Engineering Report
for

Goodlettsville Drainage Studies

Submitted to:

City of Goodlettsville, Tennessee

Submitted by:

GOODLETTSVILLE TENNESSEE

CIVIC
EXPERIENCE | TECHNOLOGY | PROGRESS

Hawkins Partners, Inc.

September 3, 2010

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GEORGE B. FOWLER
REGISTERED ENGINEER
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STATE OF TENNESSEE
09/03/10

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SECTION I

INTRODUCTION

SECTION I
INTRODUCTION

A. PURPOSE OF STUDIES

This report summarizes the results of engineering studies conducted for the City of Goodlettsville relating to the identification and evaluation of existing storm drainage issues in three specific areas of the City and present solutions to address these issues. Benefits and project costs for each alternate are to be analyzed and recommendations are to be presented.

B. AUTHORIZATION

The City of Goodlettsville, Tennessee authorized Civic Engineering & IT, Inc., along with its subconsultant Hawkins Partners, Inc., on April 28, 2010 to conduct engineering studies for the three specific areas of the City as described in the following section.

C. SCOPE OF STUDIES

The three areas included in the scope of these studies are:

Area 1- The two-block area bounded by Roscoe Street on the north, Frances Avenue on the south, Two Mile Pike on the east, and East Avenue on the west.

Area 2- Memorial Drive from French Street to South Main Street and French Street from West Cedar Street to Memorial Drive.

Area 3- Gateway Subdivision, bounded by Alta Loma Road on the north, Janette Avenue on the south, CSX Railroad on the east, and Interstate 65 on the west.

Figure I-1 at the end of this section shows the general location of these areas.

The scope of the engineering studies includes the following:

1. Collect data for all information required to evaluate proposed improvements.

2. Perform field investigations and meetings with residents as necessary.

3. Conduct a Public Meeting to obtain additional input from residents and businesses.

4. Evaluate Low Impact Development options that may be appropriate for the areas.

5. Perform hydraulic analysis needed to determine the capacity of the existing storm drainage features and required sizing of the proposed storm drainage system.

6. Analyze field data, historical flooding complaints and analytical data in order to develop alternate solutions at each location. The flood issues associated with Dry Creek in the Gateway Subdivision (Area 3) are not included in the scope of this work.

7. Prepare preliminary cost estimates for each alternate for the proposed improvements.

8. Present proposed alternates, cost estimates, and recommendations to the City of Goodlettsville in an Engineering Report.

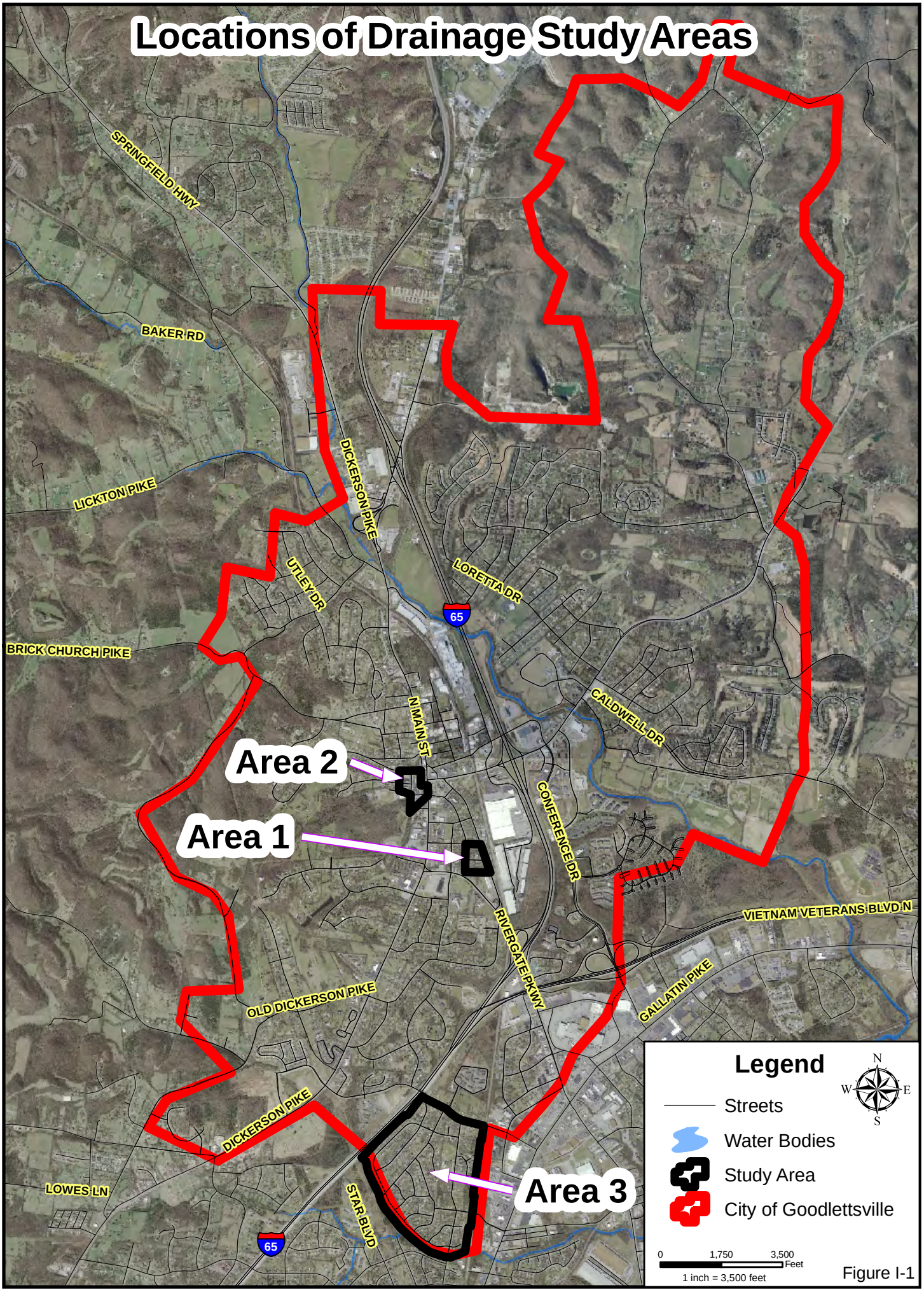

Locations of Drainage Study Areas
SPRINGFIELD HWY
BAKER RD
LICKTON PIKE
DICKERSON PIKE
UTLEY DR
LORETTA DR
65
BRICK CHURCH PIKE
N MAIN ST
CALDWELL DR
Area 2
Area 1
CONFERENCE DR
VIETNAM VETERANS BLVD N
RIVERGATE PKWY
GALLATIN PIKE
OLD DICKERSON PIKE
DICKERSON PIKE
LOWES LN
STAR BLVD
Area 3
65
Legend
Streets
Water Bodies
Study Area
City of Goodlettsville
N
W
E
S
0
1,750
3,500
Feet
1 inch = 3,500 feet

Figure I-1

SECTION II

EXISTING SYSTEM

SECTION II
EXISTING SYSTEMS

A. OVERVIEW

This section discusses the existing storm drainage infrastructure in each of the three study areas. Generally the existing systems are comprised of ditches and with roadway cross culverts.

