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LETTER OF TRANSMITTAL

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 Arkansas Dept. Environmental Quality
 Water Division
 5301 Nothshore Drive
 North Little Rock, AR 72218-5317

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RE:	Blytheville CCSE		

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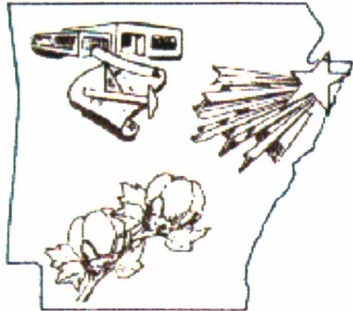
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REMARKS: Anne,
 Please give us a call or email to let us know you received the CCSE (901-683-3900).

Thank you,
 Mike

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PRESENTED TO: **ADEQ**

CITY OF BLYTHEVILLE

COMPREHENSIVE COLLECTION SYSTEM

EVALUATION

PREPARED BY: **SSR ELLERS, INC.**

October 2009



TABLE OF CONTENTS

Section 1 – Introduction	1-1
1.1 Scope and Purpose of Study	1-1
1.2 Existing Collection System	1-1
Section 2 – Capacity Evaluation Procedure.....	2-1
2.1 Interviews	2-1
2.2 Existing SSO's	2-1
2.3 Major Pump Station Selections	2-1
2.4 Monitoring Site Selections	2-2
Section 3 – Data Collection	3-1
3.1 Rain Gauge Equipment and Data	3-1
3.2 Pump Station Run Time Logs	3-2
3.3 Flow Meter Equipment and Data	3-2
Section 4 – Data Analysis	4-1
4.1 Capacity Parameters	4-1
4.2 Capacity Factors	4-1
Section 5 – Pipe Capacity Conclusions	5-1
5.1 Tributary Areas for Monitored Sites	5-1
Section 6 – Pumping Station Evaluation	6-1
6.1 Pump Station Capacity Evaluation.....	6-1
6.2 Pump Station Auxiliary Power Evaluation	6-3
6.3 Pump Stations without Direct Notification Alarms	6-3
Section 7 – Conclusions.....	7-1
7.1 Conclusions	7-1
Section 8 – Tables	8-1
Section 9 – Figures	9-1

SECTION 1 – INTRODUCTION

1.1 Scope and Purpose

The Arkansas Department of Environmental Quality (ADEQ) issued the City of Blytheville, Arkansas a Consent Administrative Order (CAO) on August 6th, 2008. The CAO required that Blytheville perform a Complete Collection System Evaluation (CCSE) as one of the steps toward eliminating peak flows caused by Inflow and Infiltration (I/I). This CCSE is due one year from the effective date of the CAO, or October 10th, 2009. The CAO requires that the CCSE address the following:

The Permittee shall complete a comprehensive collection system evaluation within one (1) year of the effective date of this order. This comprehensive collection system evaluation shall identify all wastewater mains and pumping stations that cannot carry peak hydraulic loads caused by inflow and infiltration. The evaluation shall also identify all pumping stations that do not have auxiliary power or sufficient storage as required by Part II, Section B, Paragraph 7 and shall identify all pumping stations that do not have direct notification alarms.

This report is submitted by the City of Blytheville in accordance with the requirements of the CAO. This CCSE will be used to formulate a milestone schedule, also required by the CAO, that will outline the improvements and rehabilitation required to eliminate I/I in the City's collection system.

1.2 Existing Collection System

The City of Blytheville's sanitary collection system consists of 61 pumping stations, 31 miles of force main, 117 miles of gravity sewers, and 2,130 manholes. This is a relatively large number of pump stations for a municipality of Blytheville's size and population, but the topography and water table require a larger number of pump stations than normal. The City is relatively flat, which would require that sewers be constructed deeper and deeper the longer the pipe run. Construction depths in excess of 15' are costly, and sewers will have increased risk of water table infiltration at depths greater than 15'. As such, sewer mains flow by gravity until they reach depths near 15' and then have to be lifted by a pump station. Sewage is often lifted multiple times before reaching a wastewater treatment plant (WWTP). See *Figure 1 – Collection System Pump Stations* for a map of the sewer system color coded by pump station.

In an effort to reduce the total length of gravity sewer required to reach a WWTP, the City constructed three (3) WWTP's, eliminating the need for sewage to be transported across the entire breadth of the City. The three (3) WWTP's are named the West WWTP, North WWTP, and South WWTP. *Figure 2 – Blytheville Wastewater Treatment Plants*, displays how the City's collection system is divided among the three (3) WWTP's.

SECTION 2 – CAPACITY EVALUATION PROCEDURE

Typically, it would be advantageous to perform a CCSE over the course of several years and multiple periods of dry and wet weather. However, the CAO requires that the evaluation be performed for the entire system within one year, in order to quickly eliminate violations and non-compliance issues. In order to meet the timeline, a variety of different data sets and evaluation procedures were utilized. Using a multi-faceted approach not only expedited the evaluation process, it provided a more comprehensive analysis that accounted for a variety of factors impacting the adequacy of the collection system.

2.1 Interviews

In order to focus efforts in the most efficient manner possible, the City's sanitary sewer commissioner and staff were consulted at the evaluation commencement. These interviews provided historical information about the collection system that would help guide monitoring efforts to the most advantageous locations. The City's staff delineated areas of the collection system that were built in the last ten (10) years, constructed entirely of PVC, and had minimal service issues. These lower maintenance areas were assumed to be the least susceptible to capacity issues related to I/I, and as such, were not monitored; these areas are labeled as "No problem area" on *Figure 3 – Areas of Focus and Exclusion*. It should be noted that sanitary sewer overflows (SSO's) did occur in these low-maintenance areas. However, the overwhelming majority of these overflows occurred due to equipment failure in the pump station.

2.2 Existing Sanitary Sewer Overflows (SSO's)

The City of Blytheville has reported SSO's that have occurred throughout their system, and the City's staff has maintained a record of these overflows. The SSO's reported over the last three years were collected and used to create a GIS dataset that would allow graphical representation of where SSO's have occurred throughout the system. *Figure 4 – Sanitary Sewer Overflows* displays the SSO's. As noted in section 2.1, many of the one-time SSO's occurred in response to a multi-day period of no power. The resulting overflows were primarily due to a lack back-up power rather than a system capacity issue. The locations of these SSO's heavily influenced the selection of monitoring sites.

2.3 Major Pump Station Selection

Another major source of information for the CCSE was pump station run time data. In order to focus efforts on the most pertinent pump stations, the system was analyzed to determine which pump stations are the most critical. *Table 1 – Pump Station Information* lists all pump stations in the City's collection system; note that several of the smaller, grinder pumps were not included in this table. *Table 1* lists the area draining into the pump station directly by the upstream gravity sewers and also lists the total area draining into the pump station by either direct gravity flow or by pressure flow from an adjacent pump station. *Table 1* lists the pump stations sorted by the total upstream area, gravity and pressure, from largest to smallest. In *Table 1*, the top eleven (11) pump stations are highlighted; these pump stations handle sewage from over 70% of the City's collection system, making them critical to the performance and function of Blytheville's wastewater collection system. The eleven (11) pump stations serving the largest area were equipped with run time hour meters on each pump within the pump station. The run times for

SECTION 2 – CAPACITY EVALUATION PROCEDURE

these eleven pump stations were recorded on a daily basis, and subsequent data was used for analyzing the collection system (see Section 3.2). See *Figure 5 – Major Pump Stations* for the graphical location of all major pump stations.

2.4 Monitoring Site Selection

The most illustrative and conclusive data in I/I investigations is typically provided by flow monitoring at certain locations in the collection system. The City of Blytheville purchased three (3) flow monitors to be used for this study and future studies to ensure and maintain compliance. Given the one-year time frame, the flow monitors were typically left in place for approximately 10 to 14 days depending on the number and intensity of rain events encountered while the monitor was installed at a particular location. Occasionally, flow monitors had to remain in place longer in order to ensure that a significant rain event (0.5” or greater) occurred while the meter was in place. In order to focus flow monitoring efforts in areas with the greatest likelihood of excessive I/I, flow monitors were typically located in the vicinity of the problem areas outlined by the City’s staff or areas with a greater density of SSO’s. Newer, low-maintenance areas outlined by City staff were not monitored. *Figure 6 – Monitoring Sites* displays the locations of monitoring sites used for this CCSE and the portions of the collection system that contribute to these monitoring sites.

SECTION 3 – DATA COLLECTION

3.1 Rain Gauge Equipment and Data

A critical component for I/I investigations is rainfall data. Tipping bucket rain gauges (manufactured by RainWise, Inc.) were selected for this evaluation, as they not only record depth of rainfall, but also the times at which increments of rainfall occurred. The rainfall data logger was set to record and report the rainfall depth that occurred in every five (5) minute interval. Two (2) rain gauges were used in order to provide a comparison between the two (2) data sets and provide a back up data set if one of the rain gauges were rendered inoperable during a rain event.



One rain gauge was installed in the vicinity of the Shop Pump Station and the other rain gauge was installed in the vicinity of the Division Street Pump Station. *Figure 7 – Rain Gauge Comparison* displays rainfall data from the two rain gauges with accumulating sums resetting every twenty-four (24) hours. In general, the two gauges provided relatively consistent data.

The rainfall data from both rain gauges was combined into a single rainfall data set to be compared with monitored flow characteristics and pump station data. This single rainfall data set was calculated by averaging the rainfall data from the Division Street rain gauge and the Shop rain gauge. The averaged rainfall data set was used for all I/I analysis with the exception of a one month period from June 25th to July 25th. The Shop pump station rain gauge was found to be clogged; Division street rain gauge data was used exclusively for this one month period. *Figure 8 – Averaged Rainfall Data* displays the averaged rainfall data with accumulating sums resetting every twenty-four (24) hours; this data was used for I/I analysis.

SECTION 3 – DATA COLLECTION

3.2 Pump Station Run Time Logs

The amount of time that a pump station remains in operation (one or more pumps activated) provides a great deal of information. These pump station “run times” can be compared to rainfall data to determine the increase in run time due to a specific rain event and, subsequently, provide an indication of the amount of I/I that occurred in the upstream system. For the purposes of this CCSE, the eleven (11) major pump stations were equipped with run time meters that would maintain a running log of the number of hours each pump was in operation. City of Blytheville staff recorded these run time meters on a daily basis between Monday and Friday. These recorded run time values were reduced to twenty-four (24) hour totals at each of the eleven (11) major pump stations. *Figures 9 through 19* graph the pump run times along with rainfall totals. Note that the run times shown on the graphs are a twenty-four (24) hour cumulative value for all of the pumps in the pump station.

3.3 Flow Meter Equipment and Data

Flow monitoring data was obtained using three (3) area-velocity flow meters manufactured by Isco, inc. (Isco Model 2100 Flow Module). Each monitoring system consisted of a sensor that was placed inside of a pipe and a flow module that recorded data and housed the batteries. The sensor essentially collects two (2) types of data – velocity and depth. Velocity is obtained by use of two (2) internal, ultrasonic sound wave transducers. One of the transducers emits the sound wave, and the other transducer receives the sound waves after reflecting off of particles in the flow stream. The sensor detects a unique frequency based on the motion of the particles. Using these frequencies, a velocity can be calculated internally by the flow module. Depth information is obtained by a pressure transducer that measures the pressure at the sensor (at bottom of pipe) and the pressure at the atmosphere. Using the difference between these two pressures, or the hydrostatic pressure, a depth of water in the flow stream was internally calculated by the flow module. Once the velocity and depth are calculated, the cross-sectional geometry of the pipe can be used to calculate a flow rate. Measurements and calculations needed to derive depth, velocity, and flow rate were performed continuously.



SECTION 3 – DATA COLLECTION

Depth and flow information can be compared against the rainfall record to determine how flow depths and flow rates were impacted by precipitation. This information was crucial in making capacity determinations throughout the system. *Figures 20 through 48* graph the data provided by the flow meters along with rainfall data. *Figures 20 through 48* have four panes: the top pane is rainfall data, the second pane is depth data, the third pane is velocity data, and the fourth pane is flow rate data. While the flow monitoring equipment used met or exceeded the industry standards, it is typical for the sensors to malfunction on occasion. The pressure transducers typically provide the most consistent measurements, making depth data the most reliable. The velocity sensors require a velocity greater than 1 ft/s and the ultrasonic transducers to remain relatively clear of debris. Both of these requirements were difficult to maintain in Blytheville's sanitary sewer collection system, making velocity data much less reliable than depth data. Since flow rate data was internally calculated using both depth and velocity, flow rate data was only as reliable as its two components.

SECTION 4 – DATA ANALYSIS

4.1 Capacity Parameters

Using the data collected from the rain gauges and flow monitors, specific data points were obtained from the compiled data graphs. These data points are defined as follows:

- Rainfall Event Total, R
 - Measured in inches (in)
 - Typically represented the 24-hour rainfall data prior to peaks or spikes in depth and flow data.
 - Data provided by the averaged rainfall gauges
- Monitored Pipe Diameter, D
 - Measured in inches (in)
 - Represents the inside diameter of monitored sanitary sewer pipes
 - Obtained from field measurements during installation of flow monitors
- Average Peak Flow Depth, D_{AVEP}
 - Measured in inches (in)
 - Represents the average maximum depth occurring in a 24-hour period unaffected by rainfall events; dry-weather peak depth.
 - Obtained through inspection of depth data provided by flow monitor
- Wet Weather Peak Flow Depth, D_{WWP}
 - Measured in inches (in)
 - Represents the maximum depth resulting from a rain event
 - Obtained through inspection of depth data provided by flow monitor
- Average Peak Flow Rate, Q_{AVEP}
 - Measured in gallons per minute (gpm)
 - Represents the average maximum flow rate occurring in a 24-hour period unaffected by rainfall events; dry-weather peak flow rate.
 - Obtained through inspection of flow rate data provided by flow monitor
- Wet Weather Peak Flow Rate, Q_{WWP}
 - Measured in gallons per minute (gpm)
 - Represents the maximum flow rate resulting from a rain event
 - Obtained through inspection of flow rate data provided by flow monitor

See *Table 2 – CCSE Capacity Parameters and Factors* for a list of the above capacity parameters obtained at each monitoring site. Note that wet weather parameters were recorded for each major rain event at each monitoring site.

4.2 Capacity Factors

Using the parameters listed above, capacity factors were calculated to provide a quantitative means of comparing monitoring sites and evaluating the adequacy of the existing collection system. These capacity factors are defined as follows:

- Dry Weather Depth Capacity Ratio
 - Equation: $\frac{D_{AVEP}}{D} \times 100\%$

SECTION 4 – DATA ANALYSIS

- Compares the dry weather, average daily maximum depth against the inside diameter of the pipe.
- For example, a value of 50% represents a pipe where the typical dry-weather maximum depth is half of the pipe diameter; a value of 150% represents a pipe where the typical dry-weather maximum depth is 1.5 times the diameter of the pipe.
- Wet Weather Peak Depth to Pipe Diameter
 - Equation: $\frac{D_{WWP}}{D} \times \frac{1}{R}$
 - Represents the relationship between wet weather peak depth as compared to the pipe diameter, and normalized according to the rainfall depth that created the wet weather peak. This factor essentially provides a quantity to compare the maximum wet weather depth to the pipe diameter.
 - Dividing by the rainfall depth, R, that created the wet weather peak allows for monitoring sites to be compared against one another even though they did not record data during the same storm.
- Wet Weather Peak Depth to Dry Weather Peak Depth
 - Equation: $\frac{D_{WWP}}{D_{AVEP}} \times \frac{1}{R}$
 - Compares the wet weather peak depth to the average, dry weather peak depth and normalizes the ratio to the rainfall depth that created the wet weather peak. This factor essentially provides a quantity to compare the maximum wet weather depth to the maximum dry weather depth, or provides some indication of how much higher the depth reached when the rain event occurred.
 - Dividing by the rainfall depth, R, that created the wet weather peak allows for monitoring sites to be compared against one another even though they did not record data during the same storm.
- Wet Weather Peak Flow to Dry Weather Peak Flow
 - Equation: $\frac{Q_{WWP}}{Q_{AVEP}} \times \frac{1}{R}$
 - Compares the wet weather peak flow rate to the average, dry weather peak flow rate and normalizes the ratio to the rainfall depth that created the wet weather peak. This factor essentially provides a quantity to compare the maximum wet weather flow rate to the maximum dry weather flow rate, or provides some indication of how much higher the flow rate reached when the rain event occurred.
 - Dividing by the rainfall depth, R, that created the wet weather peak allows for monitoring sites to be compared against one another even though they did not record data during the same storm.

See Table 2 – CCSE Capacity Parameters and Factors for a list of the above capacity factors calculated for each monitoring site. Note that wet weather factors were calculated for each major rain event at each monitoring site, and then averaged to provide a single factor for each site.

SECTION 5 – PIPE CAPACITY CONCLUSIONS

5.1 Tributary Areas for Monitored Sites

The flow monitors were placed in twenty-nine (29) different pipes, or monitoring locations, throughout the collection system. While the flow monitors only provided data for the single pipe that is being monitored, the data obtained can be used to make decisions about the upstream, contributing pipes and structures. For the purposes of this study, the capacity factors calculated for a specific monitoring location were assumed to be indicative of the upstream pipes. Thus, rather than only evaluating the adequacy of twenty-nine (29) pipes, the capacity factors were used to evaluate twenty-nine (29) areas. If a monitor was placed downstream of another monitor on the same main, then the downstream monitor's area of influence was assumed to terminate at the upstream flow monitor. Information related to each monitored area is outlined below:

Site Name: 705-1

- See *Figure 49 – 705-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 3
- Linear Feet of Sewer in Contributing Area: 1022 LF
- Notes: Dry-weather flows reached 78% of the pipe's diameter and significant I/I was detected during wet-weather events. The contributing area should be close-circuit televised (CCTV'd); area will possibly require rehabilitation to reduce I/I. It is possible that certain sewer lines may require upsizing to meet dry-weather capacity requirements. Storm sewer connections are suspected in this area; all stormwater connections to sanitary sewer should be capped and re-routed to drainage system.
- Determination: **INADEQUATE CAPACITY**

Site Name: 705-2

- See *Figure 50 – 705-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 36
- Linear Feet of Sewer in Contributing Area: 6509 LF
- Notes: Dry-weather flow depths reached 169% of the pipe's diameter, but this was most likely due to the operation of the pump station. Float elevations in the pump station may need to be adjusted to ensure this pipe does not back up. Excessive I/I was found in contributing area. Flushing, CCTV, and rehabilitation are likely needed for the majority of contributing area. All stormwater connections should be located using smoke-testing or CCTV and redirected to an appropriate drainage system.
- Determination: **INADEQUATE CAPACITY**

Site Name: 705-3

SECTION 5 – PIPE CAPACITY CONCLUSIONS

- See *Figure 51 – 705-3 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 11
- Linear Feet of Sewer in Contributing Area: 1572 LF
- Notes: Dry-weather flows reached 78% of the pipe's diameter and significant I/I was detected during wet-weather events. The contributing area should be close-circuit televised (CCTV'd); area will possibly require rehabilitation to reduce I/I. It is possible that certain sewer lines may require upsizing to meet dry-weather capacity requirements. Storm sewer connections are suspected in this area; all stormwater connections to sanitary sewer should be capped and re-routed to drainage system.
- Determination: **INADEQUATE CAPACITY**

Site Name: 820-1

- See *Figure 52 – 820-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 26
- Linear Feet of Sewer in Contributing Area: 6873 LF
- Notes: depth and velocity data appears to be inaccurate. Further investigation will be required at this location.
- Determination: **INCONCLUSIVE DATA**

Site Name: 1767-1

- See *Figure 53 – 1767-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 37
- Linear Feet of Sewer in Contributing Area: 7892 LF
- Notes: Dry-weather capacity was found to be sufficient, but significant I/I was detected. Many of the house connections serve uninhabited houses. The sewer lines that do not serve homes should be closed, stormwater connections should be capped and re-routed, and the remaining sanitary sewer collection system will likely require flushing, CCTV, and rehabilitation.
- Determination: **INADEQUATE CAPACITY**

Site Name: 1767-2

- See *Figure 54 – 1767-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 8
- Linear Feet of Sewer in Contributing Area: 2355 LF

SECTION 5 – PIPE CAPACITY CONCLUSIONS

- Notes: Dry-weather capacity was found to be sufficient, but significant I/I was detected. Many of the house connections serve uninhabited houses. The sewer lines that do not serve homes should be closed, stormwater connections should be capped and re-routed, and the remaining sanitary sewer collection system will likely require flushing, CCTV, and rehabilitation.
- Determination: **INADEQUATE CAPACITY**

Site Name: 21st Street-1

- See *Figure 55 – 21st Street-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 47
- Linear Feet of Sewer in Contributing Area: 14539 LF
- Notes: Flow monitoring data indicates that flow depths did not fill the pipe by more than 60%, and there were no excessive spikes in flow depth or flow rate attributed to the 1.35 inch rain event that occurred during the monitoring period. However, the pump run times more than doubled during rain events (see *Figure 9*), indicating that substantial I/I is present in the upstream system. While there appears to be adequate capacity, there is still substantial I/I that could be investigated by smoke testing, CCTV, and dye studies.
- Determination: **ADEQUATE CAPACITY**

Site Name: Division-0

- See *Figure 56 – Division-0 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 17
- Linear Feet of Sewer in Contributing Area: 5026 LF
- Notes: The flow depth at this monitoring site appears to be linked to the pumping cycles at the Division Street pump station. When the pump station is not pumping, the pipe will back up; but when the pump station begins pumping, the depth in the pipe quickly decreases. Thus, the dry-weather capacity ratio of 72% is not alarming. The float elevations in the pump station may need to be adjusted. Pump run times increased by 80% during a 1 inch rain event (see *Figure 13*), indicating substantial I/I in the contributing area. Thus, further investigation to include smoke testing, CCTV, and dye studies are recommended for the contributing area.
- Determination: **INADEQUATE CAPACITY**

Site Name: Division-1A

- See *Figure 57 – Division-1A Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 48

SECTION 5 – PIPE CAPACITY CONCLUSIONS

- Linear Feet of Sewer in Contributing Area: 16209 LF
- Notes: Recorded data appears inconclusive. Suggest reinstalling monitor for longer duration in attempt to capture larger rain events.
- Determination: **INCONCLUSIVE DATA**

Site Name: Division-1B

- See *Figure 58 – Division-1B Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 59
- Linear Feet of Sewer in Contributing Area: 15453LF
- Notes: While there is no conclusive data illustrating a response to a rain event, the dry-weather flow depth is less than 60% of the pipe diameter, so it is assumed that adequate capacity is available. Also, downstream monitors indicate that the area upstream of Division Street-1B are unlikely to have excessive I/I.
- Determination: **ADEQUATE CAPACITY**

Site Name: Division-2

- See *Figure 59 – Division-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 35
- Linear Feet of Sewer in Contributing Area: 11169 LF
- Notes: The dry-weather peak flow depth was slightly above 60% of the monitoring pipes diameter, and the upstream area appears to have significant I/I. It is recommended to smoke test, CCTV, and/or dye study the area to determine the locations of I/I. Certain pipes will possibly require upsizing to meet dry-weather capacity requirements.
- Determination: **INADEQUATE CAPACITY**

Site Name: Division-3

- See *Figure 60 – Division-3 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 25
- Linear Feet of Sewer in Contributing Area: 8209 LF
- Notes: While this site did not detect excessive I/I, the dry-weather capacity was 82% of the pipe diameter. Thus, the upstream area does not appear to have a need for locating sources of I/I, but portions of the system may require upsizing pipes.
- Determination: **INADEQUATE CAPACITY**

SECTION 5 – PIPE CAPACITY CONCLUSIONS

Site Name: Jake Rhoades-1

- See *Figure 61 – Jake Rhoades-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 7
- Linear Feet of Sewer in Contributing Area: 2471 LF
- Notes: Although dry-weather depths often exceeded the diameter of the pipe, the depths appeared to be more influenced by pump station operation than pipe capacity. The floats on the pump station may need to be lowered to improve upstream flow capacities and reduce peak depths. It is suggested that the City obtain pump run time data for the Jake Rhoades pump station before further conclusions are drawn.
- Determination: **INCONCLUSIVE DATA**

Site Name: Jake Rhoades-2

- See *Figure 62 – Jake Rhoades-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 21
- Linear Feet of Sewer in Contributing Area: 6401 LF
- Notes: Monitor appears to have malfunctioned. New monitoring site may need to be selected to ensure adequate conditions for the flow monitor.
- Determination: **INCONCLUSIVE DATA**

Site Name: Jake Rhoades-3

- See *Figure 63 – Jake Rhoades-3 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 13
- Linear Feet of Sewer in Contributing Area: 4001 LF
- Notes: Dry-weather flow depths reached 87% of the pipe's diameter, but there does not appear to be significant I/I in upstream area.
- Determination: **INADEQUATE CAPACITY**

Site Name: Lake Street-1

- See *Figure 64 – Lake Street-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 7
- Linear Feet of Sewer in Contributing Area: 2286 LF

SECTION 5 – PIPE CAPACITY CONCLUSIONS

- Notes: Flow monitoring data indicated that dry-weather depths were typically at 82% of the pipe's diameter, but this pipe's flow depth appears to be closely related the pump station's operation. Based on the Lake Street Pump Station run times (see *Figure 14*), significant I/I does exist in the contributing area, so further investigation and rehabilitation is likely required.
- Determination: **INADEQUATE CAPACITY**

Site Name: Lake Street-2

- See *Figure 65 – Lake Street-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 40
- Linear Feet of Sewer in Contributing Area: 13465 LF
- Notes: Monitor appears to have malfunctioned. New monitoring site may need to be selected to ensure adequate conditions for the flow monitor.
- Determination: **INCONCLUSIVE DATA**

Site Name: Lake Street-3

- See *Figure 66 – Lake Street-3 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 23
- Linear Feet of Sewer in Contributing Area: 9306 LF
- Notes: Dry-weather depths were found to be 75% of the pipe diameter, which is most likely not adequate to convey wet-weather flows. The effects of wet-weather I/I could not be determined due to inconsistent monitoring data. The monitor should be placed in a nearby pipe to gather higher quality data.
- Determination: **INCONCLUSIVE DATA**

Site Name: McHaney Street-1

- See *Figure 67 – McHaney Street-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 23
- Linear Feet of Sewer in Contributing Area: 9718 LF
- Notes: Based on the flow monitoring data, there does appear to be some I/I, but the pipe system has enough capacity to handle the increase in flow resulting from I/I.
- Determination: **ADEQUATE CAPACITY**

Site Name: McHaney Street-2

SECTION 5 – PIPE CAPACITY CONCLUSIONS

- See *Figure 68 – McHaney Street-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 3
- Linear Feet of Sewer in Contributing Area: 901 LF
- Notes: Velocity and flow data were not collected due to monitoring issues, but depth data was available for the duration of monitoring at this site. Flow depths did not drastically change during the recorded rain event, indicating that I/I was not a major issue in contributing area.
- Determination: **ADEQUATE CAPACITY**

Site Name: Ruddle-1

- See *Figure 69 – Ruddle-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 23
- Linear Feet of Sewer in Contributing Area: 6535 LF
- Notes: Monitored pipe was found to have adequate dry-weather capacity, but excessive I/I. Majority of upstream, contributing area will probably require flushing, CCTV, and rehabilitation. Note that several SSO's were reported in this contributing area.
- Determination: **INADEQUATE CAPACITY**

Site Name: Shop PS-1

- See *Figure 70 – Shop PS-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 42
- Linear Feet of Sewer in Contributing Area: 14255 LF
- Notes: Flow monitoring data indicates system has more than adequate dry-weather capacity. Substantial I/I is evident, but even with additional I/I flows, flow depths remain well within pipe diameter. There is a slight increase in I/I detected at this monitoring location as compared with site Shop PS-2, which means there is slightly more I/I at the ditch crossing east of the pump station than in Shop PS-2's contributing area.
- Determination: **ADEQUATE CAPACITY**

Site Name: Shop PS-2

- See *Figure 71 – Shop PS-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 103

SECTION 5 – PIPE CAPACITY CONCLUSIONS

- Linear Feet of Sewer in Contributing Area: 32628 LF
- Notes: Flow monitoring data indicates that system has more than adequate dry-weather capacity. There appears to be substantial I/I, but even with increased flow due to I/I, maximum flow depths remained within the pipe diameter.
- Determination: **ADEQUATE CAPACITY**

Site Name: Walker Park-1

- See *Figure 72 – Walker Park-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 54
- Linear Feet of Sewer in Contributing Area: 17300 LF
- Notes: Flow monitoring data indicated that the monitored pipe had adequate dry-weather capacity, but excessive I/I. This will be prime area for smoke testing, CCTV, and dye studying to track down sources of I/I; this area will most likely require extensive rehabilitation.
- Determination: **INADEQUATE CAPACITY**

Site Name: Walker Park-2

- See *Figure 73 – Walker Park-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 55
- Linear Feet of Sewer in Contributing Area: 15725 LF
- Notes: Dry-weather flow depths reached 68% of the pipe diameter and excessive I/I was discovered during wet-weather. Extensive I/I investigations are suggested (flushing and CCTV) with a large percentage of the contributing area likely to require rehabilitation. In addition to rehabilitation, certain pipes may require upsizing to accommodate dry-weather flow requirements.
- Determination: **INADEQUATE CAPACITY**

Site Name: Walker Park-3

- See *Figure 74 – Walker Park-3 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 3
- Linear Feet of Sewer in Contributing Area: 449 LF
- Notes: Dry-weather flow depths exceeded the pipe diameter. The flows in this pipe appear to be directly related to discharges from the Ruddle pump station. While this pipe appears to be under capacity, eliminating or reducing the I/I in the Ruddle pump station tributary area could alleviate issues related to wet-weather flows.

SECTION 5 – PIPE CAPACITY CONCLUSIONS

- Determination: **INADEQUATE CAPACITY**

Site Name: Ward-1

- See *Figure 75 – Ward-1 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 60
- Linear Feet of Sewer in Contributing Area: 16123 LF
- Notes: Flow monitoring data indicates that adequate dry-weather capacity exist, but extreme I/I is present related to the recorded rain events. The area flowing by gravity to the Ward-1 site, as well as the area draining to the 5th Street pump station, will most likely require flushing, CCTV, and rehabilitation of many pipes and structures. It is suggested to confirm the amount of I/I at the 5th Street pump station by collecting run time data on the pumps for at least a month with multiple rain events.
- Determination: **INADEQUATE CAPACITY**

Site Name: Ward-2

- See *Figure 76 – Ward-2 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 18
- Linear Feet of Sewer in Contributing Area: 4234 LF
- Notes: Excessive I/I detected. Suggest flushing and CCTV for all contributing sewer pipes and structures, and possible rehabilitation is most likely required for majority of collection system.
- Determination: **INADEQUATE CAPACITY**

Site Name: Ward-3

- See *Figure 77 – Ward-3 Monitoring Location and Contributing Area* for the location of the monitoring site and contributing area.
- Number of Manholes in Contributing Area: 21
- Linear Feet of Sewer in Contributing Area: 4755 LF
- Notes: Flow monitoring data indicates that dry-weather flow depths exceeded pipe diameter. The upstream area appears to be moderately impacted by I/I during rain events, but not as severely as other areas in the city's collection system.
- Determination: **INADEQUATE CAPACITY**

Figure 78 – City of Blytheville Collection System Conclusions displays the entire collection system color coded based on the following conclusions:

SECTION 5 – PIPE CAPACITY CONCLUSIONS

- Not Monitored
- Monitored and found to have Adequate Capacity
- Monitored and found to have Inadequate Capacity
- Monitored but with insufficient or inconclusive data

It should be noted that even though portions of the collection system are labeled as “Not Monitored”, the majority of the collection system with inadequate capacity was monitored. Much of the “Not Monitored” areas were designated as low priority, or low I/I, areas based on staff interviews, absence of SSO’s, and/or the fact that these areas were recently constructed. Although every portion of the old Air Force Base in the northwest corner of town was not monitored, it is assumed that the entire Base has significant I/I based on the results from the portions that were monitored.

SECTION 6 – PUMPING STATION EVALUATION

6.1 Pump Station Capacity Evaluation

Section 2.3 outlines the selection process for the eleven (11) major pump stations in Blytheville's collection system. As noted in section 3.2 the run time hours for these major pump station were recorded and graphed in *Figures 9 through 19*. These graphs, in conjunction with the flow monitoring data, were used to evaluate the capacity of the eleven major pump stations.

Pump Station Name: 21st Street

- See *Figure 9 – 21st Street Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: flow monitoring data did not indicate excessive I/I, and the pump station run times do not appear excessive for dry weather or wet weather conditions. The pump station appears to have adequate capacity.
- Determination: **ADEQUATE CAPACITY**

Pump Station Name: 705

- See *Figure 10 – 705 Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: It appears that the pump station is used minimally during dry-weather flows, typically less than 2 hours a day. This means there is minimal sanitary flow in the contributing network. During moderate rain events of 0.8" to 1.0", the pump run times increase drastically to 20 hours. This indicates severe I/I throughout the contributing system. The pump station appears to be more than adequate for dry-weather, sanitary flows, but undersized for wet weather flows. It is recommended, that capacity insufficiencies should be addressed by eliminating I/I rather than upsizing the capacity of the pump station. Based on the monitoring sites and run time meters on the Eaker Air Force Base, the Base's collection system appears to be a major source of I/I.
- Determination: **ADEQUATE CAPACITY; but system I/I needs to be addressed to reduce pump run times during rain events.**

Pump Station Name: 820

- See *Figure 11 – 820 Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: It appears that the pump station is used minimally during dry-weather flows, typically less than 2 hours a day. This means there is minimal sanitary flow in the contributing network. During moderate rain events of 0.8" to 1.0", the pump run times increase drastically to 19 hours. This indicates severe I/I throughout the contributing system. The pump station appears to be more than adequate for dry-weather, sanitary flows, but undersized for wet weather flows. It is recommended,

SECTION 6 – PUMPING STATION EVALUATION

that capacity insufficiencies should be addressed by eliminating I/I rather than upsizing the capacity of the pump station.

- Determination: **ADEQUATE CAPACITY; but system I/I needs to be addressed to reduce pump run times during rain events.**

Pump Station Name: County Road

- See *Figure 12 – County Road Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: County Road pump station is the largest pump station delivering waste water to the south treatment plant.
- Determination: **ADEQUATE CAPACITY, but may consider upgrade in the future.**

Pump Station Name: Division Street

- See *Figure 13 – Division Street Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: Determination based on run time meter readings and adjacent flow monitors.
- Determination: **ADEQUATE**

Pump Station Name: Lake Street

- See *Figure 14 – Lake Street Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: Determination based on run time meter readings and adjacent flow monitors.
- Determination: **ADEQUATE**

Pump Station Name: Lockard

- See *Figure 15 – Lockard Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: Determination based on run time meter readings and adjacent flow monitors.
- Determination: **BORDERLINE ADEQUATE, may need upgrade in future**

Pump Station Name: McHaney Street

- See *Figure 16 – McHaney Street Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: Determination based on run time meter readings and adjacent flow monitors.
- Determination: **ADEQUATE**

SECTION 6 – PUMPING STATION EVALUATION

Pump Station Name: Shop

- See *Figure 17 – Shop Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: Determination based on run time meter readings and adjacent flow monitors.
- Determination: **ADEQUATE**

Pump Station Name: Walker Park

- See *Figure 18 – Walker Park Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: Determination based on run time meter readings and adjacent flow monitors.
- Determination: **ADEQUATE**

Pump Station Name: Ward

- See *Figure 19 – Ward Pump Station Run Time* for a graph of the run times plotted with rainfall events.
- Notes: Determination based on run time meter readings and adjacent flow monitors.
- Determination: **ADEQUATE**

6.2 Pump Station Auxiliary Power Evaluation

All sixty-one (61) pump stations in Blytheville's collection system lack auxiliary power. *Table 1 – Pump Station Information* lists all pump stations.

6.3 Pump Stations without Direct Notification Alarms

All sixty-one (61) pump stations in Blytheville's collection system lack direct notification alarms. *Table 1 – Pump Station Information* lists all pump stations.

SECTION 7 – CONCLUSIONS

7.1 Conclusions

In accordance with the Consent Administrative Order, the purpose of this CCSE is to identify the portions of the collection system that are inadequate and identify pump stations that lack auxiliary power and/or direct notification alarms. The City of Blytheville will provide a Milestone Schedule within three (3) months of the submission of this CCSE (January 10th, 2010) that addresses the inadequacies in the collection system. The Milestone Schedule will provide a plan of action with associated cost estimates showing how the City plans to address the issues.

TABLES

TABLE 1 - PUMP STATION INFORMATION

Pump Station	Receiving WWTP	Total Length of U/S Gravity Area		Total Length of U/S Gravity and Pressure Area		Auxiliary Power	Direct Notific. Alarm
		(ft)	(miles)	(ft)	(miles)		
Shop	w	57,428	10.88	218,982	41.47	NO	NO
County_Road	s	7,997	1.51	162,660	30.81	NO	NO
Division_Street	w	69,291	13.12	127,829	24.21	NO	NO
Lake_Street	s	70,969	13.44	90,271	17.10	NO	NO
Lockard	n	16,213	3.07	76,379	14.47	NO	NO
820	w	9,507	1.80	71,921	13.62	NO	NO
Ward	w	33,772	6.40	53,554	10.14	NO	NO
Walker_Park	n	36,073	6.83	48,407	9.17	NO	NO
705	w	11,569	2.19	37,256	7.06	NO	NO
McHaney_Street	s	31,967	6.05	34,860	6.60	NO	NO
21st_Street	w	30,741	5.82	31,972	6.06	NO	NO
Phase1_A	n	4,817	0.91	25,990	4.92	NO	NO
Unknown_8	w	25,159	4.76	25,159	4.76	NO	NO
NWCC	s	240	0.05	22,272	4.22	NO	NO
8th_Street	s	11,606	2.20	21,426	4.06	NO	NO
Ross_Road	s	8,056	1.53	18,591	3.52	NO	NO
1767	w	17,008	3.22	17,008	3.22	NO	NO
Jake_Rhodes	s	16,537	3.13	16,537	3.13	NO	NO
Phase1_B	n	6,776	1.28	14,584	2.76	NO	NO
Ruddle	n	12,334	2.34	12,334	2.34	NO	NO
Broadmoor	w	11,362	2.15	11,362	2.15	NO	NO
David_Lane	s	3,537	0.67	9,820	1.86	NO	NO
Phase2_D	n	9,041	1.71	9,041	1.71	NO	NO
1649	w	8,678	1.64	8,678	1.64	NO	NO
5th_Street	w	8,420	1.59	8,420	1.59	NO	NO
Phase2_E	s	7,307	1.38	8,107	1.54	NO	NO
Phase1_C	n	7,808	1.48	7,808	1.48	NO	NO
Dogwood	s	7,493	1.42	7,493	1.42	NO	NO
Golf_Links	n	5,443	1.03	7,240	1.37	NO	NO
Greenbriar	n	2,799	0.53	6,729	1.27	NO	NO
Phase2_H	n	786	0.15	6,589	1.25	NO	NO
Phase2_C	s	6,284	1.19	6,284	1.19	NO	NO
Phase2_GA	n	2,575	0.49	5,802	1.10	NO	NO
Grand_View	n	2,906	0.55	5,219	0.99	NO	NO
Phase2_A	s	4,932	0.93	4,932	0.93	NO	NO
Alert_Pad	w	219	0.04	4,582	0.87	NO	NO
Dog_Pound	w	3,876	0.73	4,363	0.83	NO	NO
Briarcrest	n	3,931	0.74	3,931	0.74	NO	NO
Comfort_Inn	n	3,494	0.66	3,494	0.66	NO	NO

TABLE 1 - PUMP STATION INFORMATION

Pump Station	Receiving WWTP	Total Length of U/S Gravity Area		Total Length of U/S Gravity and Pressure Area		Auxiliary Power	Direct Notific. Alarm
		(ft)	(miles)	(ft)	(miles)		
Phase1_D	s	3,442	0.65	3,442	0.65	NO	NO
Inactive		3,239	0.61	3,239	0.61	NO	NO
Phase2_G	n	3,228	0.61	3,228	0.61	NO	NO
Intermediate_School	w	3,102	0.59	3,102	0.59	NO	NO
Phase2_B	s	3,042	0.58	3,042	0.58	NO	NO
Country_Club_Estates	n	2,935	0.56	2,935	0.56	NO	NO
Chickasawba_Courts	s	2,893	0.55	2,893	0.55	NO	NO
Sarah_Street	s	2,765	0.52	2,765	0.52	NO	NO
Ward_Normandy	n	2,314	0.44	2,314	0.44	NO	NO
2026	w	2,165	0.41	2,165	0.41	NO	NO
Interstate	n	1,985	0.38	1,985	0.38	NO	NO
River_Oaks	w	1,882	0.36	1,882	0.36	NO	NO
Ridgeway_South	n	1,797	0.34	1,797	0.34	NO	NO
Cypress_Park	w	1,753	0.33	1,753	0.33	NO	NO
Lonnie_Howard	w	1,231	0.23	1,231	0.23	NO	NO
Phase2_F	n	1,061	0.20	1,061	0.20	NO	NO
Phase2_Ea	s	800	0.15	800	0.15	NO	NO
Unknown_2	w	487	0.09	487	0.09	NO	NO

TABLE 2 - CCSE PARAMETERS AND FACTORS

Site Name	Pipe Diameter	Average Peak Flow Depth	Average Peak Flow Rate	Dry Weather Capacity Ratio (%Full)	Rain Event #1					
					Rainfall Depth	Wet Weather Peak Flow Depth	Wet Weather Peak Flow Rate	Wet Weather Capacity Ratio	Wet Weather Peak to Dry Weather Peak	Wet Weather Peak Flow to Dry Weather Peak Flow
					R	D_{WWP}	Q_{WWP}	$\frac{D_{WWP}}{D} \times \frac{1}{R}$	$\frac{D_{WWP}}{D_{AVEP}} \times \frac{1}{R}$	$\frac{Q_{WWP}}{Q_{AVEP}} \times \frac{1}{R}$
(in)	(in)	(gpm)	$\frac{D_{AVEP}}{D} \times 100\%$	(in)	(in)	(gpm)				
Division Street-1B	12	6.59	N/A	54.9%	0.59	N/A	N/A	N/A	N/A	N/A
Shop PS-2	30	10.36	918	34.5%	0.82	14.16	1732	0.6	1.7	2.3
Shop PS-1	30	10.62	767	35.4%	0.82	14.48	1425	0.6	1.7	2.3
Division-2	10	6.10	N/A	61.0%	0.82	7.54	N/A	0.9	1.5	N/A
Division-0	18	12.95	953	71.9%	0.95	12.70	1296	0.7	1.0	1.4
Division-3	10	8.17	N/A	81.7%	1.34	9.55	N/A	0.7	0.9	N/A
21st Street-1	18	9.47	N/A	52.6%	1.35	9.78	N/A	0.4	0.8	N/A
Ward-1	10	5.64	N/A	56.4%	1.37	53.06	N/A	3.9	6.9	N/A
Ward-2	12	7.15	N/A	59.6%	1.40	43.62	N/A	2.6	4.4	N/A
Walker Park-1	10	4.16	148	41.6%	1.40	58.46	722	4.2	10.0	3.5
Ruddle-1	8	3.76	65	47.0%	1.05	25.12	152	3.0	6.4	2.2
Walker Park-2	10	6.79	205	67.9%	1.05	69.71	571	6.6	9.8	2.7
Jake Rhoades-1	12	17.82	N/A	148.5%	1.13	18.20	N/A	1.3	0.9	N/A
Walker Park-3	10	11.61	N/A	116.1%	0.83	13.58	N/A	1.6	1.4	N/A
Ward-3	8	8.35	N/A	104.4%	1.15	7.04	N/A	0.8	0.7	N/A
Lake Street-1	12	9.87	N/A	82.3%	1.16	10.05	N/A	0.7	0.9	N/A
Lake Street-2	12	5.03	N/A	41.9%	0.72	N/A	N/A	N/A	N/A	N/A
Lake Street-3	10	7.50	N/A	75.0%	0.72	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-2	8	5.39	45	67.4%	0.72	N/A	N/A	N/A	N/A	N/A
McHaney Street-1	10	2.30	66	23.0%	0.58	4.35	276	0.8	3.3	7.2
Jake Rhoades-3	8	7.00	N/A	87.5%	0.58	6.70	N/A	1.4	1.7	N/A
705-1	8	6.28	263	78.5%	2.73	89.79	804	4.1	5.2	1.1
705-2	10	16.96	324	169.6%	3.33	94.45	692	2.8	1.7	0.6
McHaney Street-2	18	5.33	N/A	29.6%	0.58	5.25	N/A	0.5	1.7	N/A
705-3	8	5.45	7	68.1%	3.25	60.13	N/A	2.3	3.4	N/A
Division Street-1A	12	3.26	121	27.2%	0.38	4.13	197	0.9	3.3	4.3
1767-1	8	4.56	44	57.0%	1.14	89.19	117	9.8	17.2	2.3
1767-2	8	1.49	5	18.6%	1.14	80.57	N/A	8.9	47.6	N/A
820-1	12	3.08	N/A	25.7%	1.02	N/A	N/A	N/A	N/A	N/A

