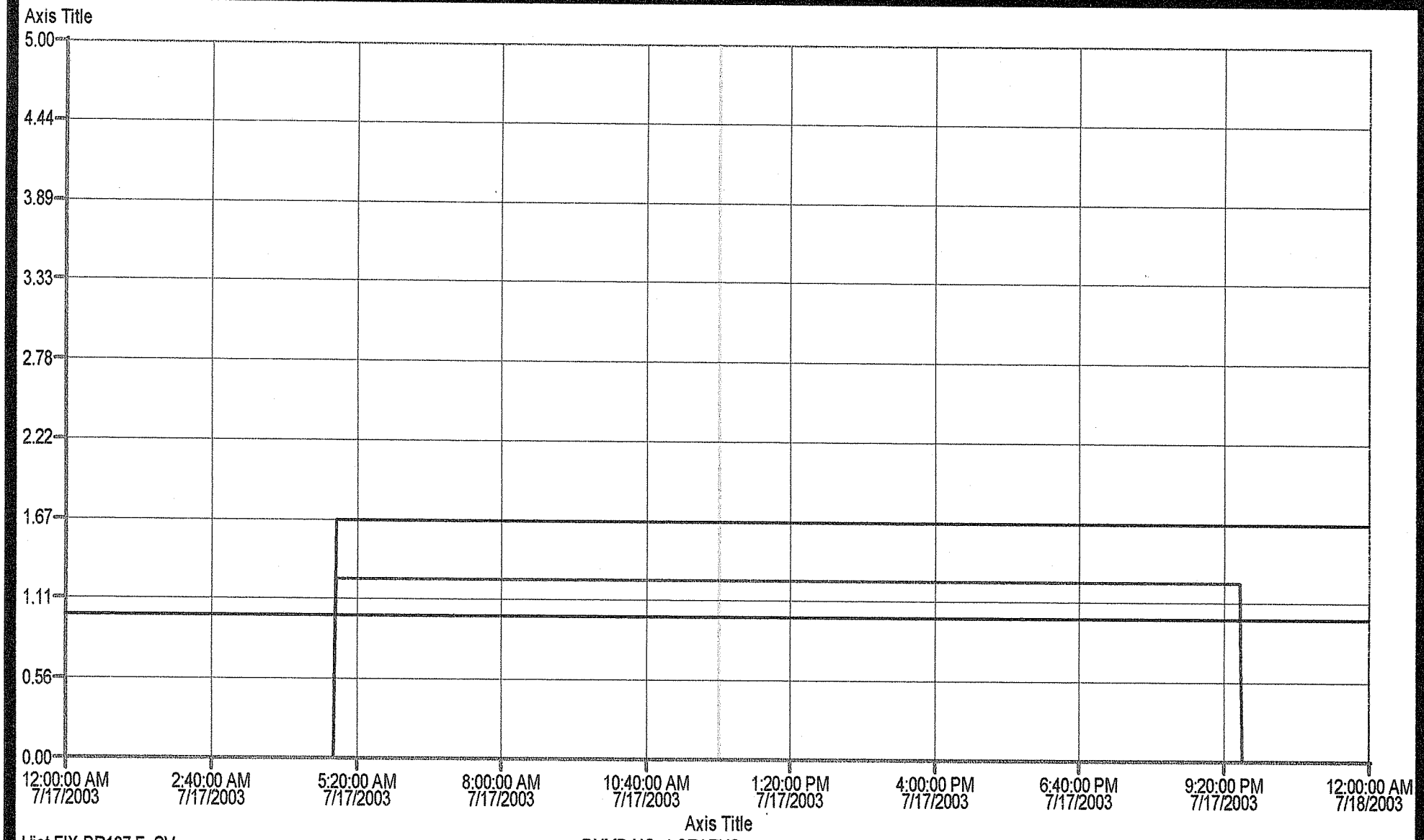


Hist.FIX.PR137.F_CV	PUMP NO. 1 STATUS	1.00
Hist.FIX.PR237.F_CV	PUMP NO. 2 STATUS	0.00
Hist.FIX.PR337.F_CV	PUMP NO. 3 STATUS	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - 37th Street

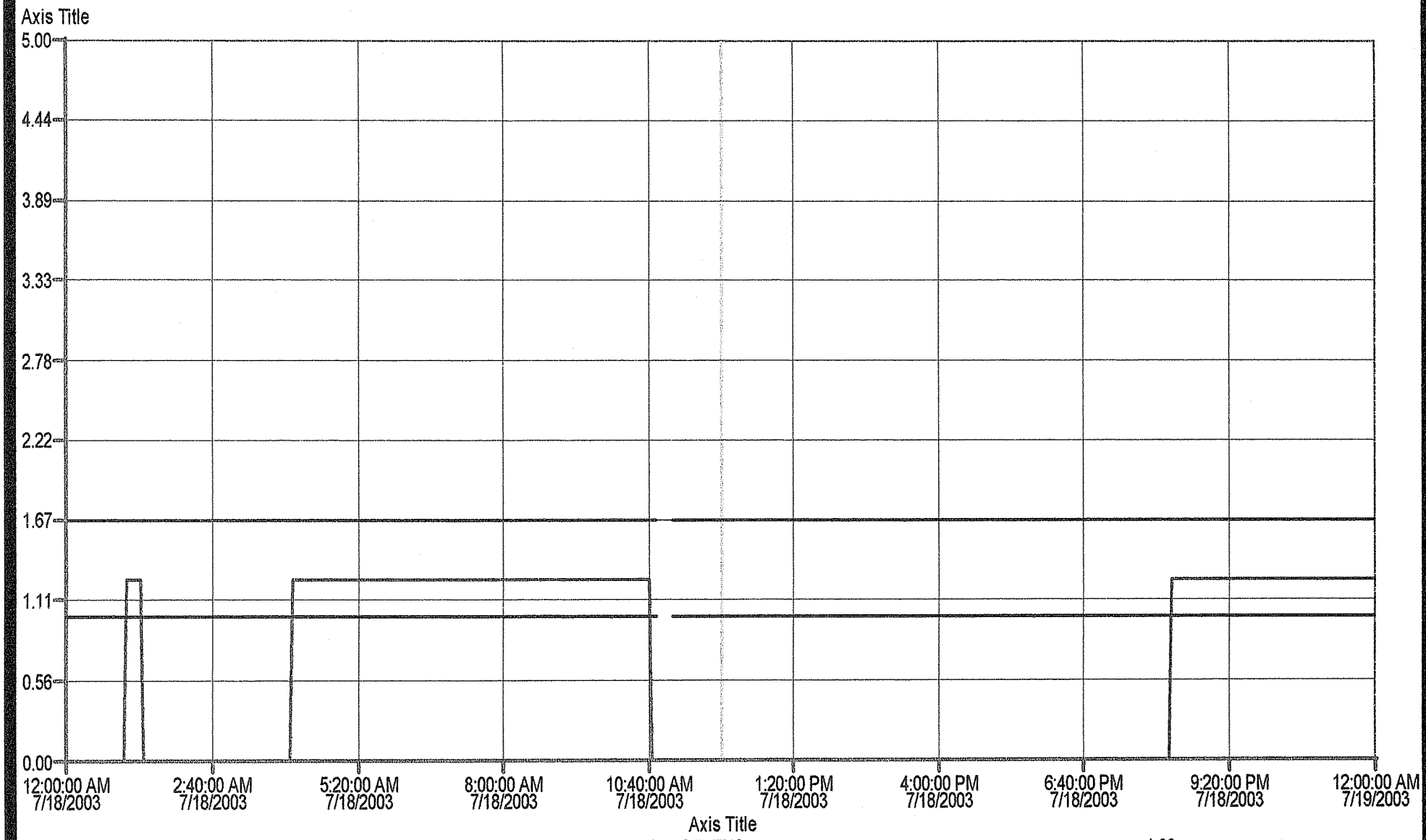


Hist.FIX.PR137.F_CV	PUMP NO. 1 STATUS	1.00
Hist.FIX.PR237.F_CV	PUMP NO. 2 STATUS	1.00
Hist.FIX.PR337.F_CV	PUMP NO. 3 STATUS	1.00

Enter New Date/Time | Enter New Time Span

Trends | NorthEast Zone Screens

NorthEast Zone - 37th Street



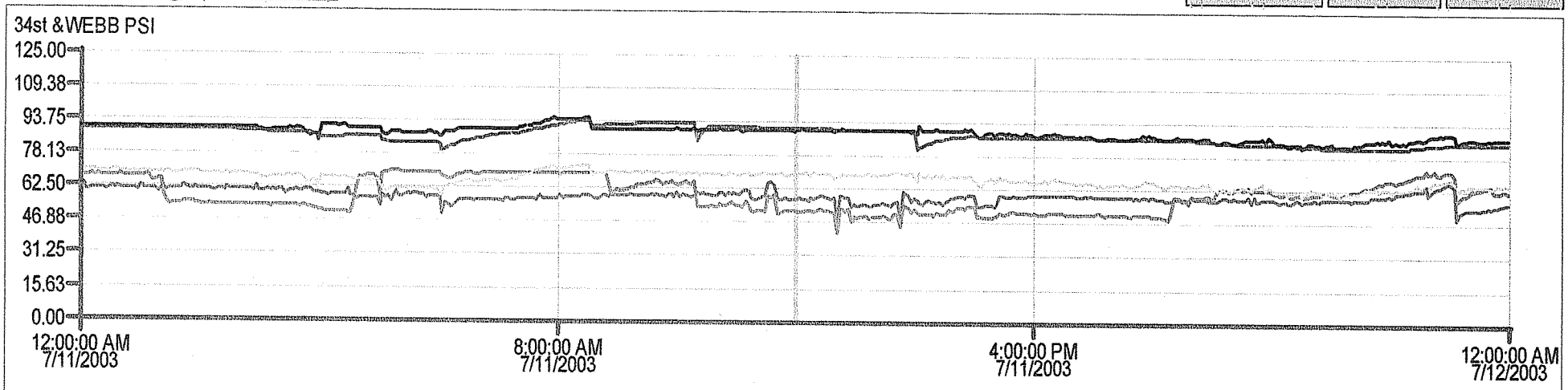
Hist.FIX.PR137.F_CV	PUMP NO. 1 STATUS	1.00
Hist.FIX.PR237.F_CV	PUMP NO. 2 STATUS	0.00
Hist.FIX.PR337.F_CV	PUMP NO. 3 STATUS	1.00

Enter New Date/Time | Enter New Time Span

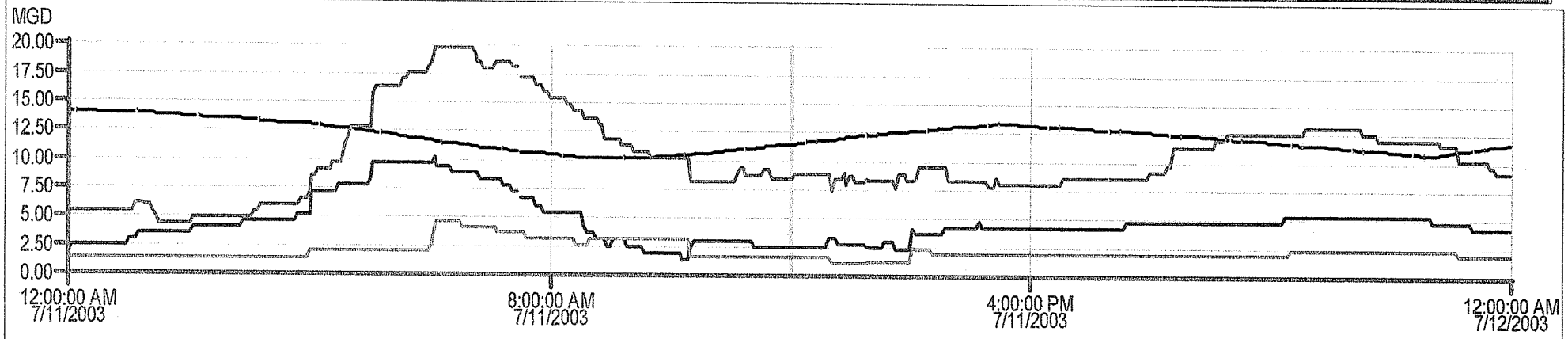
Main Menu | TREND MENU

37th ST AND WEBB RD PUMP STATIONS

SCADA Menu | 37TH ST | WEBB RD



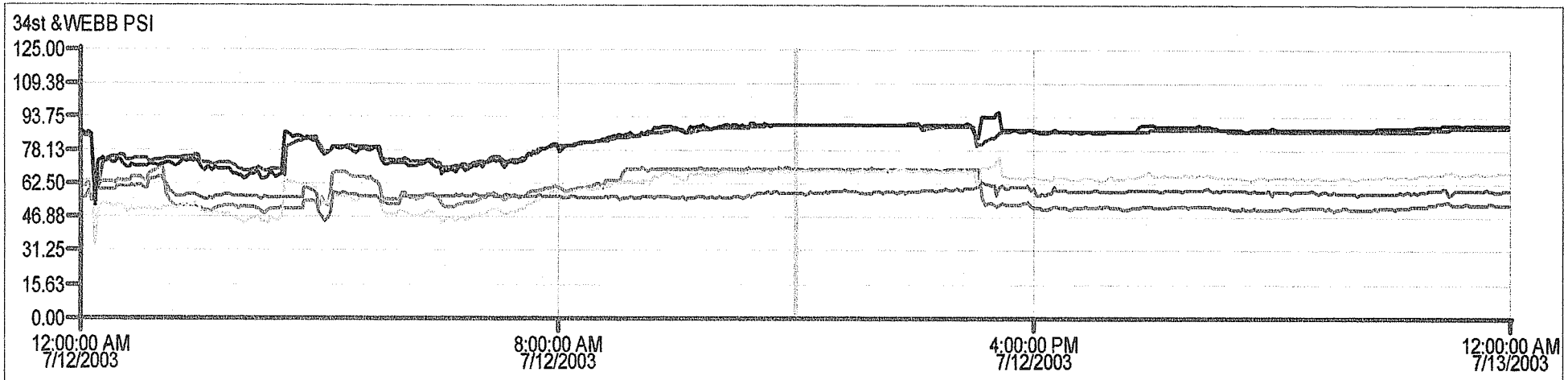
Hist.FIX.DPBWB.F_CV	WEBB BOOSTER DISC PSI	90.04	PSI
Hist.FIX.DPMWB.F_CV	WEBB MAIN DISC PSI	51.89	PSI
Hist.FIX.NE37TH_DSCHRG_PRESS.F_CV	N. DISCHARGE HEADER PRESSURE	91.25	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	68.78	PSI
Hist.FIX.NE37TH_SUCTION_PRESS.F_CV	SUCTION HEADER PRESSURE	57.89	PSI



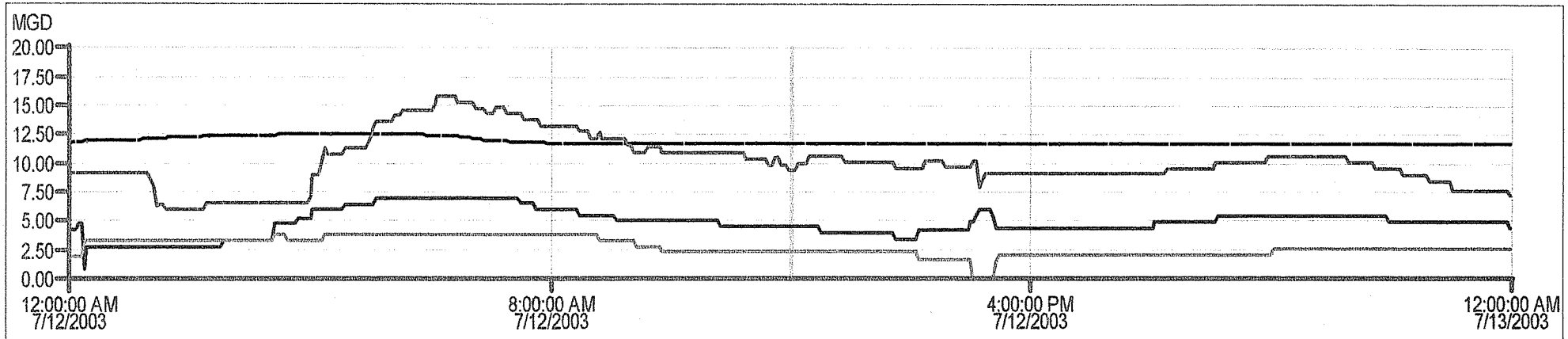
Hist.FIX.MFRWB.F_CV	WEBB MAIN FLOW RATE	8.42	MGD
Hist.FIX.BFRWB.F_CV	WEBB BOOSTER FLOW RATE	2.40	MGD
Hist.FIX.NE37_FLOWRATE.F_CV	37th Street flow rate	1.70	MGD
Hist.FIX.rlvwb.F_CV	WEBB RD RESERVOIR LEVEL	11.49	FEET

Main Menu | TREND MENU | SCADA Menu | 37TH ST | WEBB RD

37th ST AND WEBB RD PUMP STATIONS



Hist.FIX.DPBWB.F_CV	WEBB BOOSTER DISC PSI	90.31	PSI
Hist.FIX.DPMWB.F_CV	WEBB MAIN DISC PSI	69.30	PSI
Hist.FIX.NE37TH_DSCHRG_PRESS.F_CV	N. DISCHARGE HEADER PRESSURE	89.89	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	68.16	PSI
Hist.FIX.NE37TH_SUCTION_PRESS.F_CV	SUCTION HEADER PRESSURE	58.28	PSI

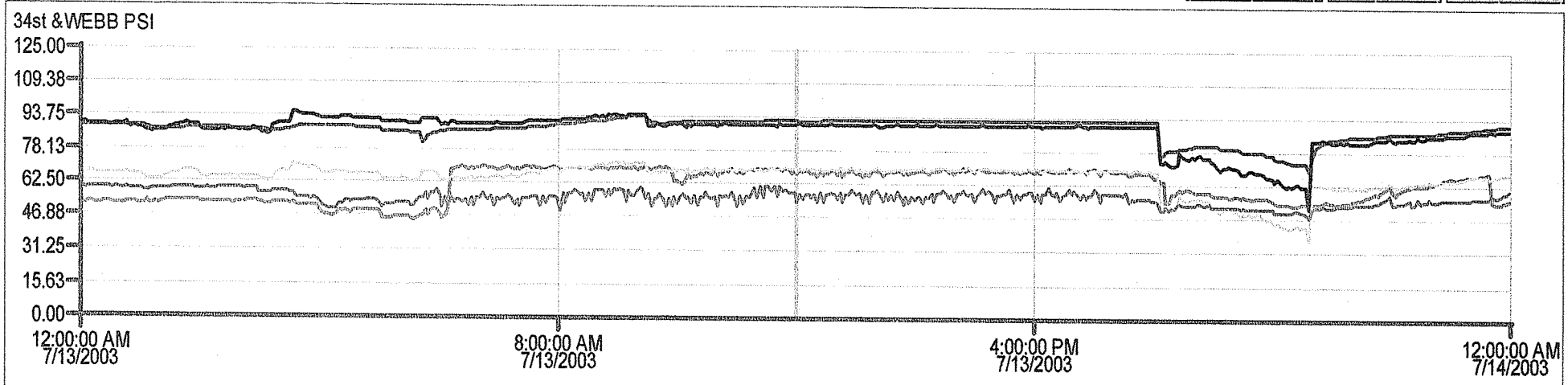


Hist.FIX.MFRWB.F_CV	WEBB MAIN FLOW RATE	9.36	MGD
Hist.FIX.BFRWB.F_CV	WEBB BOOSTER FLOW RATE	4.45	MGD
Hist.FIX.NE37_FLOWRATE.F_CV	37th Street flow rate	2.26	MGD
Hist.FIX.rivwb.F_CV	WEBB RD RESERVOIR LEVEL	11.76	FEET

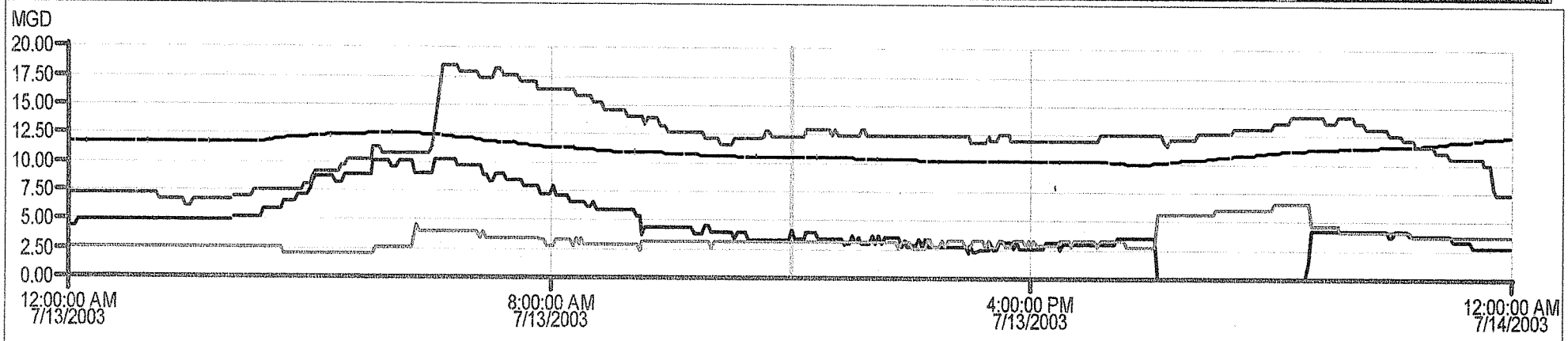
Main Menu | TREND MENU

37th ST AND WEBB RD PUMP STATIONS

SCADA Menu | 37TH ST | B RD



Hist.FIX.DPBWB.F_CV	WEBB BOOSTER DISC PSI	90.04	PSI
Hist.FIX.DPMWB.F_CV	WEBB MAIN DISC PSI	67.52	PSI
Hist.FIX.NE37TH_DSCHRG_PRESS.F_CV	N. DISCHARGE HEADER PRESSURE	92.43	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	68.30	PSI
Hist.FIX.NE37TH_SUCTION_PRESS.F_CV	SUCTION HEADER PRESSURE	54.92	PSI

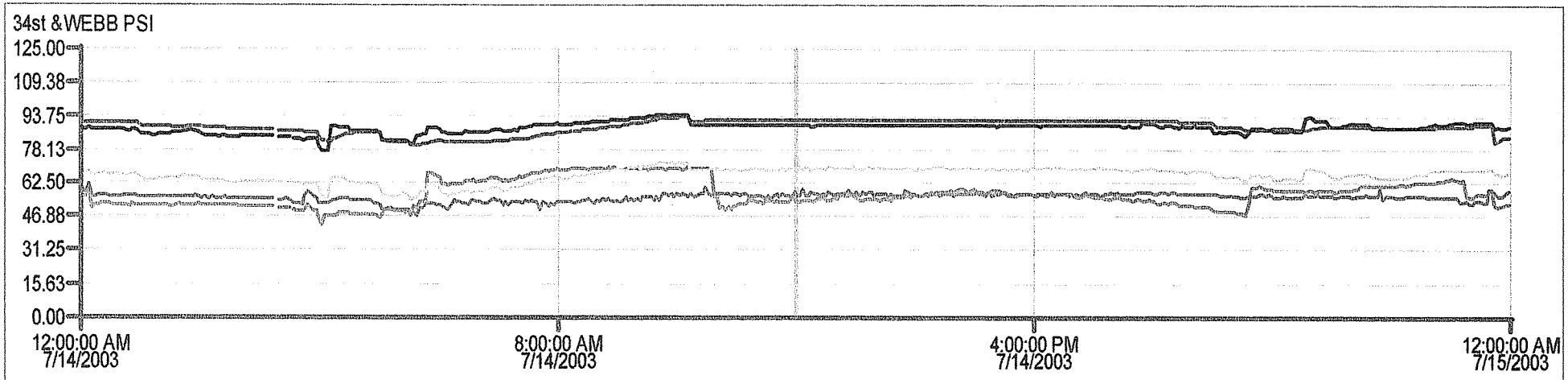


Hist.FIX.MFRWB.F_CV	WEBB MAIN FLOW RATE	12.31	MGD
Hist.FIX.BFRWB.F_CV	WEBB BOOSTER FLOW RATE	3.83	MGD
Hist.FIX.NE37_FLOWRATE.F_CV	37th Street flow rate	3.08	MGD
Hist.FIX.rlvwb.F_CV	WEBB RD RESERVOIR LEVEL	10.56	FEET

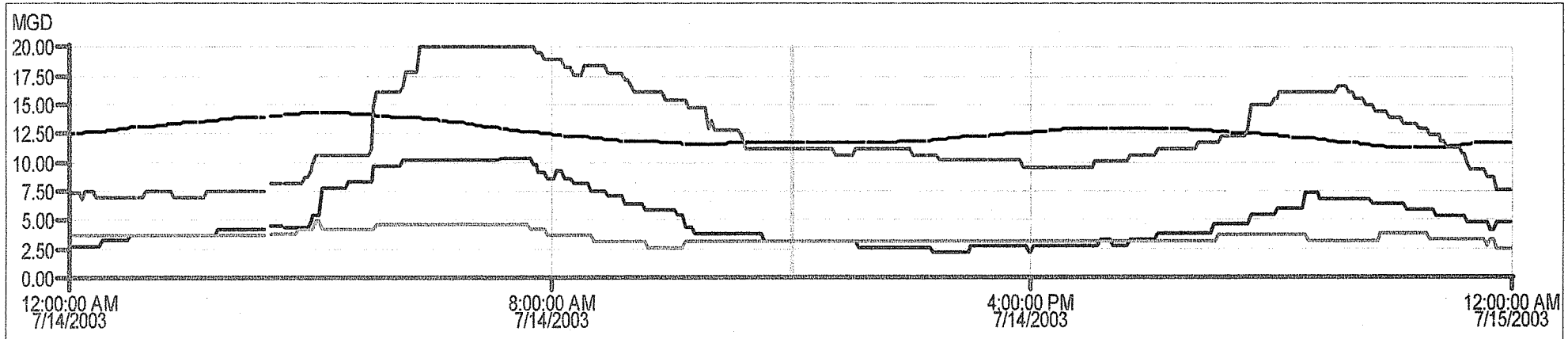
Main Menu | TREND MENU

37th ST AND WEBB RD PUMP STATIONS

SCADA Menu | 37TH ST | WEBB RD



Hist.FIX.DPBWB.F_CV	WEBB BOOSTER DISC PSI	90.28	PSI
Hist.FIX.DPMWB.F_CV	WEBB MAIN DISC PSI	54.27	PSI
Hist.FIX.NE37TH_DSCHRG_PRESS.F_CV	N. DISCHARGE HEADER PRESSURE	92.11	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	98.06	PSI
Hist.FIX.NE37TH_SUCTION_PRESS.F_CV	SUCTION HEADER PRESSURE	57.40	PSI

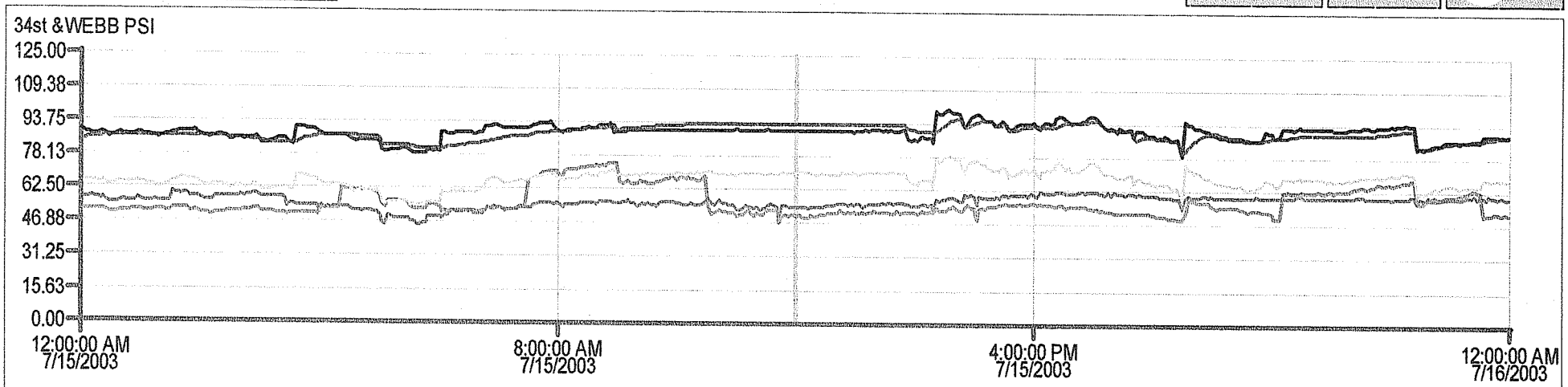


Hist.FIX.MFRWB.F_CV	WEBB MAIN FLOW RATE	11.23	MGD
Hist.FIX.BFRWB.F_CV	WEBB BOOSTER FLOW RATE	3.13	MGD
Hist.FIX.NE37_FLOWRATE.F_CV	37th Street flow rate	3.09	MGD
Hist.FIX.rlvwb.F_CV	WEBB RD RESERVOIR LEVEL	11.71	FEET

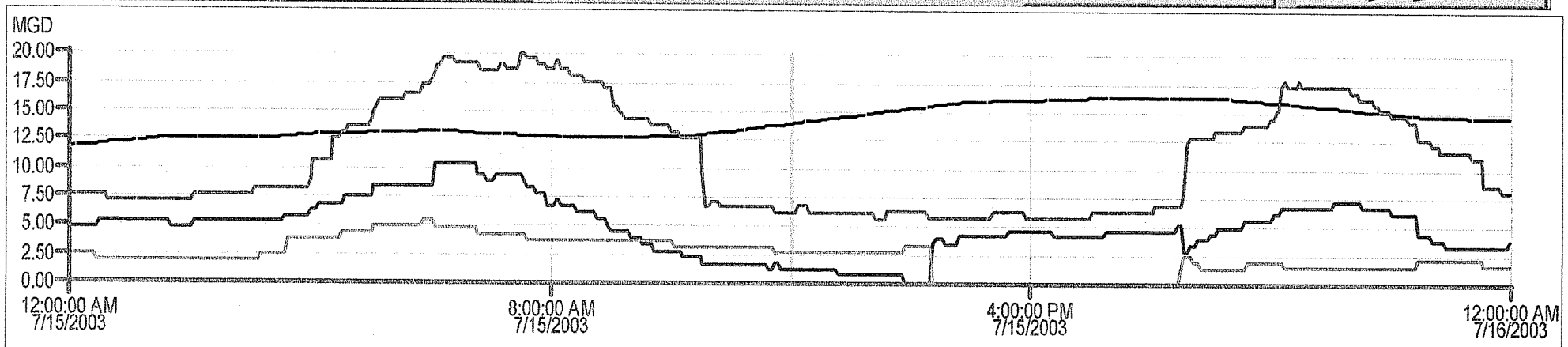
Main Menu | TREND MENU

37th ST AND WEBB RD PUMP STATIONS

SCADA Menu | 37TH ST | B RD



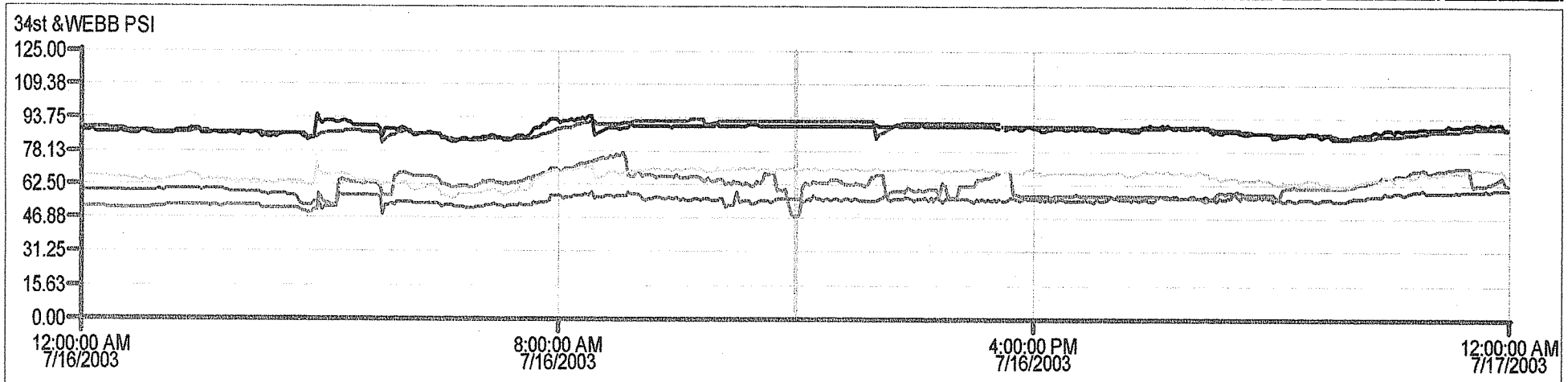
Hist.FIX.DPBWB.F_CV	WEBB BOOSTER DISC PSI	90.16	PSI
Hist.FIX.DPMWB.F_CV	WEBB MAIN DISC PSI	50.24	PSI
Hist.FIX.NE37TH_DSCHRG_PRESS.F_CV	N. DISCHARGE HEADER PRESSURE	92.78	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	69.96	PSI
Hist.FIX.NE37TH_SUCTION_PRESS.F_CV	SUCTION HEADER PRESSURE	54.65	PSI



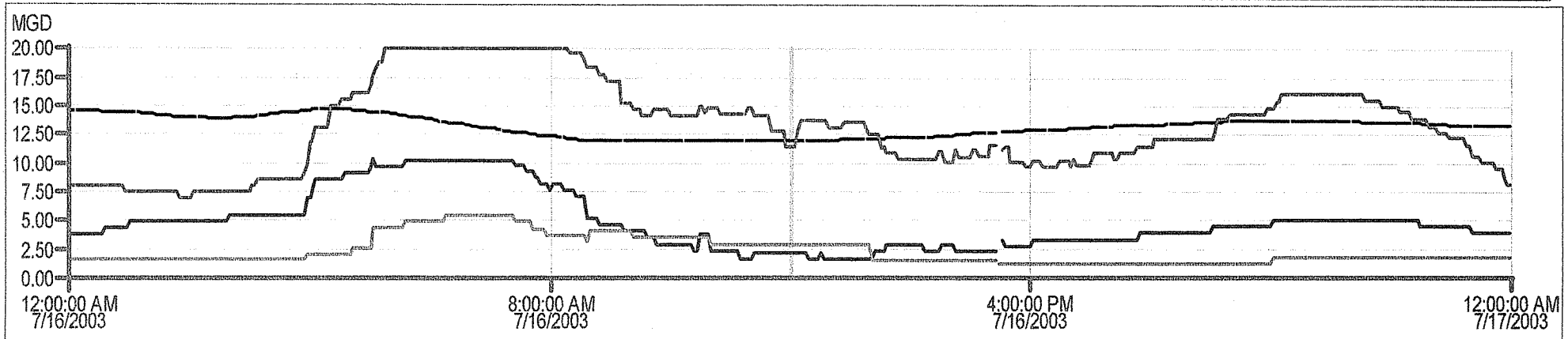
Hist.FIX.MFRWB.F_CV	WEBB MAIN FLOW RATE	6.11	MGD
Hist.FIX.BFRWB.F_CV	WEBB BOOSTER FLOW RATE	1.28	MGD
Hist.FIX.NE37_FLOWRATE.F_CV	37th Street flow rate	2.71	MGD
Hist.FIX.rlvwb.F_CV	WEBB RD RESERVOIR LEVEL	13.93	FEET

Main Menu | TREND MENU | SCADA Menu | 37TH ST | WEBB RD

37th ST AND WEBB RD PUMP STATIONS



Hist.FIX.DPBWB.F_CV	WEBB BOOSTER DISC PSI	89.93	PSI
Hist.FIX.DPMWB.F_CV	WEBB MAIN DISC PSI	48.00	PSI
Hist.FIX.NE37TH_DSCHRG_PRESS.F_CV	N. DISCHARGE HEADER PRESSURE	92.62	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	70.18	PSI
Hist.FIX.NE37TH_SUCTION_PRESS.F_CV	SUCTION HEADER PRESSURE	55.89	PSI

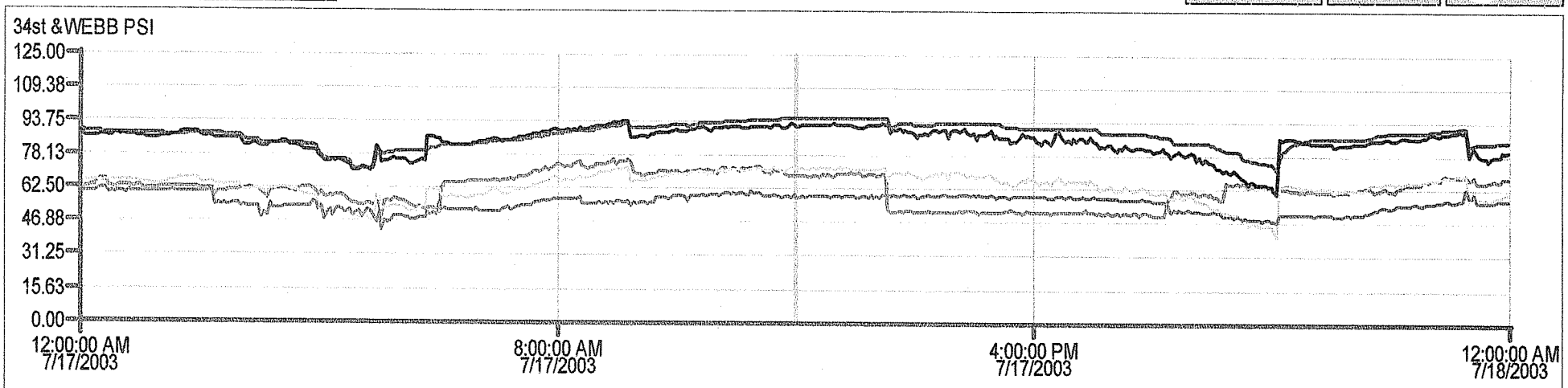


Hist.FIX.MFRWB.F_CV	WEBB MAIN FLOW RATE	11.43	MGD
Hist.FIX.BFRWB.F_CV	WEBB BOOSTER FLOW RATE	2.20	MGD
Hist.FIX.NE37_FLOWRATE.F_CV	37th Street flow rate	2.89	MGD
Hist.FIX.rlvwb.F_CV	WEBB RD RESERVOIR LEVEL	12.04	FEET

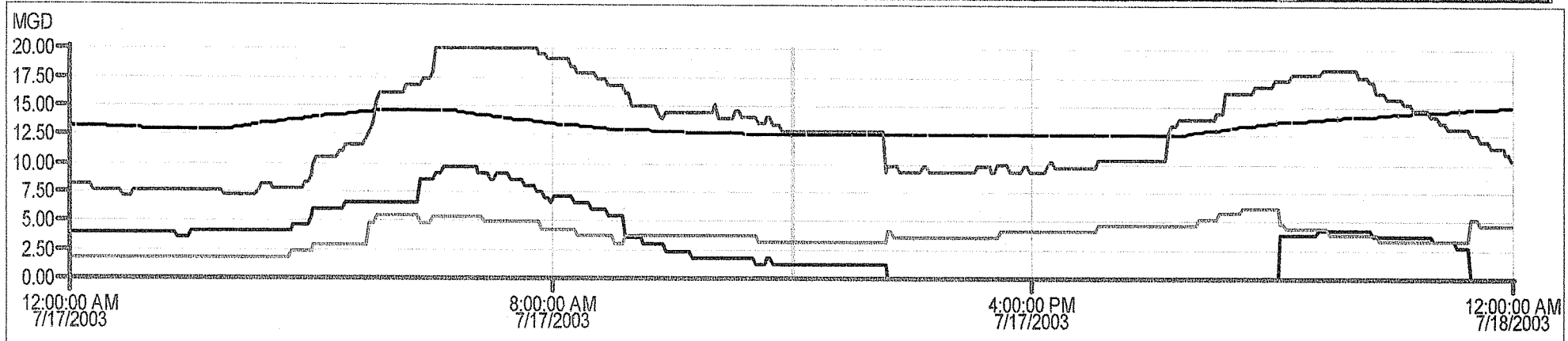
Main Menu | TREND MENU

37th ST AND WEBB RD PUMP STATIONS

SCADA Menu | 37TH ST | WEBB RD



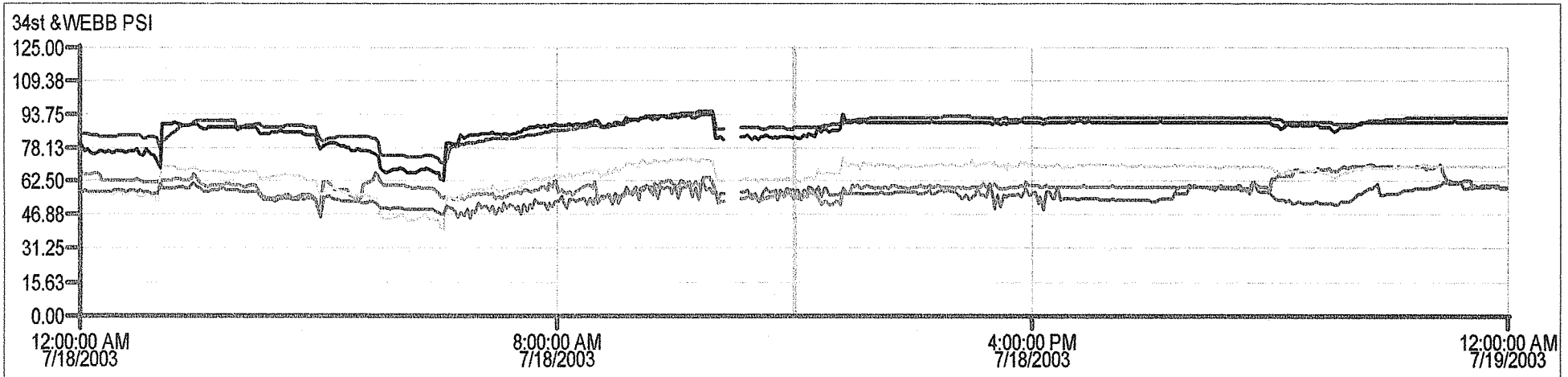
Hist.FIX.DPBWB.F_CV	WEBB BOOSTER DISC PSI	92.15	PSI
Hist.FIX.DPMWB.F_CV	WEBB MAIN DISC PSI	68.64	PSI
Hist.FIX.NE37TH_DSCHRG_PRESS.F_CV	N. DISCHARGE HEADER PRESSURE	95.00	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	72.05	PSI
Hist.FIX.NE37TH_SUCTION_PRESS.F_CV	SUCTION HEADER PRESSURE	58.57	PSI



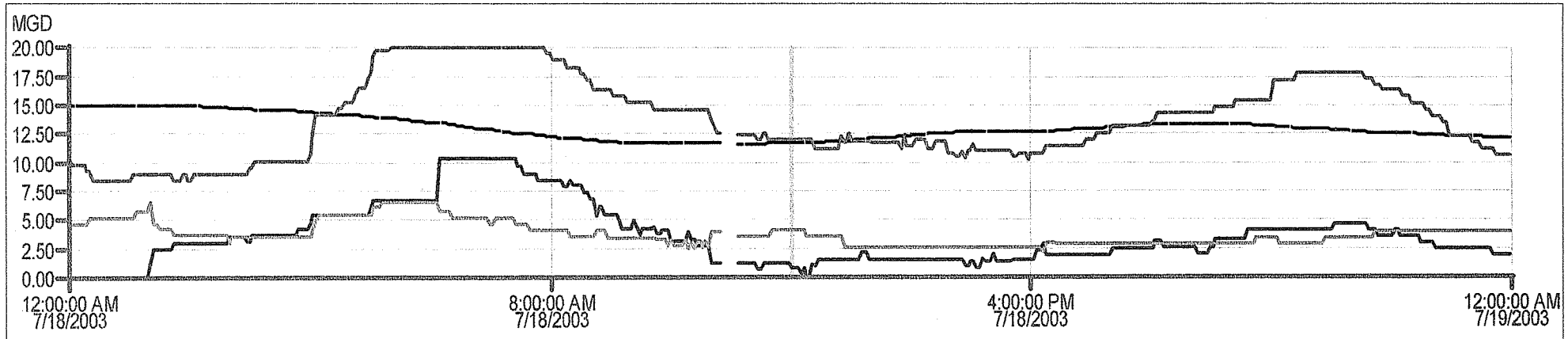
Hist.FIX.MFRWB.F_CV	WEBB MAIN FLOW RATE	12.88	MGD
Hist.FIX.BFRWB.F_CV	WEBB BOOSTER FLOW RATE	1.26	MGD
Hist.FIX.NE37_FLOWRATE.F_CV	37th Street flow rate	3.14	MGD
Hist.FIX.rlvwb.F_CV	WEBB RD RESERVOIR LEVEL	12.60	FEET

Main Menu | TREND MENU | SCADA Menu | 37TH ST | WEBB RD

37th ST AND WEBB RD PUMP STATIONS

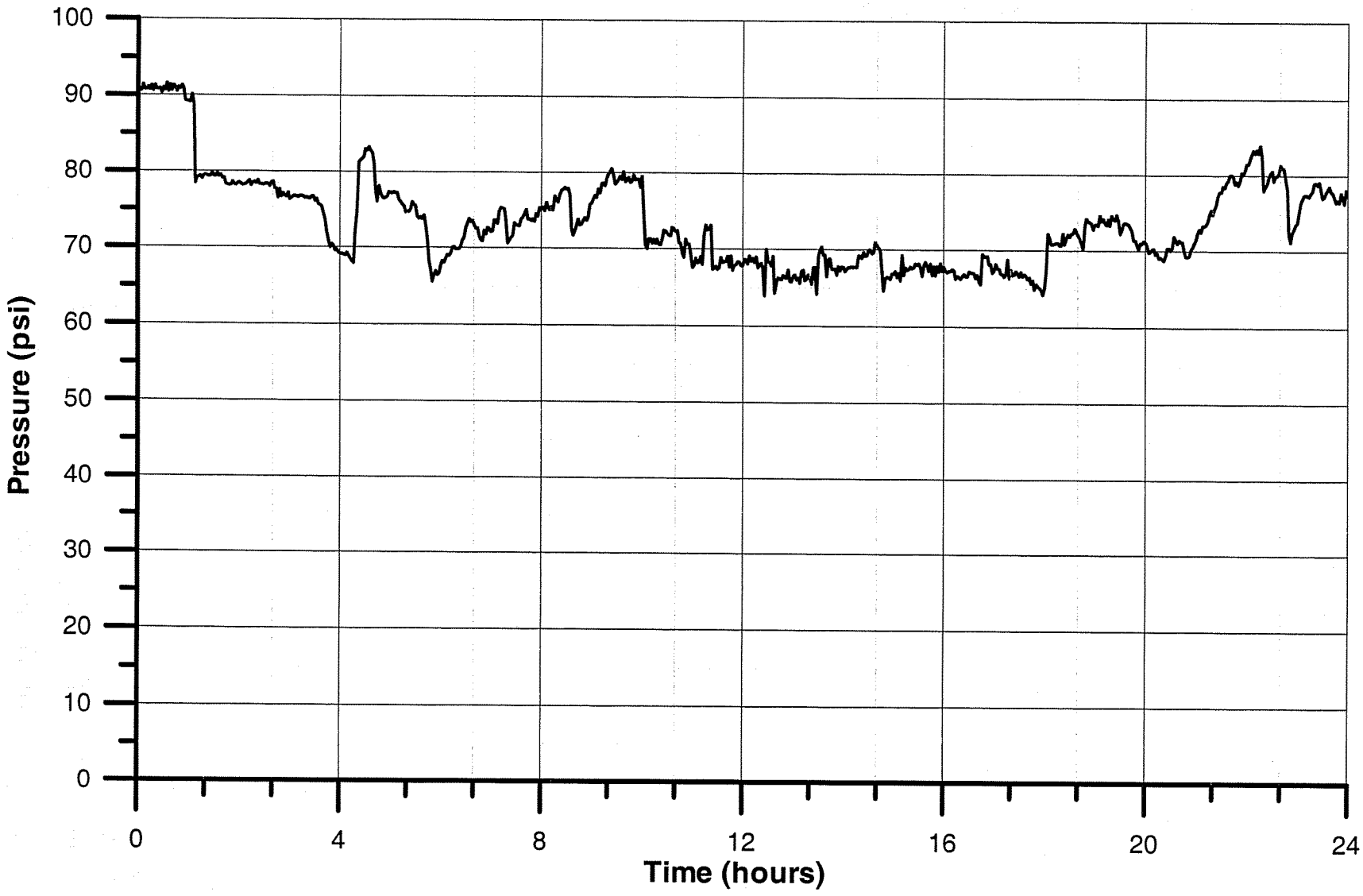


Hist.FIX.DPBWB.F_CV	WEBB BOOSTER DISC PSI	83.30	PSI
Hist.FIX.DPMWB.F_CV	WEBB MAIN DISC PSI	55.52	PSI
Hist.FIX.NE37TH_DSCHRG_PRESS.F_CV	N. DISCHARGE HEADER PRESSURE	87.53	PSI
Hist.FIX.34PSI.F_CV	SYSTEM PSI 34TH & WEBB RD	63.44	PSI
Hist.FIX.NE37TH_SUCTION_PRESS.F_CV	SUCTION HEADER PRESSURE	57.77	PSI



Hist.FIX.MFRWB.F_CV	WEBB MAIN FLOW RATE	12.01	MGD
Hist.FIX.BFRWB.F_CV	WEBB BOOSTER FLOW RATE	0.97	MGD
Hist.FIX.NE37_FLOWRATE.F_CV	37th Street flow rate	4.07	MGD
Hist.FIX.rlvwb.F_CV	WEBB RD RESERVOIR LEVEL	11.69	FEET

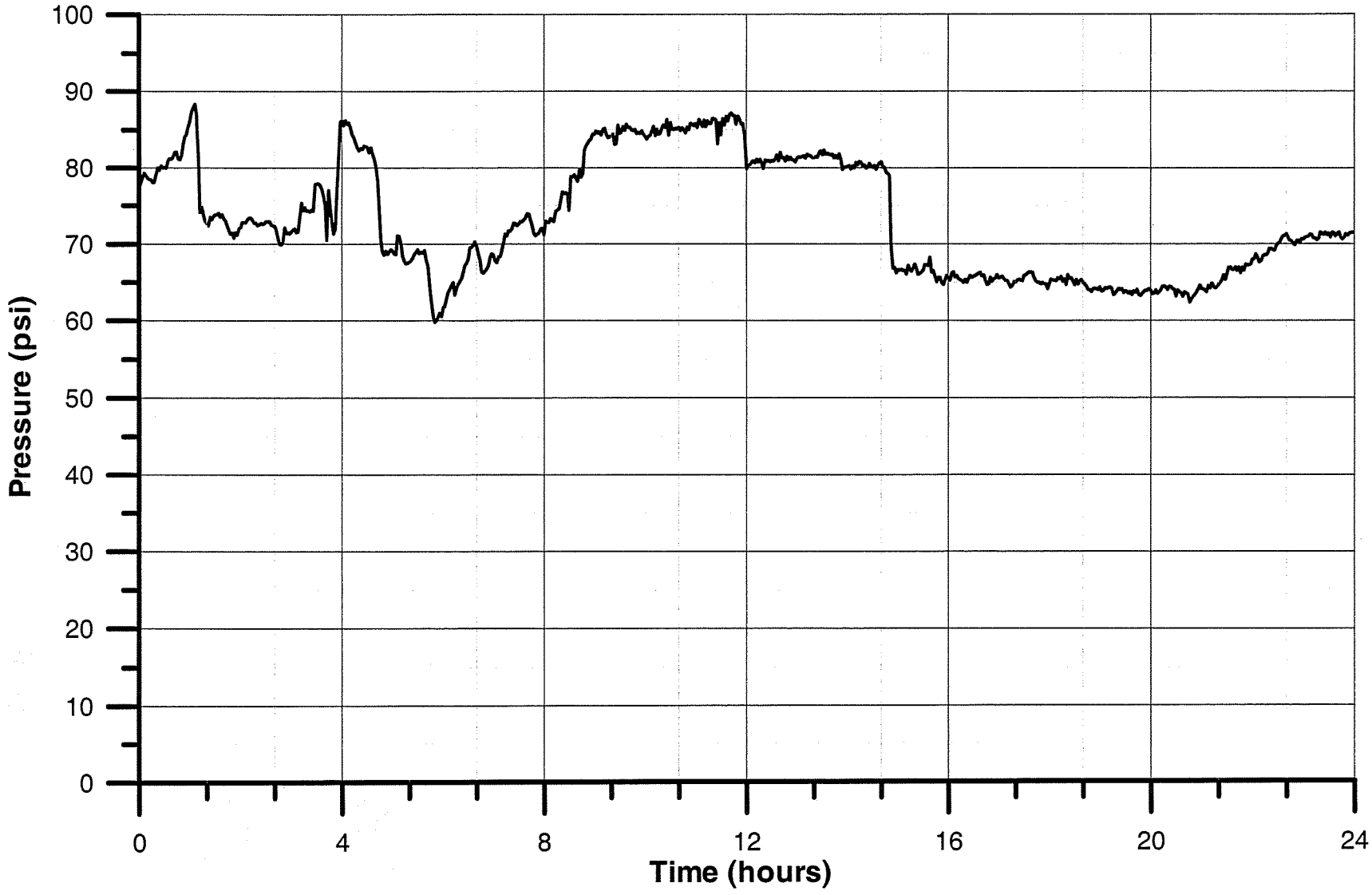
H10632 07-1



Burns & McDonnell

Wichita, Kansas
Pressure Data
Flint Hills & Prairie Point
Hydrant #10632
July 11, 2003

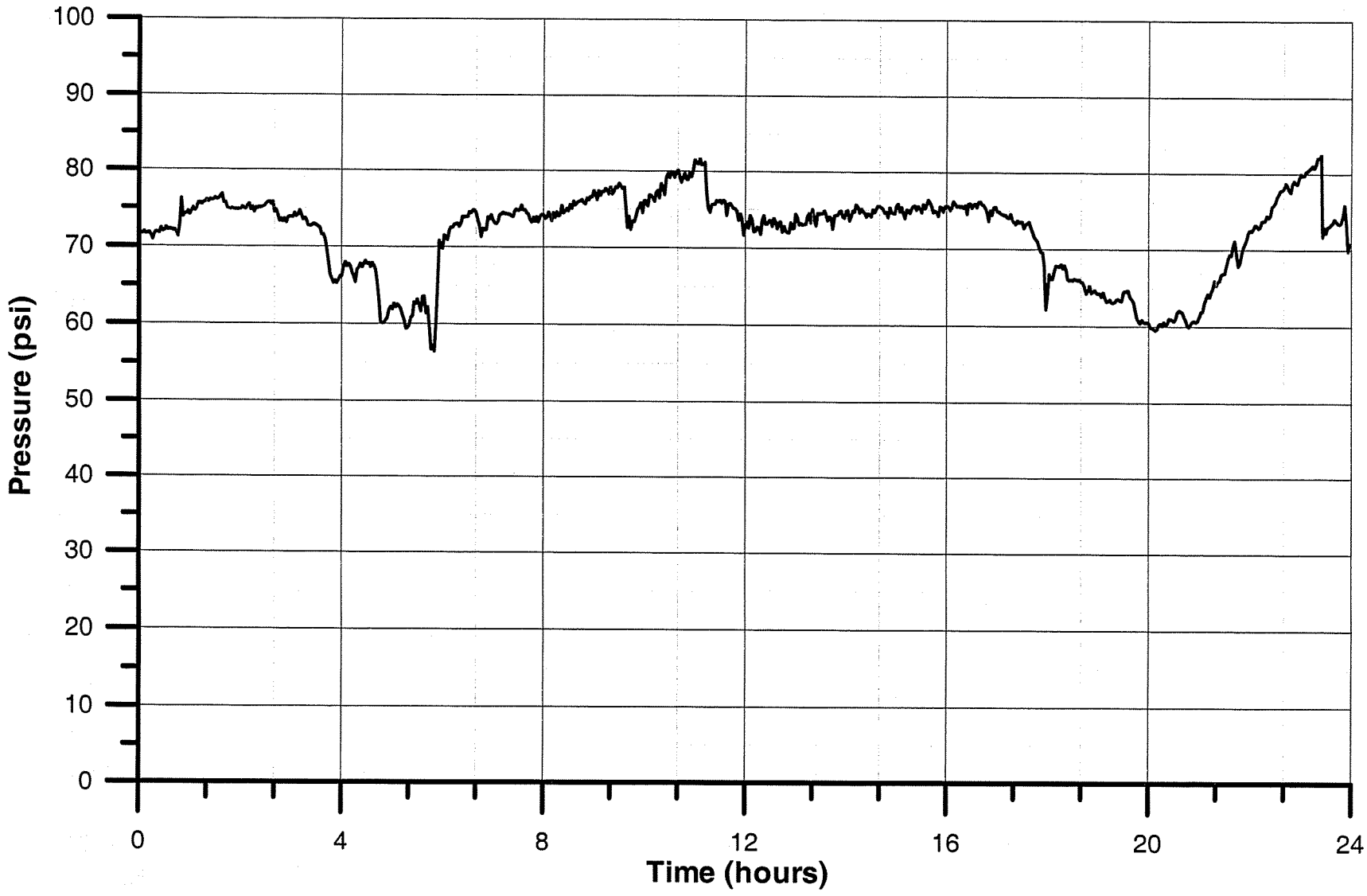
H10632 07-12-03



Burns & McDonnell

Wichita, Kansas
Pressure Data
Flint Hills & Prairie Point
Hydrant #10632
July 12, 2003