B. AREA 1 EXISTING STORM DRAINAGE SYSTEM

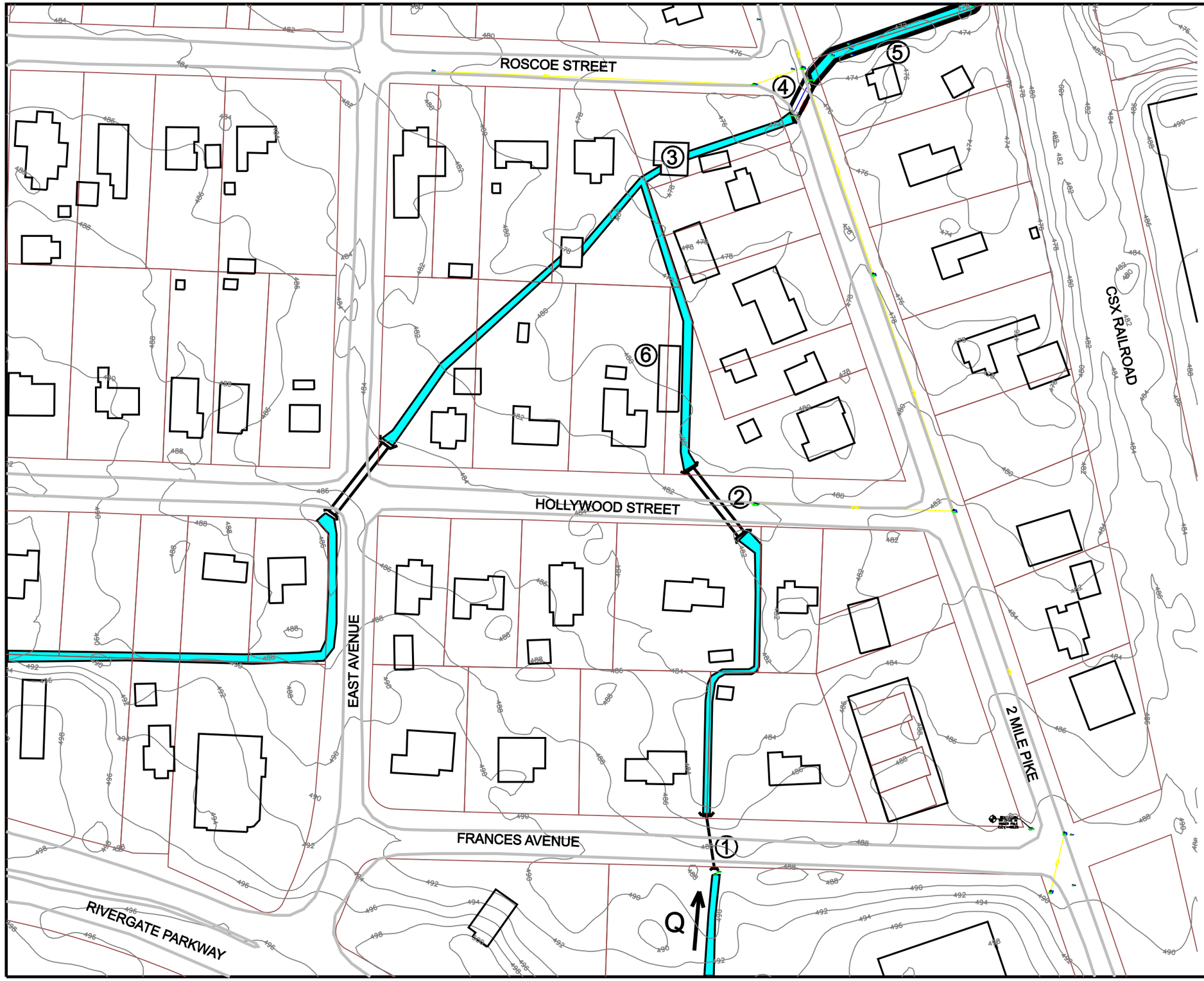
The existing storm drainage system for Area 1 is shown on Figure II-1 at the end of this section. Approximately 73 acres drain to a 52-inch by 30-inch CMP culvert under Frances Avenue. The flow of storm water then follows a ditch, crossing Hollywood Street through twin 45-inch by 28-inch RCP culverts and into a 12-foot wide by 4-foot deep concrete lined channel just upstream of Two Mile Pike. A portion of the ditch is routed under an existing house. There have been several complaints that during frequent rainfall events the existing culvert under Frances Avenue and the ditch between Frances Avenue and Two Mile Pike exceed their capacities causing flooding.

C. AREA 2 EXISTING STORM DRAINAGE SYSTEM

The existing storm drainage system for Area 2 is shown on Figure II-2 at the end of this section. Approximately 289 acres drain to an existing culvert system which flows under an existing building and then under Memorial Drive, discharging through a 5.5-foot high by 7-foot wide concrete box culvert into a concrete lined channel. The details of the storm drainage system under the building and Memorial Drive are shown on Figure II-3 at the end of this section. Another approximately 260 acres drain into a 74-inch by 59-inch CMP culvert under French Street into the same concrete lined channel. There are other smaller storm sewers in the area collecting storm water from localized areas. There is frequent flooding in this area caused by the existing channels being undersized and due to inadequate storm drainage infrastructure along Main Street (Dickerson Road).

D. AREA 3 EXISTING STORM DRAINAGE SYSTEM

The existing storm drainage system for Area 3 is shown on Exhibit A at the end of this report. The drainage patterns in this area are basically divided into two major drainage areas, both ultimately discharging into Dry Creek through a series of ditches and culverts. There is a history of frequent storm drainage problems due to several individual factors, including excessive storm water being released from road rights-of-ways onto private property. Flood plain issues along Dry Creek are not addressed as part of this study.

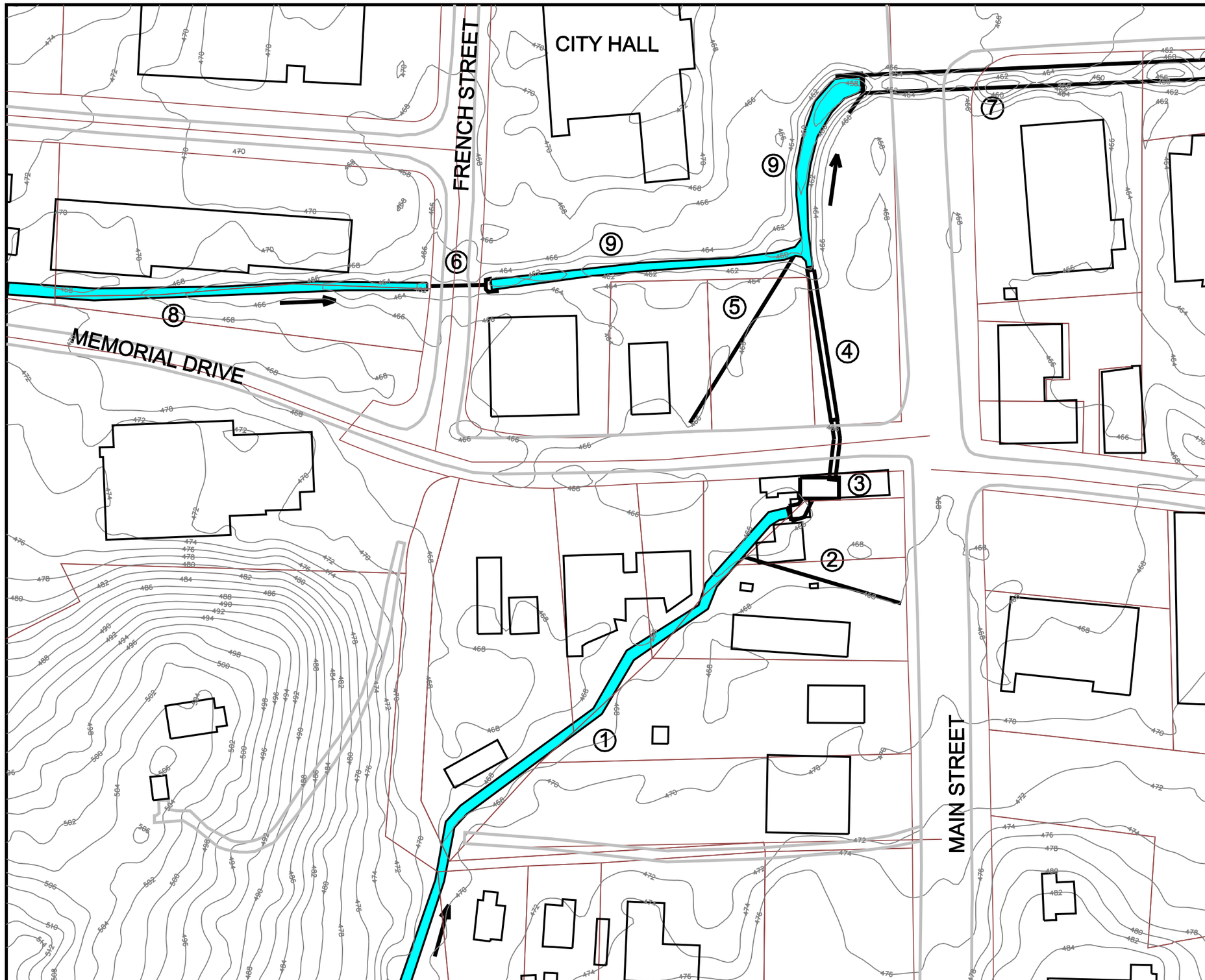


FEATURES

1. 52" X 30" ARCH CMP*
   *CORRUGATED METAL PIPE
2. DOUBLE 45" X 28" HERCP**
   **HORIZONTAL ELLIPTICAL REINFORCED CONCRETE PIPE
3. EXISTING CHANNEL FLOWS UNDER HOUSE
4. 12' X 3.5' CONCRETE BOX CULVERT
5. 12' X 4' RECTANGULAR CONCRETE CHANNEL
6. UNDERMINING OF GARAGE AT 306 HOLLYWOOD STREET

