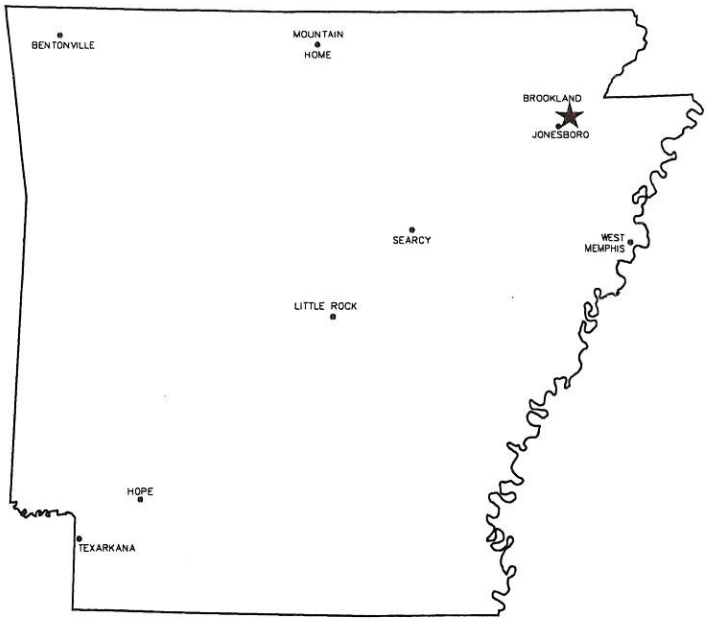

318 Leslie Ann Drainage Study
CITY OF JONESBORO

Novemeber 2014

Prepared For:

The Mayor and
City of Jonesboro City Council

Prepared by:

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1.0 Synopsis

The current residential structure (Structure) located at 318 Leslie Ann has experienced localized flooding throughout the Structure's life. The Structure's finished floor elevation is approximately 0.5 feet below Leslie Ann Drive which increases its vulnerability to localized flooding events. The most recent flooding event occurred in the month of June 2014. This event caused estimated damages to the structure between $15,000-$25,000. The City of Jonesboro (City) has retained Civil Engineering Associates LLC to analyze the existing drainage network and review alternatives to mitigate the localized flooding associated with this residential structure. The study reviewed the 10-year, 25-year, 50-year, and 100-year rainfall events to help identify the current level of protection the existing system provides. In addition, the study identified system inefficiencies and recommend solutions.

2.0 Existing Facilities

The drainage basin in which the Structure is located consists of a 26.29 acre watershed located in the Meadowlark Acres Subdivision (Subdivision), which was constructed in the 1970s. After reviewing aerial photos of the basin it appears that Subdivision achieved its build out prior to the year1985. The only construction since then consists of apartments that were constructed downstream of the drainage network between the 1994 and 2005 aerial photos. The Subdivision consist of half acres lots with homes typical of late 1970's early 1980's architecture.

The current drainage network adjacent to the structure was improved in 2011. The City spent $40,000.00 increasing the network by installing 36" equivalent pipe network parallel to existing 24". Figure 1 shows the existing drainage network near the Structure prior to the 2011improvements and the Figure 2 shows the network after the 2011 improvements.

In order to get an accurate assessment of the hydrologic and hydraulic characteristics of the basin and to determine the level of protection the current network provides, a model was built using the Autodesk Storm and Sanitary Analysis 2014. Generally, the model creation consisted of delineating the watershed, gathering field data of the existing networks elevations and adjacent structures, building a computer model, and evaluating the existing network at the 10- year, 25-year, 50-year, and 100-year rainfall events.

The watershed area, average slope, and predevelopment surface were obtained from the City's lidar information. Soils information was obtained from the National Resource Conservation Service Web Soil Survey and the Hydrologic Soil Group within the watershed was determined to be type C. The basin's time of concentration of 36.14 minutes was calculated using the TR-55 methods. The curve number used in this analysis was 80 and the method used to simulate the different rainfall events was the SCS Storm. The following table shows the storm event, the SCS rainfall distribution, and the peak runoff for the drainage basin:

Table 1. Peak Rainfall Runoff

Storm Event	SCS Rain Fall Distribution Type	Peak Runoff (cfs)
10-year	2	79.75
25-year	2	95.82
50-year	2	109.60
100-year	2	124.75

From the modeling performed it appears that the existing drainage network is providing a level of protection just below the 10-year storm event. The analysis of the system shows that the driveway culvert under 318 Leslie Ann Drive is controlling the outflow of the network. The piping network on west side of the Leslie Ann Drive has the capacity of the 25-year storm.The vacant lot south of 318 Leslie Ann Drive is lacking a drainage ditch to convey the water from the basin to the 36" horizontal elliptical culvert. This issue is causing the water to leave the confines of its channel and spread out, therefore reducing the hydraulic performance of the network.