TABLE 2 - CCSE PARAMETERS AND FACTORS

Site Name	Pipe Diameter	Average Peak Flow Depth	Average Peak Flow Rate	Dry Weather Capacity Ratio (%Full)	Rain Event #2					
					Rainfall Depth	Wet Weather Peak Flow Depth	Wet Weather Peak Flow Rate	Wet Weather Capacity Ratio	Wet Weather Peak to Dry Weather Peak	Wet Weather Peak Flow to Dry Weather Peak Flow
					R	D_{WWP}	Q_{WWP}	$\frac{D_{WWP}}{D} \times \frac{1}{R}$	$\frac{D_{WWP}}{D_{AVEP}} \times \frac{1}{R}$	$\frac{Q_{WWP}}{Q_{AVEP}} \times \frac{1}{R}$
(in)	(in)	(gpm)	$\frac{D_{AVEP}}{D} \times 100\%$	(in)	(in)	(gpm)				
Division Street-1B	12	6.59	N/A	54.9%	N/A	N/A	N/A	N/A	N/A	N/A
Shop PS-2	30	10.36	918	34.5%	0.58	17.45	2251	1.0	2.9	4.2
Shop PS-1	30	10.62	767	35.4%	0.58	17.77	2387	1.0	2.9	5.4
Division-2	10	6.10	N/A	61.0%	0.58	8.9	N/A	1.5	2.5	N/A
Division-0	18	12.95	953	71.9%	N/A	N/A	N/A	N/A	N/A	N/A
Division-3	10	8.17	N/A	81.7%	N/A	N/A	N/A	N/A	N/A	N/A
21st Street-1	18	9.47	N/A	52.6%	N/A	N/A	N/A	N/A	N/A	N/A
Ward-1	10	5.64	N/A	56.4%	3.6	94.89	N/A	2.6	4.7	N/A
Ward-2	12	7.15	N/A	59.6%	3.3	85.34	N/A	2.2	3.6	N/A
Walker Park-1	10	4.16	148	41.6%	3.65	116.07	N/A	3.2	7.6	N/A
Ruddle-1	8	3.76	65	47.0%	N/A	N/A	N/A	N/A	N/A	N/A
Walker Park-2	10	6.79	205	67.9%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-1	12	17.82	N/A	148.5%	N/A	N/A	N/A	N/A	N/A	N/A
Walker Park-3	10	11.61	N/A	116.1%	N/A	N/A	N/A	N/A	N/A	N/A
Ward-3	8	8.35	N/A	104.4%	0.65	8.29	N/A	1.6	1.5	N/A
Lake Street-1	12	9.87	N/A	82.3%	N/A	N/A	N/A	N/A	N/A	N/A
Lake Street-2	12	5.03	N/A	41.9%	N/A	N/A	N/A	N/A	N/A	N/A
Lake Street-3	10	7.50	N/A	75.0%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-2	8	5.39	45	67.4%	N/A	N/A	N/A	N/A	N/A	N/A
McHaney Street-1	10	2.30	66	23.0%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-3	8	7.00	N/A	87.5%	N/A	N/A	N/A	N/A	N/A	N/A
705-1	8	6.28	263	78.5%	0.9	37.59	301	5.2	6.7	1.3
705-2	10	16.96	324	169.6%	0.47	74.35	649	15.8	9.3	4.3
McHaney Street-2	18	5.33	N/A	29.6%	N/A	N/A	N/A	N/A	N/A	N/A
705-3	8	5.45	7	68.1%	0.8	25.54	N/A	4.0	5.9	N/A
Division Street-1A	12	3.26	121	27.2%	N/A	N/A	N/A	N/A	N/A	N/A
1767-1	8	4.56	44	57.0%	0.71	49.8	108	8.8	15.4	3.5
1767-2	8	1.49	5	18.6%	0.71	42.44	N/A	7.5	40.1	N/A
820-1	12	3.08	N/A	25.7%	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 2 - CCSE PARAMETERS AND FACTORS

Site Name	Pipe Diameter	Average Peak Flow Depth	Average Peak Flow Rate	Dry Weather Capacity Ratio (%Full)	Rain Event #3					
					Rainfall Depth	Wet Weather Peak Flow Depth	Wet Weather Peak Flow Rate	Wet Weather Capacity Ratio	Wet Weather Peak to Dry Weather Peak	Wet Weather Peak Flow to Dry Weather Peak Flow
					R	D_{WWP}	Q_{WWP}	$\frac{D_{WWP}}{D} \times \frac{1}{R}$	$\frac{D_{WWP}}{D_{AVEP}} \times \frac{1}{R}$	$\frac{Q_{WWP}}{Q_{AVEP}} \times \frac{1}{R}$
(in)	(in)	(gpm)	$\frac{D_{AVEP}}{D} \times 100\%$	(in)	(in)	(gpm)				
Division Street-1B	12	6.59	N/A	54.9%	N/A	N/A	N/A	N/A	N/A	N/A
Shop PS-2	30	10.36	918	34.5%	N/A	N/A	N/A	N/A	N/A	N/A
Shop PS-1	30	10.62	767	35.4%	N/A	N/A	N/A	N/A	N/A	N/A
Division-2	10	6.10	N/A	61.0%	N/A	N/A	N/A	N/A	N/A	N/A
Division-0	18	12.95	953	71.9%	N/A	N/A	N/A	N/A	N/A	N/A
Division-3	10	8.17	N/A	81.7%	N/A	N/A	N/A	N/A	N/A	N/A
21st Street-1	18	9.47	N/A	52.6%	N/A	N/A	N/A	N/A	N/A	N/A
Ward-1	10	5.64	N/A	56.4%	N/A	N/A	N/A	N/A	N/A	N/A
Ward-2	12	7.15	N/A	59.6%	N/A	N/A	N/A	N/A	N/A	N/A
Walker Park-1	10	4.16	148	41.6%	0.78	28.02	692	3.6	8.6	6.0
Ruddle-1	8	3.76	65	47.0%	N/A	N/A	N/A	N/A	N/A	N/A
Walker Park-2	10	6.79	205	67.9%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-1	12	17.82	N/A	148.5%	N/A	N/A	N/A	N/A	N/A	N/A
Walker Park-3	10	11.61	N/A	116.1%	N/A	N/A	N/A	N/A	N/A	N/A
Ward-3	8	8.35	N/A	104.4%	N/A	N/A	N/A	N/A	N/A	N/A
Lake Street-1	12	9.87	N/A	82.3%	N/A	N/A	N/A	N/A	N/A	N/A
Lake Street-2	12	5.03	N/A	41.9%	N/A	N/A	N/A	N/A	N/A	N/A
Lake Street-3	10	7.50	N/A	75.0%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-2	8	5.39	45	67.4%	N/A	N/A	N/A	N/A	N/A	N/A
McHaney Street-1	10	2.30	66	23.0%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-3	8	7.00	N/A	87.5%	N/A	N/A	N/A	N/A	N/A	N/A
705-1	8	6.28	263	78.5%	0.46	67.4	300	18.3	23.3	2.5
705-2	10	16.96	324	169.6%	0.59	45.06	487	7.6	4.5	2.5
McHaney Street-2	18	5.33	N/A	29.6%	N/A	N/A	N/A	N/A	N/A	N/A
705-3	8	5.45	7	68.1%	0.6	42.48	N/A	8.9	13.0	N/A
Division Street-1A	12	3.26	121	27.2%	N/A	N/A	N/A	N/A	N/A	N/A
1767-1	8	4.56	44	57.0%	N/A	N/A	N/A	N/A	N/A	N/A
1767-2	8	1.49	5	18.6%	N/A	N/A	N/A	N/A	N/A	N/A
820-1	12	3.08	N/A	25.7%	N/A	N/A	N/A	N/A	N/A	N/A

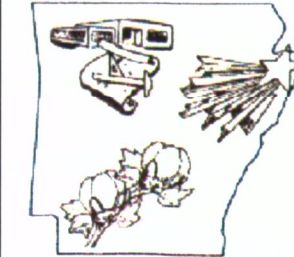
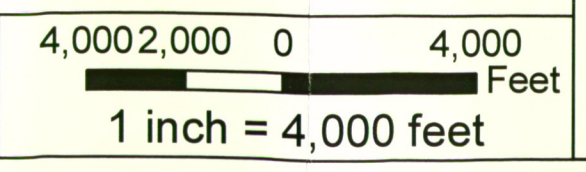
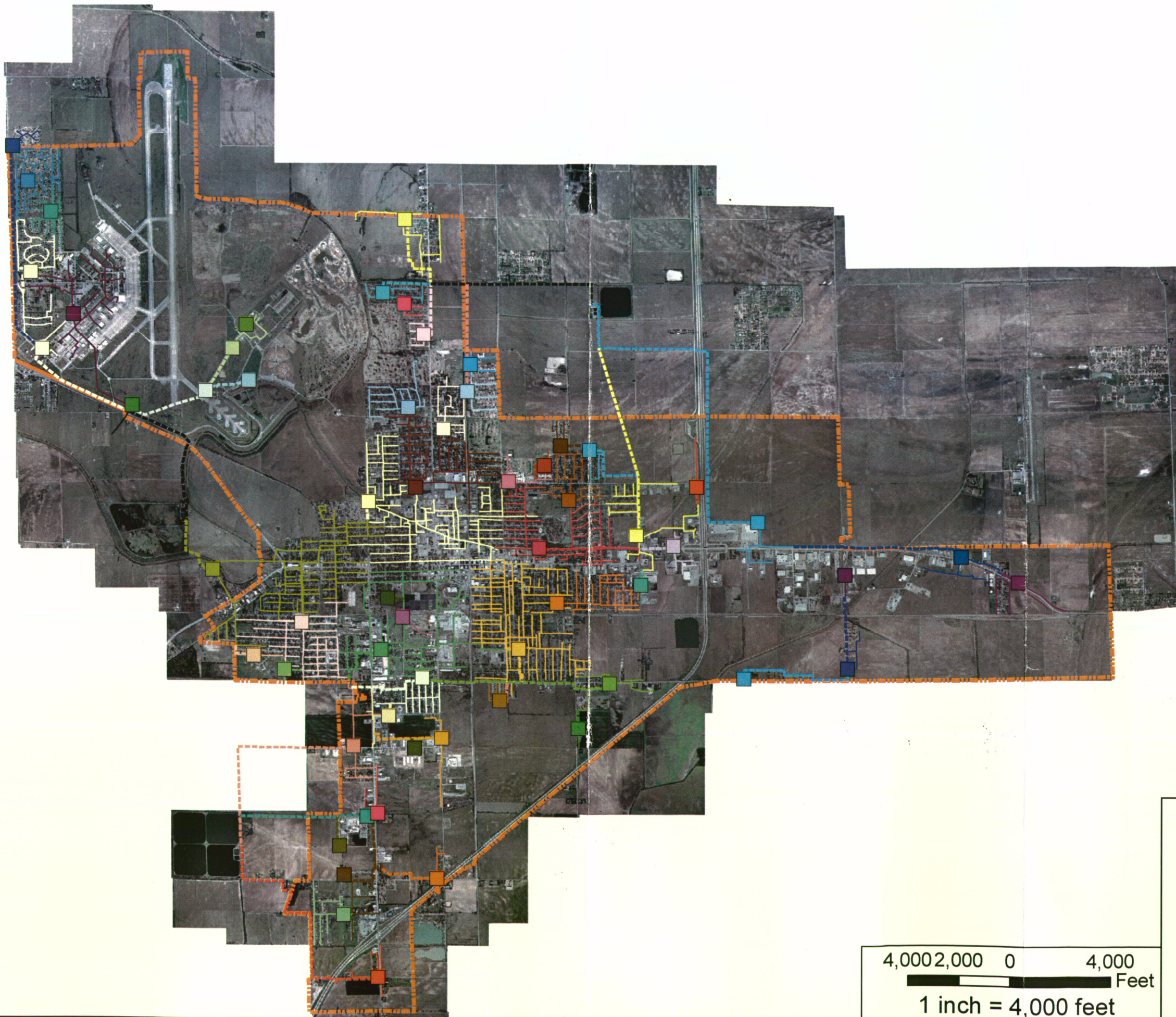
TABLE 2 - CCSE PARAMETERS AND FACTORS

Site Name	Pipe Diameter	Average Peak Flow Depth	Average Peak Flow Rate	Dry Weather Capacity Ratio (%Full)	Rain Event #4					
					Rainfall Depth	Wet Weather Peak Flow Depth	Wet Weather Peak Flow Rate	Wet Weather Capacity Ratio	Wet Weather Peak to Dry Weather Peak	Wet Weather Peak Flow to Dry Weather Peak Flow
					R	D_{WWP}	Q_{WWP}	$\frac{D_{WWP}}{D} \times \frac{1}{R}$	$\frac{D_{WWP}}{D_{AVEP}} \times \frac{1}{R}$	$\frac{Q_{WWP}}{Q_{AVEP}} \times \frac{1}{R}$
(in)	(in)	(gpm)	$\frac{D_{AVEP}}{D} \times 100\%$	(in)	(in)	(gpm)				
Division Street-1B	12	6.59	N/A	54.9%	N/A	N/A	N/A	N/A	N/A	N/A
Shop PS-2	30	10.36	918	34.5%	N/A	N/A	N/A	N/A	N/A	N/A
Shop PS-1	30	10.62	767	35.4%	N/A	N/A	N/A	N/A	N/A	N/A
Division-2	10	6.10	N/A	61.0%	N/A	N/A	N/A	N/A	N/A	N/A
Division-0	18	12.95	953	71.9%	N/A	N/A	N/A	N/A	N/A	N/A
Division-3	10	8.17	N/A	81.7%	N/A	N/A	N/A	N/A	N/A	N/A
21st Street-1	18	9.47	N/A	52.6%	N/A	N/A	N/A	N/A	N/A	N/A
Ward-1	10	5.64	N/A	56.4%	N/A	N/A	N/A	N/A	N/A	N/A
Ward-2	12	7.15	N/A	59.6%	N/A	N/A	N/A	N/A	N/A	N/A
Walker Park-1	10	4.16	148	41.6%	N/A	N/A	N/A	N/A	N/A	N/A
Ruddle-1	8	3.76	65	47.0%	N/A	N/A	N/A	N/A	N/A	N/A
Walker Park-2	10	6.79	205	67.9%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-1	12	17.82	N/A	148.5%	N/A	N/A	N/A	N/A	N/A	N/A
Walker Park-3	10	11.61	N/A	116.1%	N/A	N/A	N/A	N/A	N/A	N/A
Ward-3	8	8.35	N/A	104.4%	N/A	N/A	N/A	N/A	N/A	N/A
Lake Street-1	12	9.87	N/A	82.3%	N/A	N/A	N/A	N/A	N/A	N/A
Lake Street-2	12	5.03	N/A	41.9%	N/A	N/A	N/A	N/A	N/A	N/A
Lake Street-3	10	7.50	N/A	75.0%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-2	8	5.39	45	67.4%	N/A	N/A	N/A	N/A	N/A	N/A
McHaney Street-1	10	2.30	66	23.0%	N/A	N/A	N/A	N/A	N/A	N/A
Jake Rhoades-3	8	7.00	N/A	87.5%	N/A	N/A	N/A	N/A	N/A	N/A
705-1	8	6.28	263	78.5%	N/A	N/A	N/A	N/A	N/A	N/A
705-2	10	16.96	324	169.6%	N/A	N/A	N/A	N/A	N/A	N/A
McHaney Street-2	18	5.33	N/A	29.6%	N/A	N/A	N/A	N/A	N/A	N/A
705-3	8	5.45	7	68.1%	0.79	24.65	N/A	3.9	5.7	N/A
Division Street-1A	12	3.26	121	27.2%	N/A	N/A	N/A	N/A	N/A	N/A
1767-1	8	4.56	44	57.0%	N/A	N/A	N/A	N/A	N/A	N/A
1767-2	8	1.49	5	18.6%	N/A	N/A	N/A	N/A	N/A	N/A
820-1	12	3.08	N/A	25.7%	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 2 - CCSE PARAMETERS AND FACTORS

Site Name	Pipe Diameter	Average Peak Flow Depth	Average Peak Flow Rate	Dry Weather Capacity Ratio (%Full)	Averaged Factors		
					Wet Weather Capacity Ratio	Wet Weather Peak to Dry Weather Peak	Wet Weather Peak Flow to Dry Weather Peak Flow
					$\frac{D_{WWP}}{D} \times \frac{1}{R}$	$\frac{D_{WWP}}{D_{AVEP}} \times \frac{1}{R}$	$\frac{Q_{WWP}}{Q_{AVEP}} \times \frac{1}{R}$
	D (in)	D _{AVEP} (in)	Q _{AVEP} (gpm)	$\frac{D_{AVEP}}{D} \times 100\%$			
Division Street-1B	12	6.59	N/A	54.9%	N/A	N/A	N/A
Shop PS-2	30	10.36	918	34.5%	0.8	2.3	3.3
Shop PS-1	30	10.62	767	35.4%	0.8	2.3	3.8
Division-2	10	6.10	N/A	61.0%	1.2	2.0	N/A
Division-0	18	12.95	953	71.9%	0.7	1.0	1.4
Division-3	10	8.17	N/A	81.7%	0.7	0.9	N/A
21st Street-1	18	9.47	N/A	52.6%	0.4	0.8	N/A
Ward-1	10	5.64	N/A	56.4%	3.3	5.8	N/A
Ward-2	12	7.15	N/A	59.6%	2.4	4.0	N/A
Walker Park-1	10	4.16	148	41.6%	3.6	8.8	3.5
Ruddle-1	8	3.76	65	47.0%	3.0	6.4	2.2
Walker Park-2	10	6.79	205	67.9%	6.6	9.8	2.7
Jake Rhoades-1	12	17.82	N/A	148.5%	1.3	0.9	N/A
Walker Park-3	10	11.61	N/A	116.1%	1.6	1.4	N/A
Ward-3	8	8.35	N/A	104.4%	1.2	1.1	N/A
Lake Street-1	12	9.87	N/A	82.3%	0.7	0.9	N/A
Lake Street-2	12	5.03	N/A	41.9%	N/A	N/A	N/A
Lake Street-3	10	7.50	N/A	75.0%	N/A	N/A	N/A
Jake Rhoades-2	8	5.39	45	67.4%	N/A	N/A	N/A
McHaney Street-1	10	2.30	66	23.0%	0.8	3.3	7.2
Jake Rhoades-3	8	7.00	N/A	87.5%	1.4	1.7	N/A
705-1	8	6.28	263	78.5%	9.2	11.7	1.6
705-2	10	16.96	324	169.6%	8.8	5.2	2.5
McHaney Street-2	18	5.33	N/A	29.6%	0.5	1.7	N/A
705-3	8	5.45	7	68.1%	4.8	7.0	N/A
Division Street-1A	12	3.26	121	27.2%	0.9	3.3	4.3
1767-1	8	4.56	44	57.0%	9.3	16.3	2.9
1767-2	8	1.49	5	18.6%	8.2	43.9	N/A
820-1	12	3.08	N/A	25.7%	N/A	N/A	N/A

FIGURES






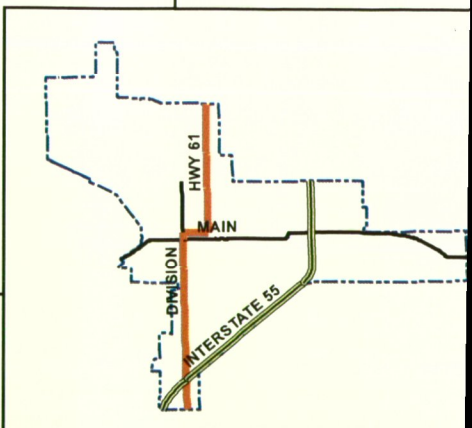
City of
Blytheville

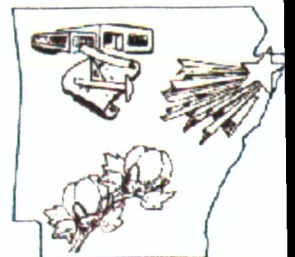
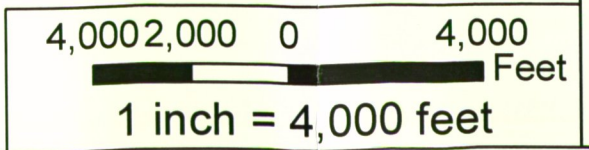
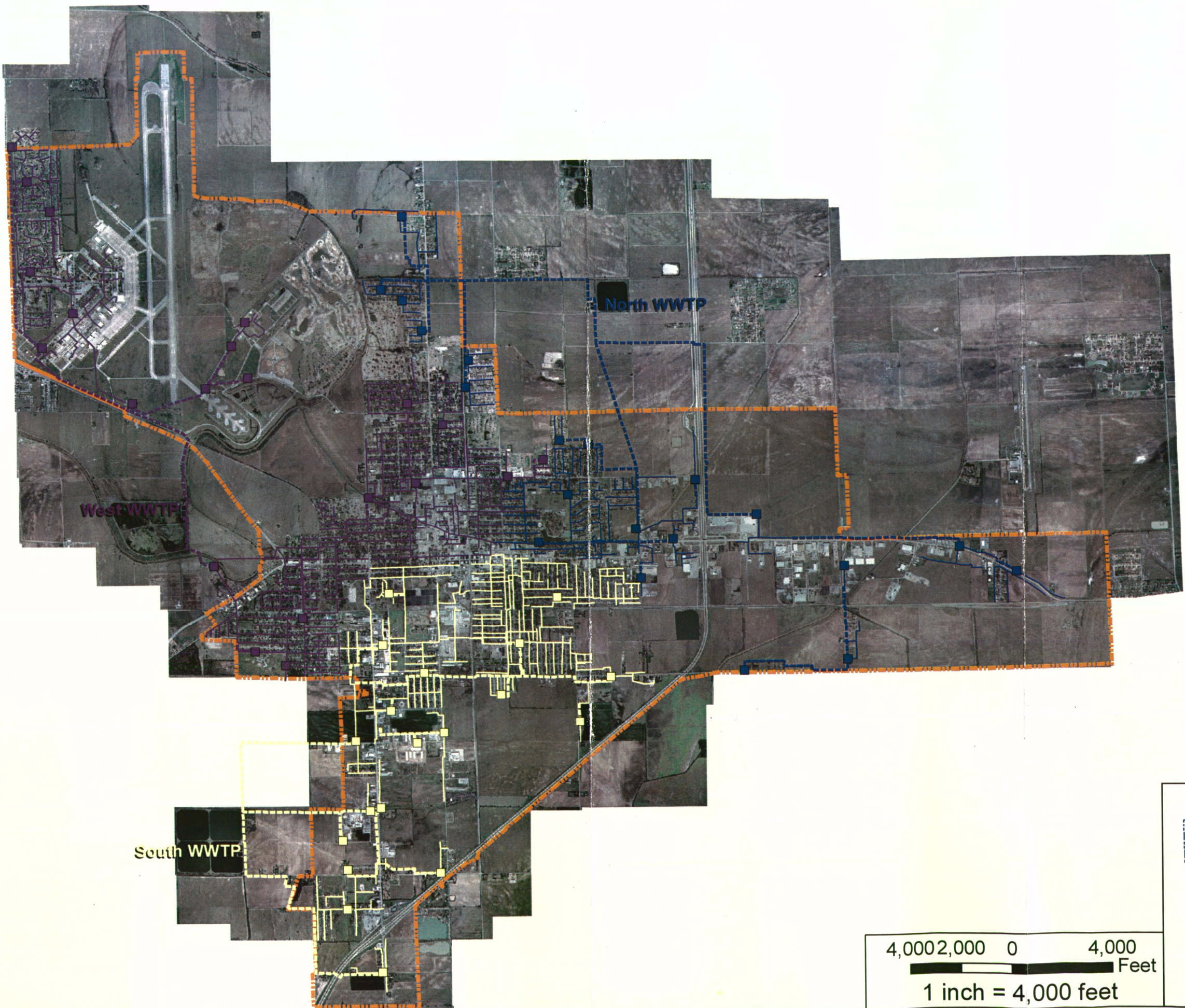


Figure 1

Collection System
Pump Stations

-  Pump Station
-  Sanitary Sewer
-  Force Main






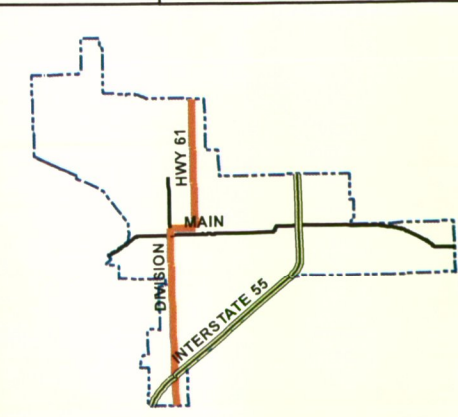


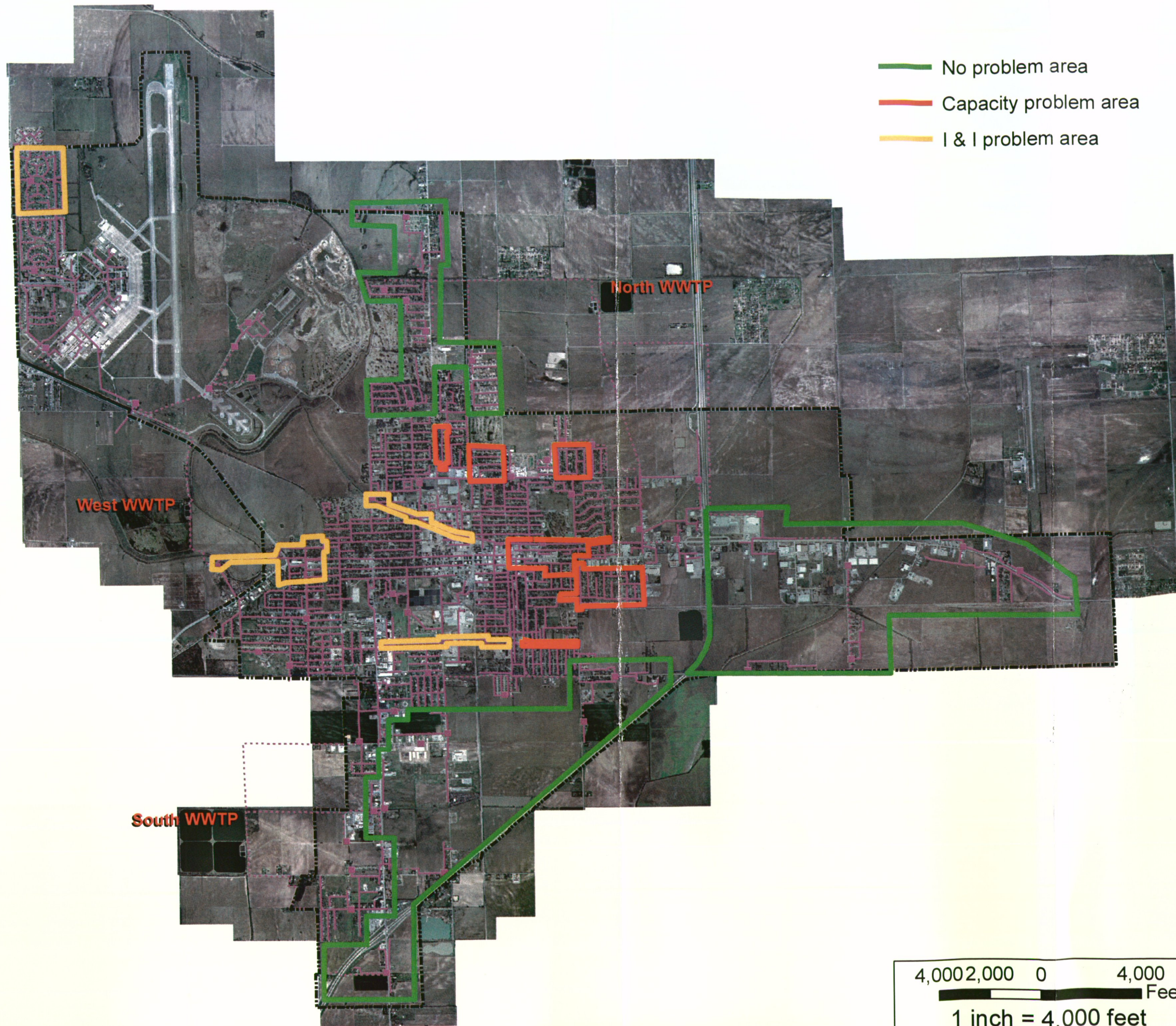
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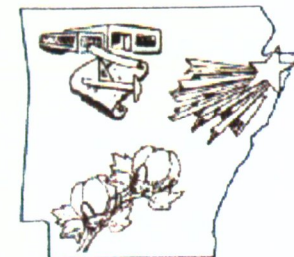
Figure 2
Blytheville Wastewater
Treatment Plants

-  Pump Station
-  Sanitary Sewer
-  Force Main





- No problem area
- Capacity problem area
- I & I problem area



City of
Blytheville

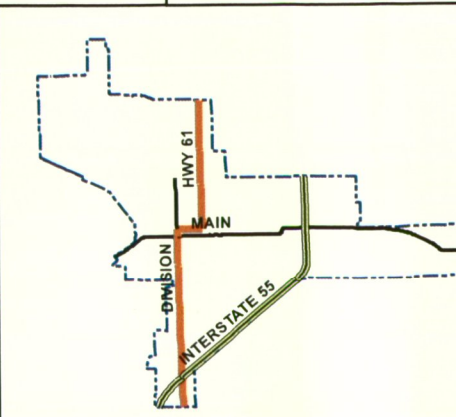


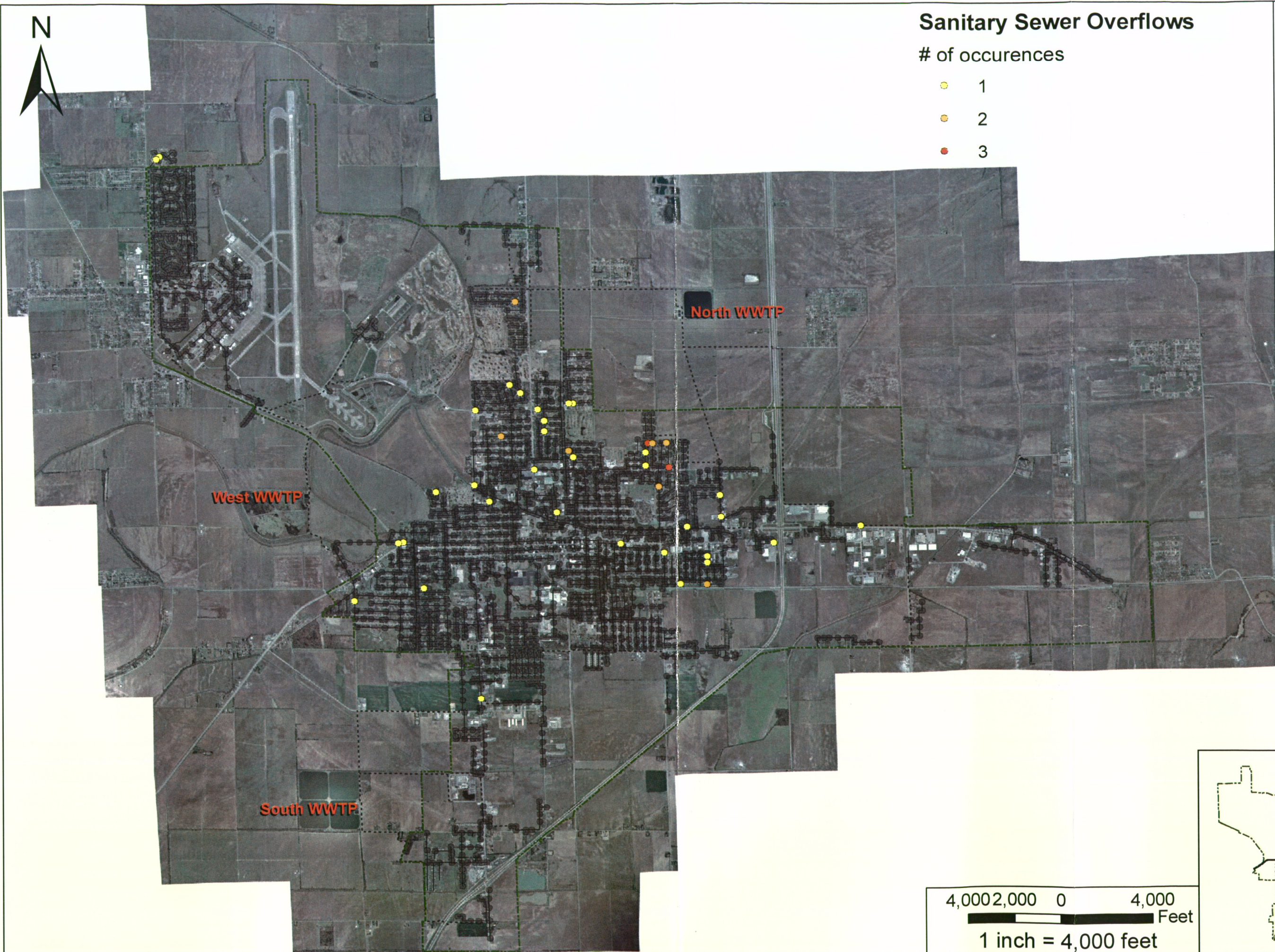
Figure 3

Areas of Focus
and Exclusion

- Pump Station
- Sanitary Sewer
- - - Force Main

4,000 2,000 0 4,000 Feet
1 inch = 4,000 feet

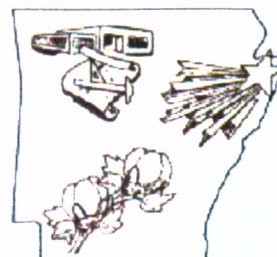




Sanitary Sewer Overflows

of occurrences

- 1
- 2
- 3



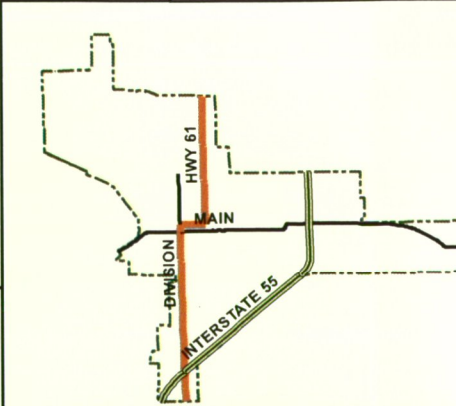
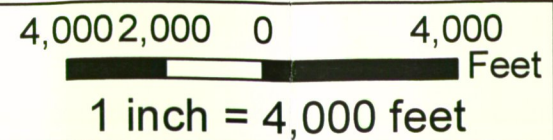
**City of
Blytheville**

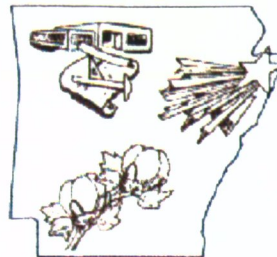
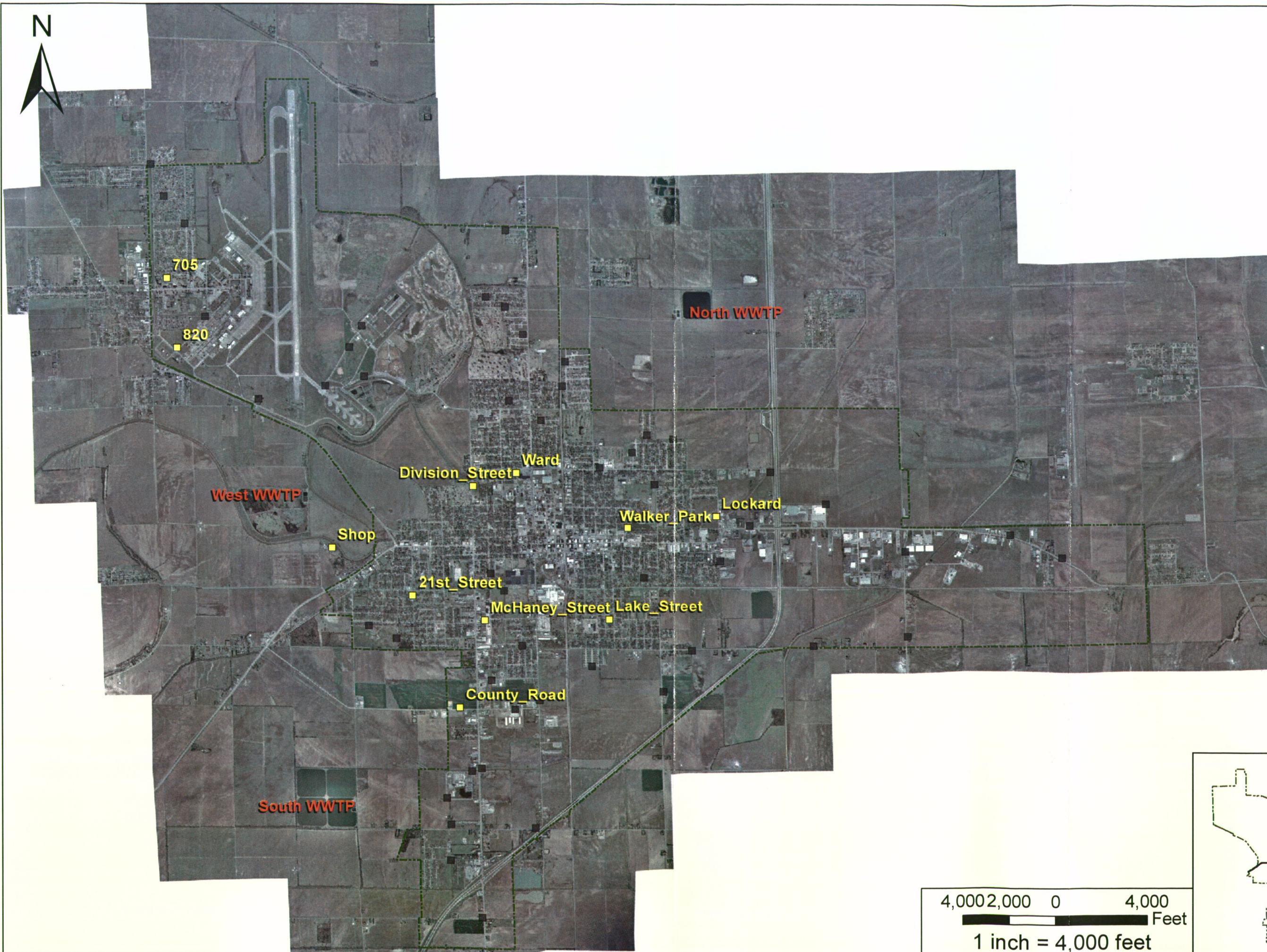


Figure 4

Sanitary Sewer
Overflows

- Manholes
- Pump Station
- Sanitary Sewer
- - - Force Main









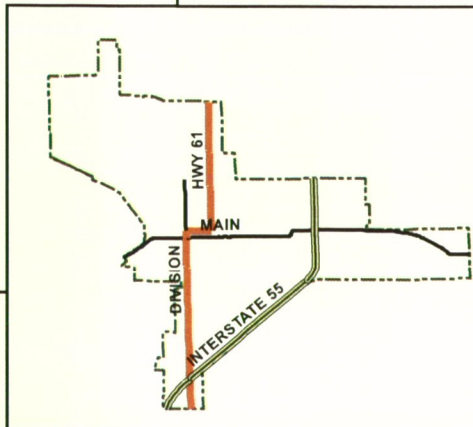
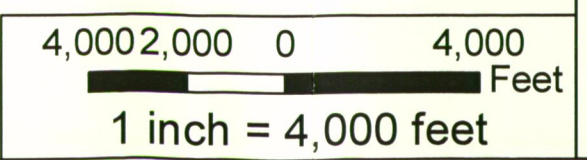
City of
Blytheville



Figure 5

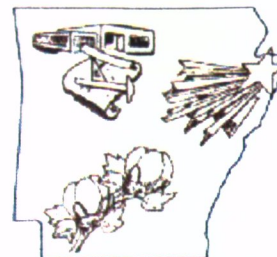
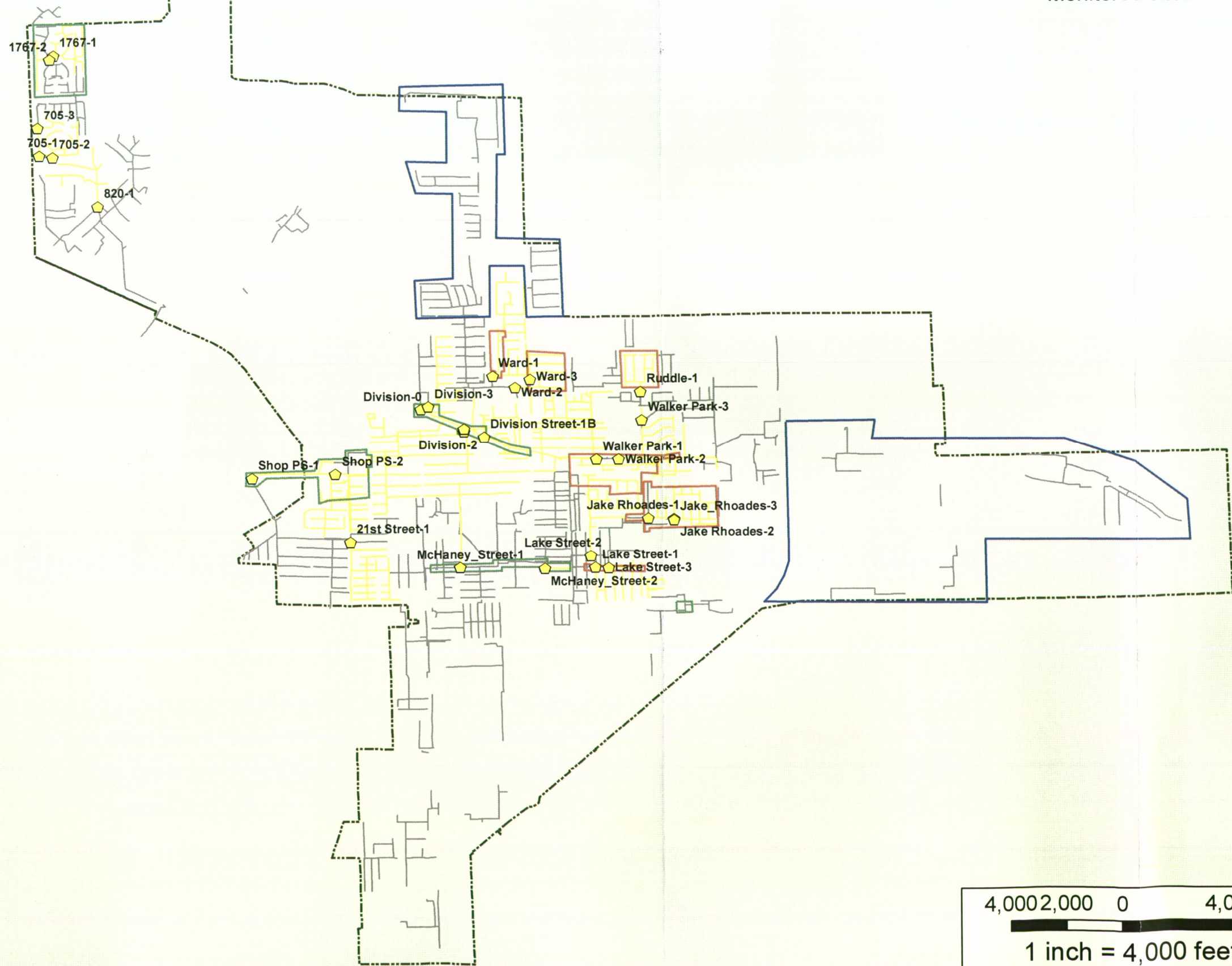
Major Pump Stations

-  Manholes
-  Pump Station
-  Sanitary Sewer
-  Force Main





- No problem area
- Capacity problem area
- I & I problem area
- ◊ Monitored sites



City of
Blytheville



Figure 6

Monitoring Sites

- Manholes
- Pump Station
- Sanitary Sewer
- - - Force Main

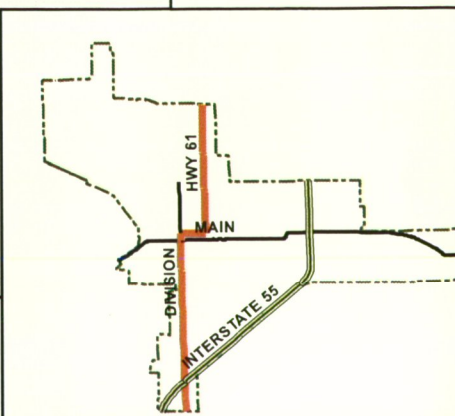
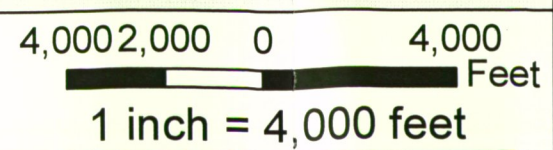