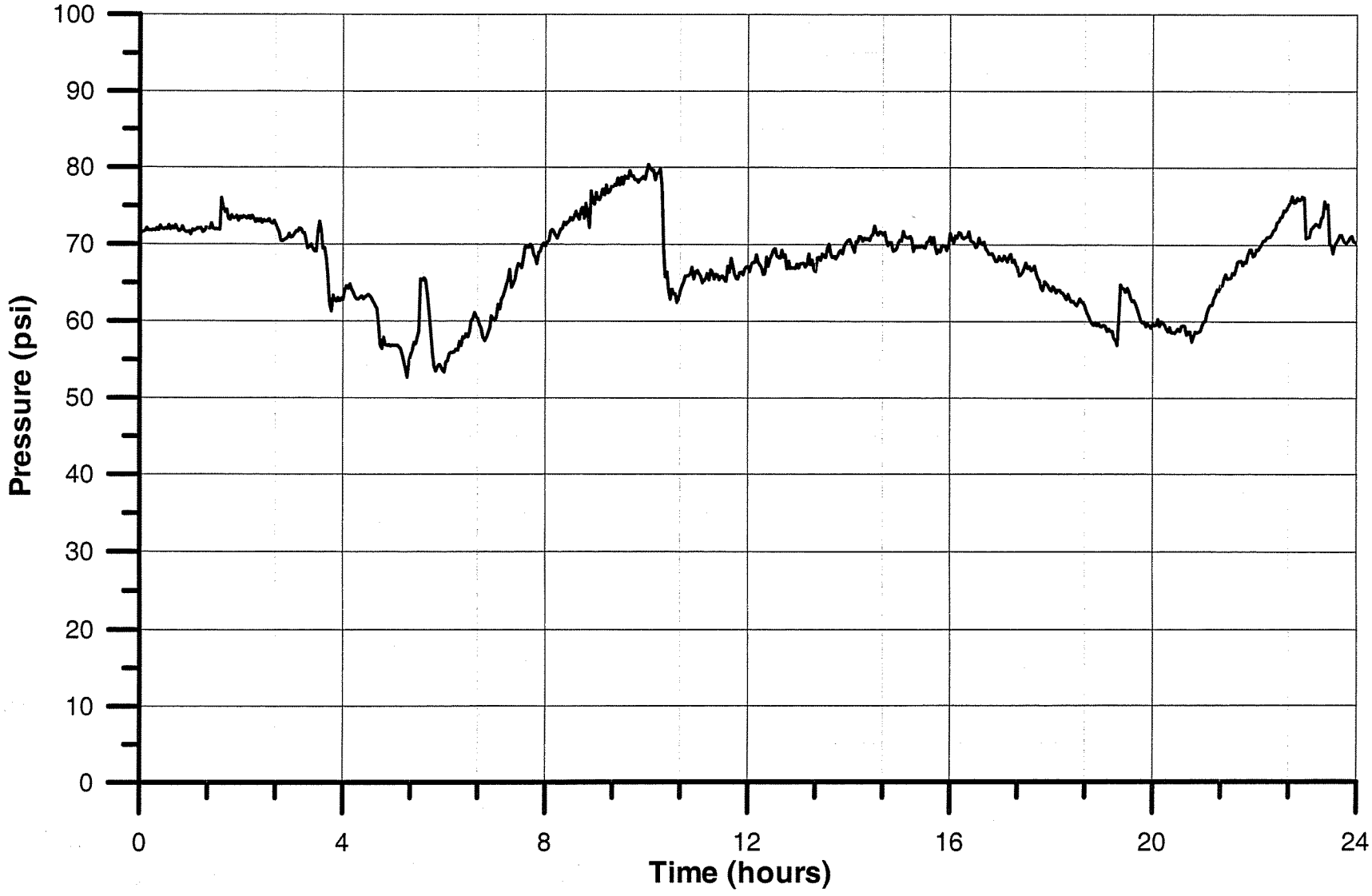
H10632 07-1



Burns & McDonnell

Wichita, Kansas
Pressure Data
Flint Hills & Prairie Point
Hydrant #10632
July 13, 2003

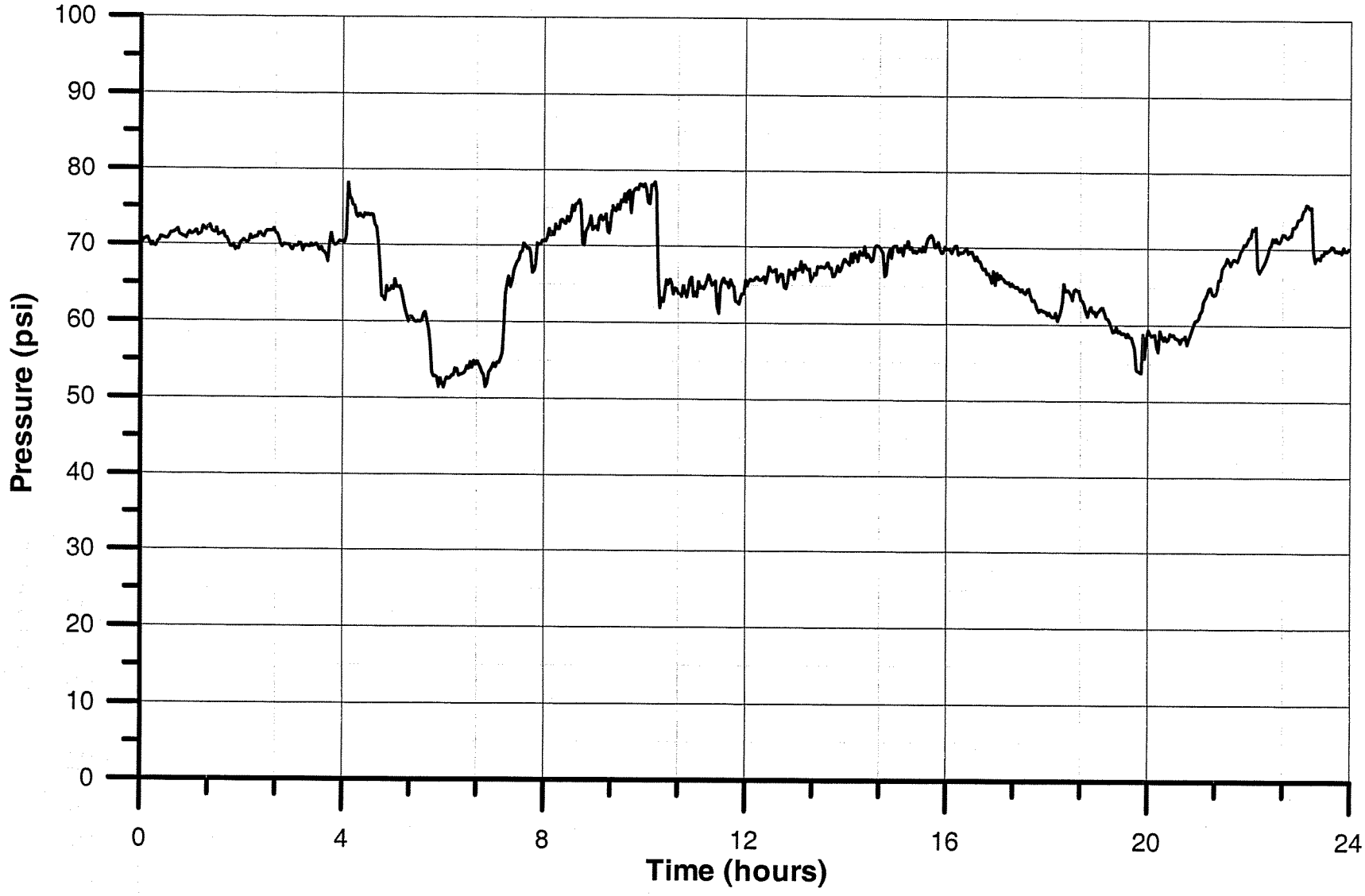
H10632 07-14-03



Burns & McDonnell

Wichita, Kansas
Pressure Data
Flint Hills & Prairie Point
Hydrant #10632
July 14, 2003

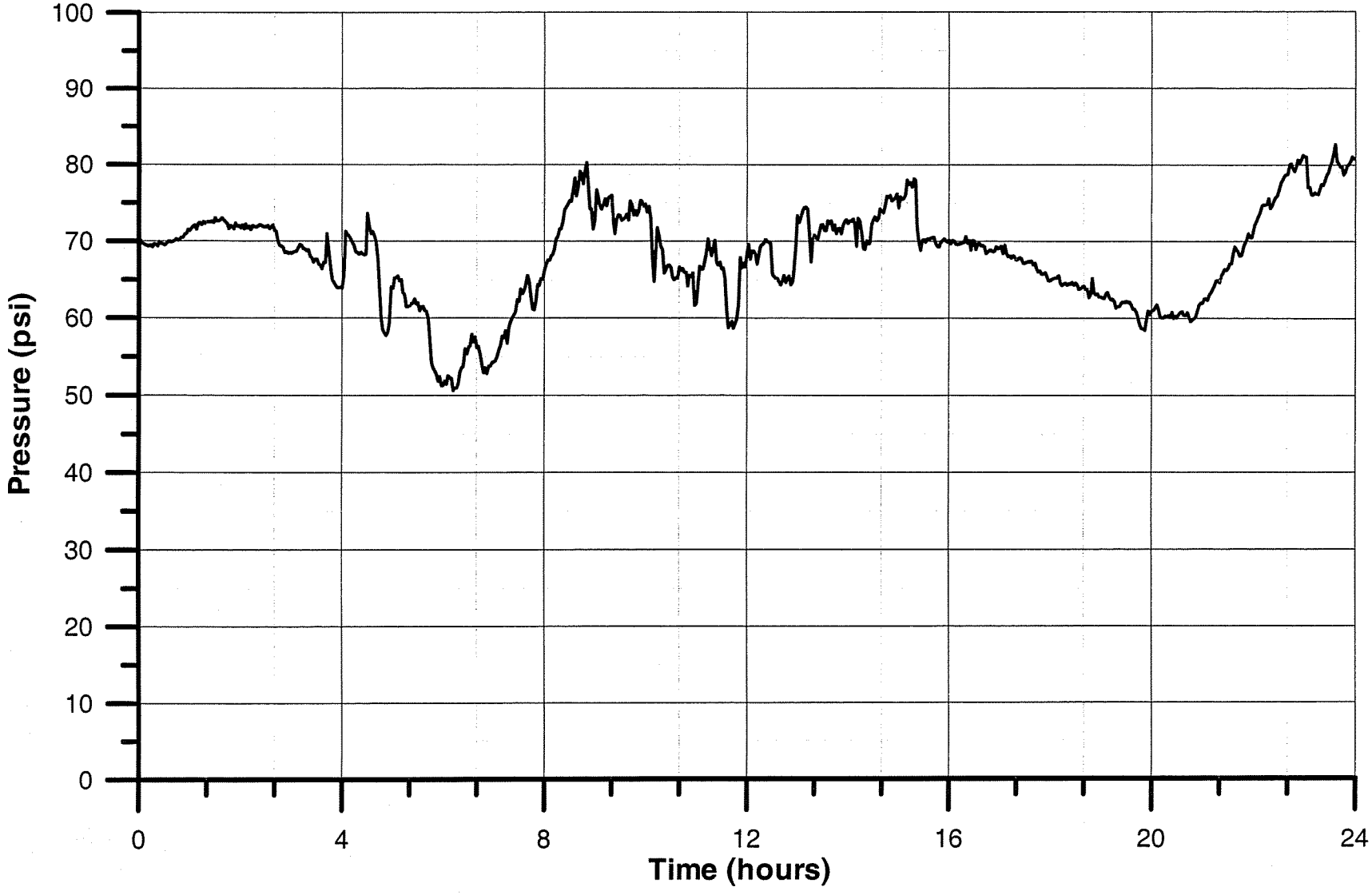
H10632 07-1



Burns & McDonnell

Wichita, Kansas
Pressure Data
Flint Hills & Prairie Point
Hydrant #10632
July 15, 2003

H10632 07-16-03



Burns & McDonnell

Wichita, Kansas
Pressure Data
Flint Hills & Prairie Point
Hydrant #10632
July 16, 2003

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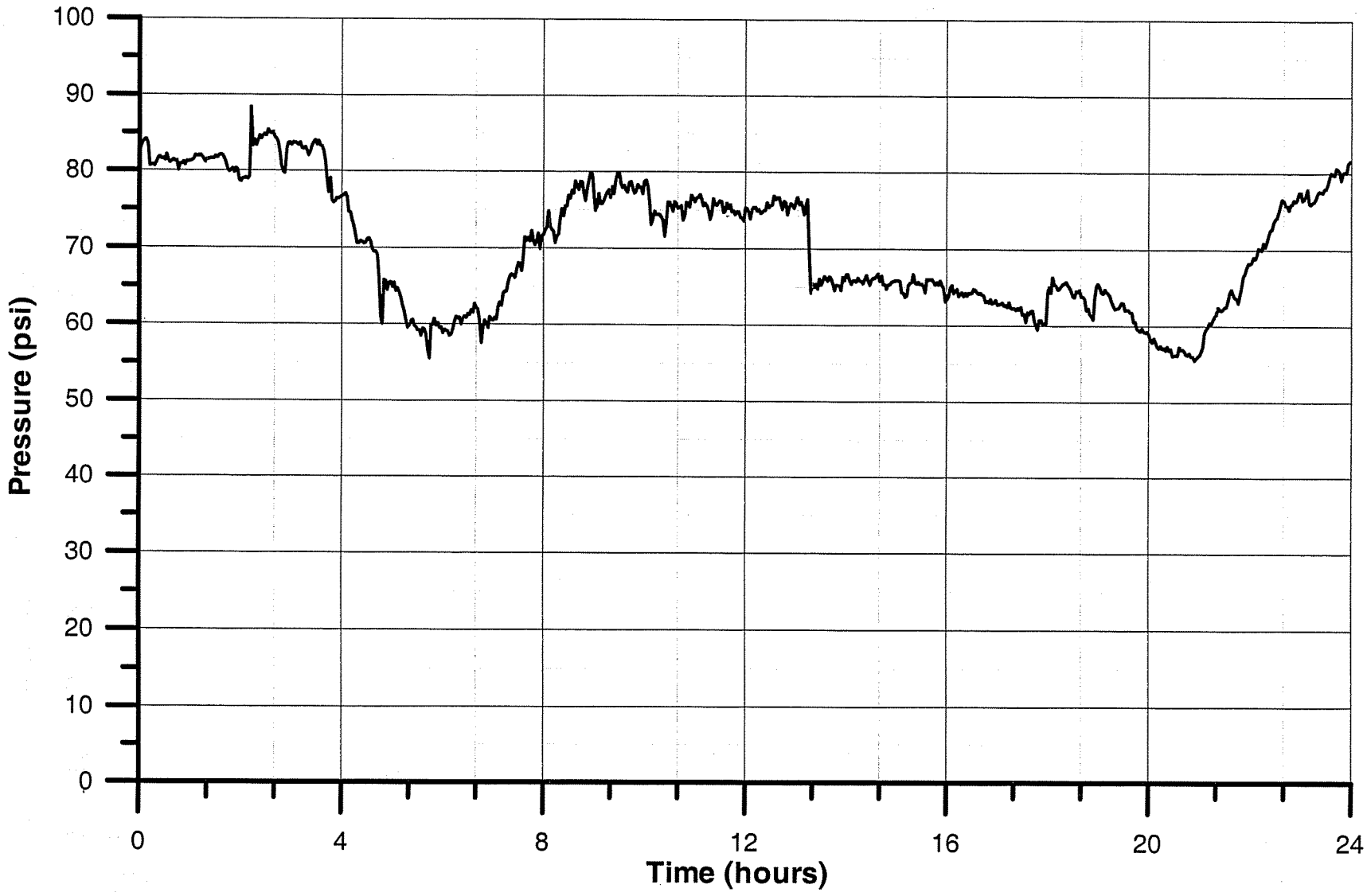

Burns & McDonnell

Wichita, Kansas
Pressure Data
Flint Hills & Prairie Point
Hydrant #10632
July 17, 2003

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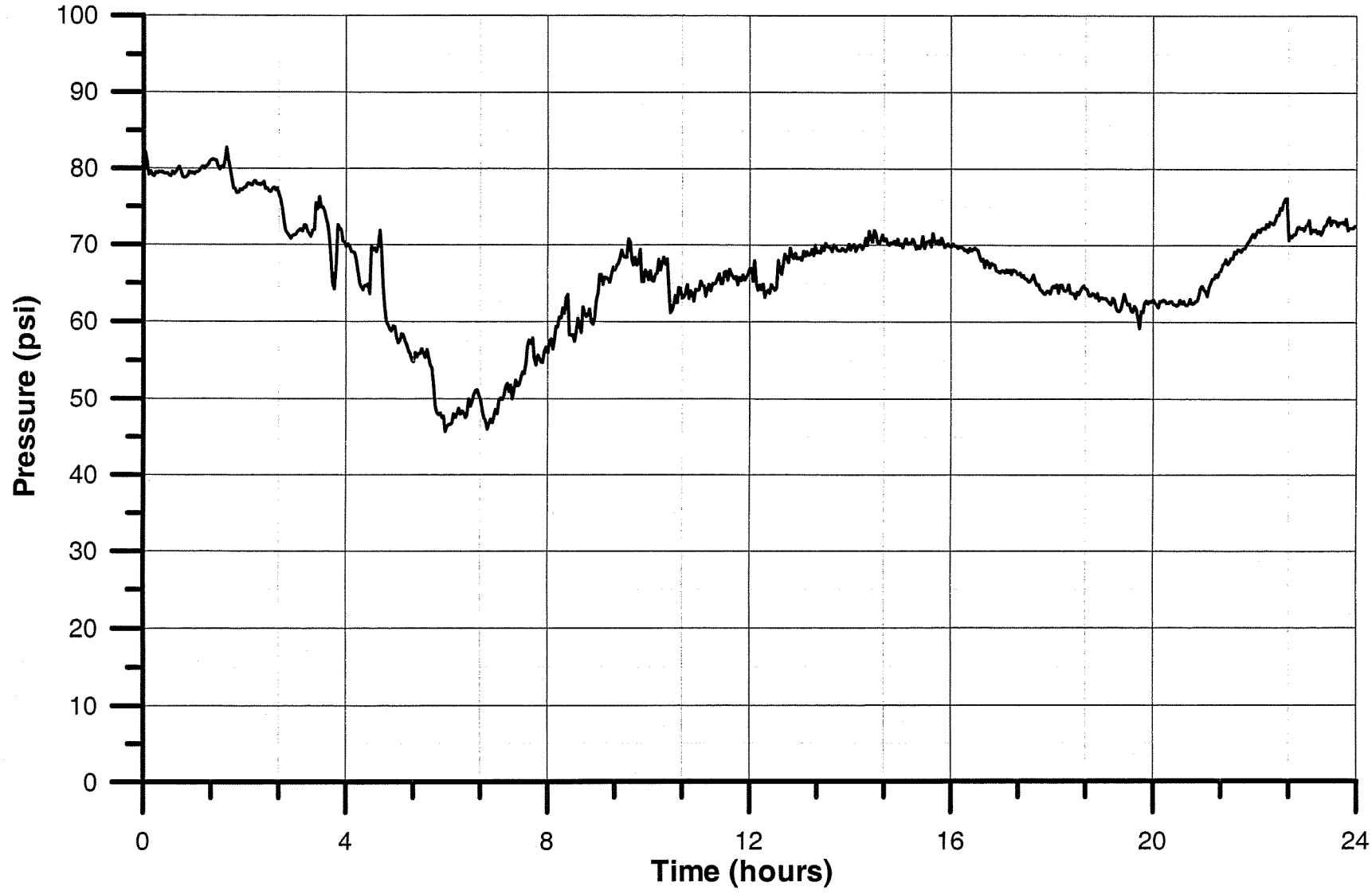
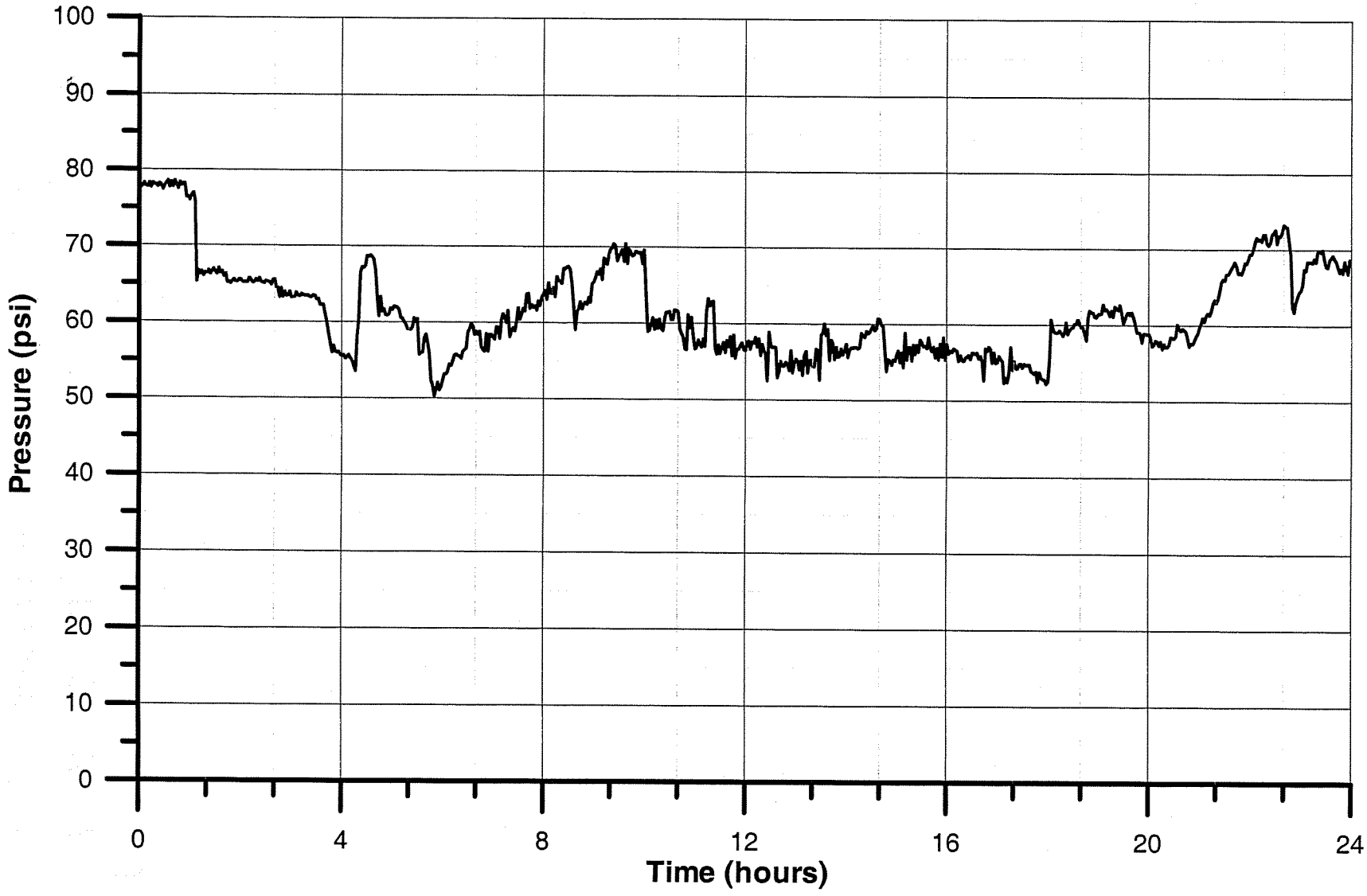


Burns & McDonnell

Wichita, Kansas
Pressure Data
Flint Hills & Prairie Point
Hydrant #10632
July 18, 2003

H9495 07-11



Burns & McDonnell

Wichita, Kansas
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Quail Crossing & Mountain
Hydrant #9495
July 11, 2003

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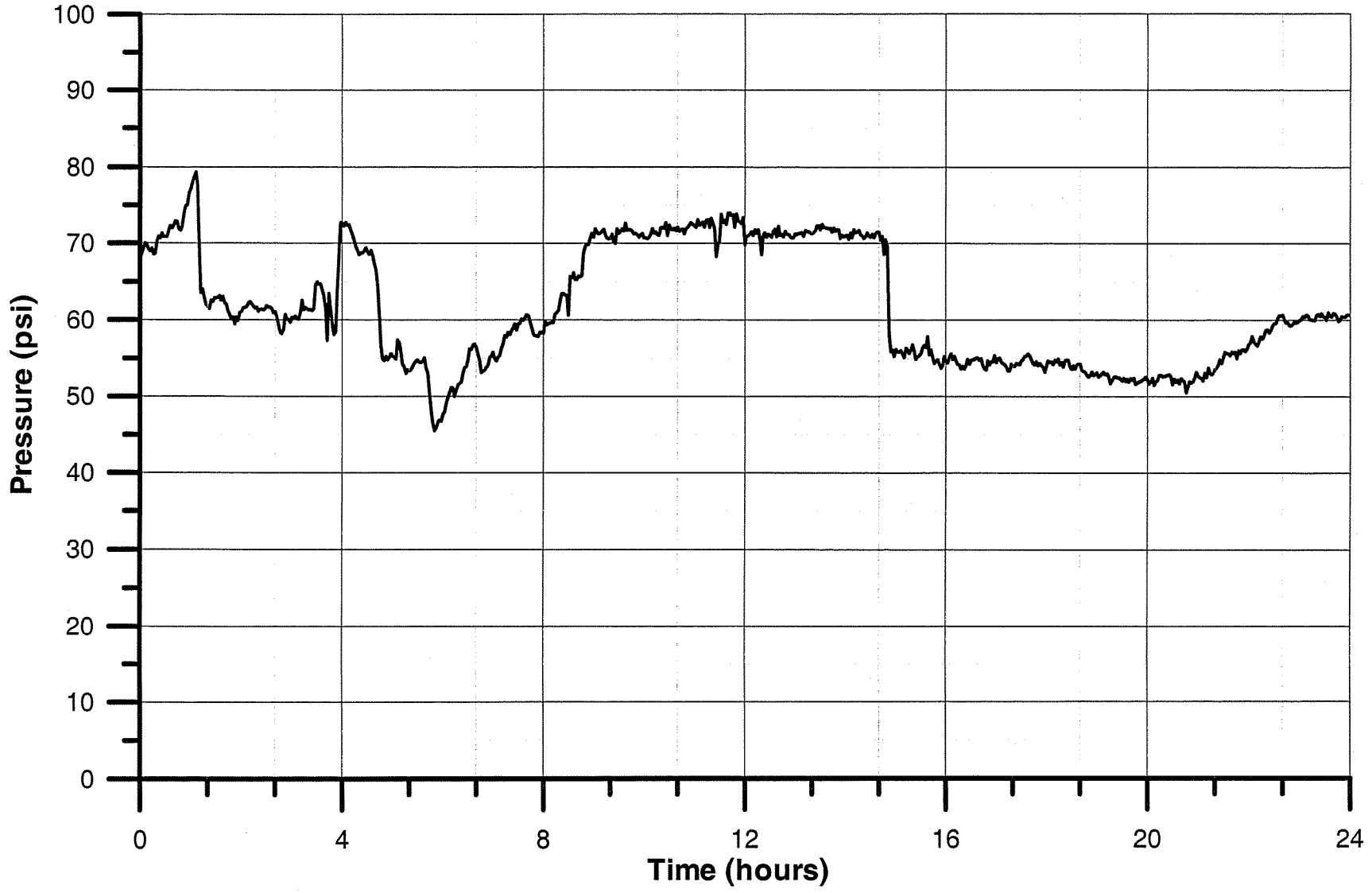
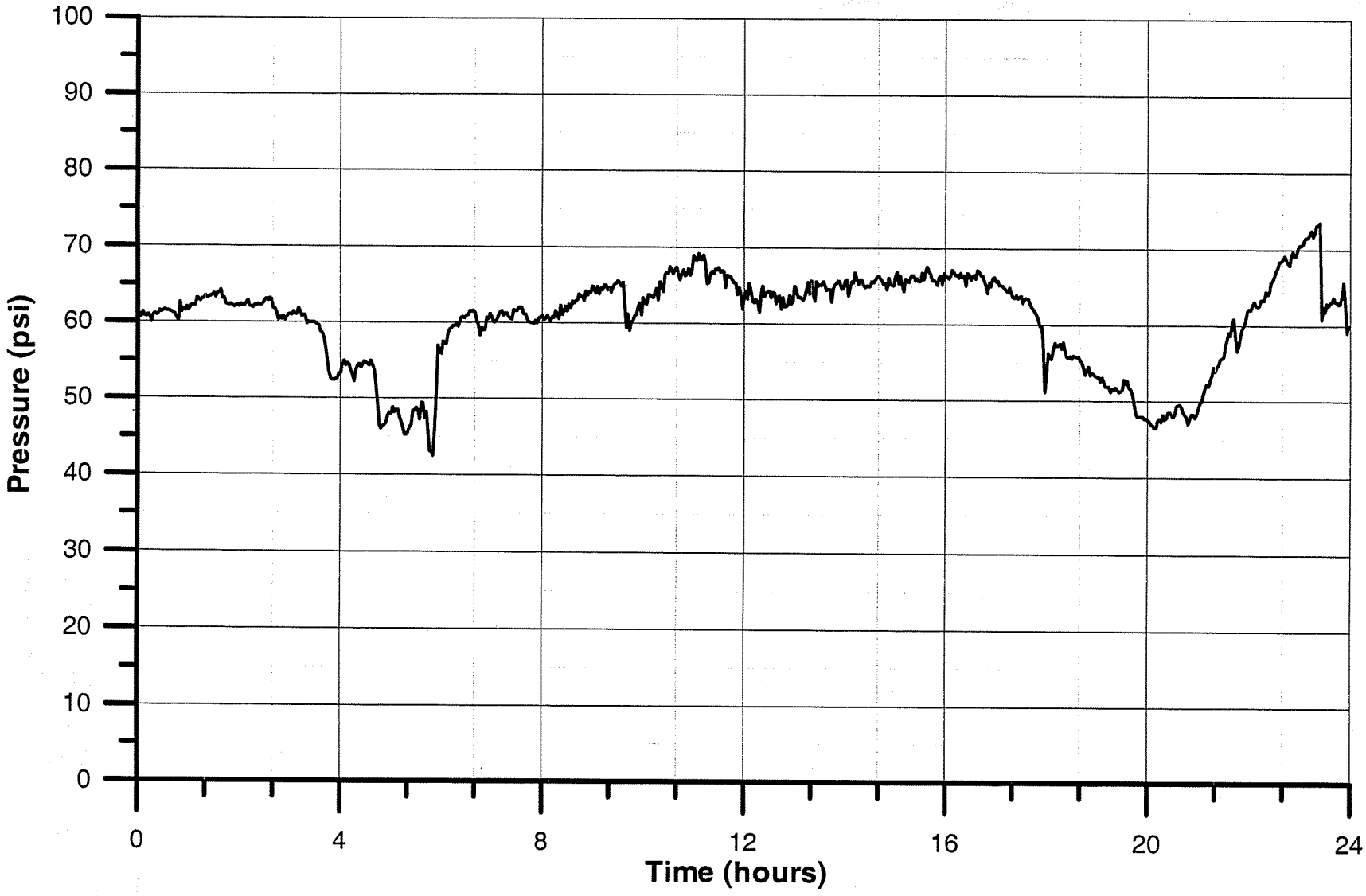


Burns & McDonnell

Wichita, Kansas
Pressure Data
Quail Crossing & Mountain
Hydrant #9495
July 12, 2003

H9495 07-13



Burns & McDonnell

Wichita, Kansas
Pressure Data
Quail Crossing & Mountain
Hydrant #9495
July 13, 2003

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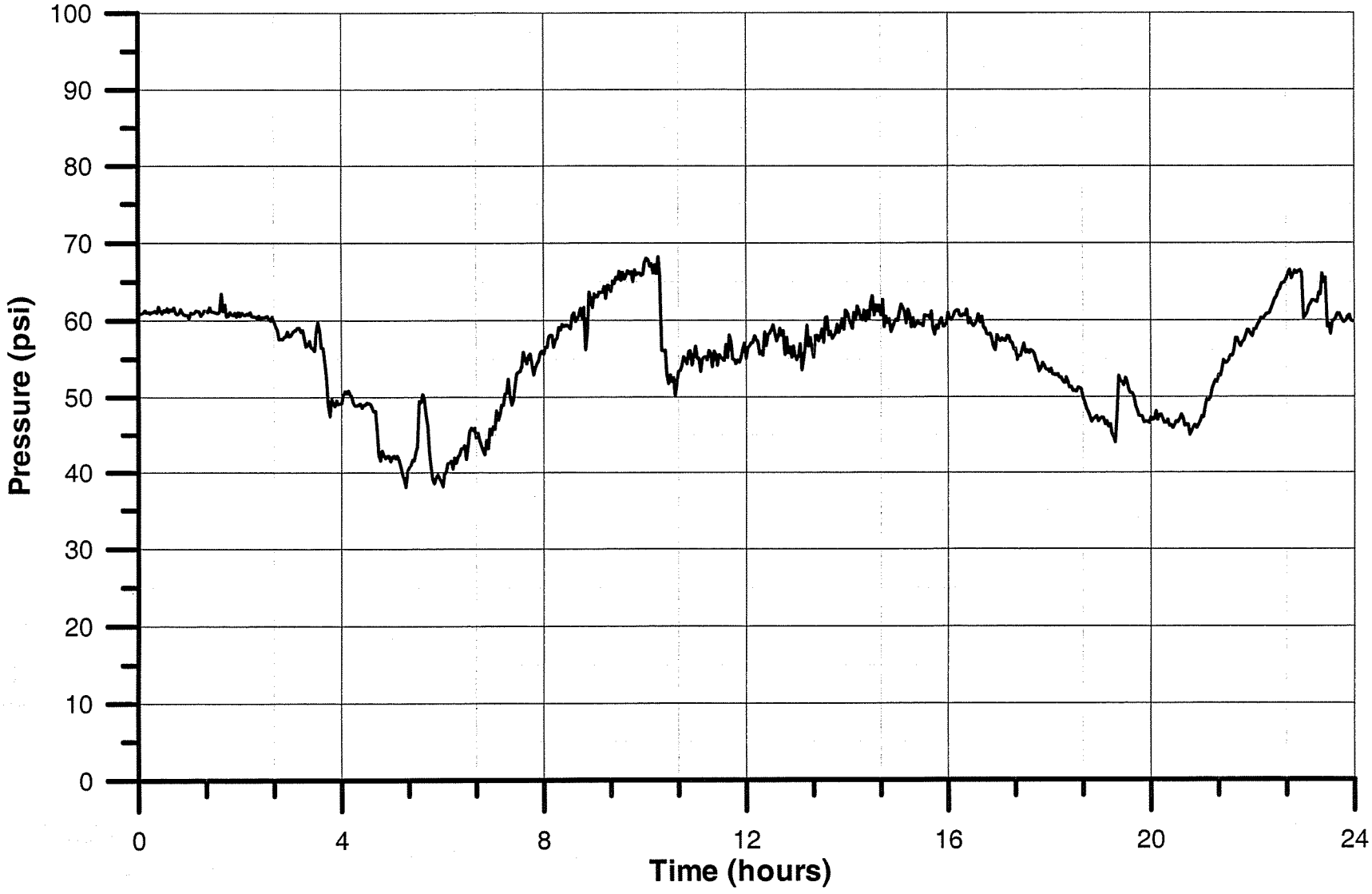

Burns & McDonnell

Wichita, Kansas
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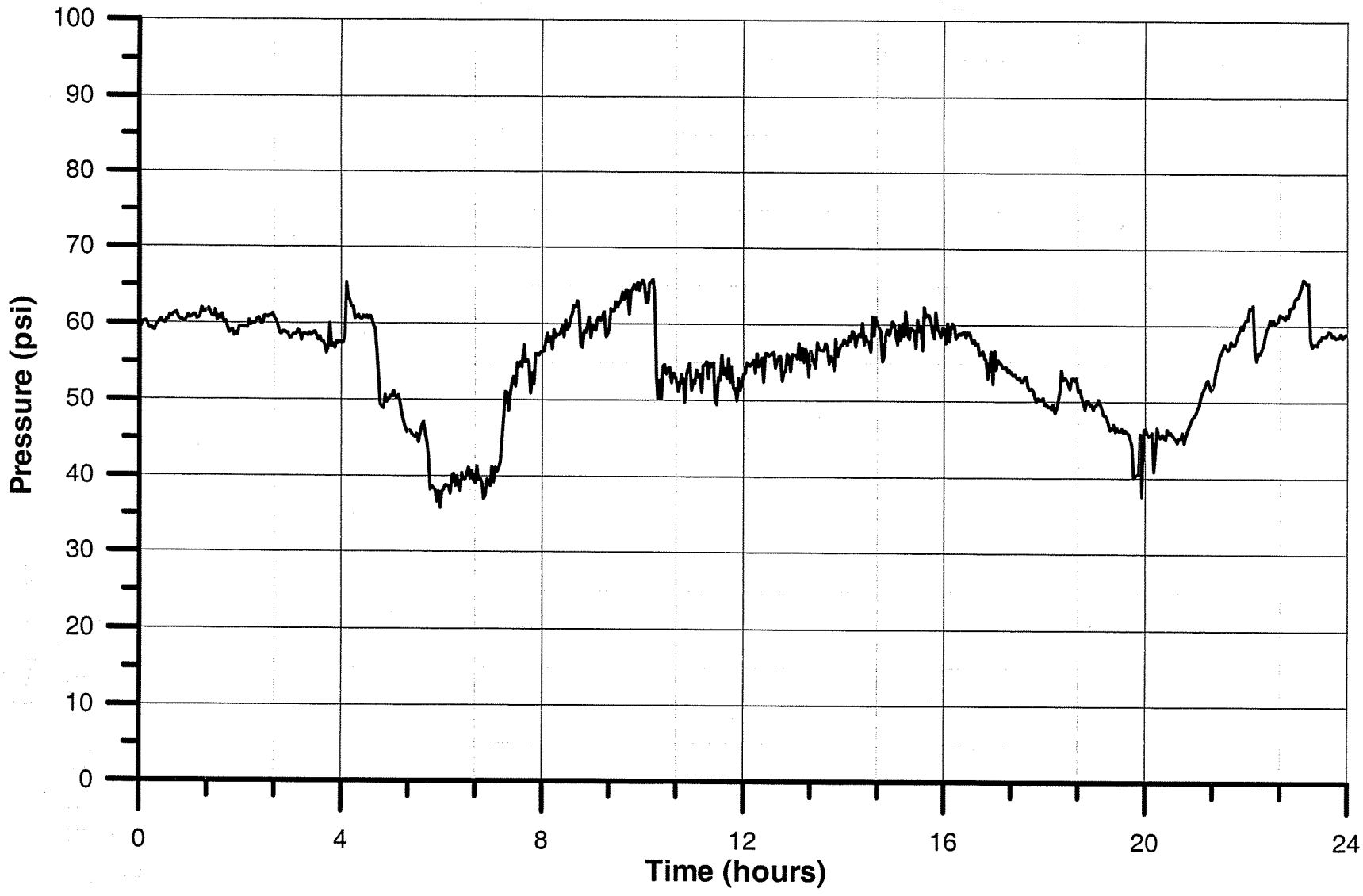
Quail Crossing & Mountain
Hydrant #9495
July 14, 2003

H9495 07-15



Burns & McDonnell

Wichita, Kansas
Pressure Data
Quail Crossing & Mountain
Hydrant #9495
July 15, 2003

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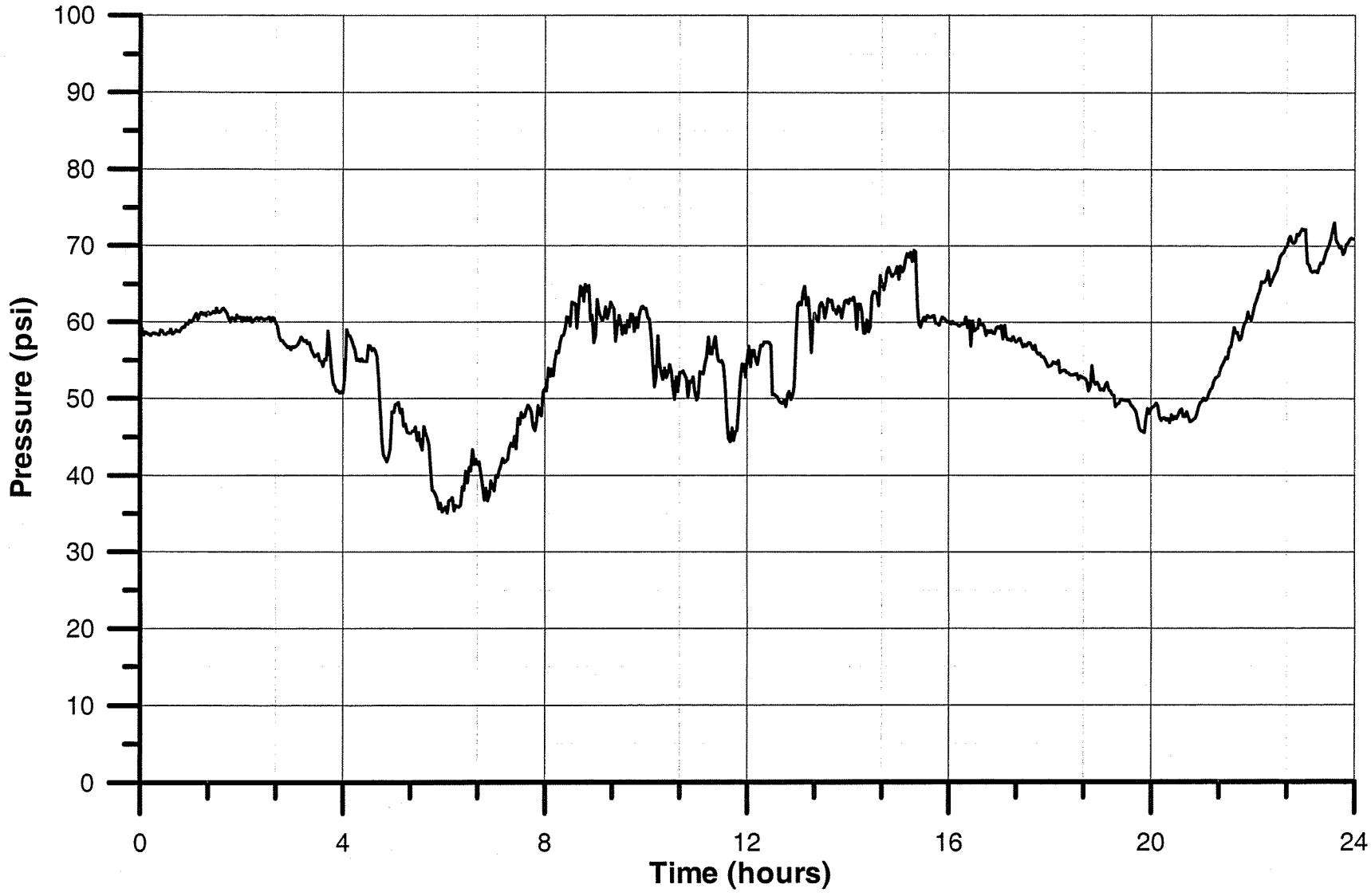

Burns & McDonnell

Wichita, Kansas
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Quail Crossing & Mountain
Hydrant #9495
July 16, 2003

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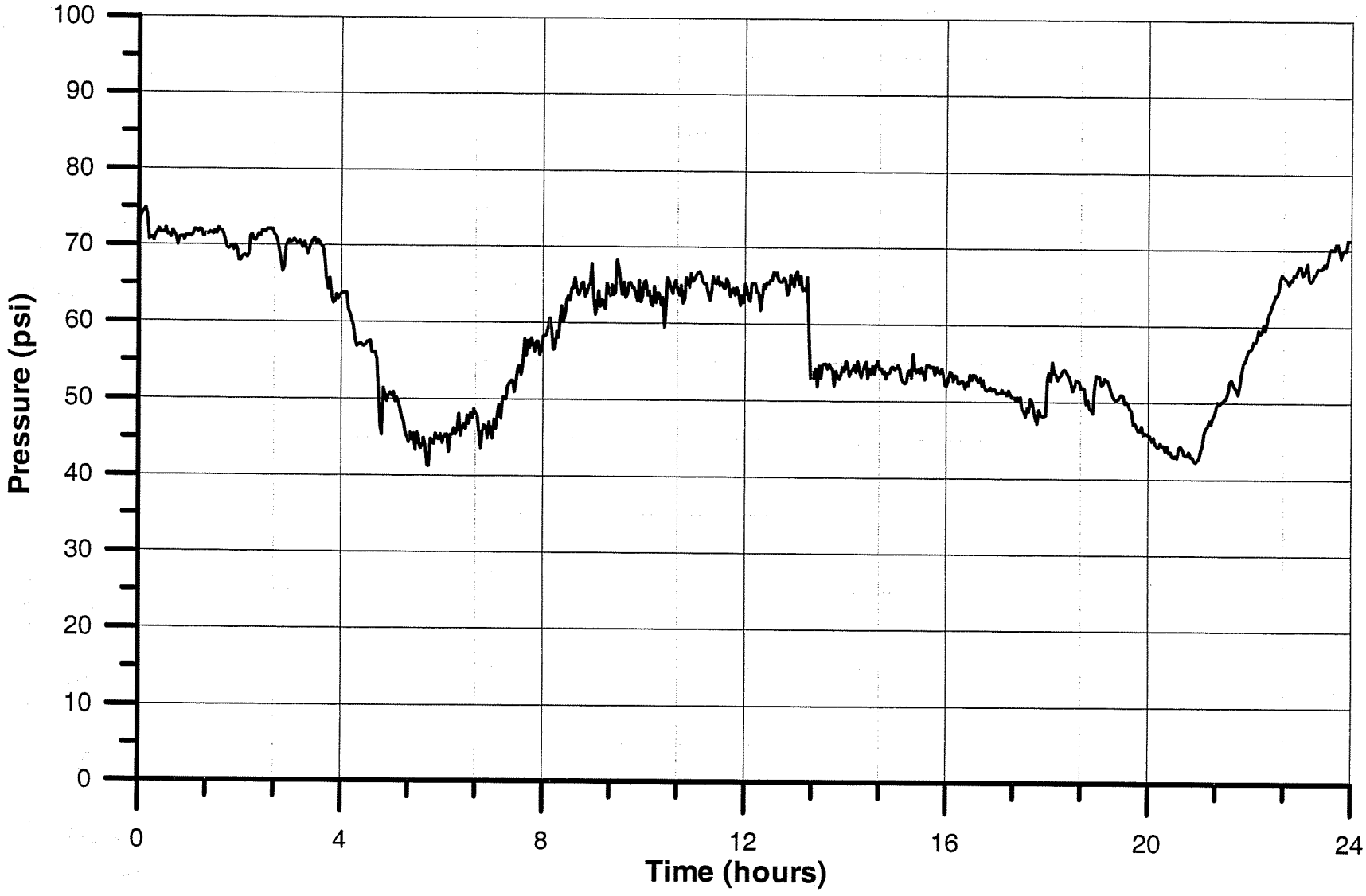

Burns & McDonnell

Wichita, Kansas
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July 17, 2003

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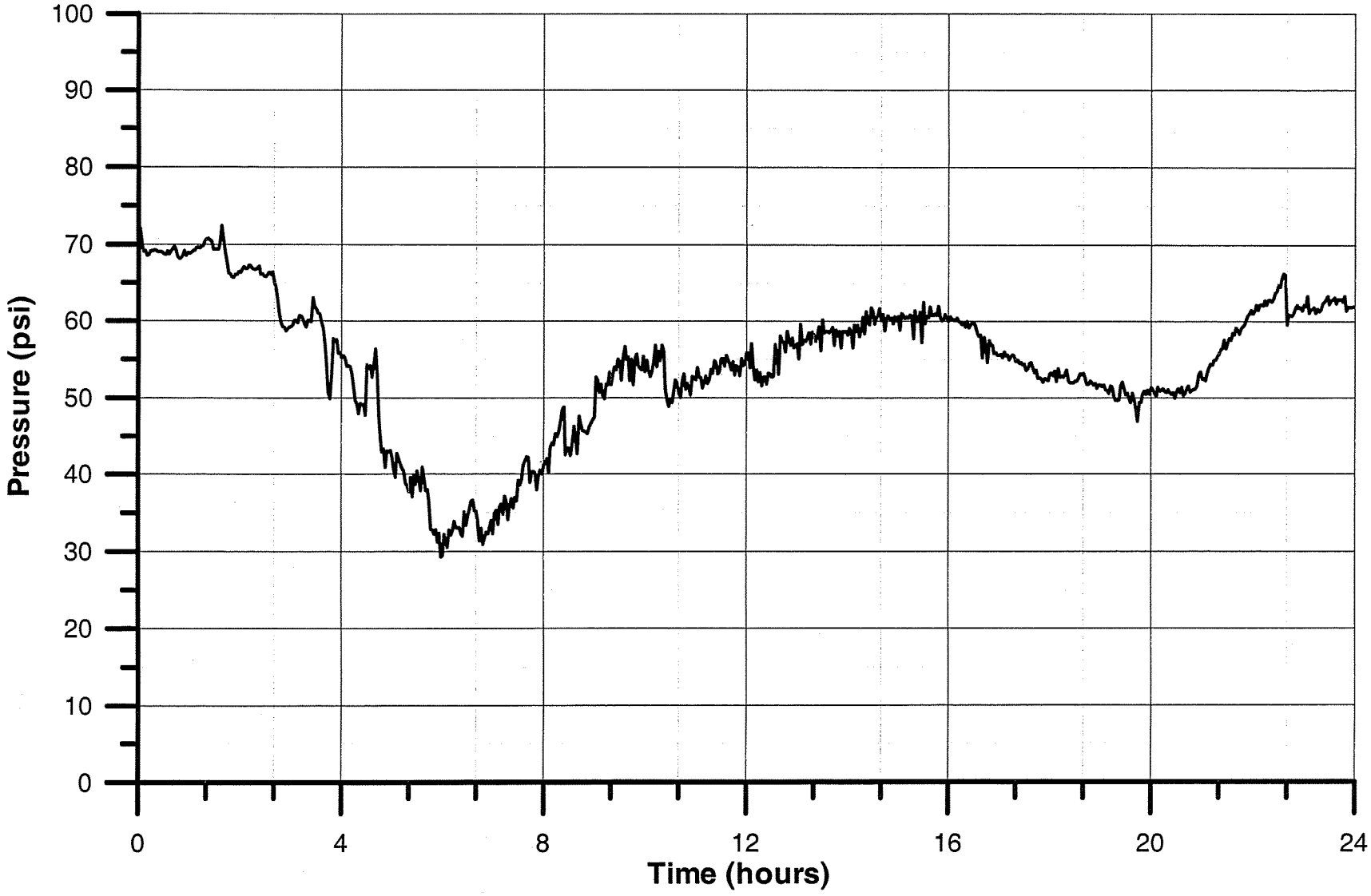

Burns & McDonnell

Wichita, Kansas
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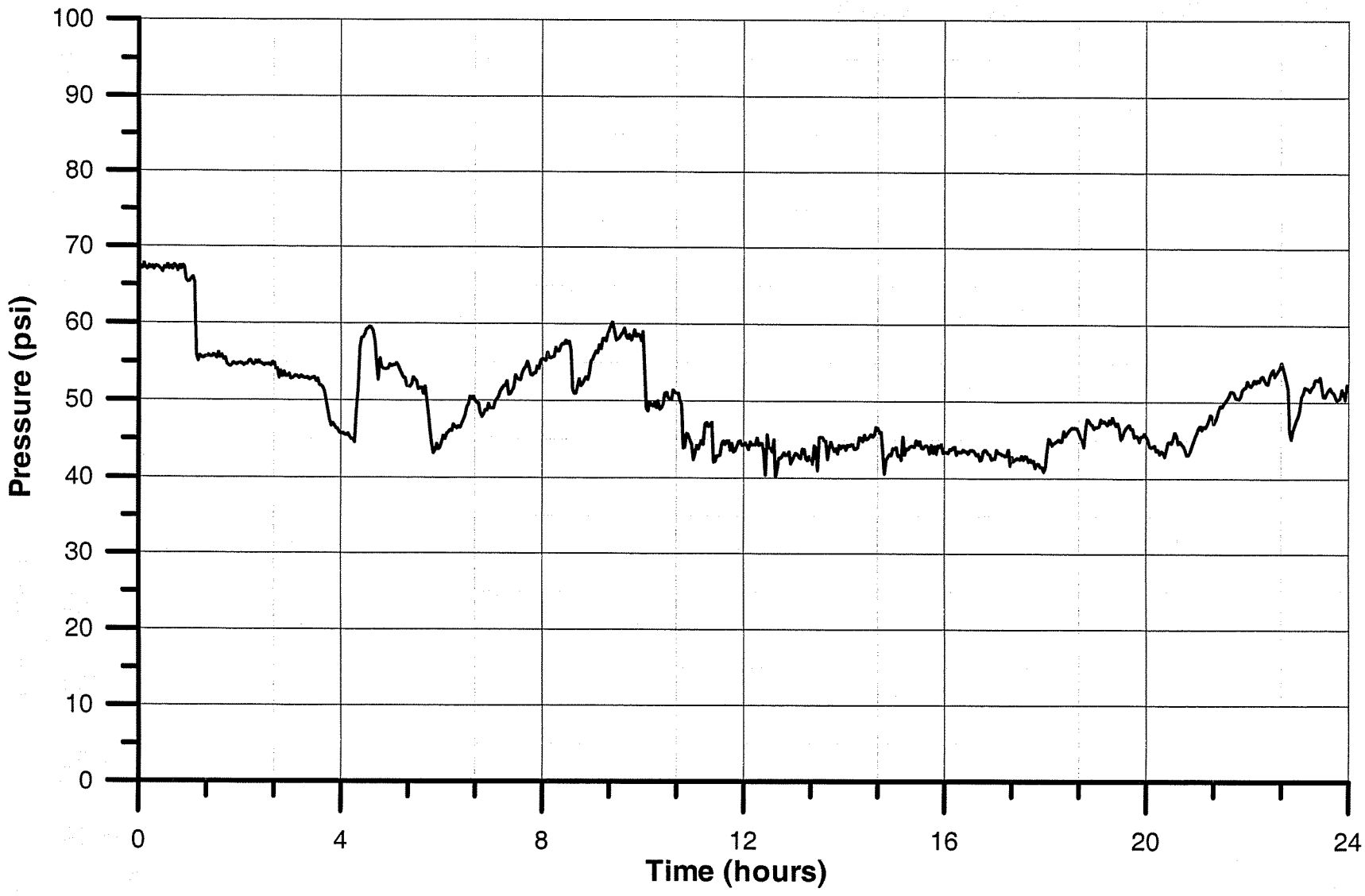
Quail Crossing & Mountain
Hydrant #9495
July 18, 2003

H9866 07-11



Burns & McDonnell

Wichita, Kansas
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July 11, 2003