AREA 1 EXISTING STORM DRAINAGE SYSTEM

FIGURE II-1

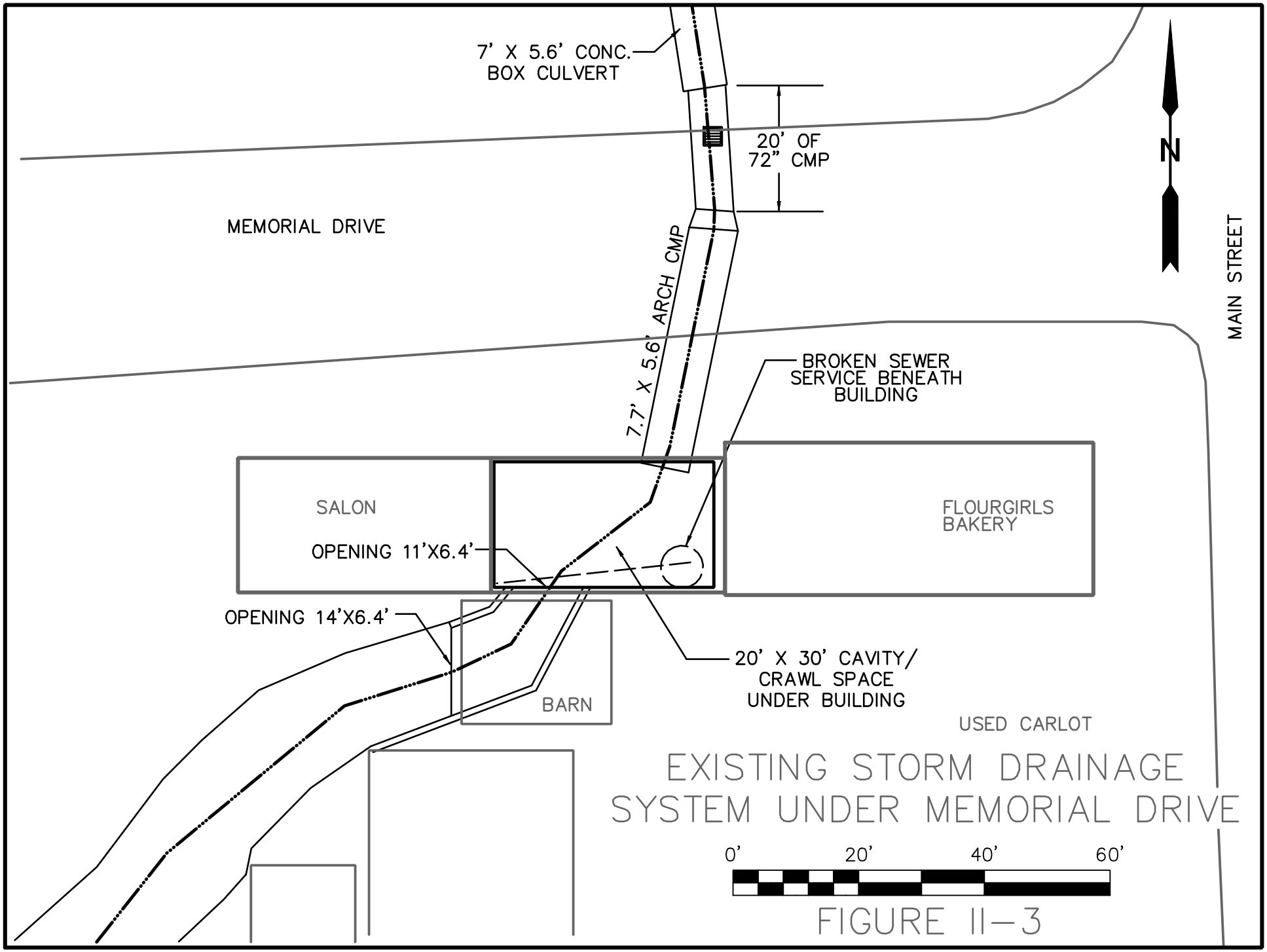


FEATURES

1. EXISTING SOUTHERN BRANCH
2. 36" CMP*
   *CORRUGATED METAL PIPE
3. SEE FIGURE II-3 FOR DETAILS
4. 7' X 5.6' CONCRETE BOX CULVERT
5. 3.5' X 2.4' ARCH CMP
6. 74" X 59" ARCH CMP
7. DOUBLE 9.5' X 7.5' CONCRETE BOX CULVERT
8. EXISTING WESTERN BRANCH
9. EXISTING CONCRETE LINED CHANNEL

AREA 2
EXISTING STORM DRAINAGE SYSTEM

FIGURE II-2



EXISTING STORM DRAINAGE SYSTEM UNDER MEMORIAL DRIVE

FIGURE II–3

SECTION III

EVALUATION OF EXISTING SYSTEM DEFICIENCIES

SECTION III
EVALUATION OF EXISTING DEFICIENCIES

A. APPROACH

In order to develop sound recommendations for improvements to the existing storm drainage infrastructure, an effective evaluation of the existing system had to be conducted. First, all available historical data related to past citizen complaints of storm drainage problems were collected from the City. Existing pipe and ditch sizes were determined from field investigations. A public meeting was conducted to glean any additional public input related to the study areas. In addition, several meetings were held with individual property owners regarding their specific concerns. Finally, theoretical capacities of existing infrastructure components were developed by engineering hydraulic analysis.

B. KNOWN STORM DRAINAGE COMPLAINT LOCATIONS

The City of Goodlettsville has maintained a list of past storm drainage complaints including the location, name of contact person, and a description of the problem. Additionally, several residents have recently contacted the City once they heard of the current studies being performed. Many residents have submitted photographs depicting specific problems during heavy rainfall events. The locations of reported drainage problems were plotted on maps of the study areas along with a brief description of the reported problems. This information is shown on Figure III-1 (for Area 1) and Figure III-2 (for Area 2) at the end of this seciton and on Exhibit B (for Area 3) at the end of this report.

GOODLETTSVILLE
TENNESSEE

SORRY WE MISSED YOU.

Civic Engineering has been contracted by the City of Goodlettsville to investigate a report of stormwater issues in your area.

We have made an attempt to contact you but found no one at home. Please contact us at your earliest convenience regarding our visit. Call Rick Mayo with Civic Engineering at 615.425.2000 or email at mayor@civicinc.com

CIVIC ENGINEERING

C. FIELD INVESTIGATIONS

Filed investigations were conducted for two main purposes. First, an inventory of the locations and sizes of existing culverts and ditches was made in order to determine the current hydraulic capacity of the storm drainage infrastructure in the study areas. Then, each of the known complaint areas were visited to get a better understanding of the factors associated with each location.

D. PROPERTY OWNER CONTACTS

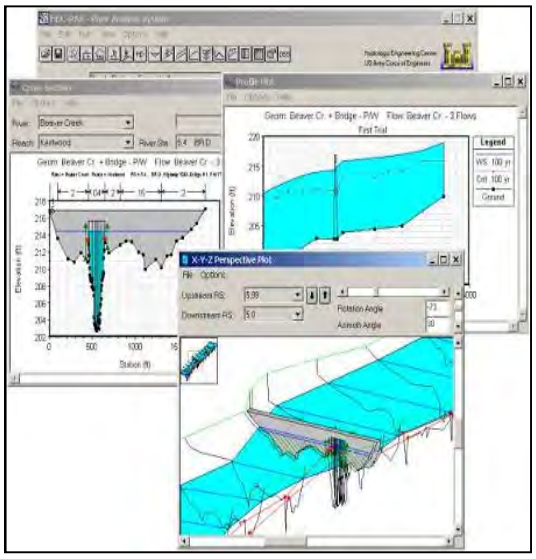
An attempt was made to contact property owners who requested that they be contacted in order to discuss each one's concerns. Usually this was accomplished by a meeting on the site. Also, several property owners were available for discussing their issues while the field investigation work was being performed. Photographs were taken along with notes regarding the specific issue discussed.

E. PUBLIC MEETING

A public meeting was conducted on June 8, 2010 in order to obtain additional information regarding storm drainage complaints from citizens of the three study areas. Maps showing locations and descriptions of known complaint areas where displayed. Listening stations were set up where several representatives of the consulting engineer and the City were available to receive comments from the attendees. Comment sheets were also available if the residents preferred to fill them out to relay details about their particular circumstance. Notes from the meeting and comment sheets received from the public were reviewed and analyzed to help formulate an overall design strategy for the proposed alternate solutions.

F. HYDRAULIC ANALYSIS

A hydraulic analysis was performed in each of the three study areas in order to determine the capacity of the existing storm drainage infrastructure. A determination was made if each component of the drainage system was capable of conveying both the 50-year and 100-year storm event in Areas 1 and 2 and the 10-year and 25-year storm event in Area 3. Any existing components that were found to have adequate capacity are noted to remain in following scenarios in this report when alternate solutions are presented. Theoretical storm flows were developed by either the Rational or USDA TR-55 method. Culvert capacities were analyzed based on inlet control. Ditches were evaluated by obtaining average measurements of a typical cross section in the field and using an average longitudinal slope based on existing contour maps, then developing capacities by using the Manning's equation.



Legend

- Service Request
- Water
- Study Area
- Property Boundary
- 100-Year Floodplain
- Floodway

N
W E
S

0 75 150 300
Feet
1 inch = 150 feet

Address	Complaint
305 Two Mile Pk.....	Flooding Problems
306 Hollywood St.....	Ditch beside house floods yard and is undermining garage adjacent to ditch
307 Hollywood St.....	Ditch beside house and in rear of lot overflows banks and floods shed and garage
308 Frances St.....	Ditch along West side and rear property lines floods yard. Water has overtoped Frances Street at culvert location.