FIGURE 7
RAIN GAUGE COMPARISON

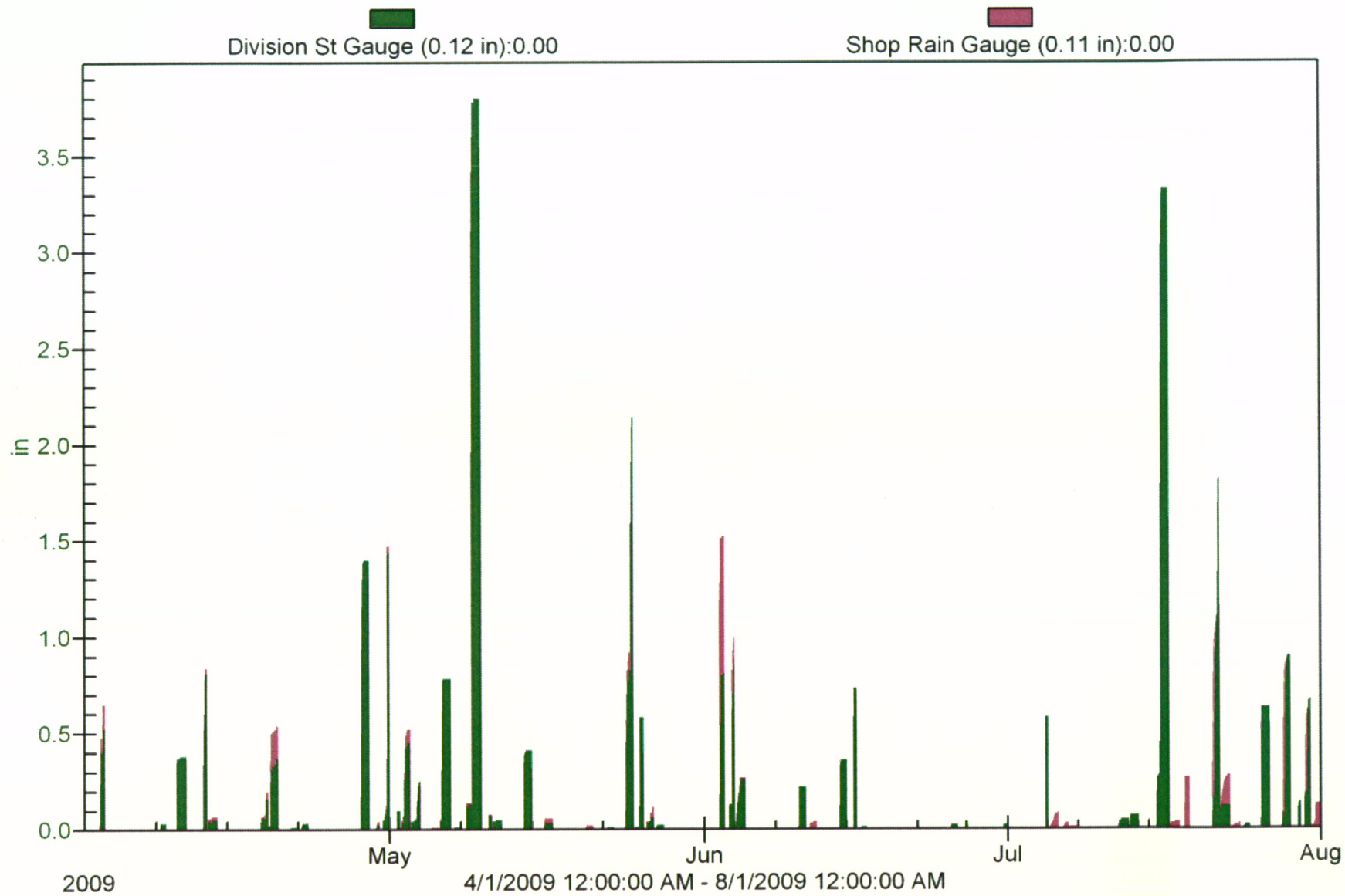


FIGURE 8
AVERAGED RAINFALL DATA

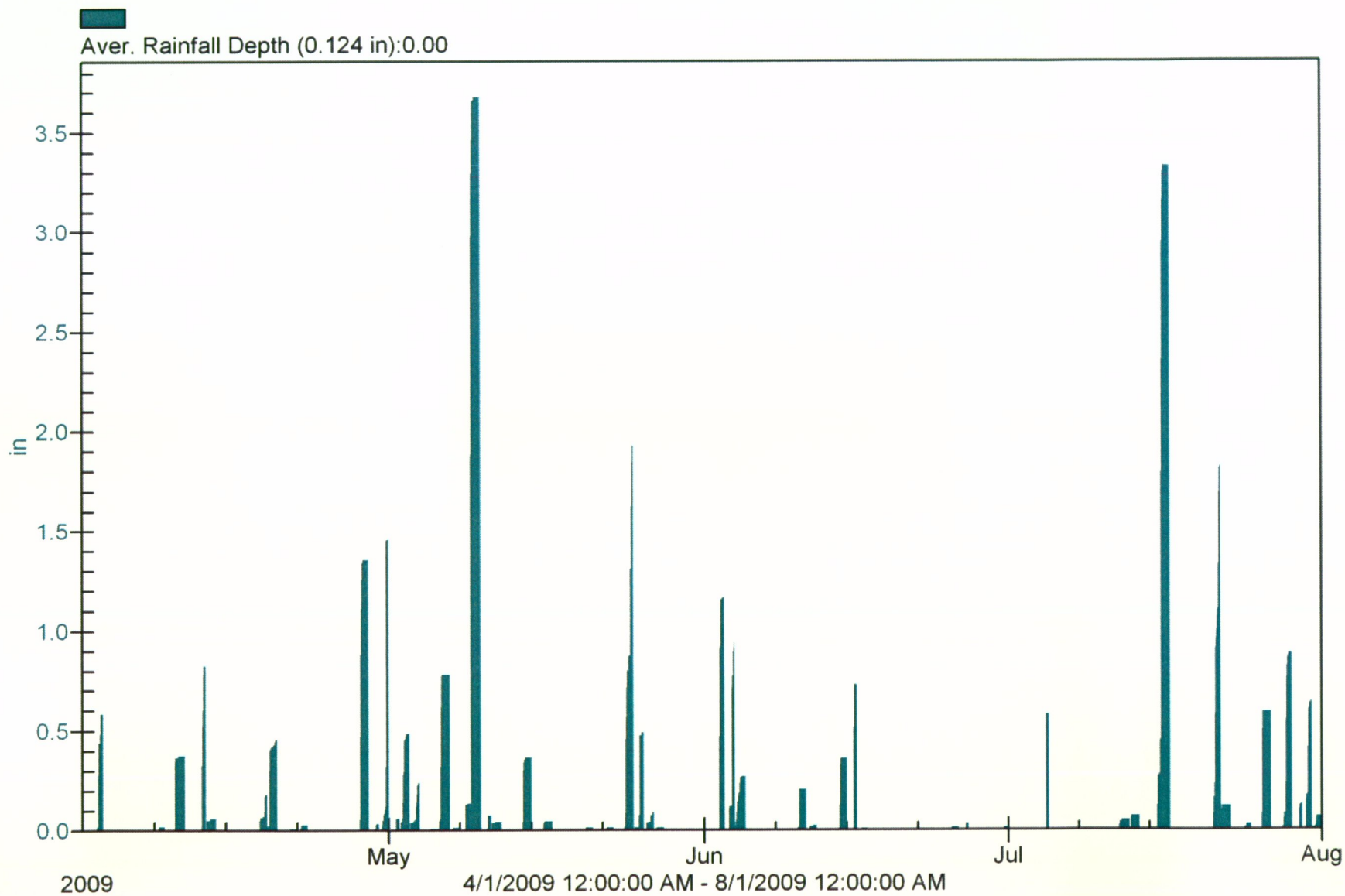


FIGURE 9
21ST STREET PUMP STATION RUN TIME

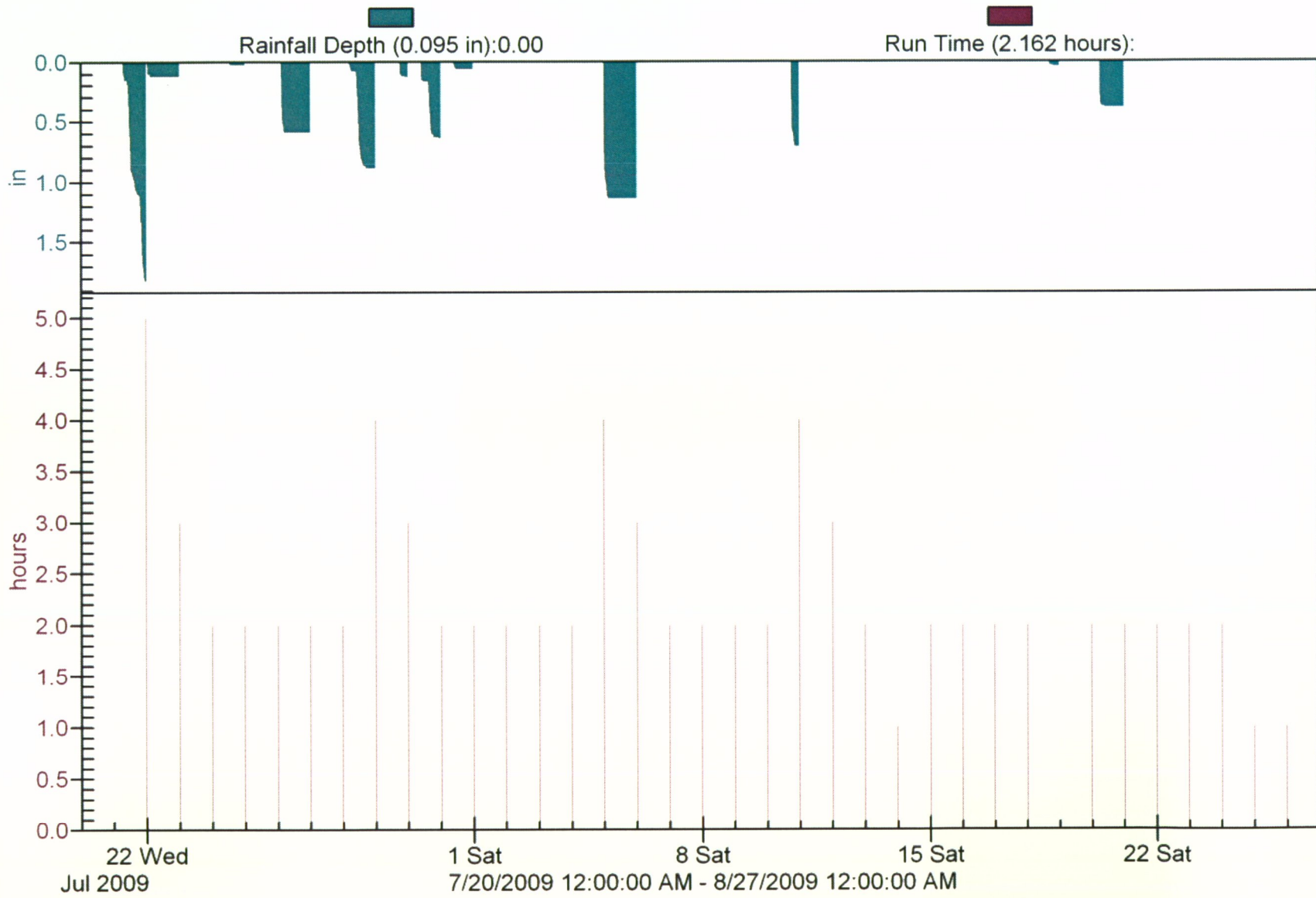


FIGURE 10
705 PUMP STATION RUN TIME

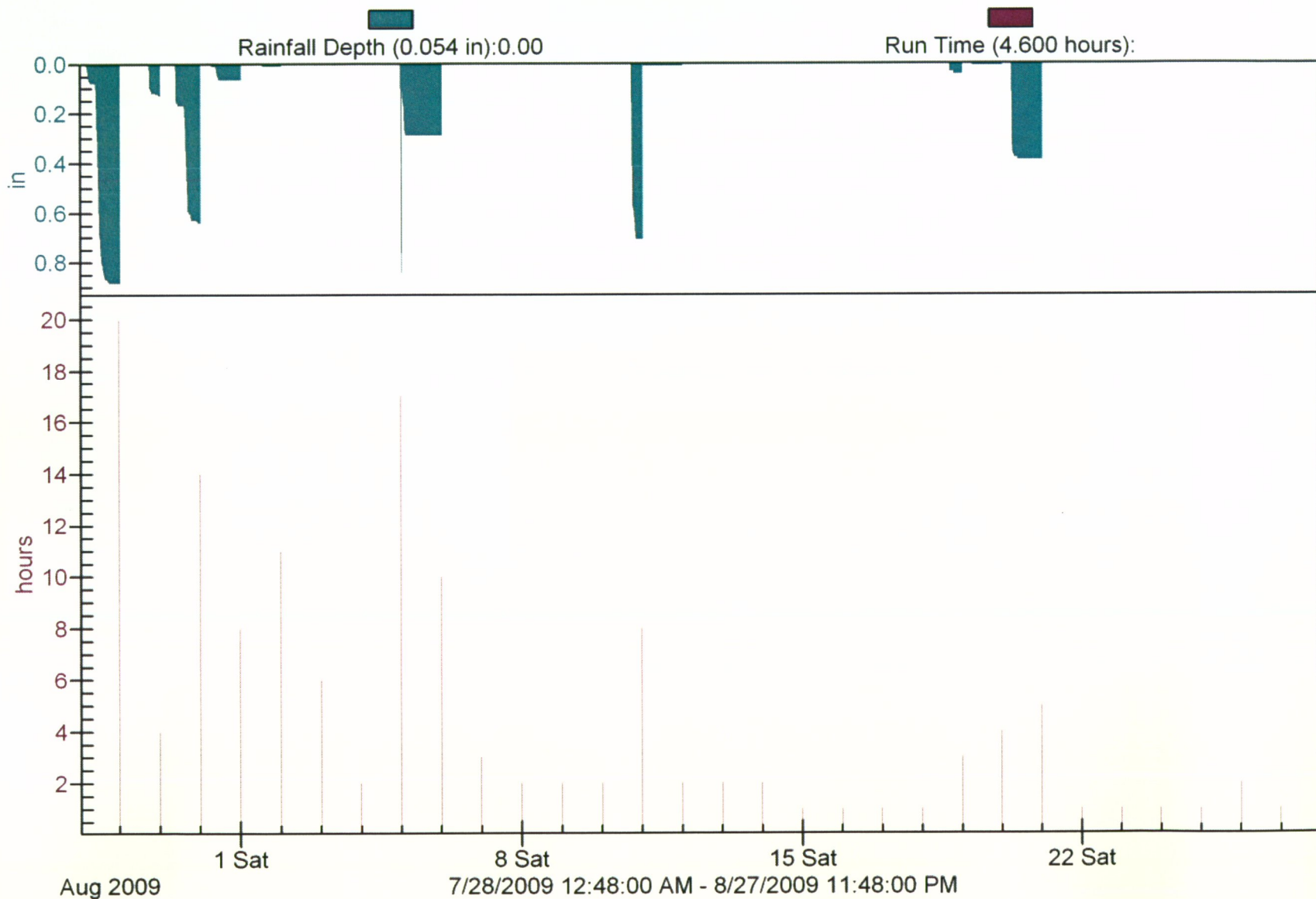


FIGURE 11
820 PUMP STATION RUN TIME

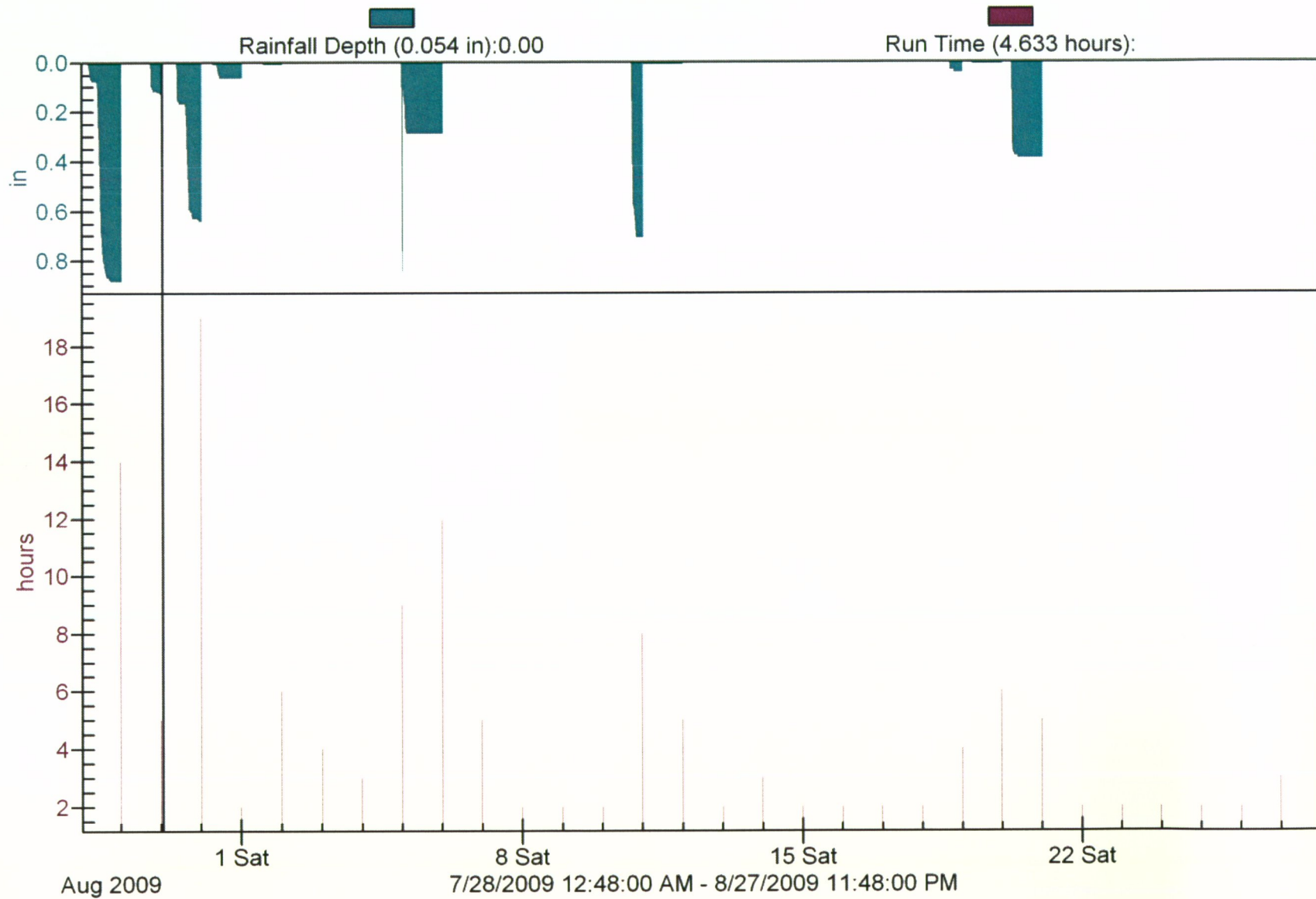


FIGURE 12
COUNTY ROAD PUMP STATION RUN TIME

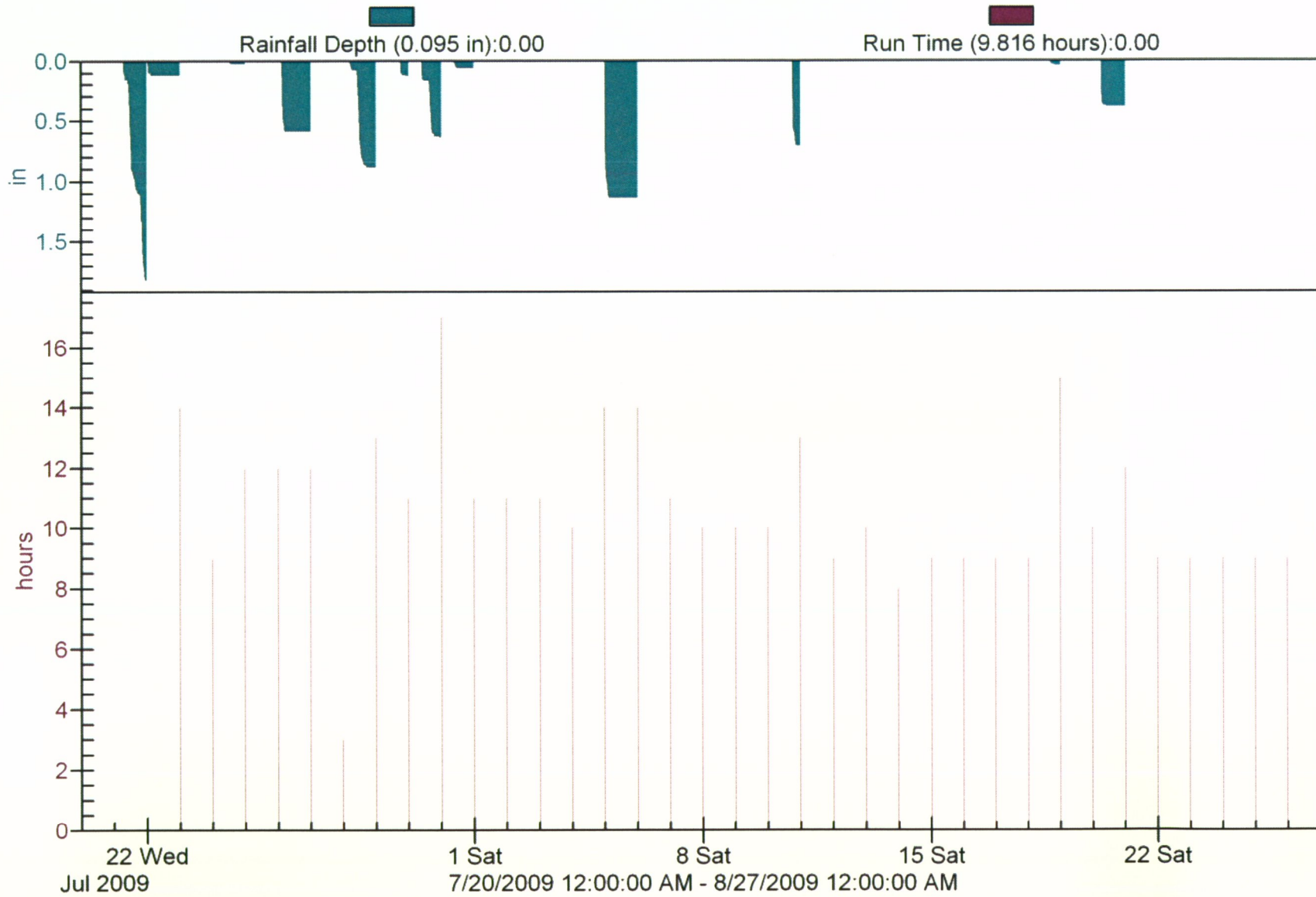


FIGURE 14

LAKE STREET PUMP STATION RUN TIME

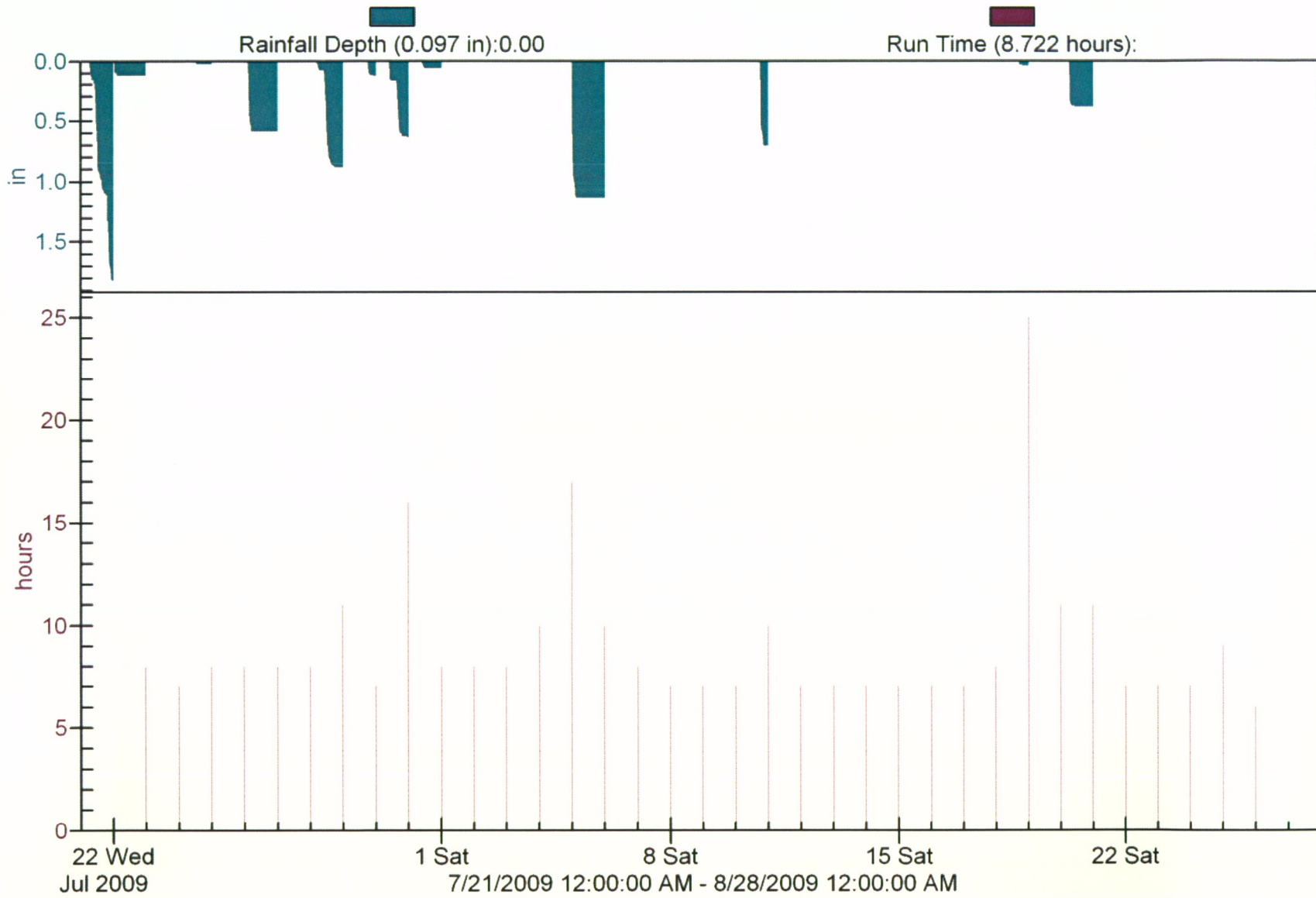


FIGURE 16

MCHANNEY STREET PUMP STATION RUN TIME

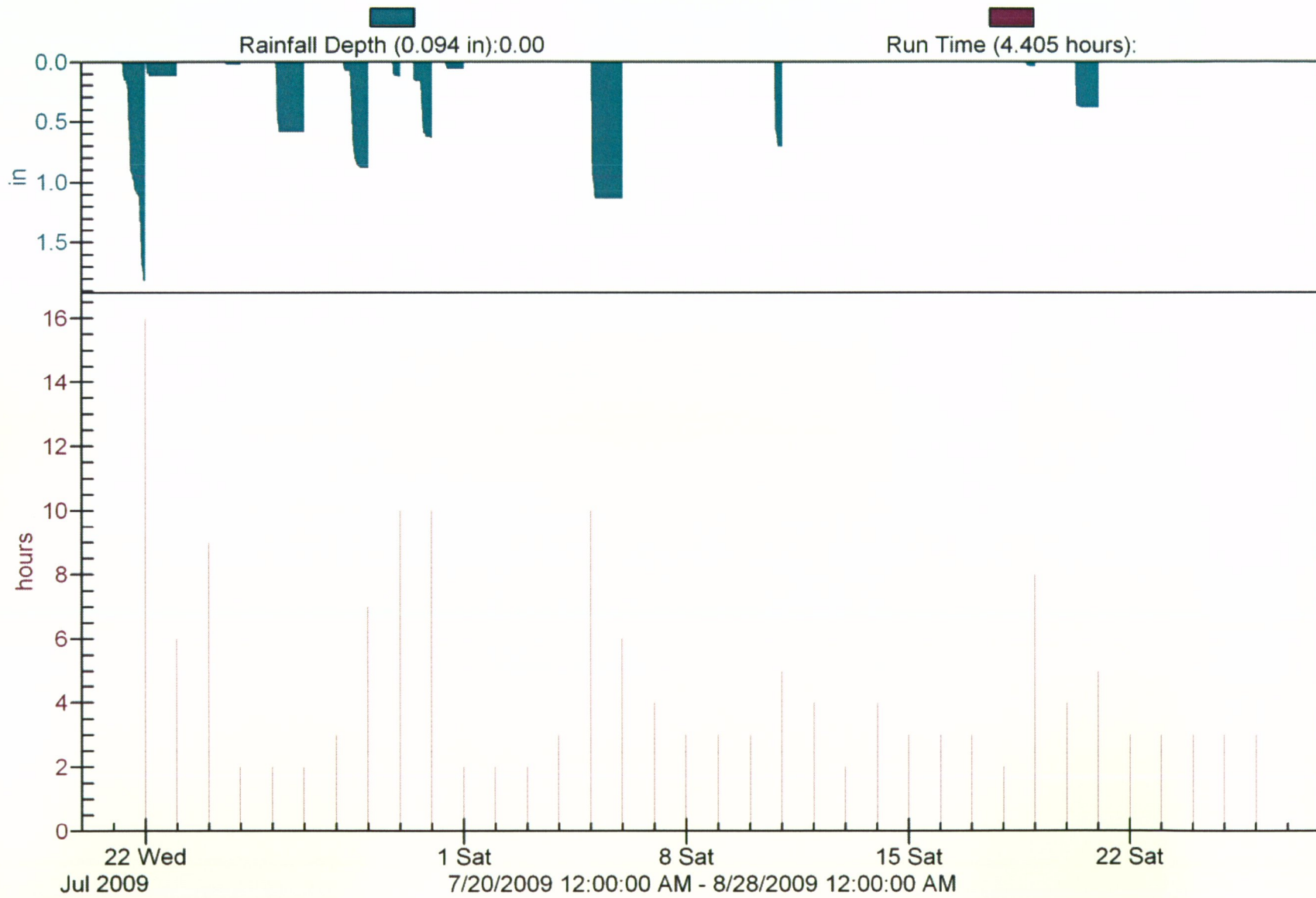


FIGURE 17
SHOP PUMP STATION RUN TIME

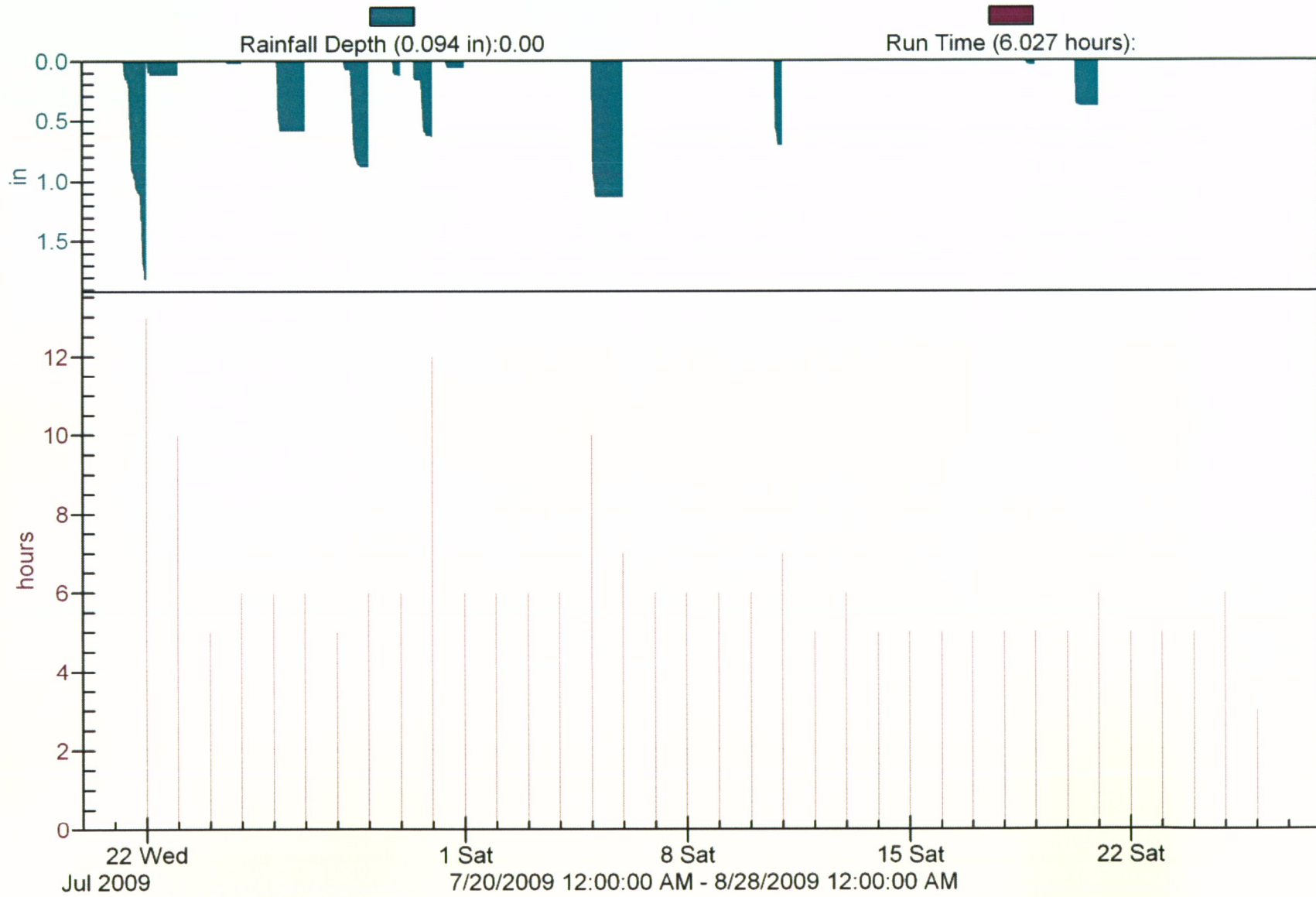


FIGURE 18
WALKER PARK PUMP STATION RUN TIME

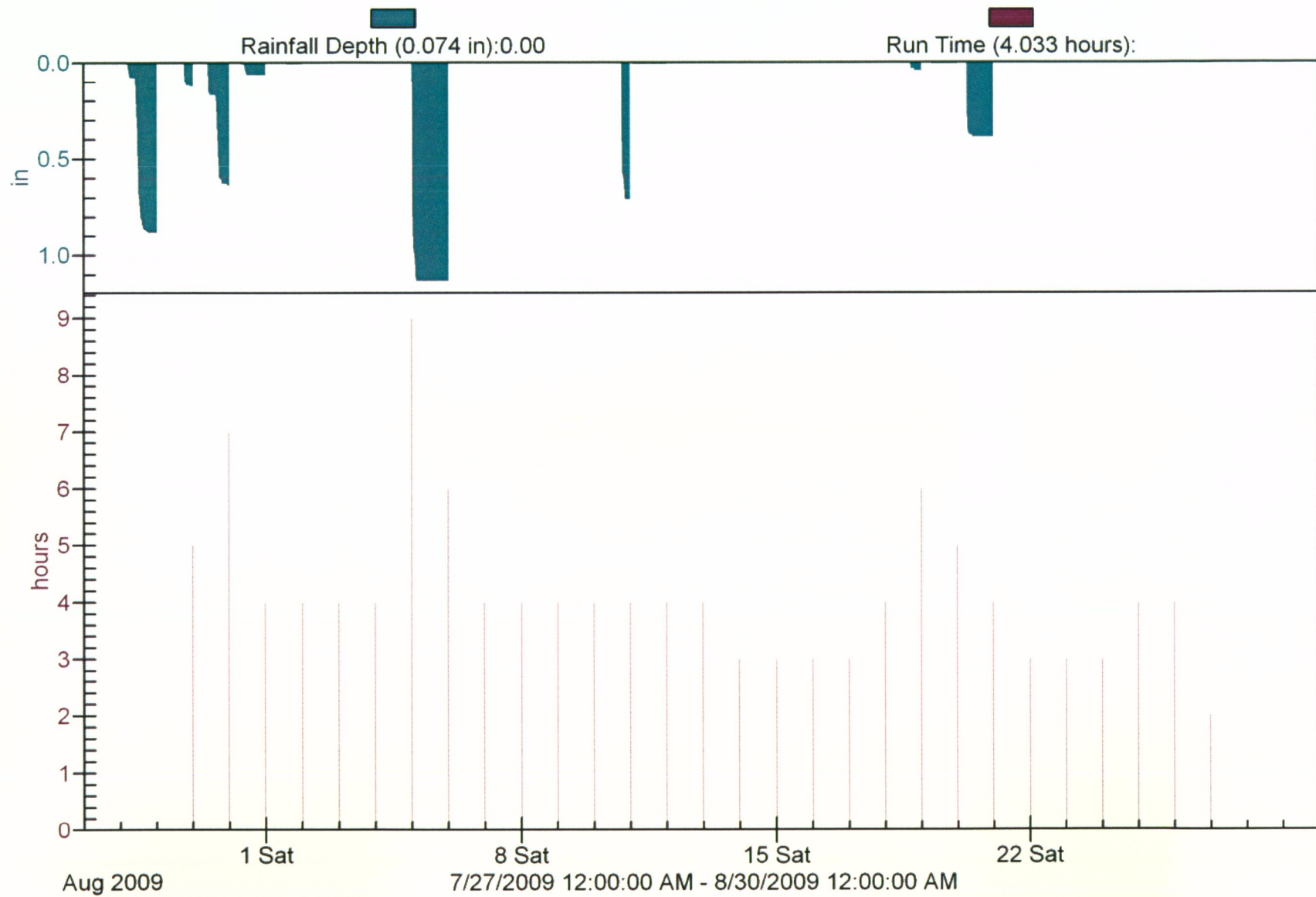


FIGURE 20
705-1 COMPILED SITE DATA

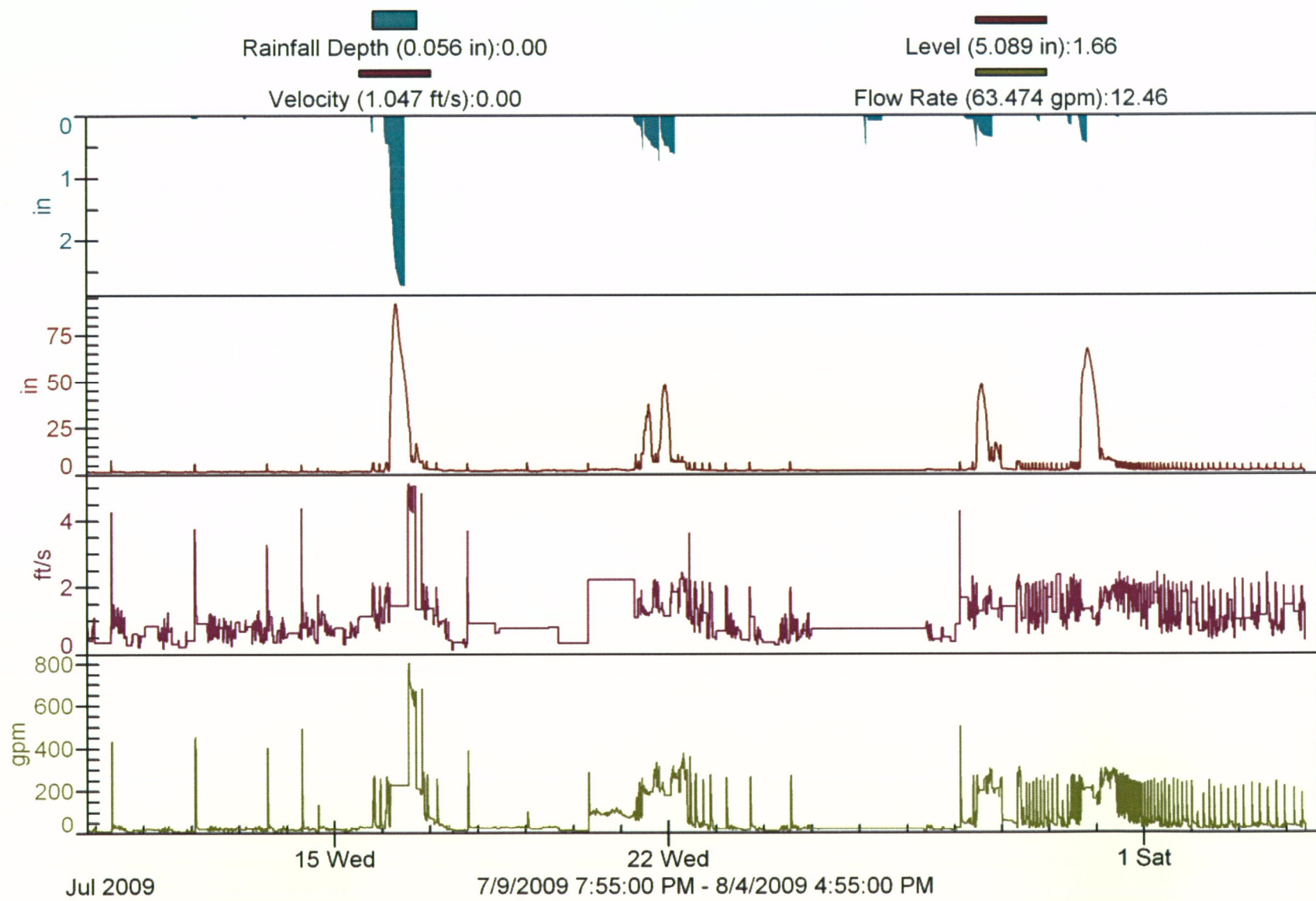


FIGURE 21
705-2 COMPILED SITE DATA

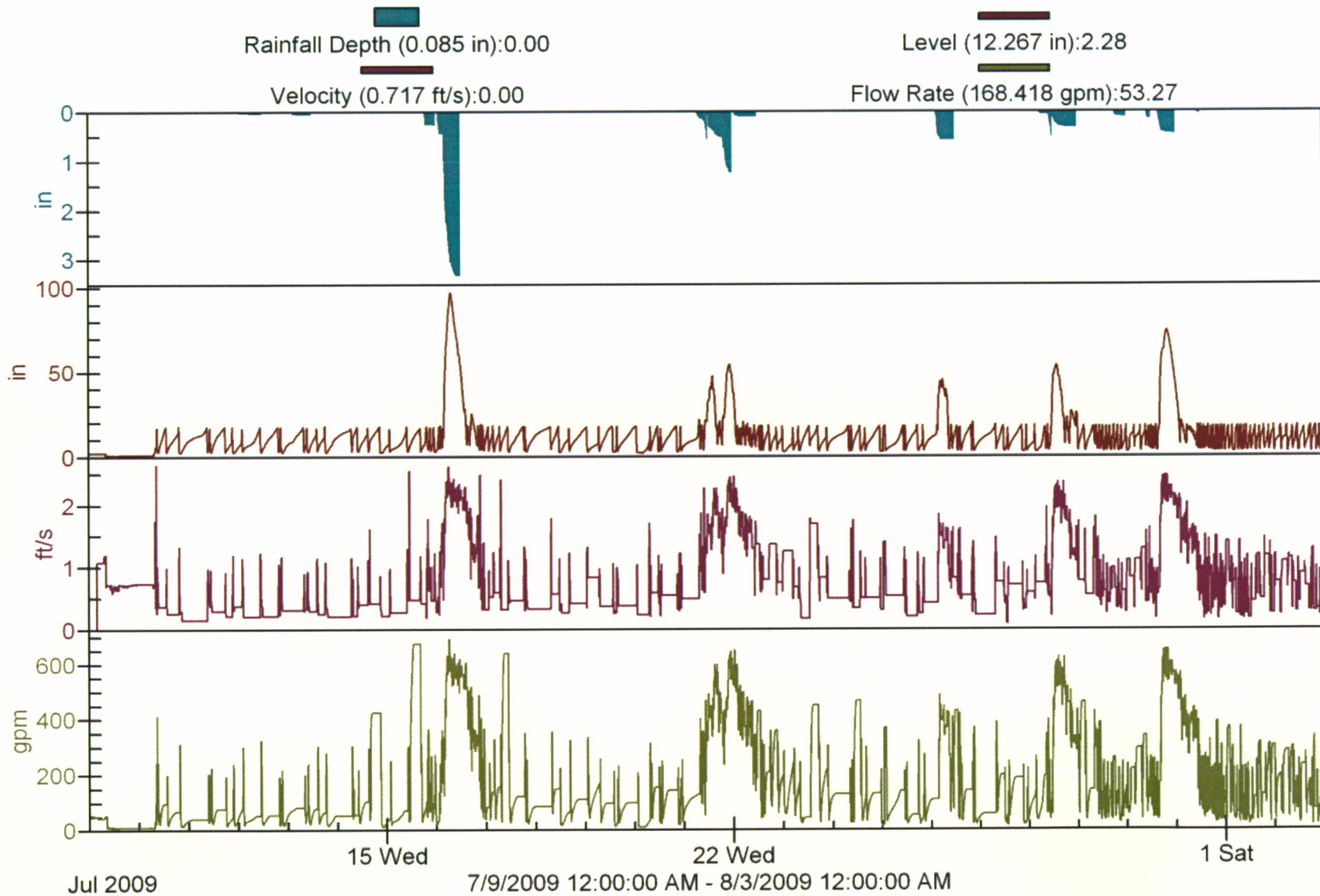


FIGURE 22
705-3 COMPILED SITE DATA

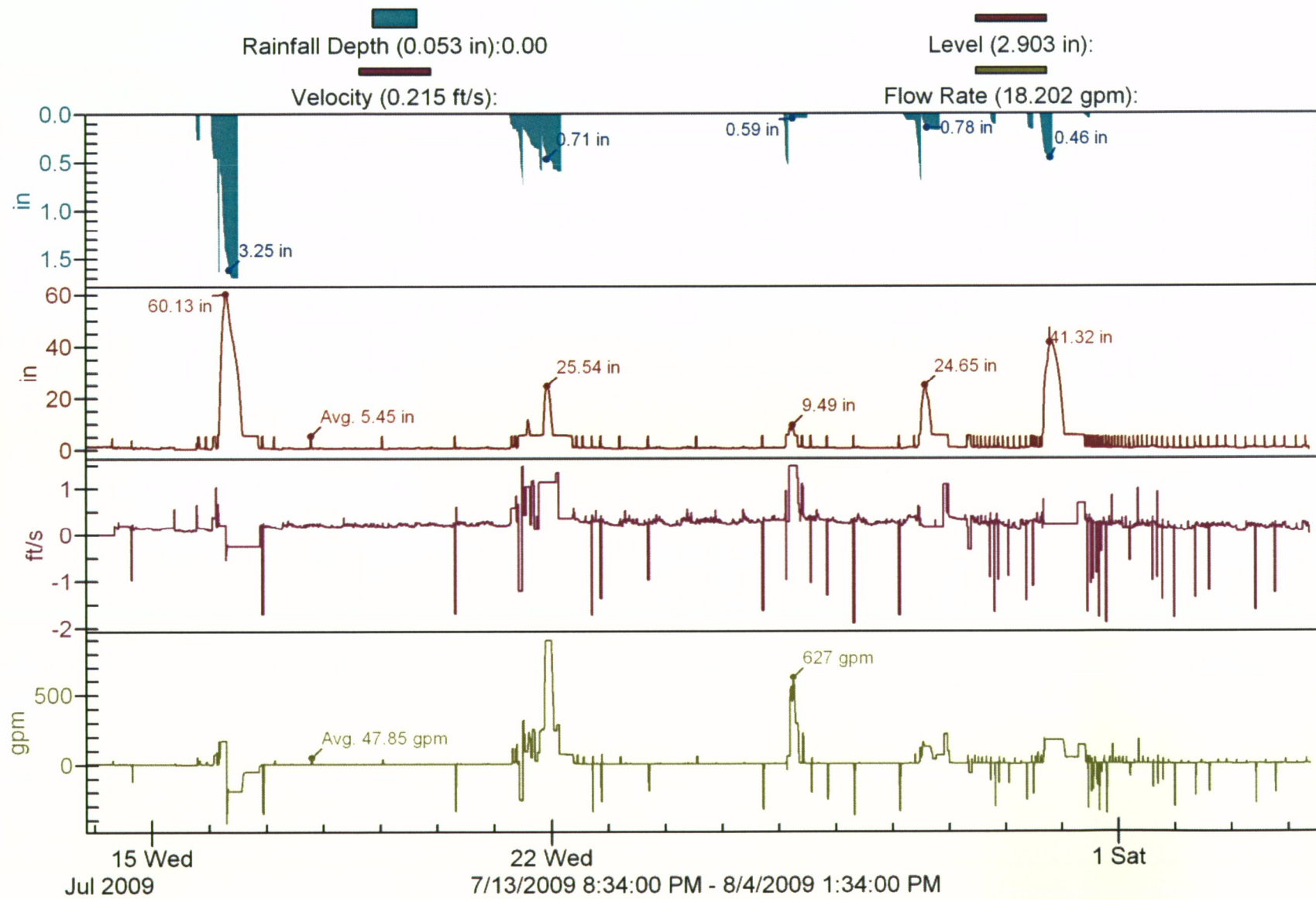


FIGURE 23
820-1 COMPILED SITE DATA

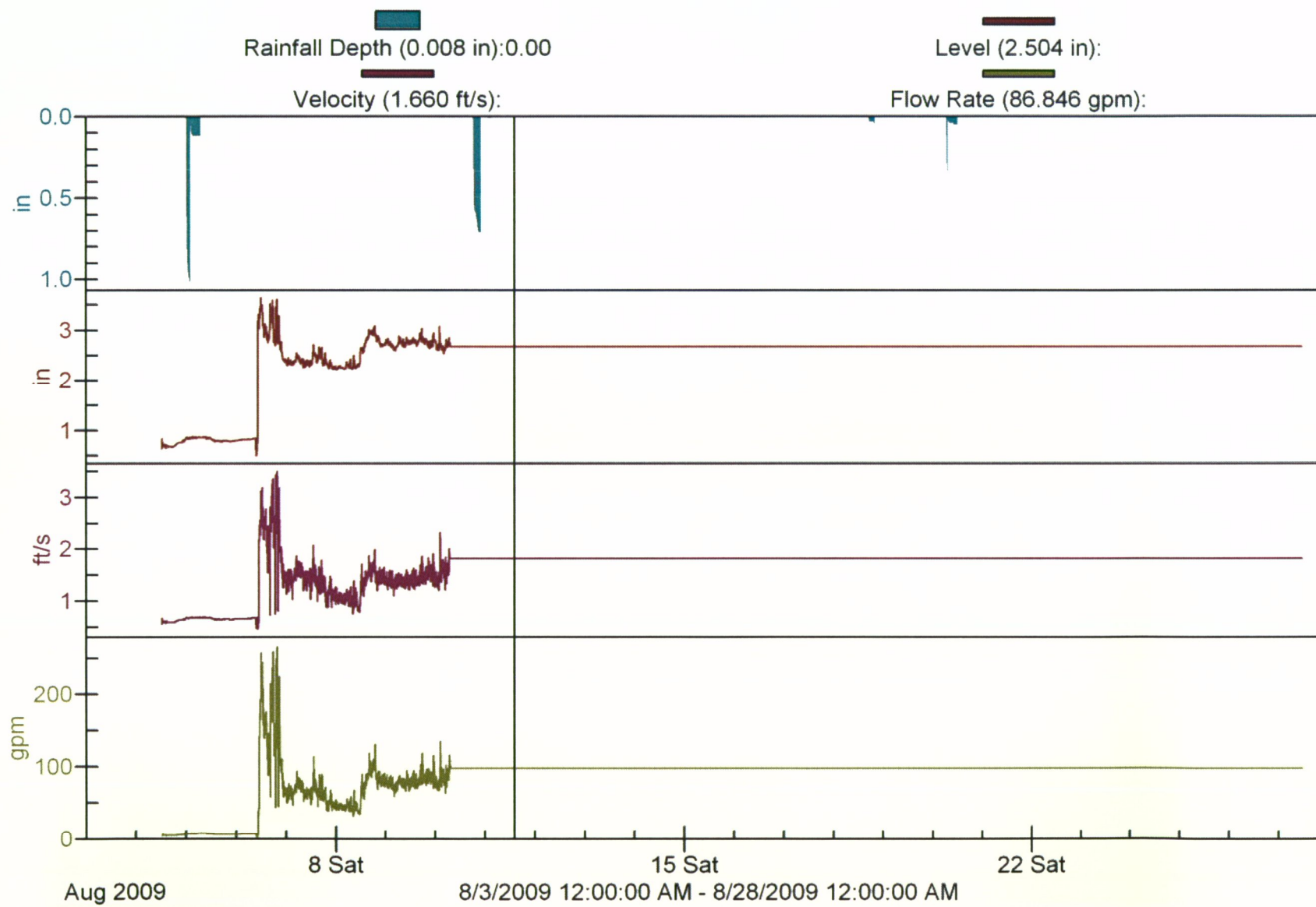


FIGURE 24
1767-1 COMPILED SITE DATA

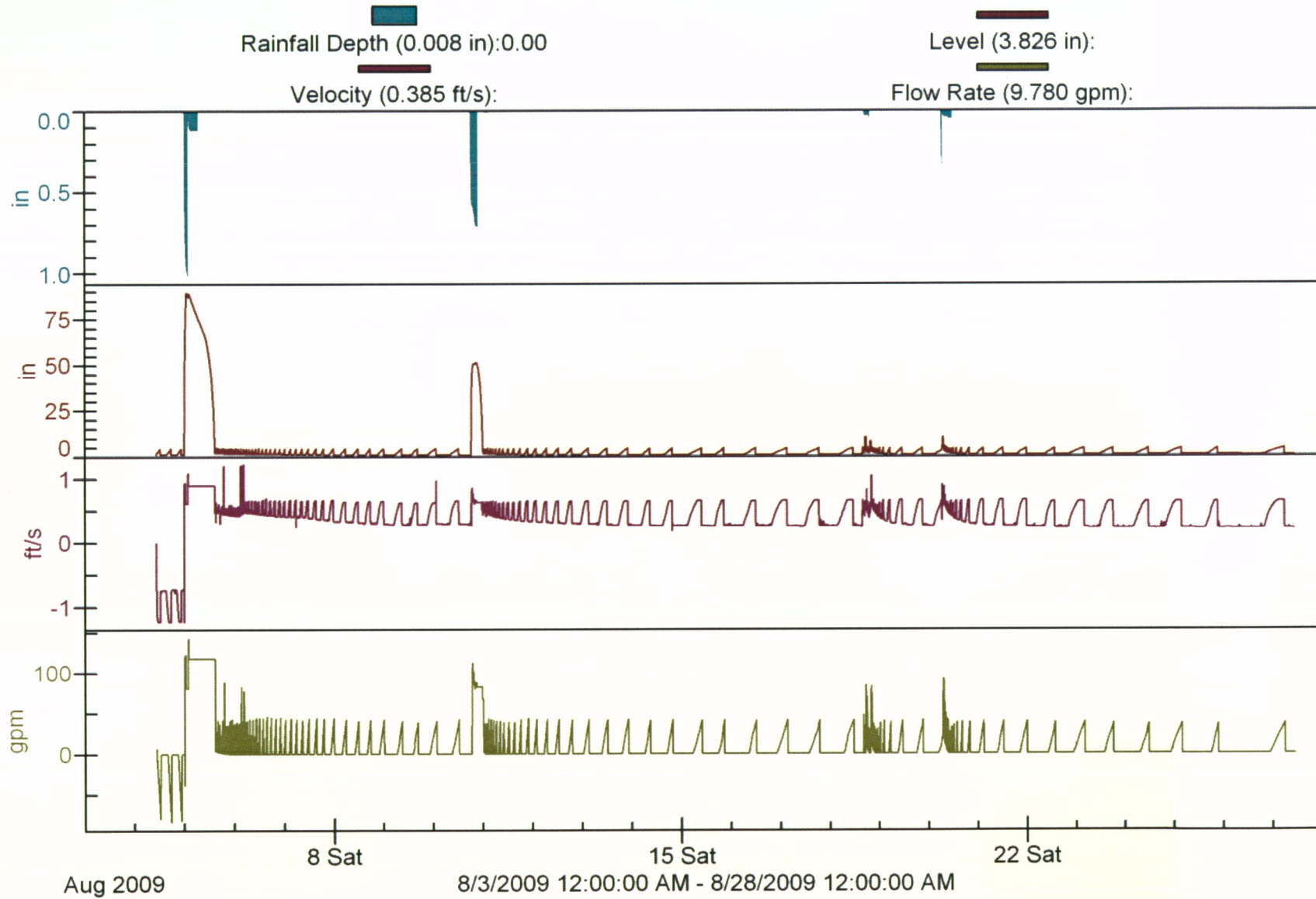


FIGURE 25
1767-2 COMPILED SITE DATA

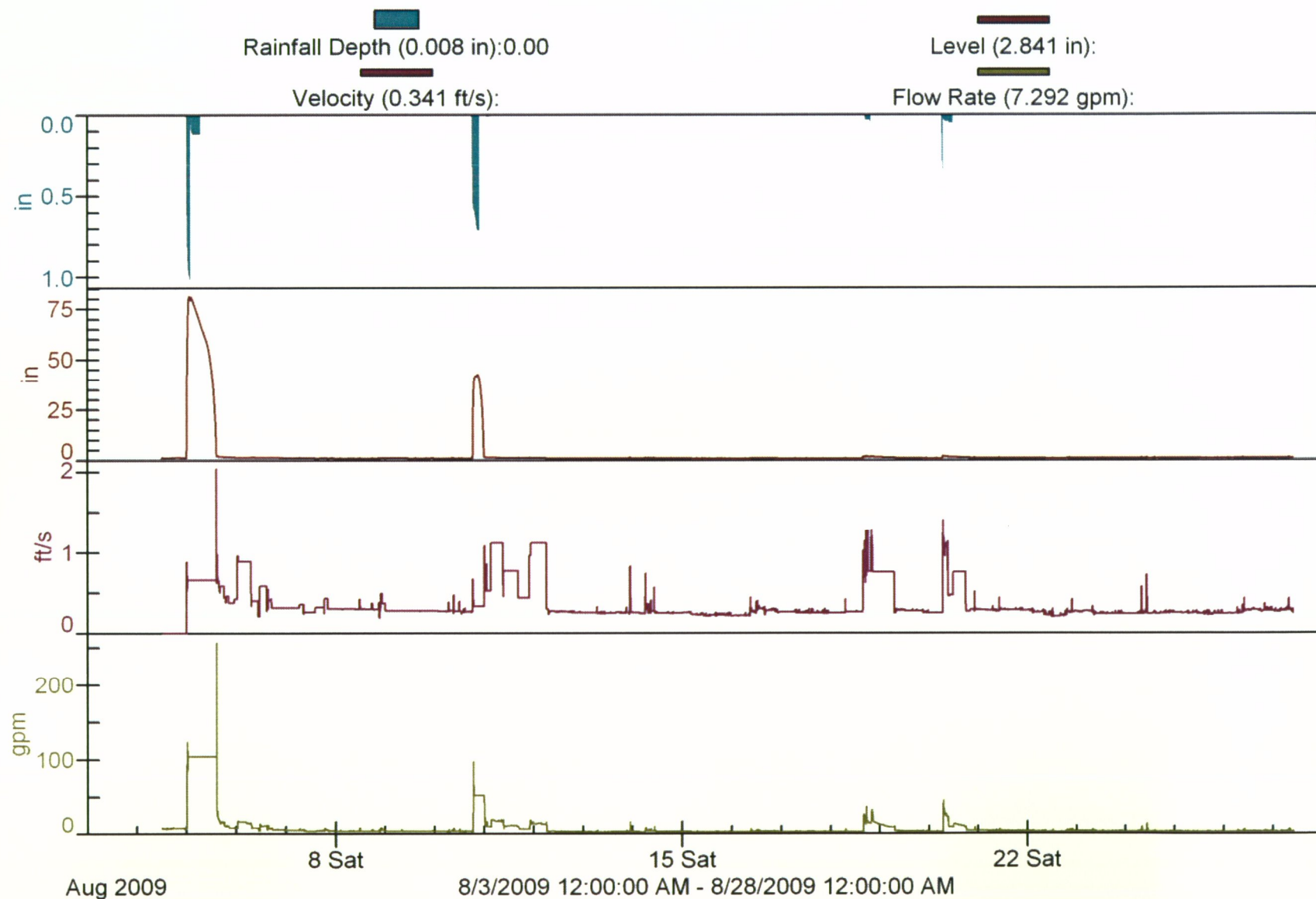


FIGURE 26
21ST STREET-1 COMPILED SITE DATA

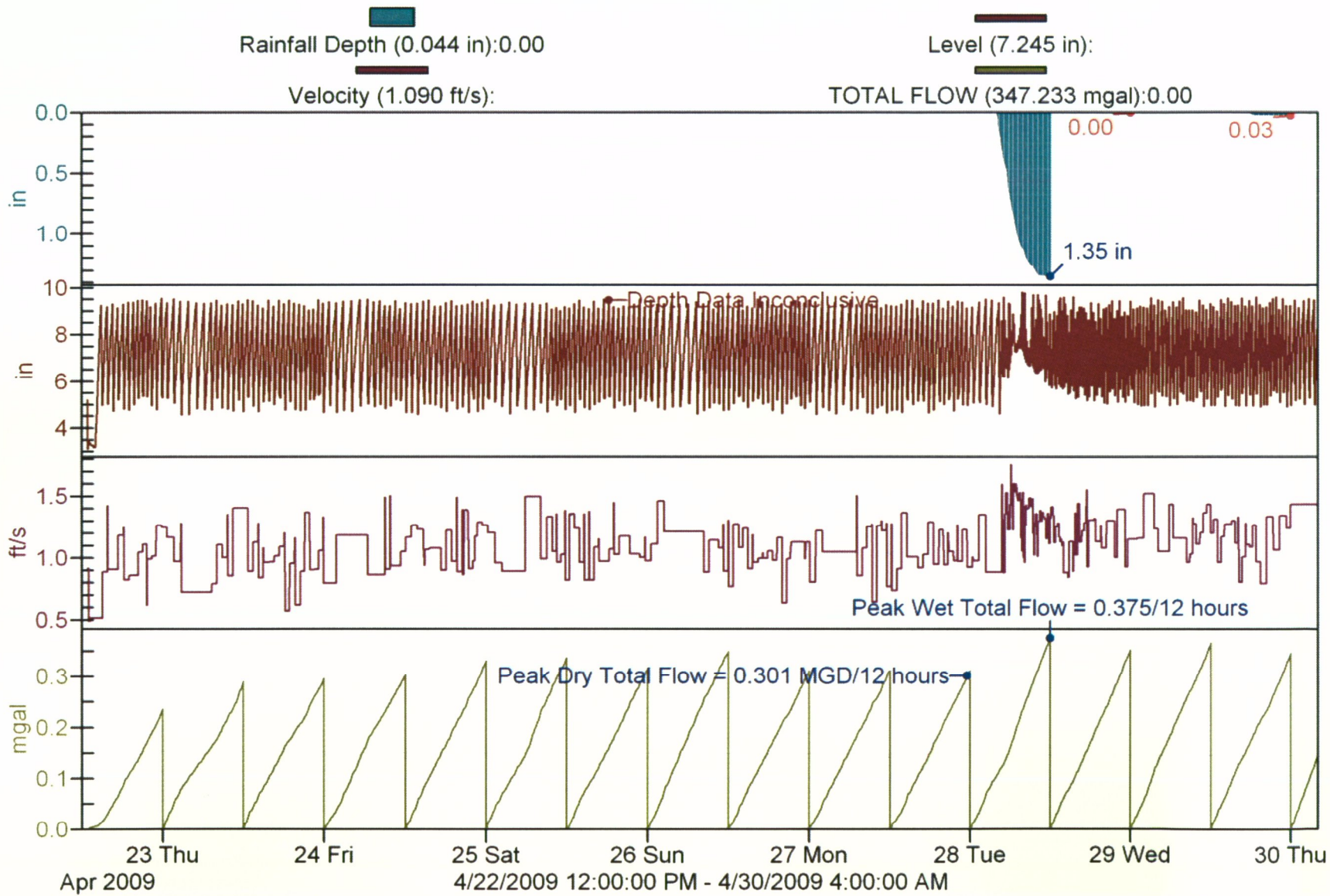


FIGURE 27
DIVISION-0 COMPILED SITE DATA

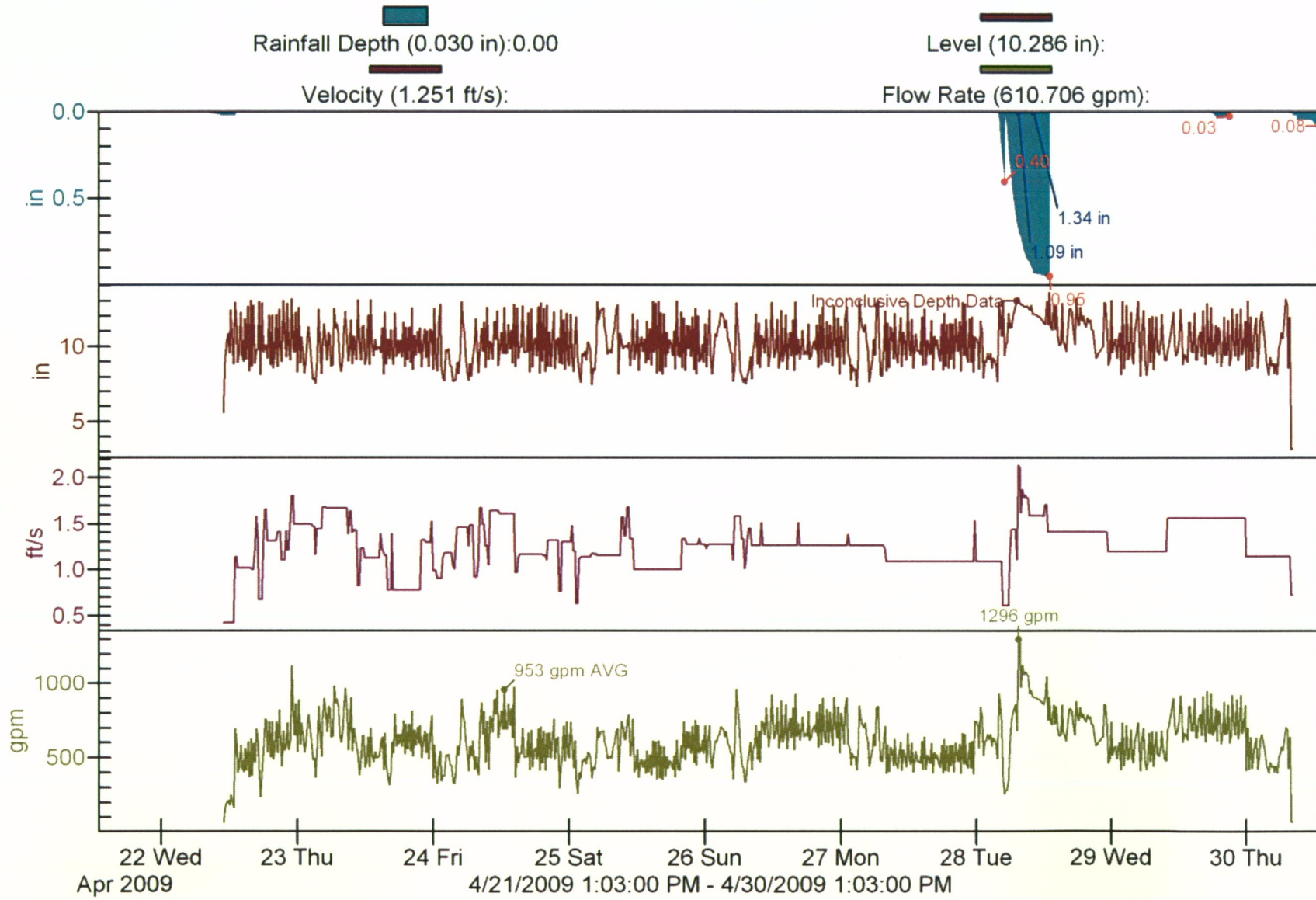