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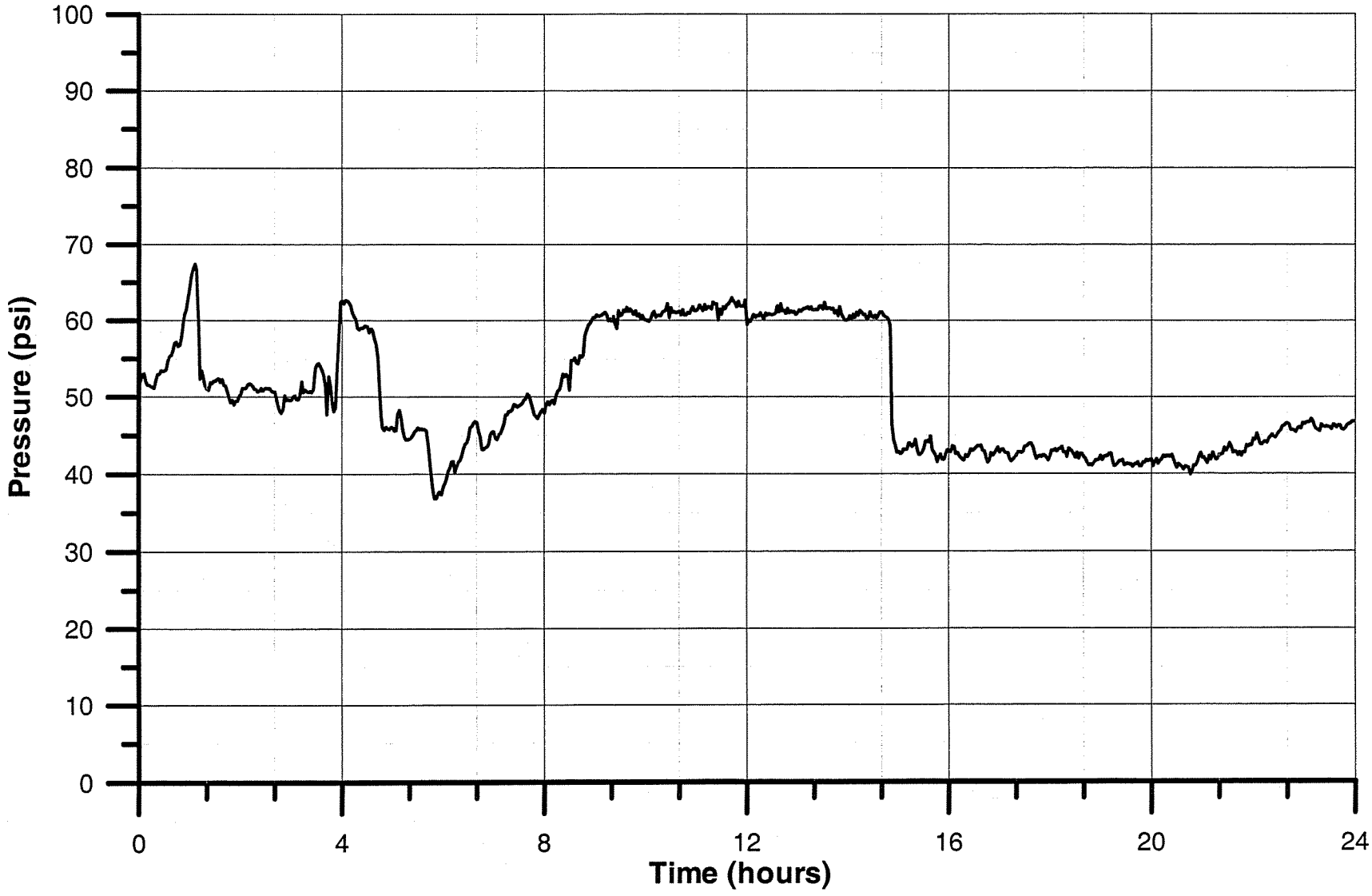

Burns & McDonnell

Wichita, Kansas
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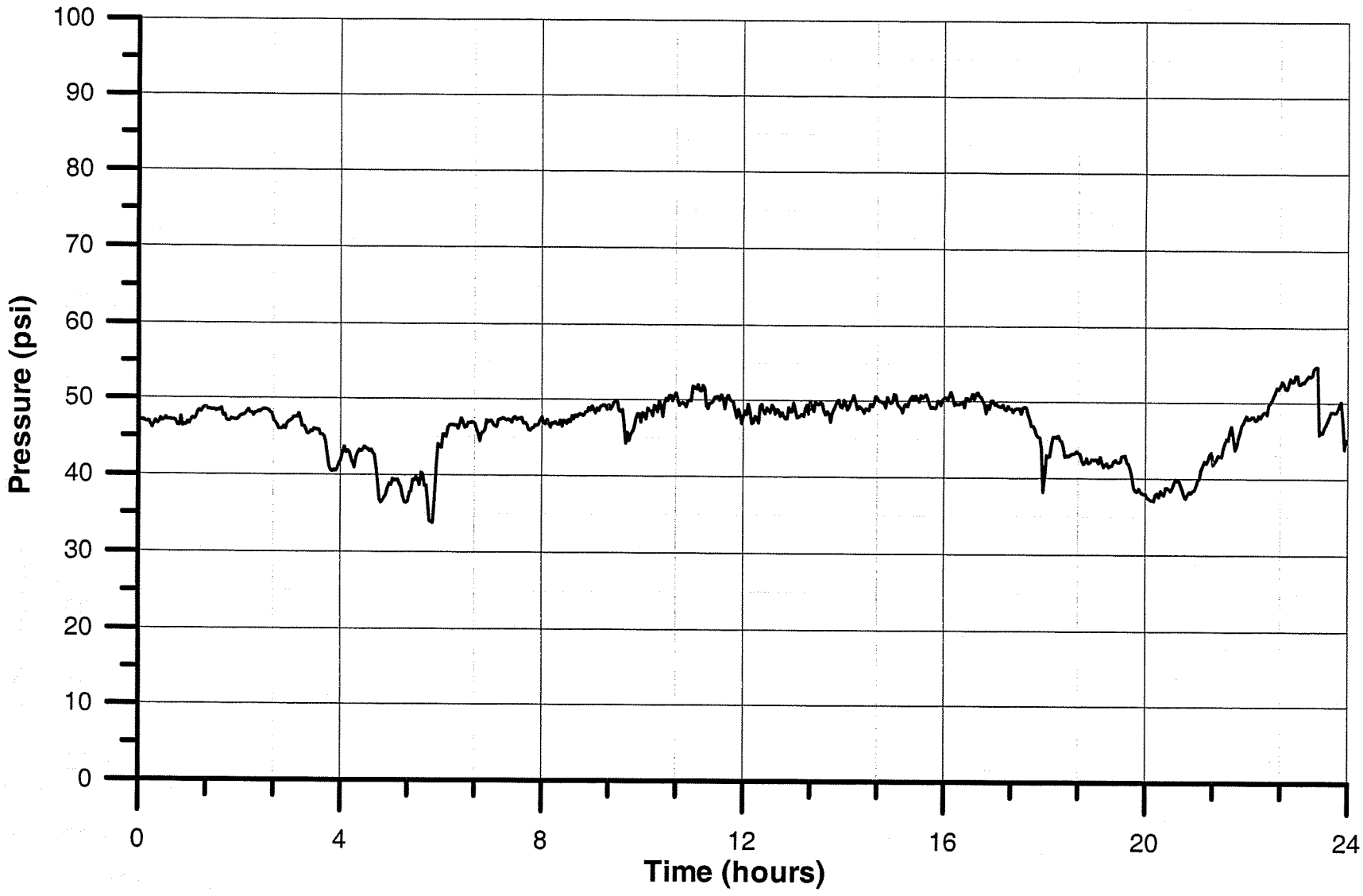
Hydrant #9866
July 12, 2003

H9866 07-13



Burns & McDonnell

Wichita, Kansas
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July 13, 2003

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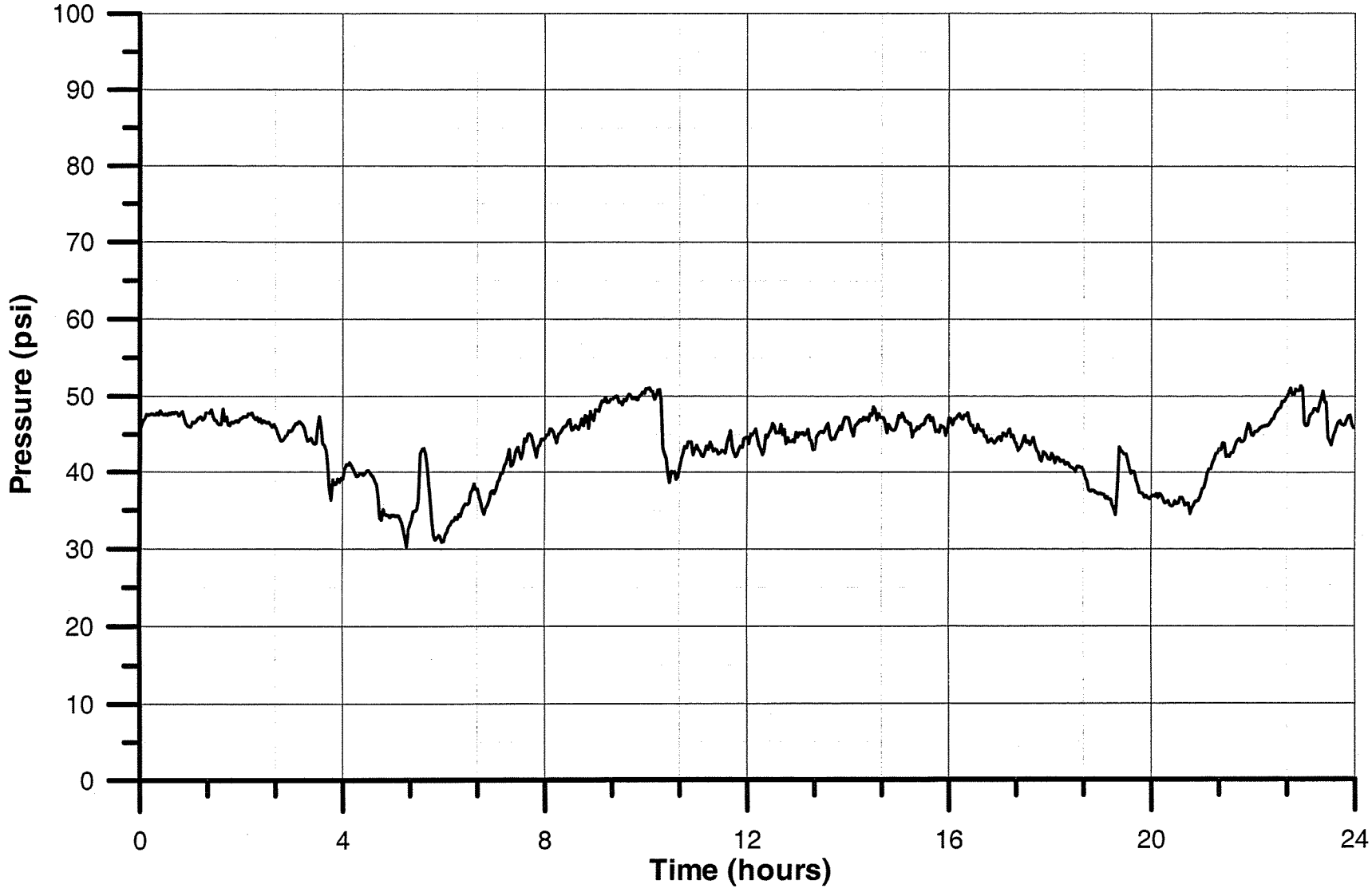

Burns & McDonnell

Wichita, Kansas
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July 14, 2003

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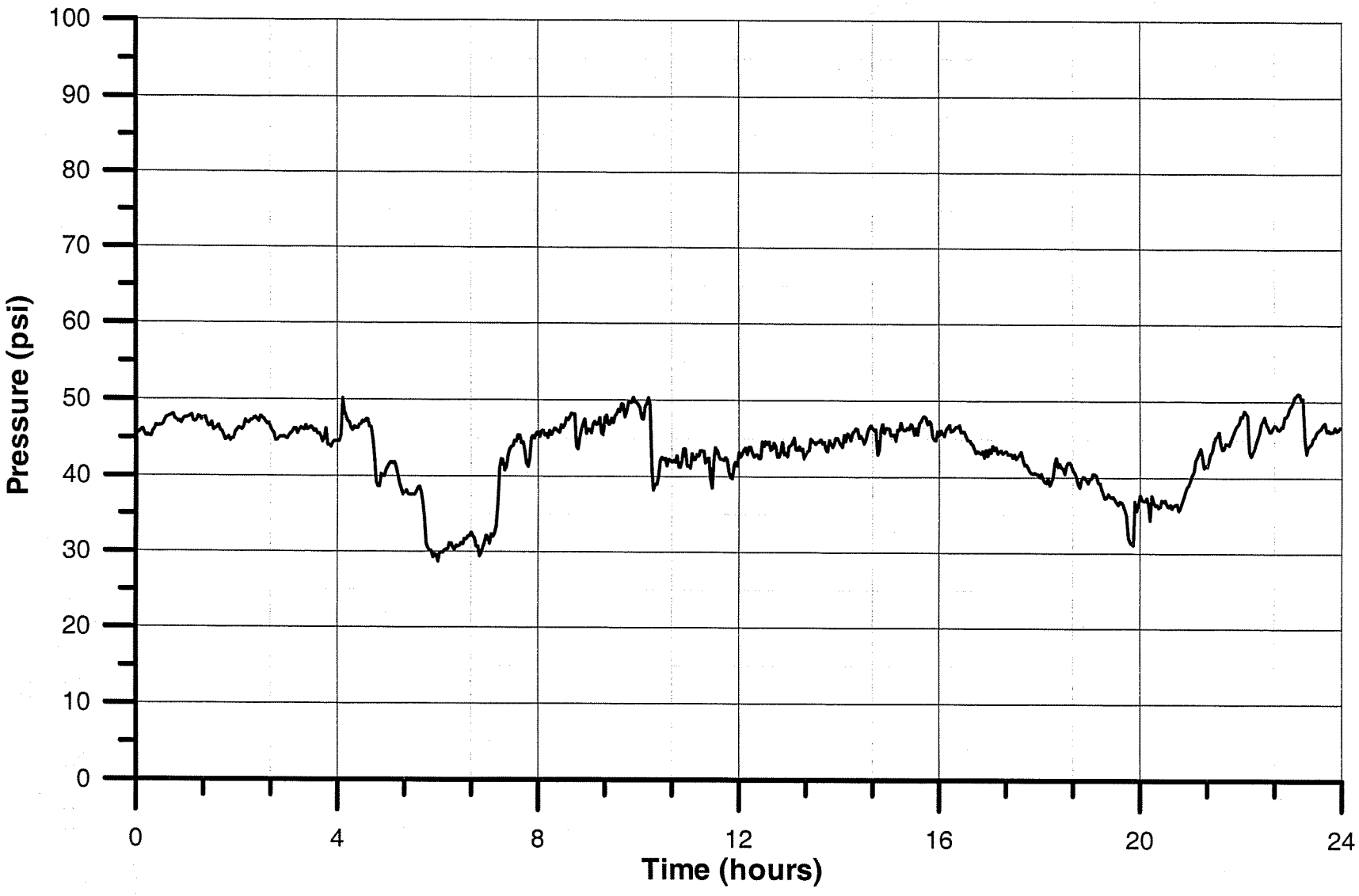

Burns & McDonnell

Wichita, Kansas
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July 15, 2003

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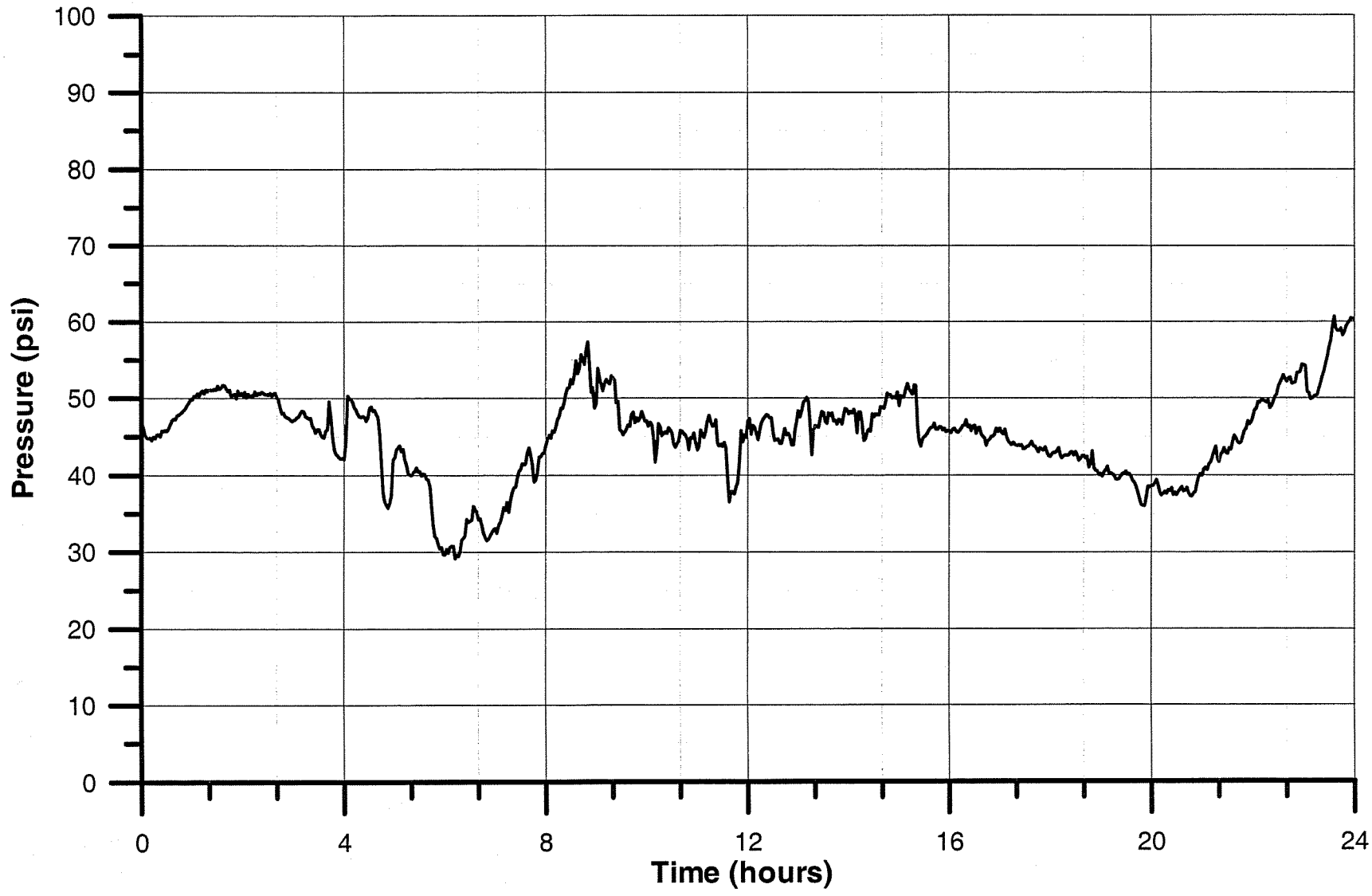

Burns & McDonnell

Wichita, Kansas
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July 16, 2003

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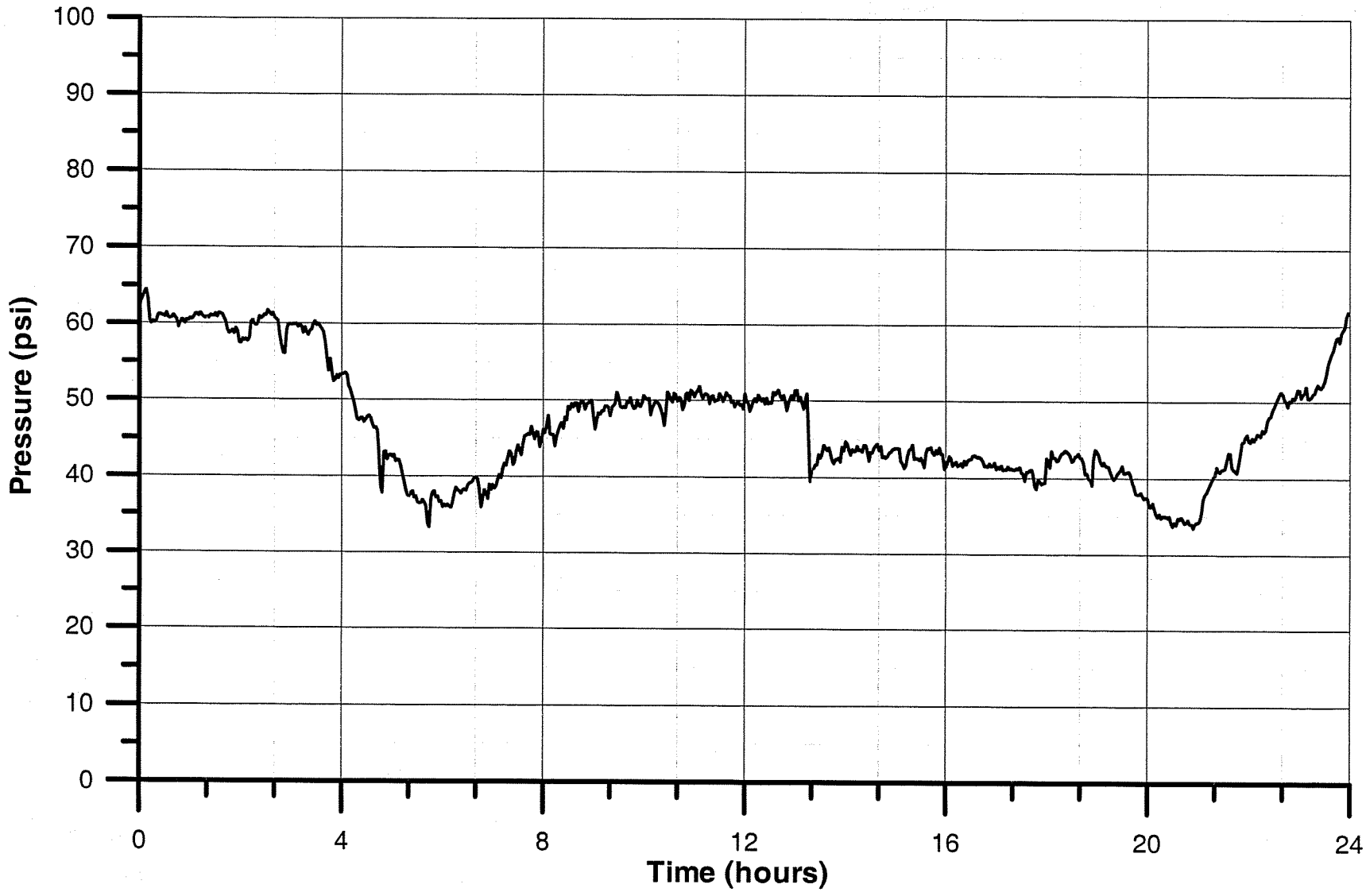

Burns & McDonnell

Wichita, Kansas
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Hydrant #9866
July 17, 2003

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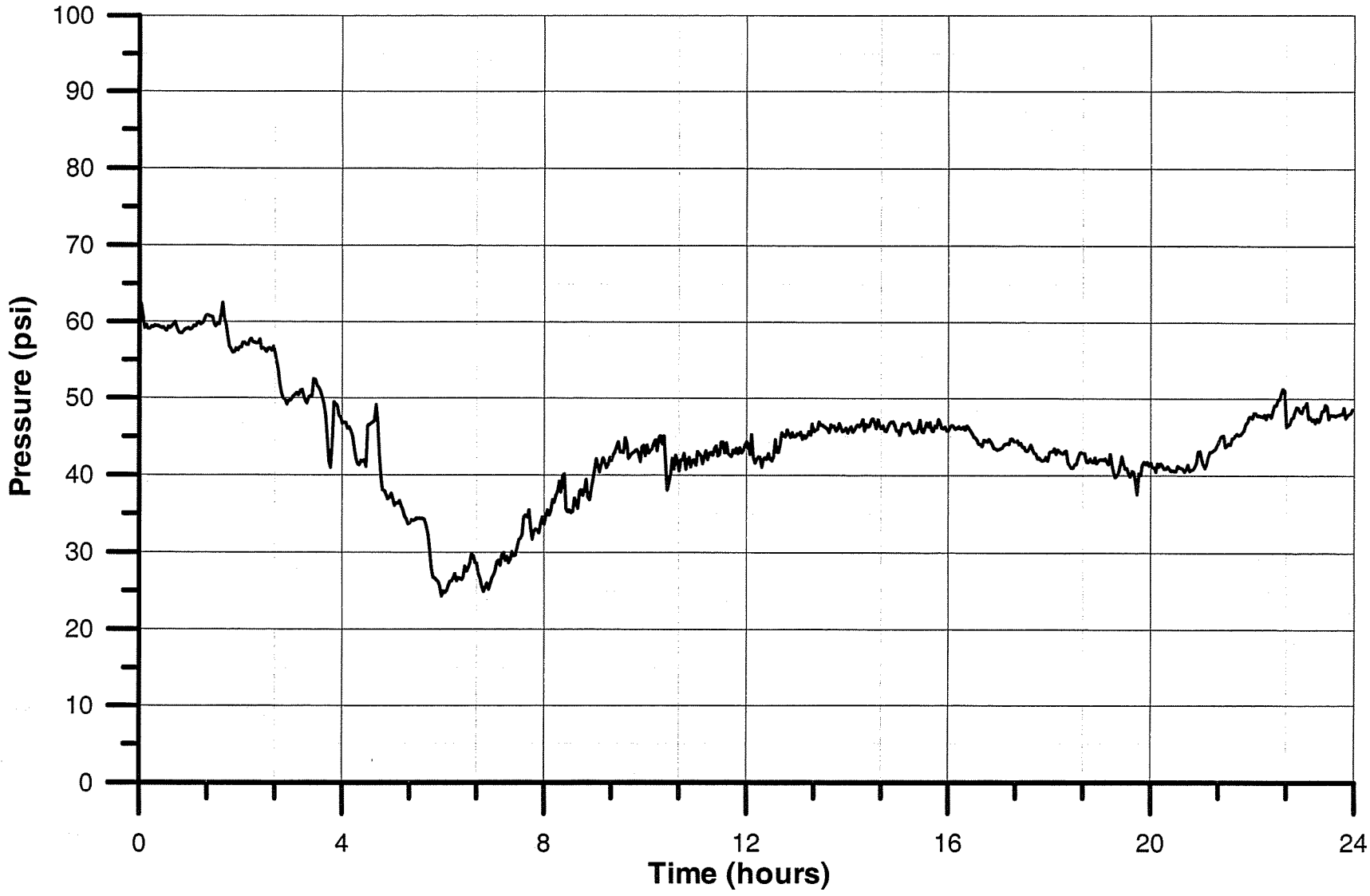

Burns & McDonnell

Wichita, Kansas
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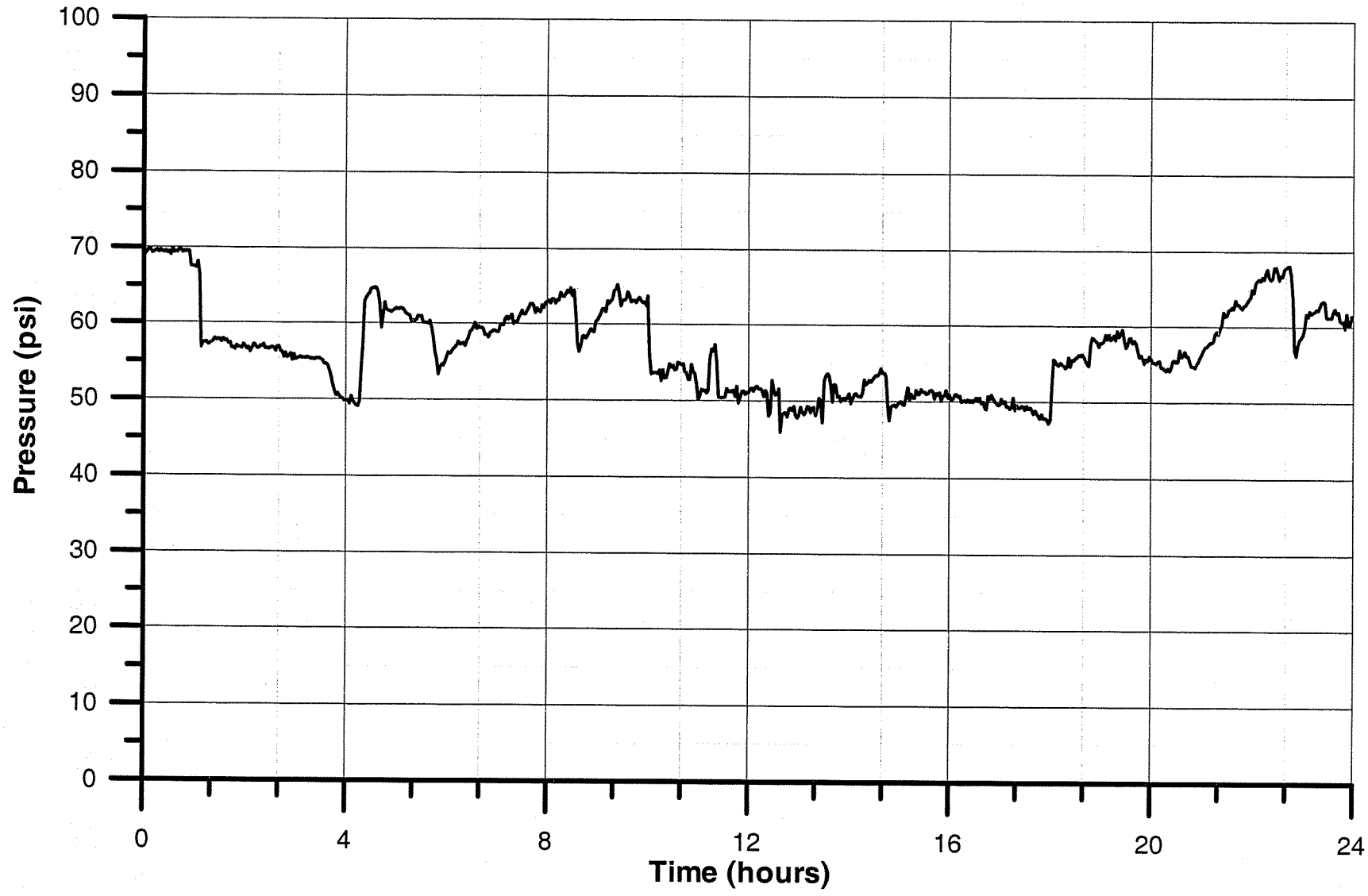
Hydrant #9866
July 18, 2003

H6580 07-11



Burns & McDonnell

Wichita, Kansas
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Goebel & Central
Hydrant #6580
July 11, 2003

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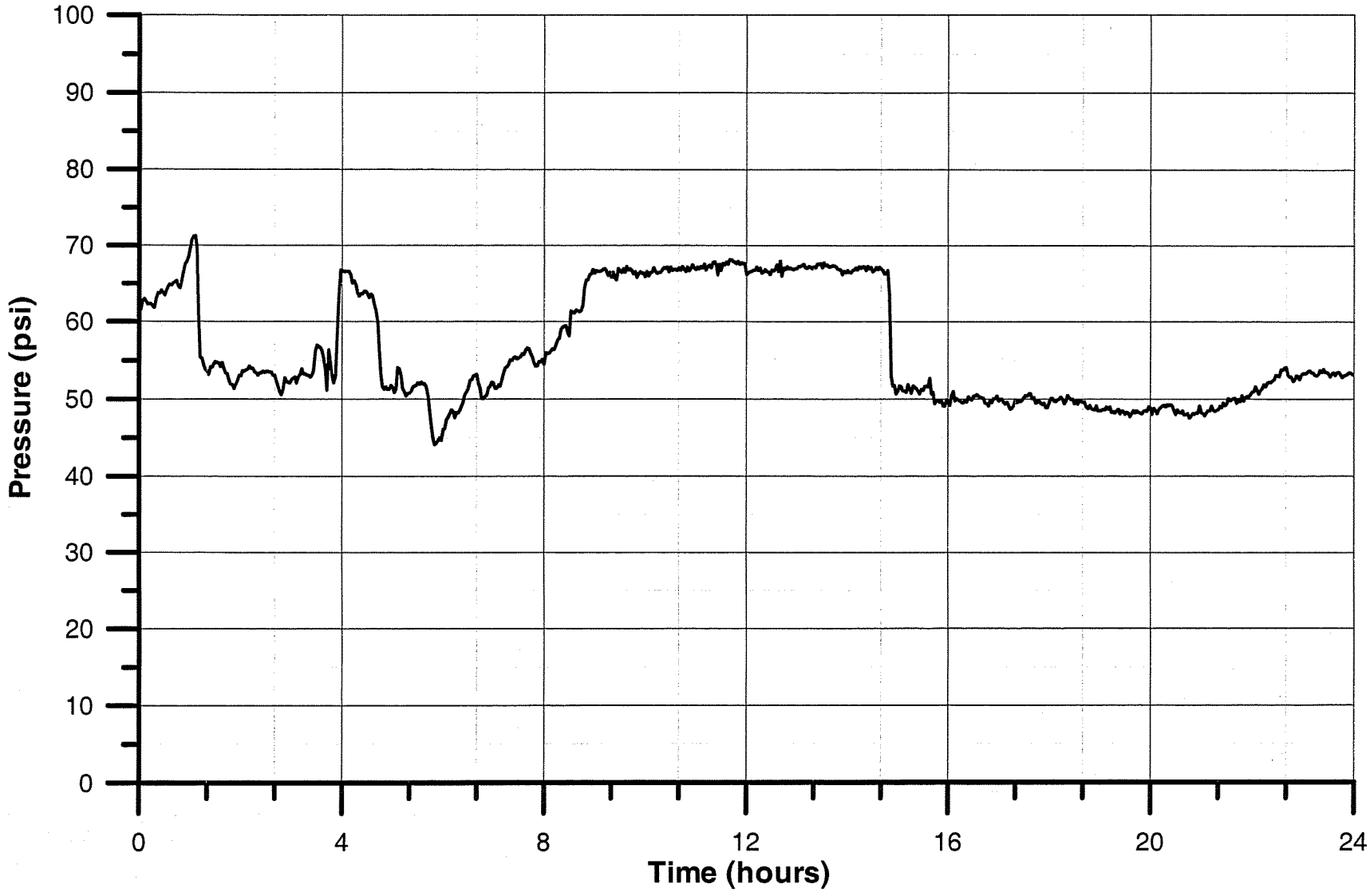

Burns & McDonnell

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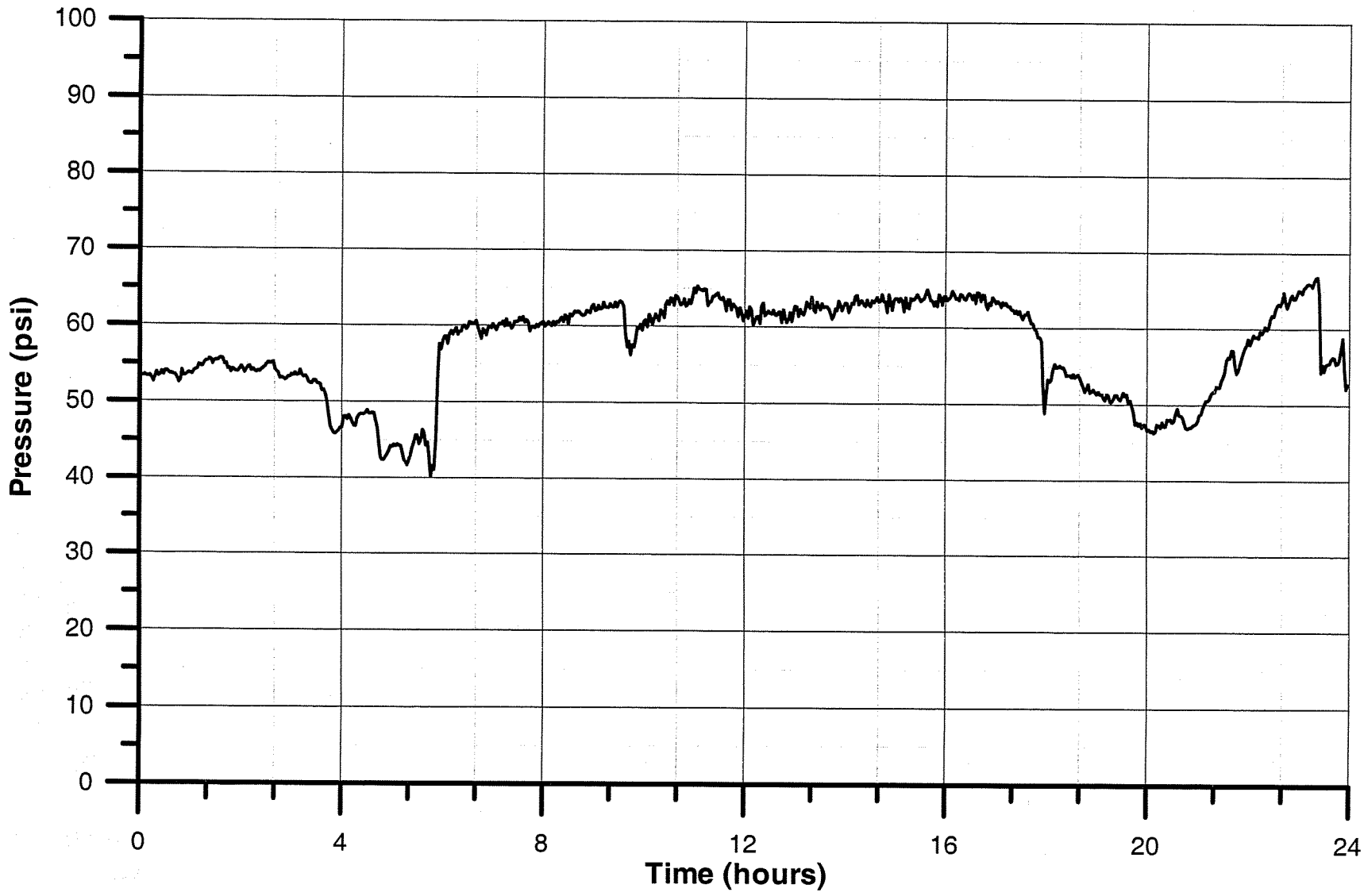
Hydrant #6580
July 12, 2003

H6580 07-13



Burns & McDonnell

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Hydrant #6580
July 13, 2003

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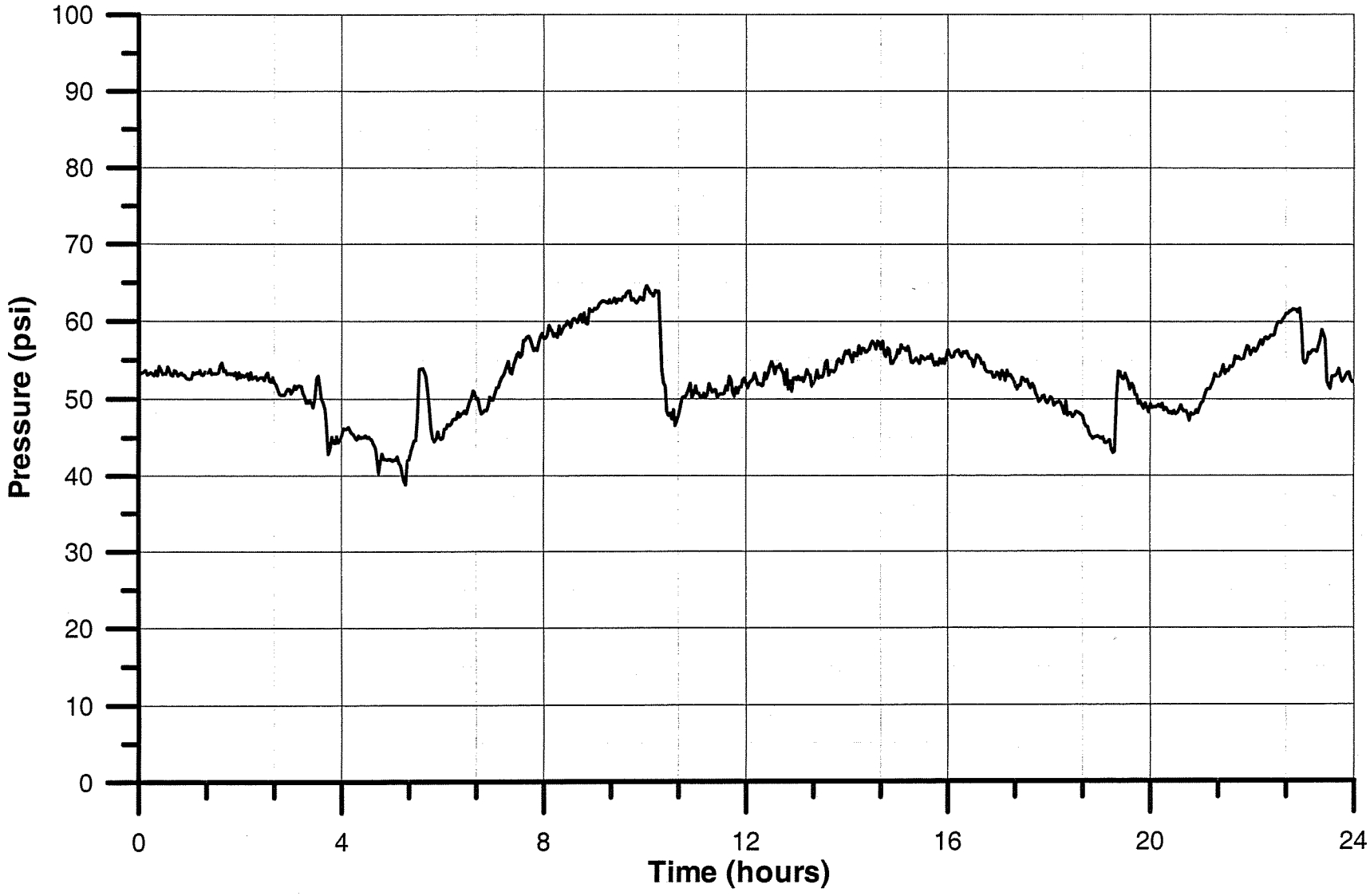

Burns & McDonnell

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Hydrant #6580
July 14, 2003

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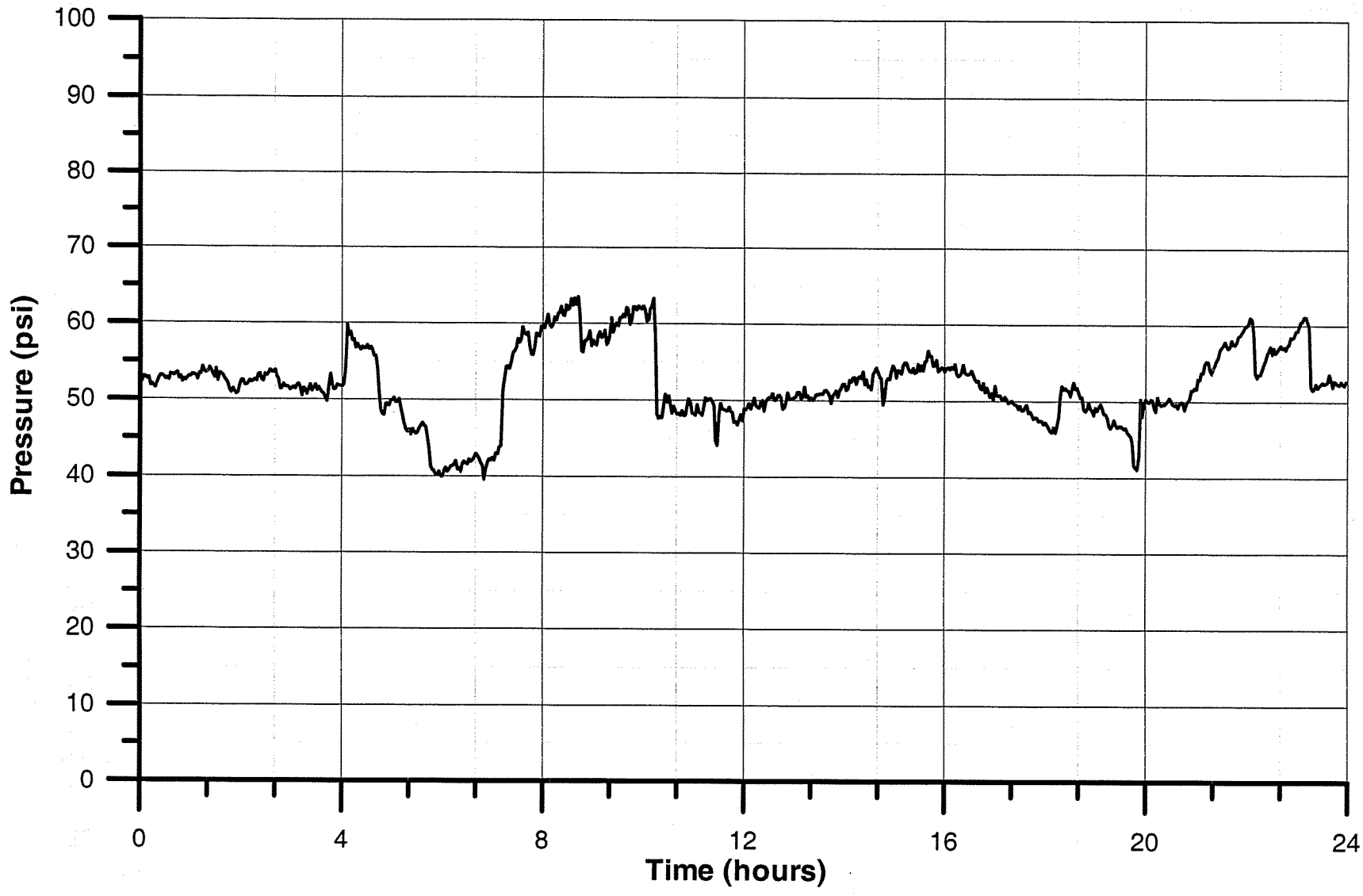

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Hydrant #6580
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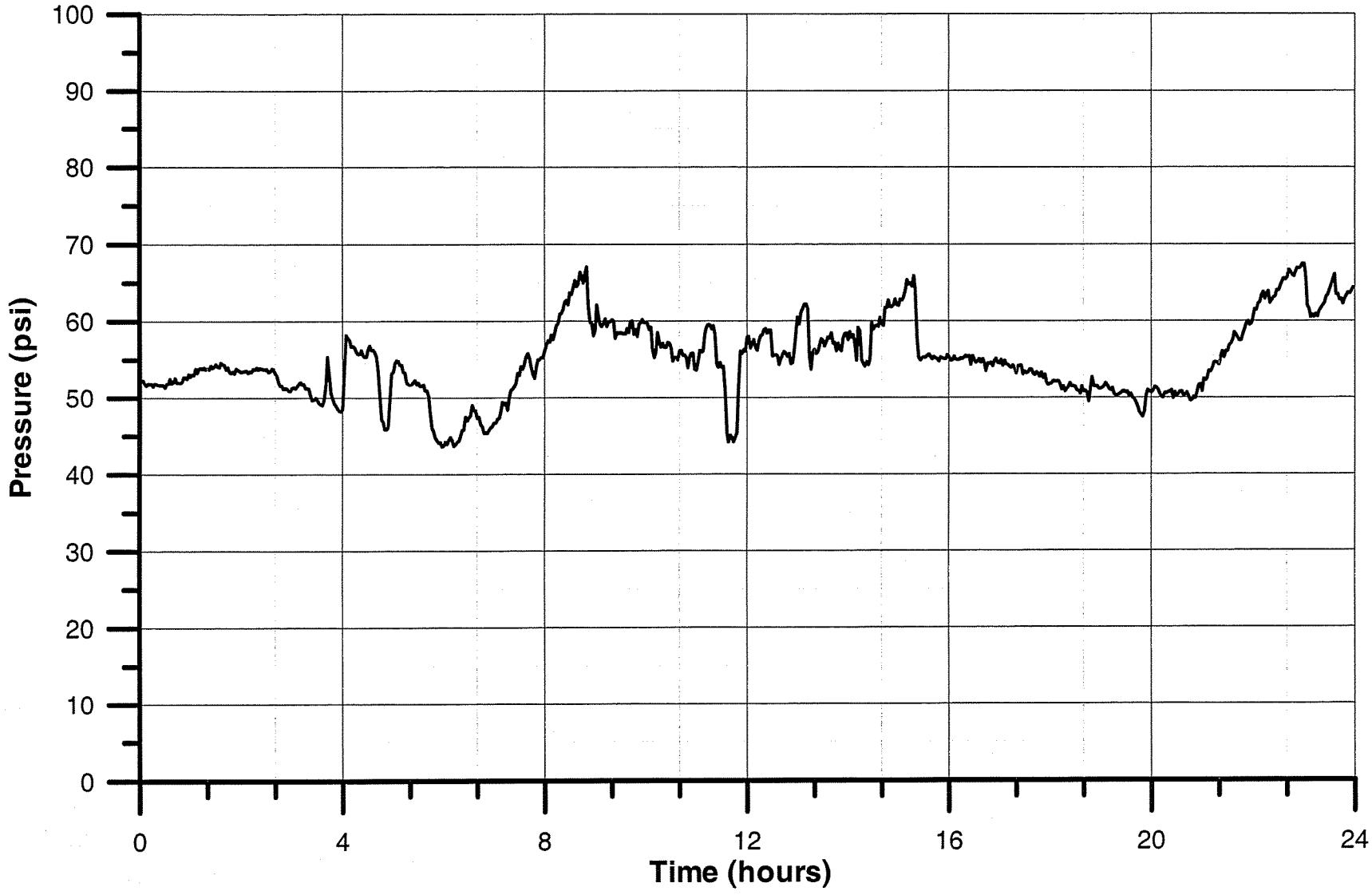

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Wichita, Kansas
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Goebel & Central
Hydrant #6580
July 16, 2003

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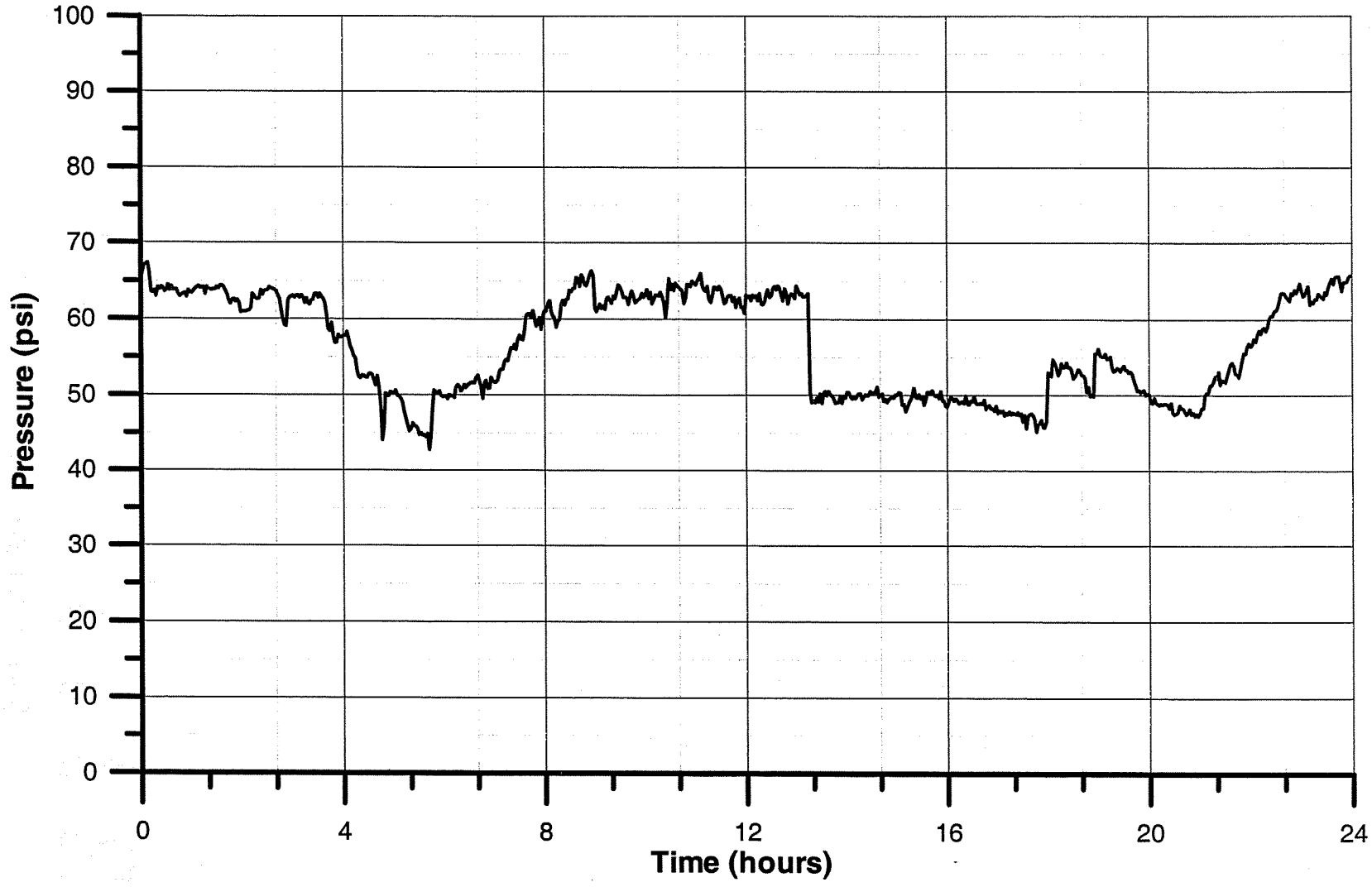

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Wichita, Kansas
Pressure Data
Goebel & Central
Hydrant #6580
July 17, 2003

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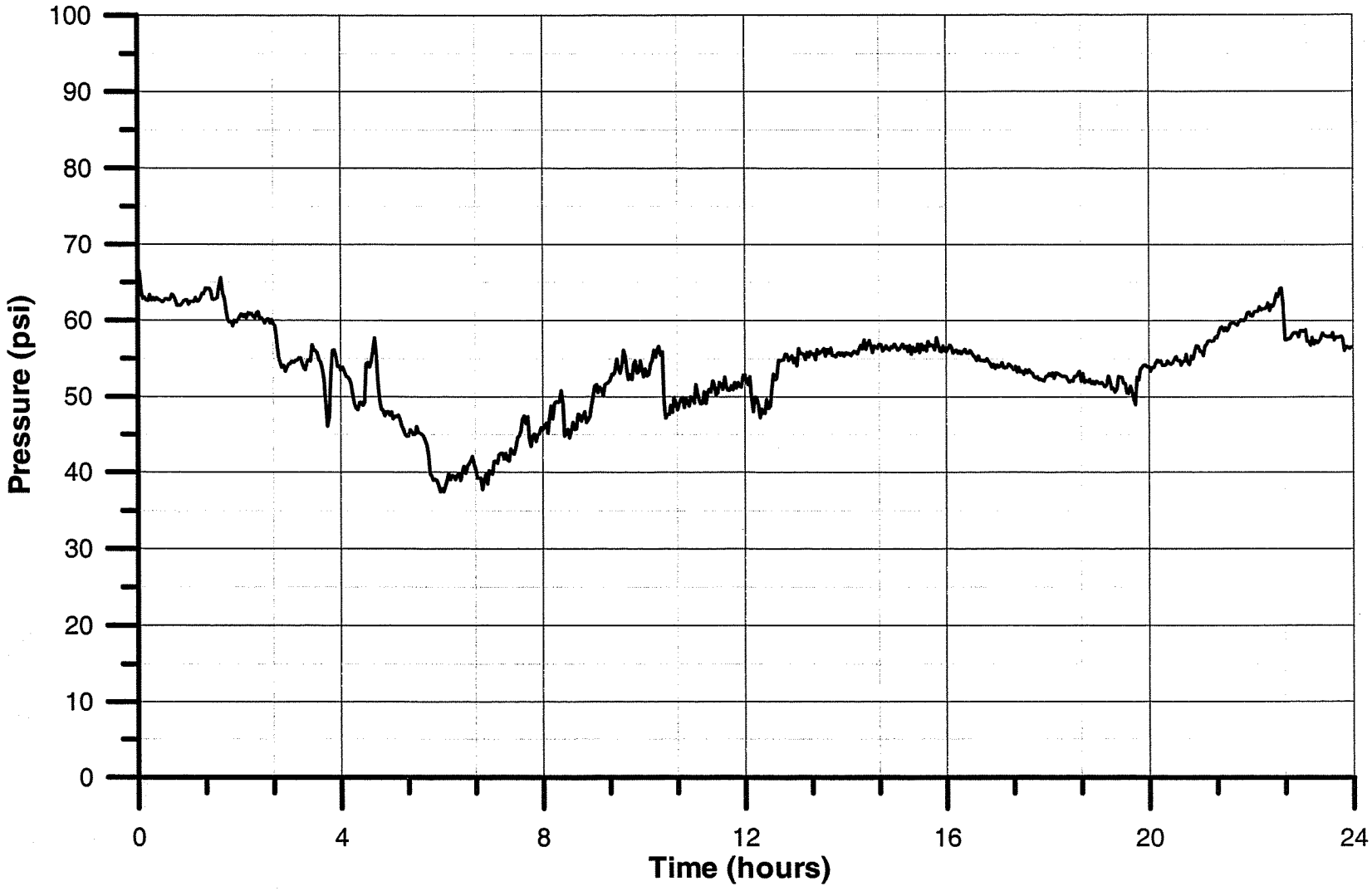