3.0 Proposed Solutions

Five alternatives were reviewed to help provide the City with necessary information to reach a decision to mitigate the problem.

Alternative No. 1-This alternative involves extending the driveway drainage structure to the existing drainage easement, installing a junction box at the end of the pipe and extending a ditch to the east. The intention of this solution is to improve the hydraulic efficiency of the network. As seen in the cost estimate located in Table 2, this alternative appears to be relatively inexpensive to the other alternatives. This solution should provide a level of protection to the structure somewhere around the 10-year storm.

Table 2. Alternative No. 1-Cost Estimate

Item Description	Estimated Qty.	Unit Price	Estimated Price
Junction Box (EA)	1	$ 3,000.00	$ 3,000.00
36" Horizontal Elliptical Pipe (L.F.)	30	$ 80.00	$ 2,400.00
Reshape Drainage Easement (Lump Sum)	1	$ 1,000.00	$ 1,000.00
TOTAL			**$ 6,400.00**

Alternative No. 2- This alternative involves extending the driveway structure to the existing drainage easement, installing a junction box at the end the pipe, adding additional pipe under the driveway, and ditching to the east. The intention of this solution

is to improve the hydraulic efficiency of the network by removing the bottle neck under the drive way.

The cost estimate located in Table 3 shows the cost of this solution including land acquisition that would be necessary to install the new structures.

Table 3. Alternative No. 2-Cost Estimate

Item Description	Estimated Qty.	Unit Price	Estimated Price
Junction Box (EA)	1	$ 3,000.00	$ 3,000.00
36" Horizontal Elliptical Pipe (L.F.)	30	$ 80.00	$ 2,400.00
Reshape Drainage Easement (Lump Sum)	1	$ 1,000.00	$ 1,000.00
24" RCP	60	$ 60.00	$ 3,600.00
Easement Acquisition (estimated)	1	$ 8,250.00	$ 8,250.00
TOTAL			**$ 18,250.00**

This solution should provide a level of protection just below the 25-year storm event.

Alternative No. 3-This alternative involves constructing a new drainage network that is able to facilitate the 100-year storm. The proposed improvements would involve the installation of 60" RCP to replace the current network. This solution would remove all bottle necks within the network and allow the water to discharge into an unnamed tributary of the Turtle Creek Tributary. This would cause increase runoff to the tributary and would need to be explored further to ensure that the new flow would not have an adverse effect downstream on the base flood elevation. The cost estimate located in Table 4 shows the cost associated with this solution.

Table 4. Alternative No. 3-Cost Estimate

Item Description	Estimated Qty.	Unit Price	Estimated Price
Junction Box (EA)	4	$ 3,000.00	$ 12,000.00
Concrete Headwall (EA)	1	$ 3,000.00	$ 3,000.00
Reshape Drainage Ditches(Lump Sum)	1	$ 4,000.00	$ 4,000.00
60" RCP (L.F.)	316	$ 243.00	$ 76,788.00
Utility Relocation (Lump Sum)	1	$ 15,000.00	$ 15,000.00
Easement Acquisition (estimated)	1	$ 21,750.00	$ 21,750.00
TOTAL			**$ 132,538.00**

Alternative No. 4-This alternative involves purchasing the Structure for its appraised value of $110,000.00 and removing it from the lot. This alternative would help mitigate the flooding of the structure by simply removing it. There would be no additional work needed due to the problem being eliminated. The total estimated cost of this project can be found in the table below.

Table 5. Alternative No. 4 Cost Estimate

Item Description	Estimated Qty.	Unit Price	Estimated Price
Purchasing Structure (Lump Sum)	1	$ 110,000.00	$ 110,000.00
Demolition of Structure (Lump Sum)	1	$ 10,000.00	$ 10,000.00
TOTAL			**$ 120,000.00**

The level of protection provided would be for the 100 year storm due to the structure being removed. However, the existing network would fail during the 25-year storm and cause flooding of the lot without causing damage to that structure due to it being removed.