FIGURE 28

DIVISION STREET-1A COMPILED SITE DATA

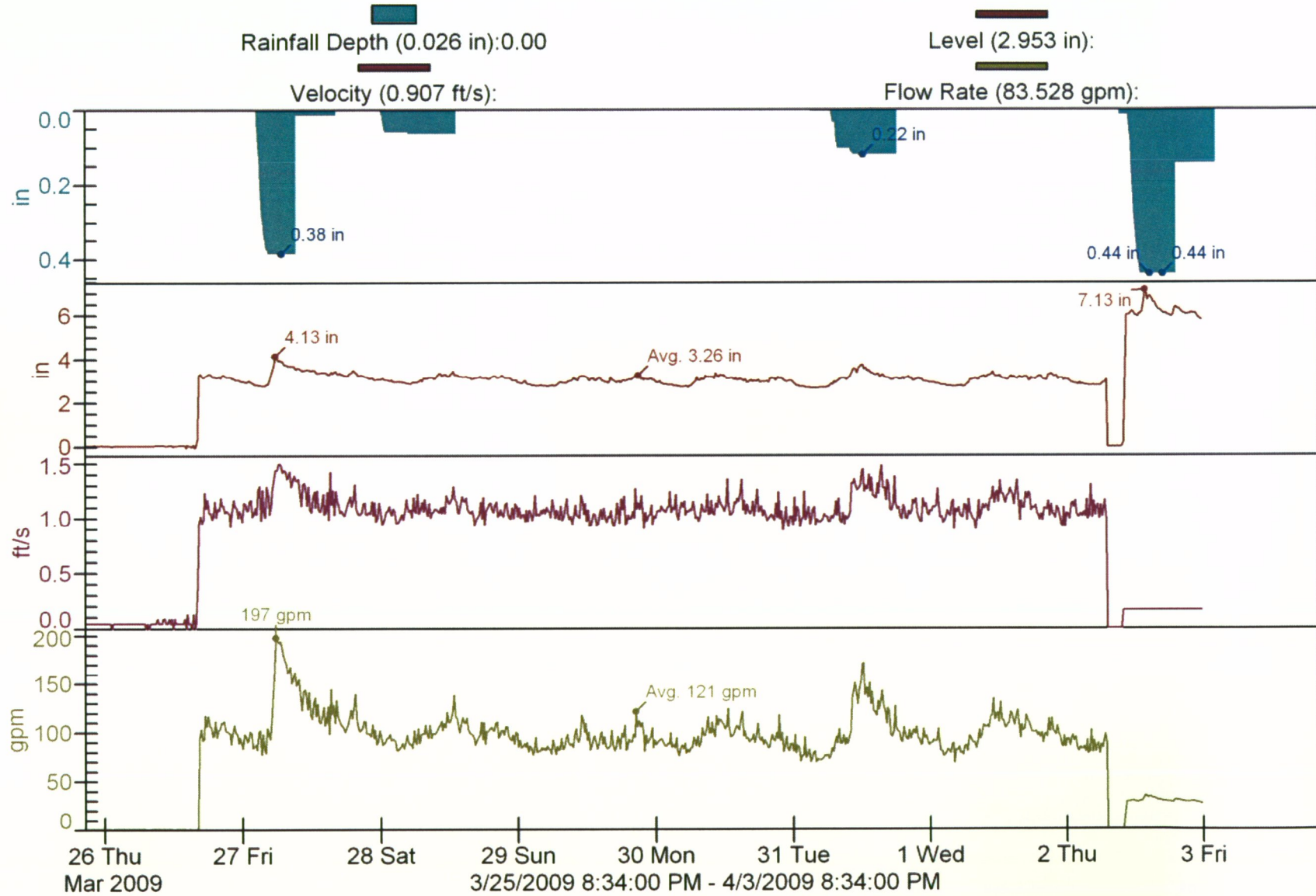


FIGURE 29
DIVISION-1B COMPILED SITE DATA

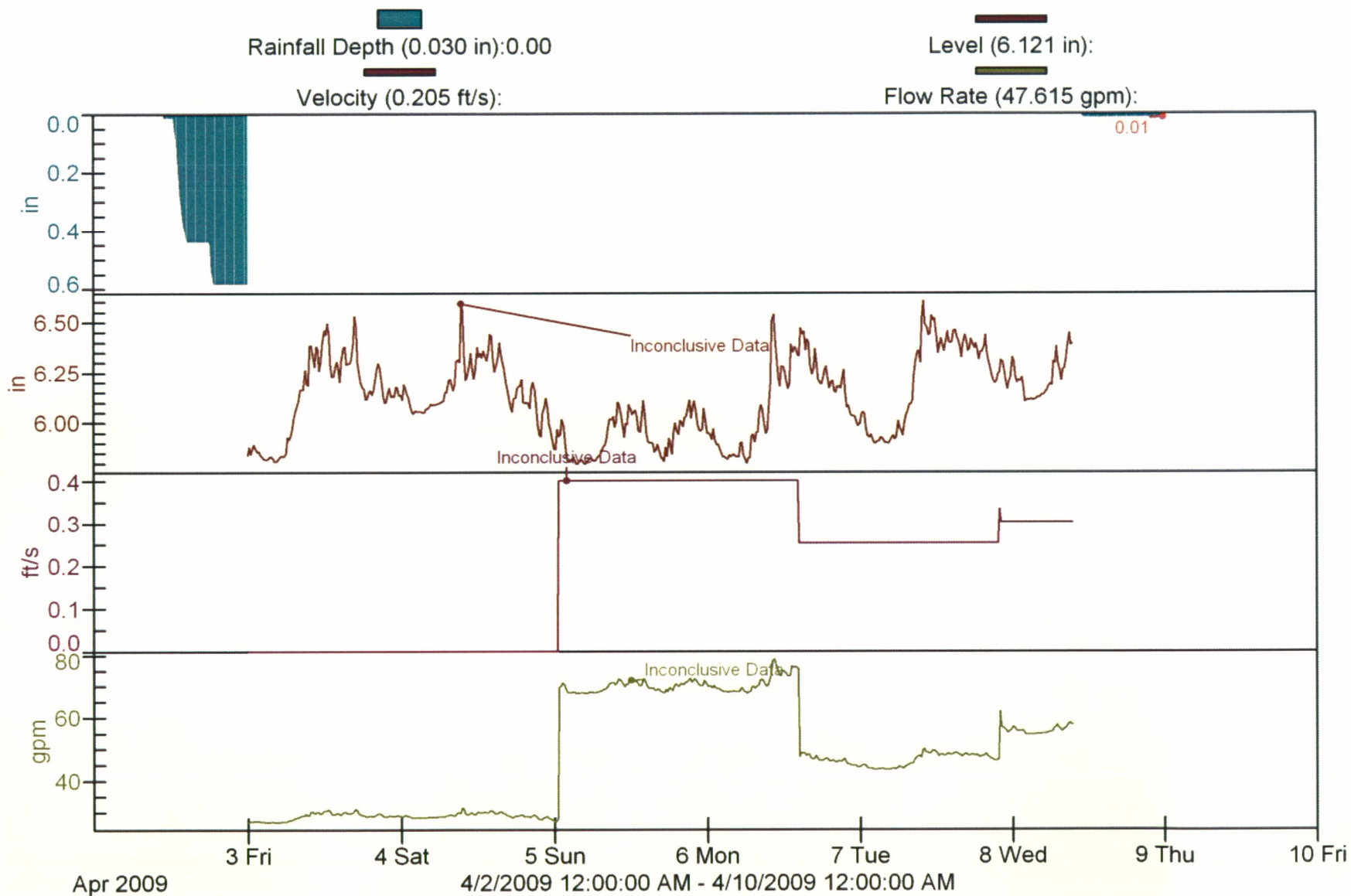


FIGURE 30
DIVISION-2 COMPILED SITE DATA

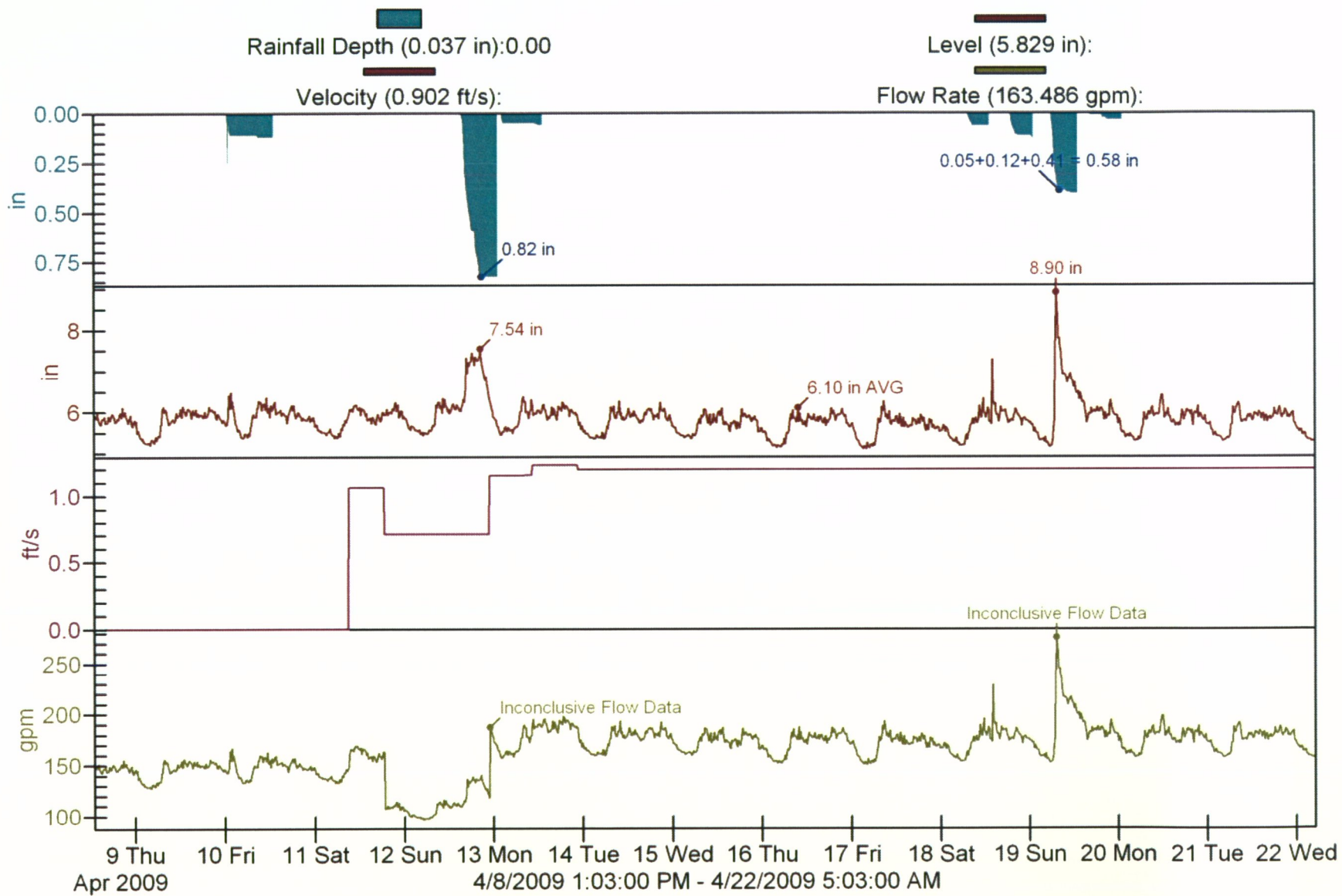


FIGURE 31
DIVISION-3 COMPILED SITE DATA

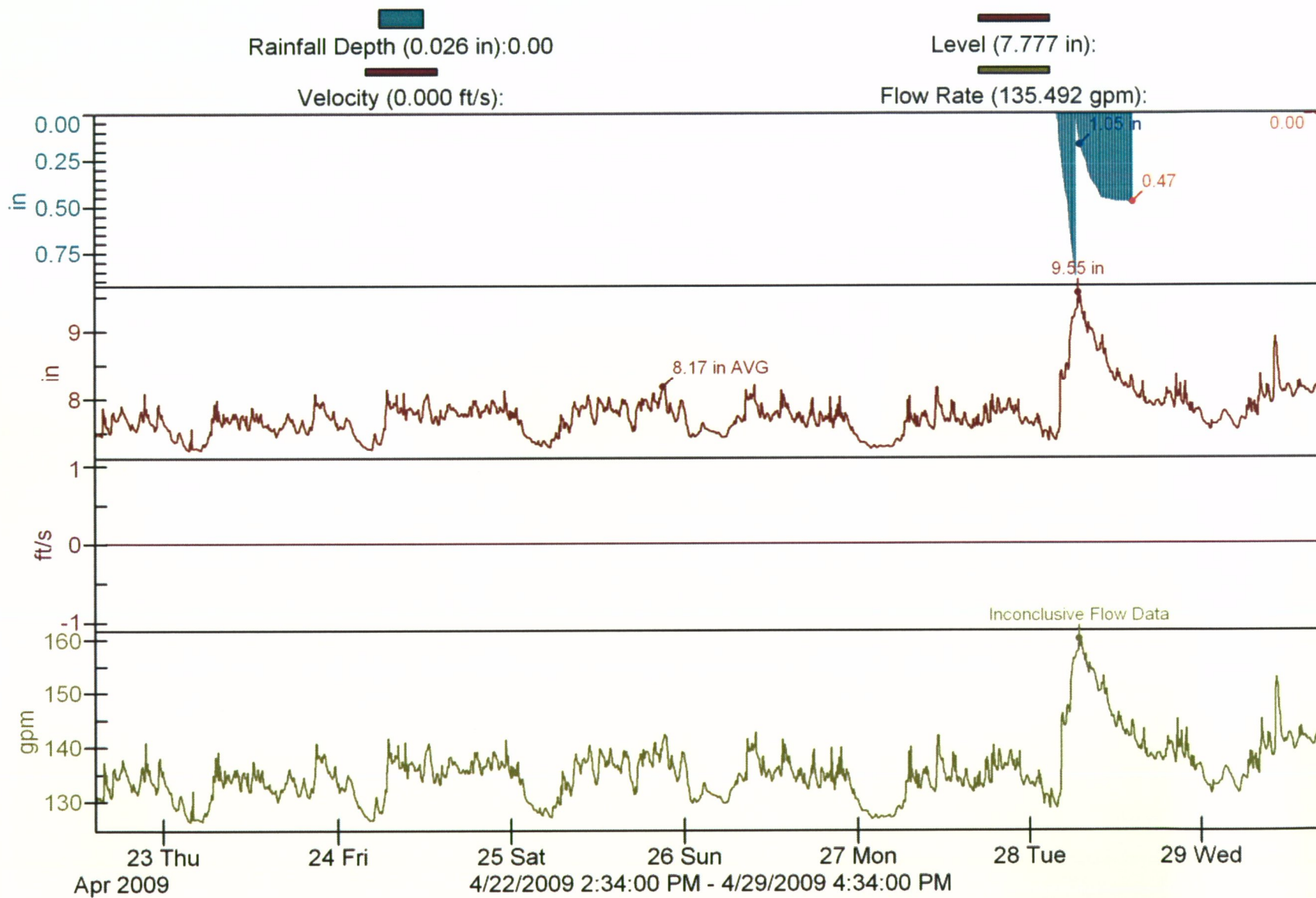


FIGURE 32

JAKE RHOADES-1 COMPILED SITE DATA

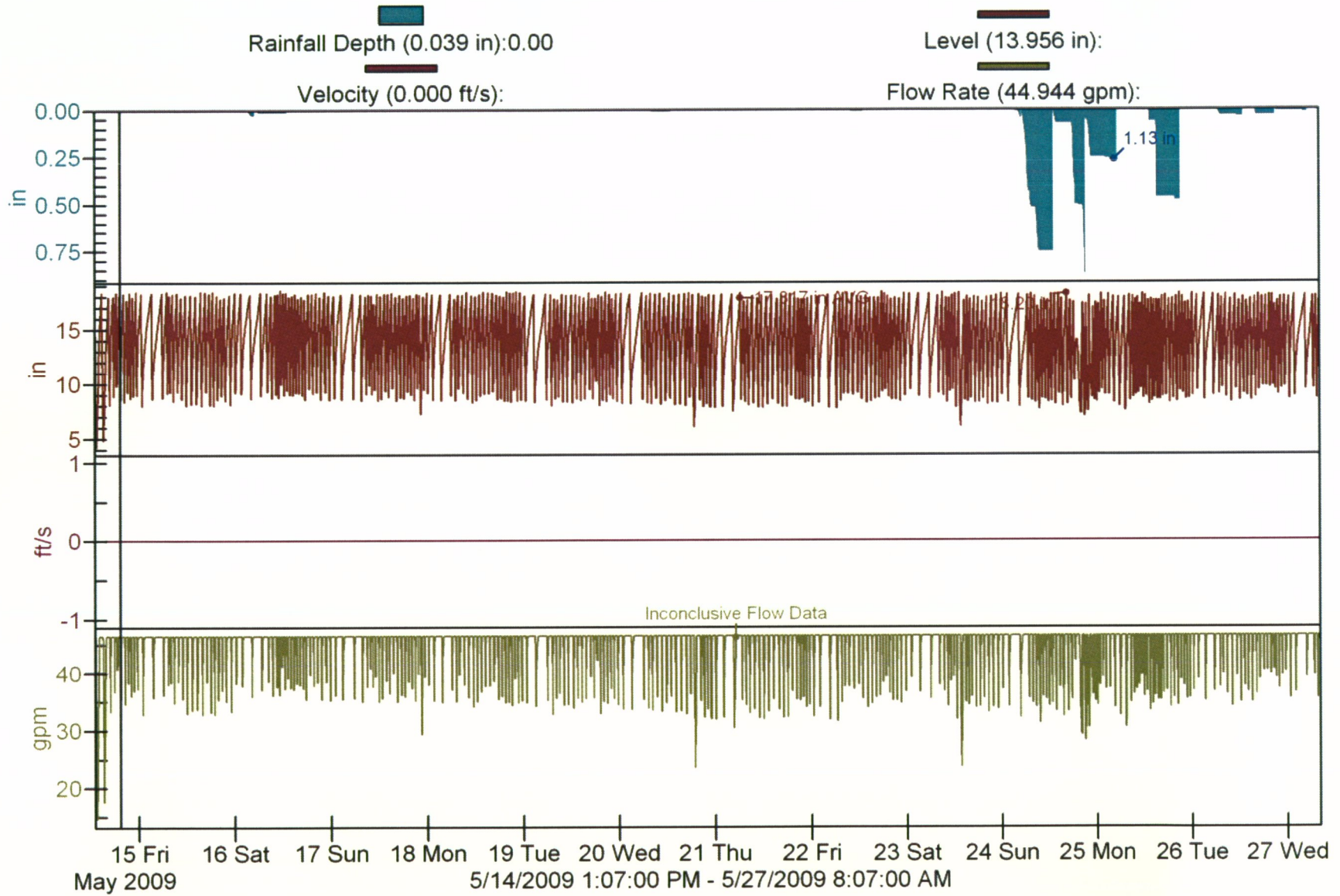


FIGURE 33

JAKE RHOADES-2 COMPILED SITE DATA

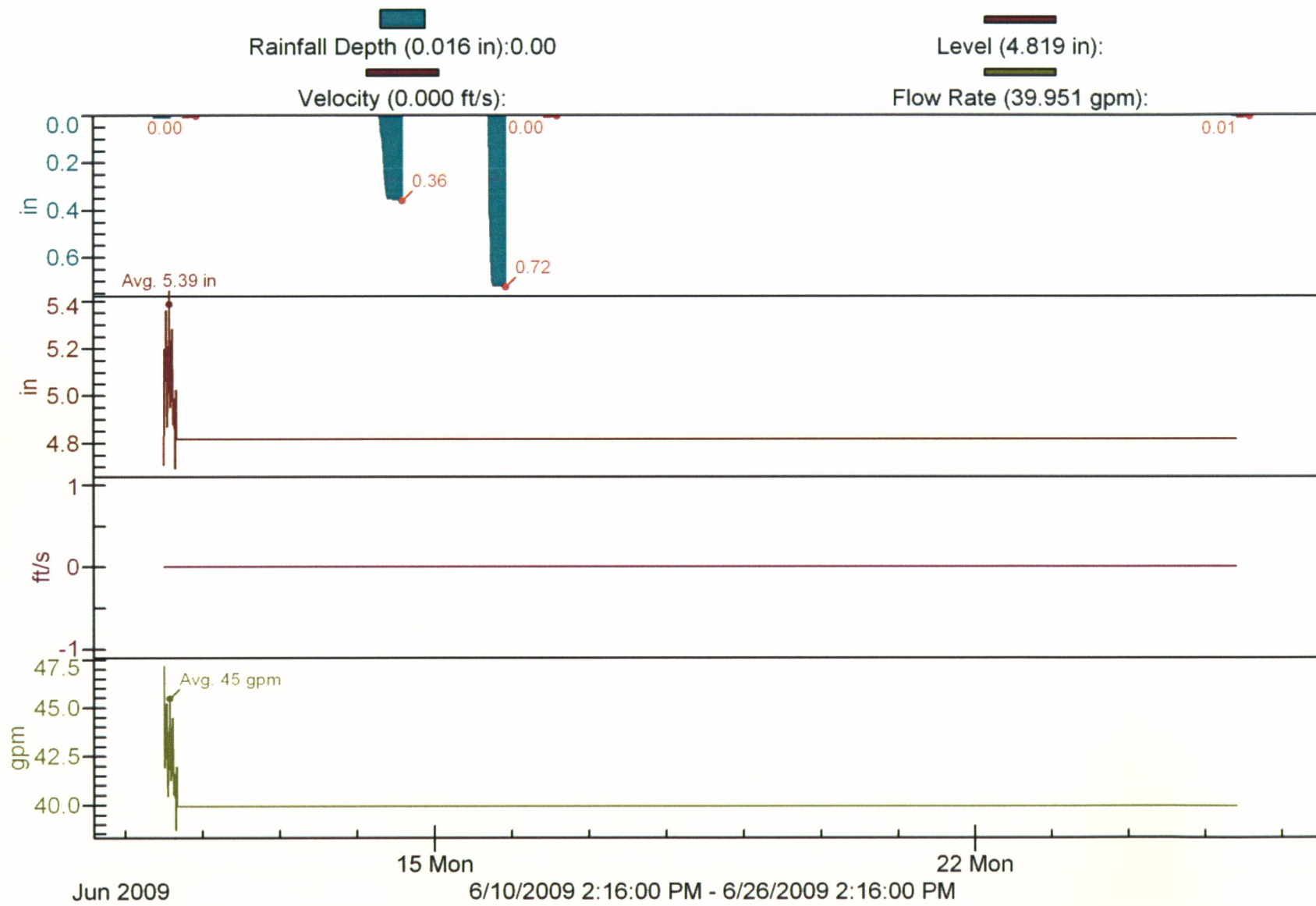


FIGURE 34

JAKE RHOADES-3 COMPILED SITE DATA

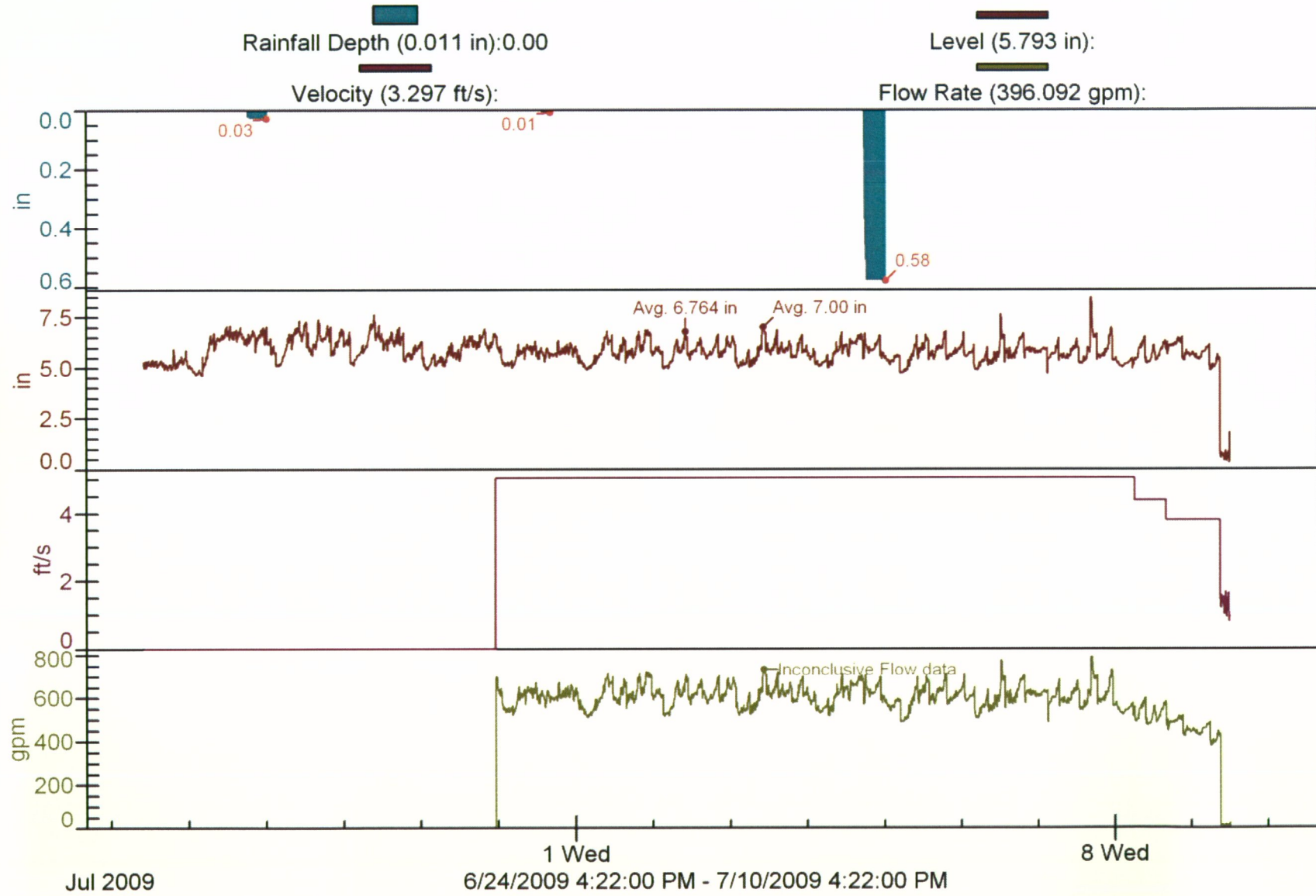


FIGURE 35
LAKE STREET-I COMPILED SITE DATA

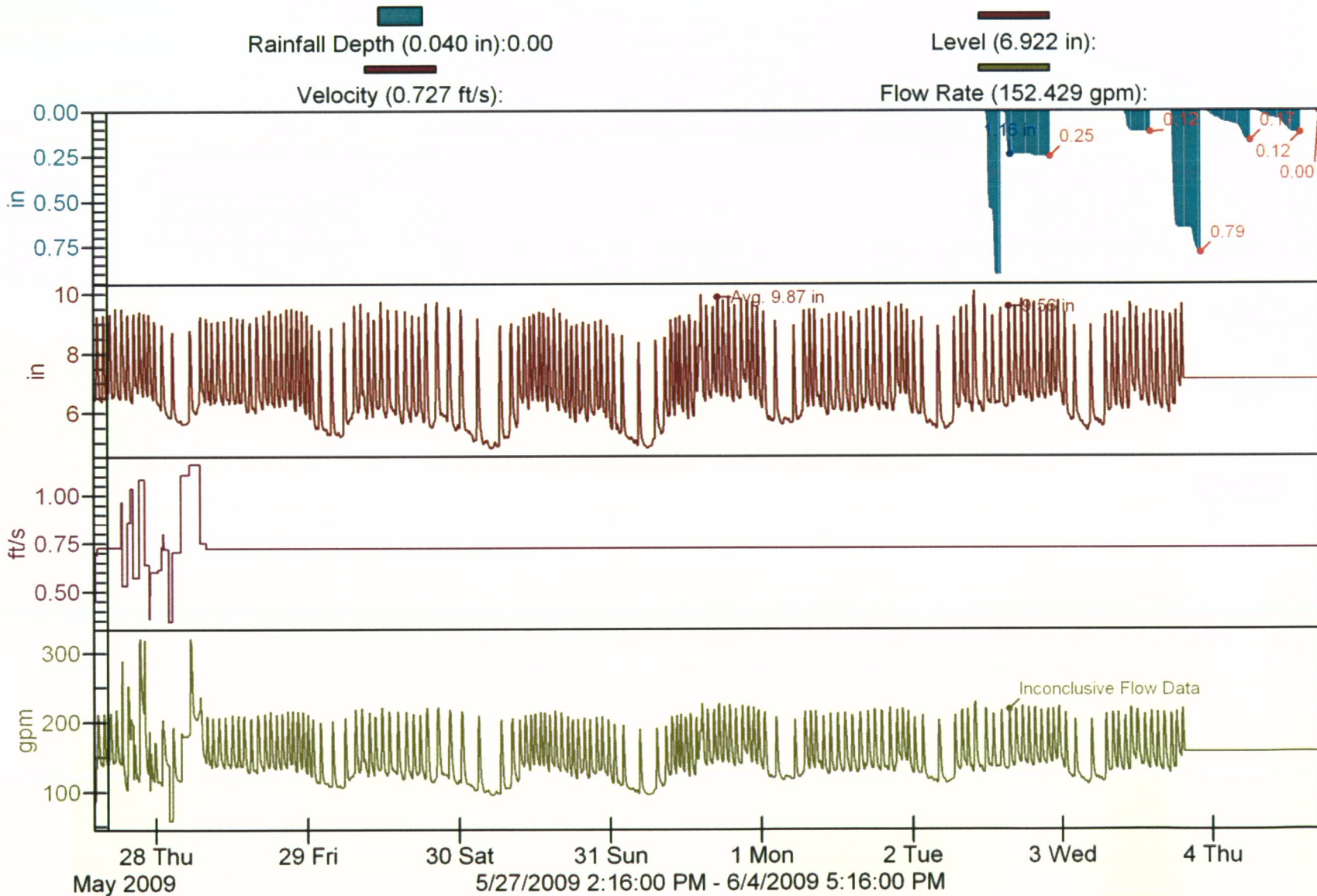


FIGURE 36
LAKE STREET-2 COMPILED SITE DATA

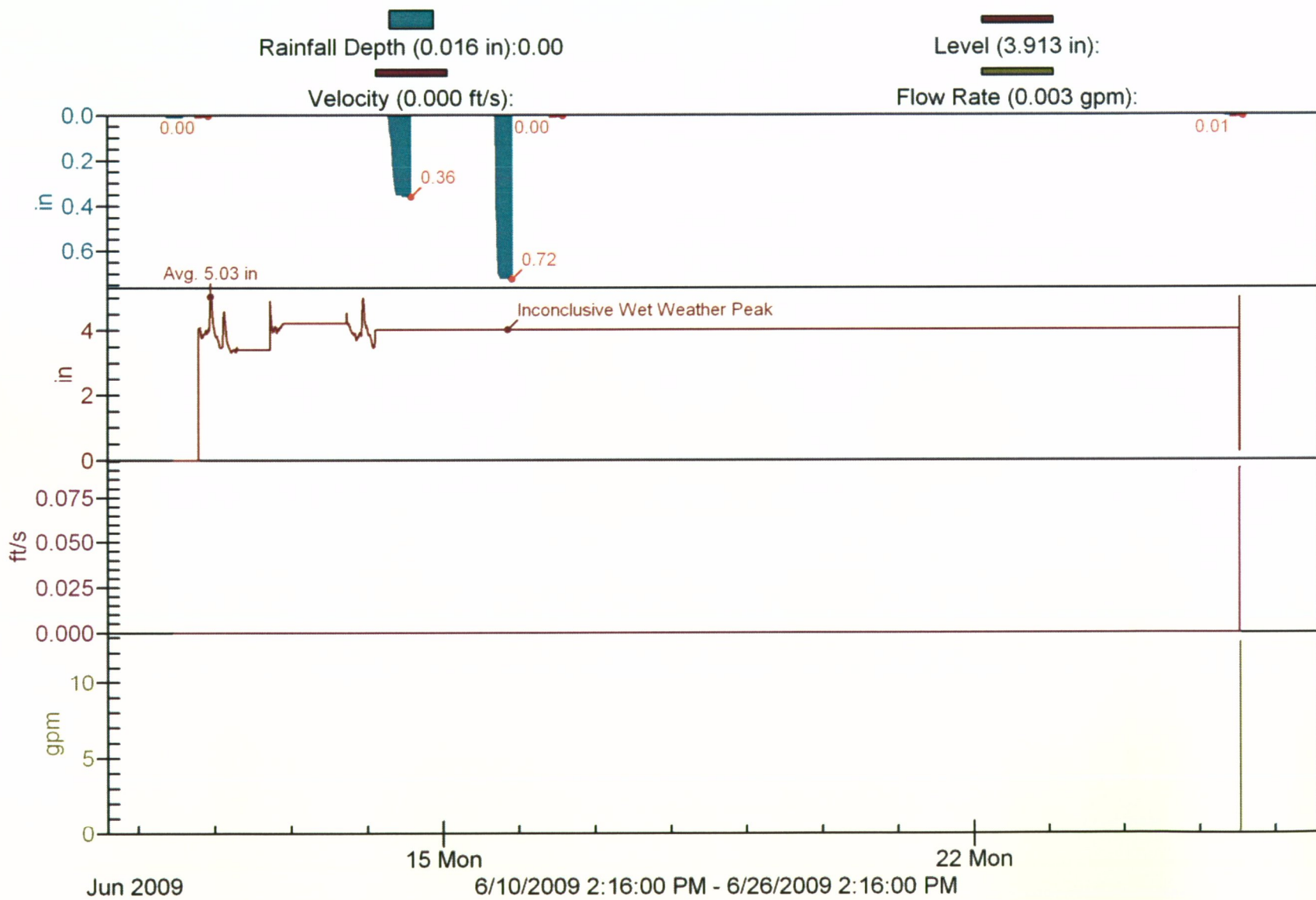


FIGURE 37
LAKE STREET-3 COMPILED SITE DATA

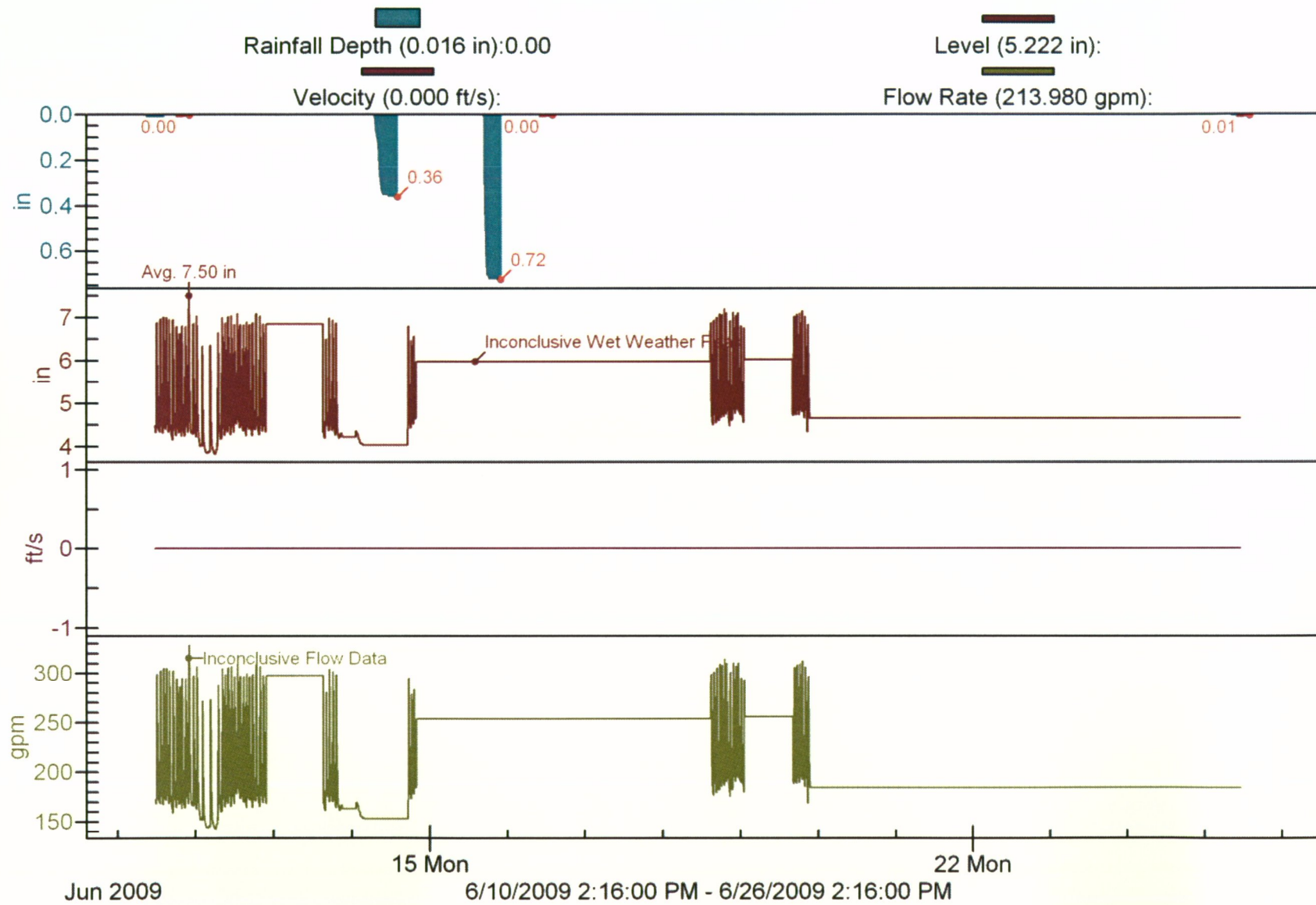


FIGURE 38

MCHANNEY STREET-I COMPILED SITE DATA

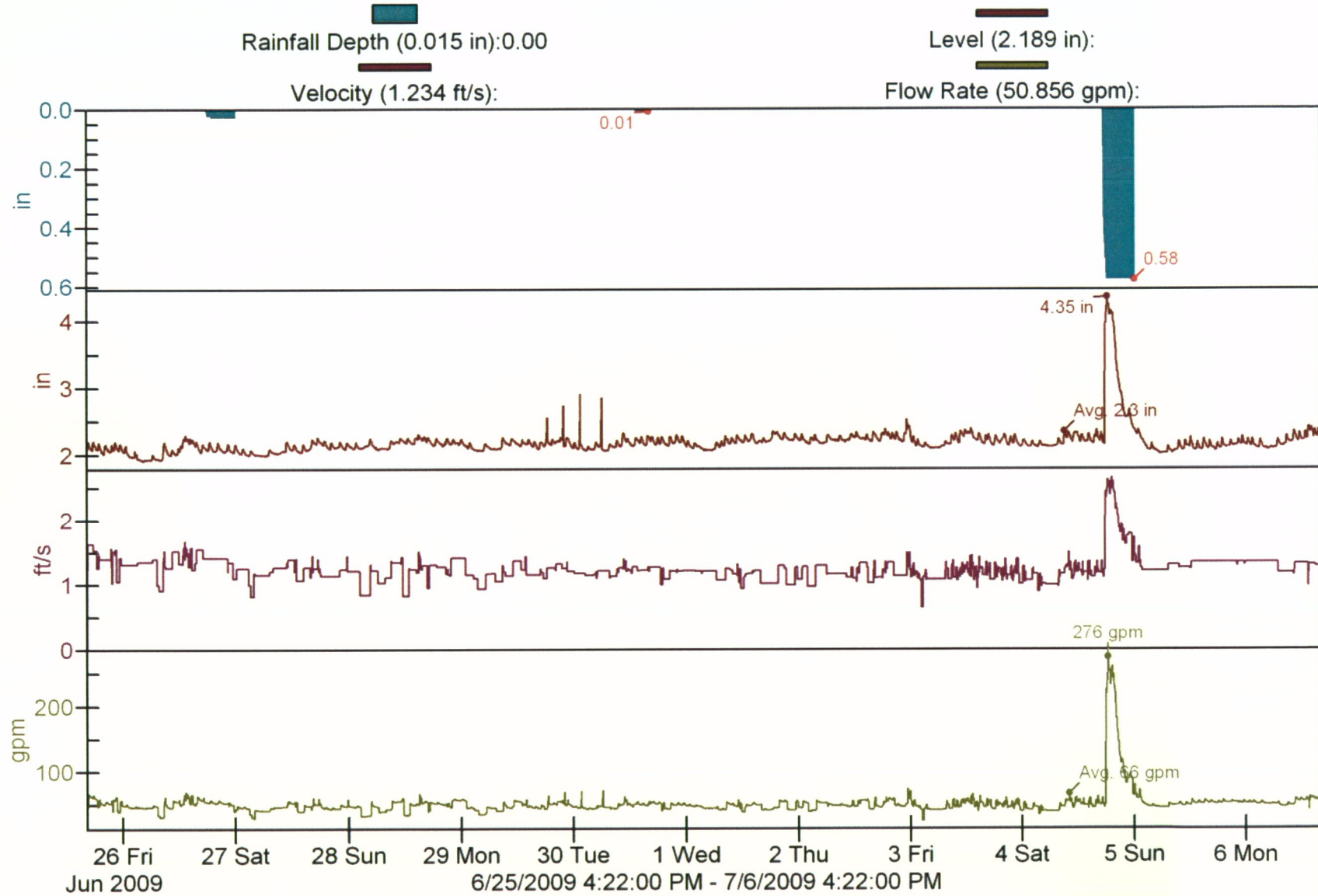


FIGURE 39

MCHANNEY STREET-2 COMPILED SITE DATA

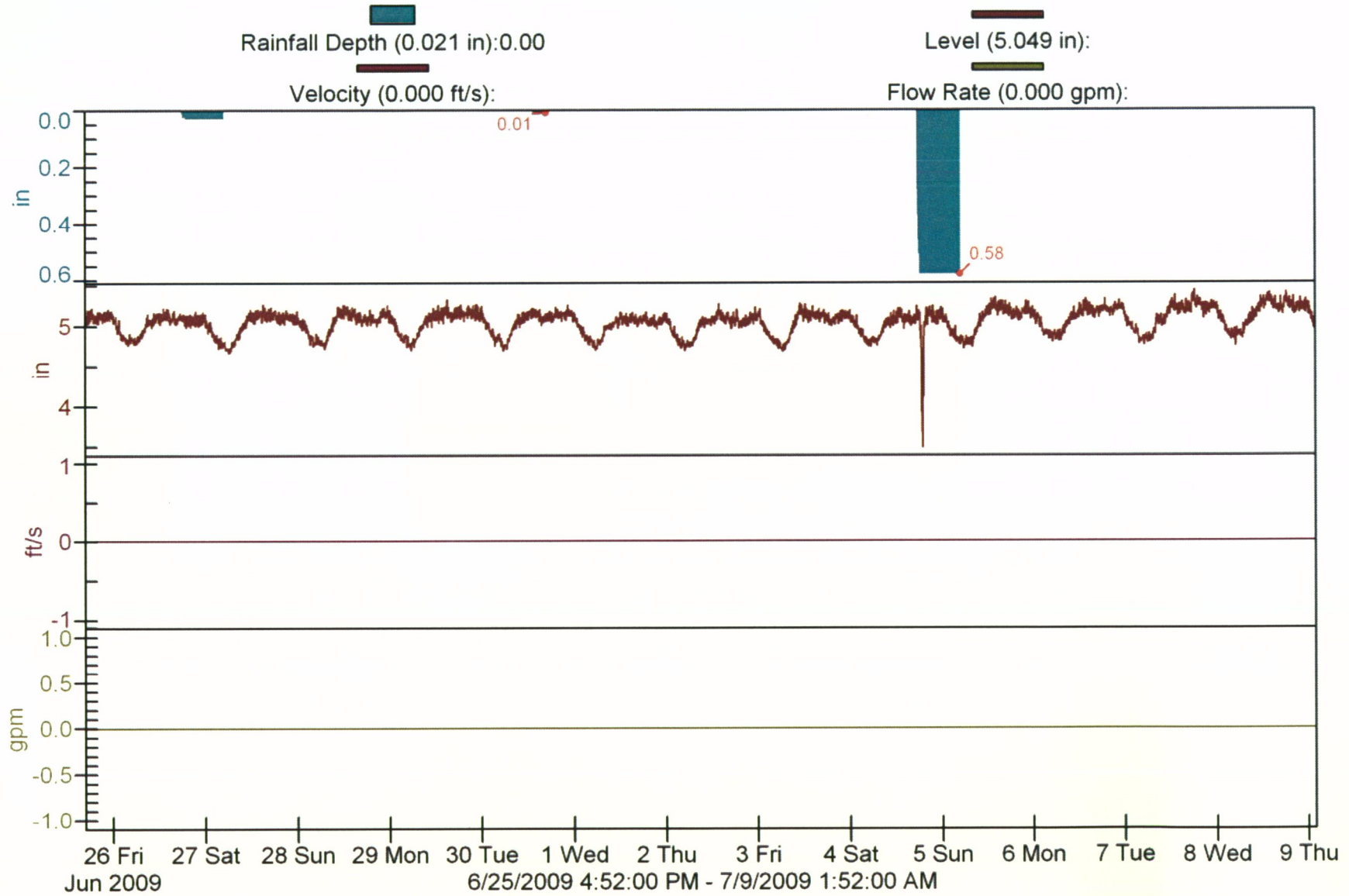


FIGURE 40
RUDDLE-1 COMPILED SITE DATA

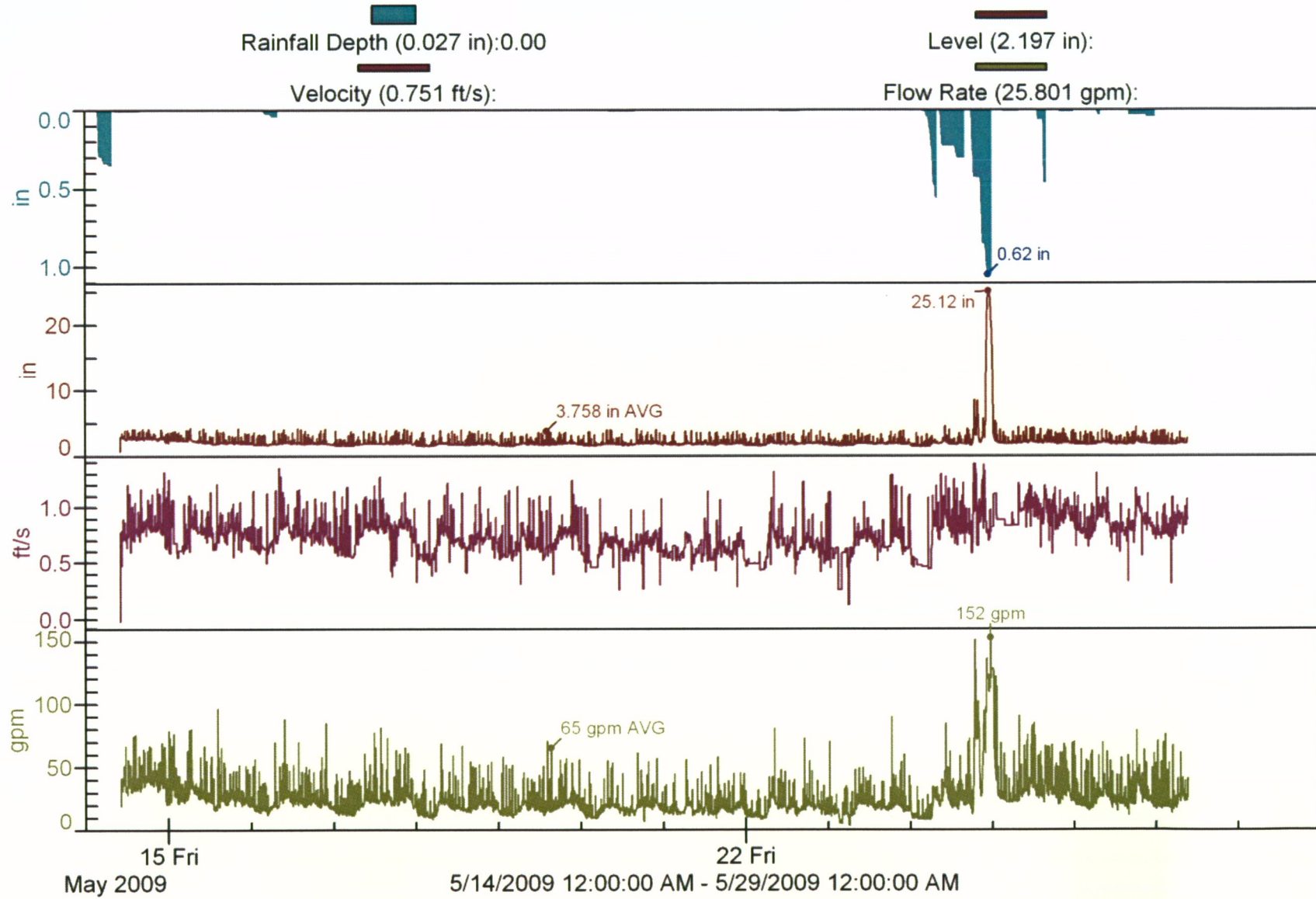


FIGURE 41
SHOP PS-1 COMPILED SITE DATA

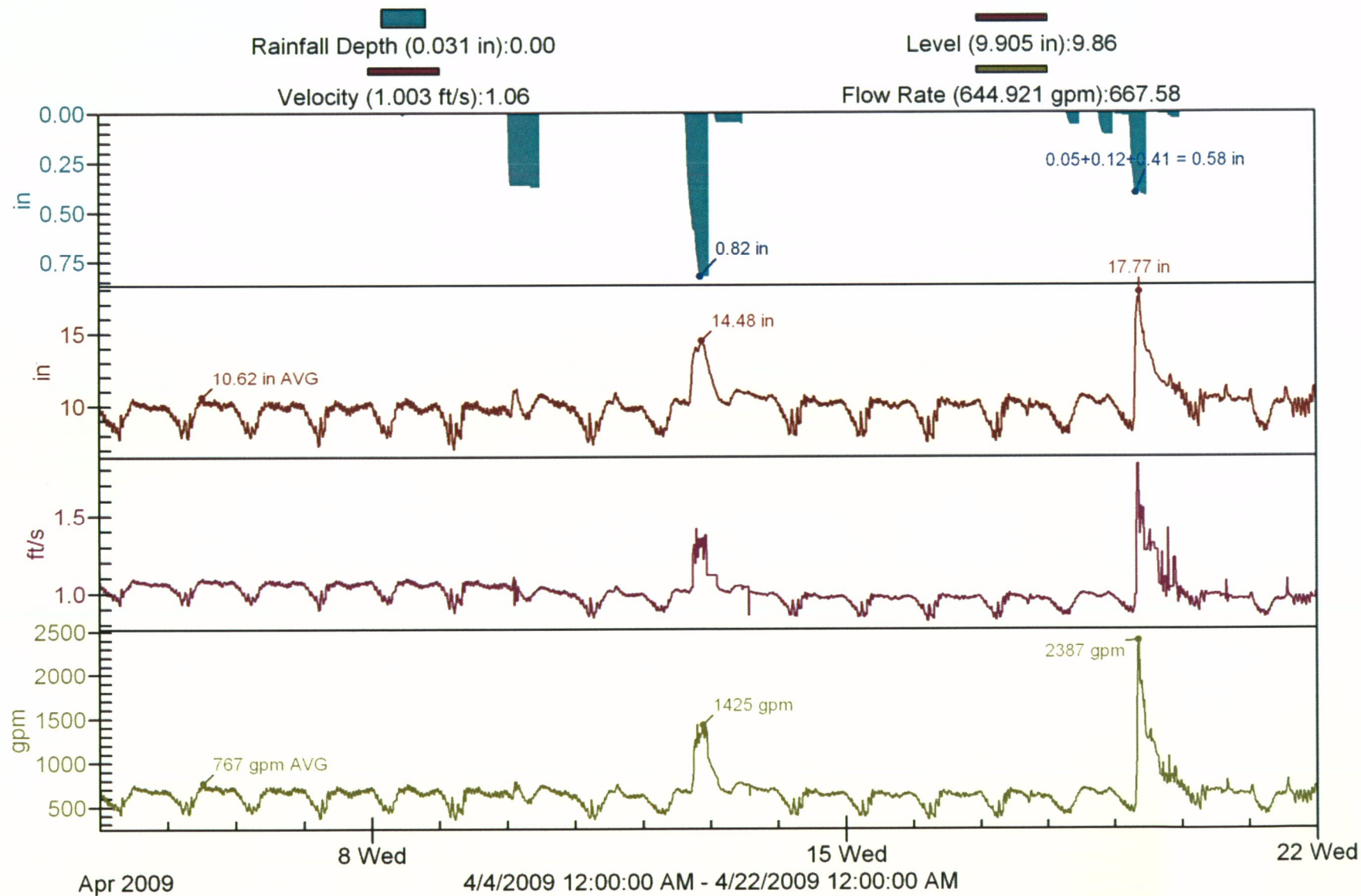


FIGURE 42
SHOP PS-2 COMPILED SITE DATA

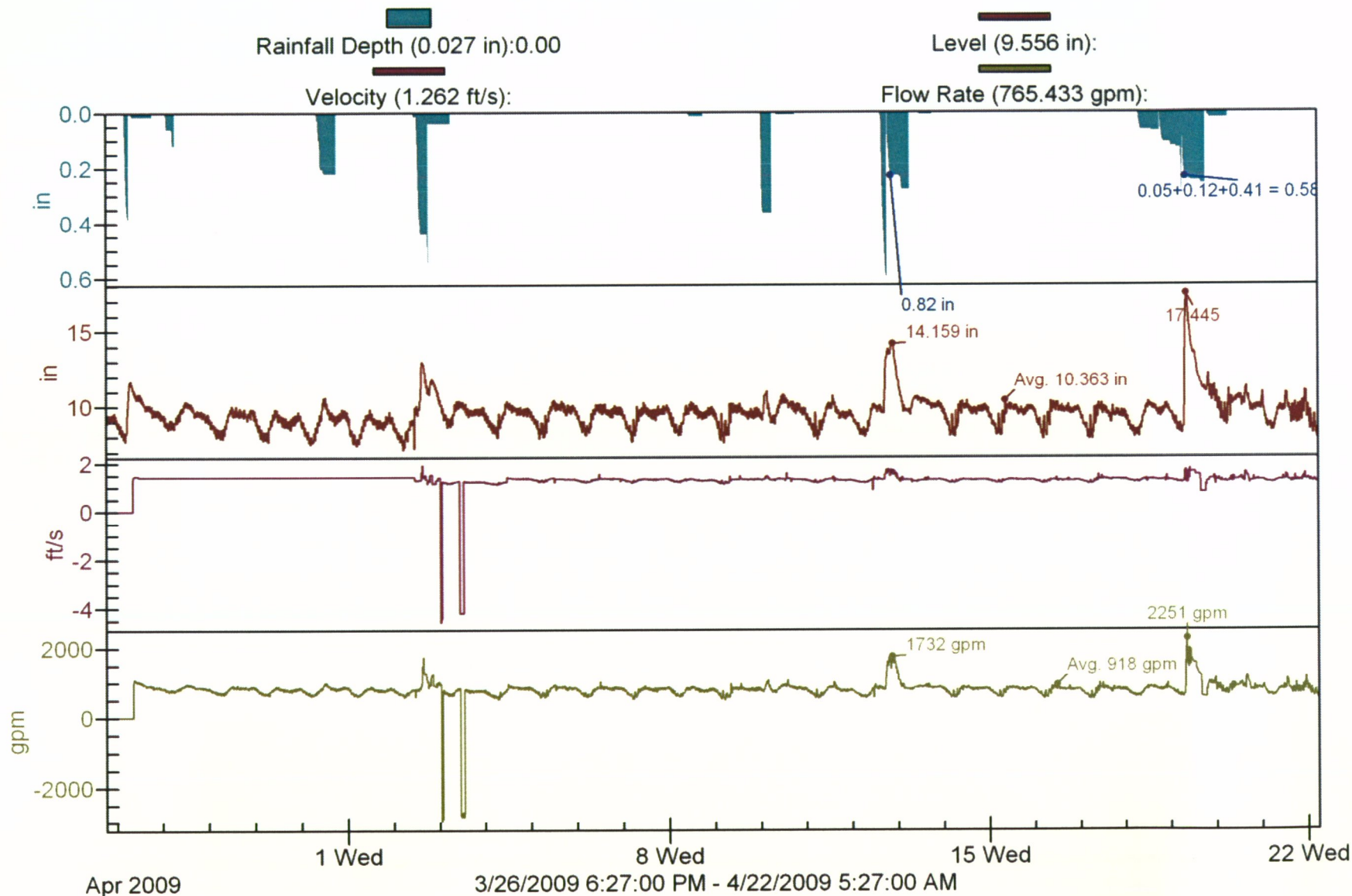


FIGURE 43
WALKER PARK-I COMPILED SITE DATA

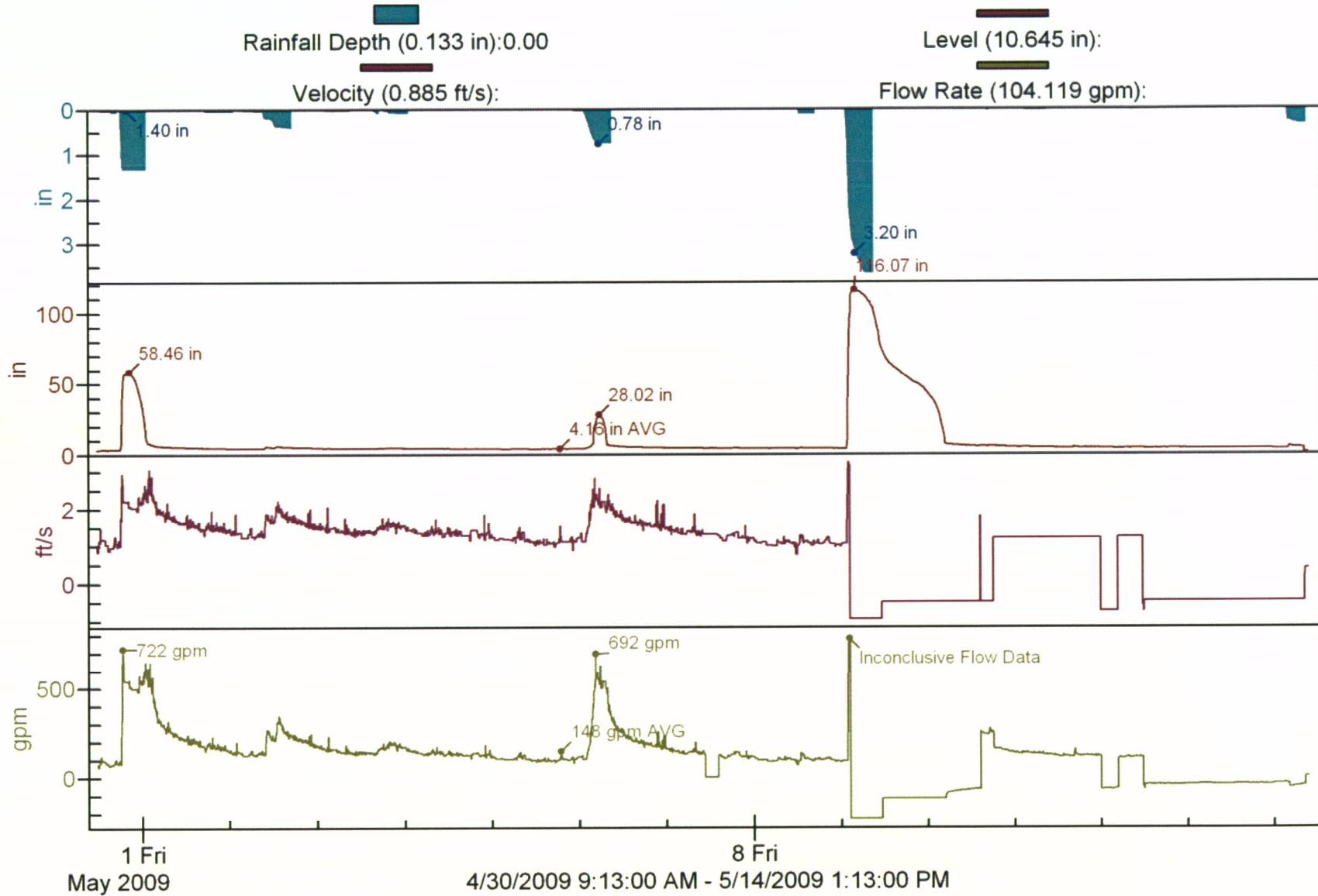


FIGURE 44
WALKER PARK-2 COMPILED SITE DATA