Burns & McDonnell

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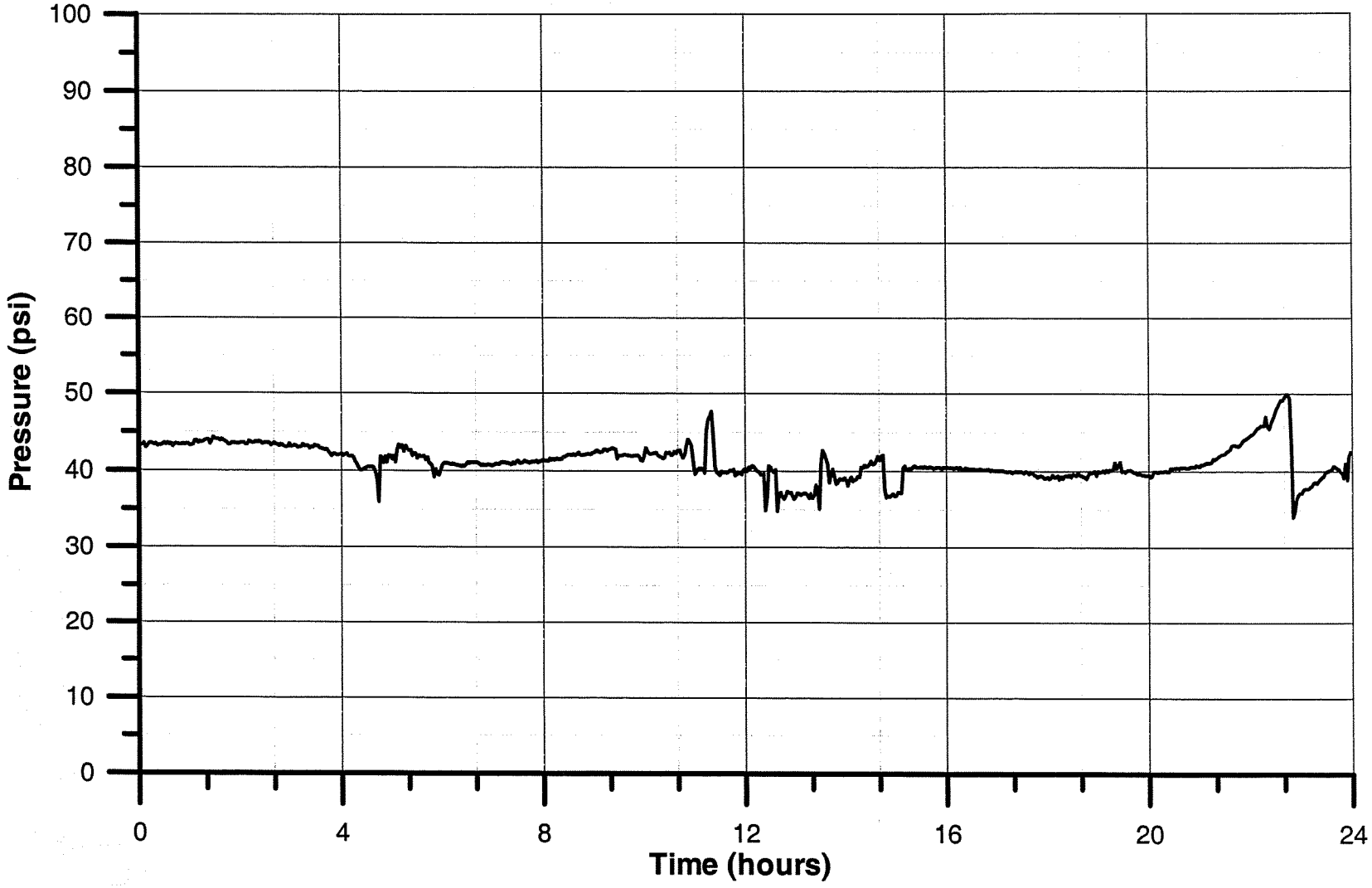
Goebel & Central
Hydrant #6580
July 18, 2003

H5274 07-11



Burns & McDonnell

Wichita, Kansas
Pressure Data
N. of 17th N. of Homestead
Hydrant #5274
July 11, 2003

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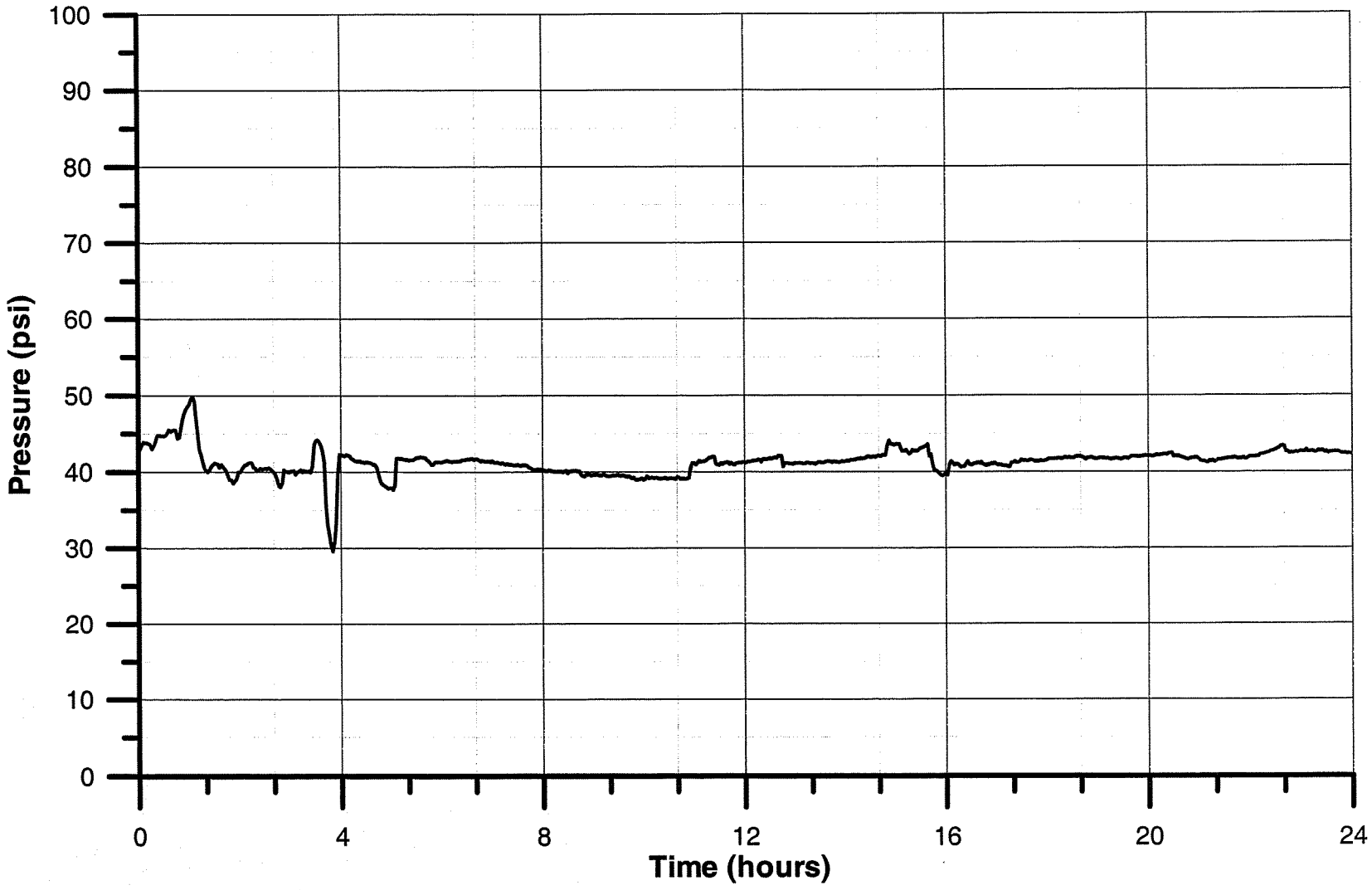

Burns & McDonnell

Wichita, Kansas
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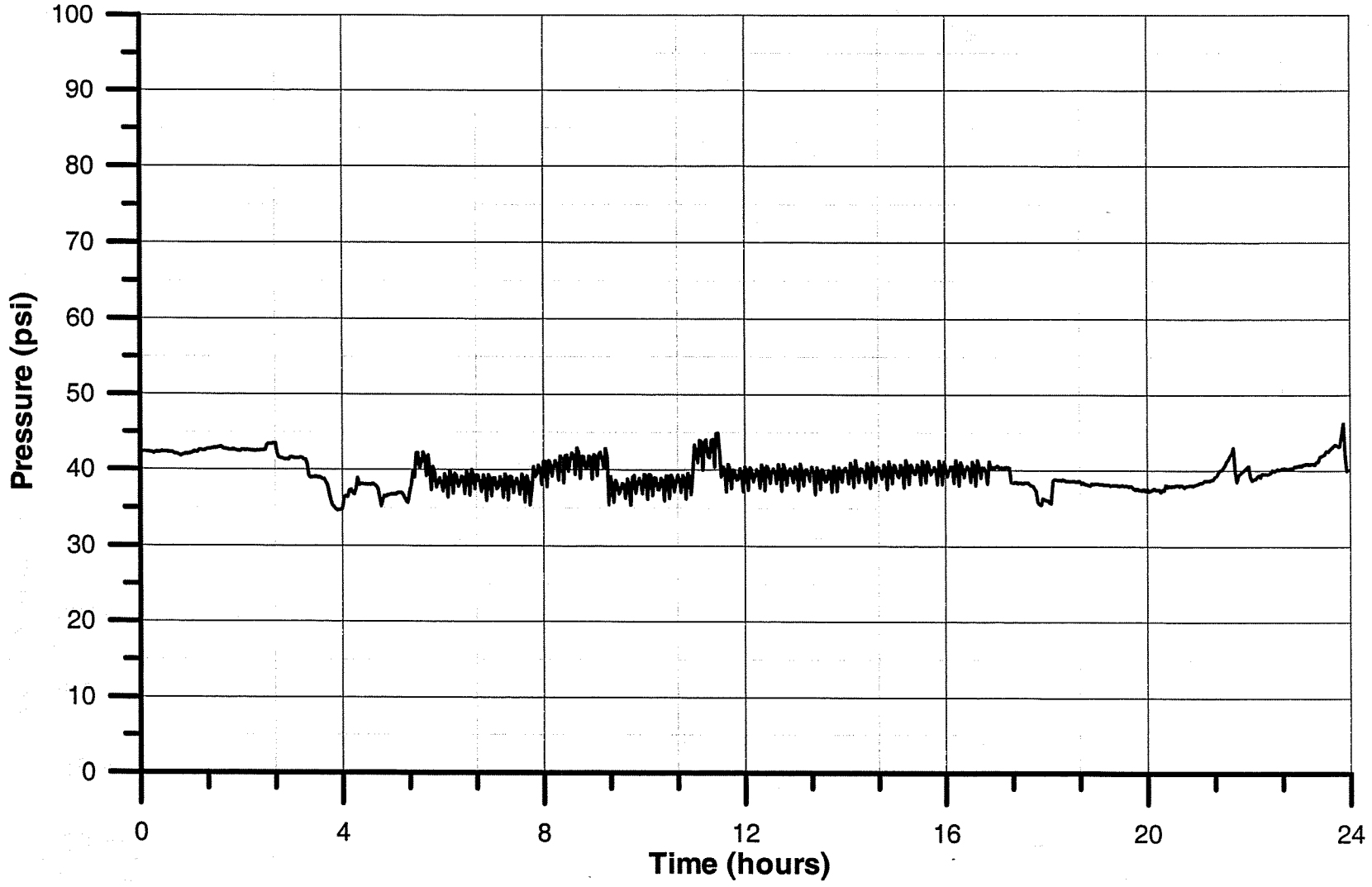
July 12, 2003

H5274 07-13



Burns & McDonnell

Wichita, Kansas
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Hydrant #5274
July 13, 2003

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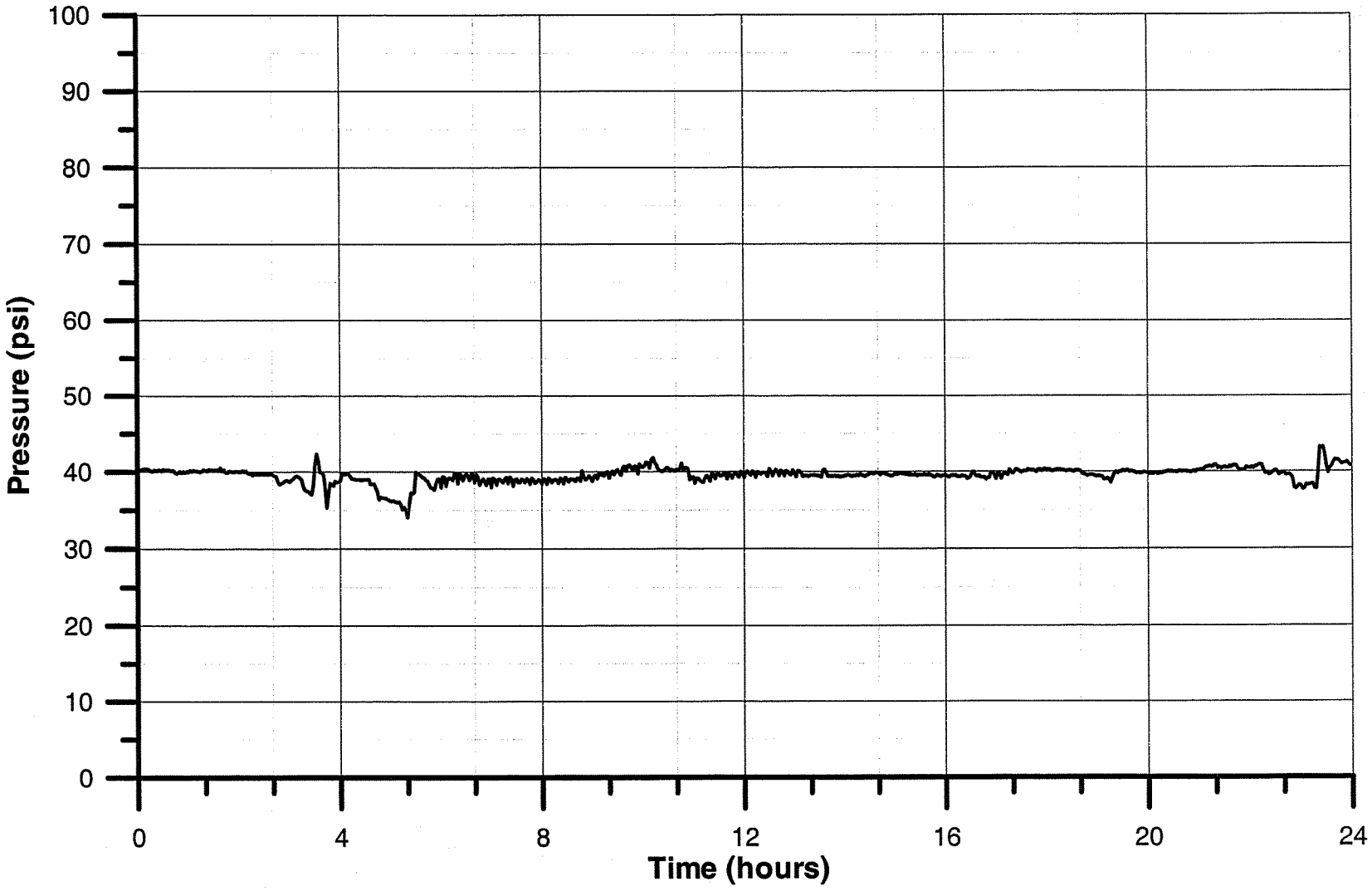
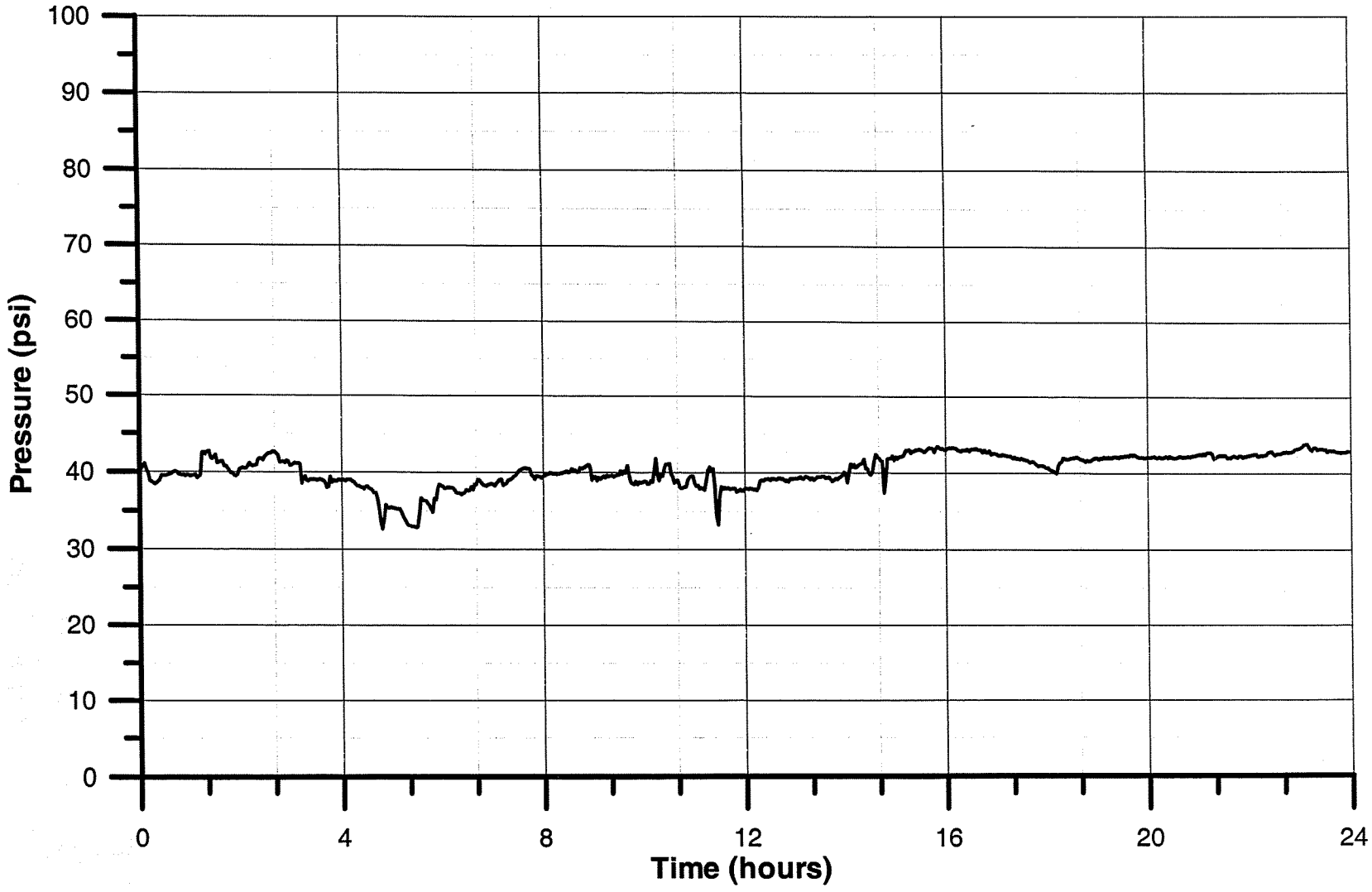


Burns & McDonnell

Wichita, Kansas
Pressure Data
N. of 17th N. of Homestead
Hydrant #5274
July 14, 2003

H5274 07-



Burns & McDonnell

Wichita, Kansas
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N. of 17th N. of Homestead
Hydrant #5274
July 15, 2003

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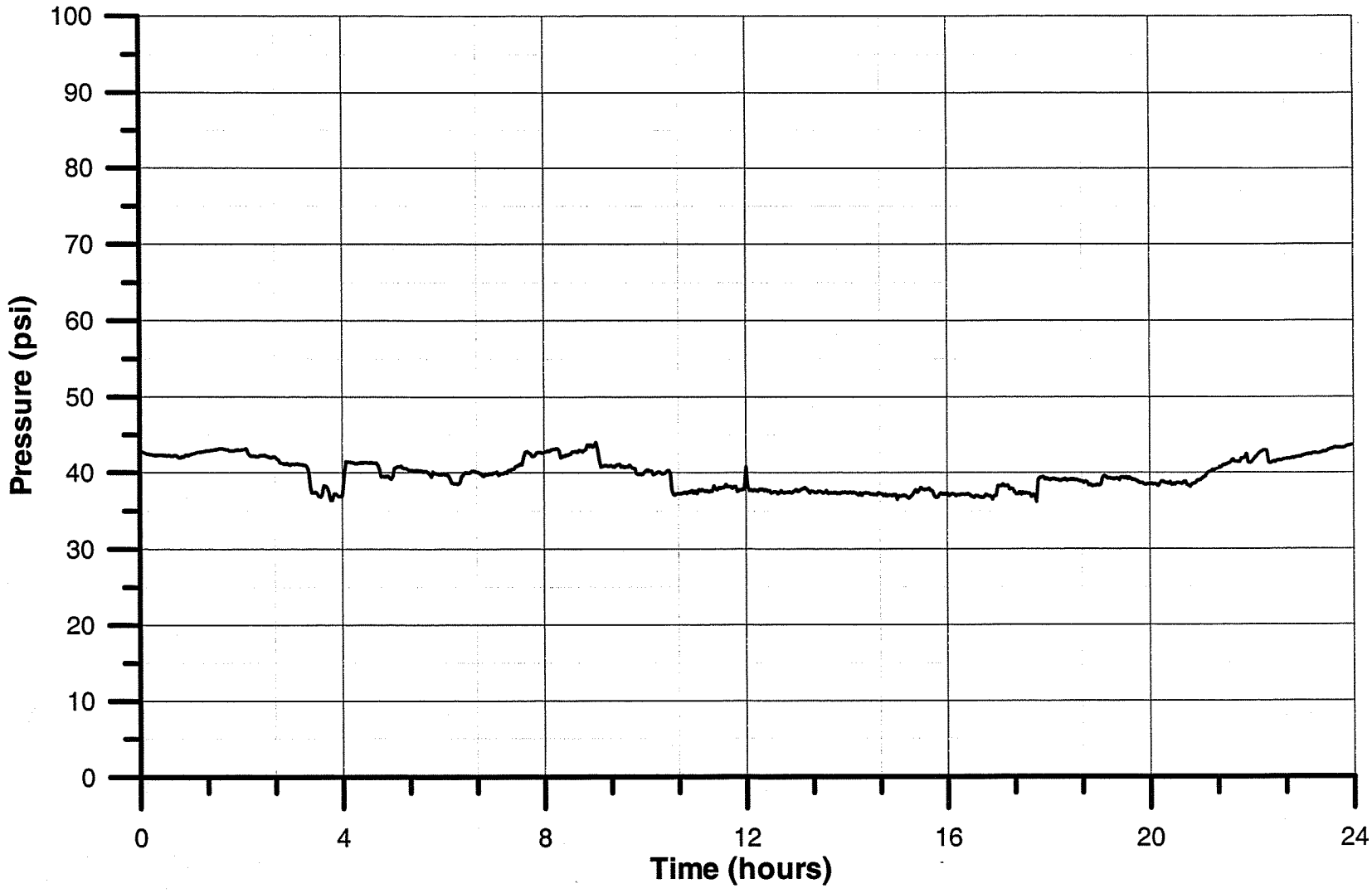
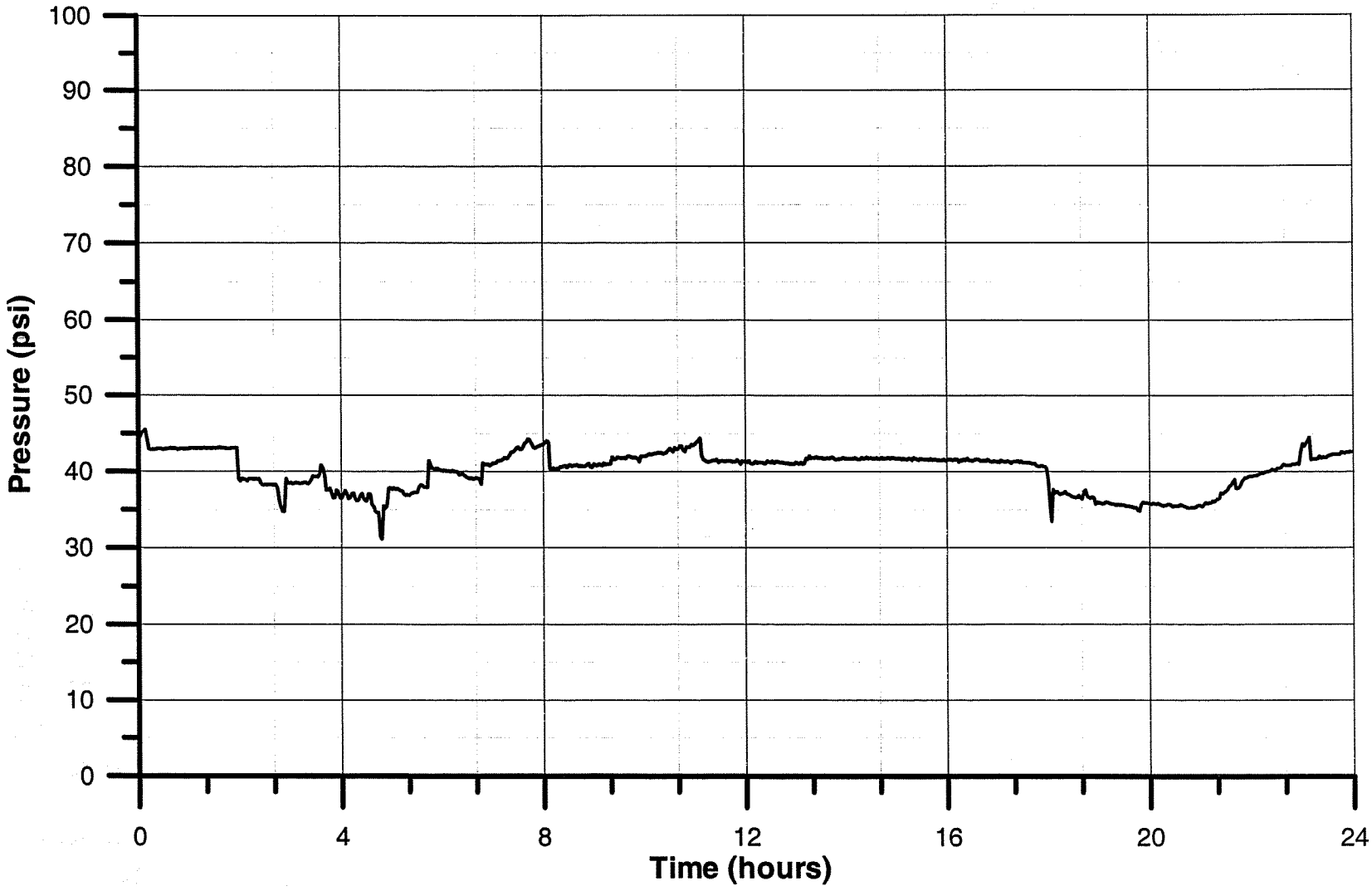


Burns & McDonnell

Wichita, Kansas
Pressure Data
N. of 17th N. of Homestead
Hydrant #5274
July 16, 2003

H5274 07-17



Burns & McDonnell

Wichita, Kansas
Pressure Data
N. of 17th N. of Homestead
Hydrant #5274
July 17, 2003

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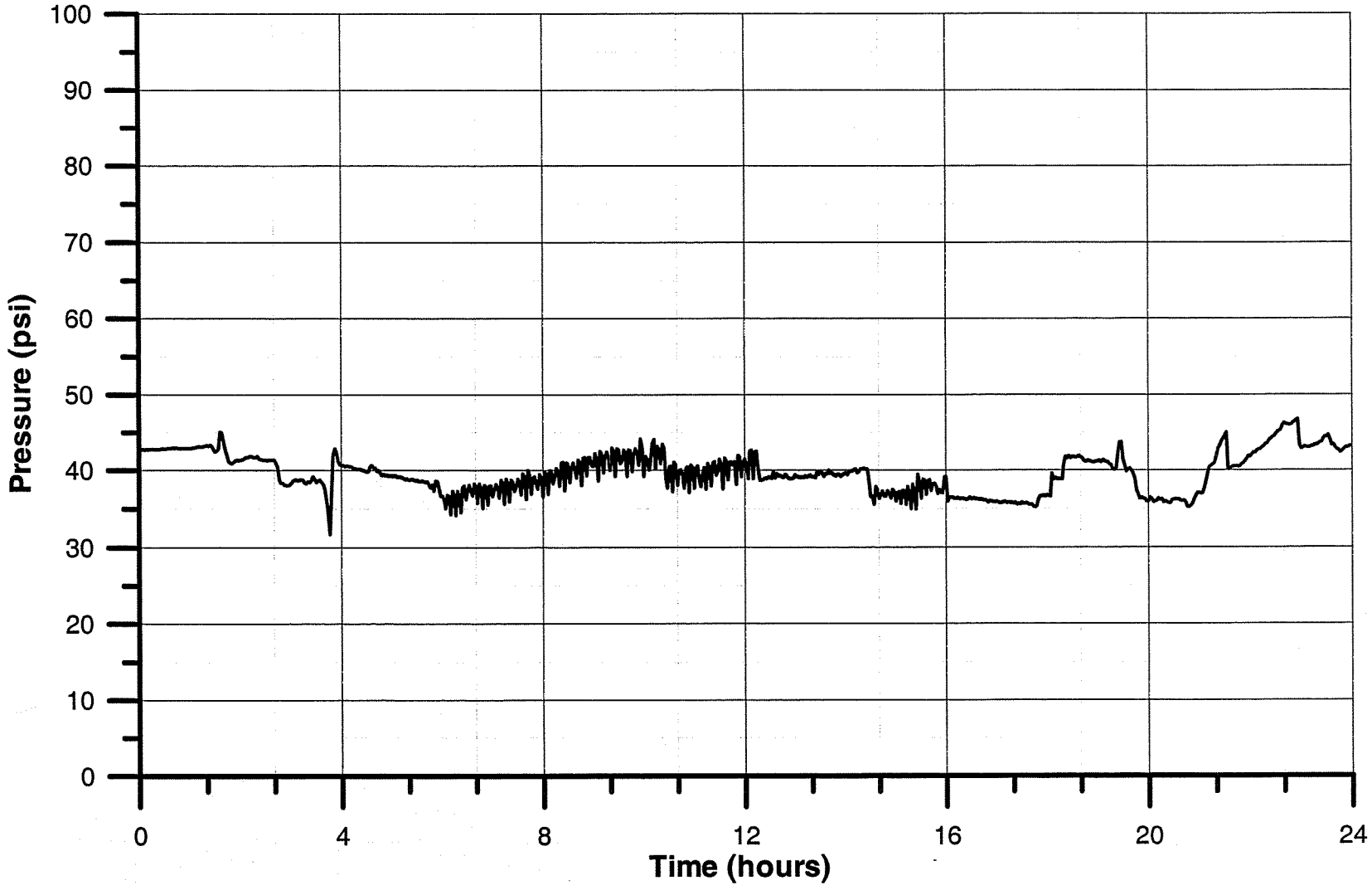
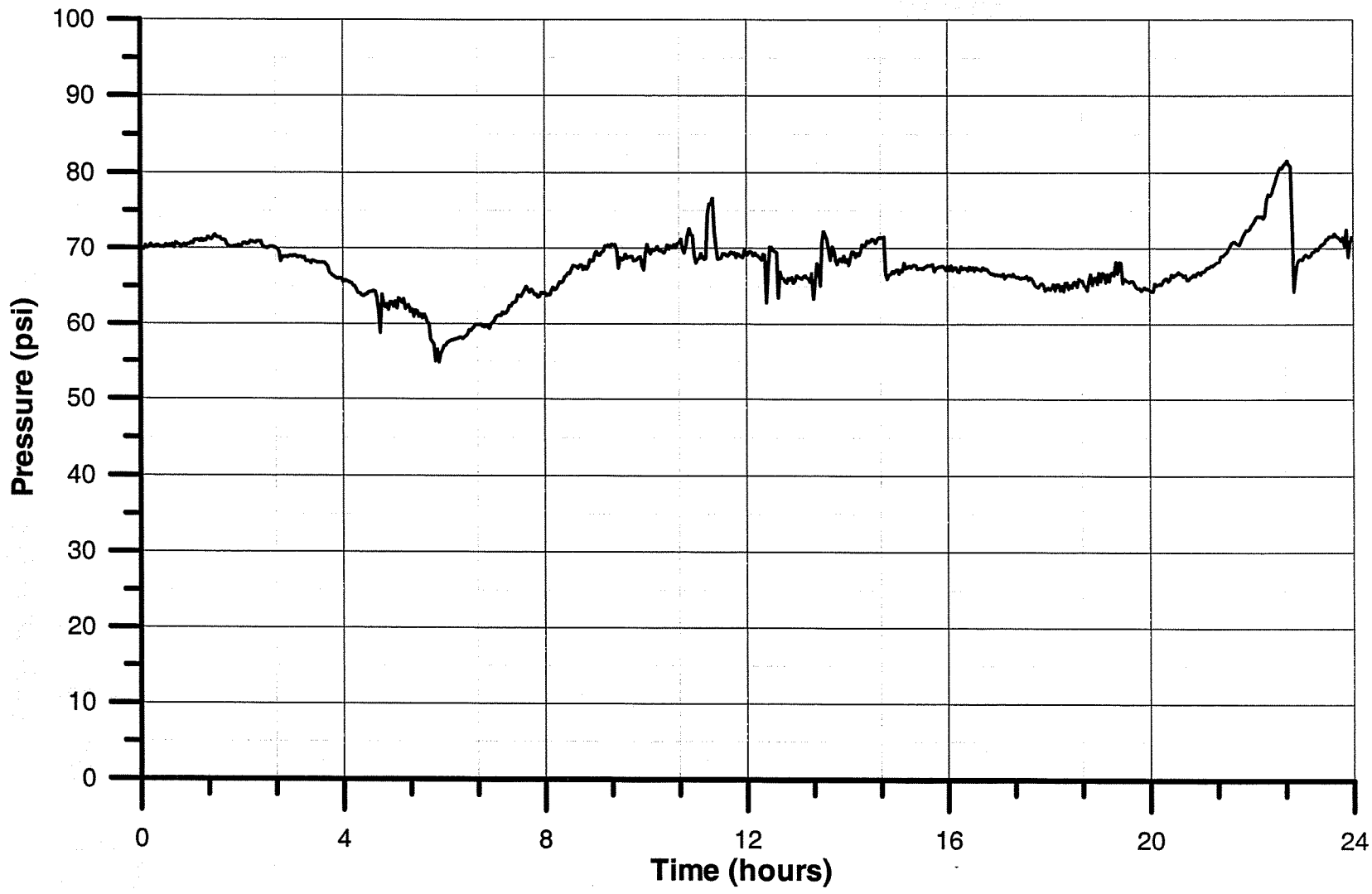


Burns & McDonnell

Wichita, Kansas
Pressure Data
N. of 17th N. of Homestead
Hydrant #5274
July 18, 2003

H3492 07-11



Burns & McDonnell

Wichita, Kansas
Pressure Data
Linden & Central
Hydrant #3492
July 11, 2003

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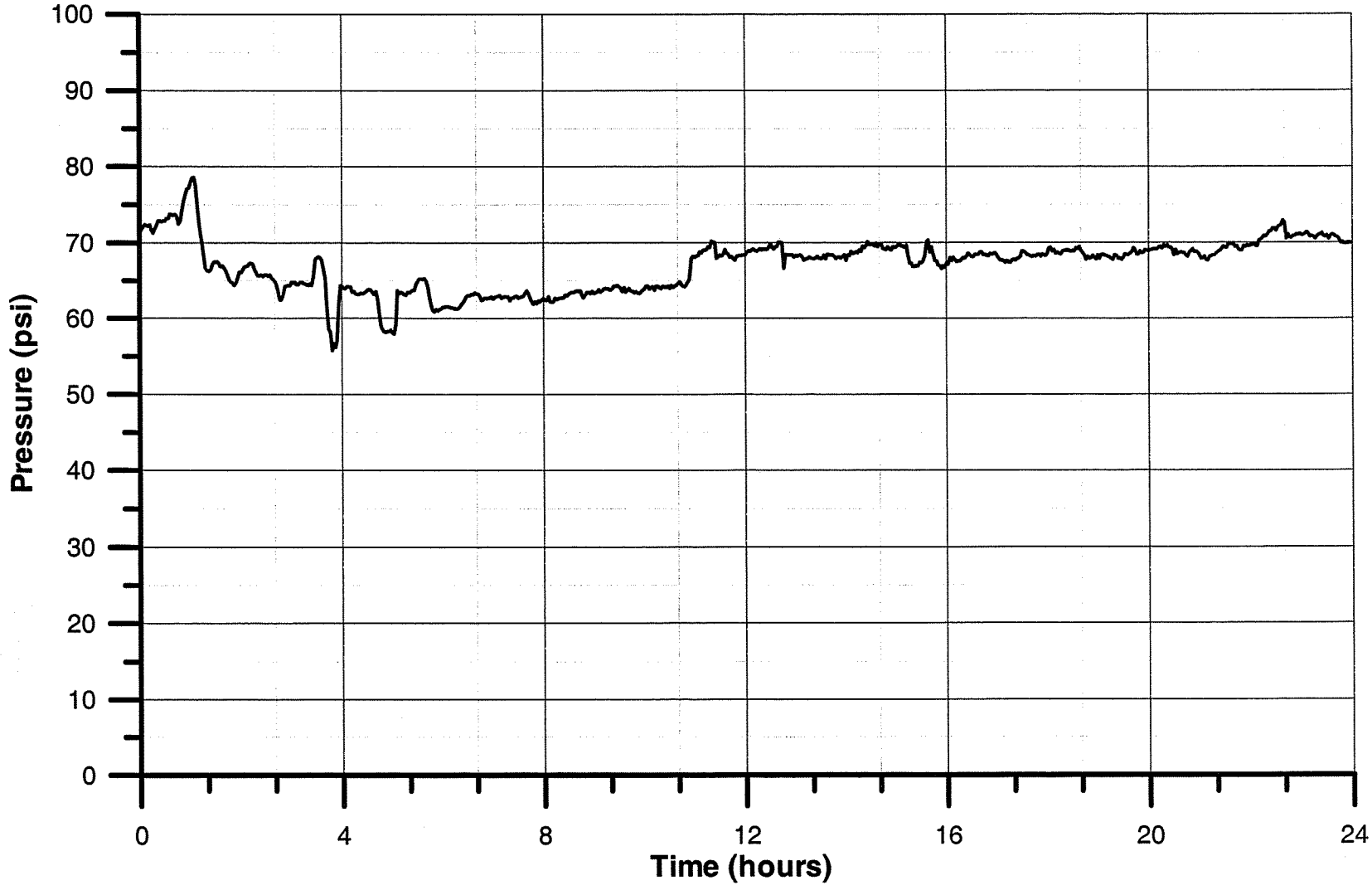
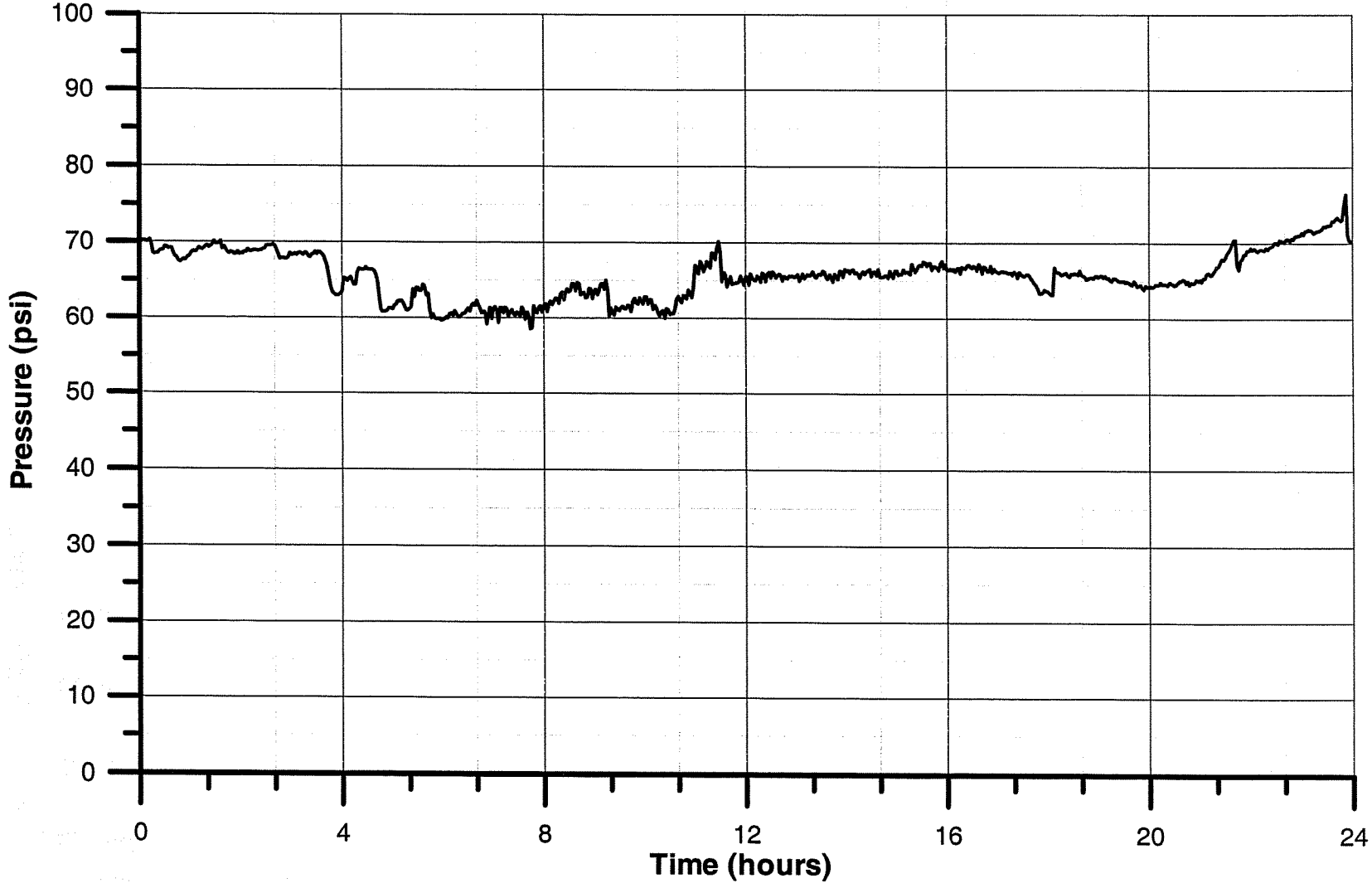


Burns & McDonnell

Wichita, Kansas
Pressure Data
Linden & Central
Hydrant #3492
July 12, 2003

H3492 07-13



Burns & McDonnell

Wichita, Kansas
Pressure Data
Linden & Central
Hydrant #3492
July 13, 2003

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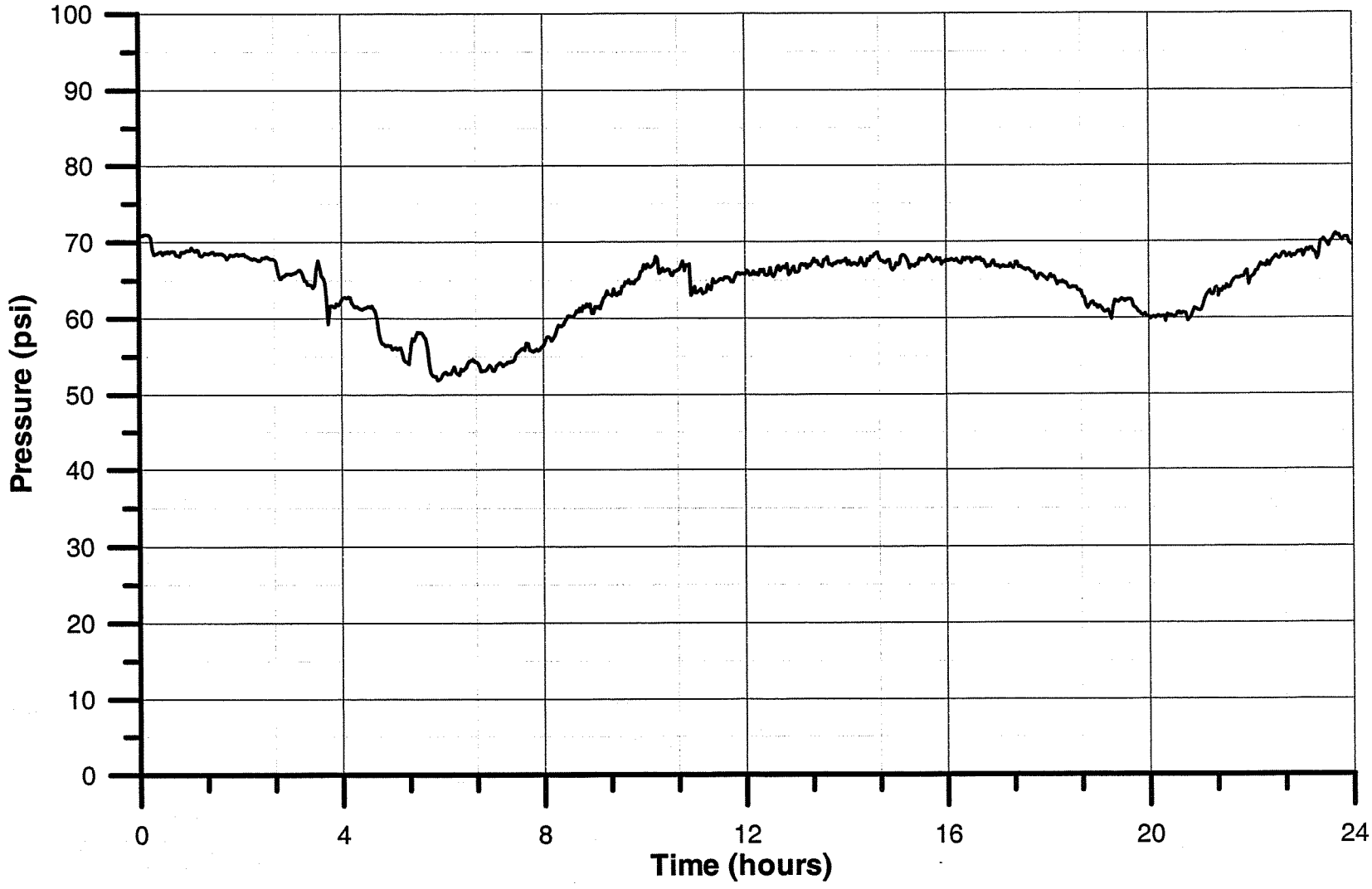

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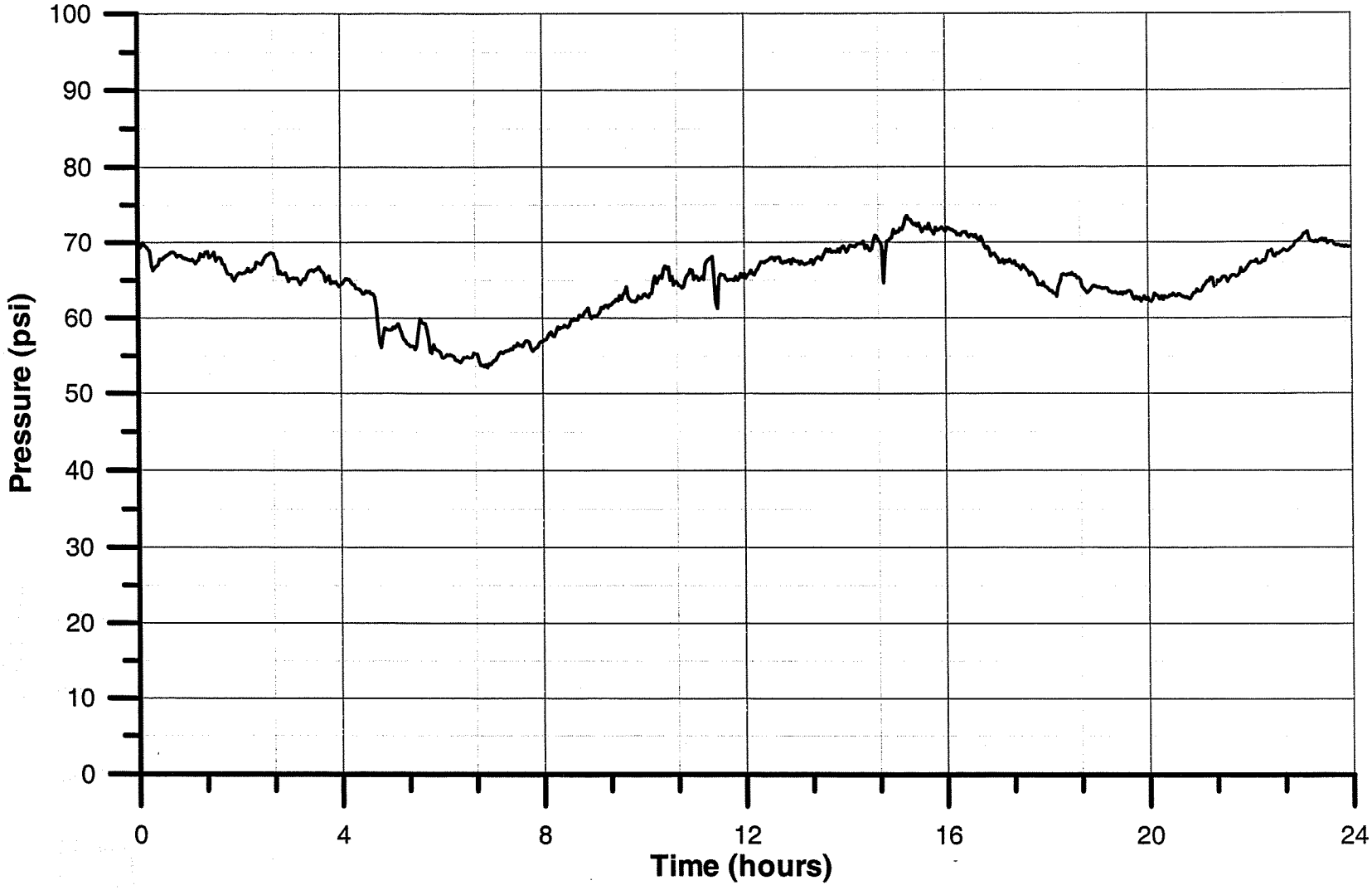
Wichita, Kansas
Pressure Data
Linden & Central
Hydrant #3492
July 14, 2003

H3492 07-1



Burns & McDonnell

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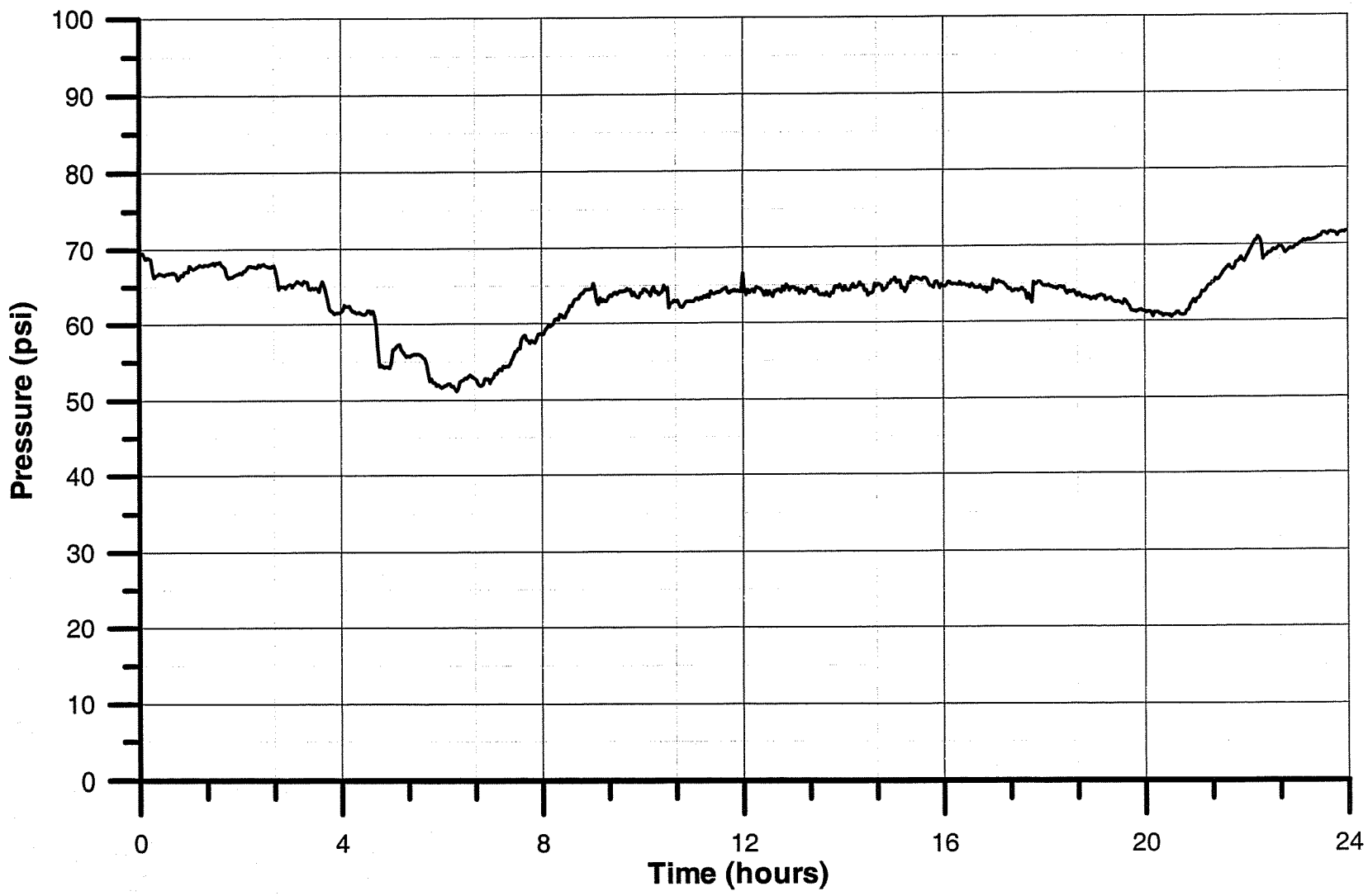