Area 1
Existing Drainage Complaint Locations

Figure III-1

Legend

- Service Request
- Water
- Study Area
- Property Boundary
- 100-Year Floodplain
- Floodway

N W E S

0 75 150 300
Feet
1 inch = 150 feet

Address	Complaint
103 Memorial Dr.....	Stream overflows and runs through his property and into building
105 Memorial Drt.....	Stream overflows and runs through his property and building
201 S Main Stt.....	Water gets into building fairly often. Probably from both creek in back of property and from Dickerson Rd (S Main Street).
107 Memorial Dr.....	Two dead trees located in creek behind property
117 French St.....	Water washes debris onto parking lot during heavy rains.

Area 2
Existing Drainage Complaint Locations

Figure III-2

SECTION IV

ALTERNATE SOLUTIONS

SECTION IV
ALTERNATE SOLUTIONS

A. OVERVIEW

After a thorough investigation of known storm drainage complaints and capacity analyses of the existing storm drainage infrastructure, alternate solutions to address the system deficiencies were developed. Areas 1 and 2 were analyzed for both the 25-year and 100-year design storms. Area 3 was analyzed for both the 10-year and 25-year design storms. Low Impact Development (LID) solutions were also incorporated into the alternates to supplement traditional methods such as storm sewers, curbing, and ditches. These LID components assist not only in reducing the quantity of storm water reaching the storm drainage system, but provide methods of tremendously improving storm water quality by removing much of the sediment and contaminants in the storm water.

B. INCORPORATION OF LOW IMPACT DEVELOPMENT SOLUTIONS

The drainage studies incorporate Low Impact Development (LID) techniques to improve water quality and increase capture of storm water runoff volume in each of the project areas. LID facilities, such as bioretention/detention areas and pervious pavement, intercept storm water as close to its source as possible to provide infiltration and evapo-transpiration of the runoff.

Area 1

This neighborhood sees flooding problems because of the overgrown and constrained drainage ditch running between properties north of Frances Avenue. In an effort to minimize impacts on the adjacent properties, the design team decided early on to redirect a portion of the storm water before reaching the neighborhood.

Upstream from the neighborhood, a series of large bioretention basins were planned on the future library site and existing school property. The basins are planned to capture excess flow from the existing ditch by filtering and delaying the storm water runoff through native plantings and reducing volume through infiltration and evapo-transpiration. The use of these sites have the additional benefit of providing educational opportunities for library and school programs through outdoor labs, signage, and passive recreation (walking trails).

Sample Bioretention Basin

Area 2

The area around City Hall is at the confluence of two drainage basins that cover approximately 600 acres. In this area, green infrastructure opportunities were identified on City-owned property, helping to reduce the existing impervious cover in the area and enhance water quality prior to entering the storm channels. This area has the opportunity to be a showcase of LID techniques and illustrate the City's commitment to improving water quality in

Goodlettsville.

In conjunction with the recommended stream overflow diversion, a series of bioretention basins are recommended to daylight the existing drainage system immediately adjacent City Hall and to limit overall length of new conventional ("gray") infrastructure. These basins will help to slow down the flow in the drainage channels and improve water quality. The basin at Memorial Drive and French Street would require the relocation of the existing playground to a recommended area within the existing park and away from potential vehicular conflicts at its current location. Memorial Drive would be enhanced by a defined streetscape within the right-of-way that includes bioretention areas utilizing the existing catch basins as overflow. Bioretention areas are also recommended, in coordination with the proposed catch basins, along the western edge of Main Street.

The final proposed elements of pervious pavement and bioretention areas would reduce the overall impervious cover in the area by taking existing parking and upgrading those areas to pervious pavement at City Hall, at the Park and Community parking areas, and potentially through partnerships with neighboring commercial properties.

Area 3

The Gateway neighborhood is a 1960's era neighborhood that relied on grass ditches, mountable curbs, and in some cases, inverted crowns in the roadway to direct storm water runoff towards Dry Creek. To address the various problem areas within the neighborhood, the overall project has been subdivided into smaller projects that can be implemented over time.

Sample Lawn Swale

The green infrastructure components are planned to work in conjunction with "gray" infrastructure upgrades (curb and gutter, storm line replacement, etc.) For instance, along roadways highlighted for improvements, bioswales or rain gardens would be added on the high side of the road cross-section to capture and treat runoff before making it to the roadway surface. Along streets with the inverted crowns and at various intersection locations, vehicular-rated pervious pavers would be installed to dissipate the storm water runoff at proposed inlets.

C. AREA 1 ALTERNATES

Alternate 1 involves intercepting all of the design storm flow upstream (south) of Frances Avenue and diverting it through a new box culvert east along Frances Avenue and north along Two Mile Pike to the existing concrete channel at Roscoe Street. The only storm water flow to be carried by the existing ditch north of Frances Avenue will be the area along the route of the ditch. The construction of the box culvert will require the relaying of the existing sanitary sewer line and relocation of utilities in Two Mile Pike. The details of this alternate are shown on Figure IV-1 at the end of this section.

Alternate 2 is similar to Alternate 1 except it involves intercepting most of the design storm flow upstream (south) of Frances Avenue and diverting it through a new box culvert smaller which would be smaller the one for Alternate 1. The remaining storm flow would continue along the existing ditch north of Frances Avenue. Some improvements to the existing ditch would be required. The details of this alternate are shown on Figure IV-2 at the end of this section.

Alternate 3 includes constructing a bioretention/detention area upstream of Frances Avenue at the site of a proposed library along the south side of Rivergate Parkway. This facility would decrease the quantity of storm water runoff as well as help improve water quality downstream. The remaining components of this alternate are similar to Alternate 1, including removing all design storm flow upstream (south) of Frances Avenue. The new storm sewer or box culvert along Frances Avenue and Two Mile Pike will be smaller than Alternate 1. The details of this alternate are shown on Figure IV-3 at the end of this section.

D. AREA 2 ALTERNATES

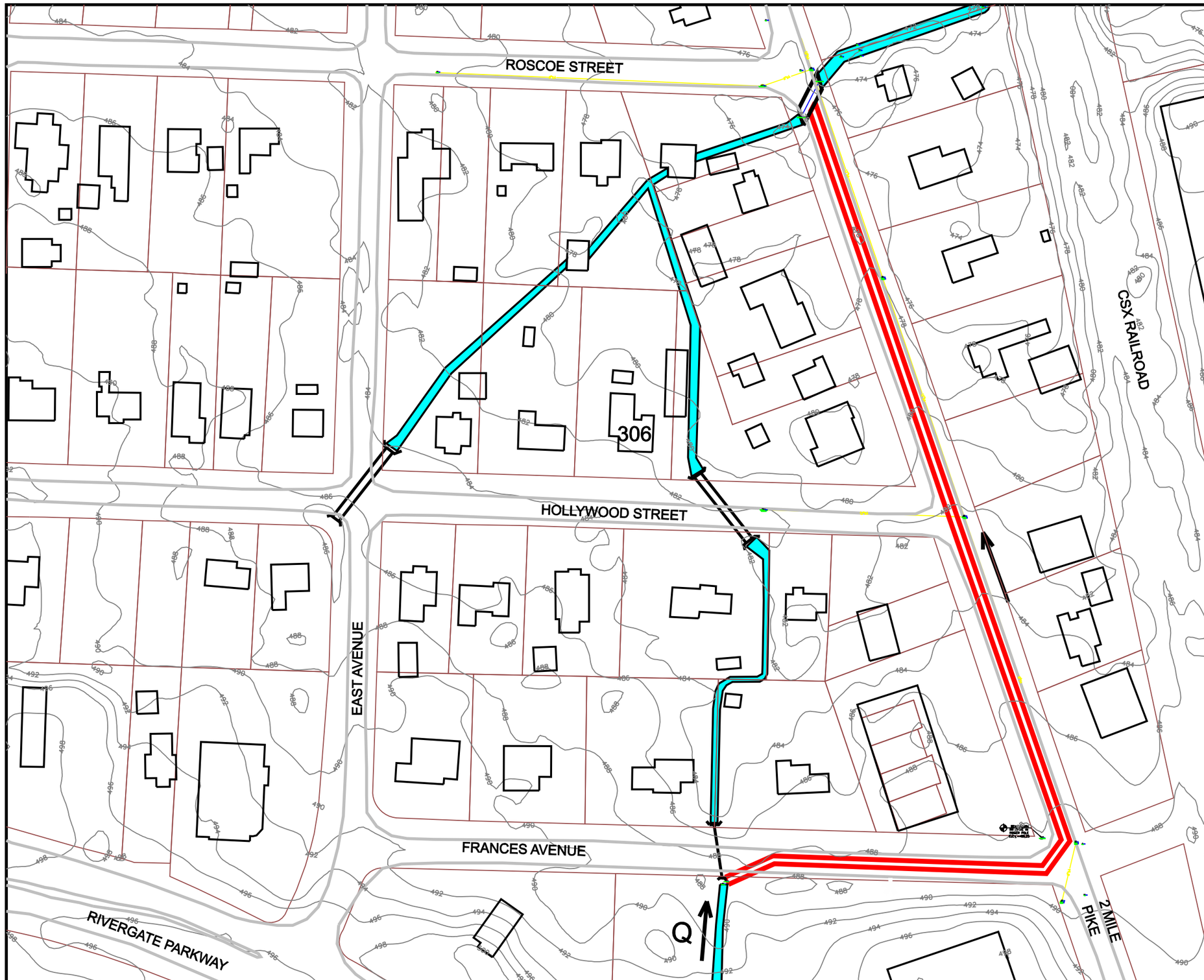
Alternate 1 involves the construction of a new box culvert from the existing stream south of Memorial Drive to the existing concrete channel on the City Hall property to carry the entire design storm. This will allow the abandonment of the existing culvert under the existing structure and Memorial Drive. The existing stream south of this point will need to be widened. A new culvert would be installed under French Street to carry the design storm flow and the existing stream west of this point would also require widening. The existing concrete channel in front of City Hall would have to be widened. This alternate only addresses the flooding issues along existing streams. The details of this alternate, including Low Impact Development components, are shown on Figure IV-4 at the end of this section.