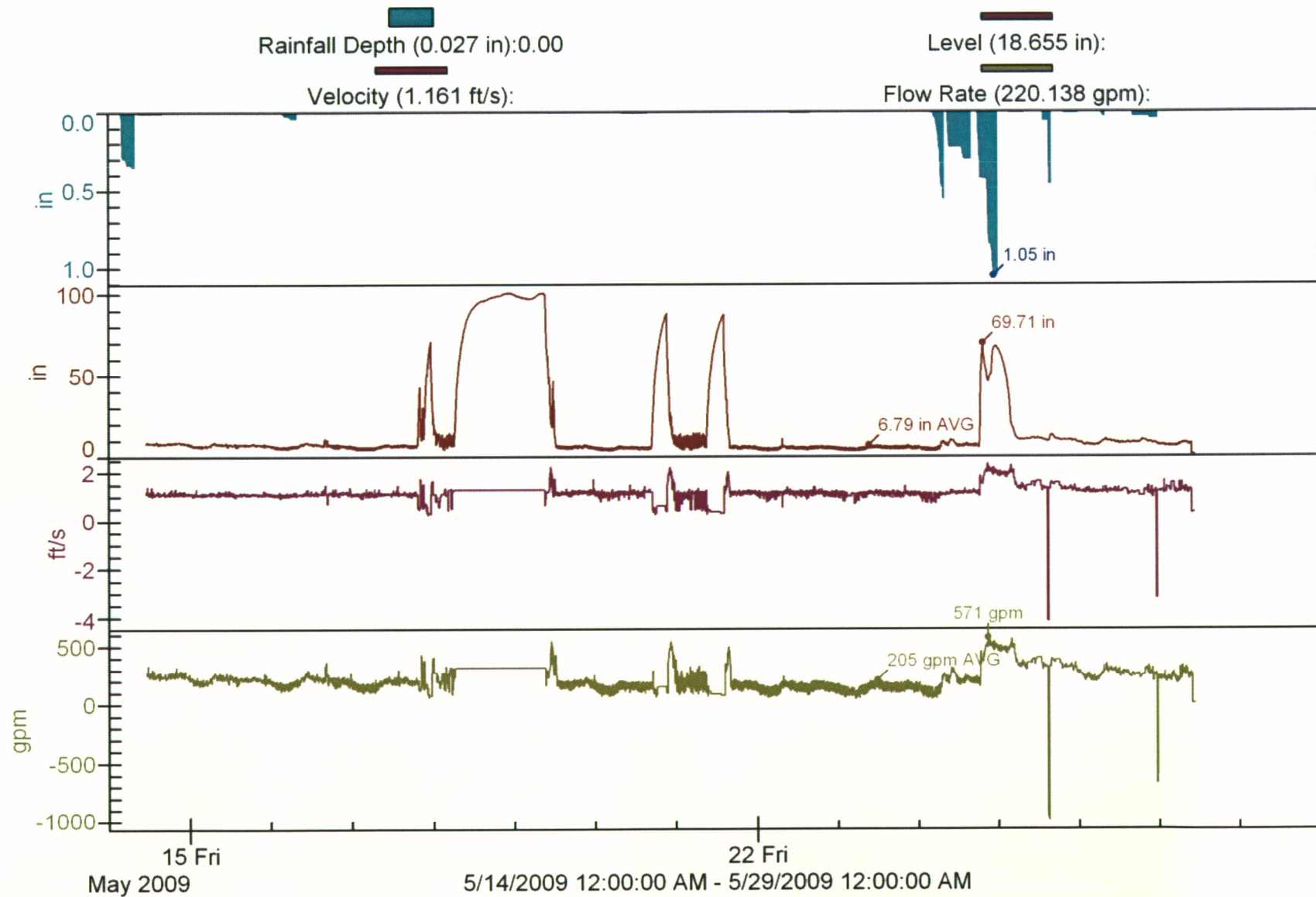


FIGURE 45
WALKER PARK-3 COMPILED SITE DATA

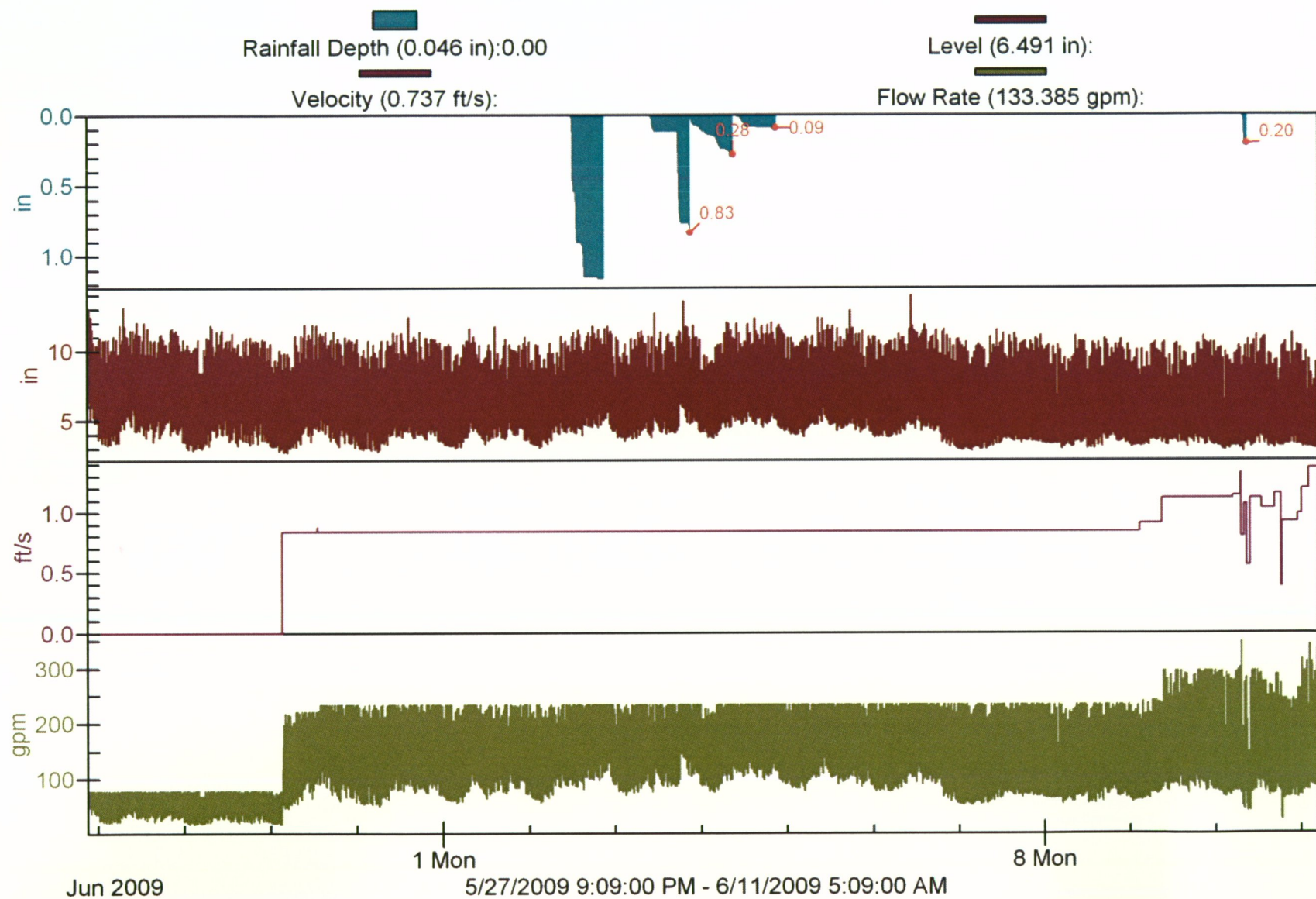


FIGURE 46
WARD-1 COMPILED SITE DATA

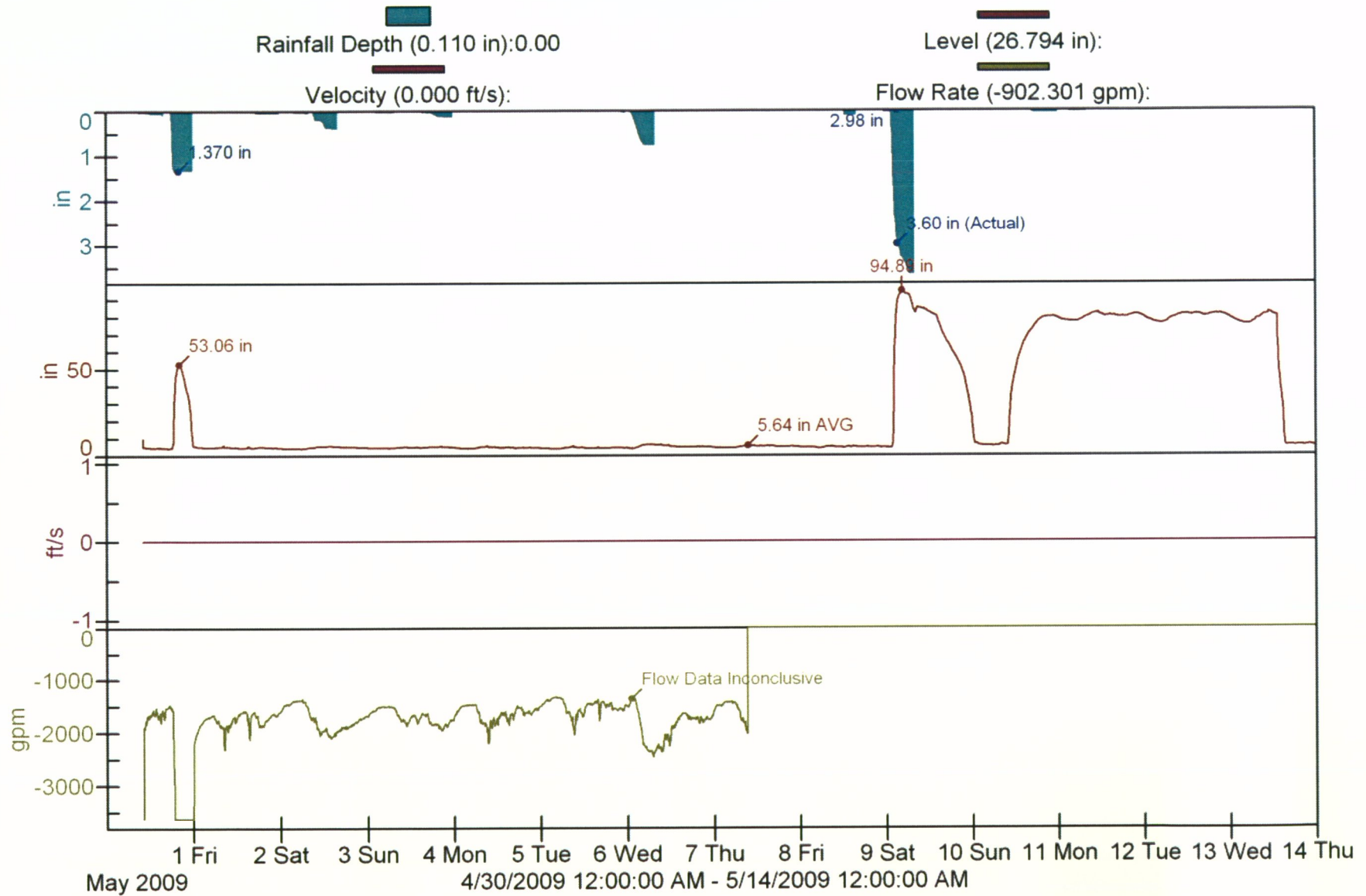


FIGURE 47
WARD-2 COMPILED SITE DATA

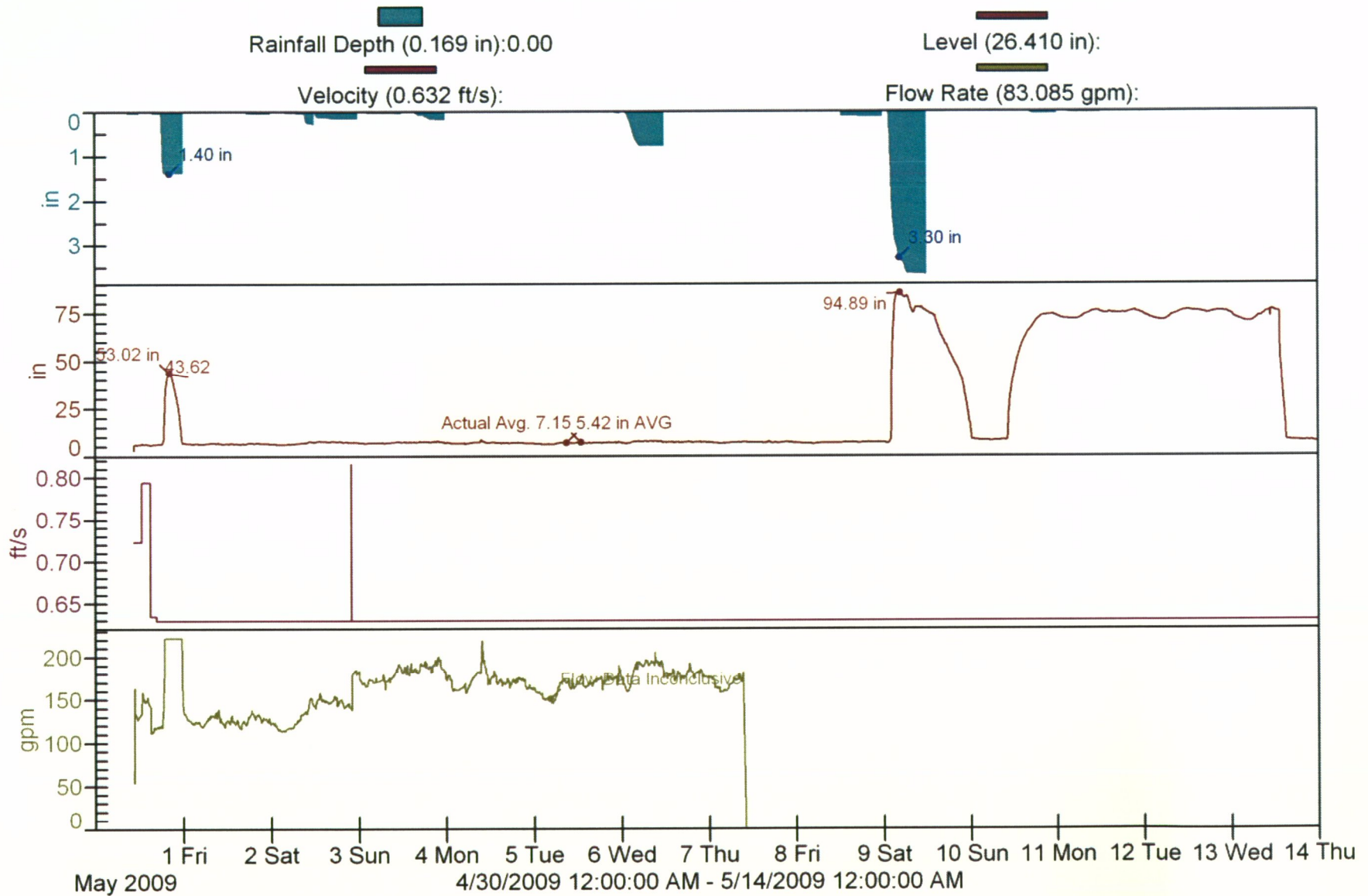
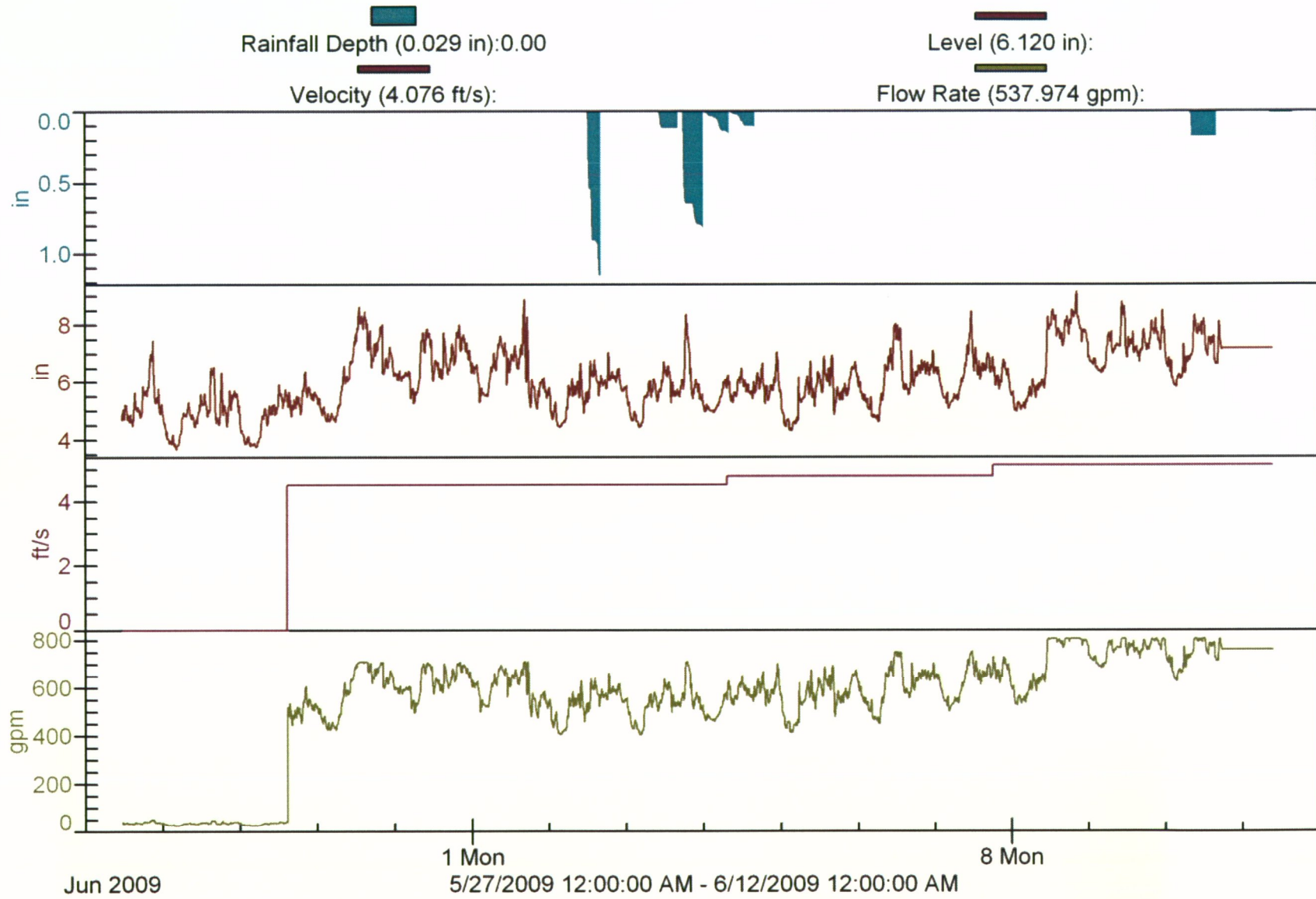
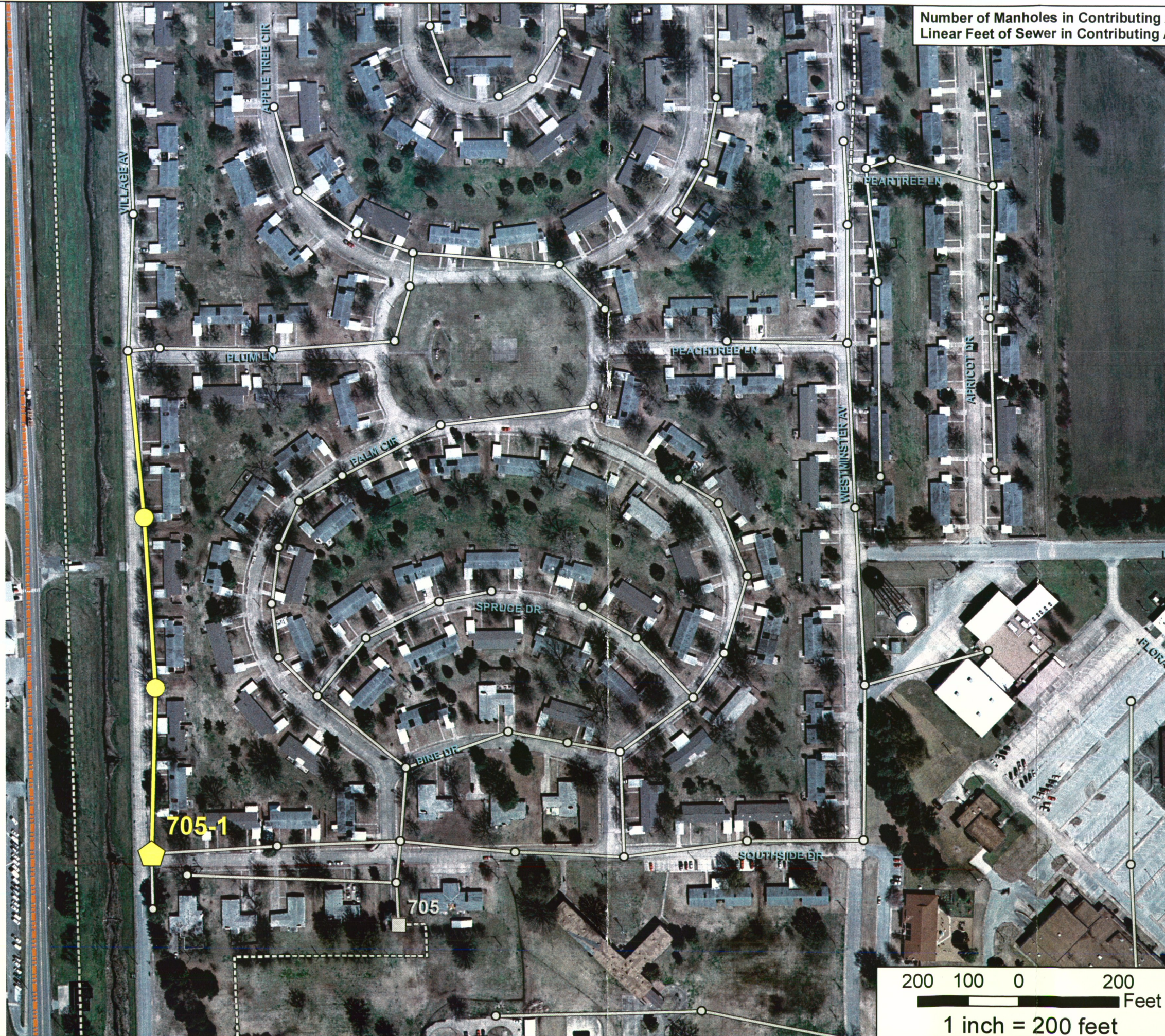
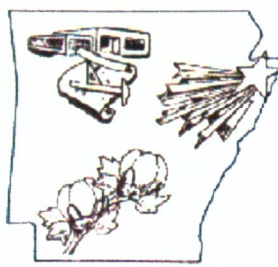


FIGURE 48
WARD-3 COMPILED SITE DATA





Number of Manholes in Contributing Area: 3
Linear Feet of Sewer in Contributing Area: 1022 LF



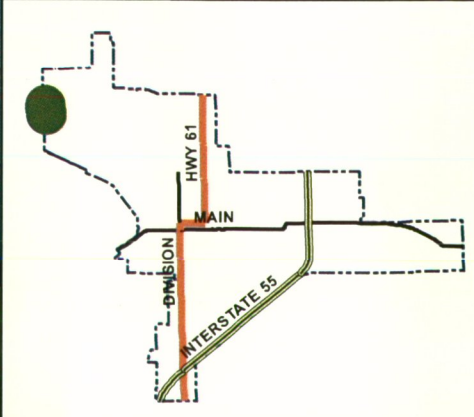
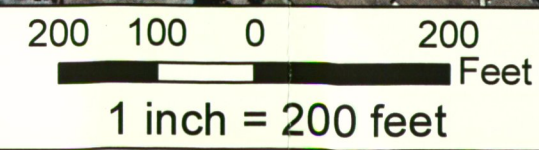
City of Blytheville

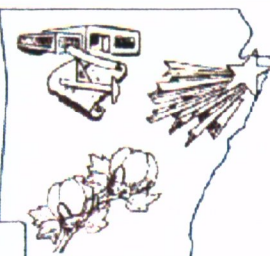
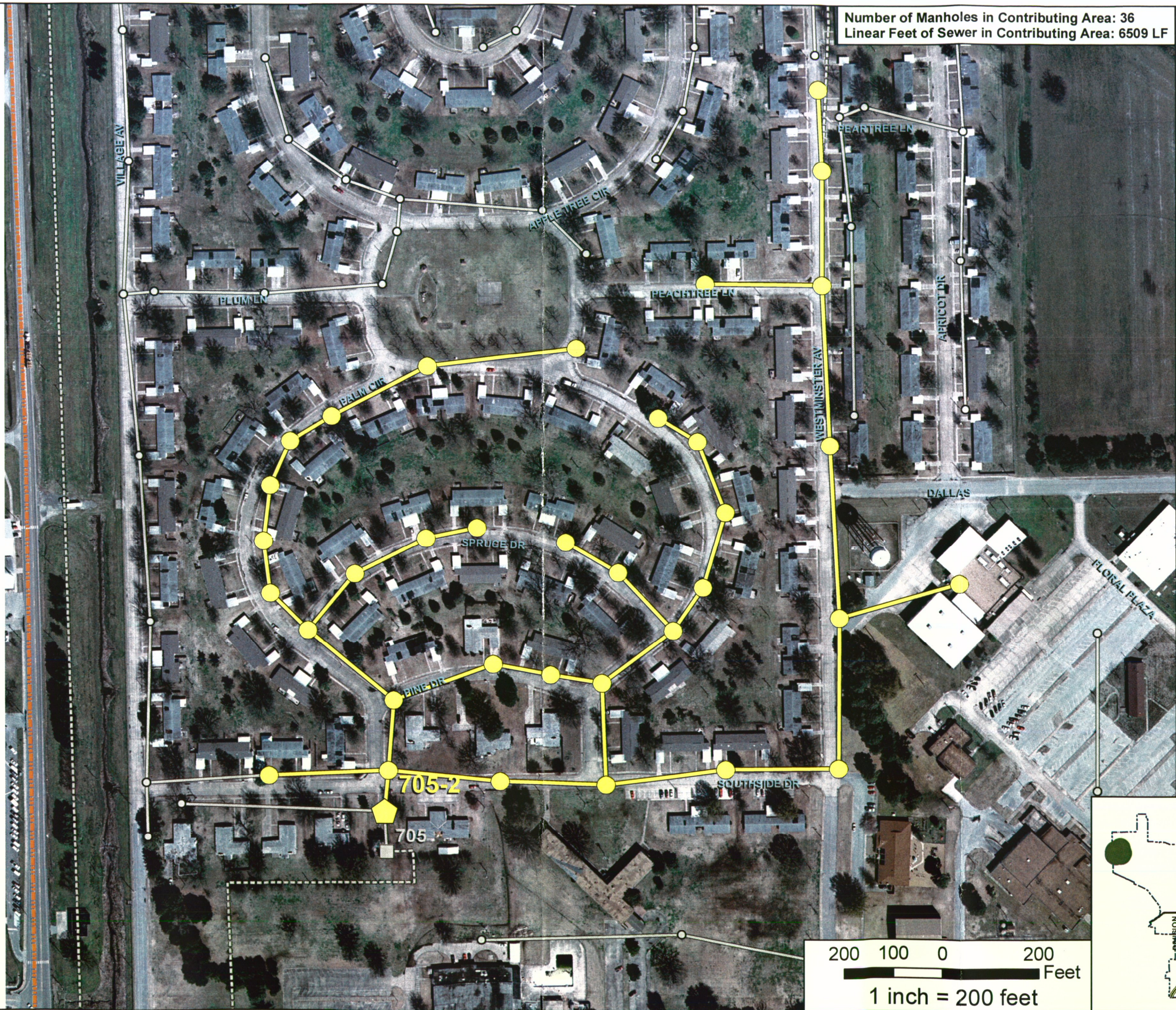


Figure 49

705-1 Monitoring Location and Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





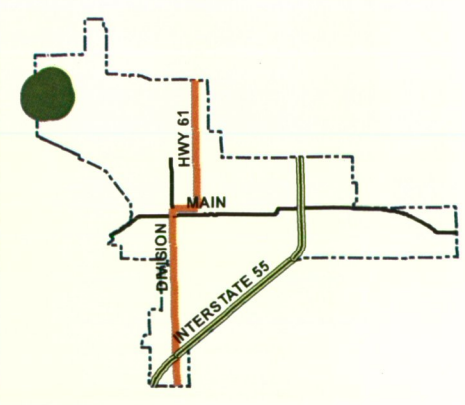
City of
Blytheville

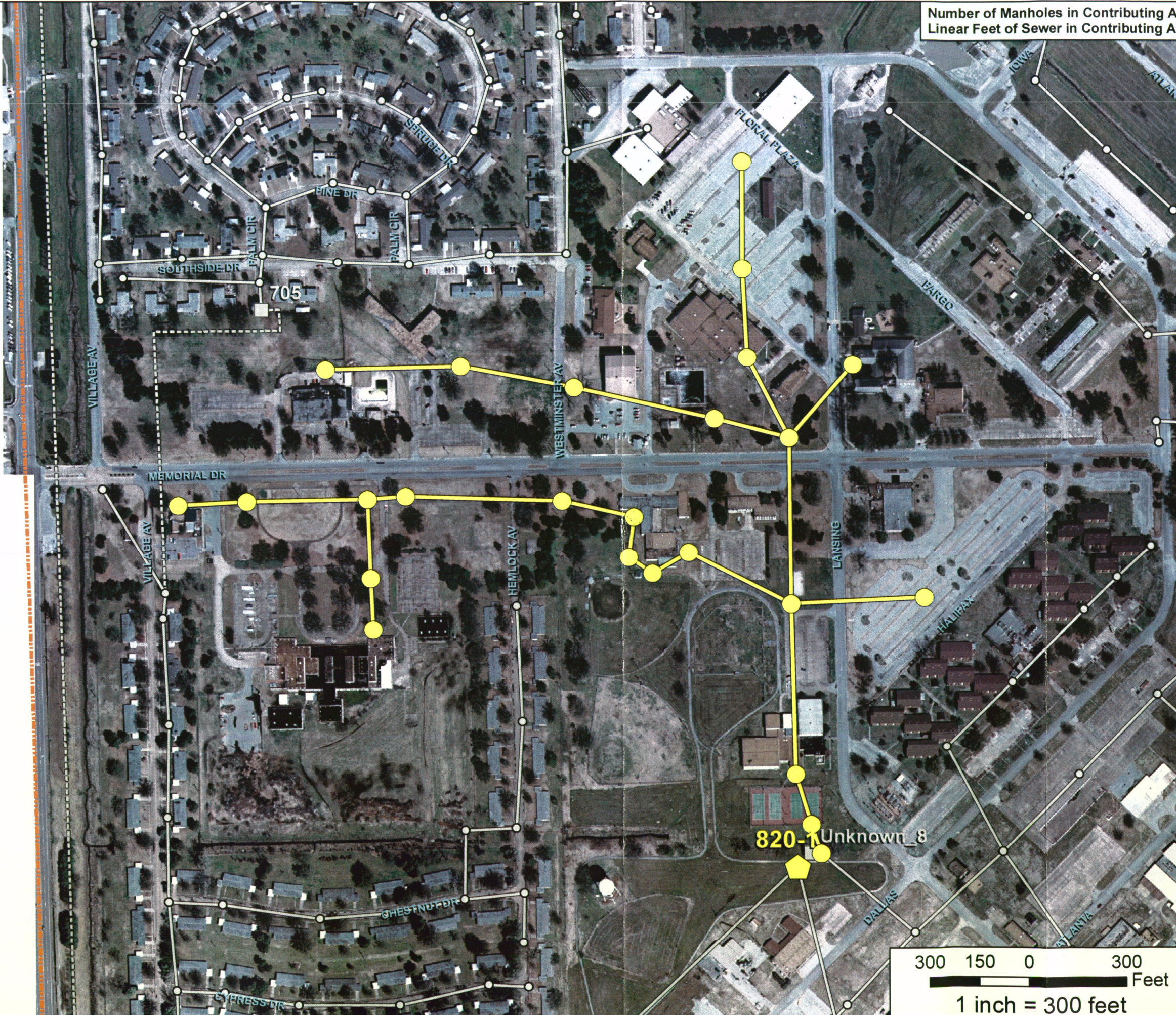


Figure 50

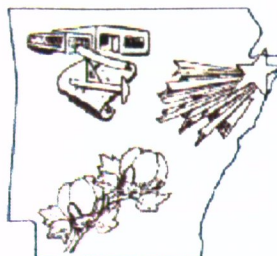
705-2 Monitoring
Location and
Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 26
Linear Feet of Sewer in Contributing Area: 6873 LF








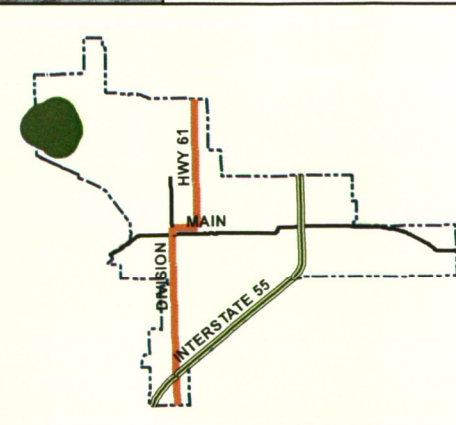
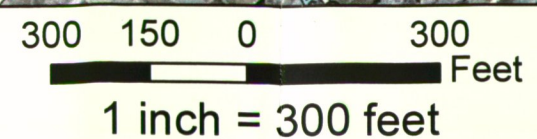
City of Blytheville

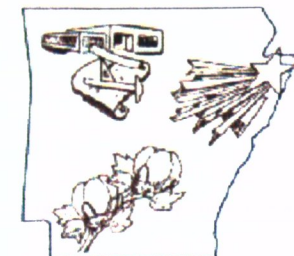
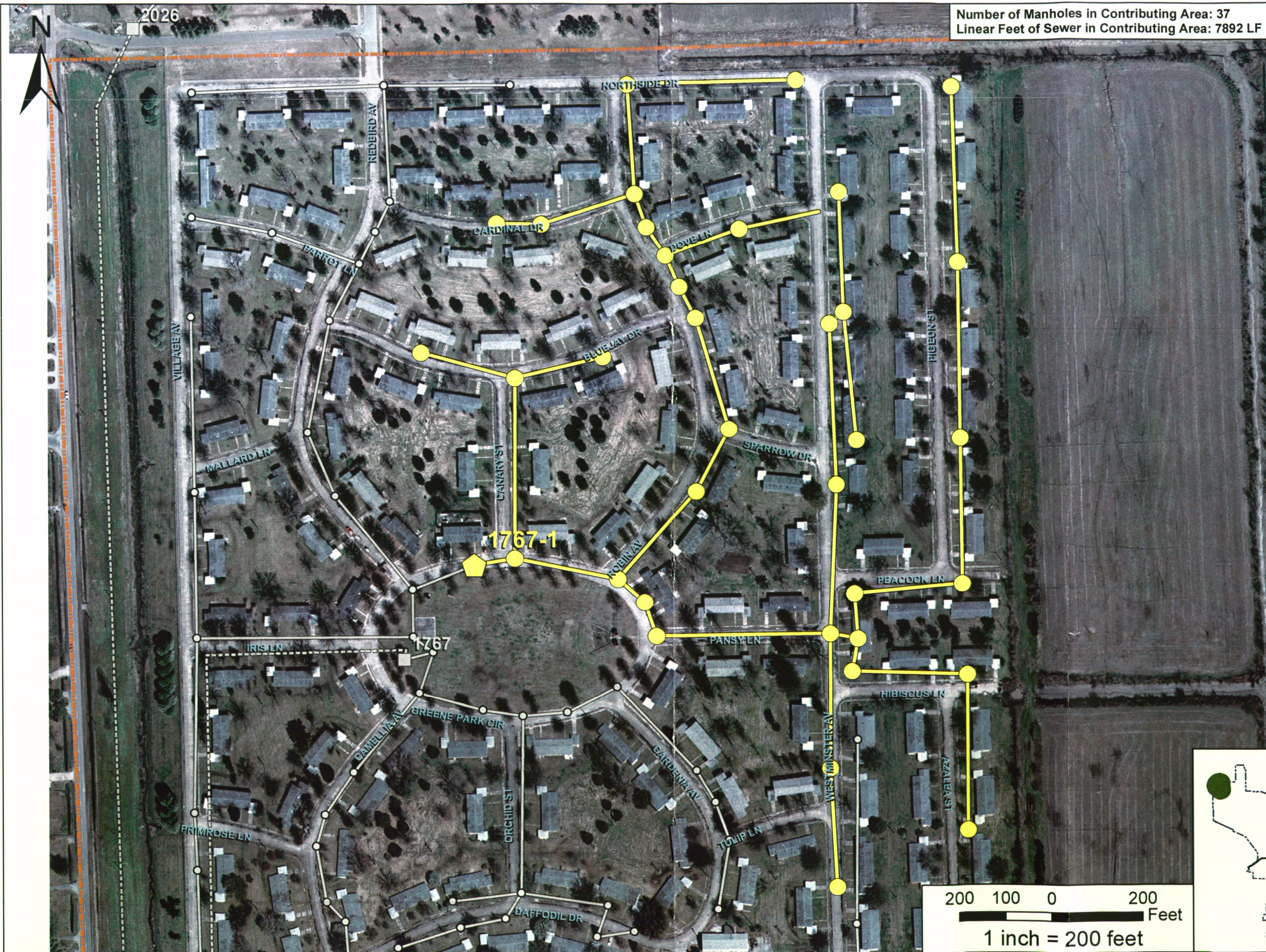


Figure 52

820-1 Monitoring Location and Contributing Area

-  Not Contributing
-  Contributing
-  Not Contributing
-  Contributing
-  Pump Station