Burns & McDonnell

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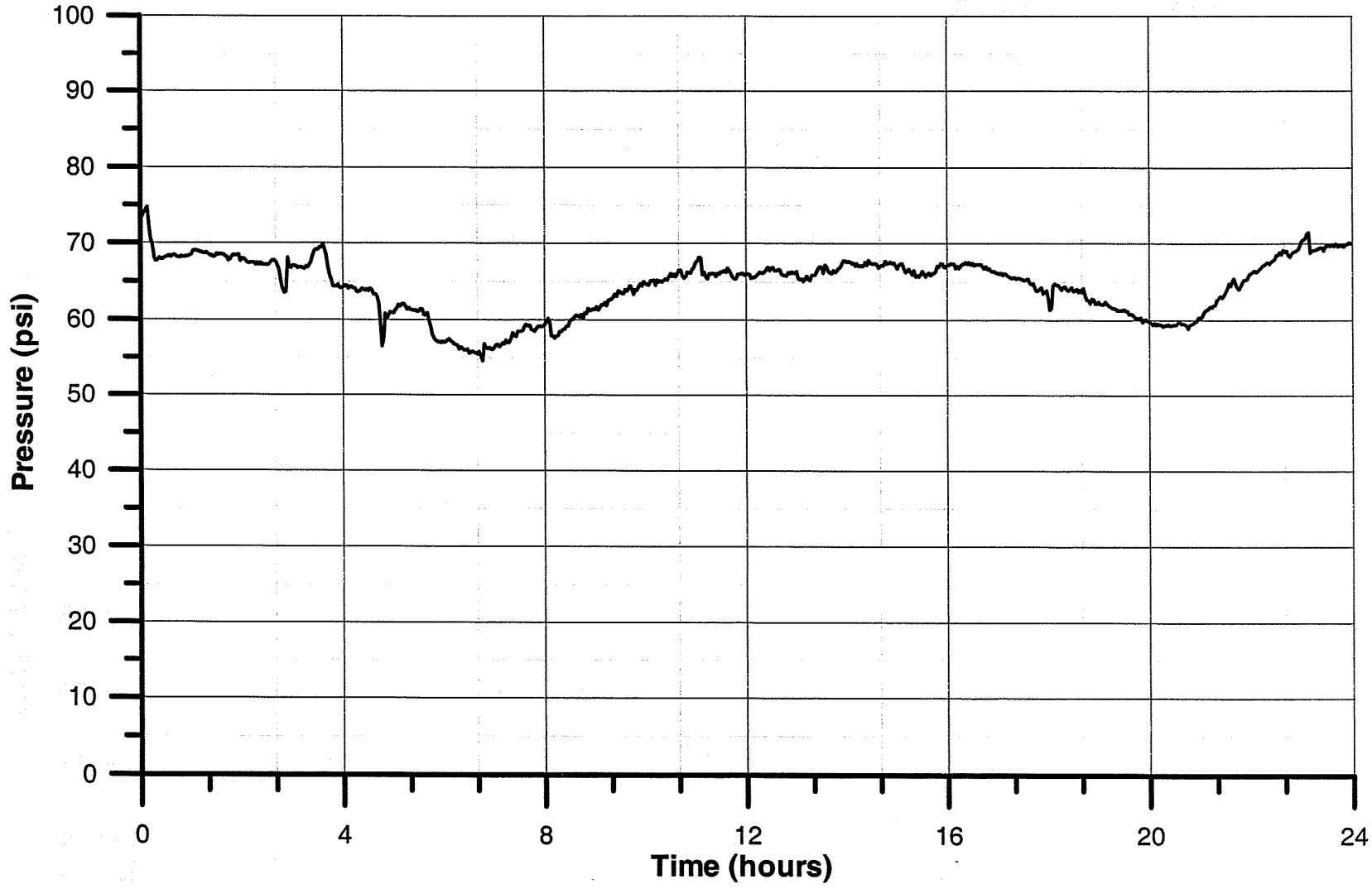

Burns & McDonnell

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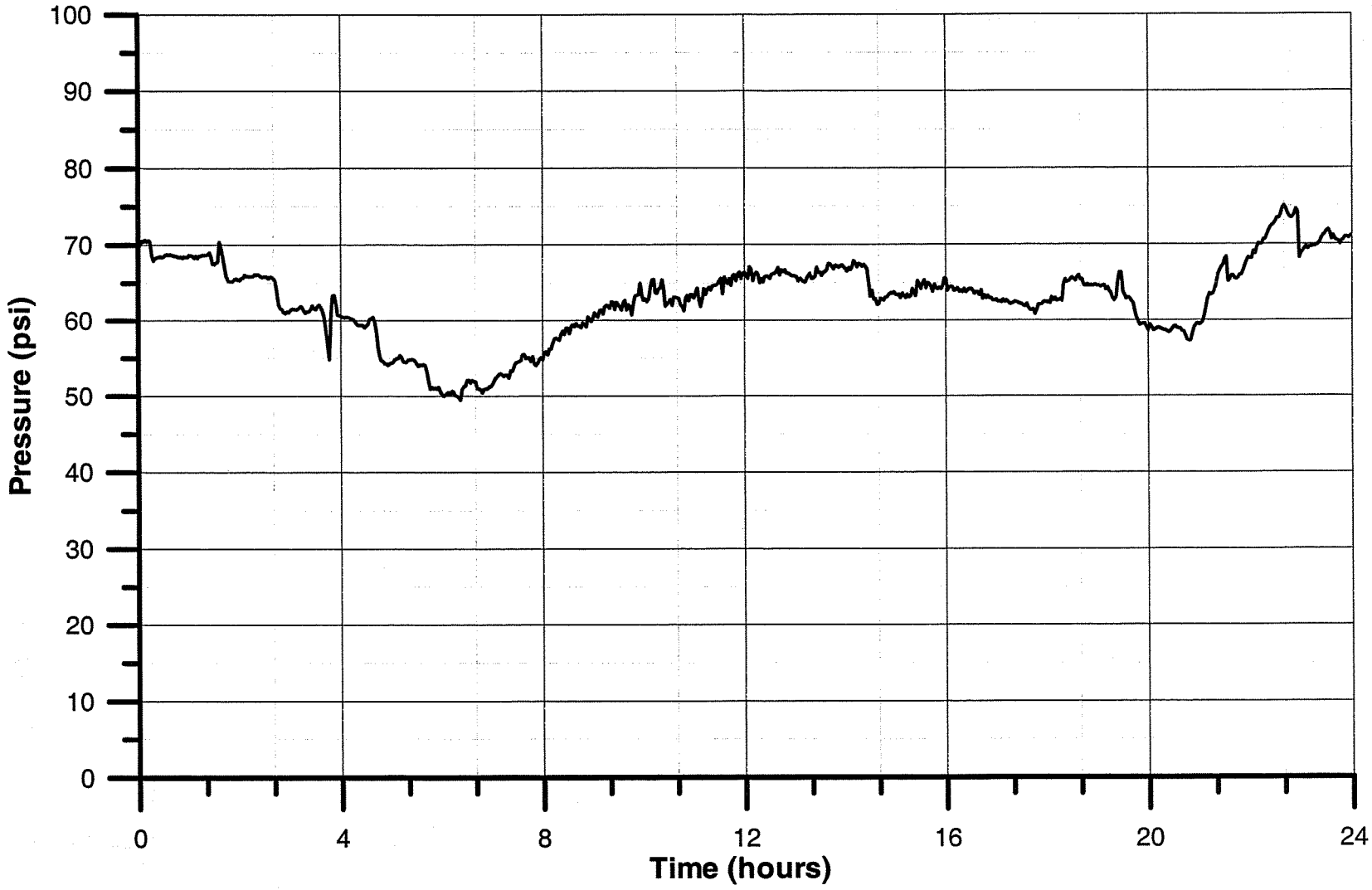

Burns & McDonnell

Wichita, Kansas
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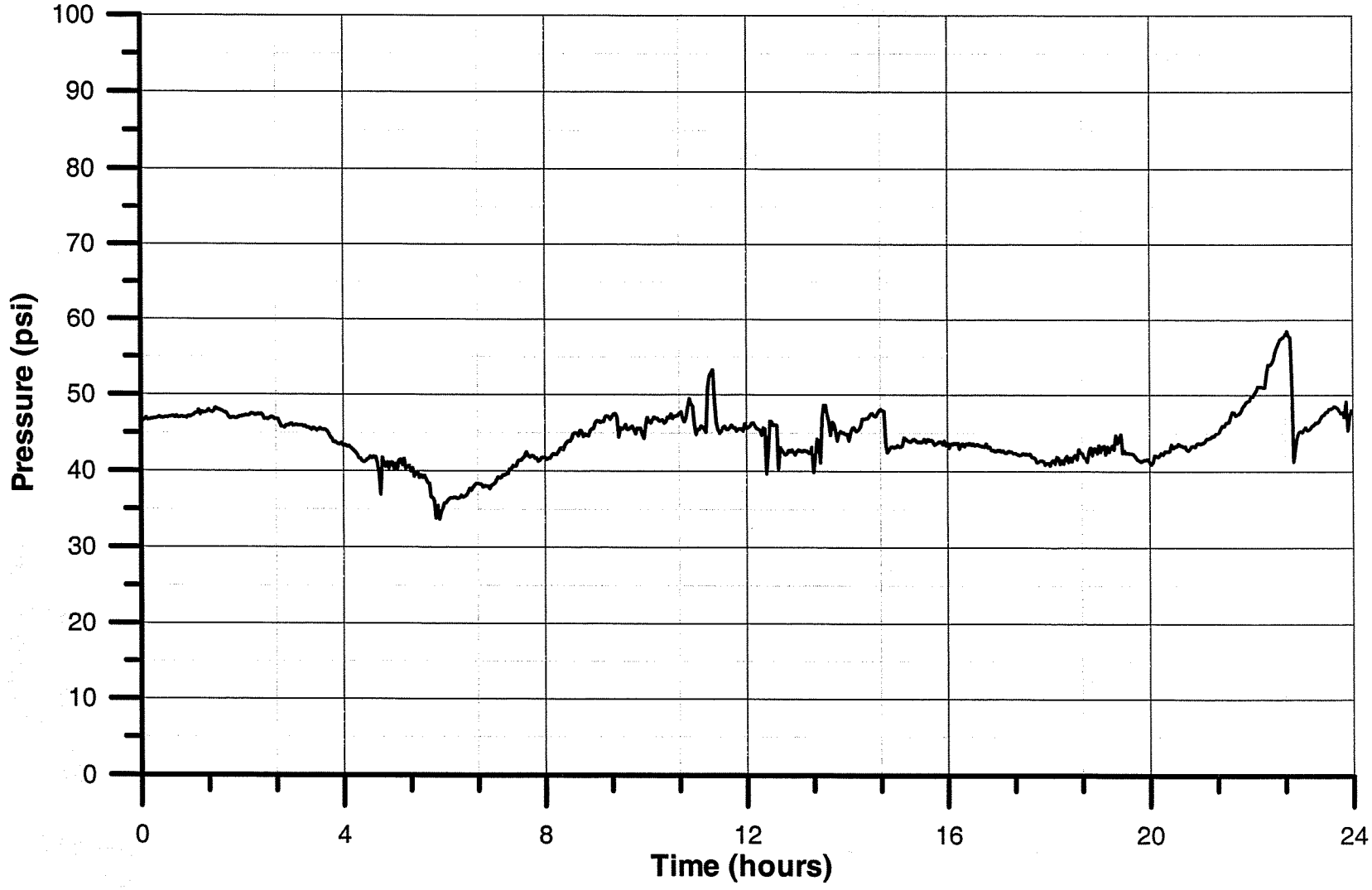

Burns & McDonnell

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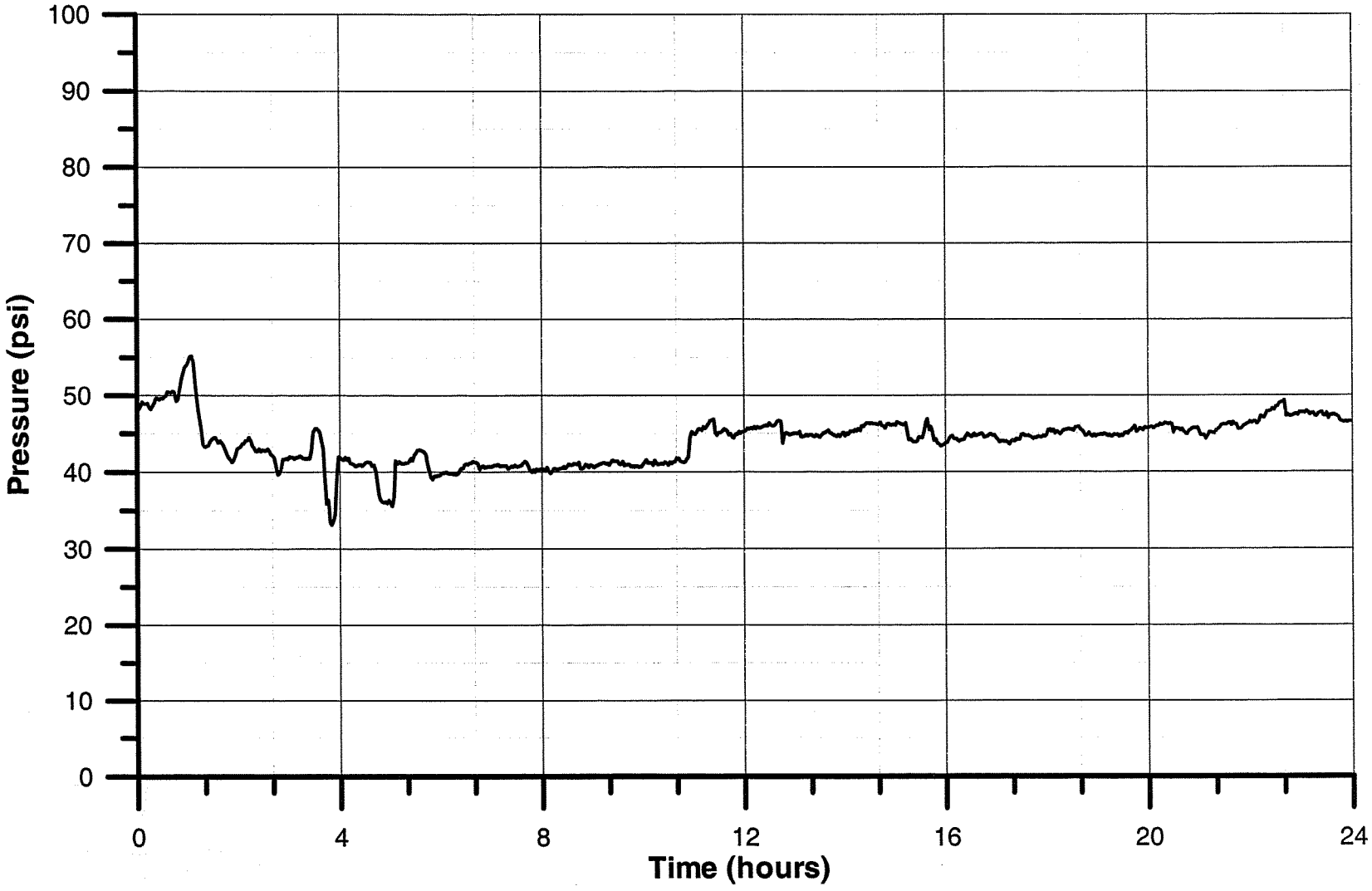

Burns & McDonnell

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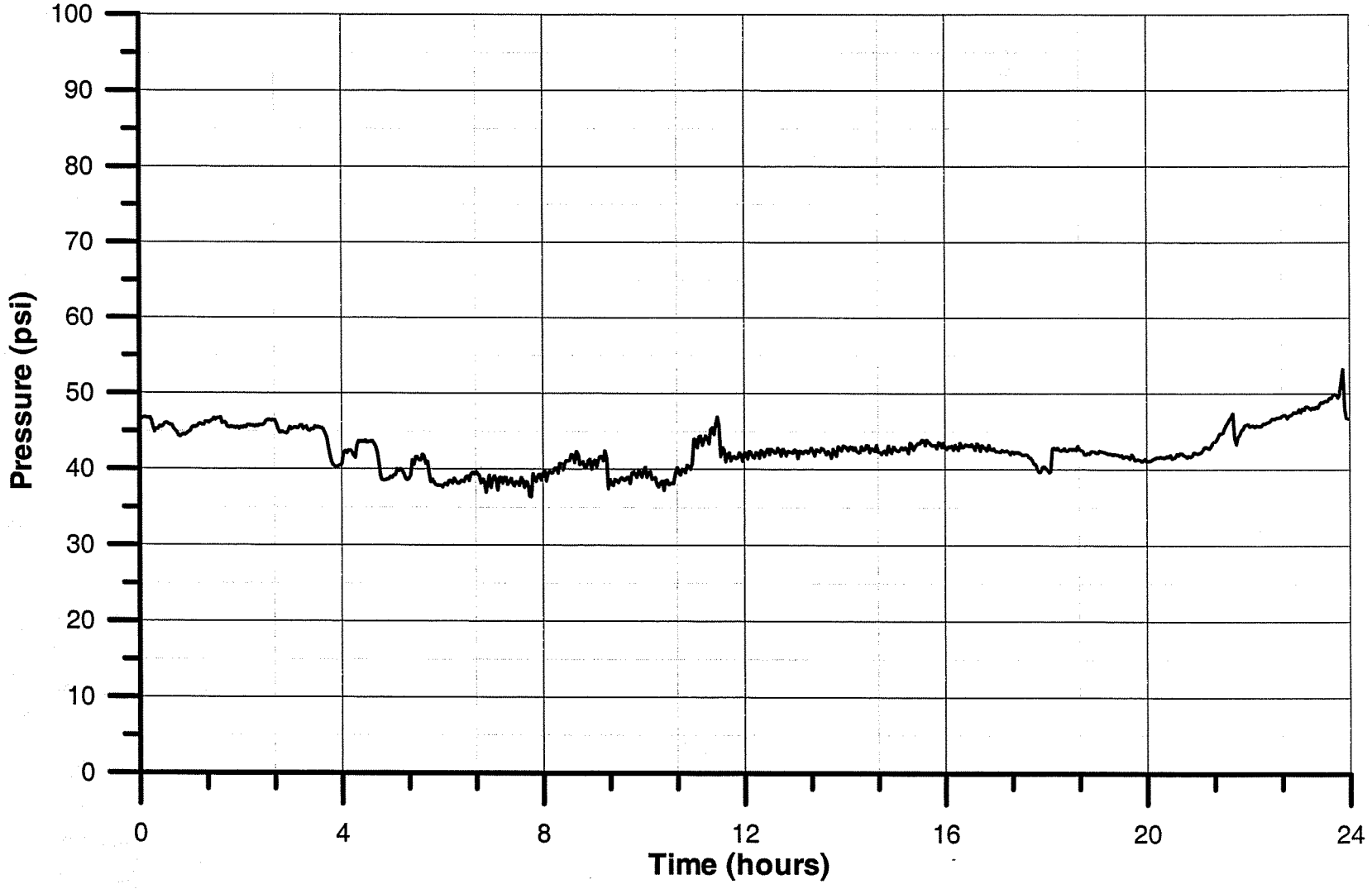

Burns & McDonnell

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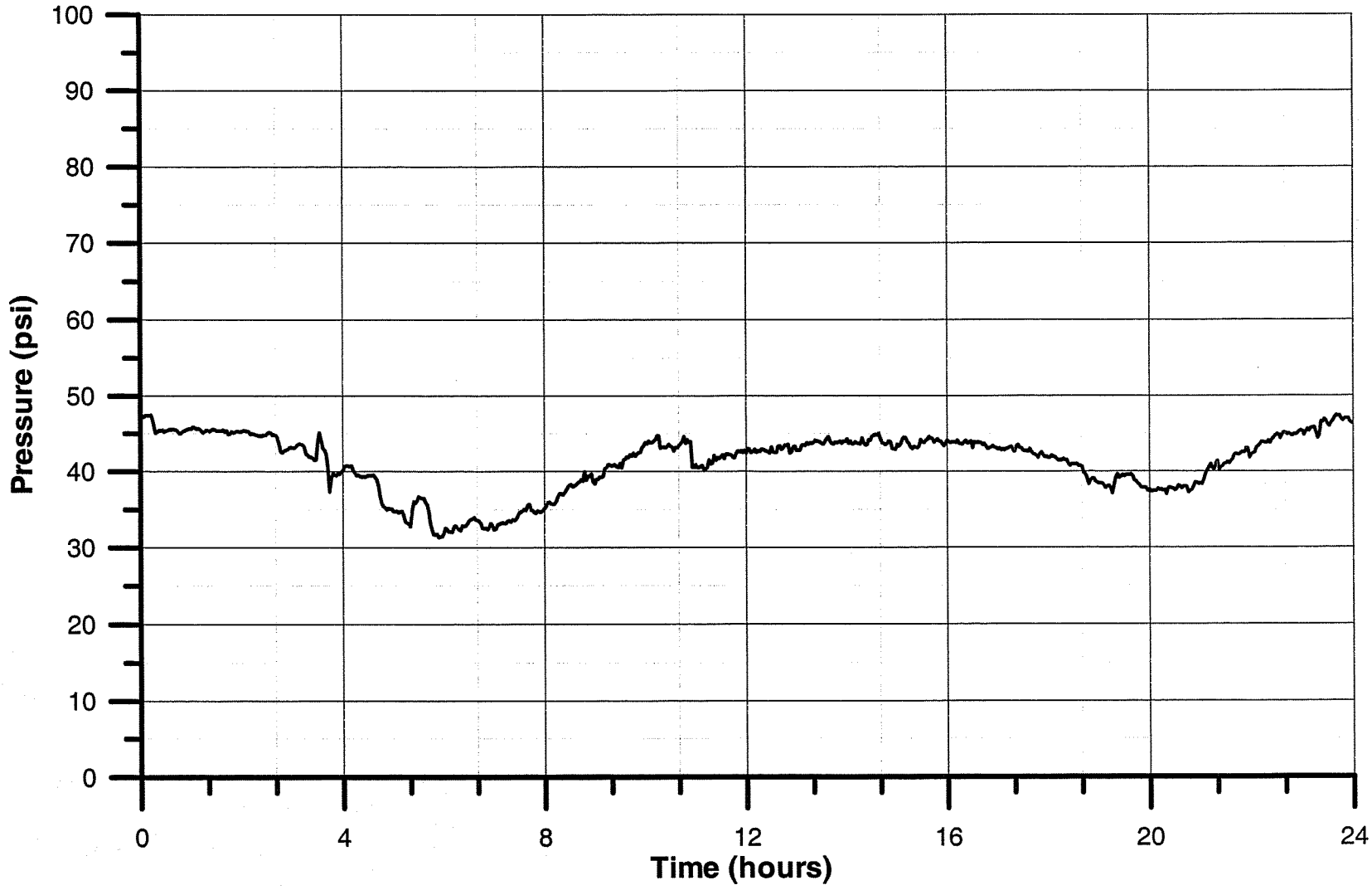

Burns & McDonnell

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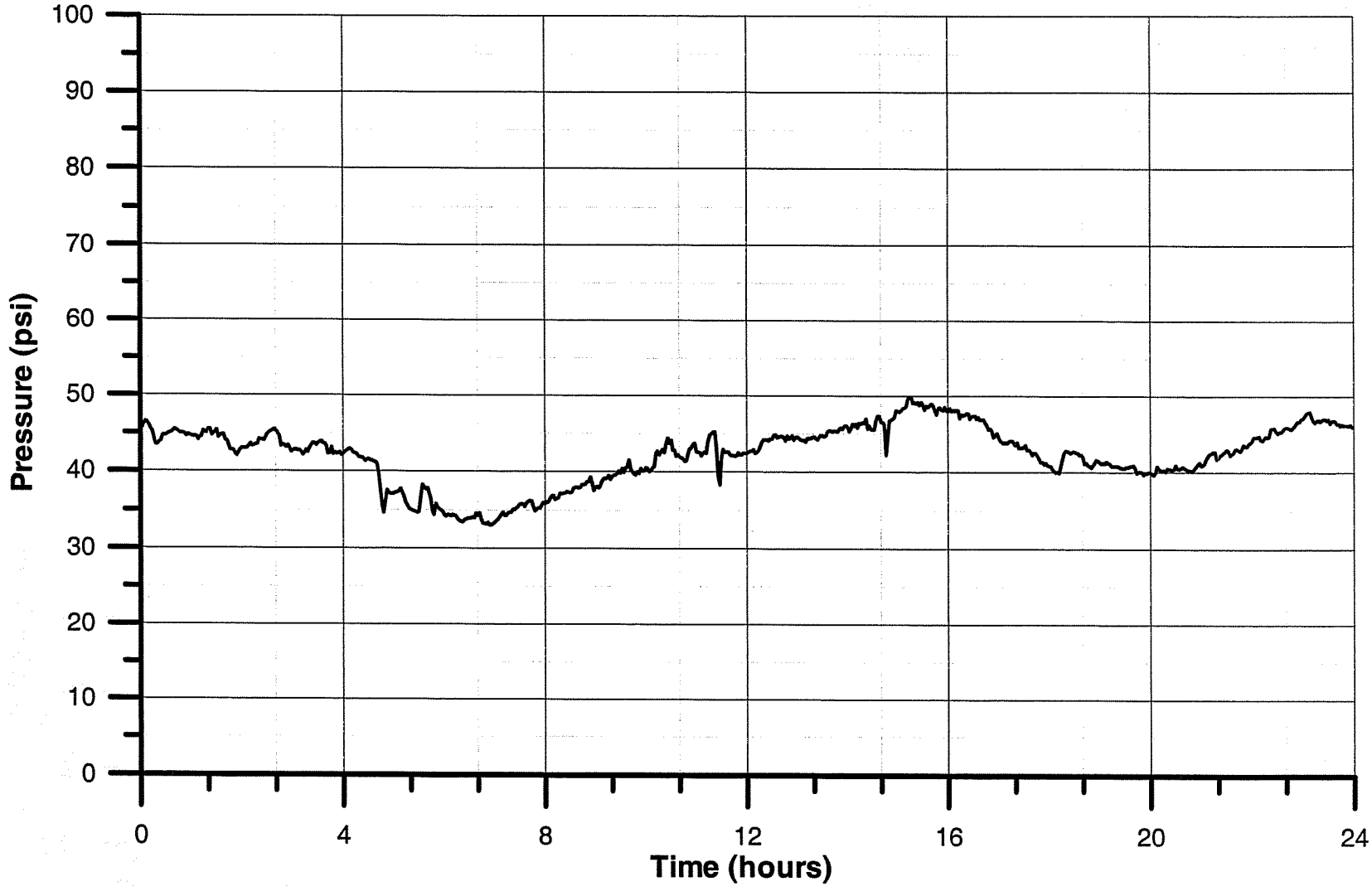

Burns & McDonnell

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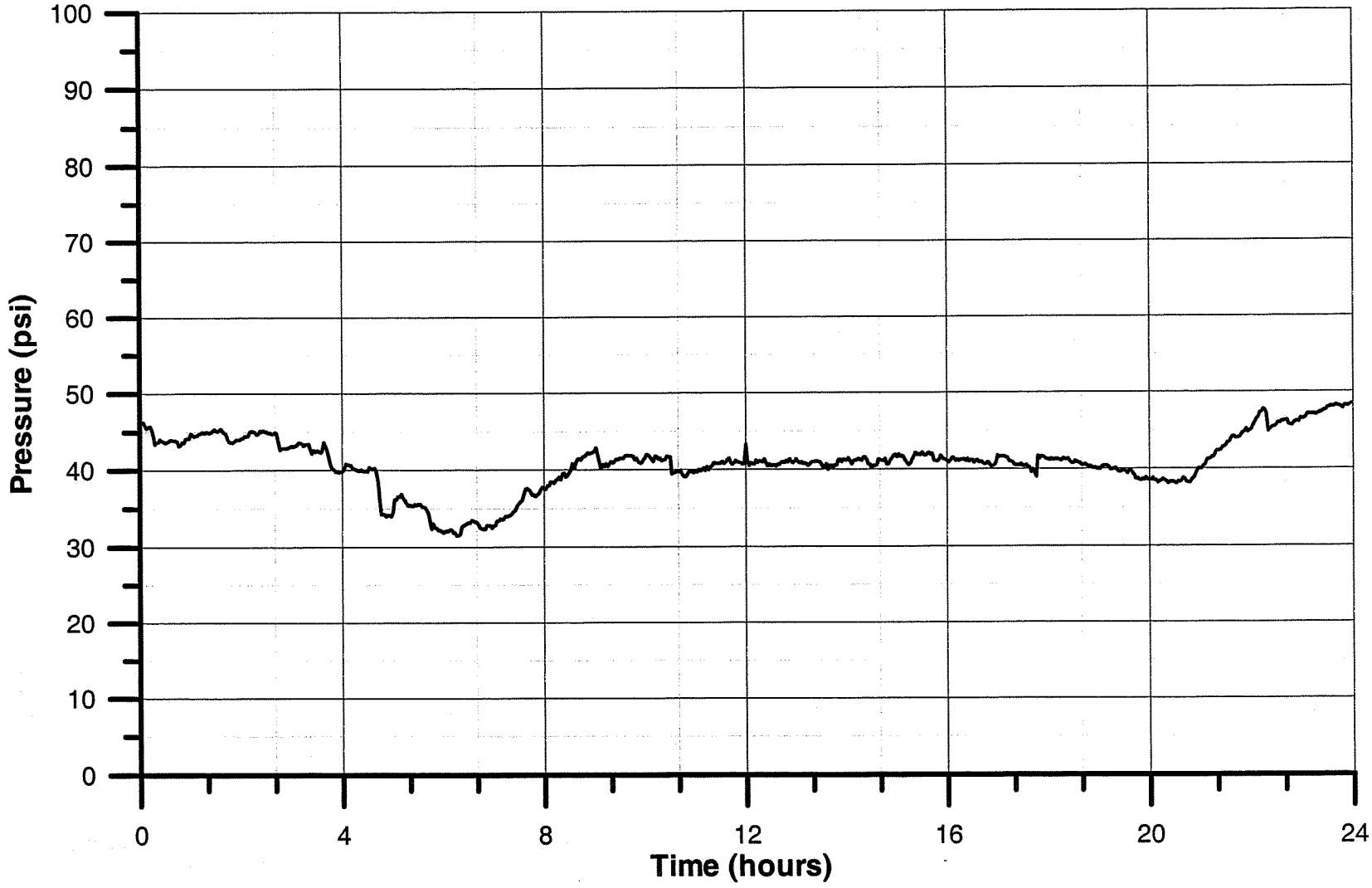

Burns & McDonnell

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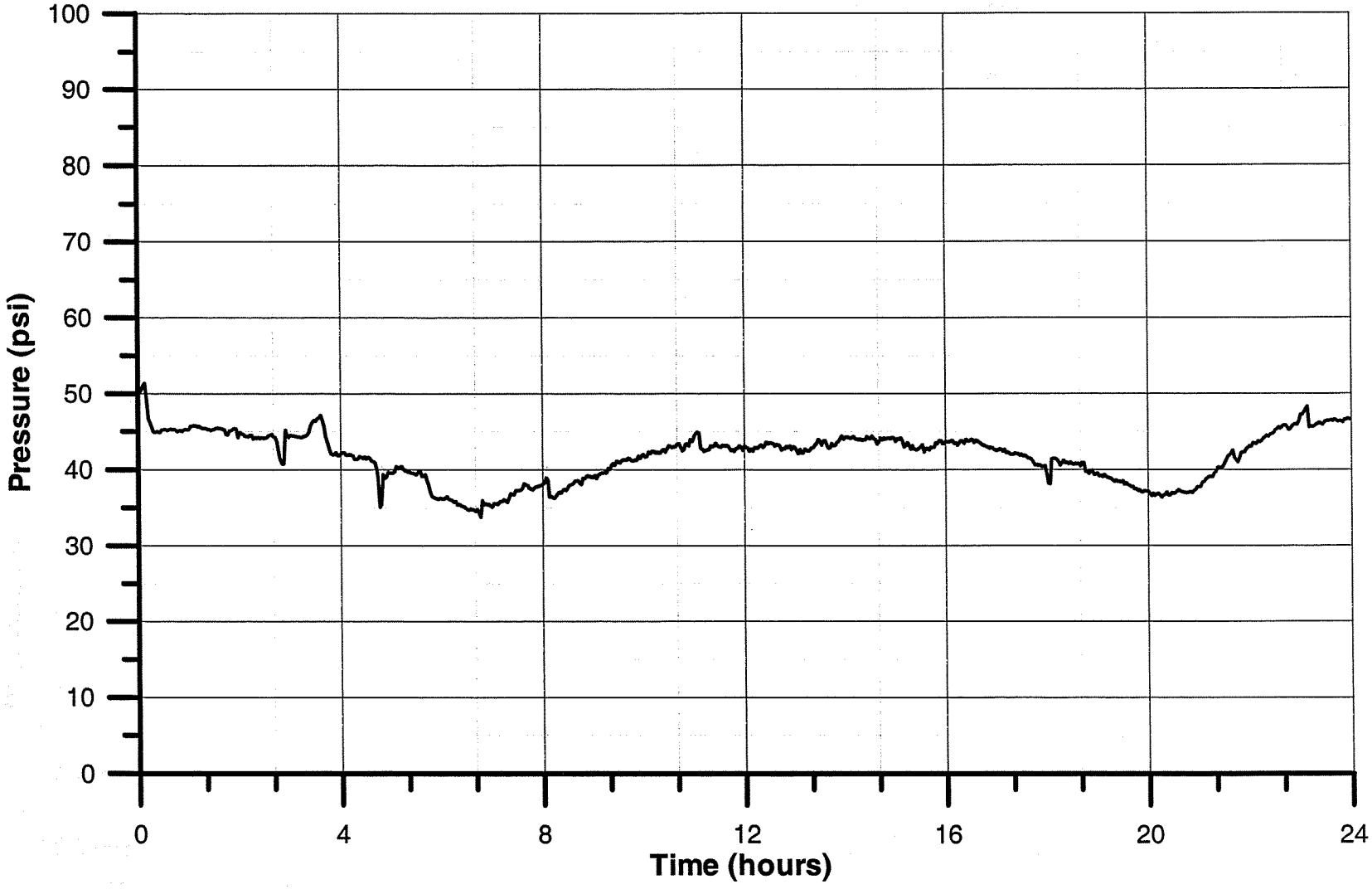

Burns & McDonnell

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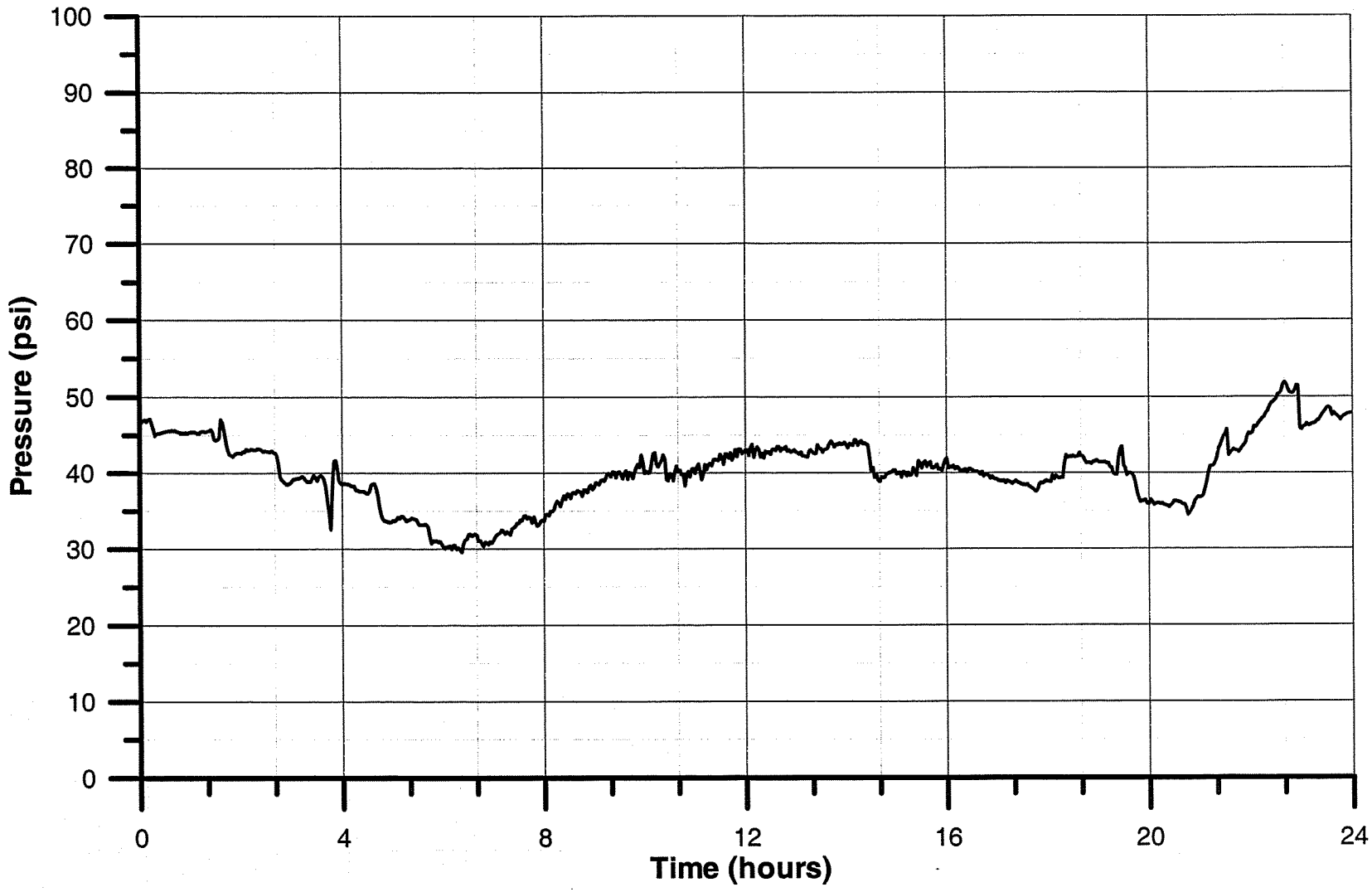

Burns & McDonnell

Wichita, Kansas
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July 18, 2003

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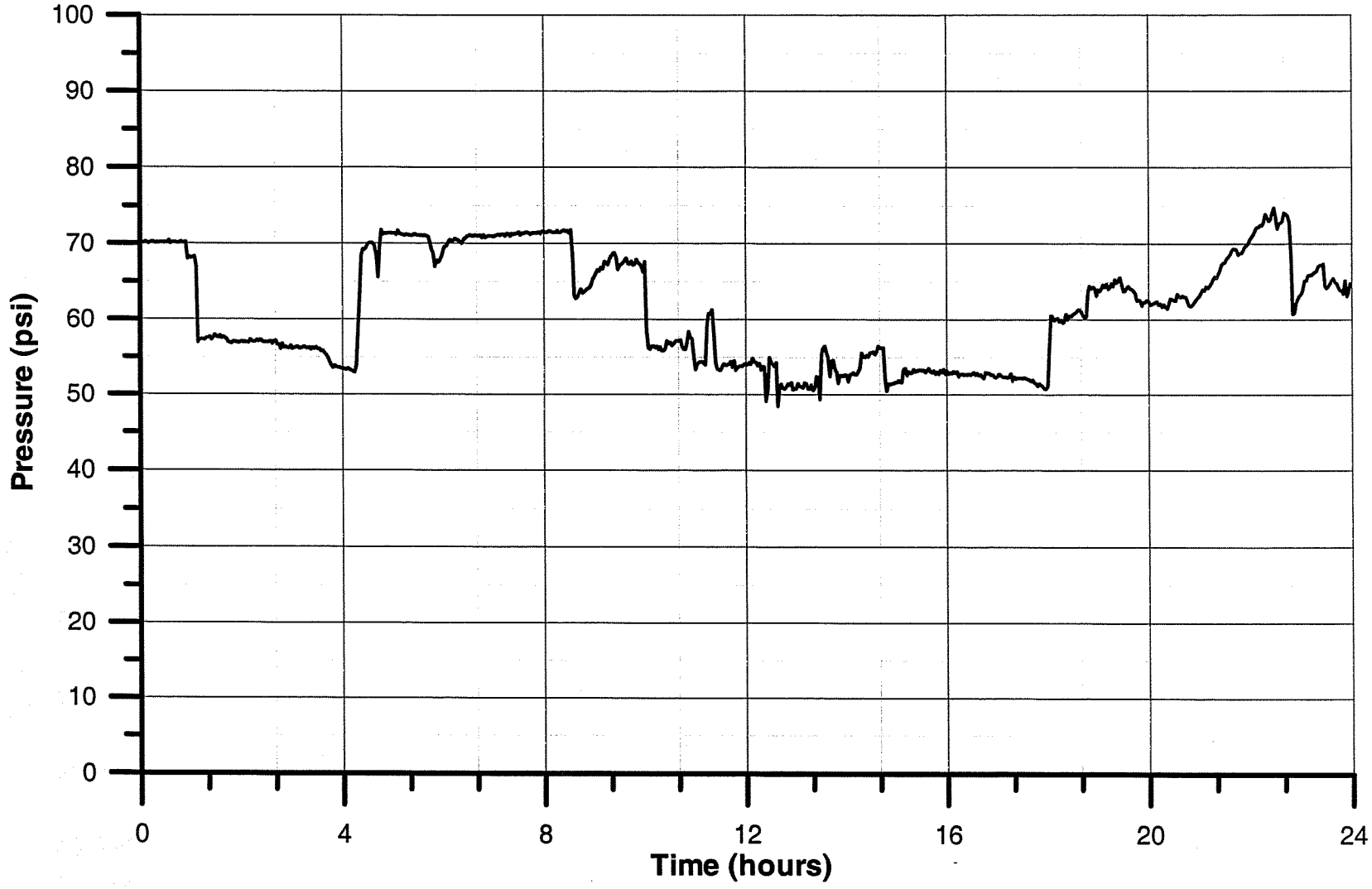

Burns & McDonnell

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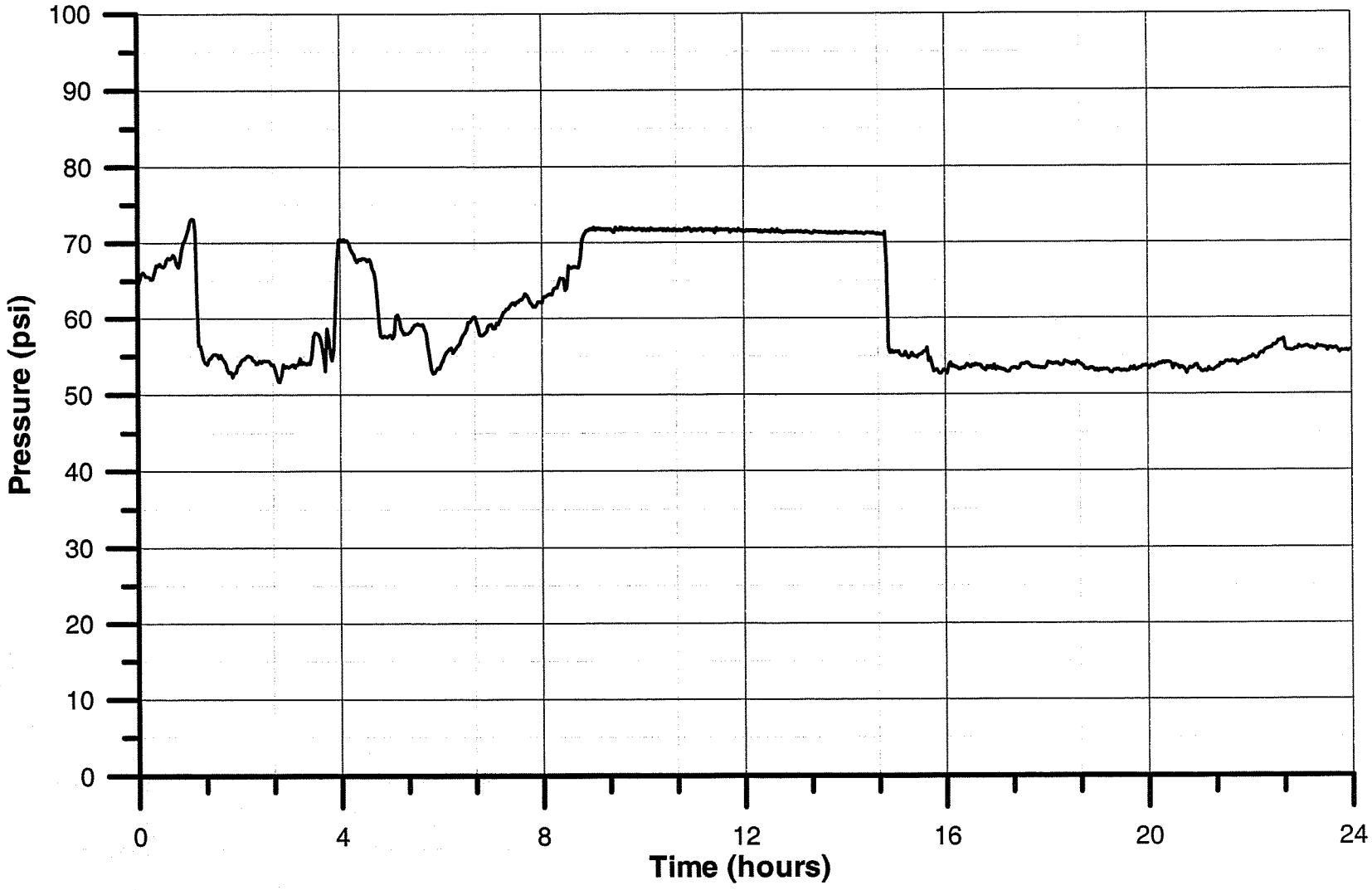

Burns & McDonnell

Wichita, Kansas
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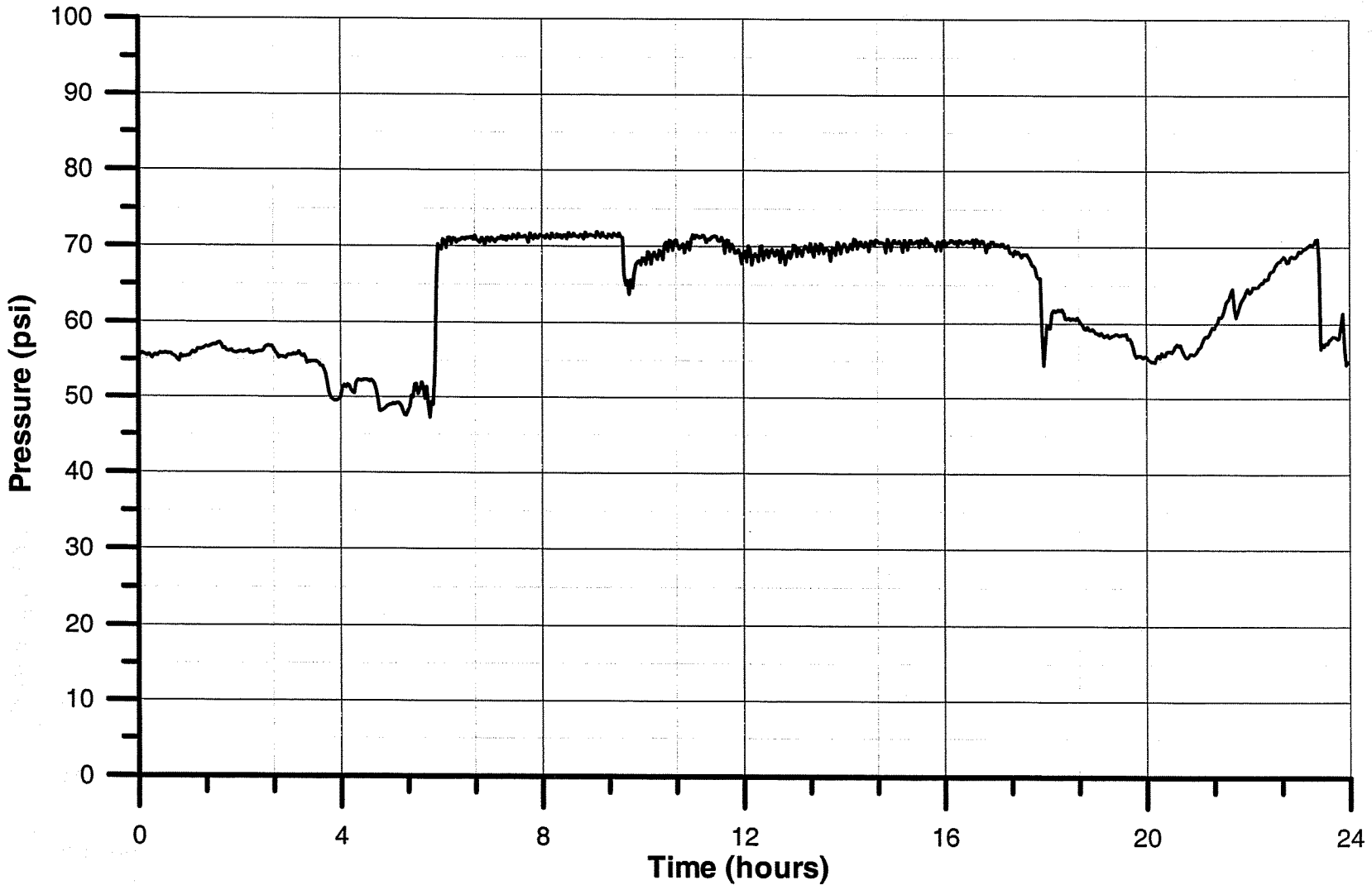

Burns & McDonnell

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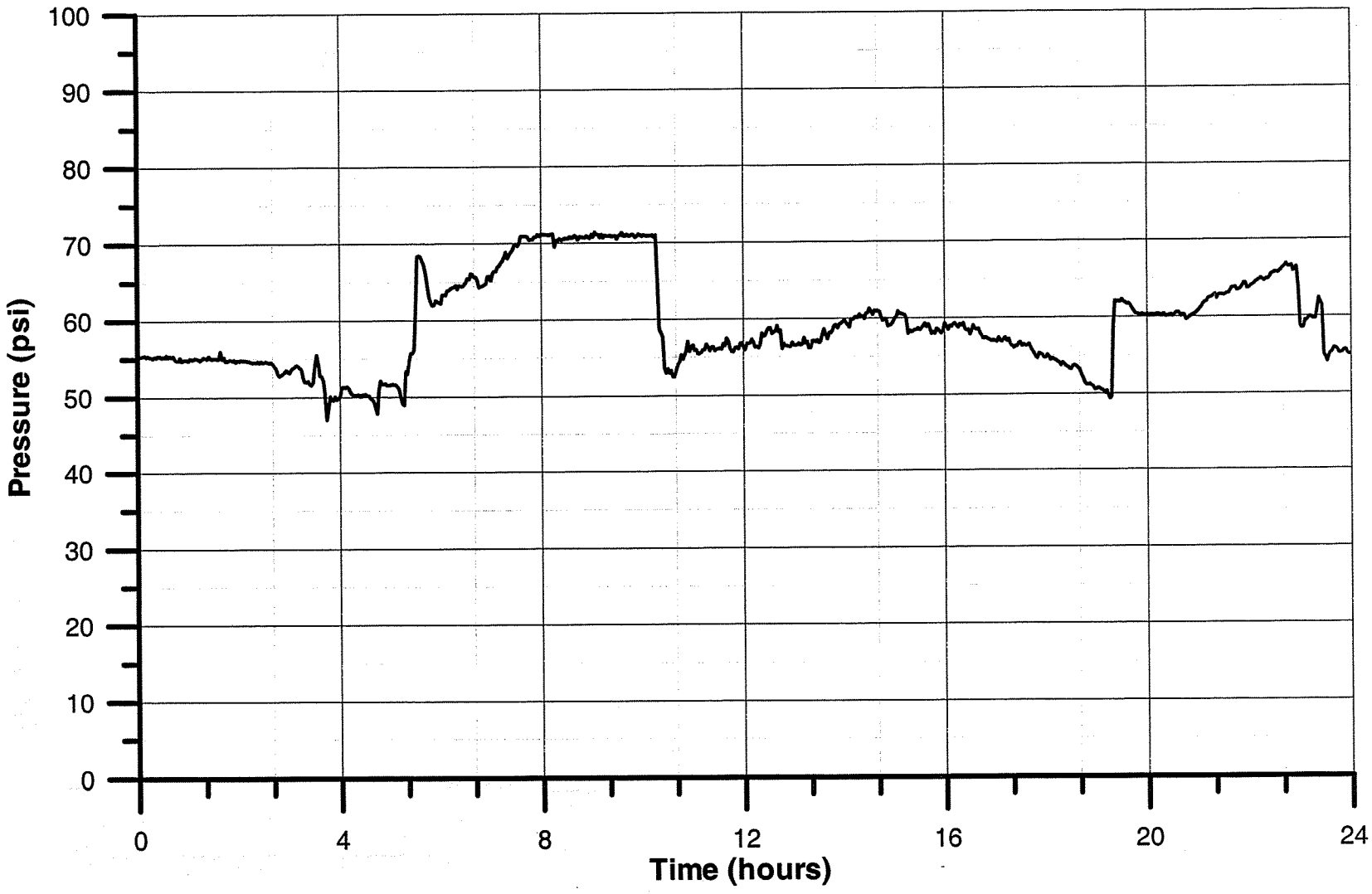

Burns & McDonnell

Wichita, Kansas
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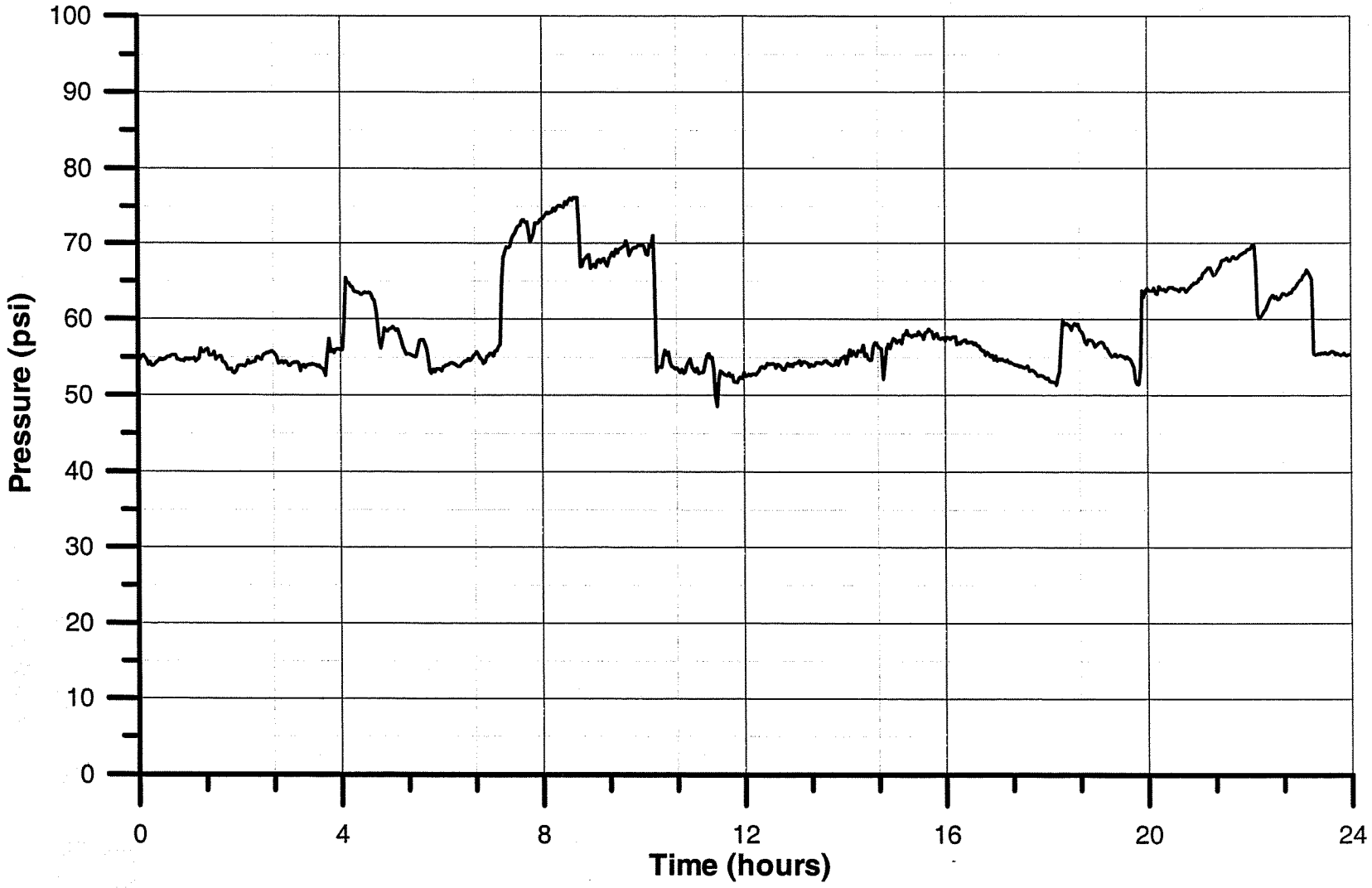