Alternative No. 5-This alternative involves purchasing the Structure for the appraised value of $110,000.00, removing the structure from the lot, and constructing a detention pond. This alternative would alleviate the flooding of the existing house. However, the construction of the detention pond would have little effect on reducing base flood elevations of the Turtle Creek lateral due to the lack of storage volume that is able to be obtained. Therefore this alternative was not explored in greater detail.

FIGURES

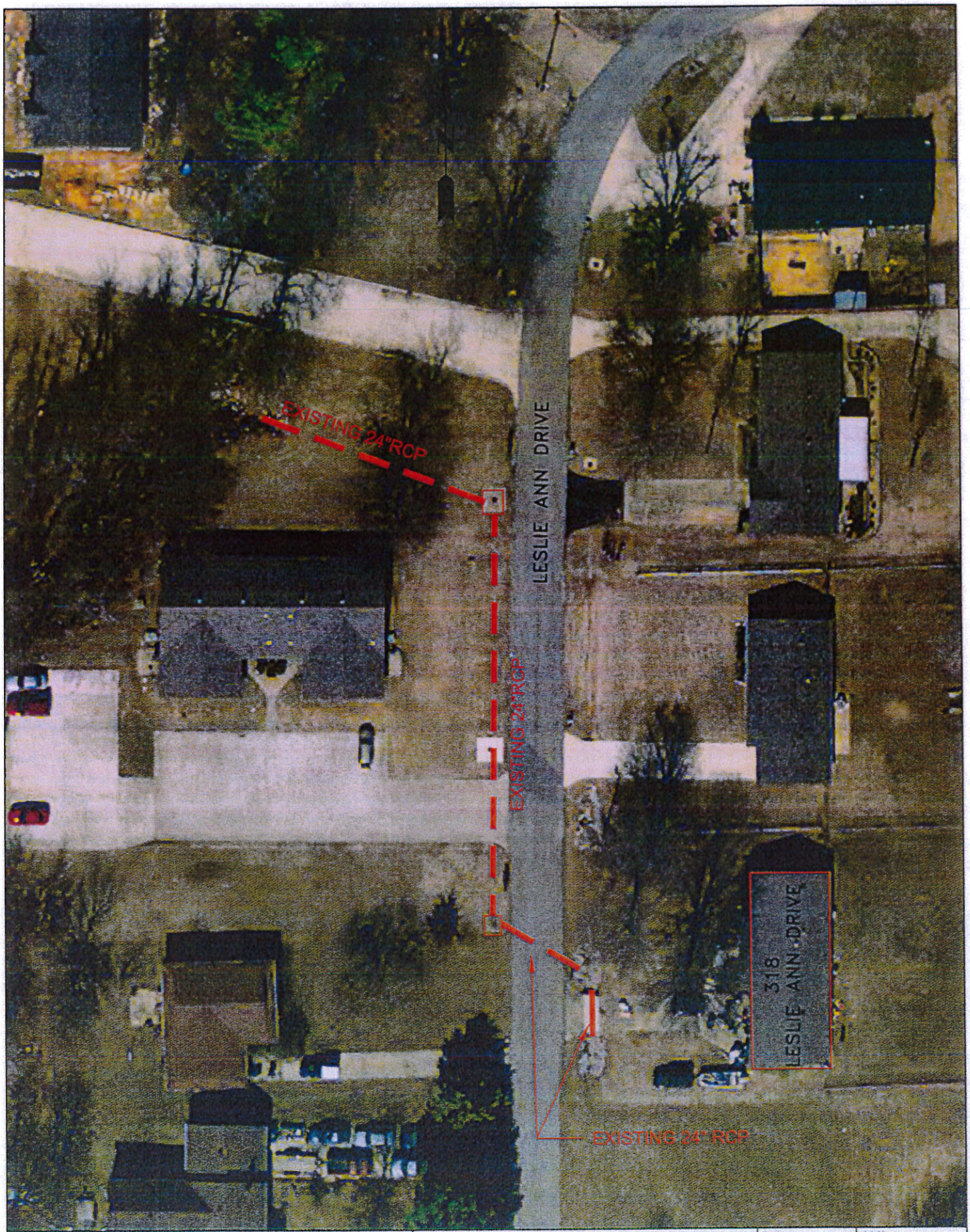

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FIGURE – 1
EXISTING DRAINAGE NETWORK
BEFORE 2011 IMPROVEMENTS

Scale	Job No.
N.T.S.	JB-14-01
Date	Sheet
NOV. 2014	1

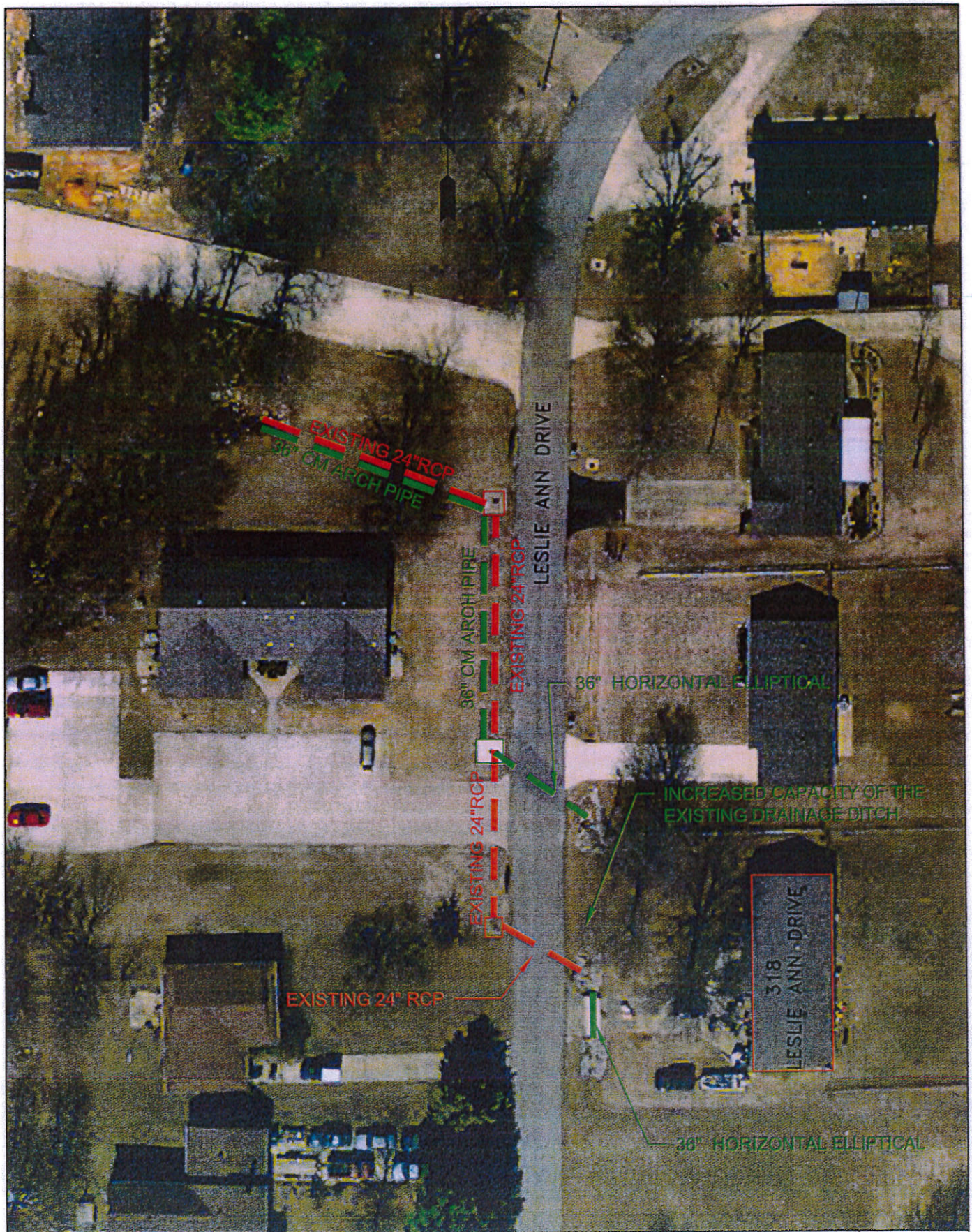

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FIGURE – 2
EXISTING DRAINAGE NETWORK
AFTER 2011 IMPROVEMENTS

Scale	Job No.
N.T.S.	JB-14-01
Date	Sheet
NOV. 2014	1