Alternate 2 is the same as Alternate 1 with the addition of a closed storm drainage system (storm sewers and inlets) along Main Street (Dickerson Road). This will also address excessive storm water coming form Main Street onto Memorial Drive to alleviate flooding of the structures due to this flow at the southwest corner of Main Street and Memorial Drive. The details of this alternate, including Low Impact Development components, are shown on Figure IV-5 at the end of this section.

Alternate 3 involves the construction of a new box culvert from a bend in the existing stream south of Memorial Drive to the existing concrete channel on the City Hall property to carry most of the design storm. The normal flow as well as a small amount of storm flow will continue to flow through the existing culvert under the existing structure and Memorial Drive. A new culvert would be installed under French Street to carry the design storm flow and the existing stream west of this point would require widening. The existing concrete channel in front of and beside of City Hall would have to be widened. A closed drainage system along Main Street (Dickerson Road) would be constructed. The details of this alternate, including Low Impact Development components, are shown on Figure IV-6 at the end of this section.

E. AREA 3

The recommended solutions to address known existing storm drainage issues in the Gateway Subdivision for both the 10-year and 25-year storm events, including Low Impact Development components, are shown on Exhibit C at the end of this report. Flooding issues relating to Dry Creek are not part of the scope of this study. The general concept used in developing these solutions was to attempt to keep storm water flow inside street rights-of-way and avoid uncontrolled discharges onto private property. When discharges onto private property occur, a properly designed storm drainage system is provided. Figures IV-7, IV-8, and IV-9 showing typical street sections to be used in the implementation of the proposed improvements are located at the end of this section.



FEATURES

Q100=404.5 CFS
Q25 =279.3 CFS

TOTAL DIVERSION OF FLOW REQUIRING NEW BOX CULVERT FROM FRANCES TO ROSCOE
REPAIR OF UNDERMINED GARAGE AT 306 HOLLYWOOD

BOX CULVERT W/ TAPERED INLET
25 YEAR - 8' X 3.5'
100 YEAR - 11.5' X 3.5'

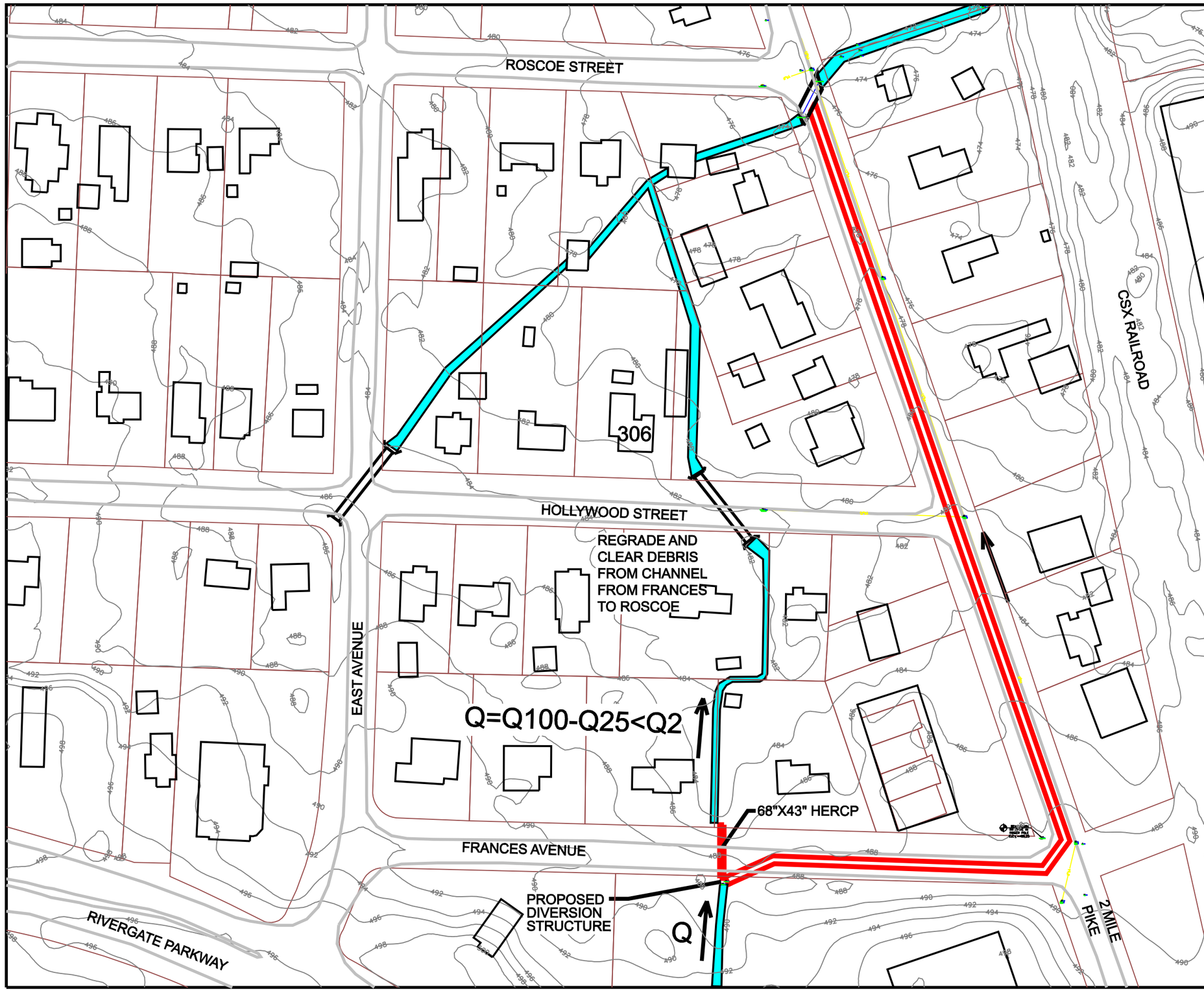
WILL REQUIRE ADDITIONAL RELAY OF UTILITIES WITHIN ROADWAY AND RELAY OF SANITARY SEWER ALONG 2 MILE PIKE

NOTE: POTENTIAL TO PROVIDE CHANNEL UP TO 2 MILE PIKE FOR ALL ALTERNATIVES

PROPOSED BOX CULVERT

AREA 1 - ALTERNATE 1

FIGURE IV-1



FEATURES

Q100=404.5 CFS
Q25 =279.3 CFS

PARTIAL DIVERSION OF FLOW REQUIRING NEW BOX CULVERT FROM FRANCES TO ROSCOE, REPAIR OF UNDERMINED GARAGE AT 306 HOLLYWOOD, AND MINOR CHANNEL IMPROVEMENTS

CULVERT W/ TAPERED INLET
25 YEAR - 48" RCP*
100 YEAR - 8' X 3.5' BOX
BOTH - 68"X43" HERCP** (Frances)
*RCP - REINFORCED CONCRETE PIPE
**HERCP - HORIZONTAL ELLIPTICAL RCP