Burns & McDonnell

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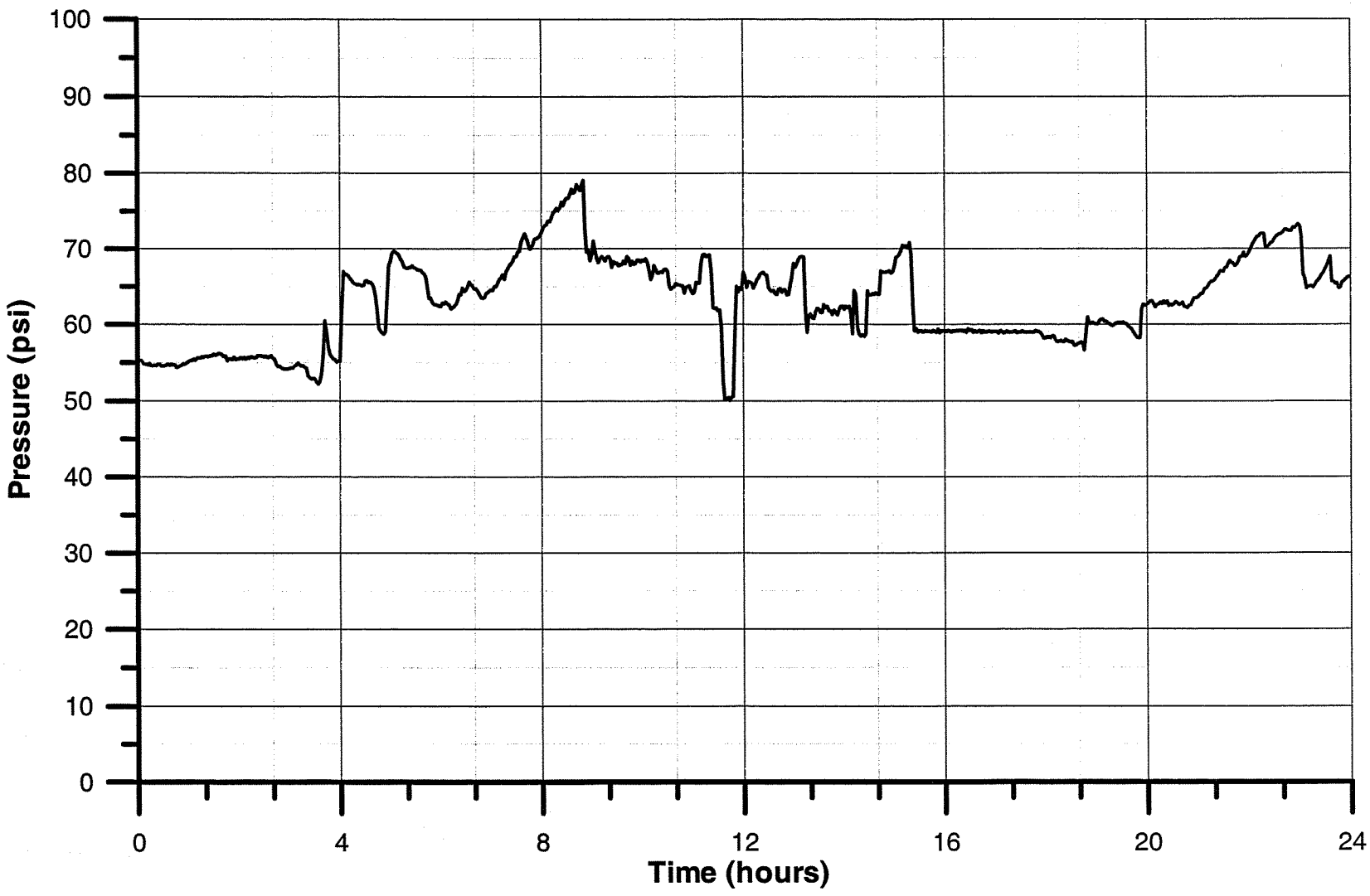

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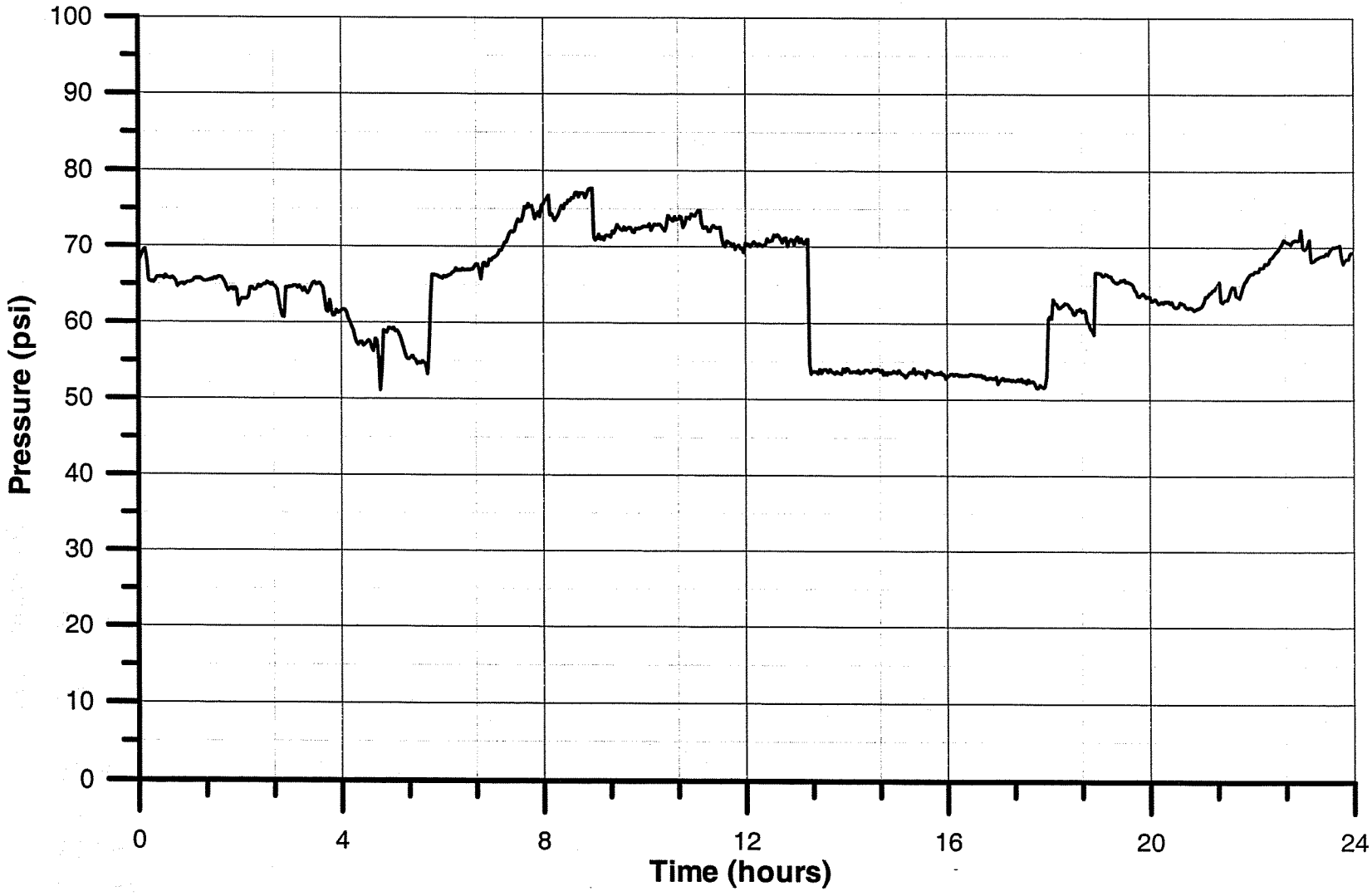

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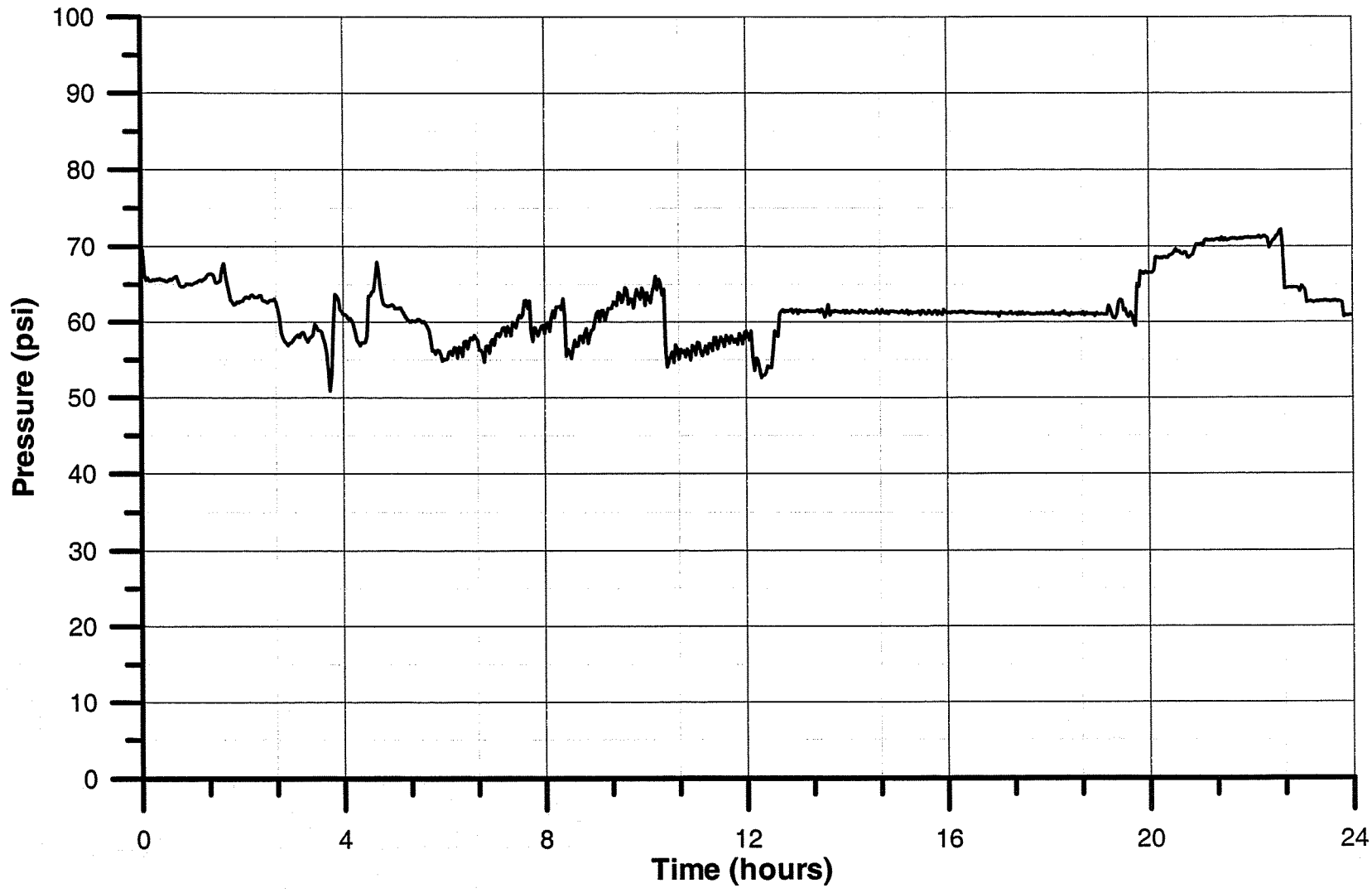

Burns & McDonnell

Wichita, Kansas
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127th St. E & 21st N
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JACKSON, ILLINOIS 60901
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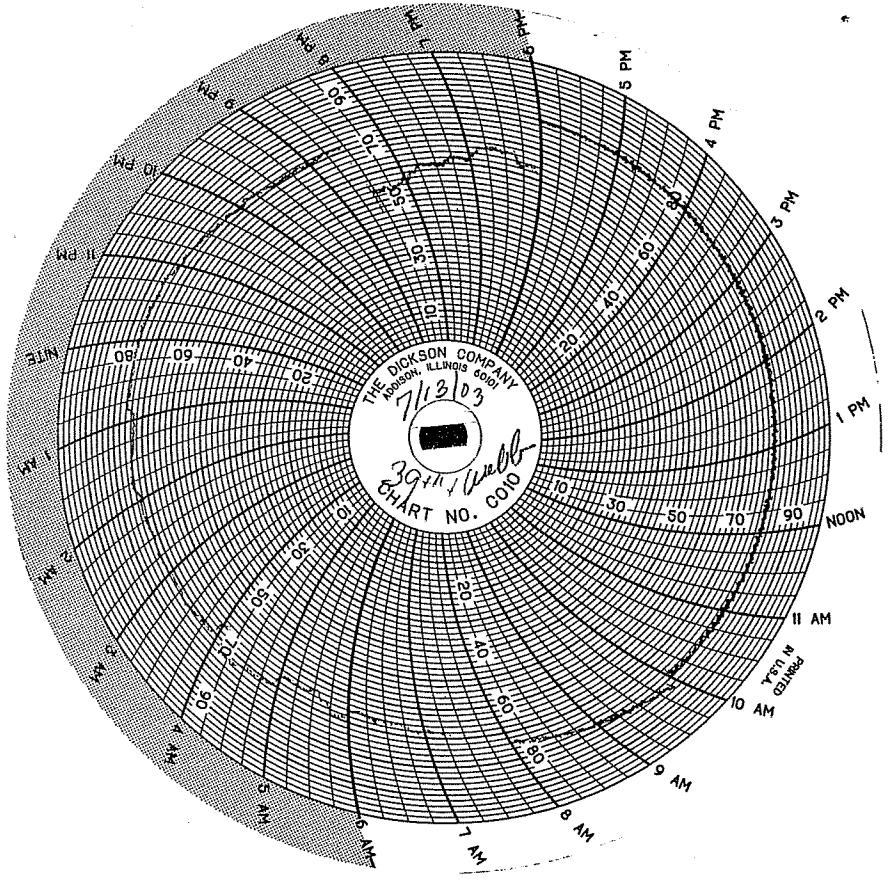
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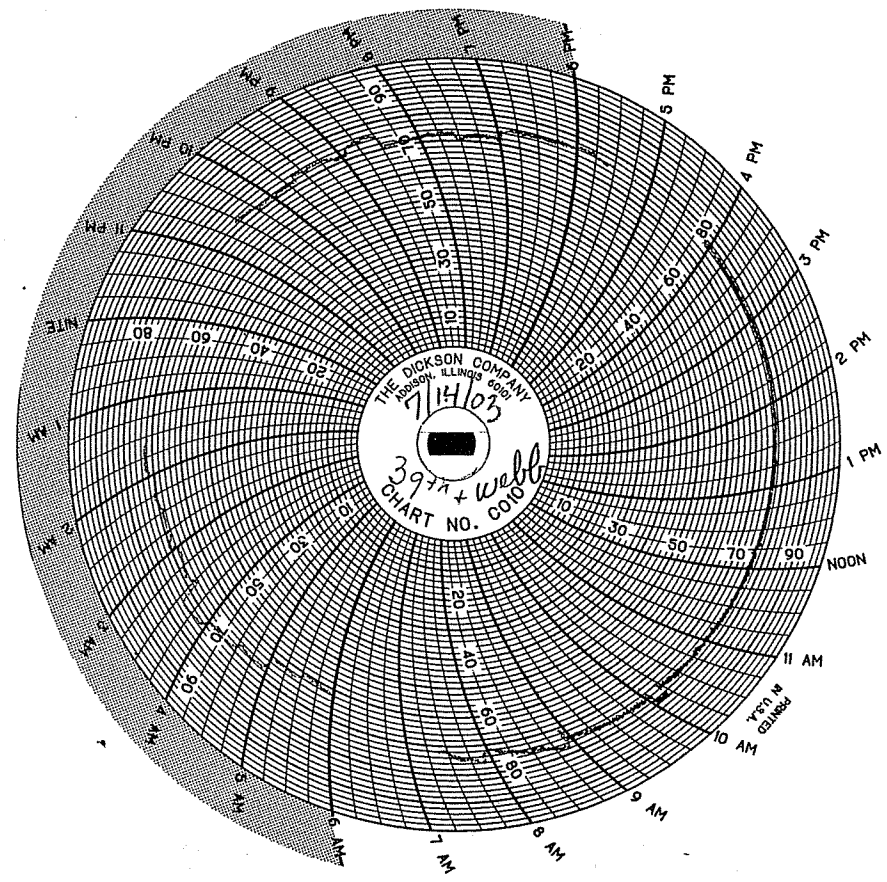
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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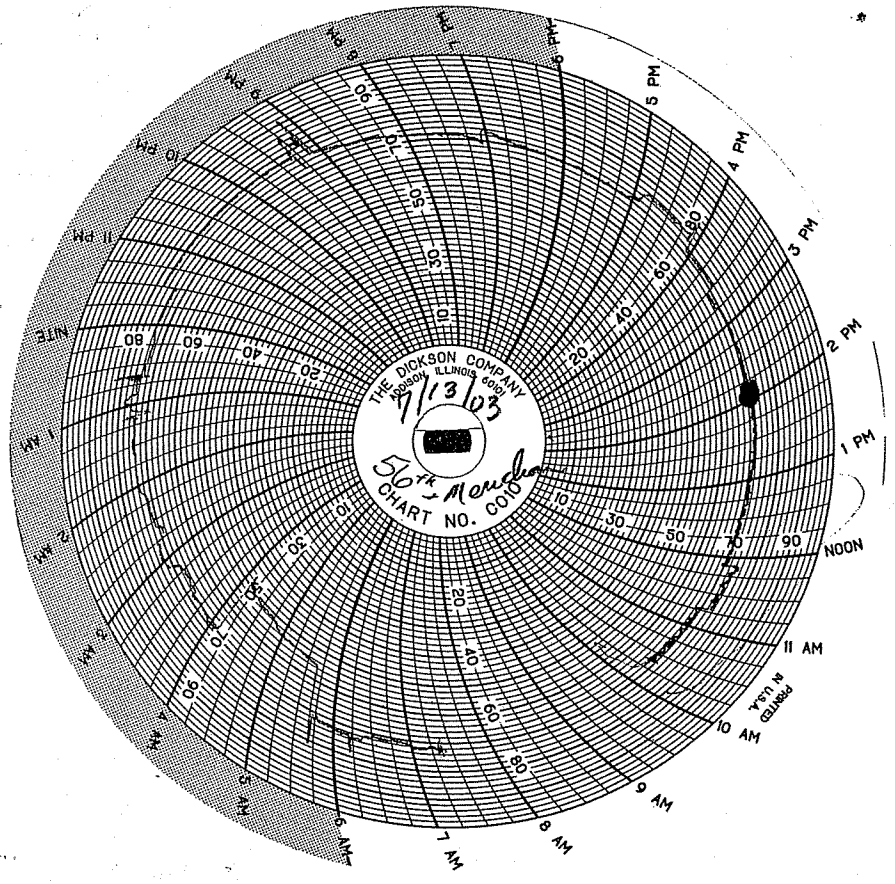
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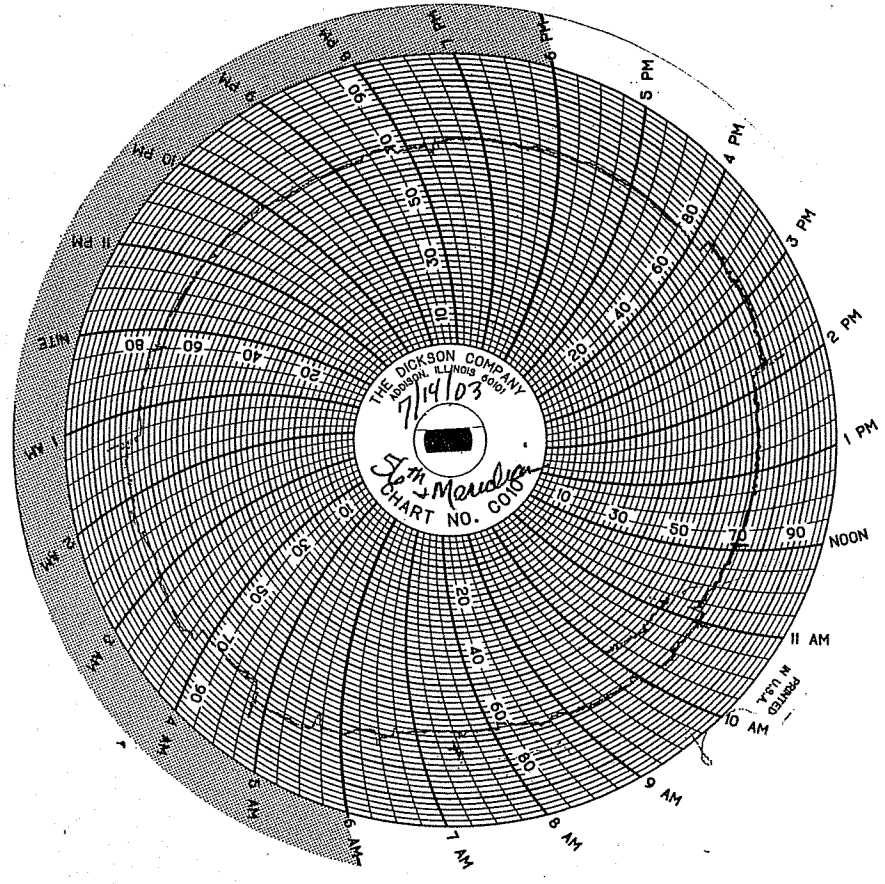
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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1074

THE DICKSON COMPANY
ROCKFORD, ILLINOIS 60601
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THE DICKSON COMPANY
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THE DICKSON COMPANY
Kosson, Illinois
Form 1151
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THE DICKSON COMPANY
Kosson, Illinois
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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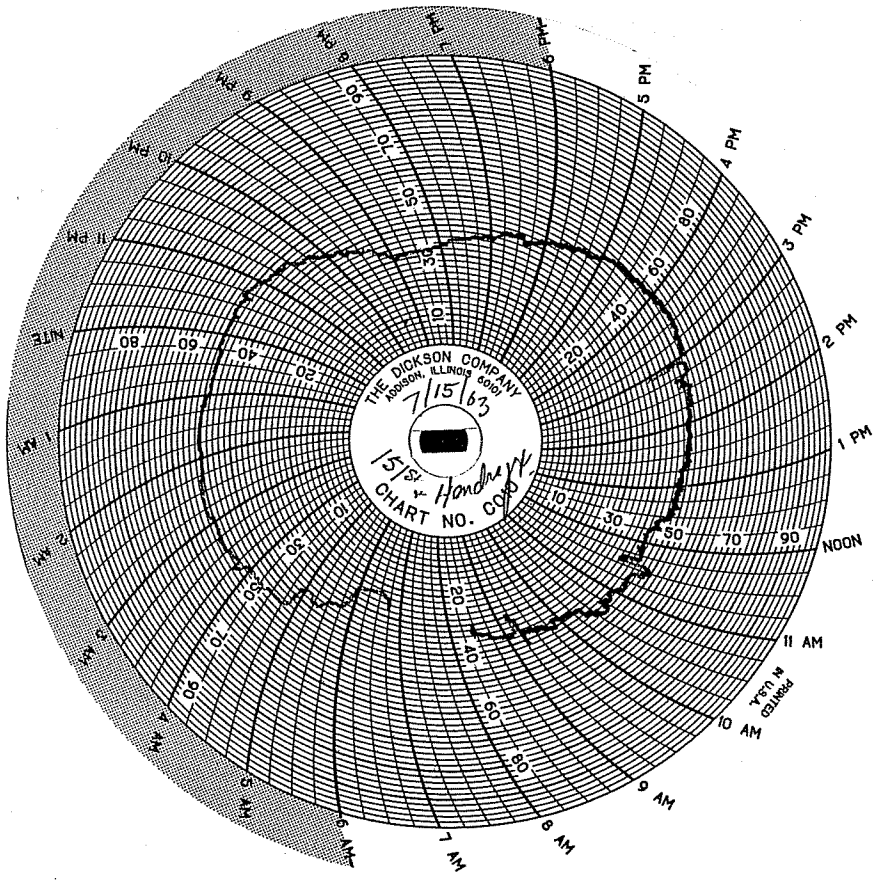
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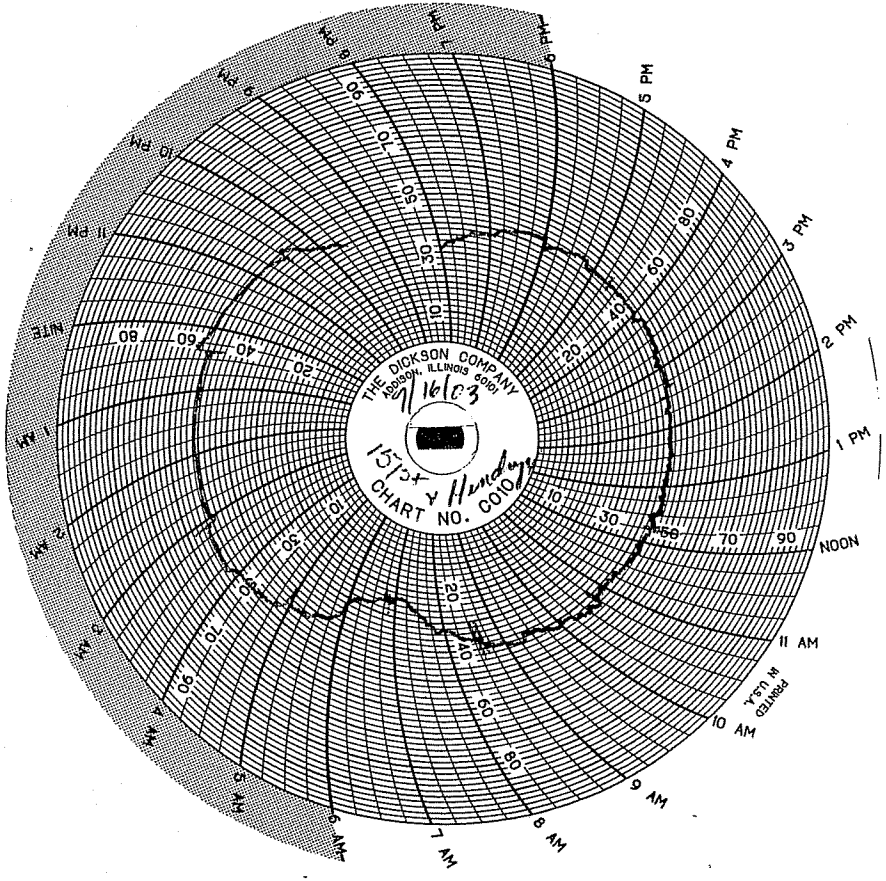
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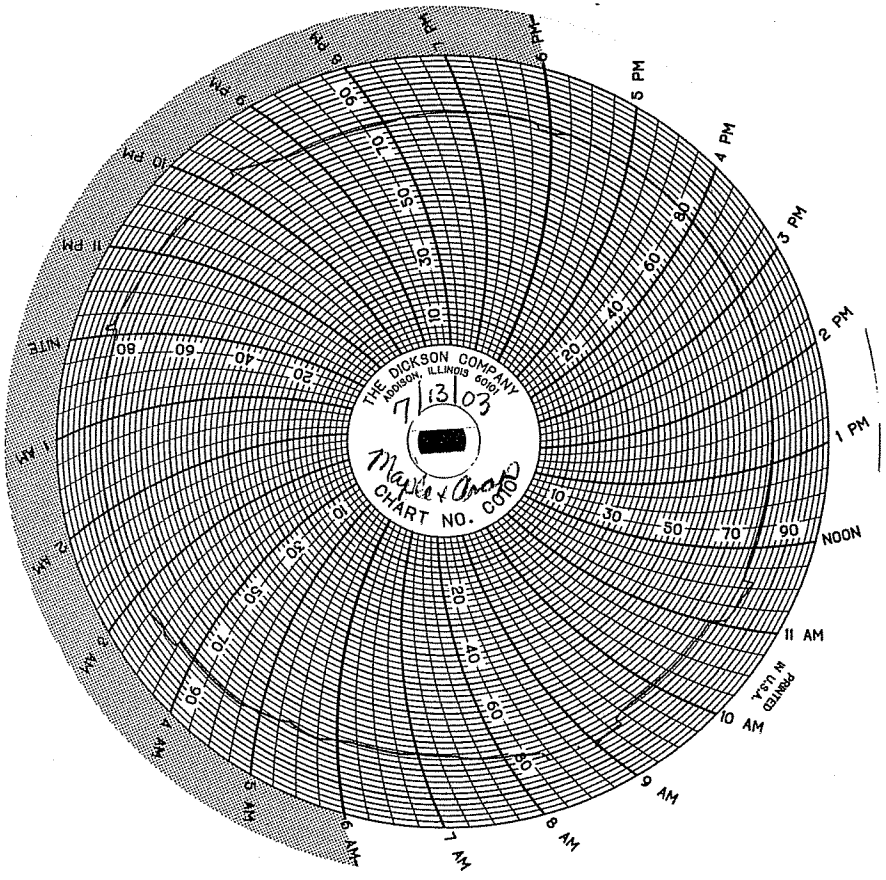
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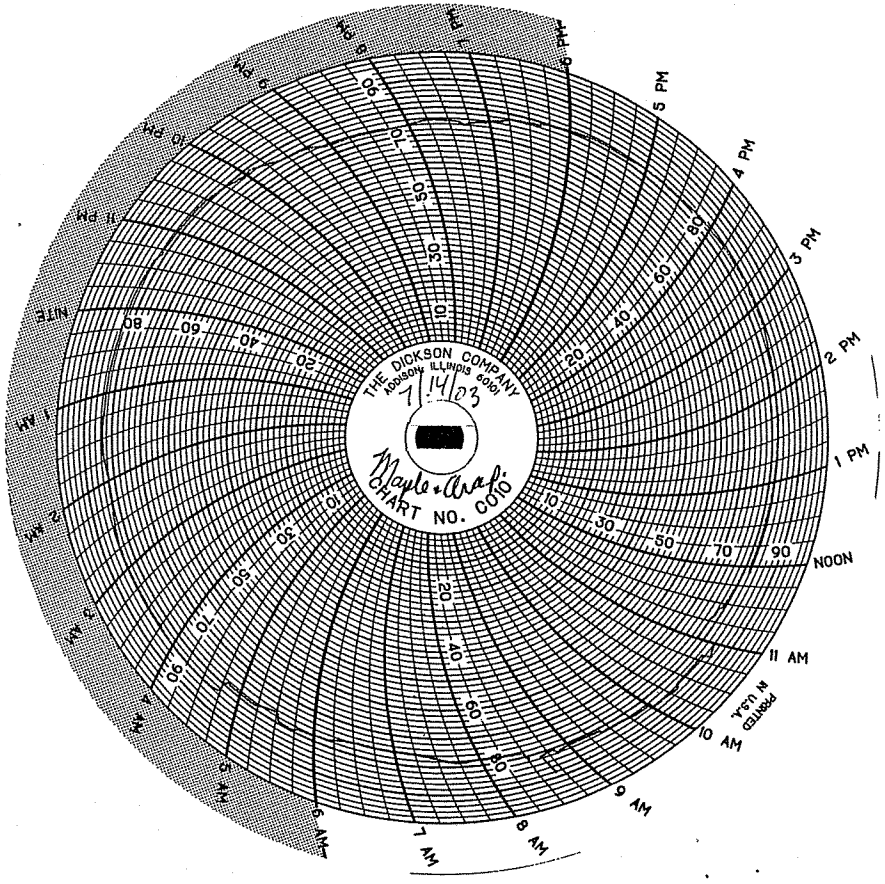
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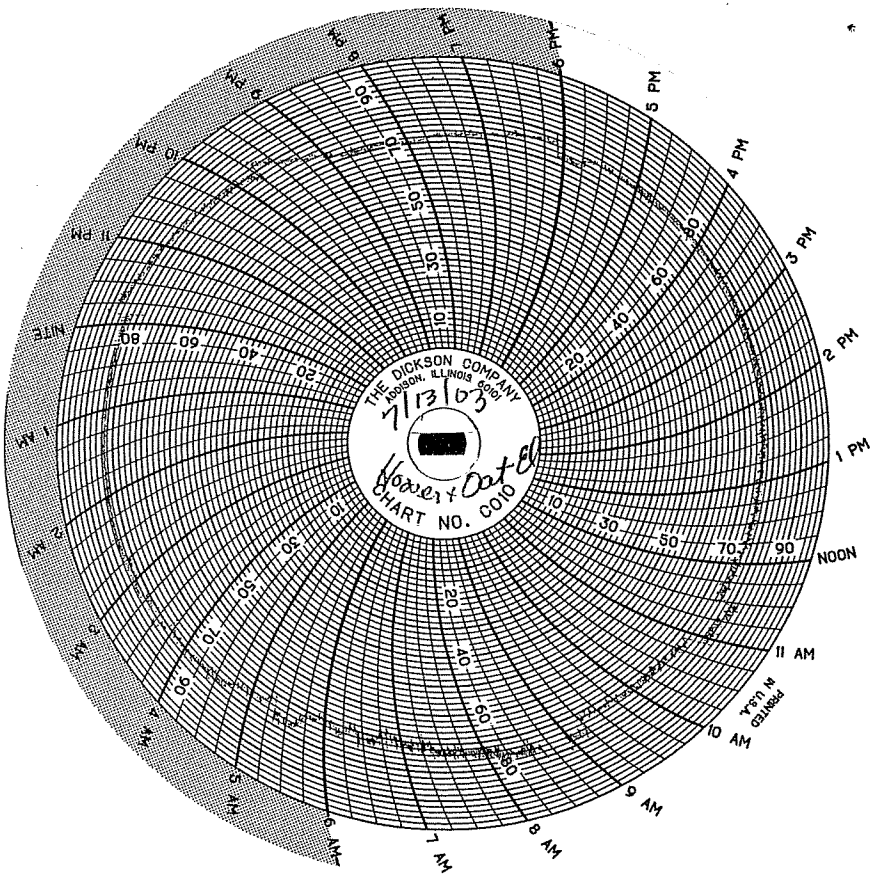
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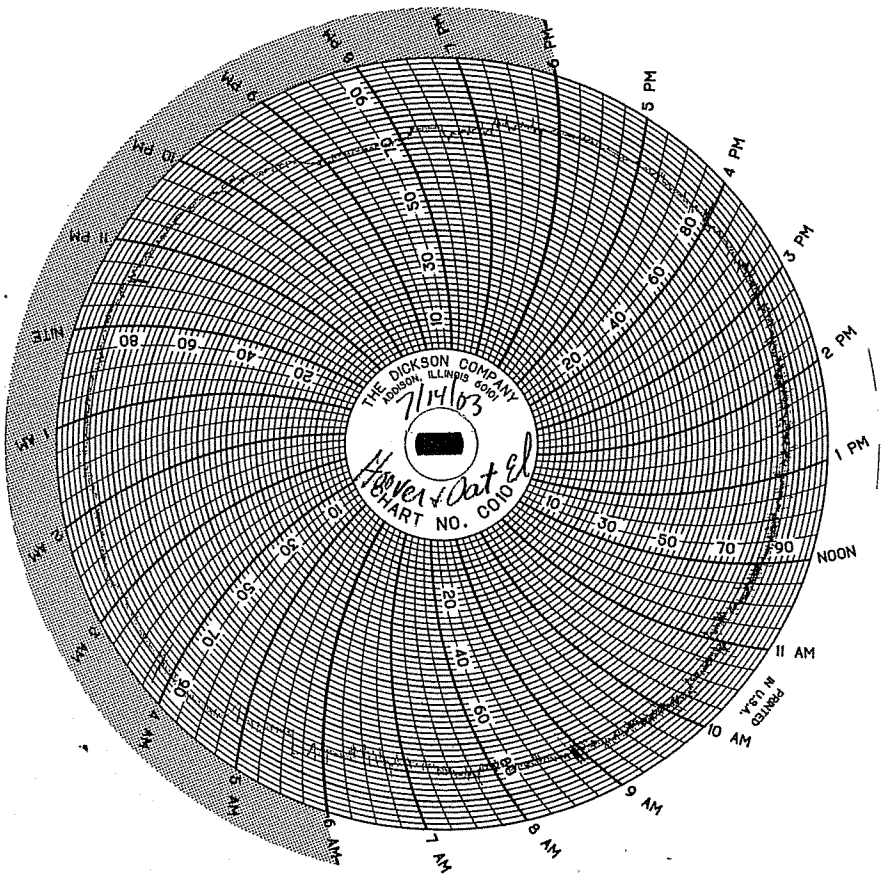
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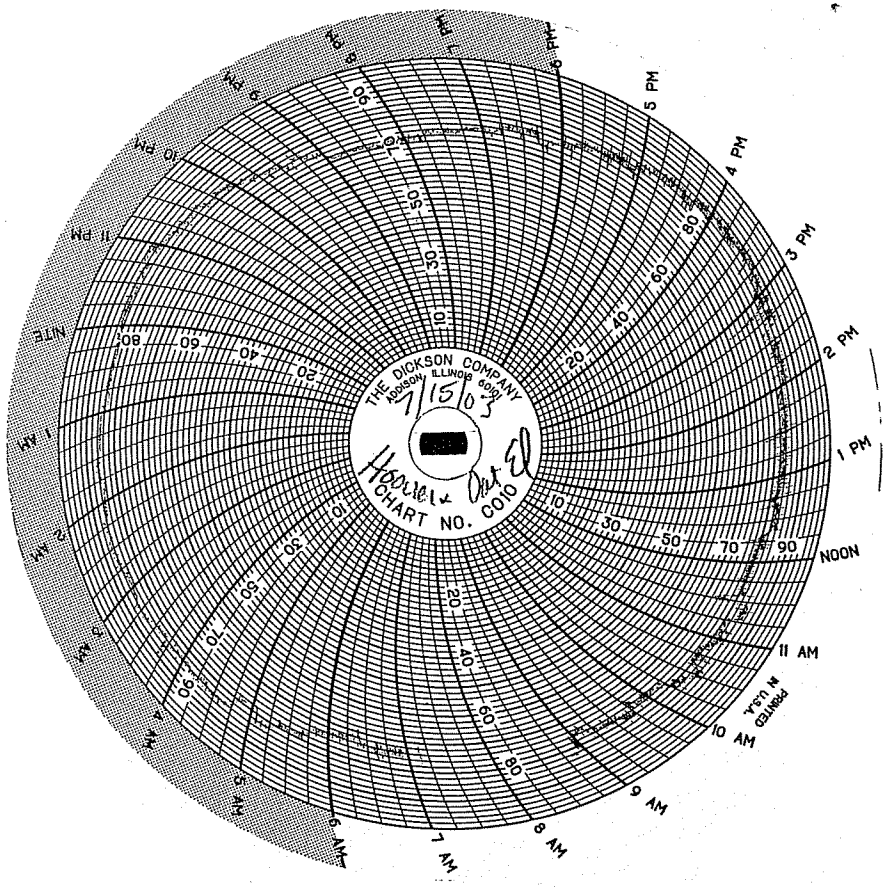
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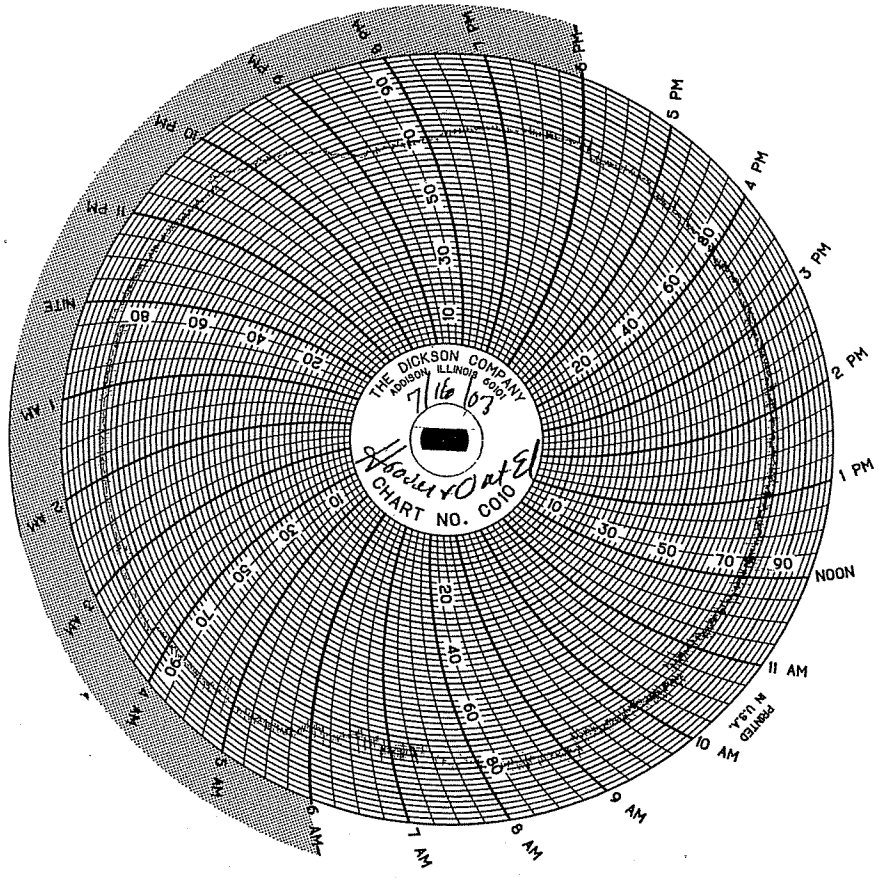
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THE DICKSON COMPANY
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THE DICKSON COMPANY
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Appendix E

Diurnal Curves

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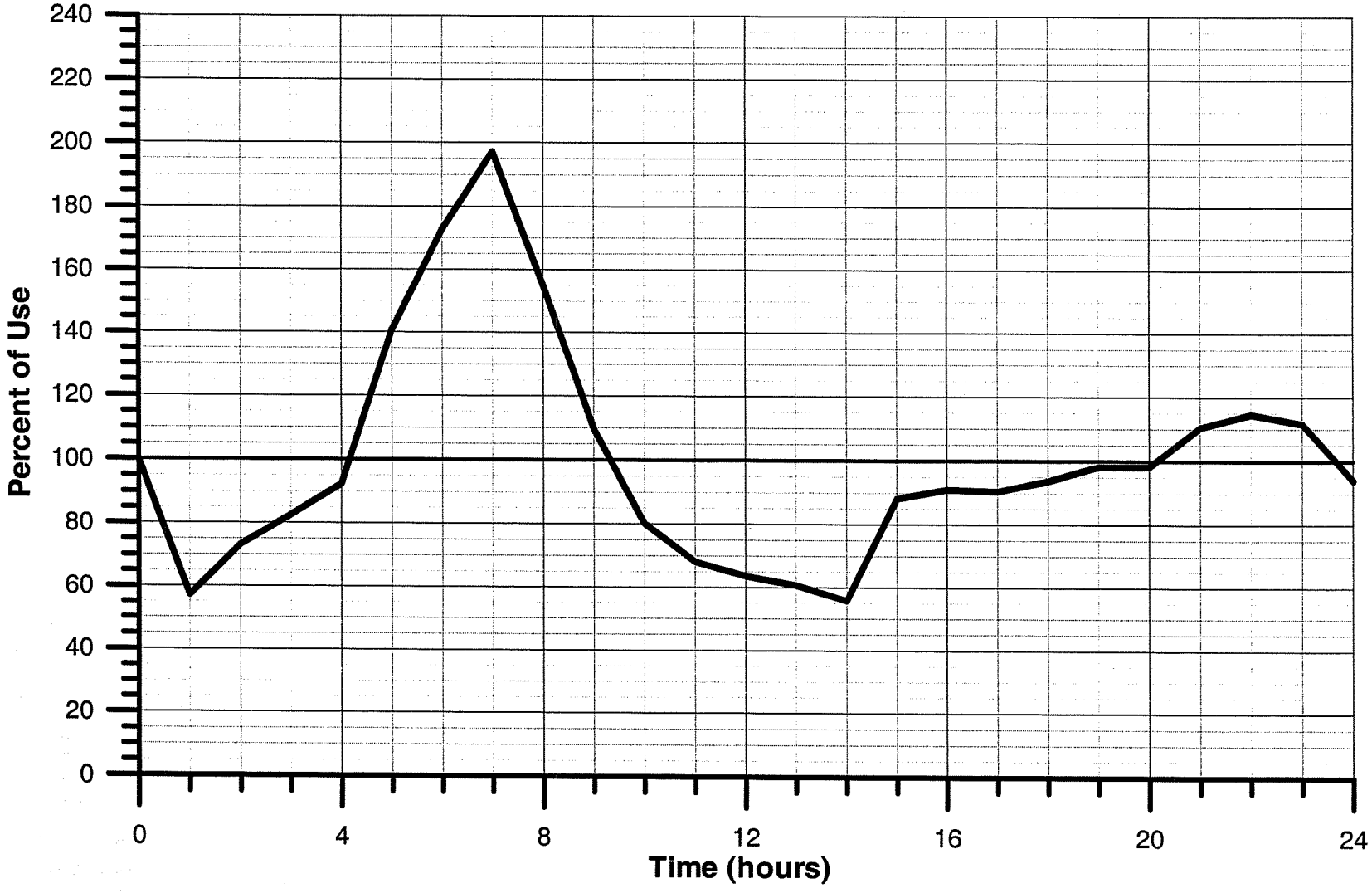

Burns & McDonnell

Figure
Wichita, Kansas
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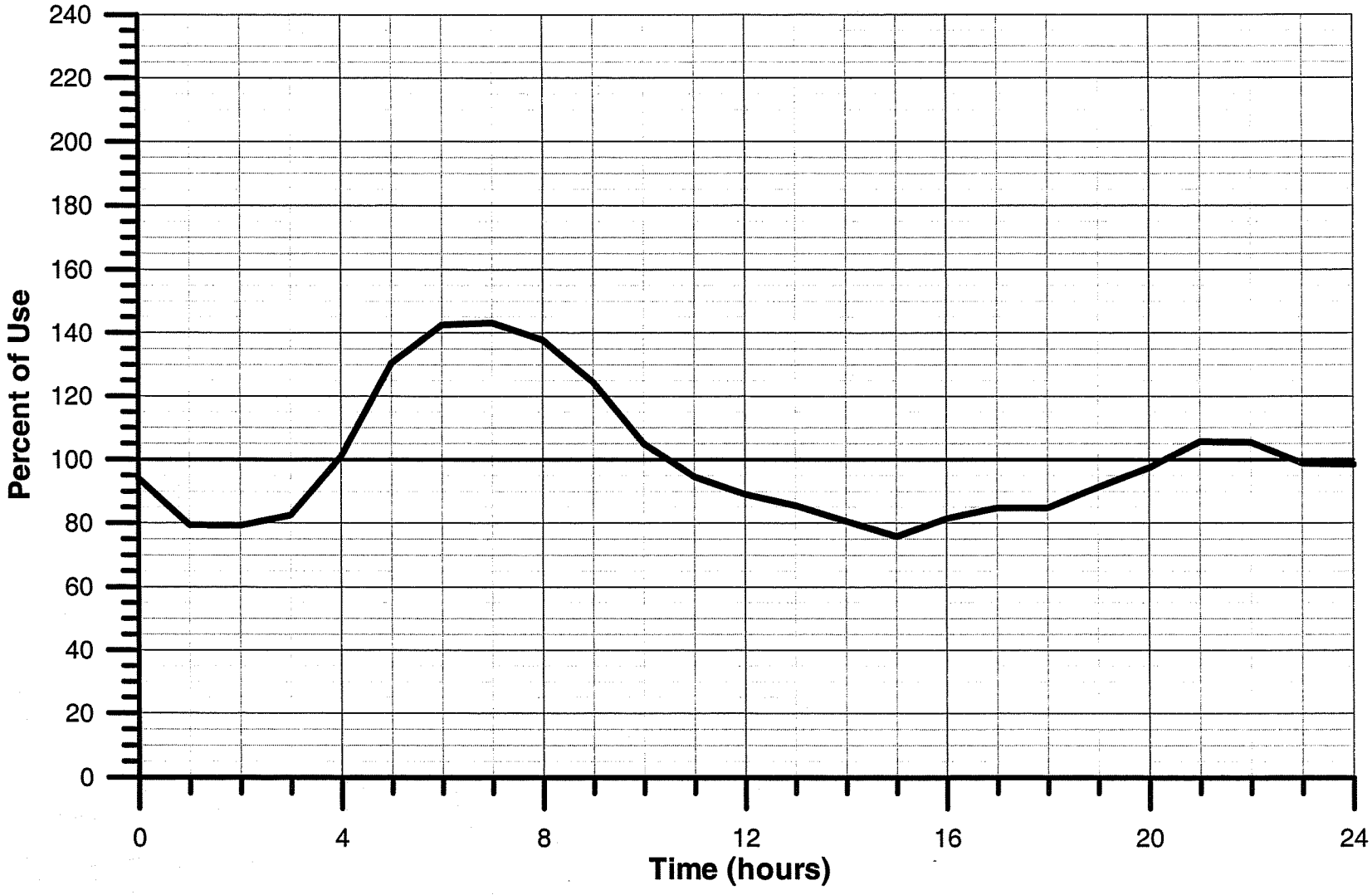
July 11, 2003

diurnalnepz 07-12-03



Burns & McDonnell

Figure
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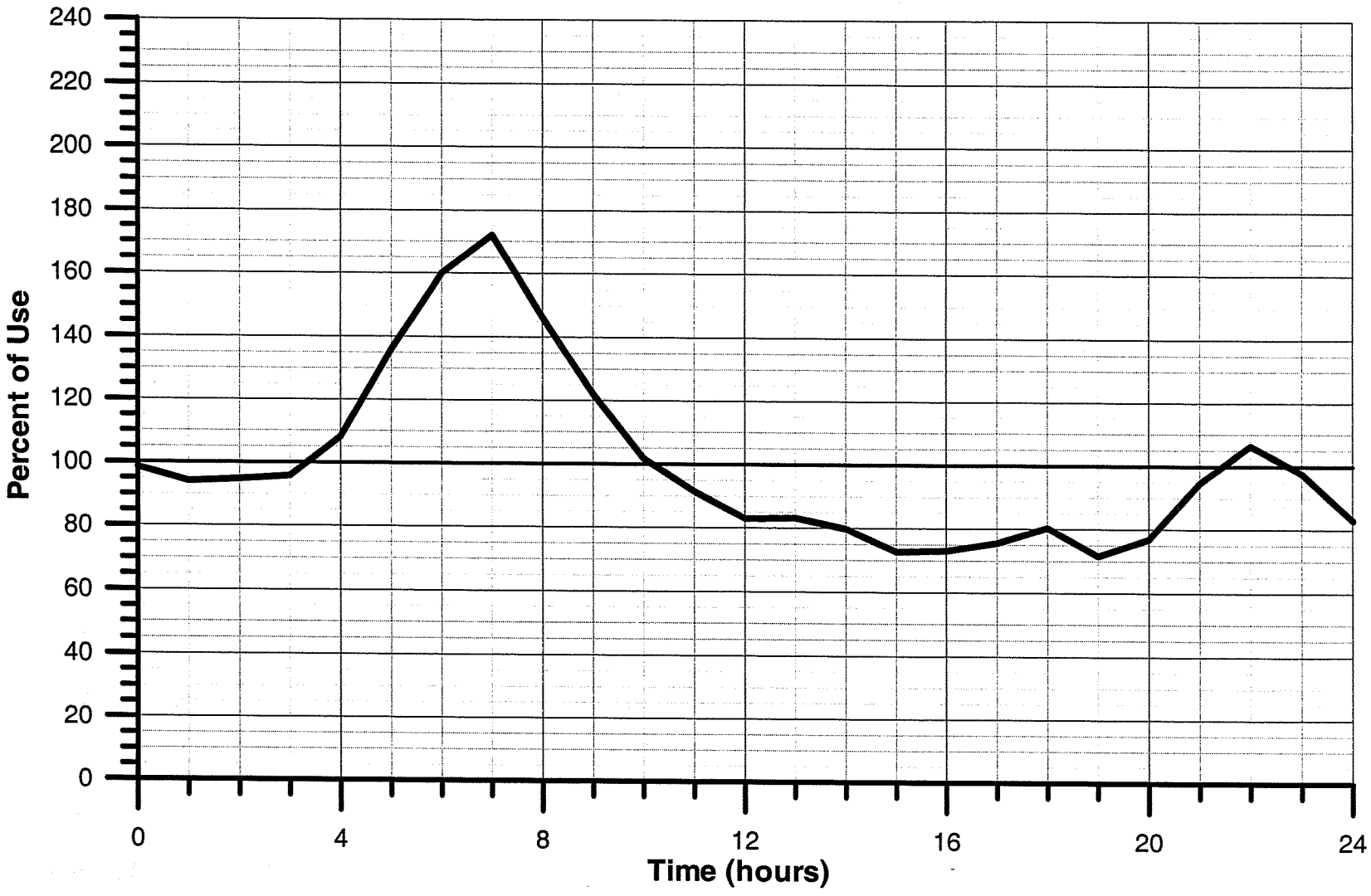
Diurnal Curve - NE PZ
July 12, 2003