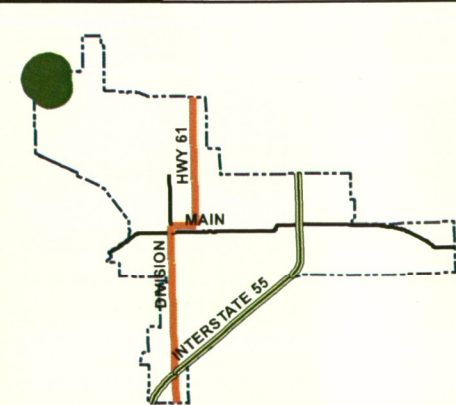
City of Blytheville



Figure 53

1767-1 Monitoring Location and Contributing Area

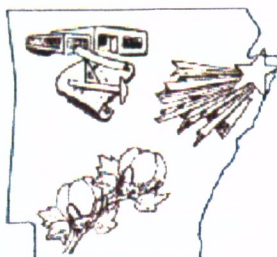
- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





2026

Number of Manholes in Contributing Area: 8
Linear Feet of Sewer in Contributing Area: 2355 LF



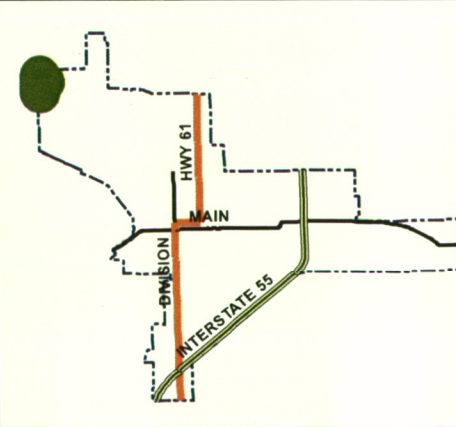
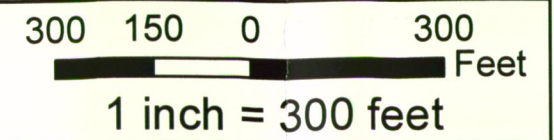
City of Blytheville



Figure 54

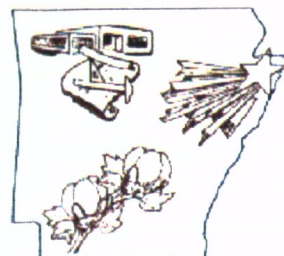
1767-2 Monitoring Location and Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 47
 Linear Feet of Sewer in Contributing Area: 14539 LF



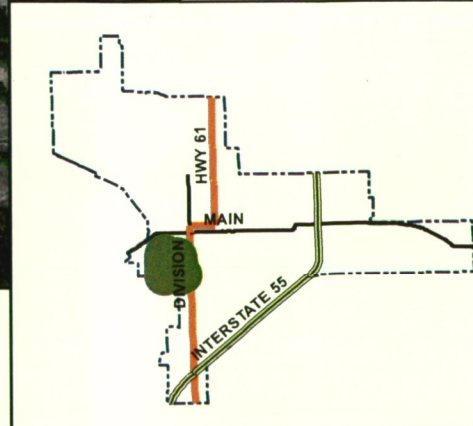
City of
 Blytheville



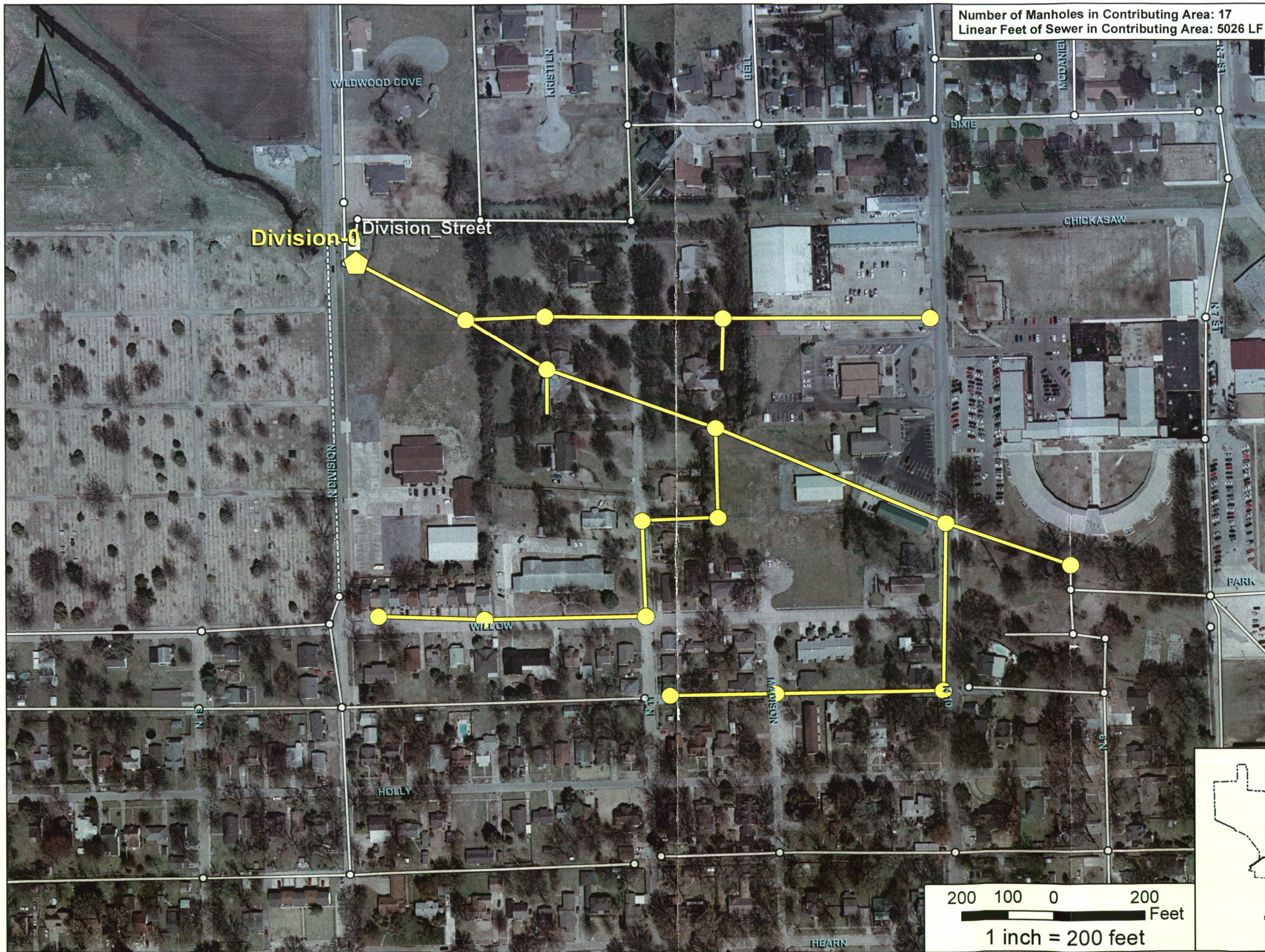
Figure 55

21st Street-1 Monitoring
 Location and
 Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



300 150 0 300
 Feet
 1 inch = 300 feet



Number of Manholes in Contributing Area: 17
 Linear Feet of Sewer in Contributing Area: 5026 LF

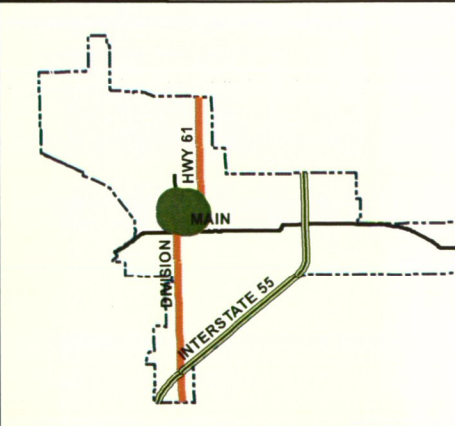


City of
 Blytheville

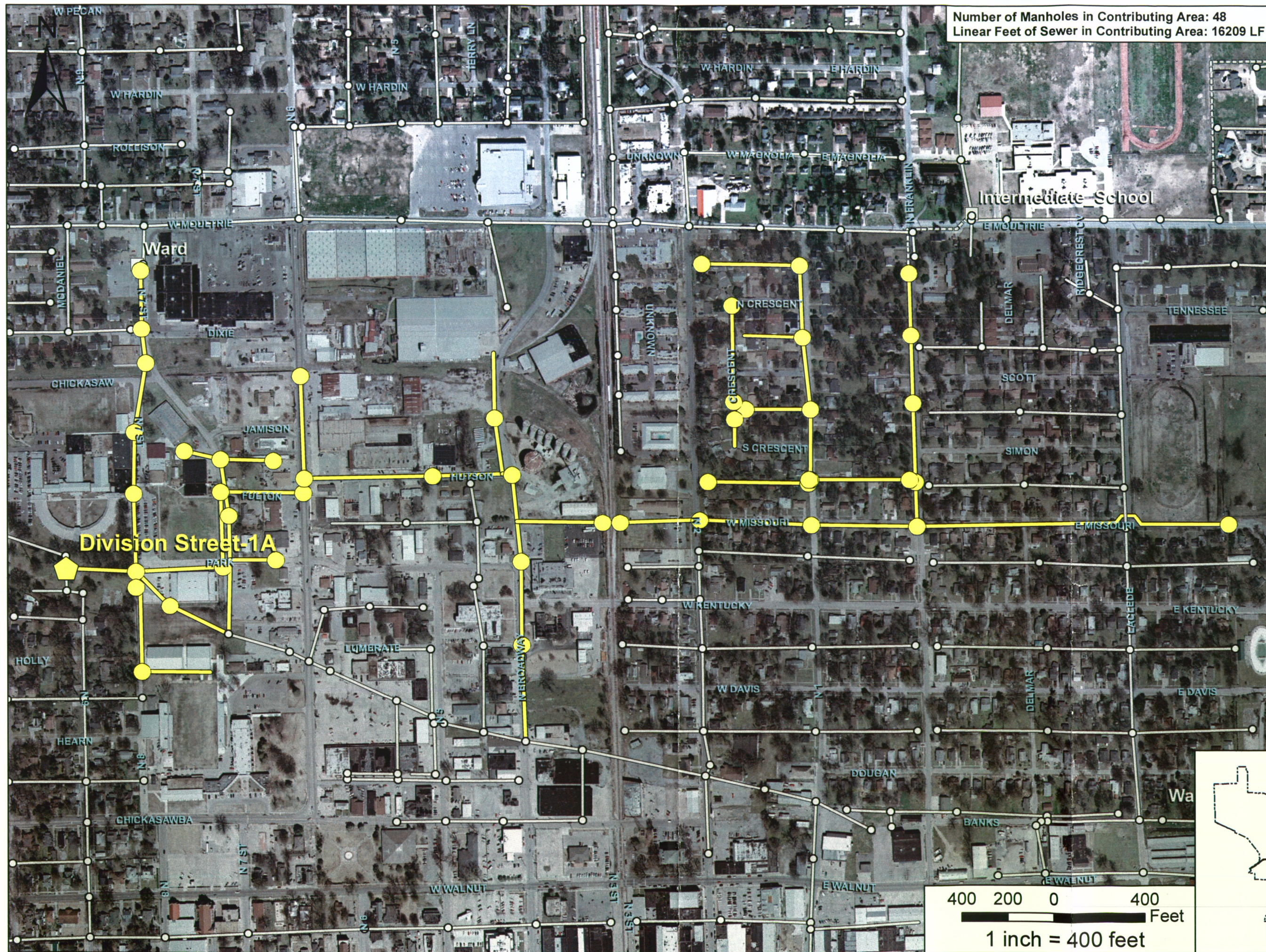


Figure 56
 Division-0 Monitoring
 Location and
 Contributing Area

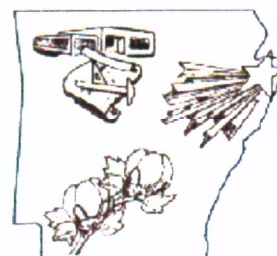
- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



200 100 0 200 Feet
 1 inch = 200 feet



Number of Manholes in Contributing Area: 48
 Linear Feet of Sewer in Contributing Area: 16209 LF

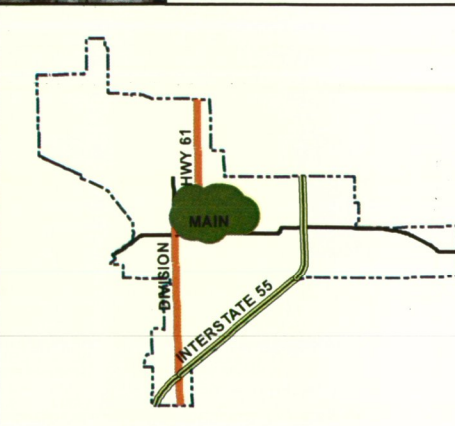
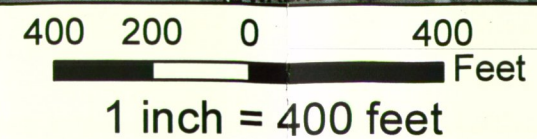