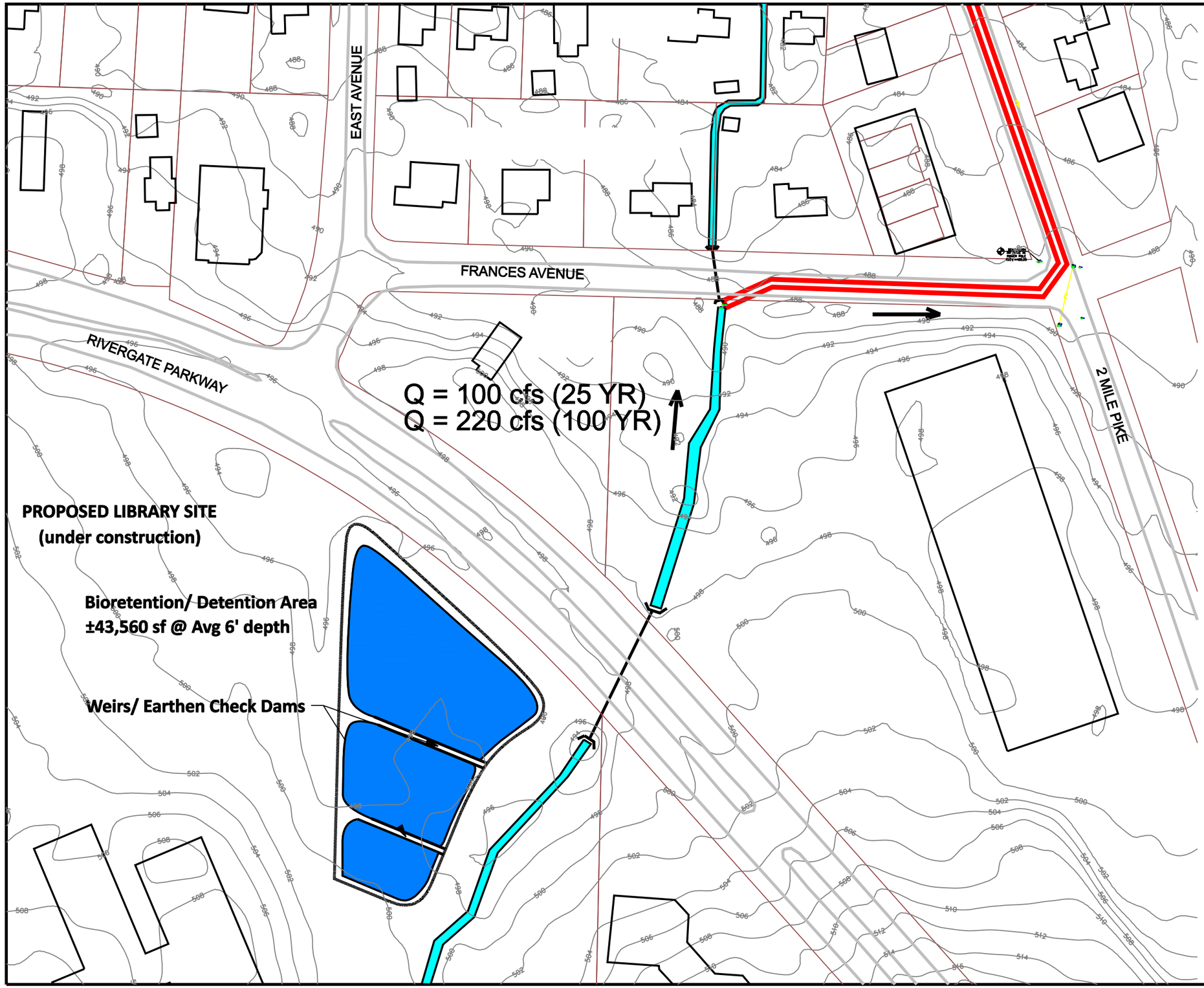
WILL REQUIRE ADDITIONAL RELAY OF UTILITIES WITHIN ROADWAY AND RELAY OF SANITARY SEWER ALONG 2 MILE PIKE

NOTE: POTENTIAL TO PROVIDE CHANNEL UP TO 2 MILE PIKE FOR ALL ALTERNATIVES

PROPOSED CULVERT

AREA 1 - ALTERNATE 2

FIGURE IV-2



FEATURES

Q100=404.5 CFS
Q25 =279.3 CFS

INSTALLATION OF DETENTION POND EAST OF LIBRARY WITH FULL DIVERSION OF FLOW APPROACHING FRANCES AVE, REQUIRES NEW BOX CULVERT FROM FRANCES TO ROSCOE, AND REPAIR OF UNDERMINED GARAGE AT 306 HOLLYWOOD

BIORETENTION/DETENTION AREA (1 ACRE AT 6' AVERAGE DEPTH) TO HANDLE 25-YEAR FLOW WITH A RELEASE OF 100 CFS AND TO HANDLE 100-YR FLOW WITH A RELEASE OF 220 CFS

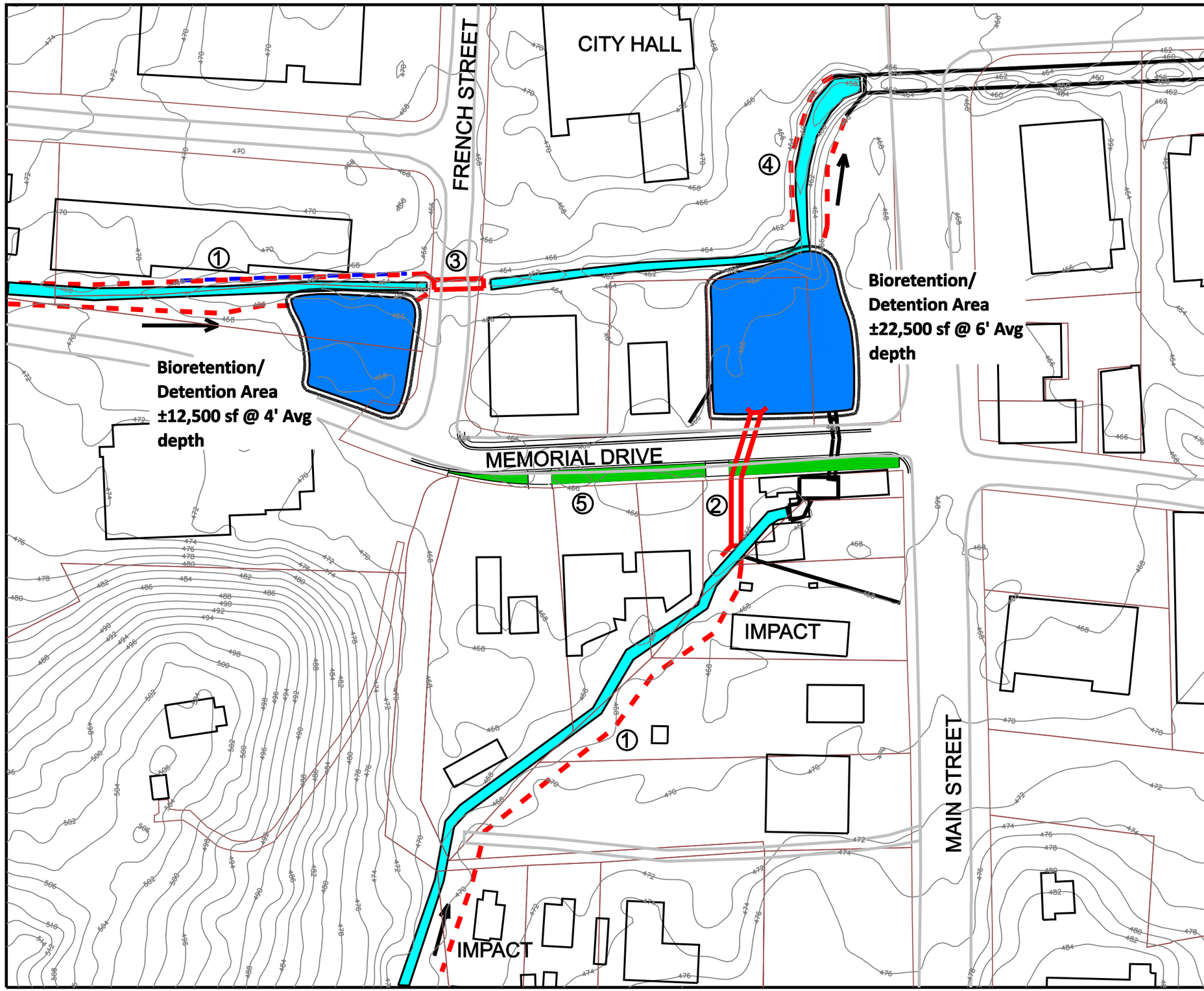
WILL REQUIRE ADDITIONAL RELAY OF UTILITIES WITHIN ROADWAY AND RELAY OF SANITARY SEWER ALONG 2 MILE PIKE

CULVERT W/ TAPERED INLET
25 YEAR - 48" RCP
100 YEAR - 8.5' X 3.5'