Burns & McDonnell

Figure
Wichita, Kansas
Diurnal Curve - NE PZ
July 13, 2003

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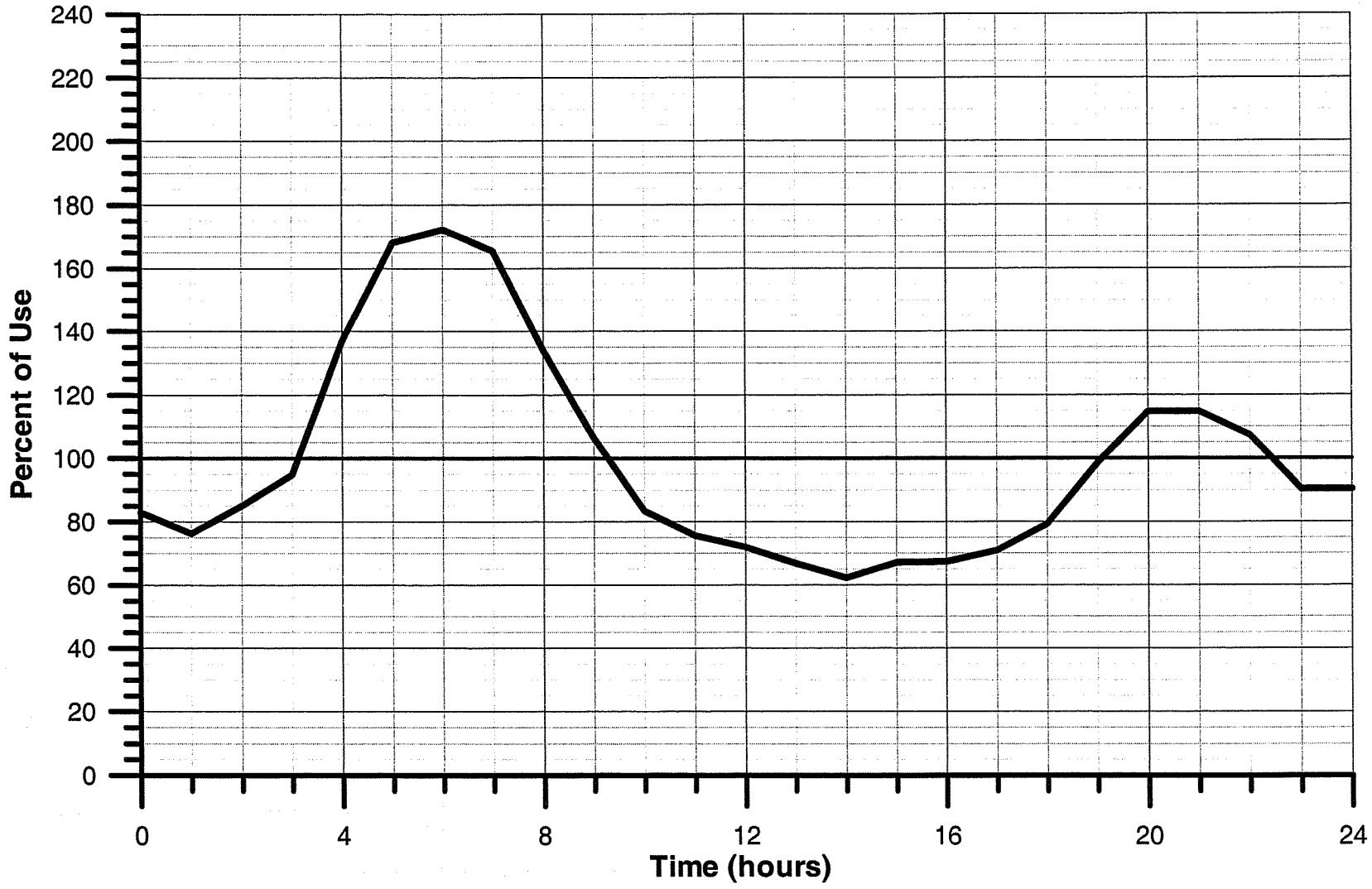
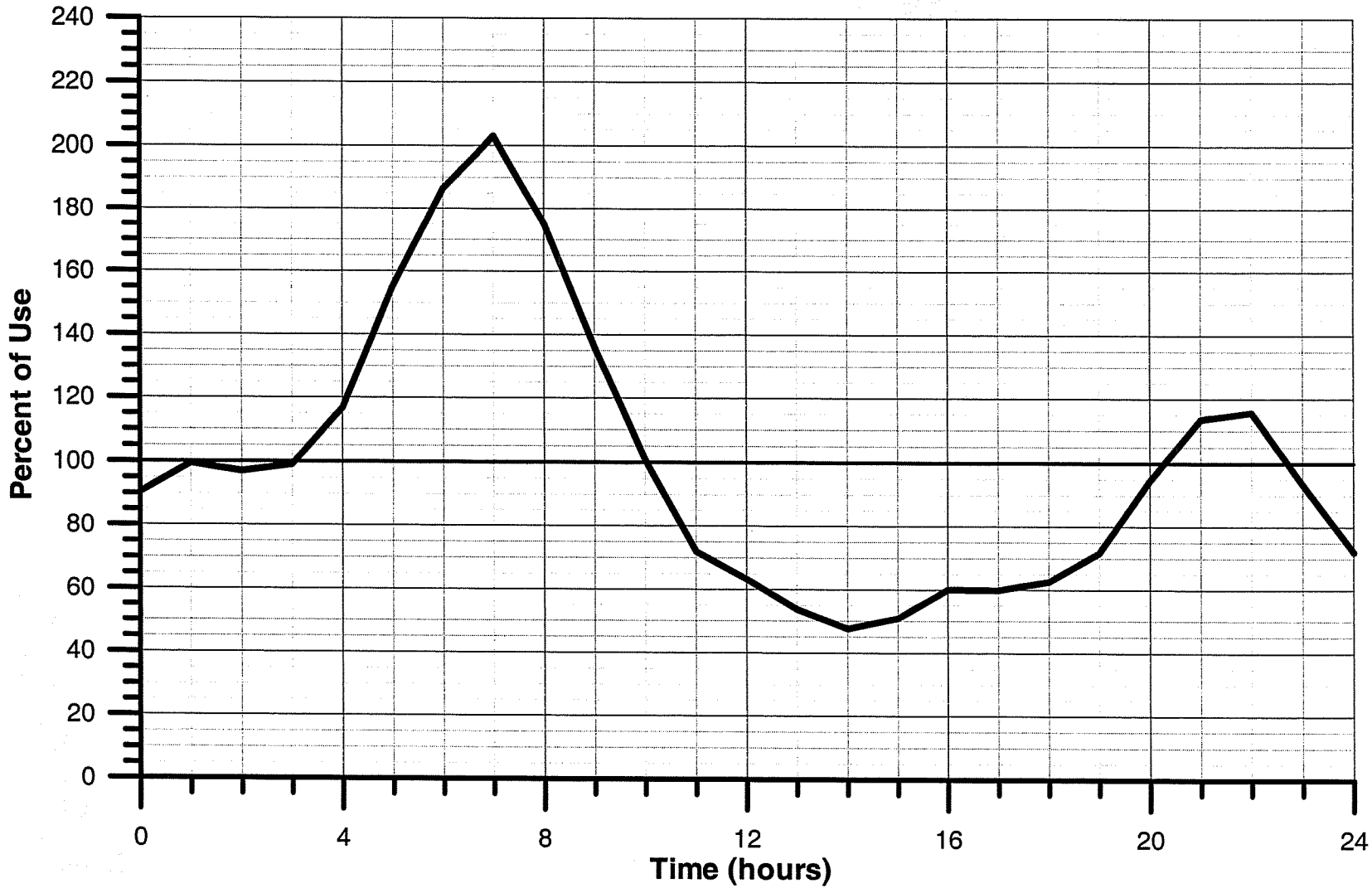


Burns & McDonnell

Figure
Wichita, Kansas
Diurnal Curve - NE PZ
July 14, 2003

diurnalnepz 5-03



Burns & McDonnell

Figure
Wichita, Kansas
Diurnal Curve - NE PZ
July 15, 2003

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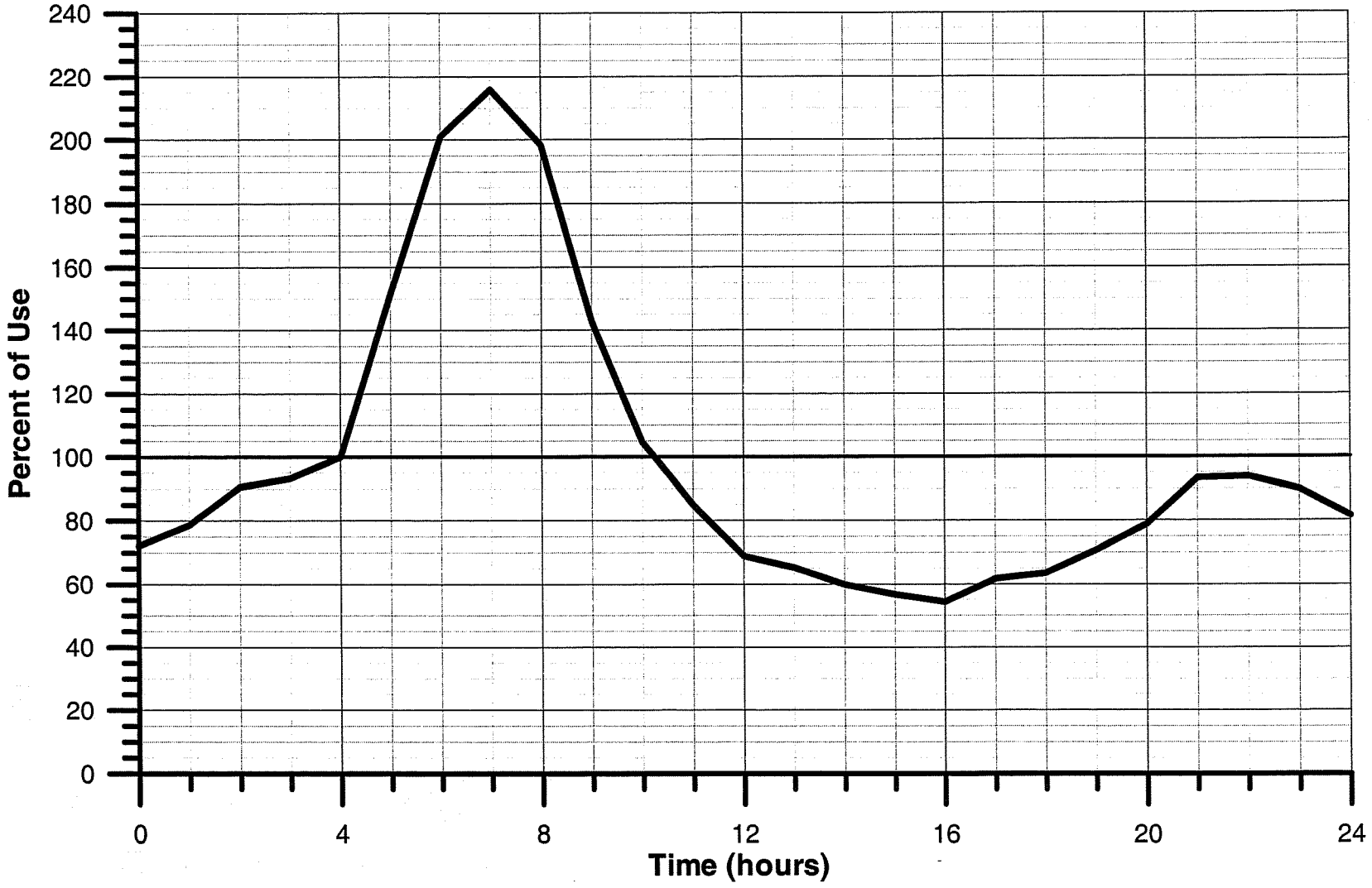
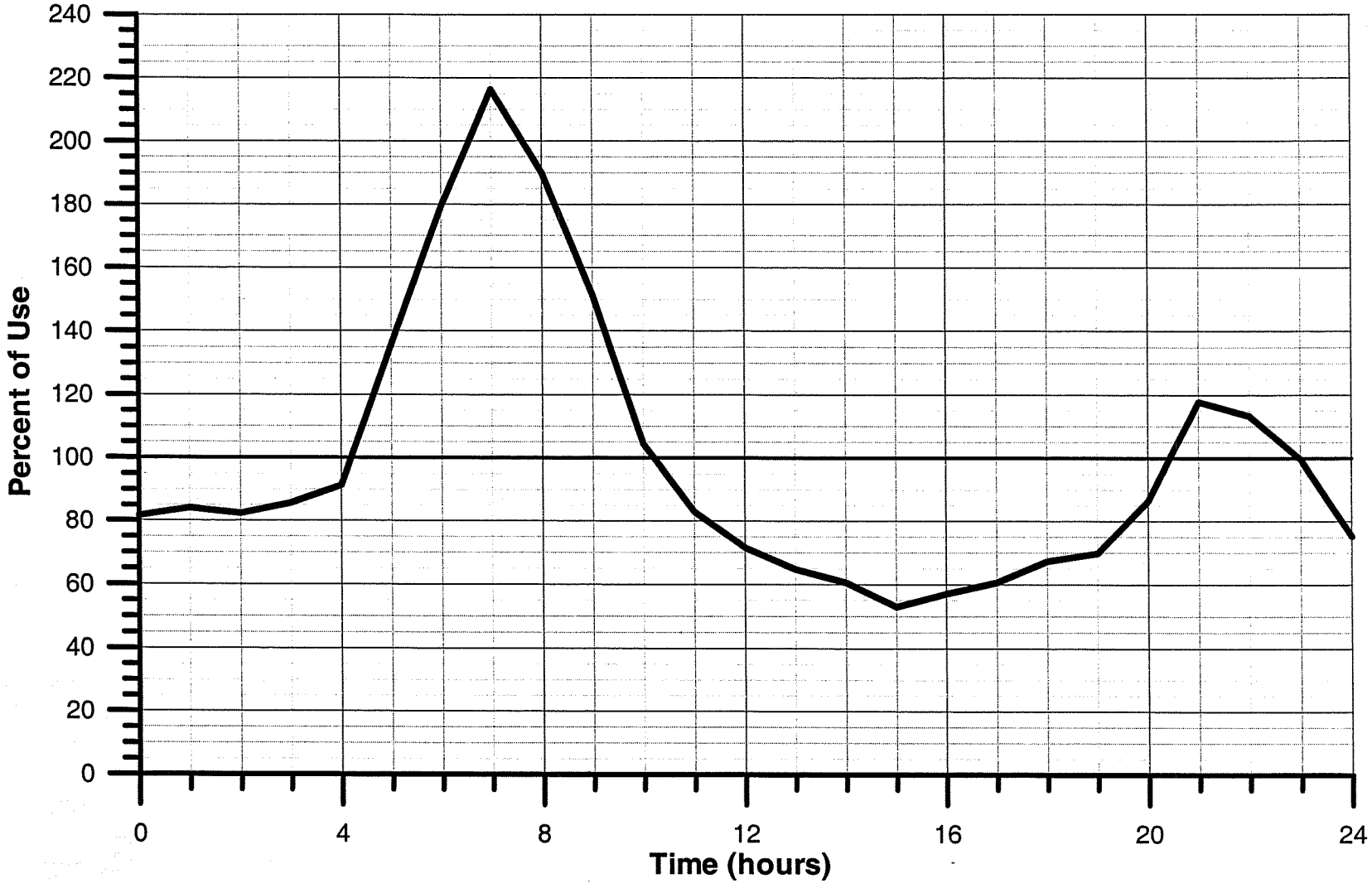


Burns & McDonnell

Figure
Wichita, Kansas
Diurnal Curve - NE PZ
July 16, 2003



Burns & McDonnell

Figure
Wichita, Kansas
Diurnal Curve - NE PZ
July 17, 2003

diurnalnepz 07-18-03

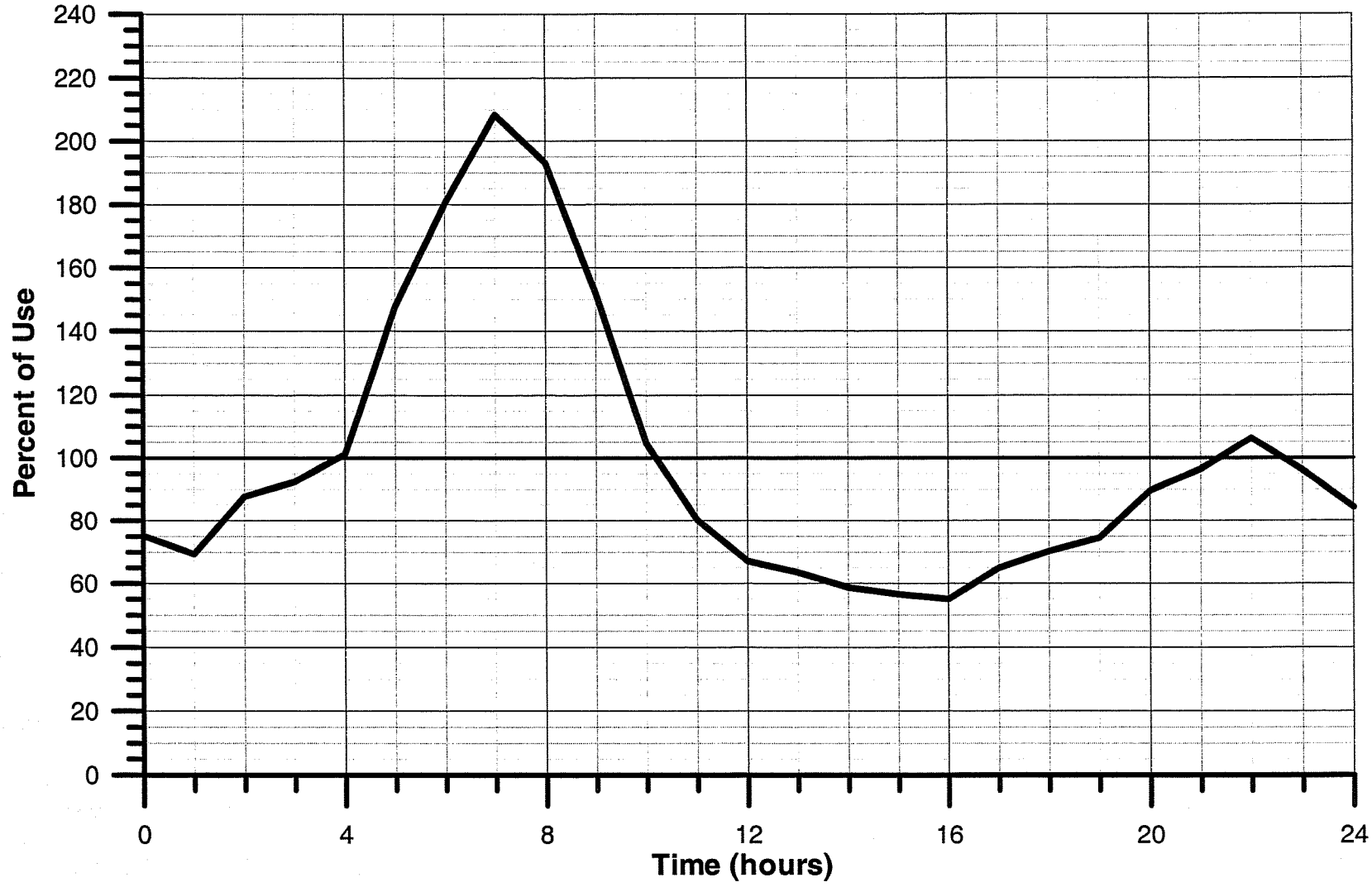


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Figure
Wichita, Kansas
Diurnal Curve - NE PZ
July 18, 2003

diurnalentire 1-03

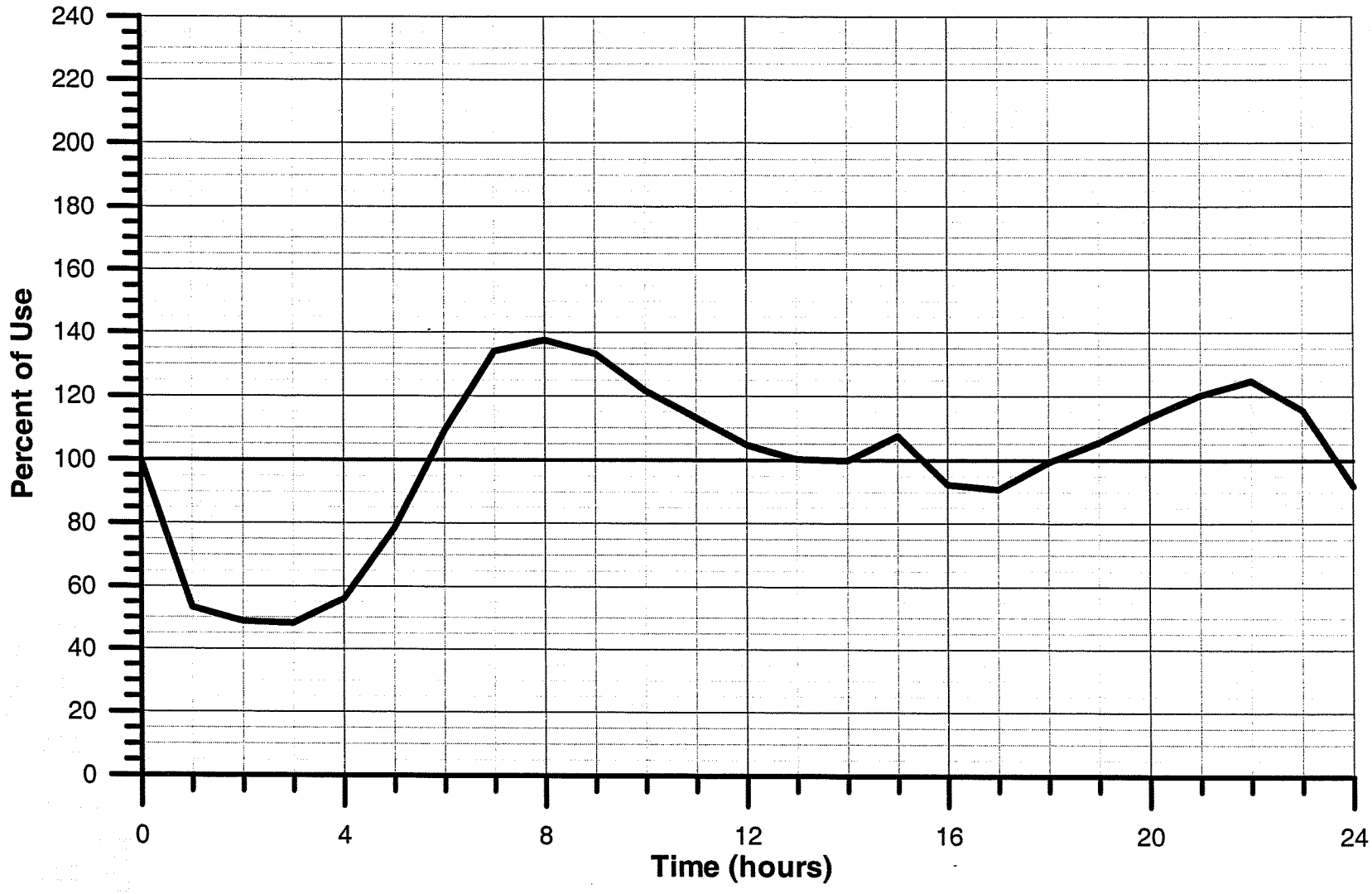

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Figure
Wichita, Kansas
Diurnal Curve - Entire System
July 11, 2003

diurnalentire 07-12-03

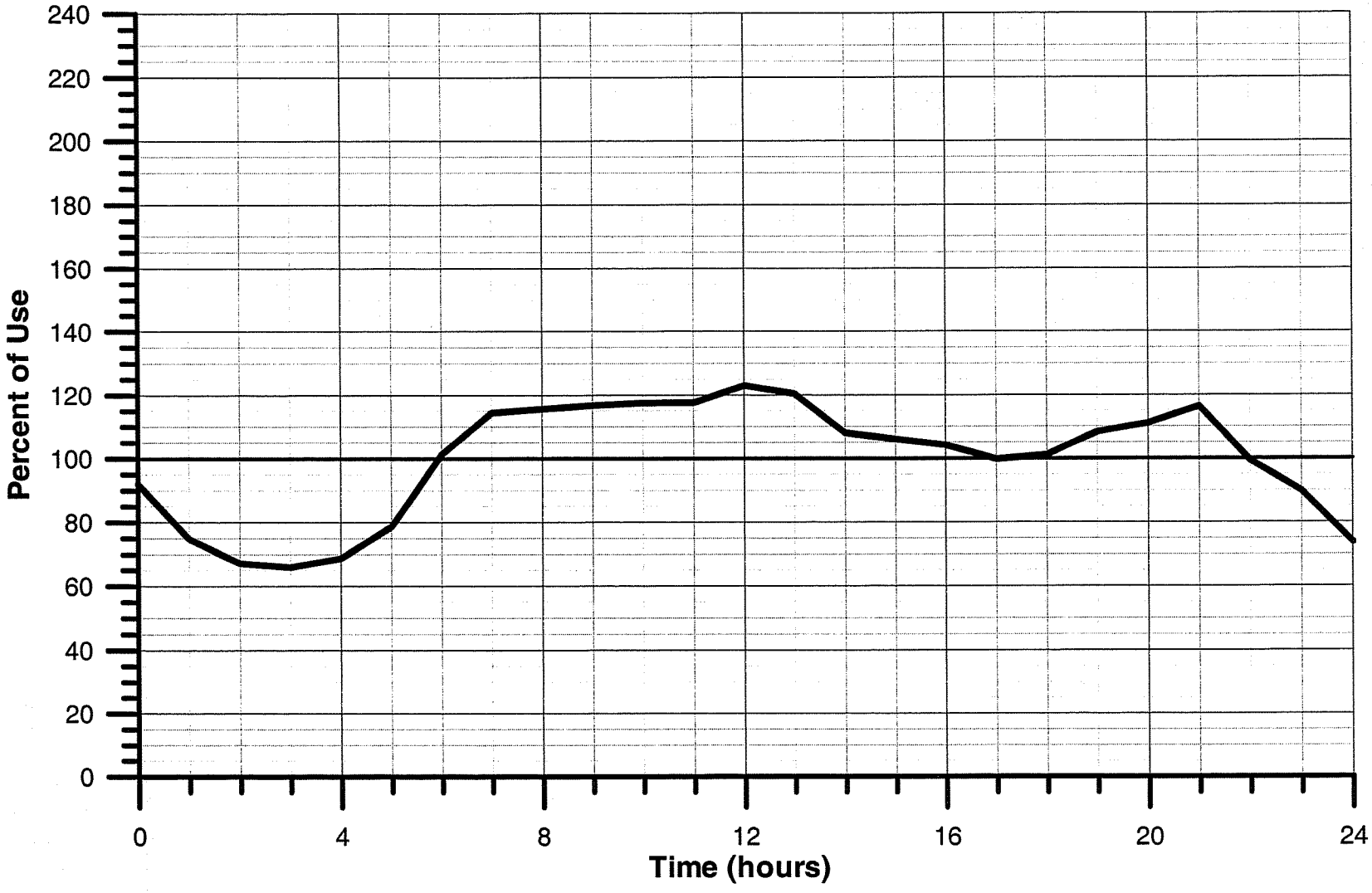

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Figure
Wichita, Kansas
Diurnal Curve - Entire System
July 12, 2003

diurnalentire 13-03

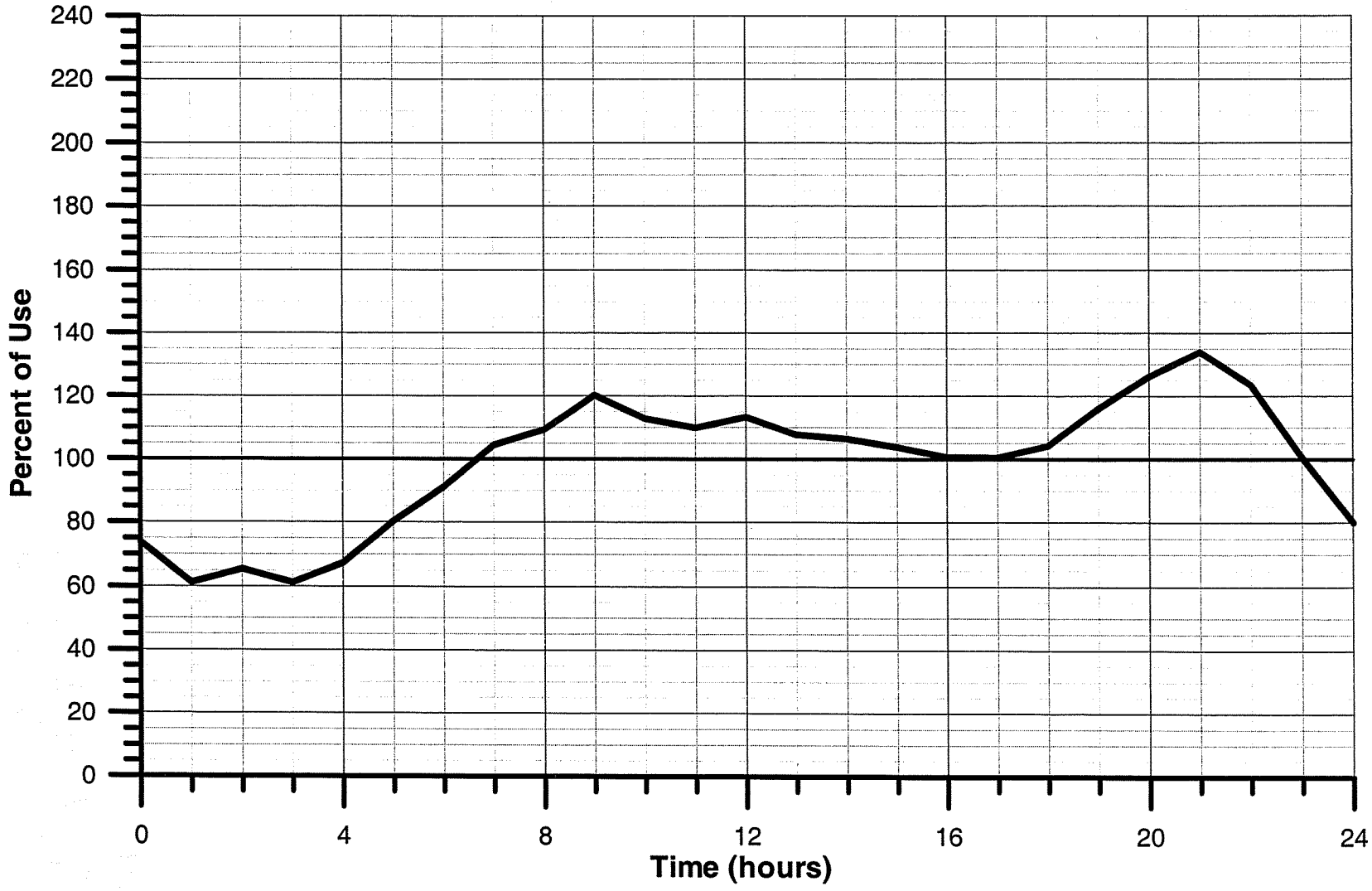

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Figure
Wichita, Kansas
Diurnal Curve - Entire System
July 13, 2003

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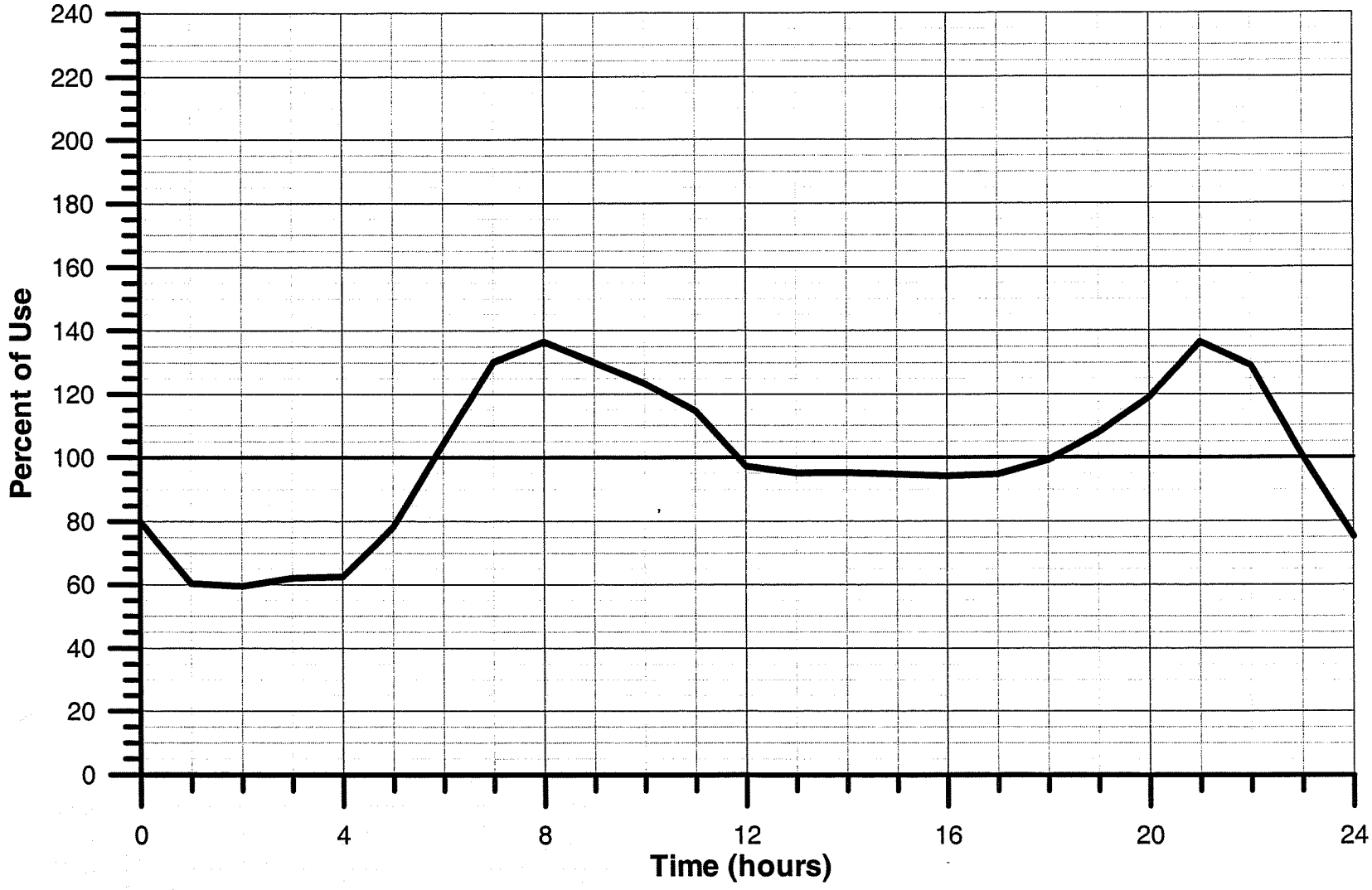

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Figure
Wichita, Kansas
Diurnal Curve - Entire System
July 14, 2003

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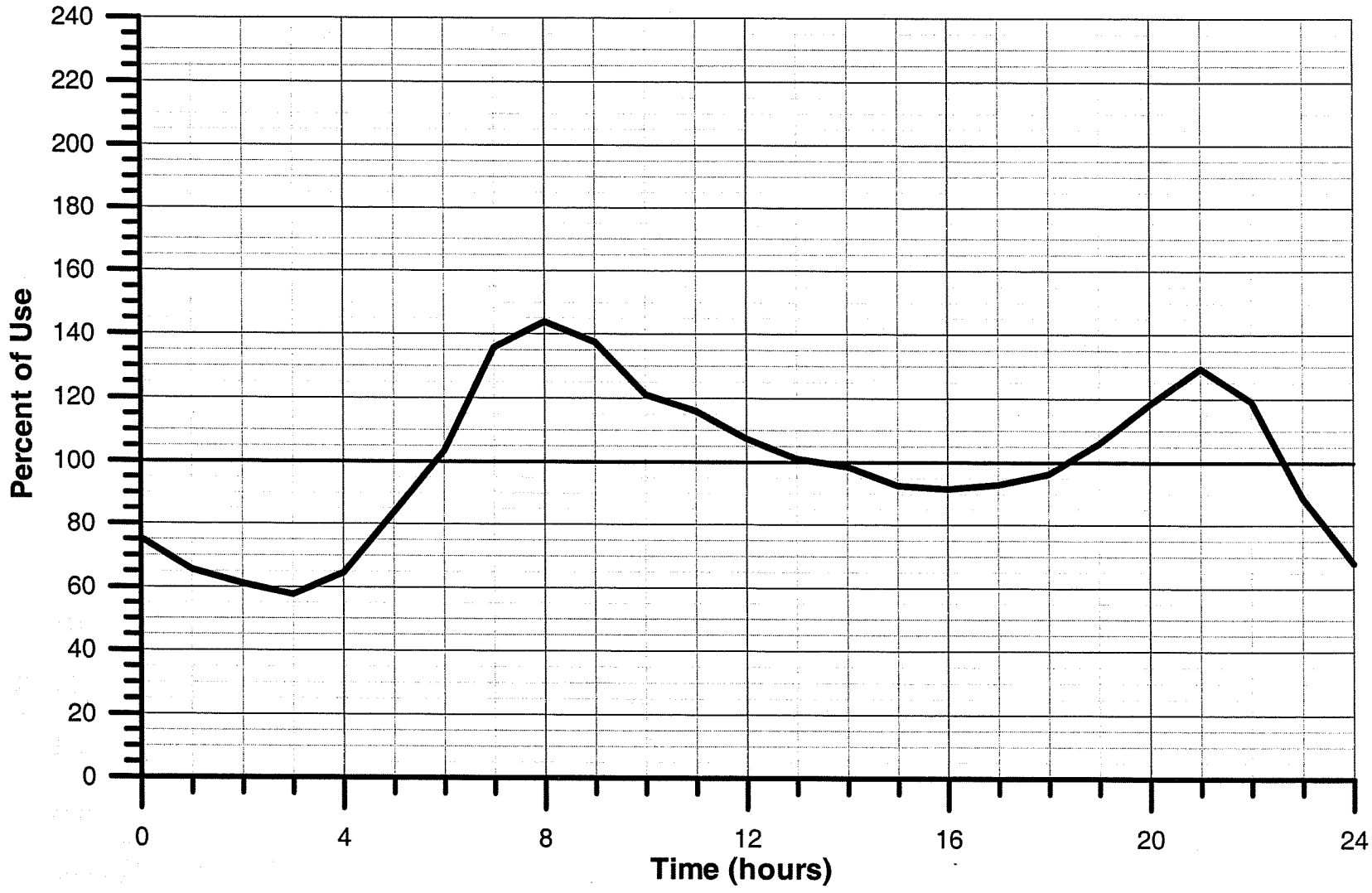

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Figure
Wichita, Kansas
Diurnal Curve - Entire System
July 15, 2003

diurnalentire 07-16-03

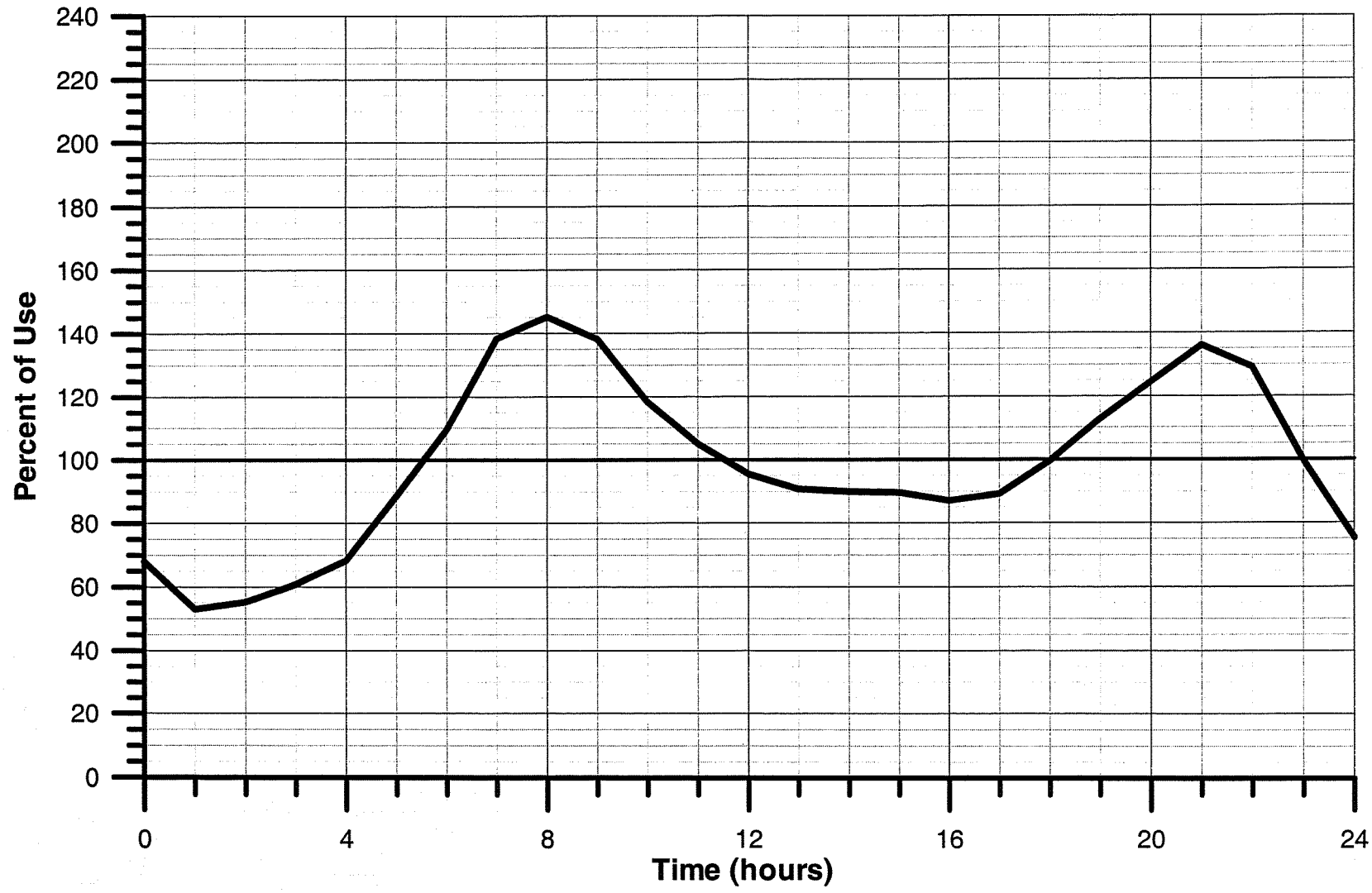

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Figure
Wichita, Kansas
Diurnal Curve - Entire System
July 16, 2003

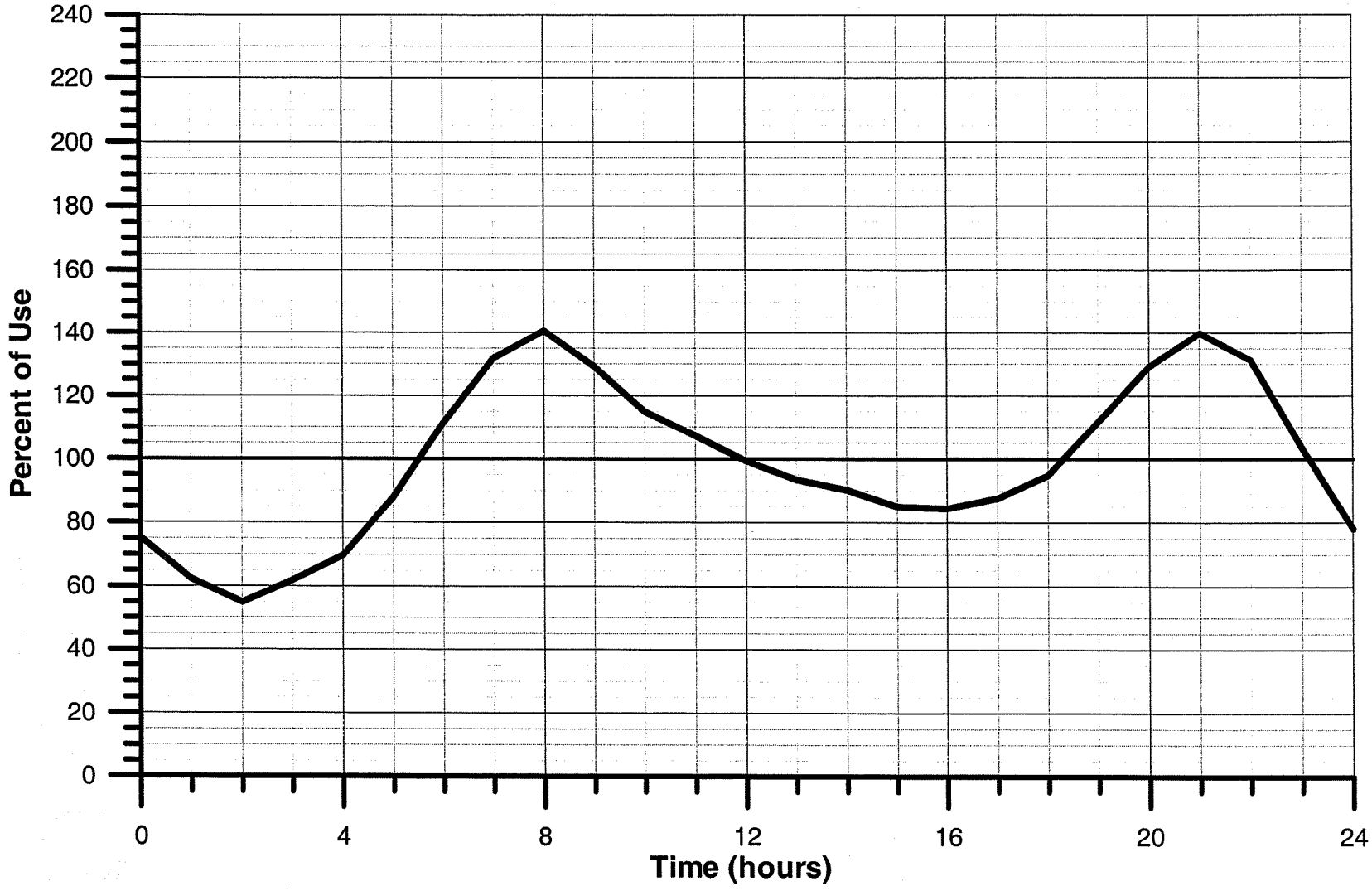

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Figure
Wichita, Kansas
Diurnal Curve - Entire System
July 17, 2003

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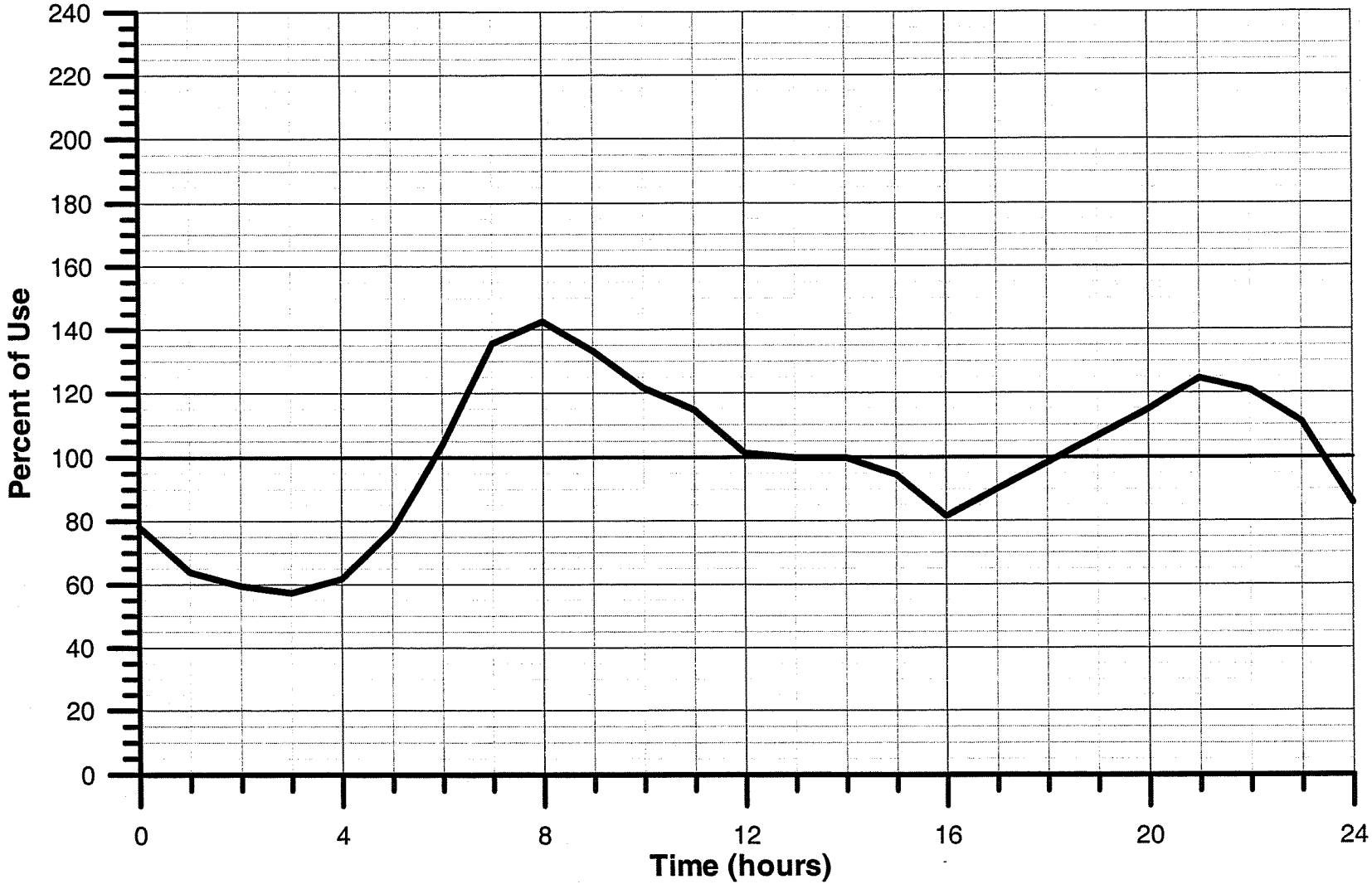

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Figure
Wichita, Kansas
Diurnal Curve - Entire System
July 18, 2003

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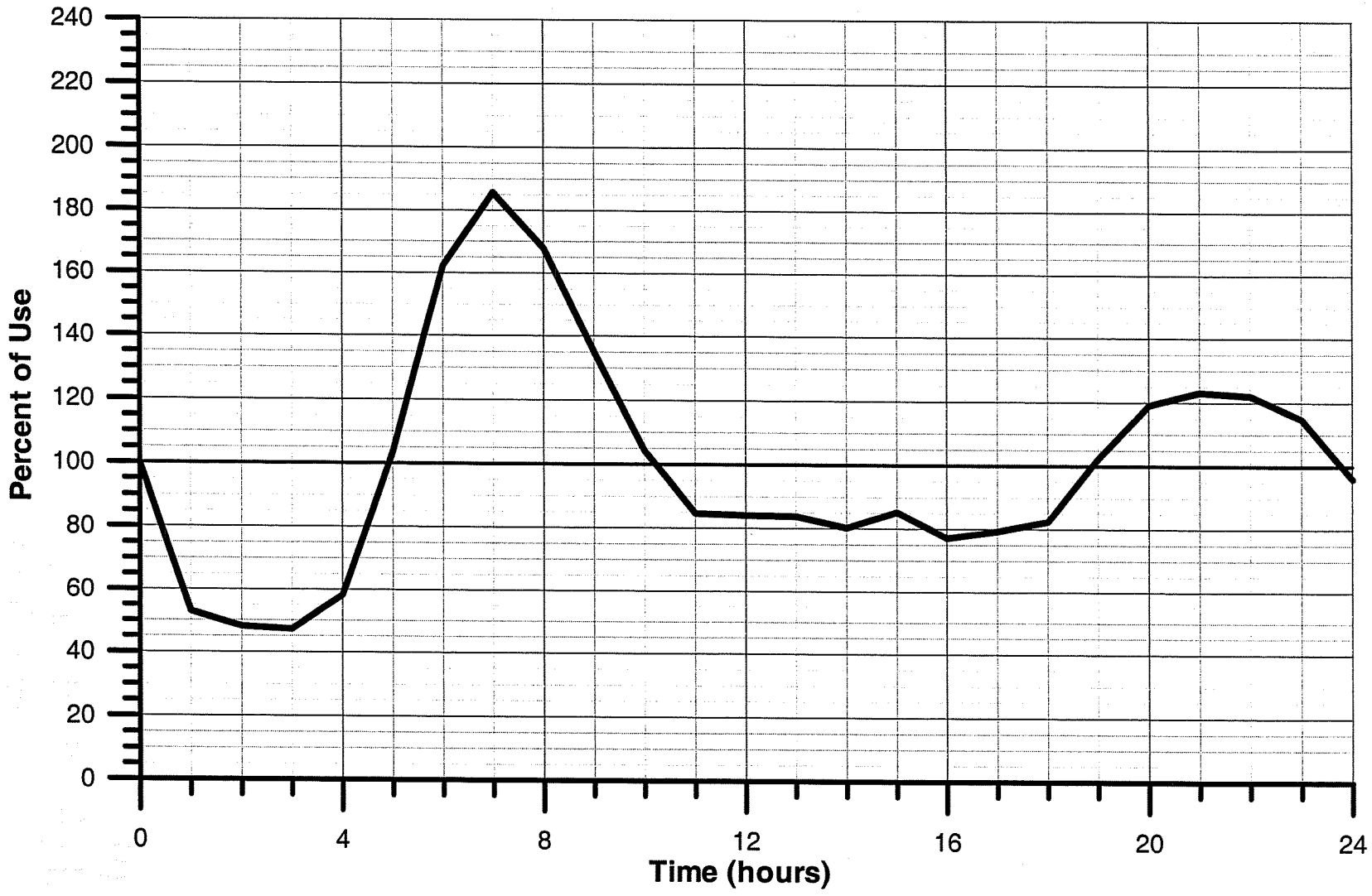

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Figure
Wichita, Kansas
Diurnal Curve - East PZ
July 11, 2003

diurnalepz 07-12-03

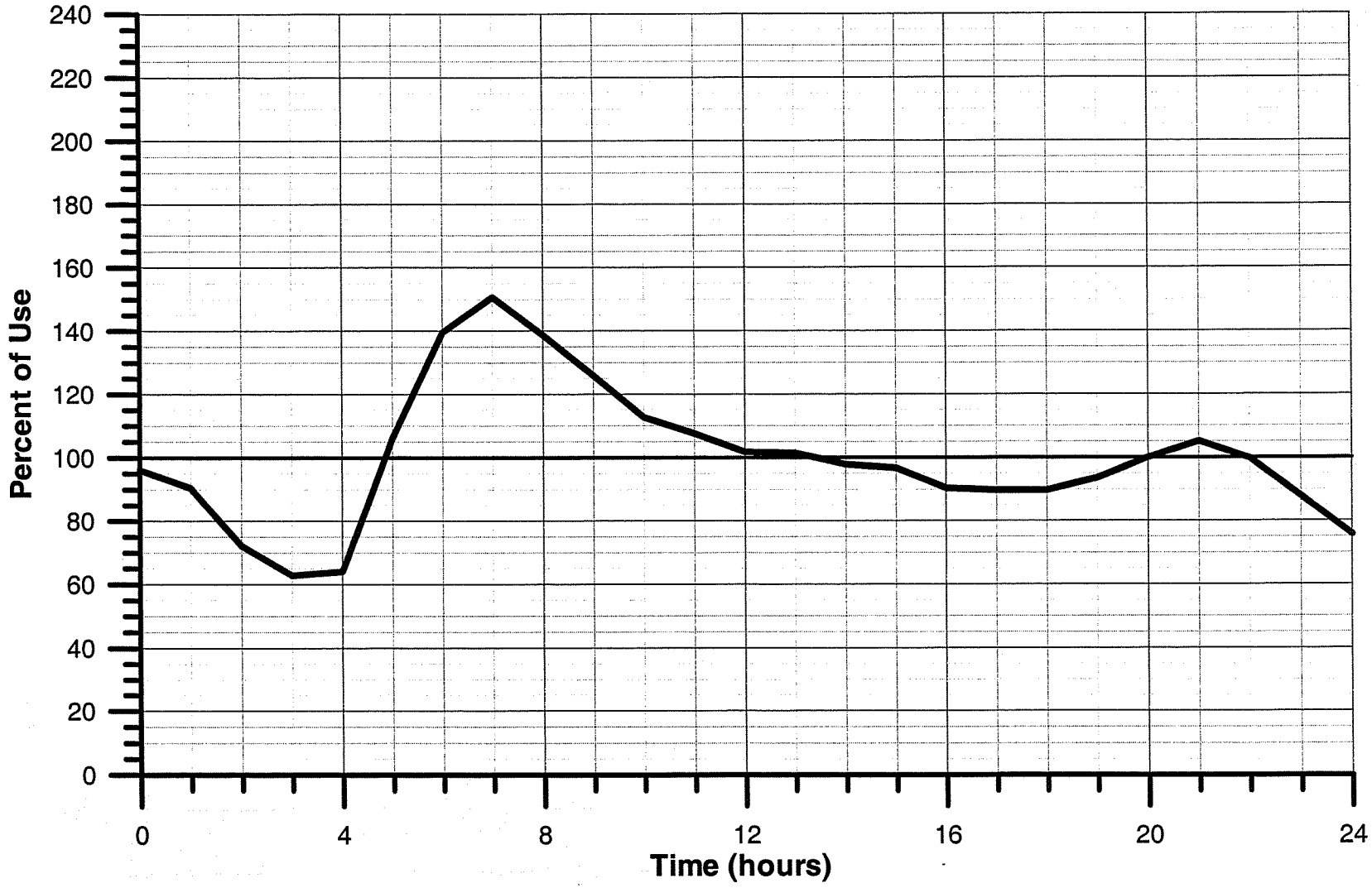

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Figure
Wichita, Kansas
Diurnal Curve - East PZ
July 12, 2003