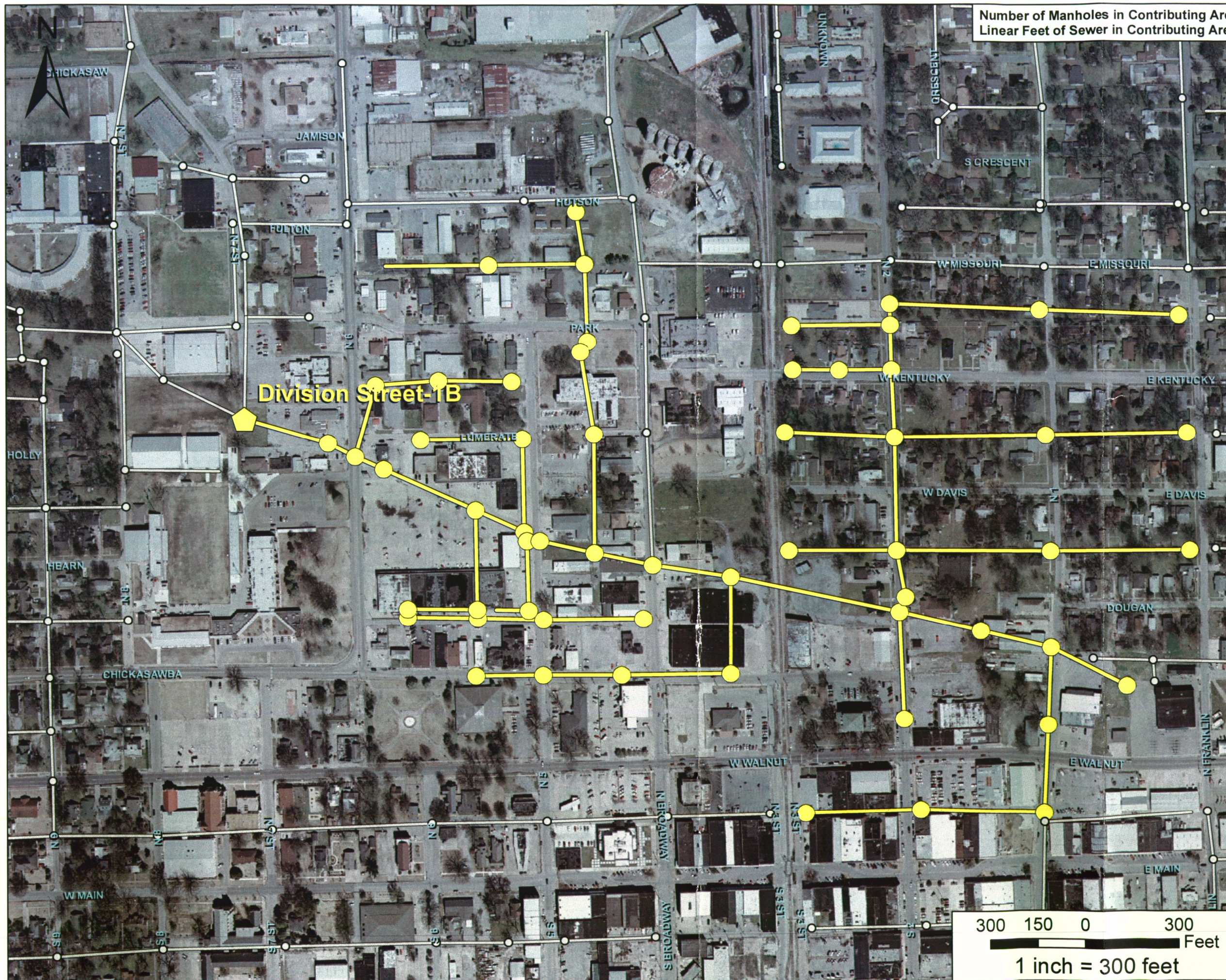
City of Blytheville



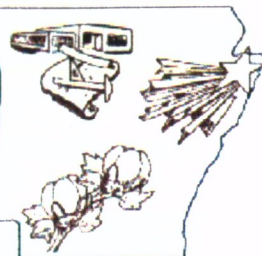
Figure 57
 Division-1A Monitoring
 Location and
 Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 59
 Linear Feet of Sewer in Contributing Area: 15453 LF

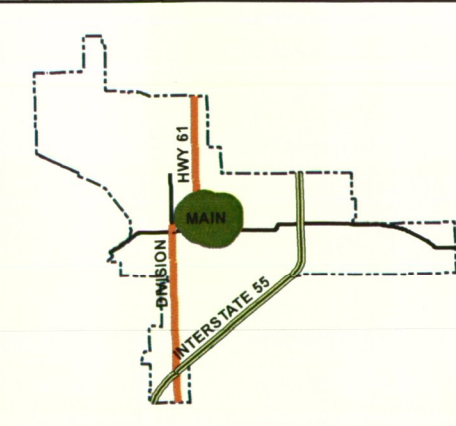


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 Blytheville

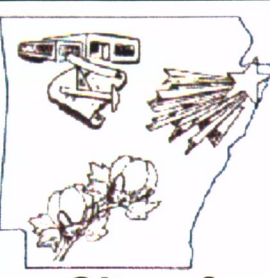
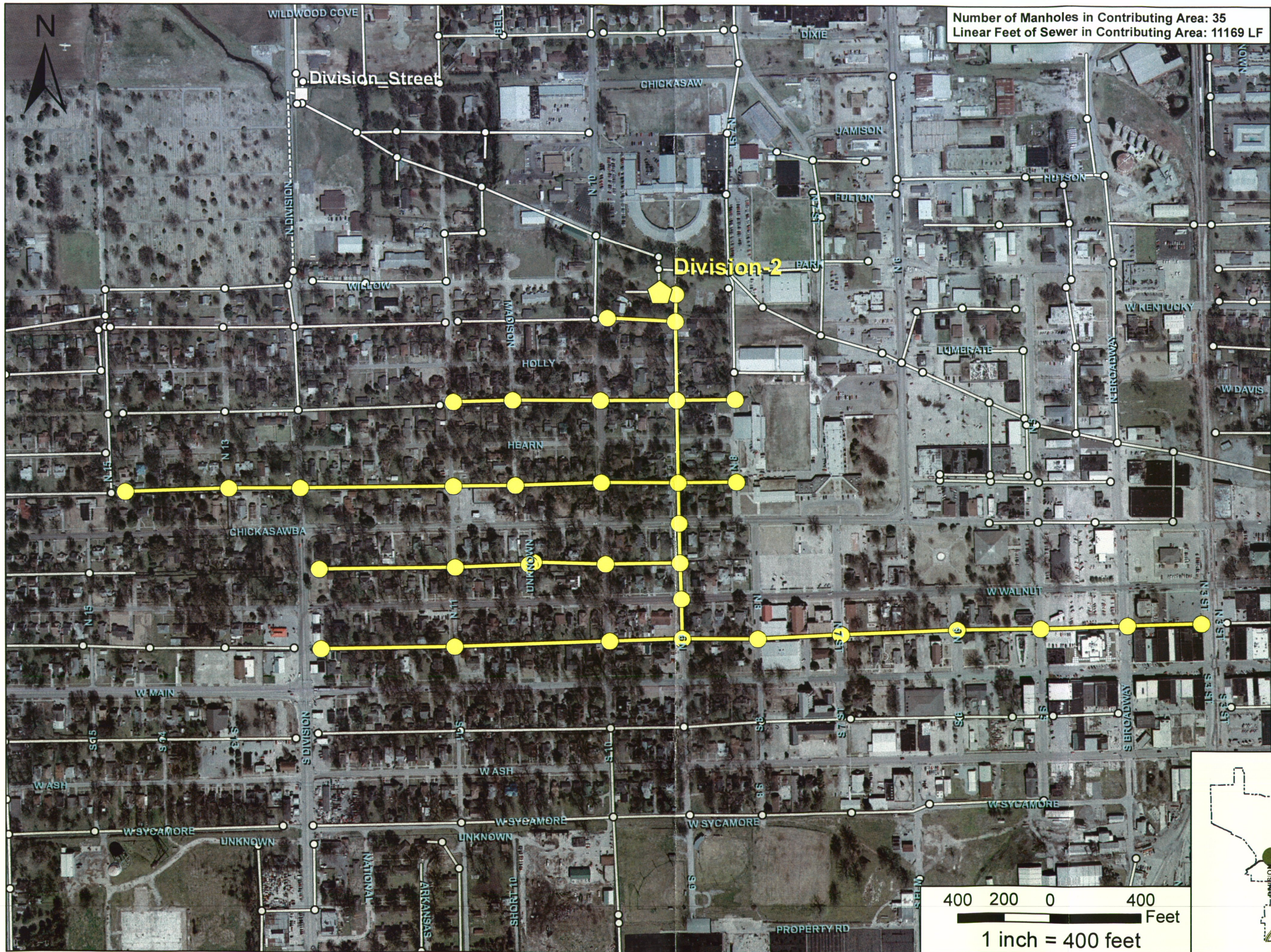


Figure 58
 Division-1B Monitoring
 Location and
 Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



300 150 0 300
 Feet
 1 inch = 300 feet

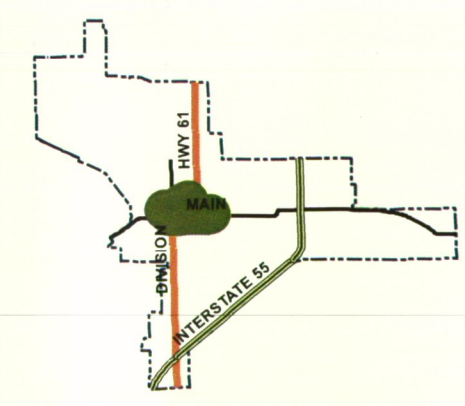


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Blytheville



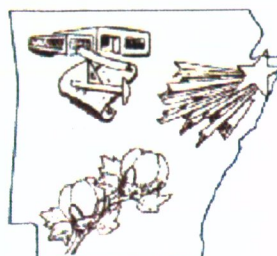
Figure 59
 Division-2 Monitoring
 Location and
 Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 25
Linear Feet of Sewer in Contributing Area: 8209 LF



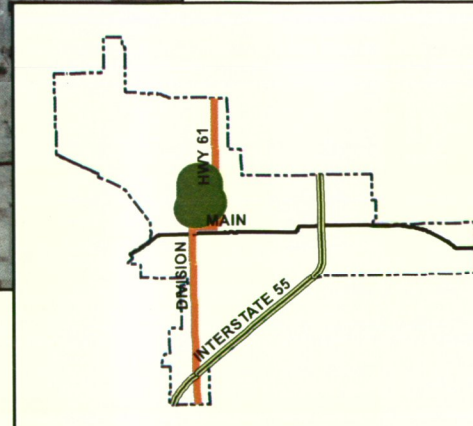
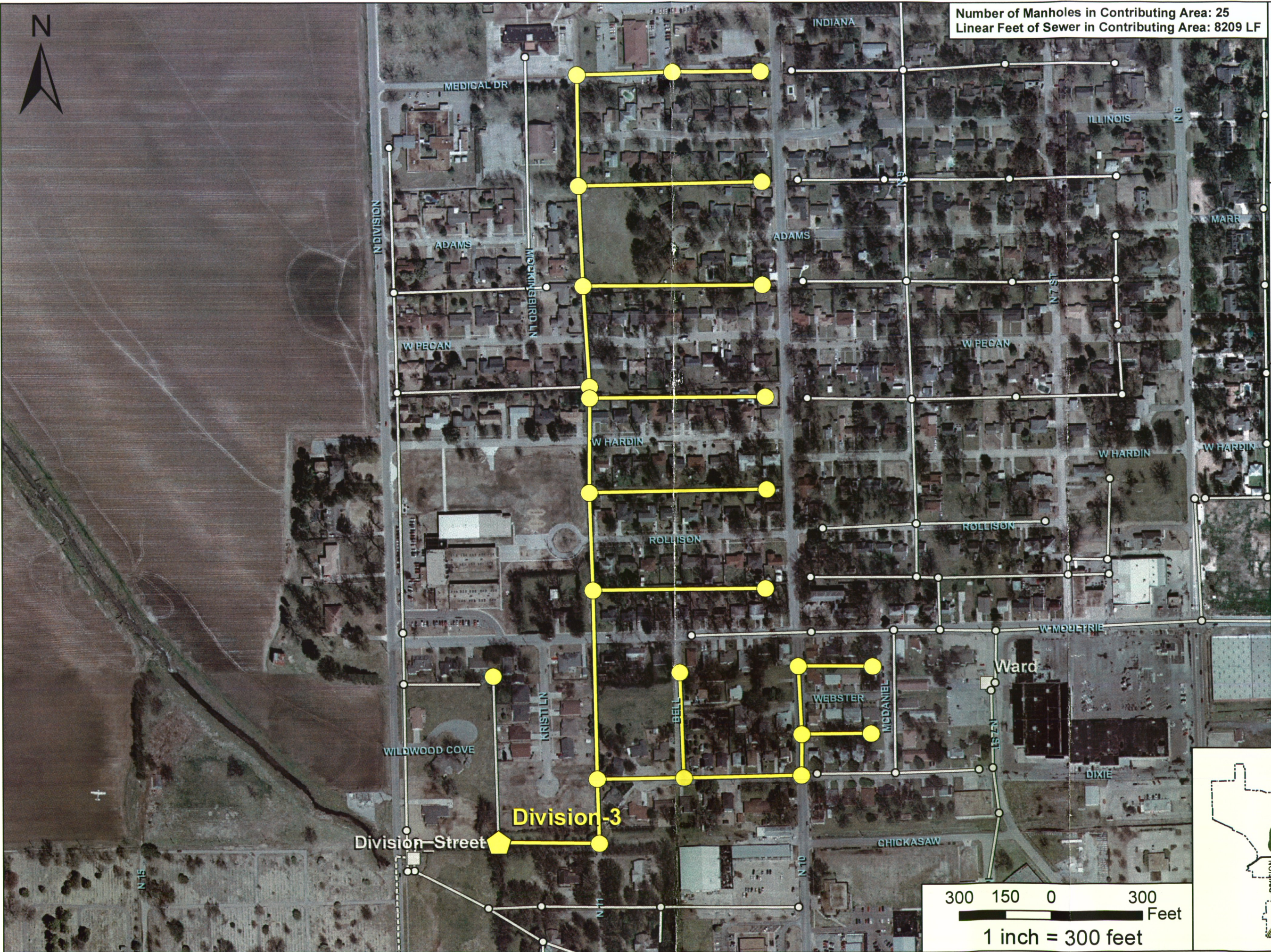
City of
Blytheville



Figure 60

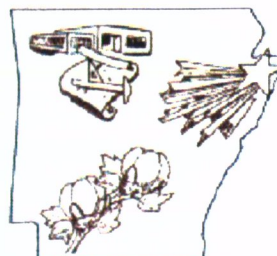
Division-3 Monitoring
Location and
Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



300 150 0 300 Feet
1 inch = 300 feet

Number of Manholes in Contributing Area: 7
Linear Feet of Sewer in Contributing Area: 2471 LF



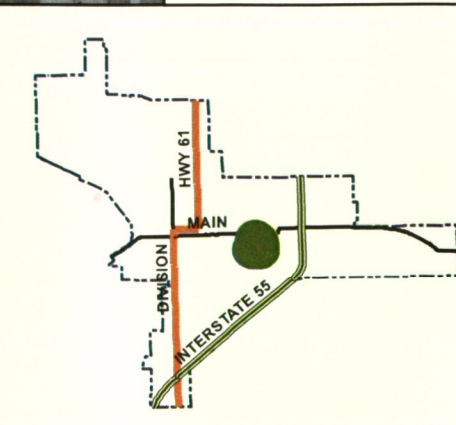
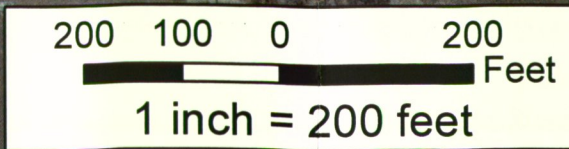
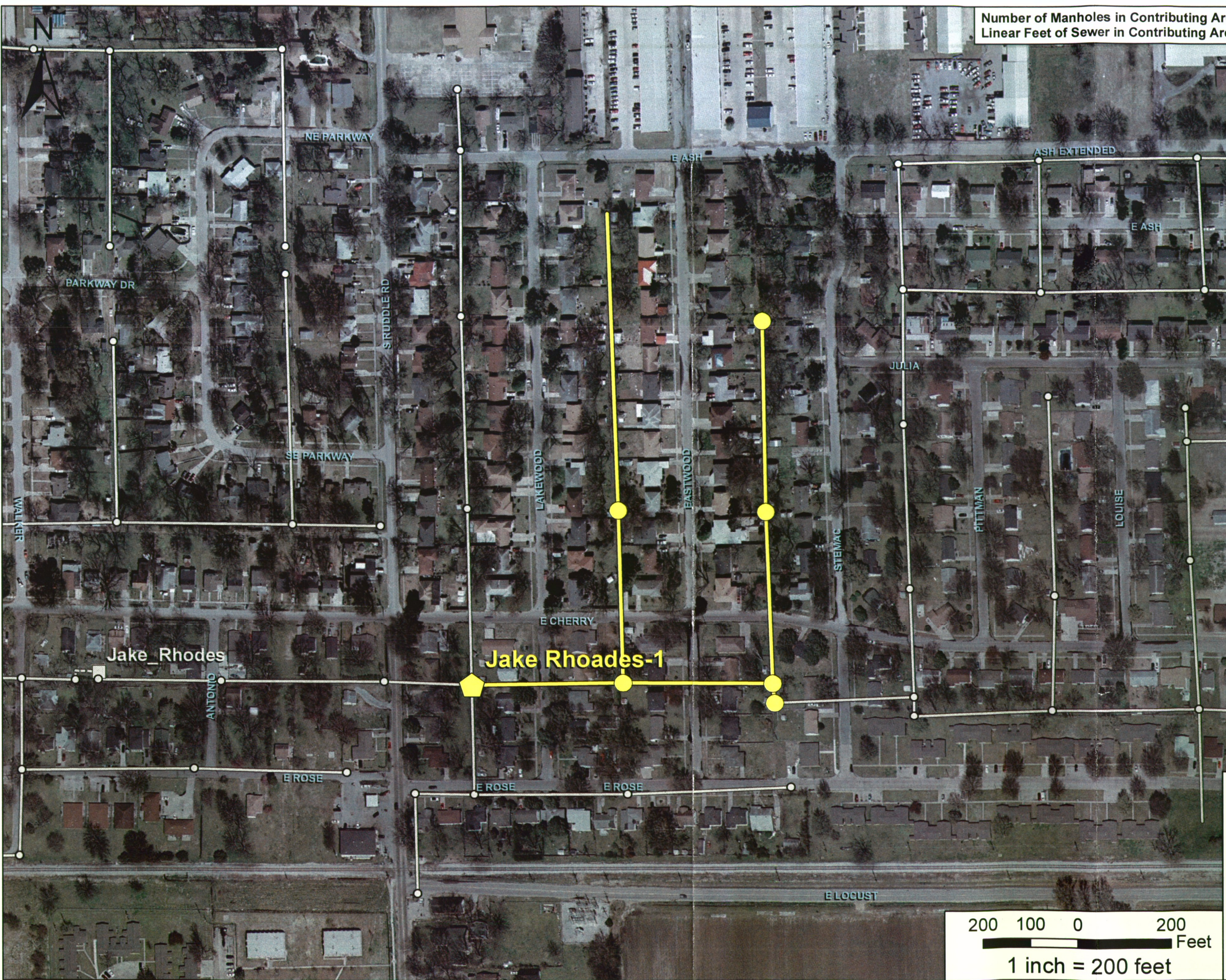
City of
Blytheville

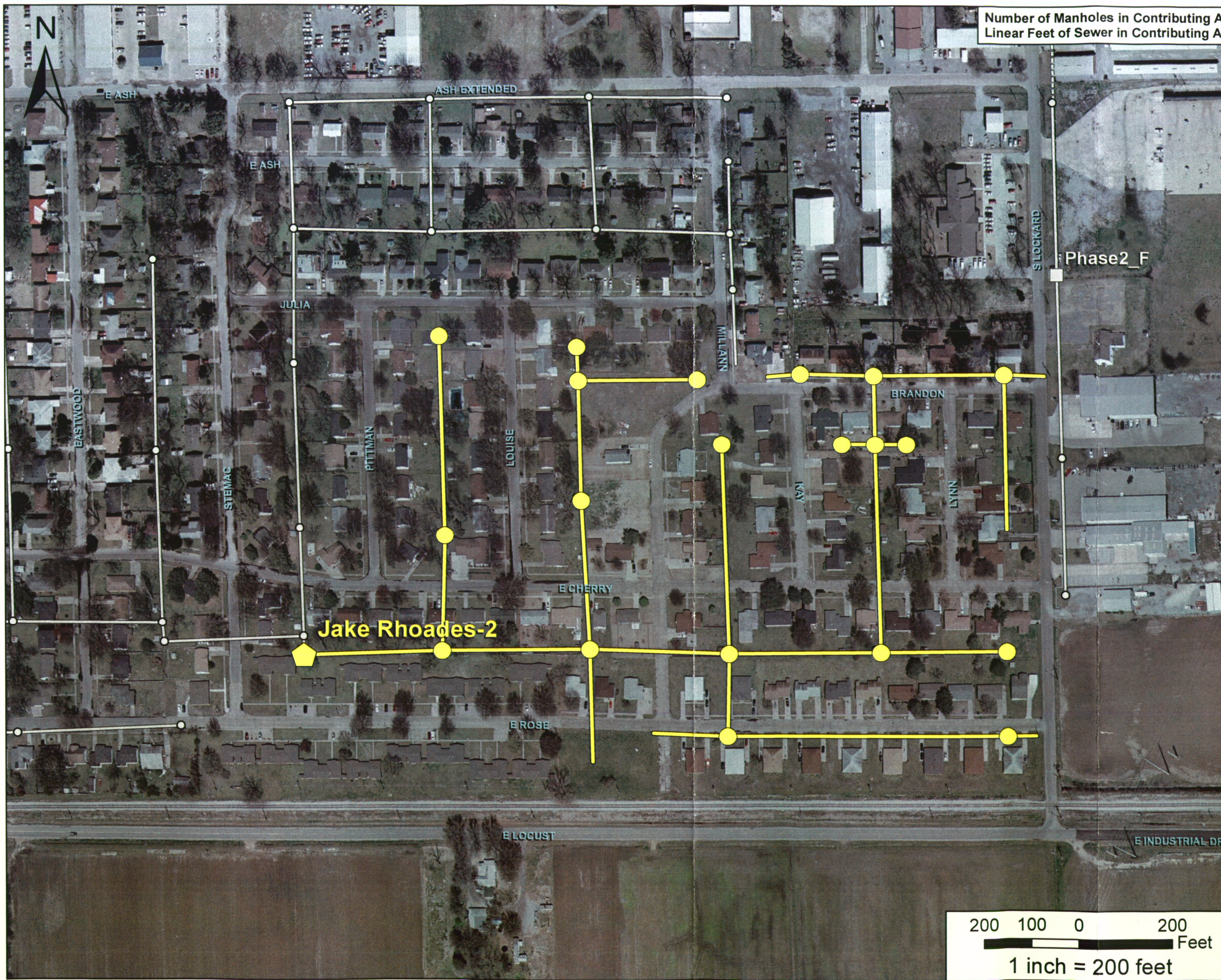


Figure 61

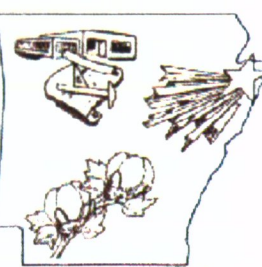
Jake Rhoades-1
Monitoring Location
and Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 21
 Linear Feet of Sewer in Contributing Area: 6401 LF

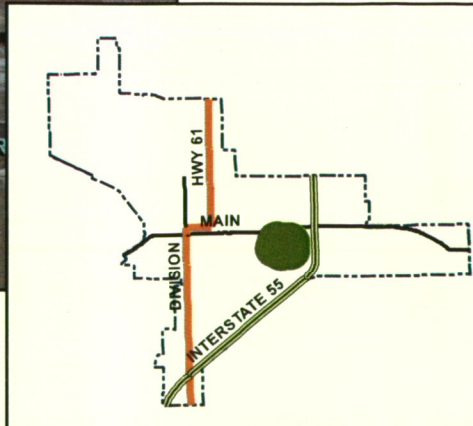


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Figure 62
 Jake Rhoades-2
 Monitoring Location
 and Contributing Area

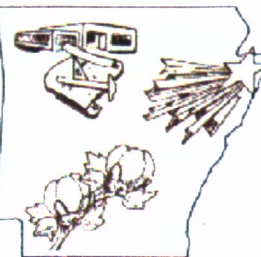
- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



200 100 0 200
 Feet
 1 inch = 200 feet



Number of Manholes in Contributing Area: 13
 Linear Feet of Sewer in Contributing Area: 4001 LF



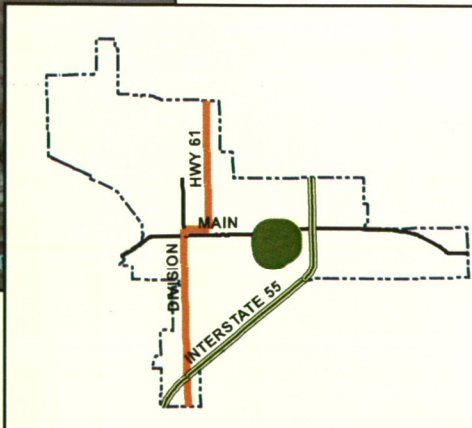
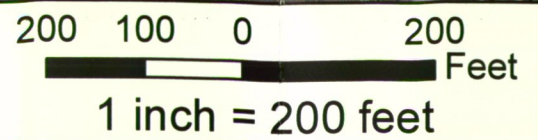
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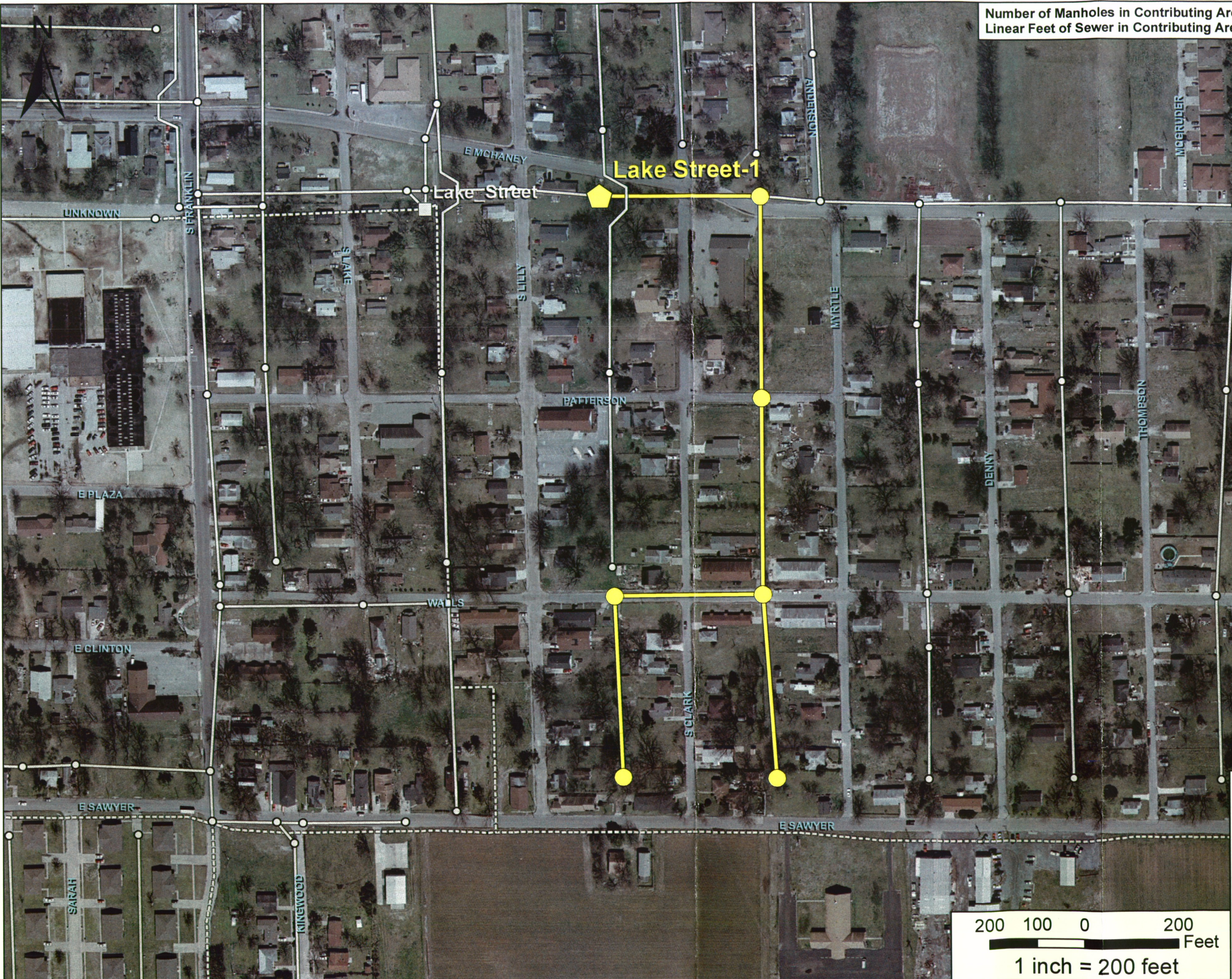
Figure 63

Jake Rhoades-3
 Monitoring Location
 and Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



Number of Manholes in Contributing Area: 7
Linear Feet of Sewer in Contributing Area: 2286 LF

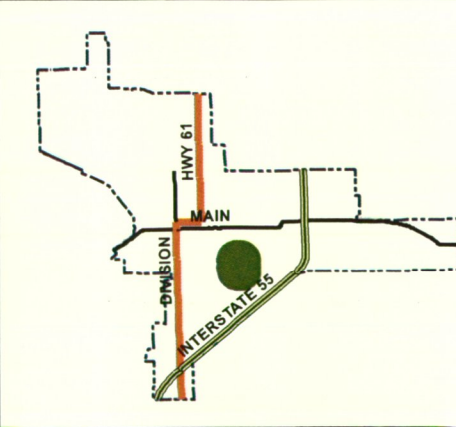
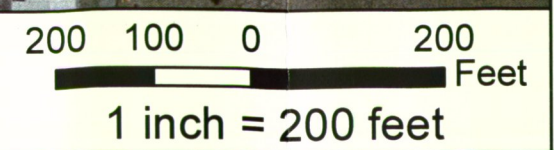


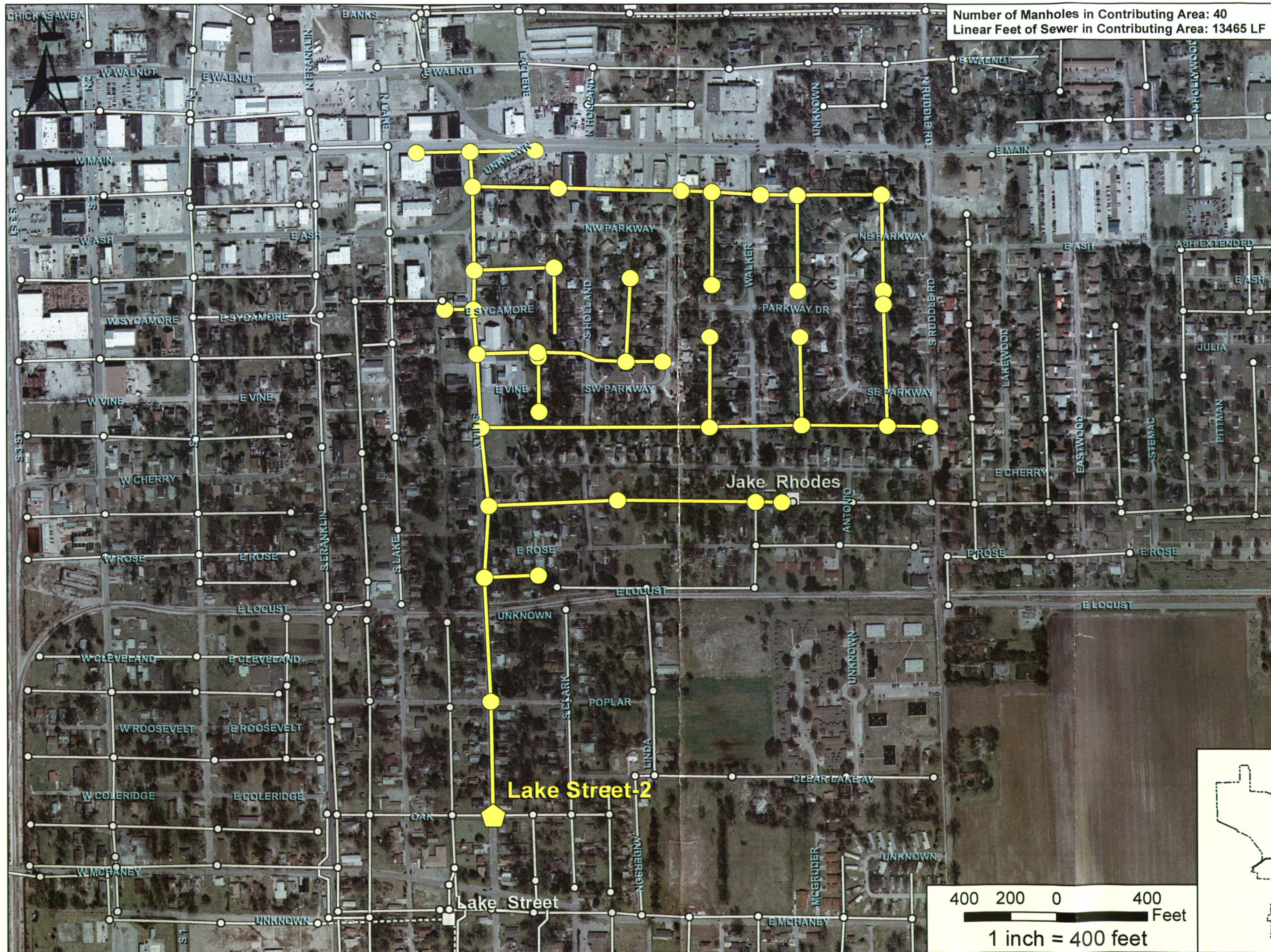
City of
Blytheville



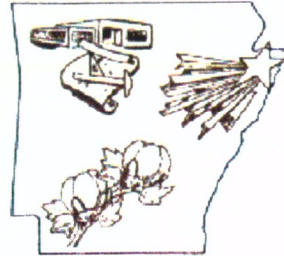
Figure 64
Lake Street-1
Monitoring Location
and Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 40
 Linear Feet of Sewer in Contributing Area: 13465 LF



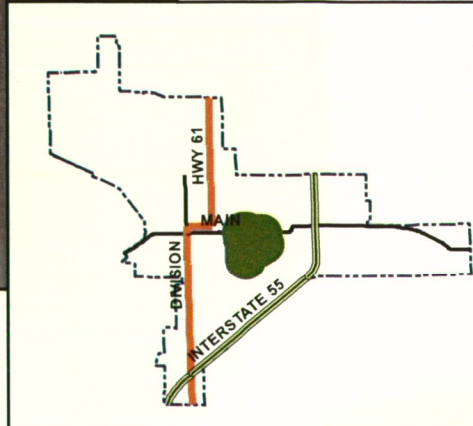
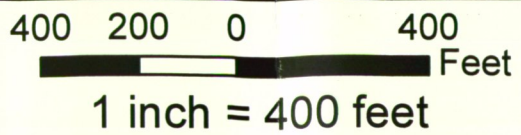
City of
 Blytheville

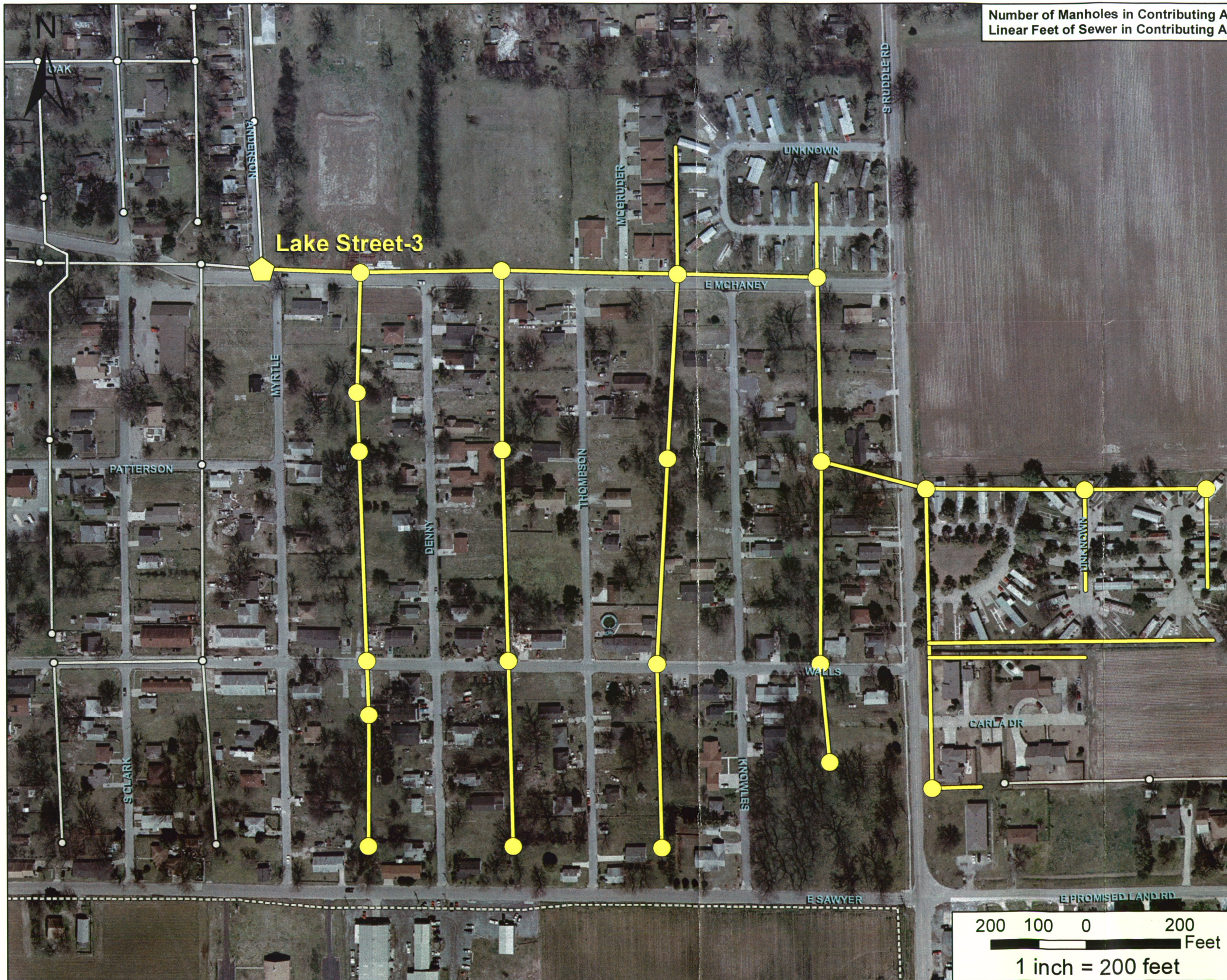


Figure 65

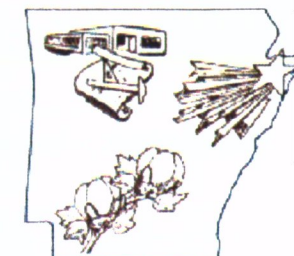
Lake Street-2
 Monitoring Location
 and Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 23
 Linear Feet of Sewer in Contributing Area: 9306 LF

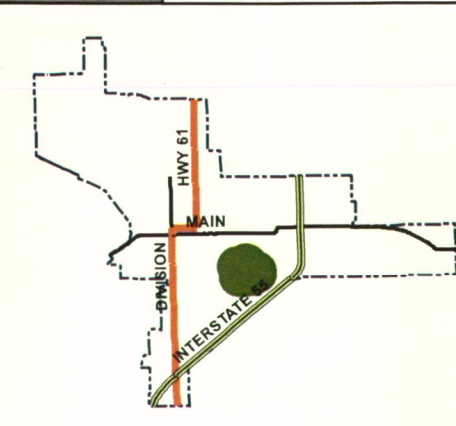
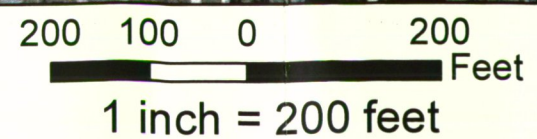


City of Blytheville

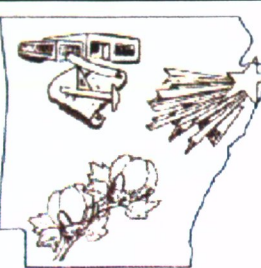


Figure 66
 Lake Street-3
 Monitoring Location
 and Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



Number of Manholes in Contributing Area: 23
Linear Feet of Sewer in Contributing Area: 9718 LF



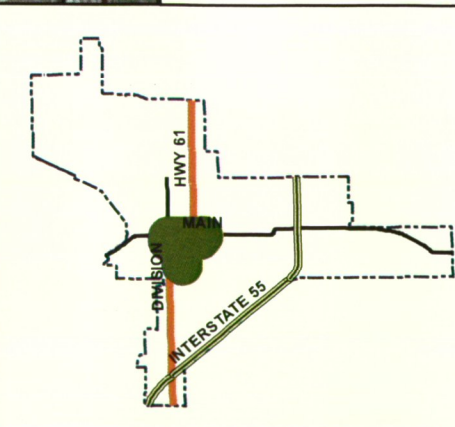
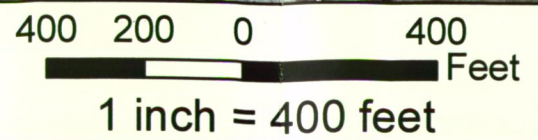
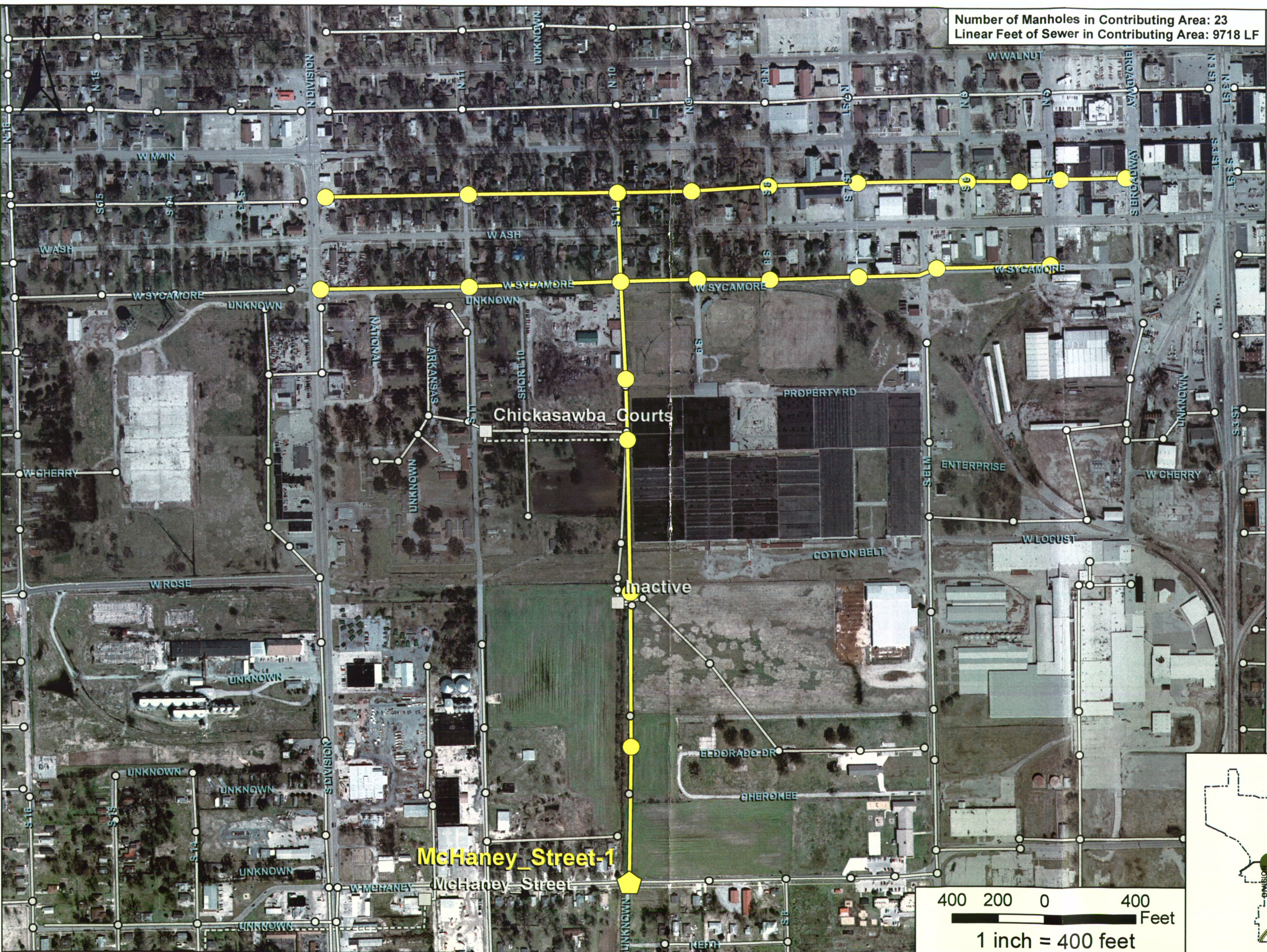
City of
Blytheville