PROPOSED CULVERT

AREA 1 - ALTERNATE 3

FIGURE IV-3



FEATURES

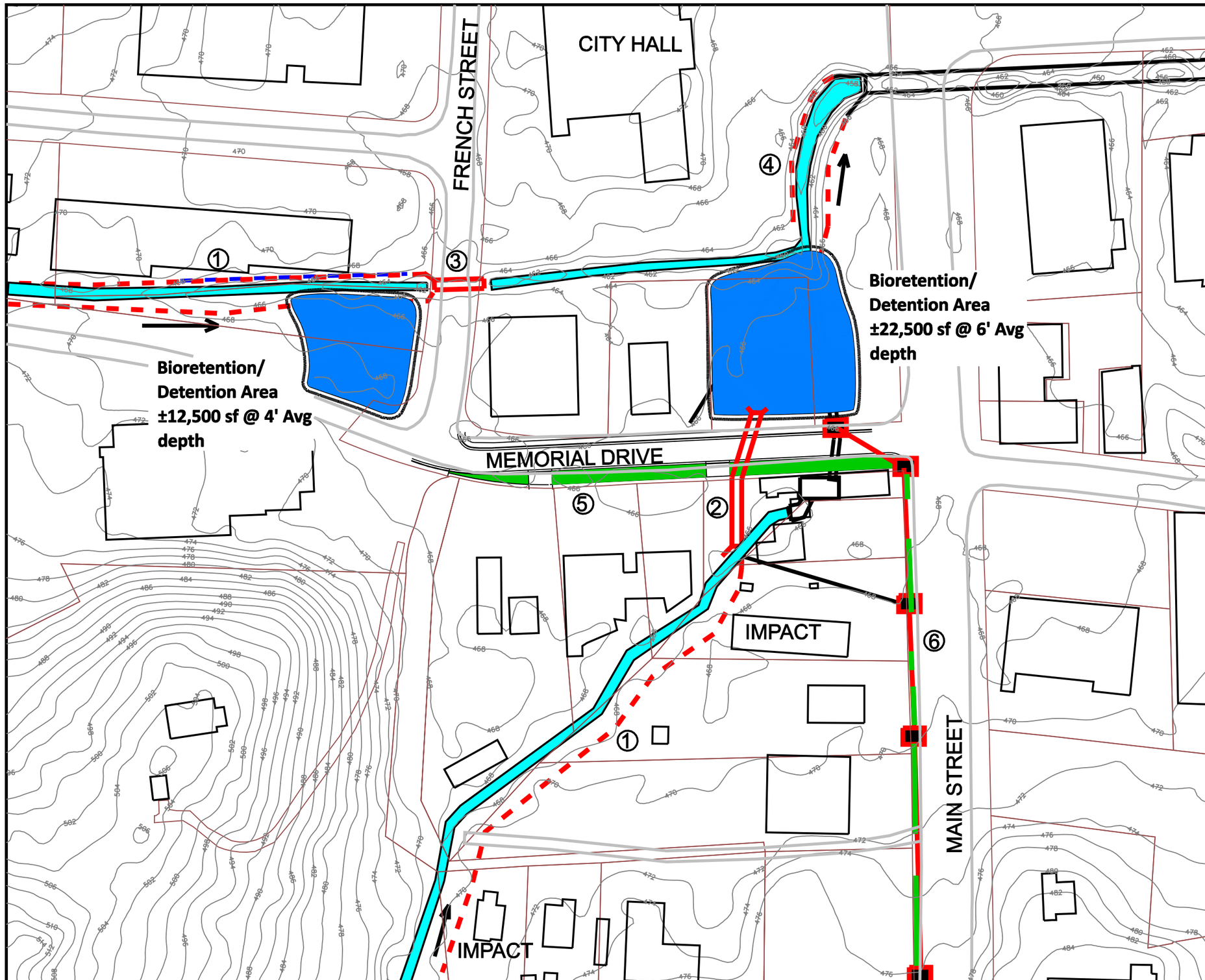
Q100=715 CFS
Q25 =555 CFS

1. CHANNEL WIDENING OF SOUTHERN AND WESTERN BRANCHES
2. TOTAL DIVERSION OF FLOW INTO NEW BOX CULVERT FROM SOUTH OF FLOURGIRLS TO DETENTION AREA
   25 YR - 8' X 5.5' BOX CULVERT
   100 YR - 10 X 5.5' BOX CULVERT
3. NEW BOX CULVERT UNDER FRENCH STREET
   25 YR - 8' X 4.5' BOX CULVERT
   100 YR - 10' X 4.5' BOX CULVERT
4. CHANNEL WIDENING FROM CHANNEL JUNCTION TO BOX CULVERT UNDER MAIN STREET
5. LOW IMPACT DEVELOPMENT SOLUTIONS - STREET SCAPE WITH BIORETENTION

PROPOSED BOX CULVERT
PROP. CHANNEL WIDENING
BIORETENTION
BIORETENTION/DETENTION AREA

AREA 2 - ALTERNATE 1

FIGURE IV-4



FEATURES

Q100=715 CFS
Q25 =555 CFS

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2. TOTAL DIVERSION OF FLOW INTO NEW BOX CULVERT FROM SOUTH OF FLOURGIRLS TO CHANNEL JUNCTION
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   100 YR - 10 X 5.5' BOX CULVERT
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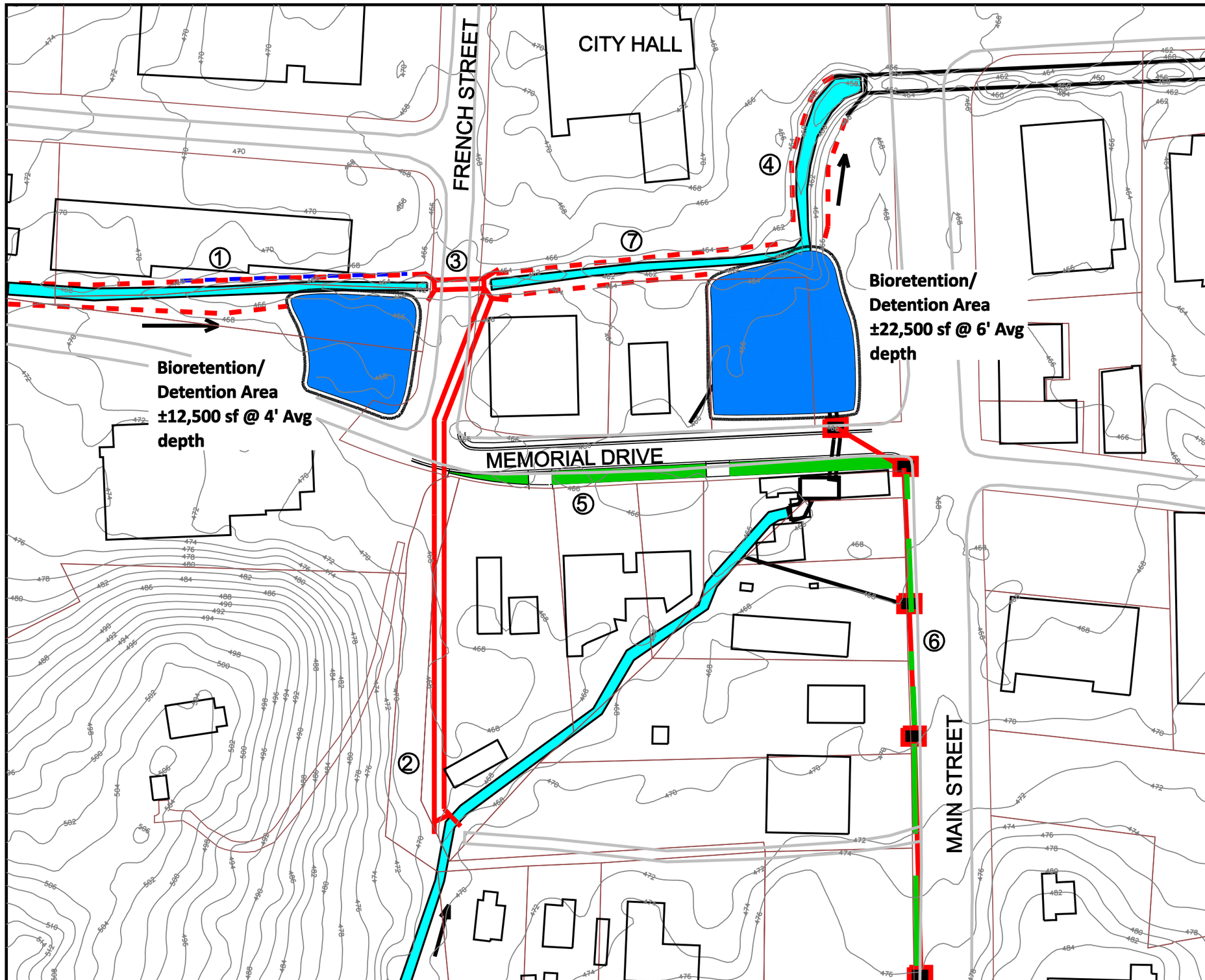
   25 YR - 8' X 4.5' BOX CULVERT
   100 YR - 10' X 4.5' BOX CULVERT
4. CHANNEL WIDENING FROM CHANNEL JUNCTION TO BOX CULVERT UNDER MAIN STREET
5. LOW IMPACT DEVELOPMENT SOLUTIONS - STREET SCAPE WITH BIORETENTION
6. CLOSED DRAINAGE SYSTEM ALONG SOUTH MAIN STREET

PROPOSED BOX CULVERT
PROP. CHANNEL WIDENING
BIORETENTION
CLOSED DRAINAGE SYSTEM (INLET AND PIPE)
BIORETENTION/DETENTION AREA