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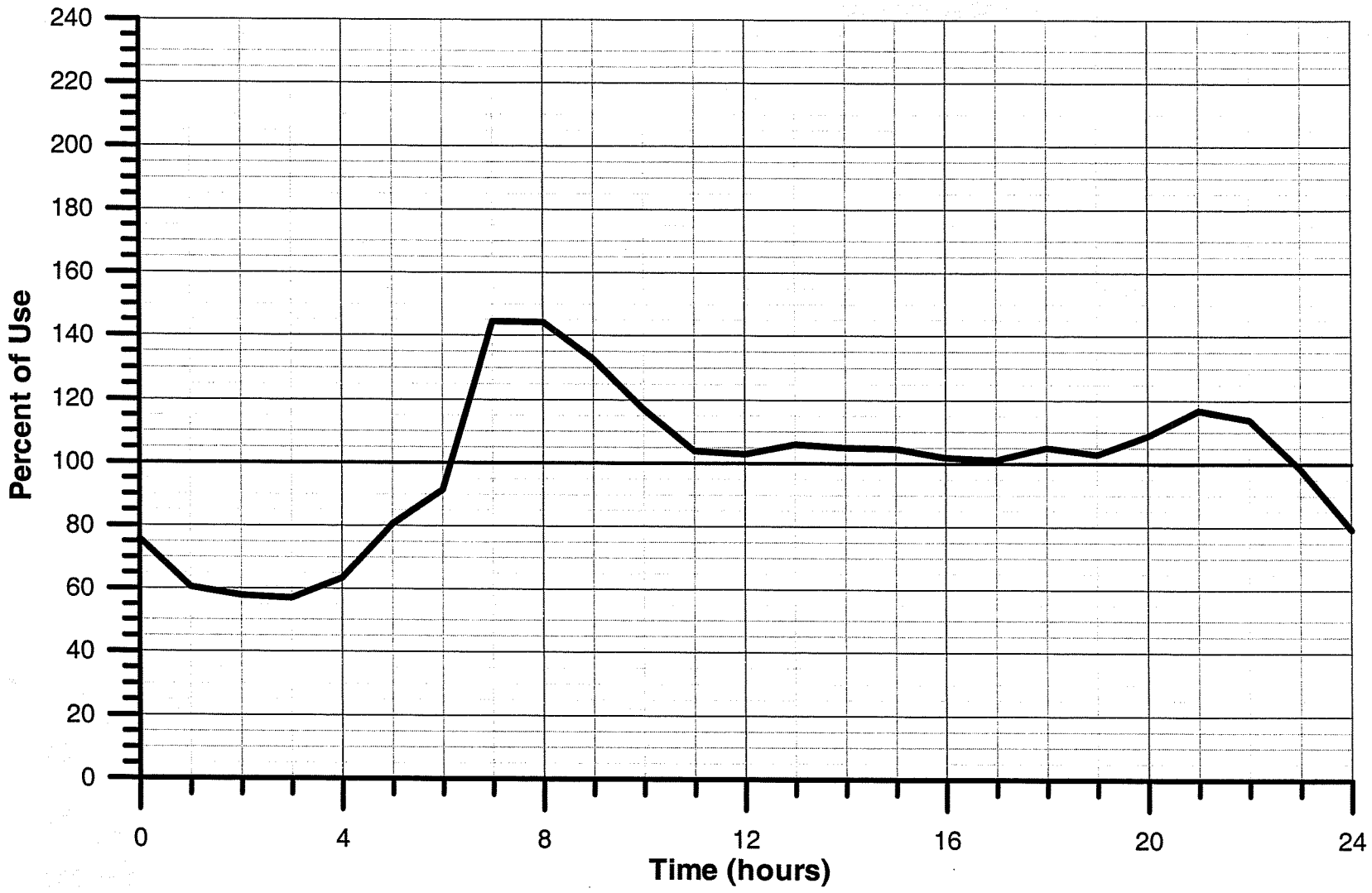

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Figure
Wichita, Kansas
Diurnal Curve - East PZ
July 13, 2003

diurnalepz 07-14-03

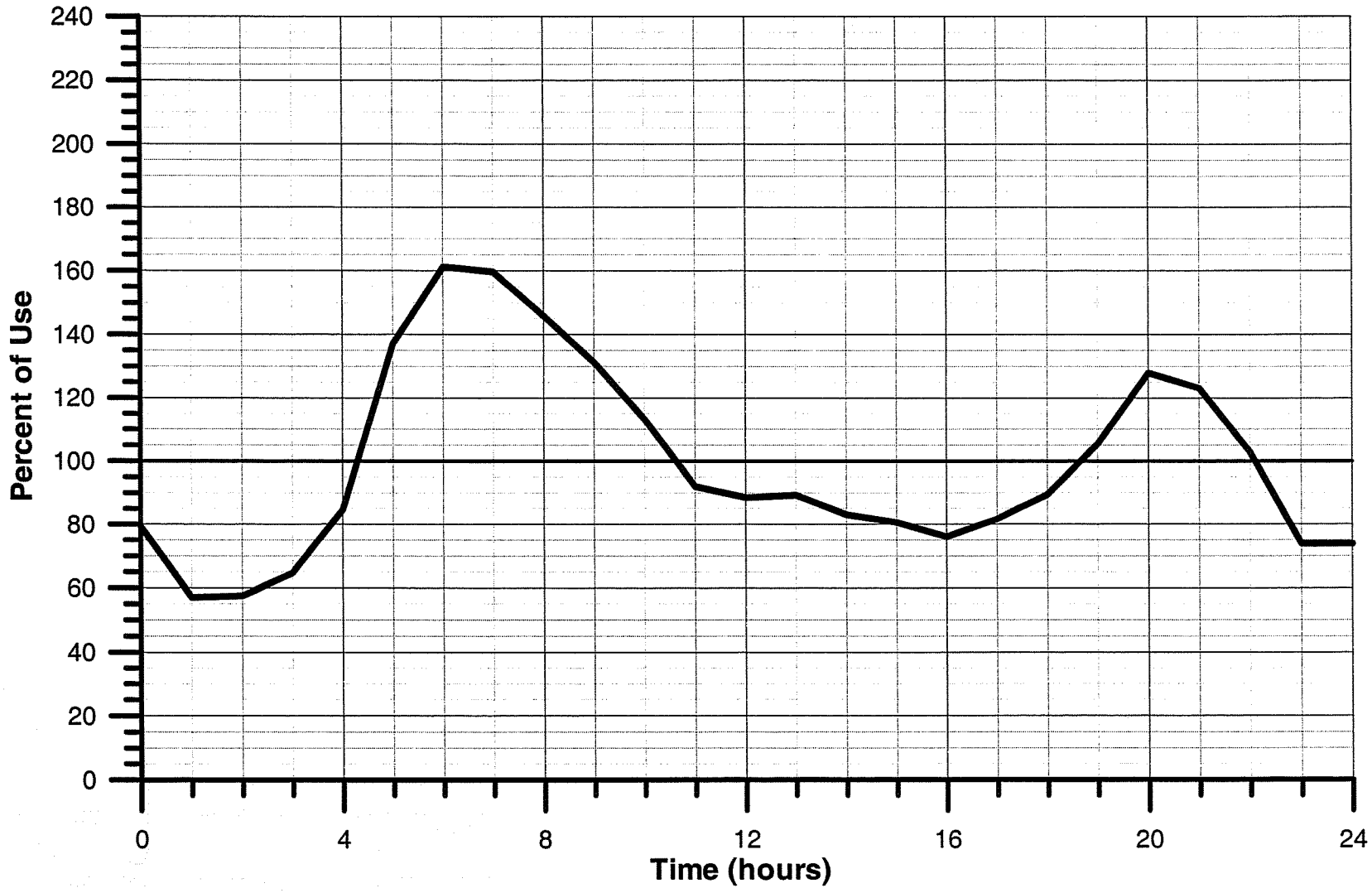

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Figure
Wichita, Kansas
Diurnal Curve - East PZ
July 14, 2003

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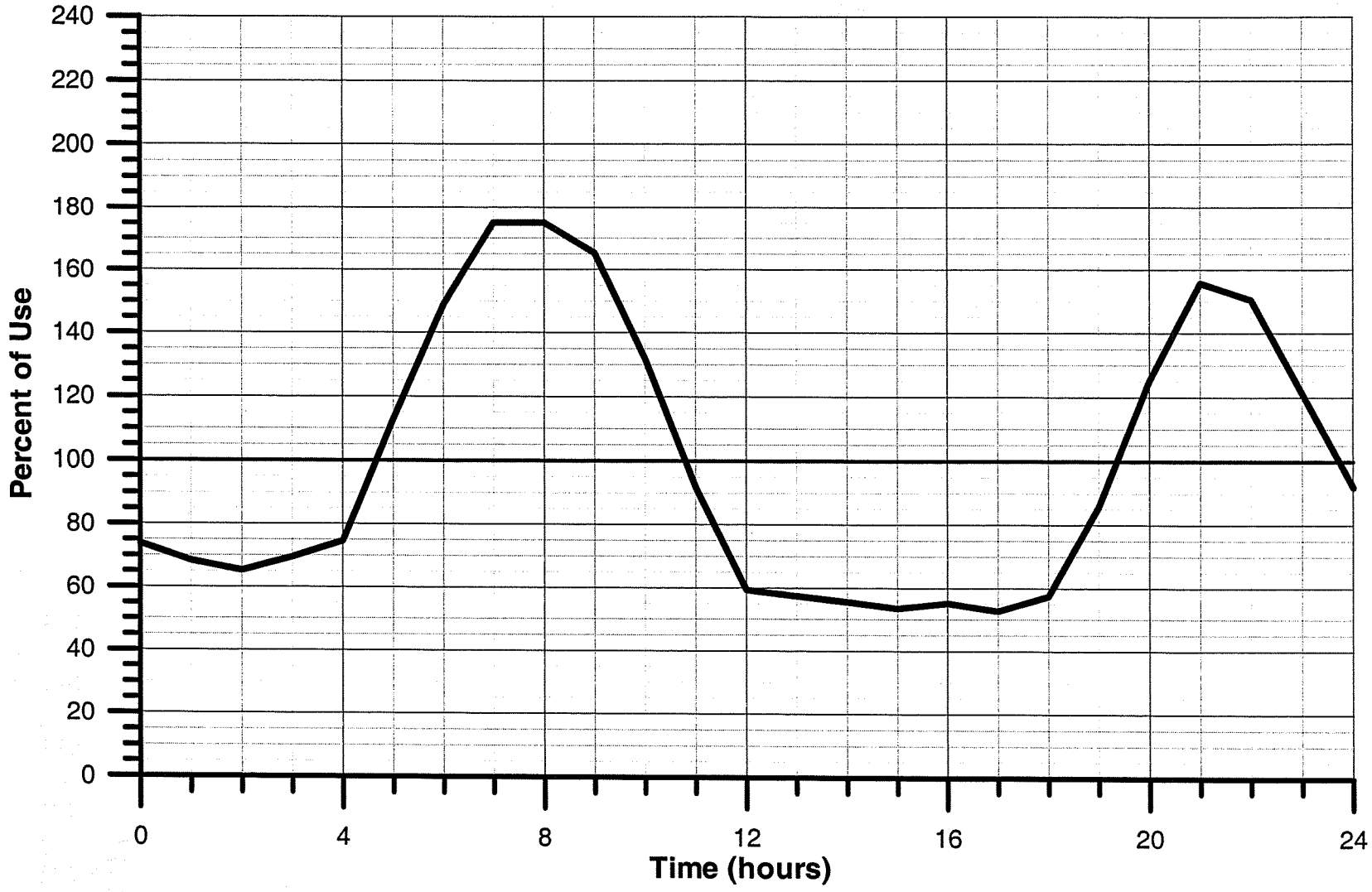

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Figure
Wichita, Kansas
Diurnal Curve - East PZ
July 15, 2003

diurnalepz 07-16-03

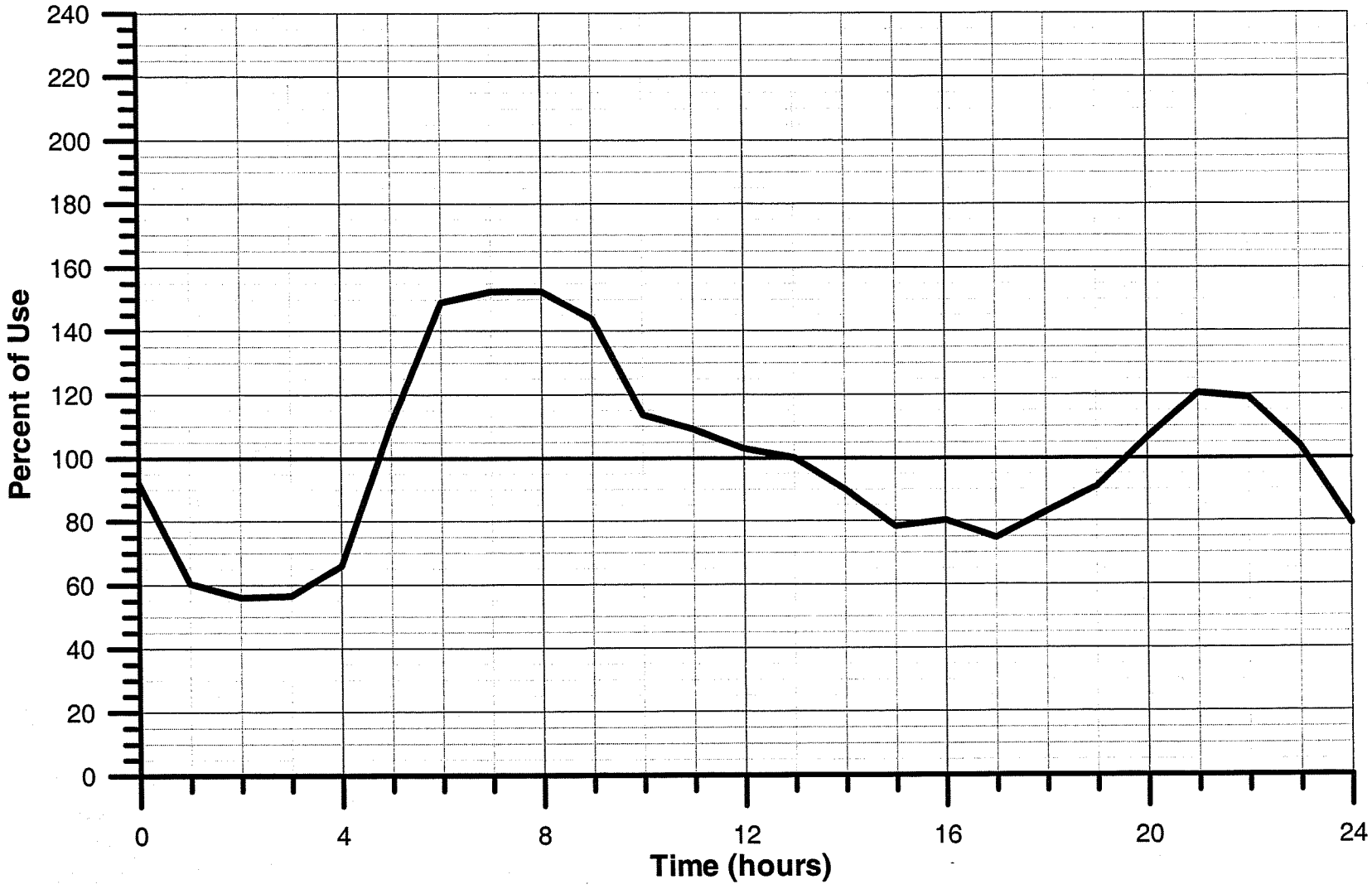

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Figure
Wichita, Kansas
Diurnal Curve - East PZ
July 16, 2003

diurnalepz -03

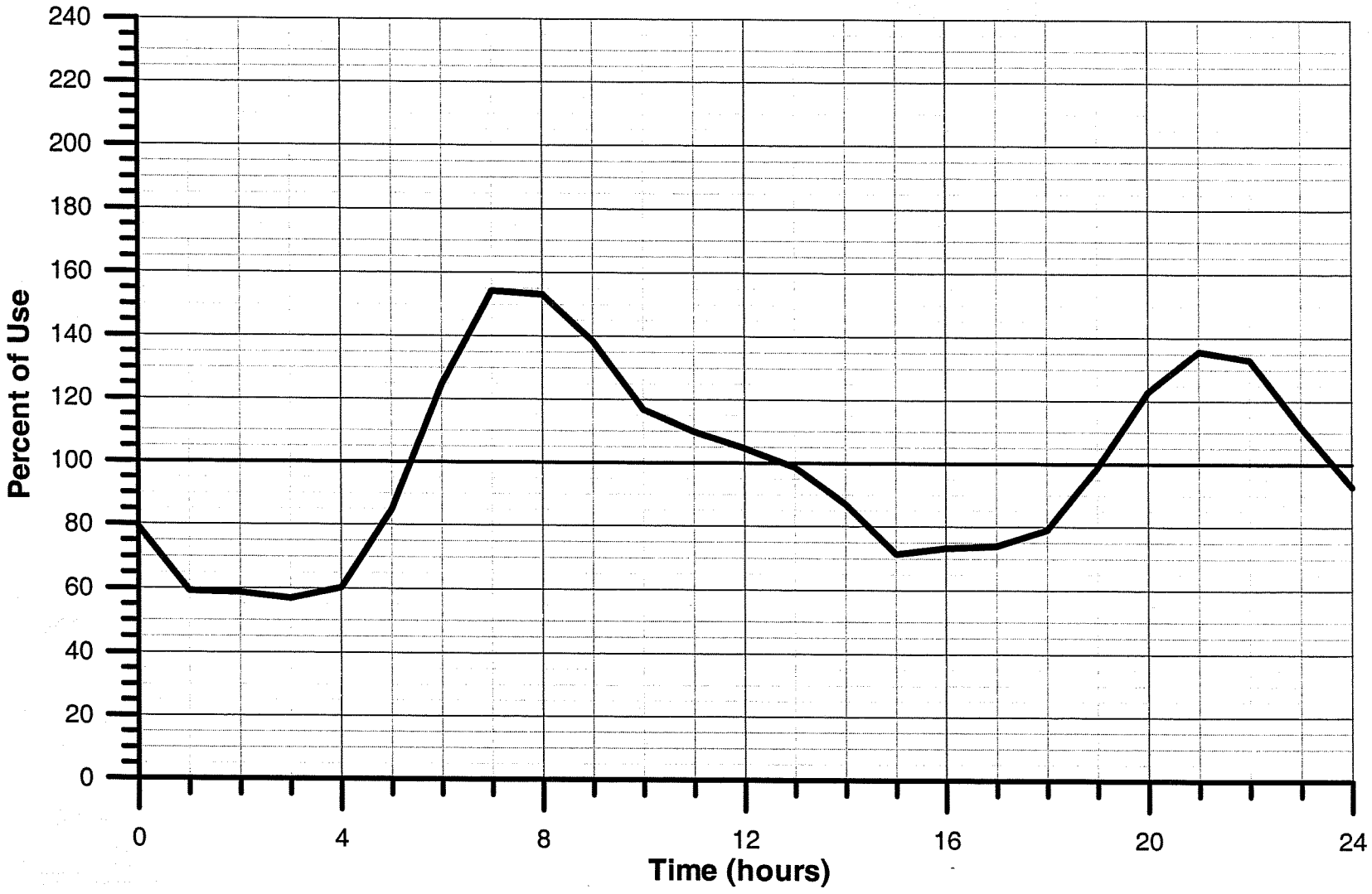

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Figure
Wichita, Kansas
Diurnal Curve - East PZ
July 17, 2003

diurnalepz 07-18-03

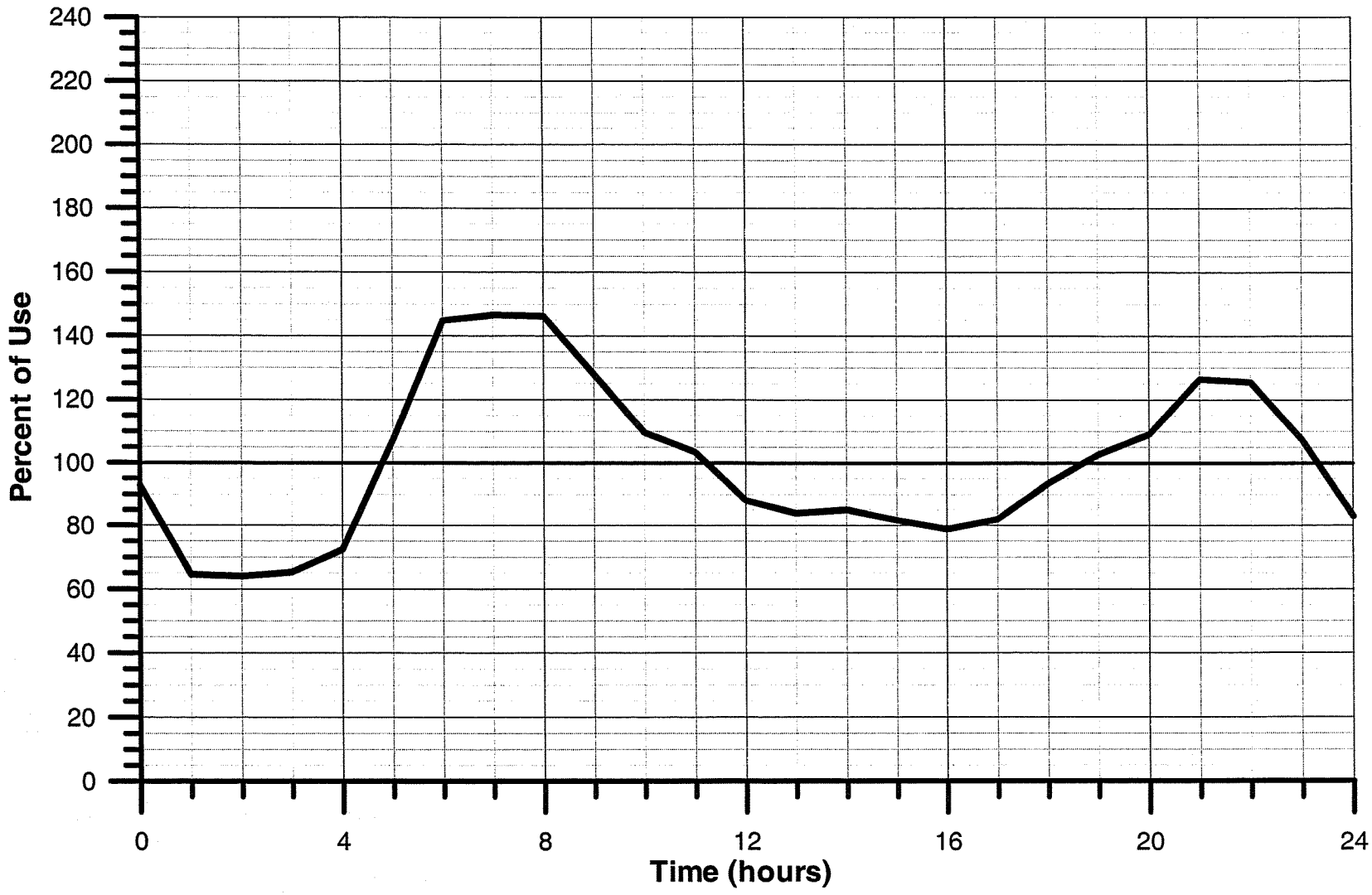

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Figure
Wichita, Kansas
Diurnal Curve - East PZ
July 18, 2003

diurnalhess -11-03

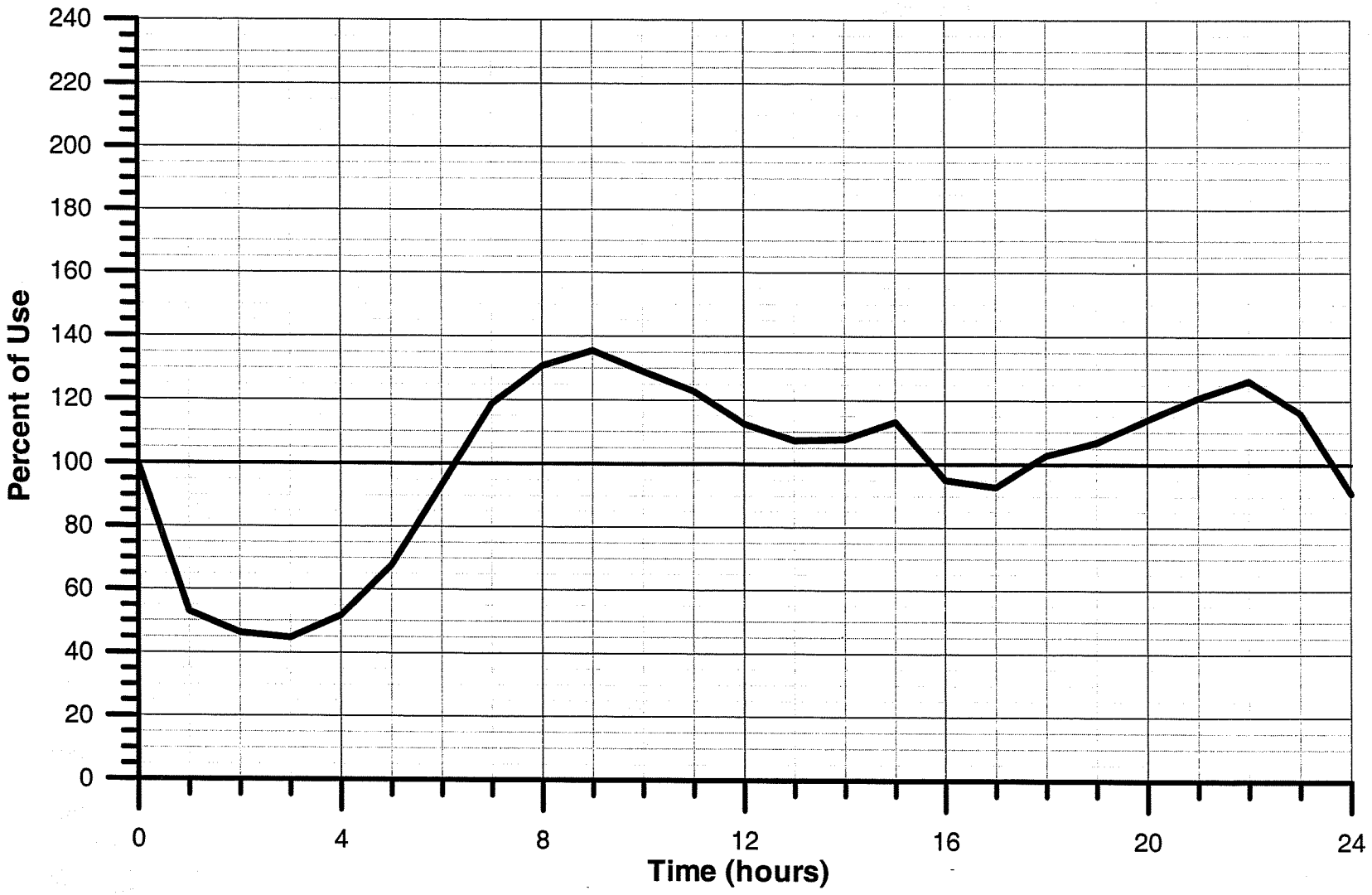

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Figure
Wichita, Kansas
Diurnal Curve - Hess PZ
July 11, 2003

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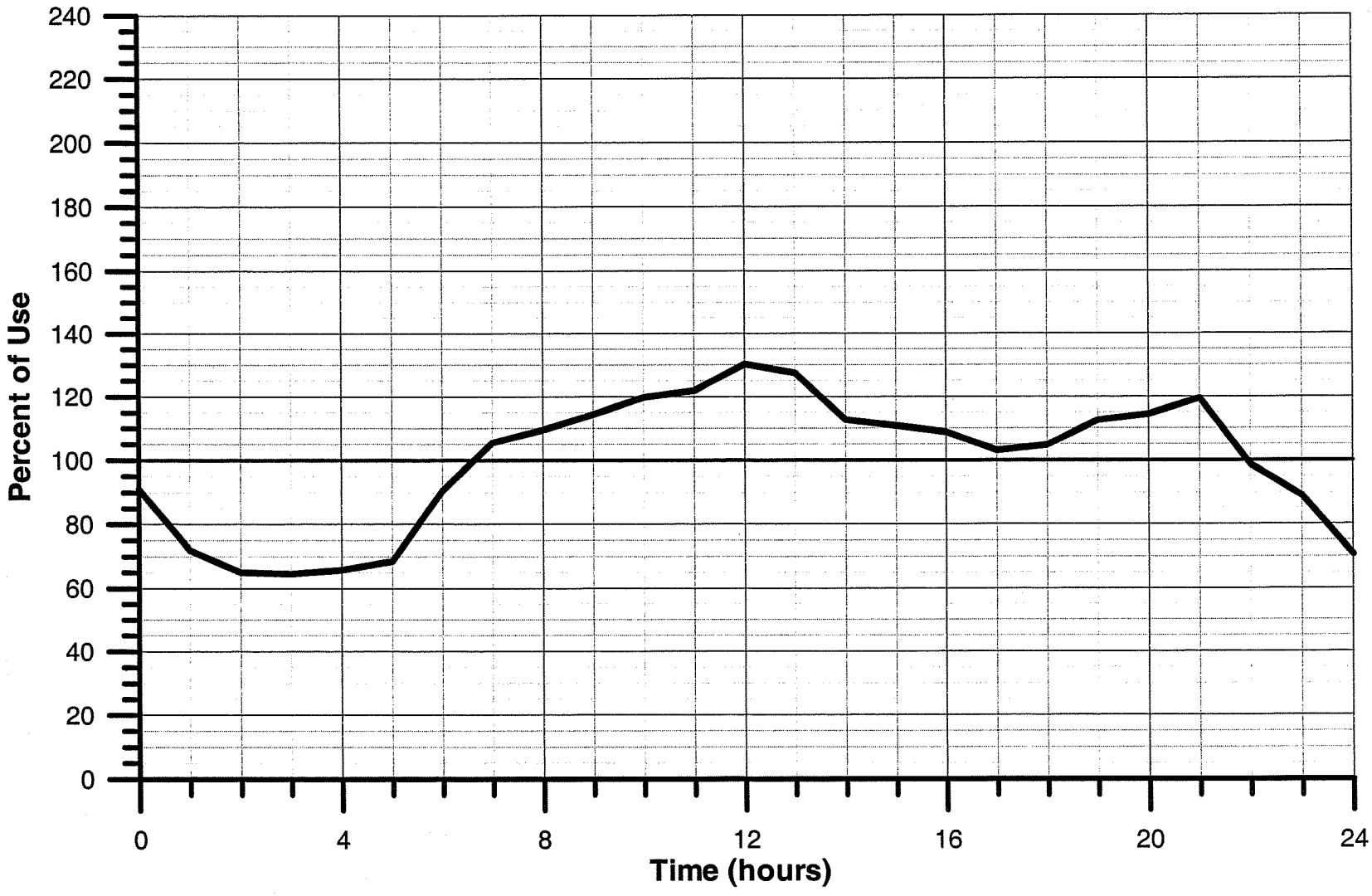

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Figure
Wichita, Kansas
Diurnal Curve - Hess PZ
July 12, 2003

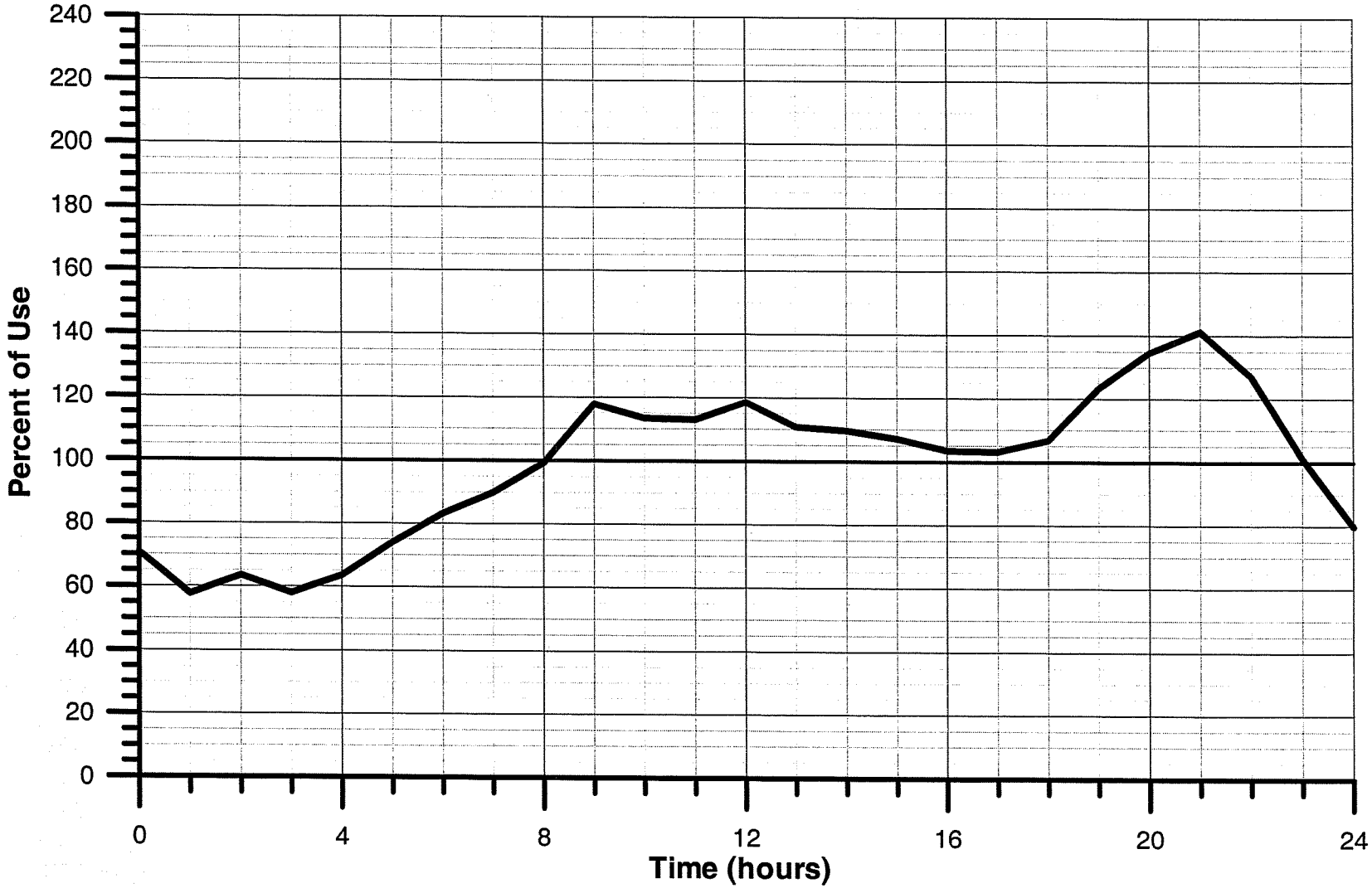

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Figure
Wichita, Kansas
Diurnal Curve - Hess PZ
July 13, 2003

diurnalhesspz 07-14-03

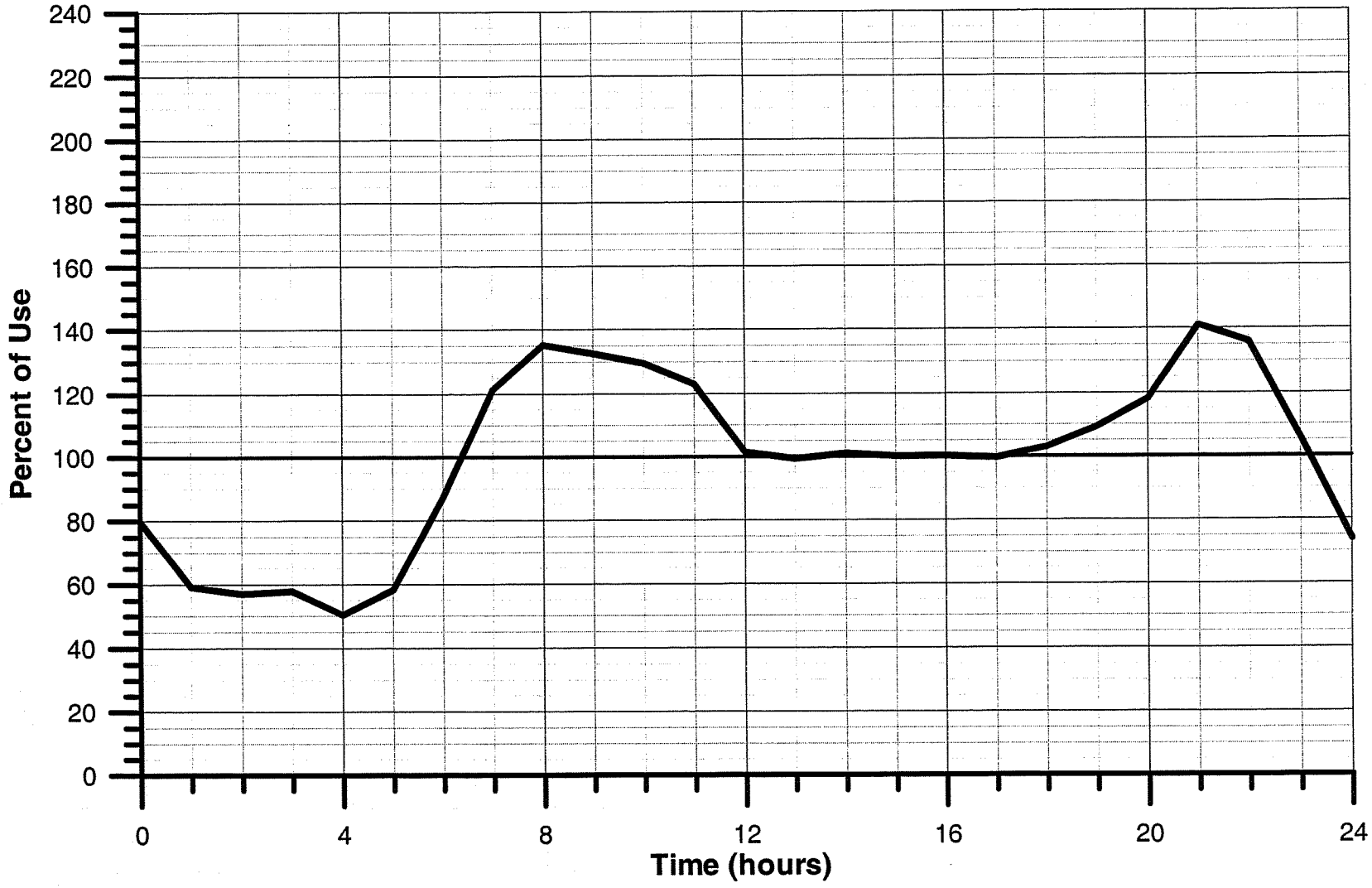

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Figure
Wichita, Kansas
Diurnal Curve - Hess PZ
July 14, 2003

diurnalhess[illegible]-15-03

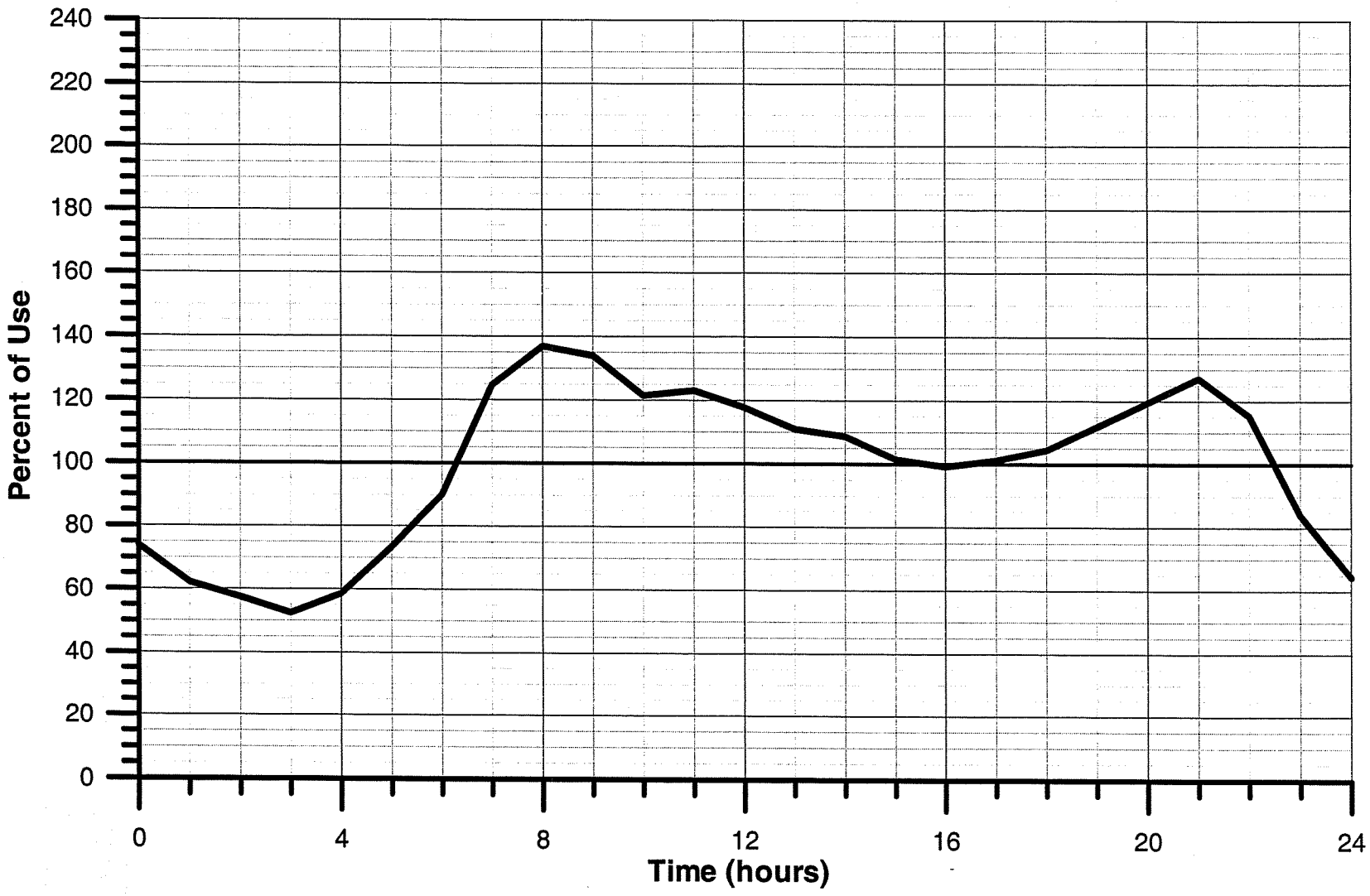

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Figure
Wichita, Kansas
Diurnal Curve - Hess PZ
July 15, 2003

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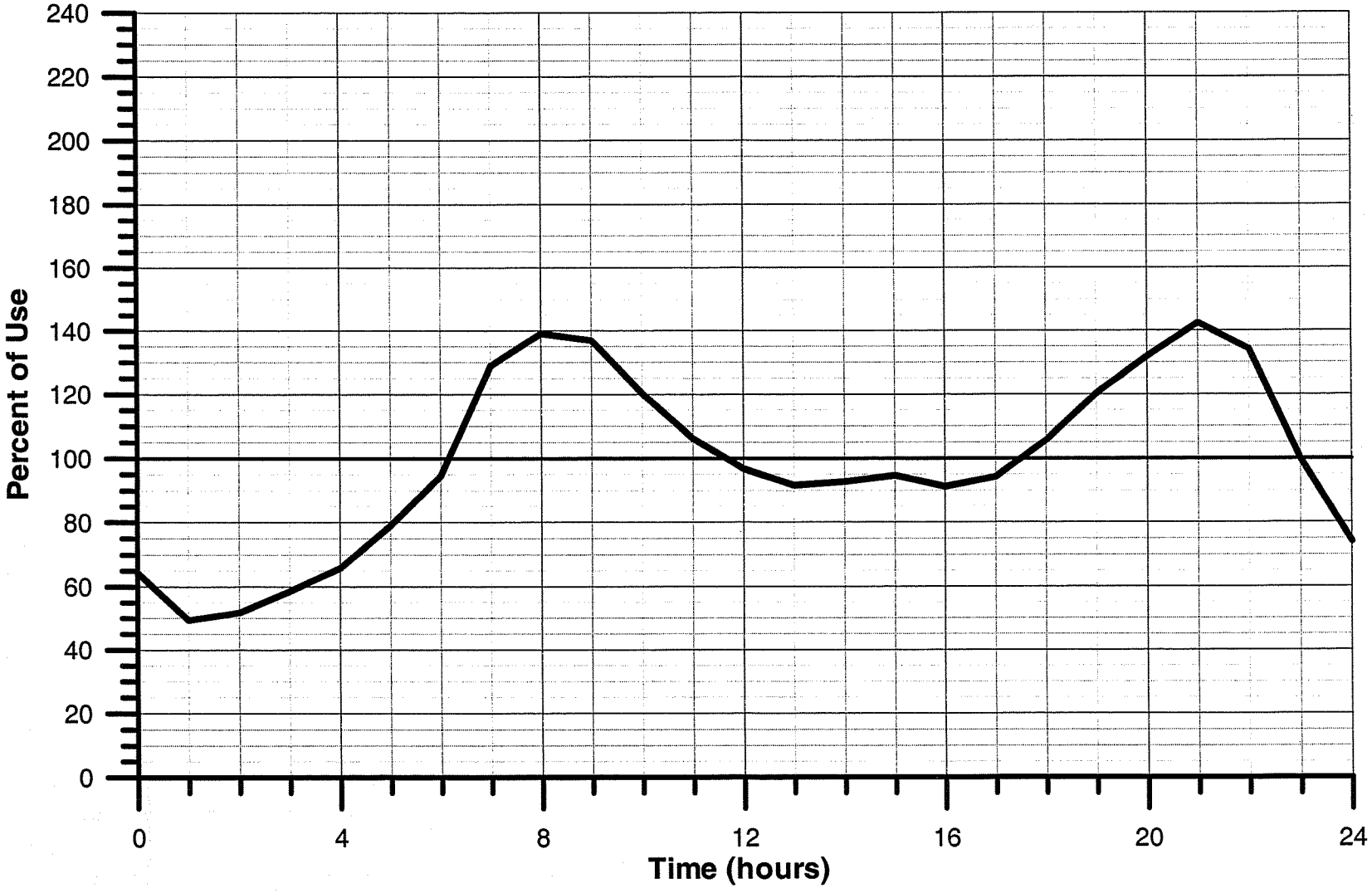

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Figure
Wichita, Kansas
Diurnal Curve - Hess PZ
July 16, 2003

diurnalhess -17-03

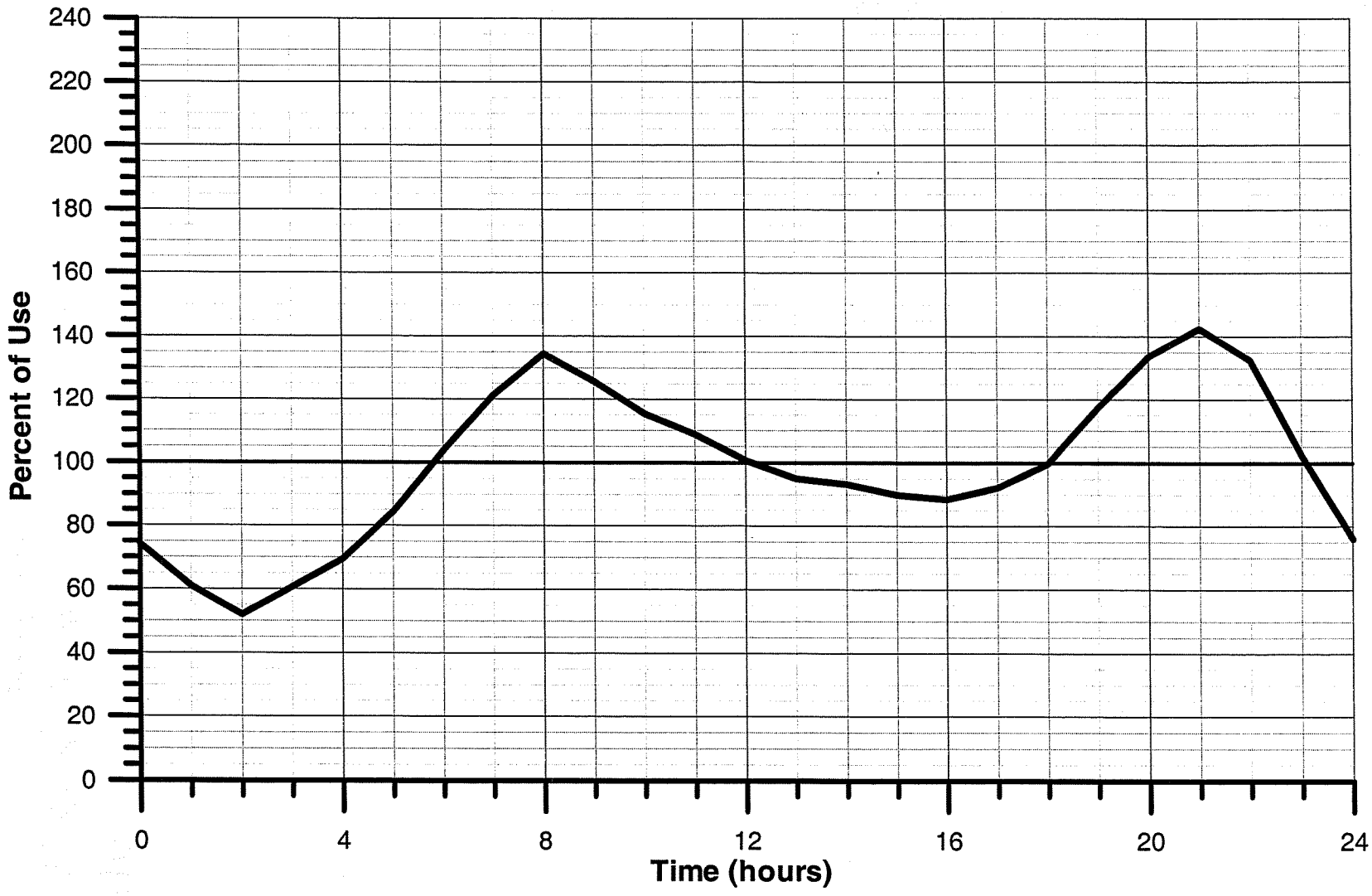

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Figure
Wichita, Kansas
Diurnal Curve - Hess PZ
July 17, 2003

diurnalhesspz 07-18-03

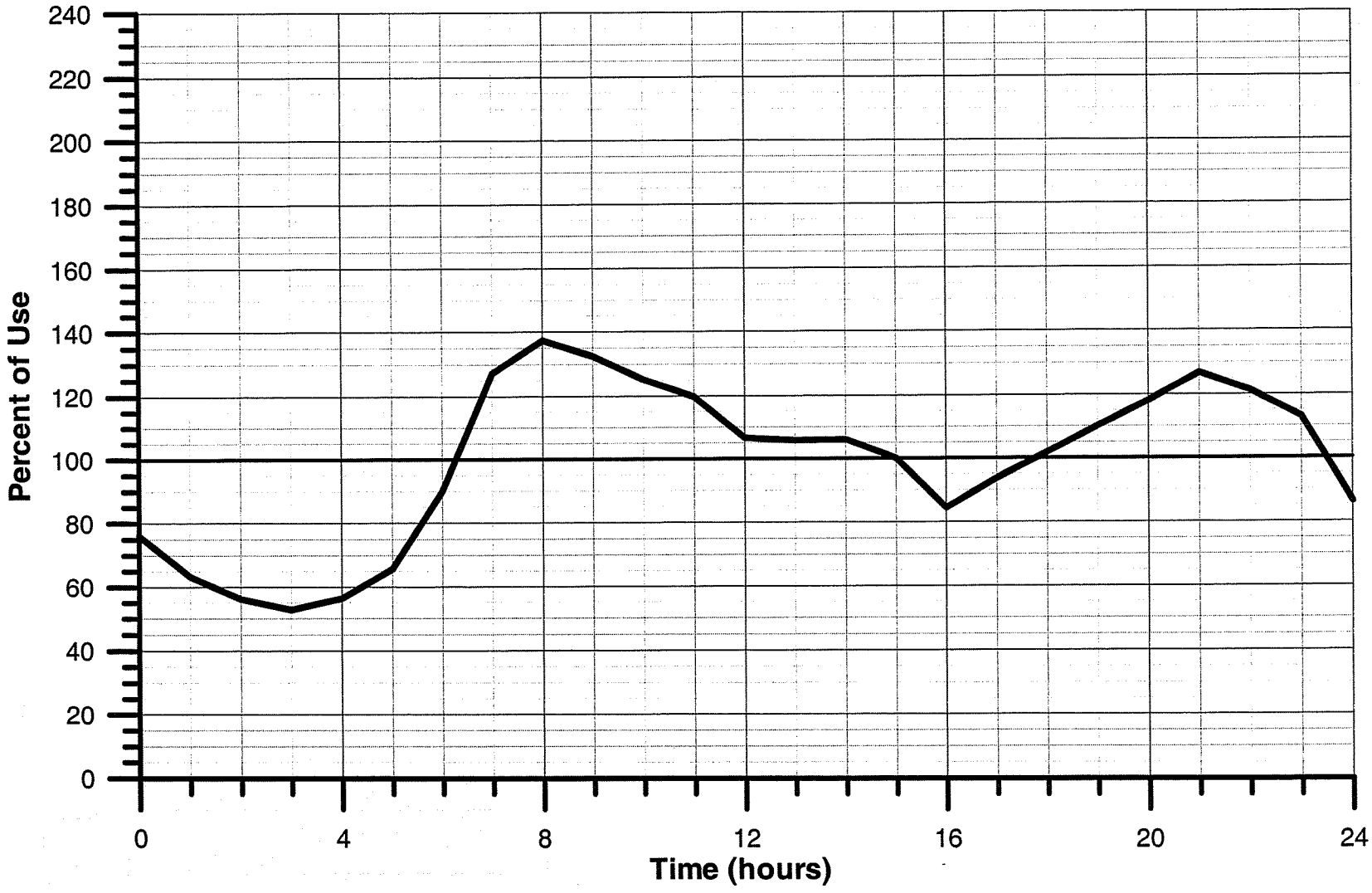

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Figure
Wichita, Kansas
Diurnal Curve - Hess PZ
July 18, 2003

Appendix F

Pump Description per Scenario

Pump Description Per Scenario

Pump Activity per Scenario

		Hess High Service Booster Pump Station							
Model Year	Model Scenario	Pump 1	Pump 2 (VFD)	Pump 5	Pump 6	Pump 3	Pump 4 (VFD)	Pump 7 (VFD)	Pump 8
2003	Maximum Day	on	0.93	off	on	off	0.93	0.93	off
	Peak Hour	on	0.90	off	on	on	on	on	off
	Minimum Hour[1]	off	0.95	off	off	off	0.95	off	off
2010	Maximum Day	on	0.90	on	off	off	0.95	on	off
	Peak Hour	on	on	on	on	on	on	on	on
	Minimum Hour	off	0.95	off	off	off	on	off	off
2025	Maximum Day	on	on	off	off	on	on	on	off
	Peak Hour[2]	on	1.10	on	on	on	1.30	1.30	on
	Minimum Hour	off	0.93	off	off	off	0.93	0.90	off

		Webb Road Booster Pump Station						37th Street Booster Station		
Model Year	Model Scenario	EPZ Pump 1 (VFD)	EPZ Pump 2 (VFD)	EPZ Pump 3 (VFD)	NEPZ Pump 1	NEPZ Pump 2	NEPZ Pump 3 (VFD)	Pump 1 (VFD)	Pump 2	Pump 3
2003	Maximum Day	off	on	on	off	on	off	off	off	off
	Peak Hour	off	on	on	on	on	off	on	on	off
	Minimum Hour[1]	off	off	0.85	pumps off; bypass from EPZ to NEPZ is open			off	off	off
2010	Maximum Day	off	on	on	off	on	off	on	off	off
	Peak Hour	off	on	on	on	on	off	off	off	on
	Minimum Hour	off	off	on	on	off	off	off	off	off
2025	Maximum Day	off	on	on	off	on	on	on	off	off
	Peak Hour[2]	off	on	on	on	on	off	off	on	off
	Minimum Hour	off	off	on	off	on	off	off	off	off

		Far West Booster Pump Station			West Booster Pump Station			Southeast Booster Pump Station				WTP 2 Pump Station			
Model Year	Model Scenario	Pump 1 (VFD)	Pump 2	Pump 3	Pump 1	Pump 2	Pump 3	Pump 1	Pump 2	Pump 3	Pump 4	Pump 1	Pump 2	Pump 3	Pump 4
2003	Maximum Day														
	Peak Hour														
	Minimum Hour[1]														
2010	Maximum Day	0.50	off	off	pumps off; bypass is open			pumps off; bypass open							
	Peak Hour	0.75	off	off	on	on		on	on	on	off				
	Minimum Hour	pums off; bypass open			off	on		pumps off; bypass open							
2025	Maximum Day	off	on	off	on	on	off	on	on	off	off	on	off	off	off
	Peak Hour[2]	on	on	on	on	on	on	off	off	off	on	on	on	on	on
	Minimum Hour	0.80	off	off	on	off	off	pump off; bypass open				on	off	off	off

Notes:
1. Year 2003 Minimum Hour has the same demand as the Average Day Calibration Model - they have the same demand factor.
2. Pumps 2, 4, and 7, at Hess, (all have VFD) were randomly chosen as the pumps that required higher speed settings (i.e. the pumps to be replaced) to meet the year 2025 peak hour demands.
3. On implies pump is on and operating on the manufacturer's curve
4. Off implies the pump is closed (not pumping any water)
5. A number implies the speed setting. Only found on pumps with VFDs.
6. Cells left blank indicate the pump is not in that particular scenario.
7. In year 2010, the three pumps at 37th Street BPS are replaced with new pumps. "Pump 1 (VFD)" at 37th Street BPS applies only to year 2003.