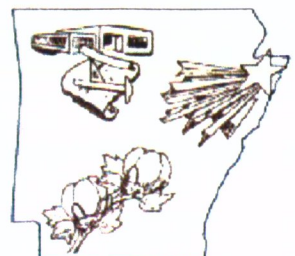
Figure 67

McHaney Street-1
Monitoring Location and
Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



Number of Manholes in Contributing Area: 3
Linear Feet of Sewer in Contributing Area: 901 LF



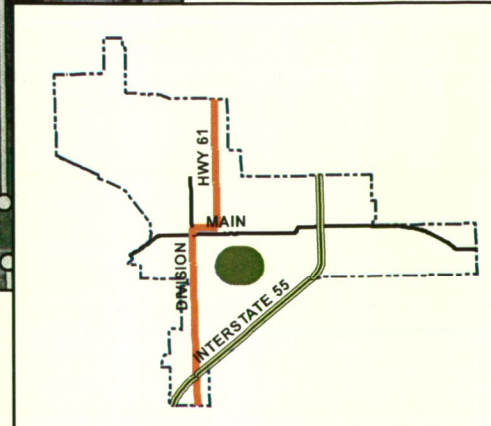
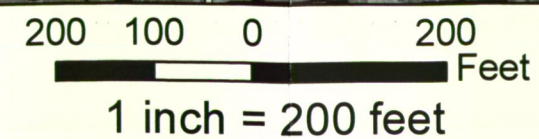
City of
Blytheville



Figure 68

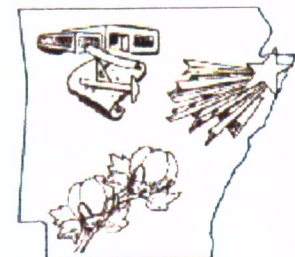
McHaney Street-2
Monitoring Location and
Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 23
Linear Feet of Sewer in Contributing Area: 6535 LF

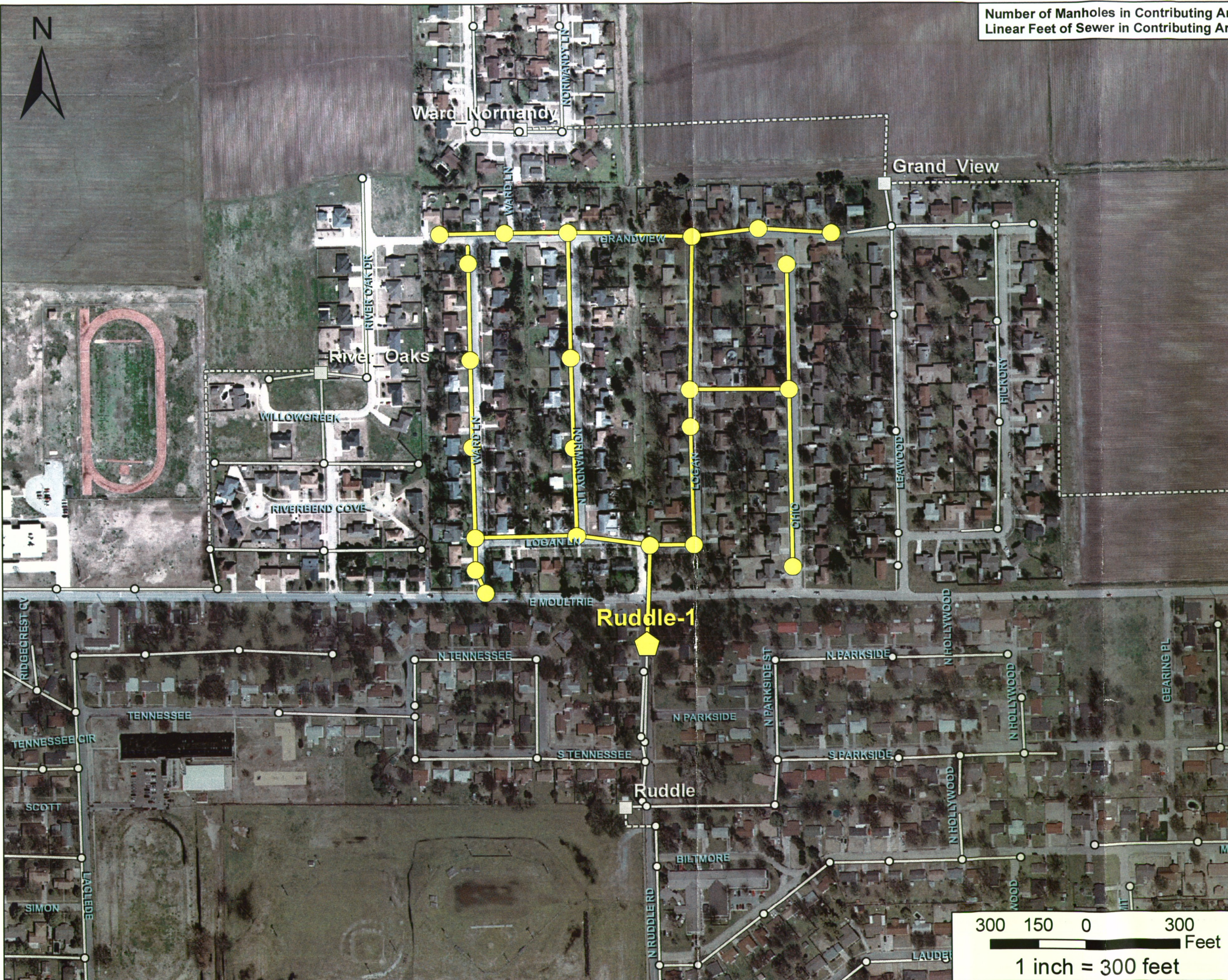


City of
Blytheville

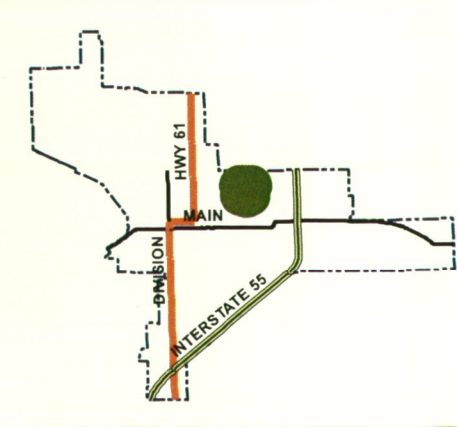
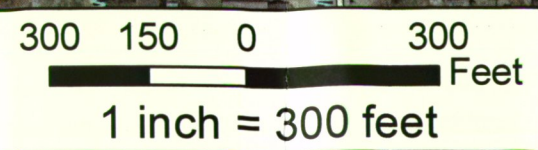


Figure 69

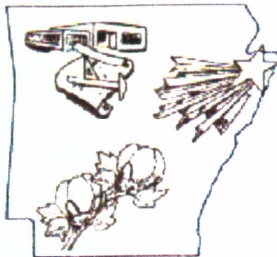
Ruddle-1
Monitoring Location and
Contributing Area



- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



Number of Manholes in Contributing Area: 42
 Linear Feet of Sewer in Contributing Area: 14255 LF



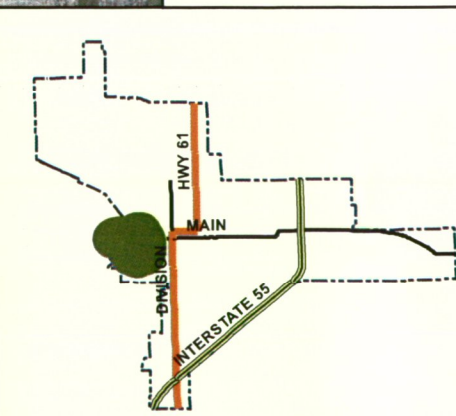
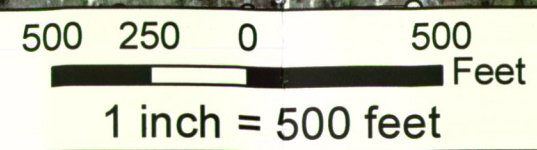
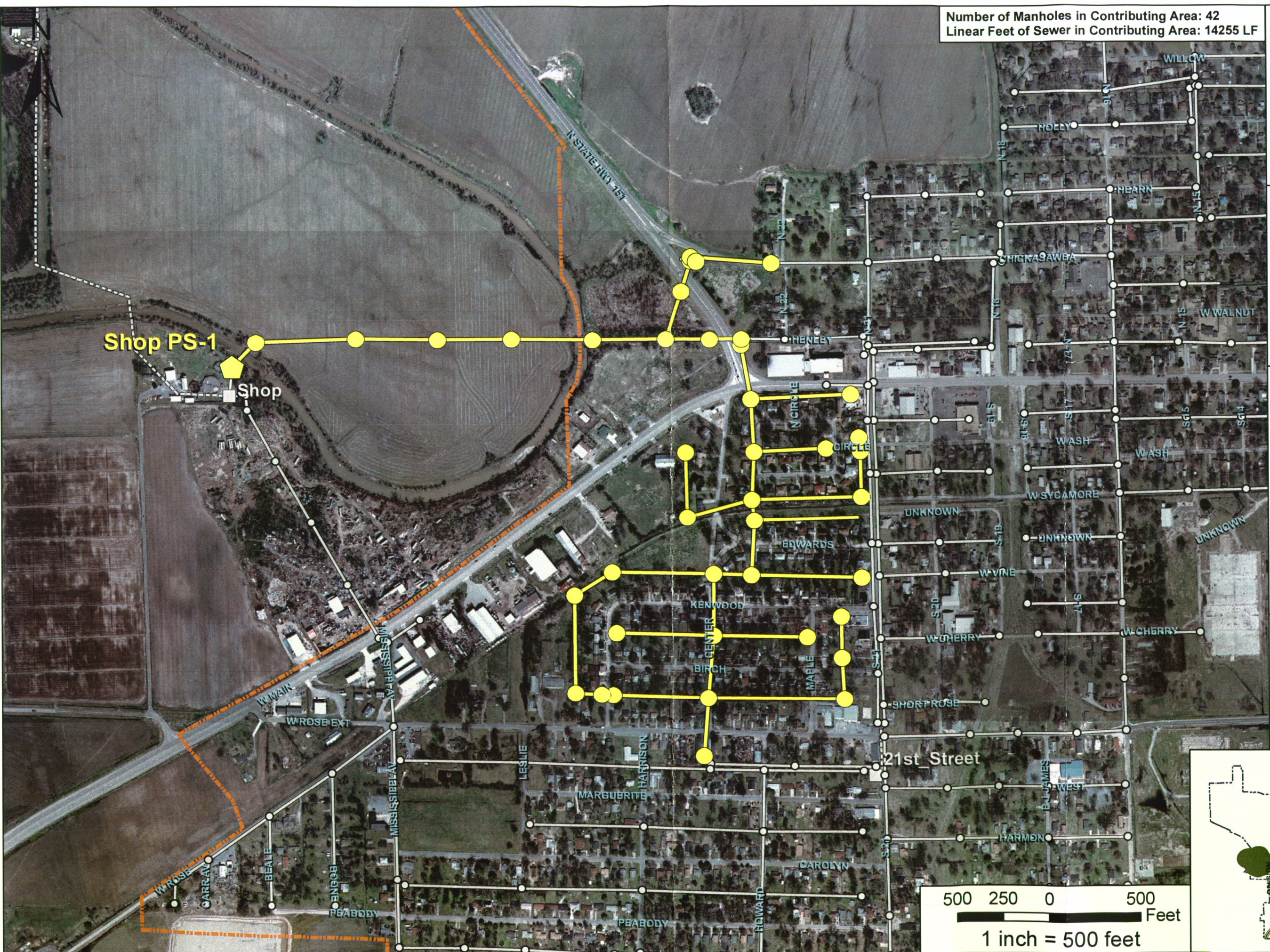
City of
 Blytheville

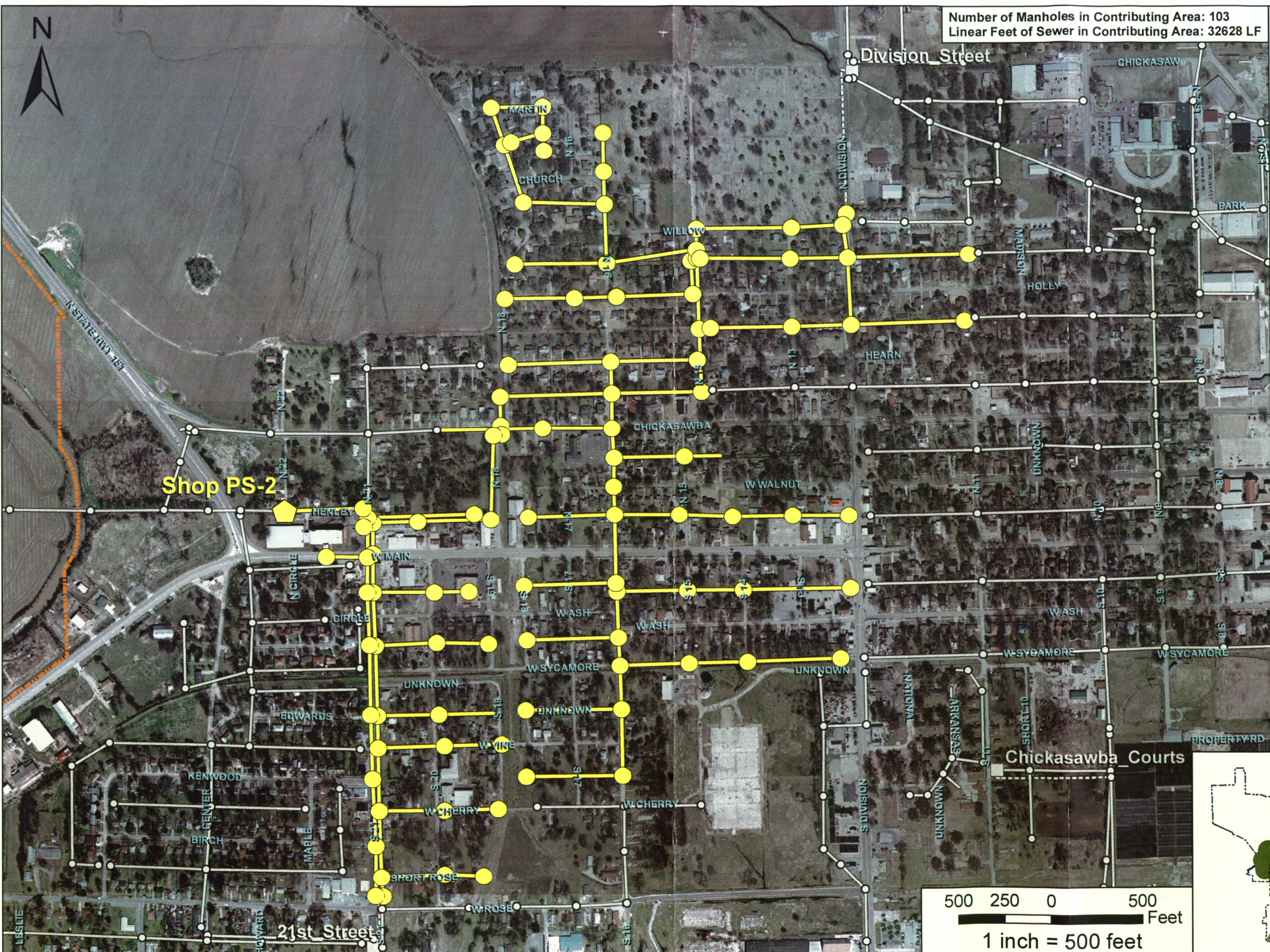


Figure 70

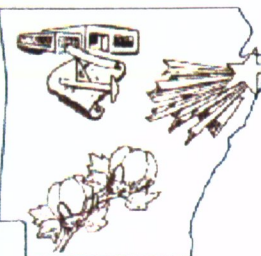
Shop PS-1
 Monitoring Location and
 Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station





Number of Manholes in Contributing Area: 103
 Linear Feet of Sewer in Contributing Area: 32628 LF



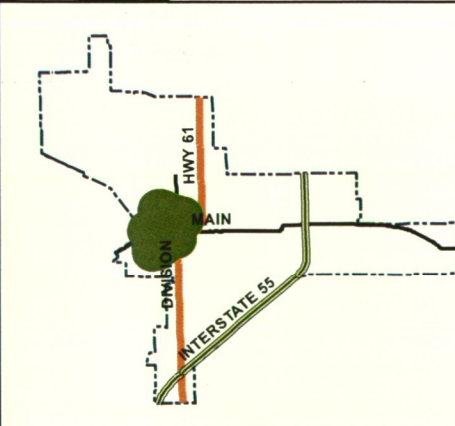
City of Blytheville



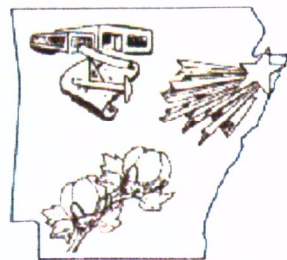
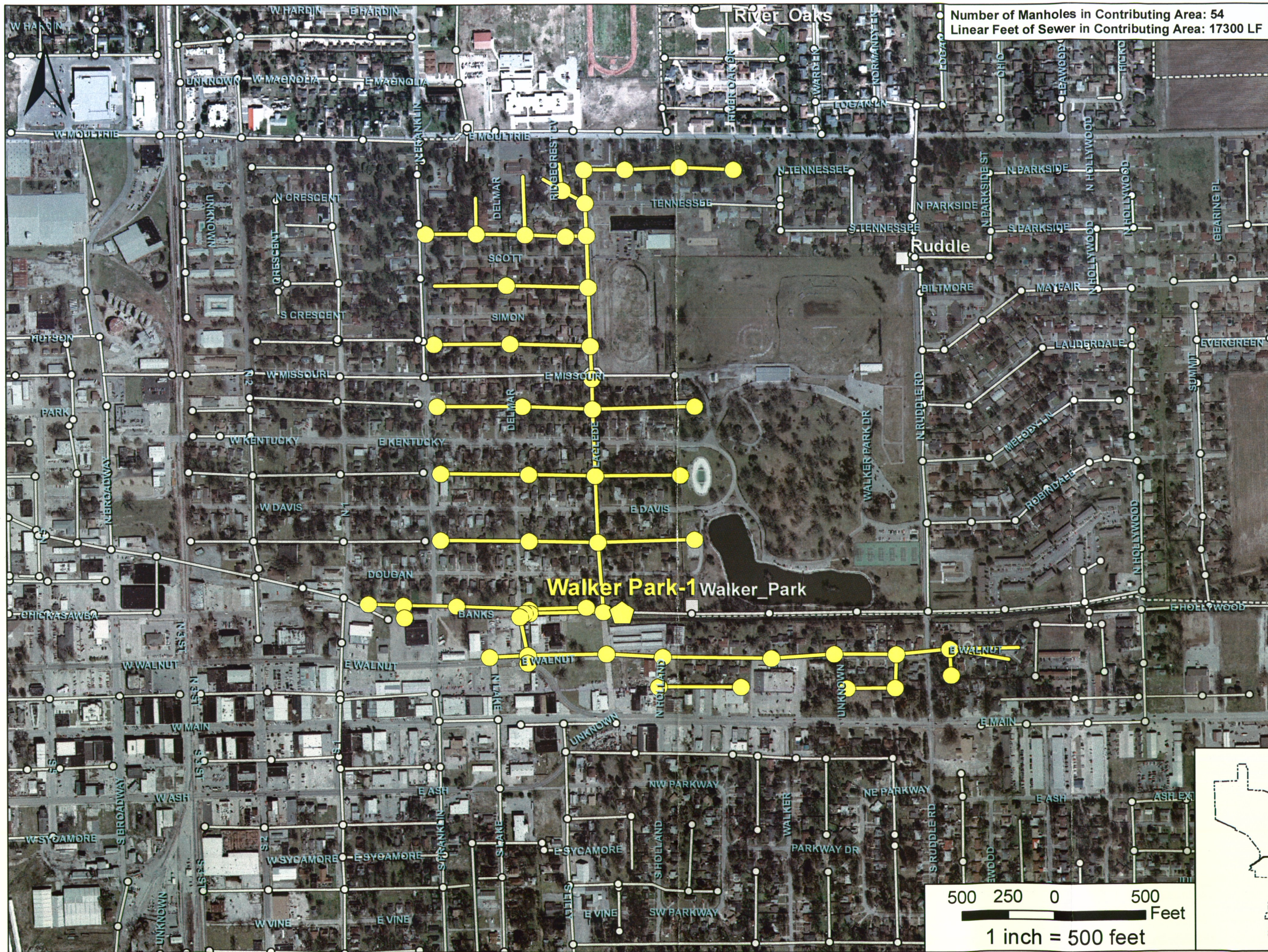
Figure 71

Shop PS-2
 Monitoring Location and
 Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



500 250 0 500 Feet
 1 inch = 500 feet

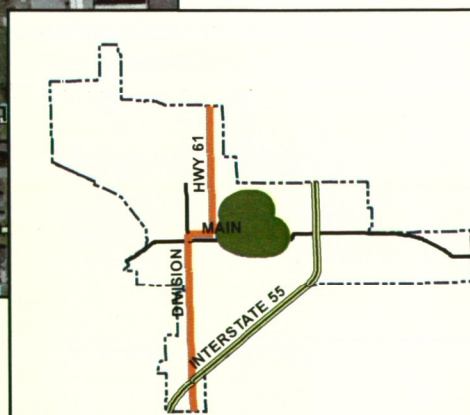


City of
Blytheville

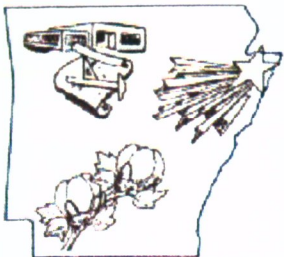
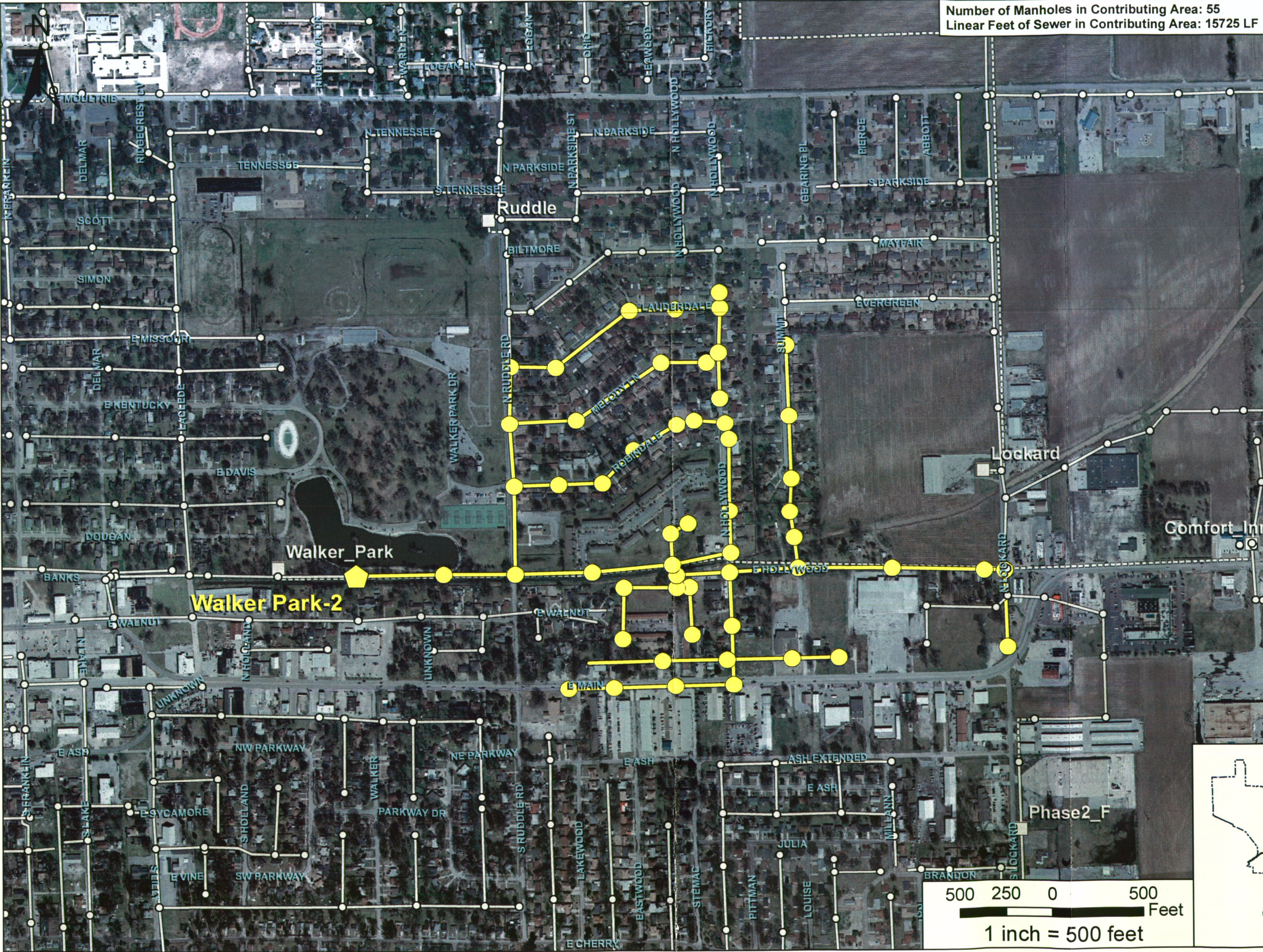


Figure 72
Walker Park-1
Monitoring Location and
Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



Number of Manholes in Contributing Area: 55
Linear Feet of Sewer in Contributing Area: 15725 LF



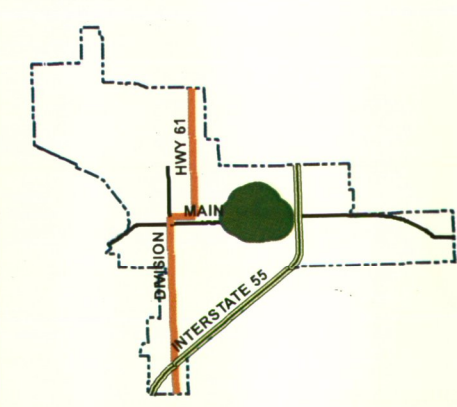
City of
Blytheville



Figure 73

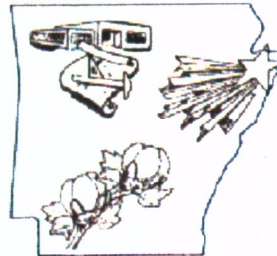
Walker Park-2
Monitoring Location and
Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



500 250 0 500 Feet
1 inch = 500 feet

Number of Manholes in Contributing Area: 3
Linear Feet of Sewer in Contributing Area: 449 LF



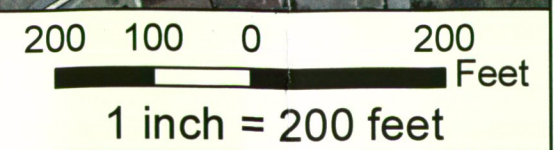
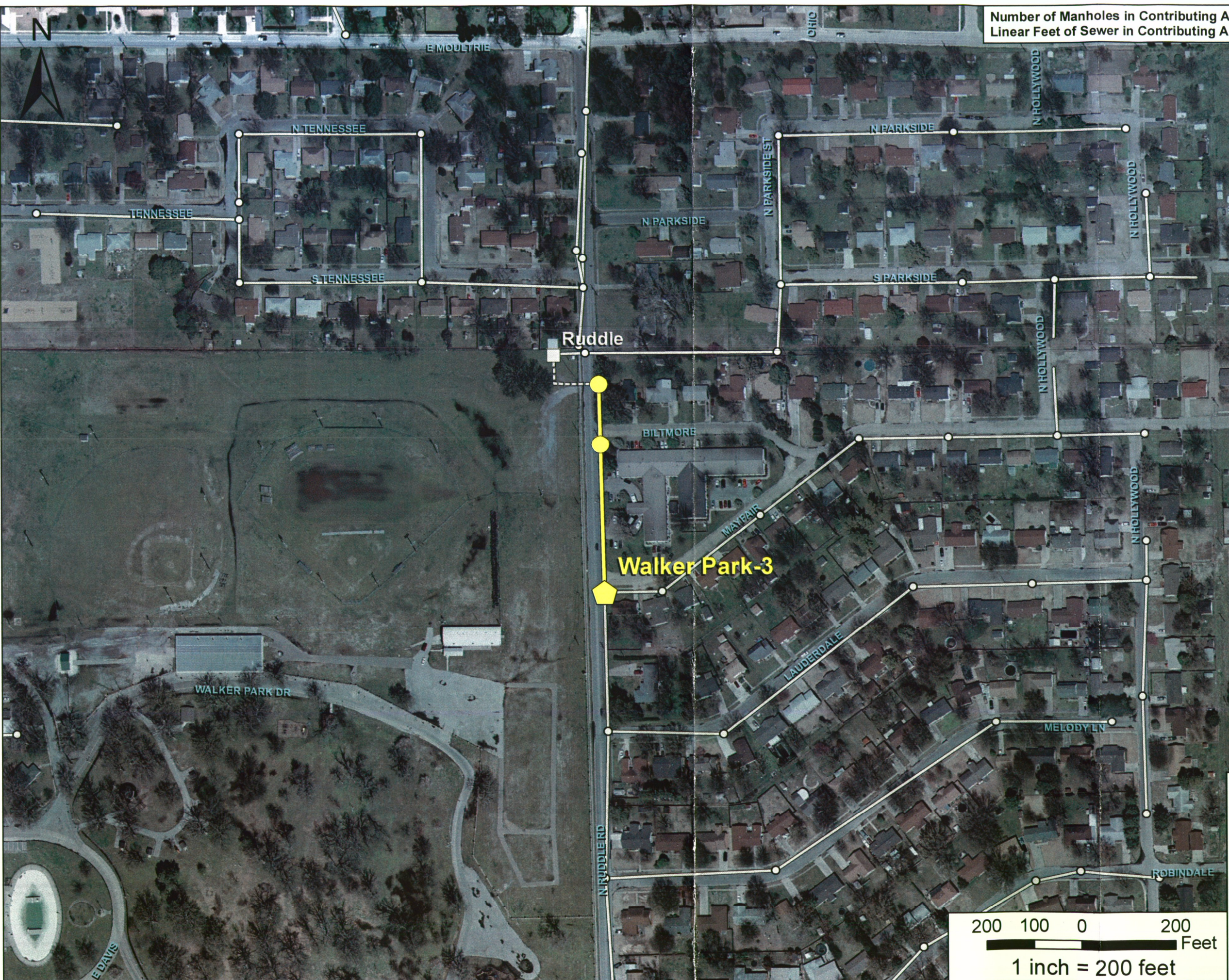
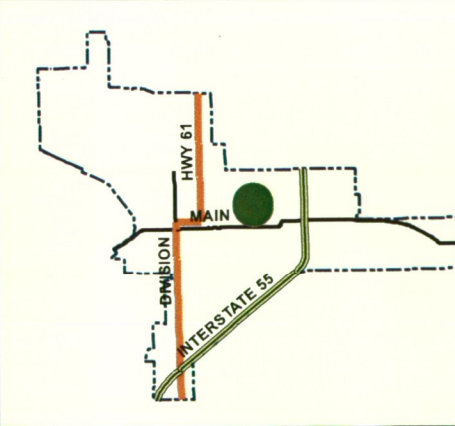
City of
Blytheville



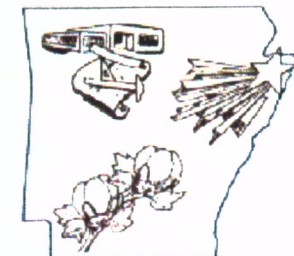
Figure 74

Walker Park-3
Monitoring Location and
Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



Number of Manholes in Contributing Area: 18
 Linear Feet of Sewer in Contributing Area: 4234 LF



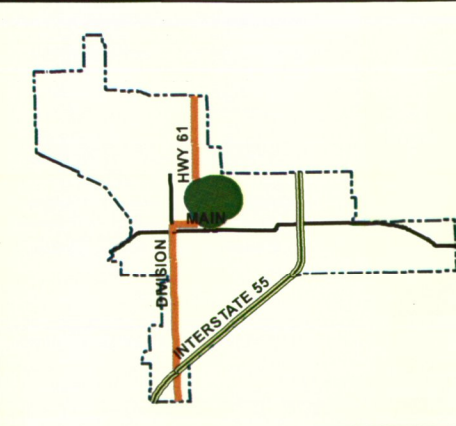
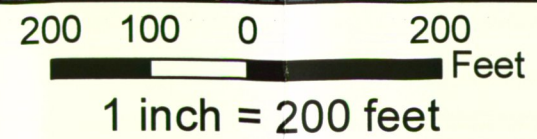
City of Blytheville



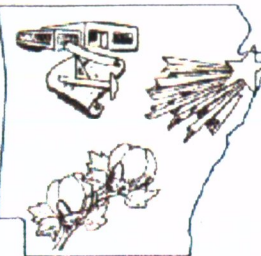
Figure 76

Ward-2 Monitoring Location and Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station



Number of Manholes in Contributing Area: 21
Linear Feet of Sewer in Contributing Area: 4755 LF



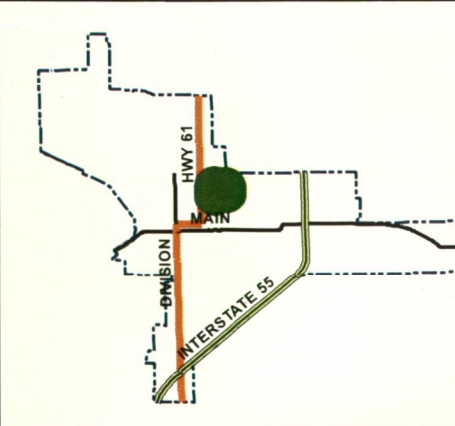
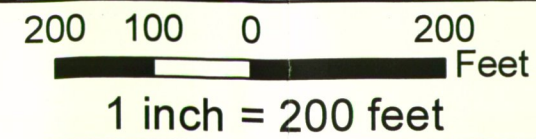
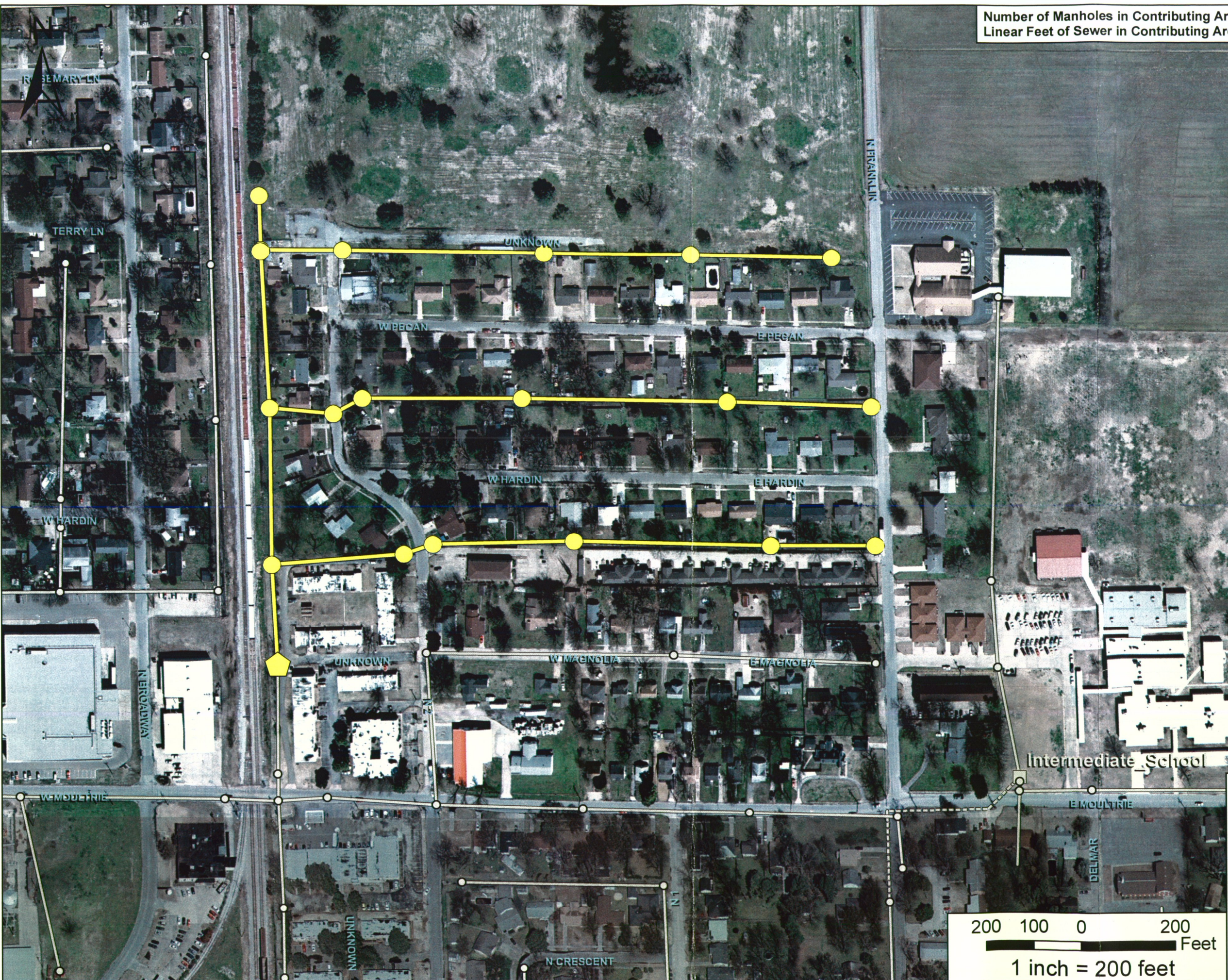
City of
Blytheville

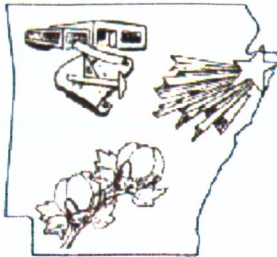
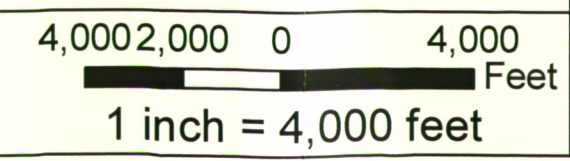
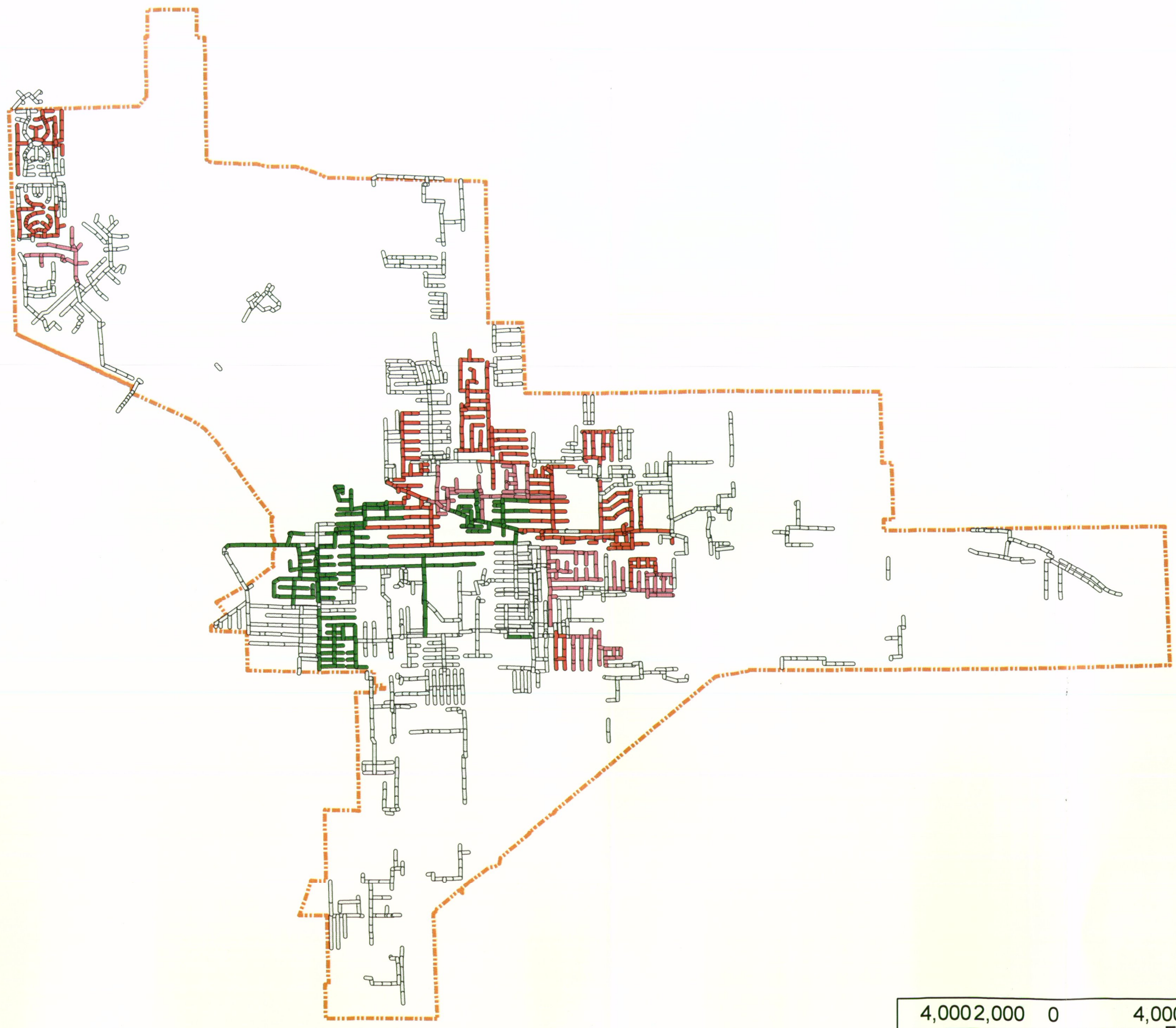


Figure 77

Ward-3 Monitoring
Location and
Contributing Area

- Not Contributing
- Contributing
- Not Contributing
- Contributing
- Pump Station









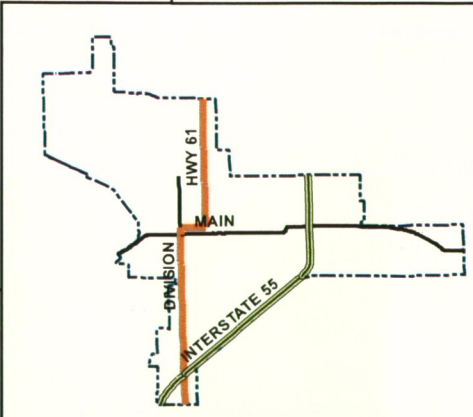
City of
Blytheville



Figure 78

City of Blytheville
Collection System
Conclusions

-  Adequate Capacity
-  Inadequate Capacity
-  Inconclusive Data
-  Not Monitored



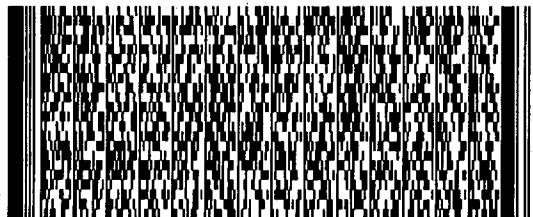
From: Origin ID: OLVA (901) 683-3900
Ryan McDaniel
SSR, Inc.
2650 Thousand Oaks Blvd
Suite 3200
MEMPHIS, TN 38118



J05308987312023

SHIP TO: (999) 999-9999 **BILL SENDER**
Anne Roberts, Water Division
Arkansas Dept. Environmentl Quality
5301 NORTSHORE DR

NORTH LITTLE ROCK, AR 72118



Ship Date: 07OCT09
Act/Wgt: 3.0 LB
CAD: 8365085/INET9090
Account#: S *****

Delivery Address Bar Code



Ref # 0961 0190
Invoice #
PO #
Dept #

TRK# 7960 1272 4370
0201

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