AREA 2 - ALTERNATE 2

FIGURE IV-5



FEATURES

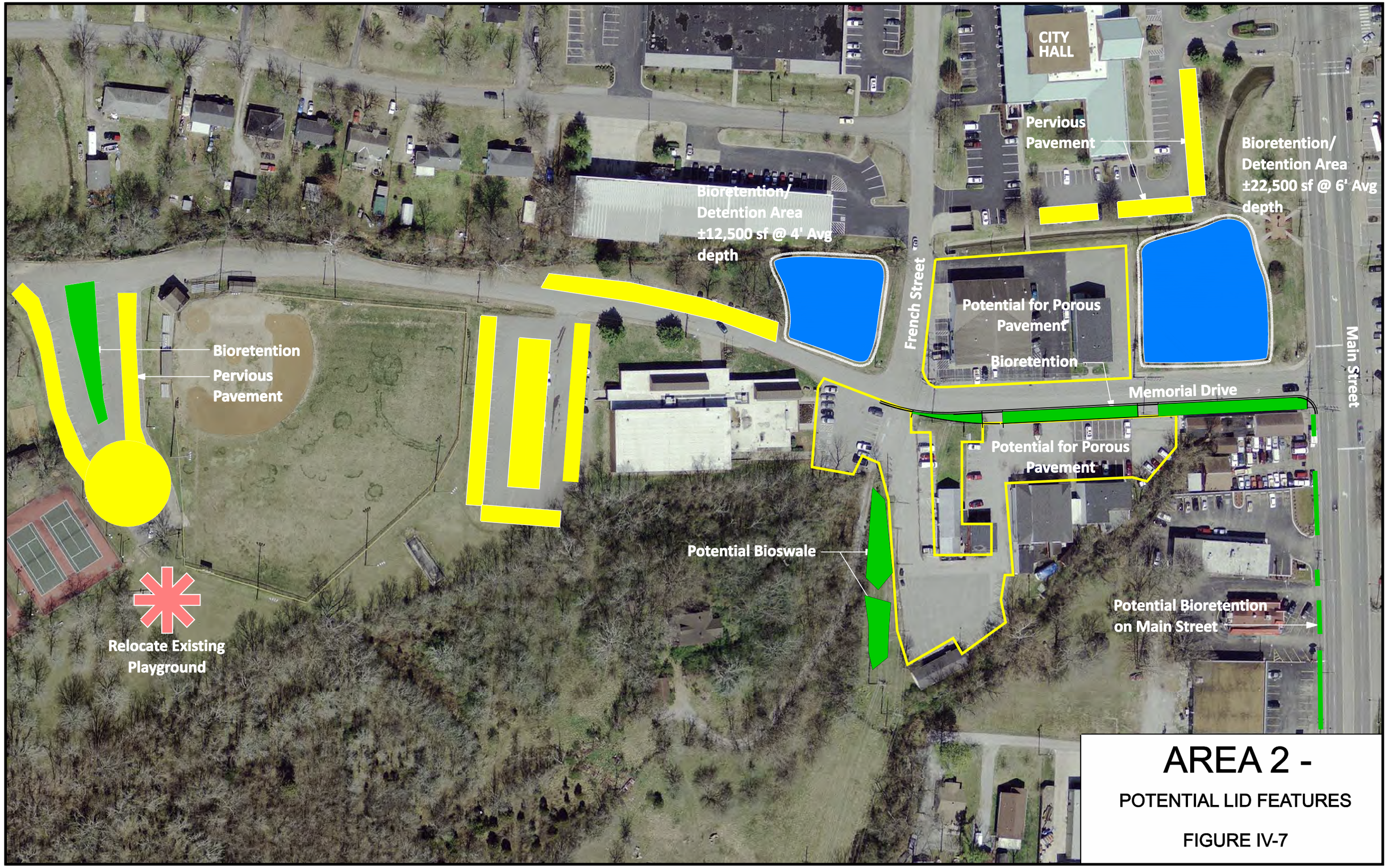
Q100=715 CFS
Q25 =555 CFS

1. CHANNEL WIDENING OF WEST BRANCH
2. PARTIAL DIVERSION OF FLOW INTO NEW BOX CULVERT FROM STREAM BEND TO EAST OF FRENCH STREET
   25 YR - 6' X 5.5' BOX CULVERT
   100 YR - 8' X 5.5' BOX CULVERT
3. NEW BOX CULVERT UNDER FRENCH STREET
   25 YR - 8' X 4.5' BOX CULVERT
   100 YR - 10' X 4.5' BOX CULVERT
4. CHANNEL WIDENING FROM CHANNEL JUNCTION TO BOX CULVERT UNDER MAIN STREET
5. LOW IMPACT DEVELOPMENT SOLUTIONS - STREET SCAPE WITH BIORETENTION
6. CLOSED DRAINAGE SYSTEM ALONG SOUTH MAIN STREET
7. IMPROVE CHANNEL TO CONC. RECTANGULAR CHANNEL 8' X 4.5'

PROPOSED BOX CULVERT
PROP. CHANNEL WIDENING
BIORETENTION
CLOSED DRAINAGE SYSTEM (INLET AND PIPE)
BIORETENTION/DETENTION AREA

AREA 2 - ALTERNATE 3

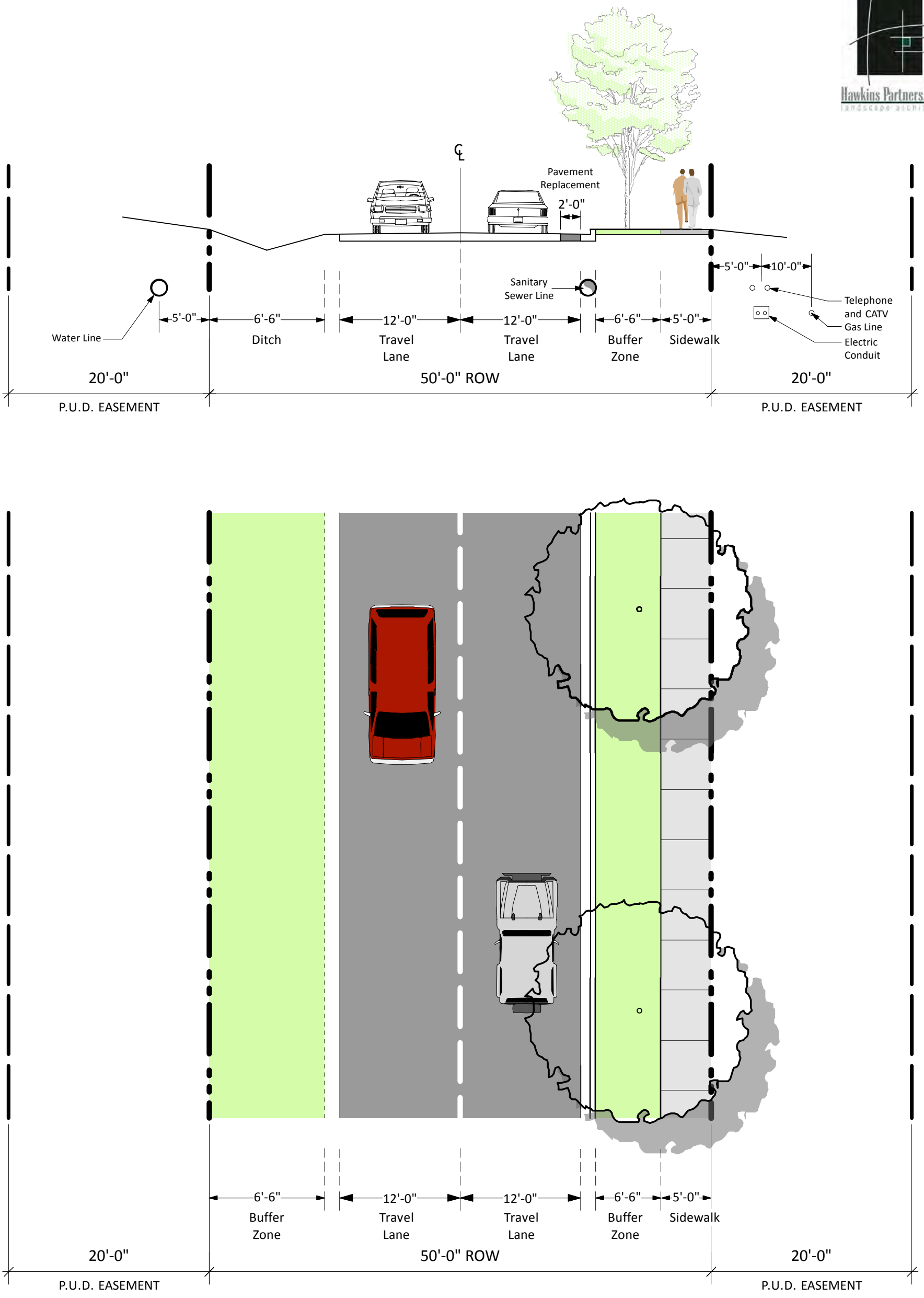
FIGURE IV-6



AREA 2 -

POTENTIAL LID FEATURES

FIGURE IV-7

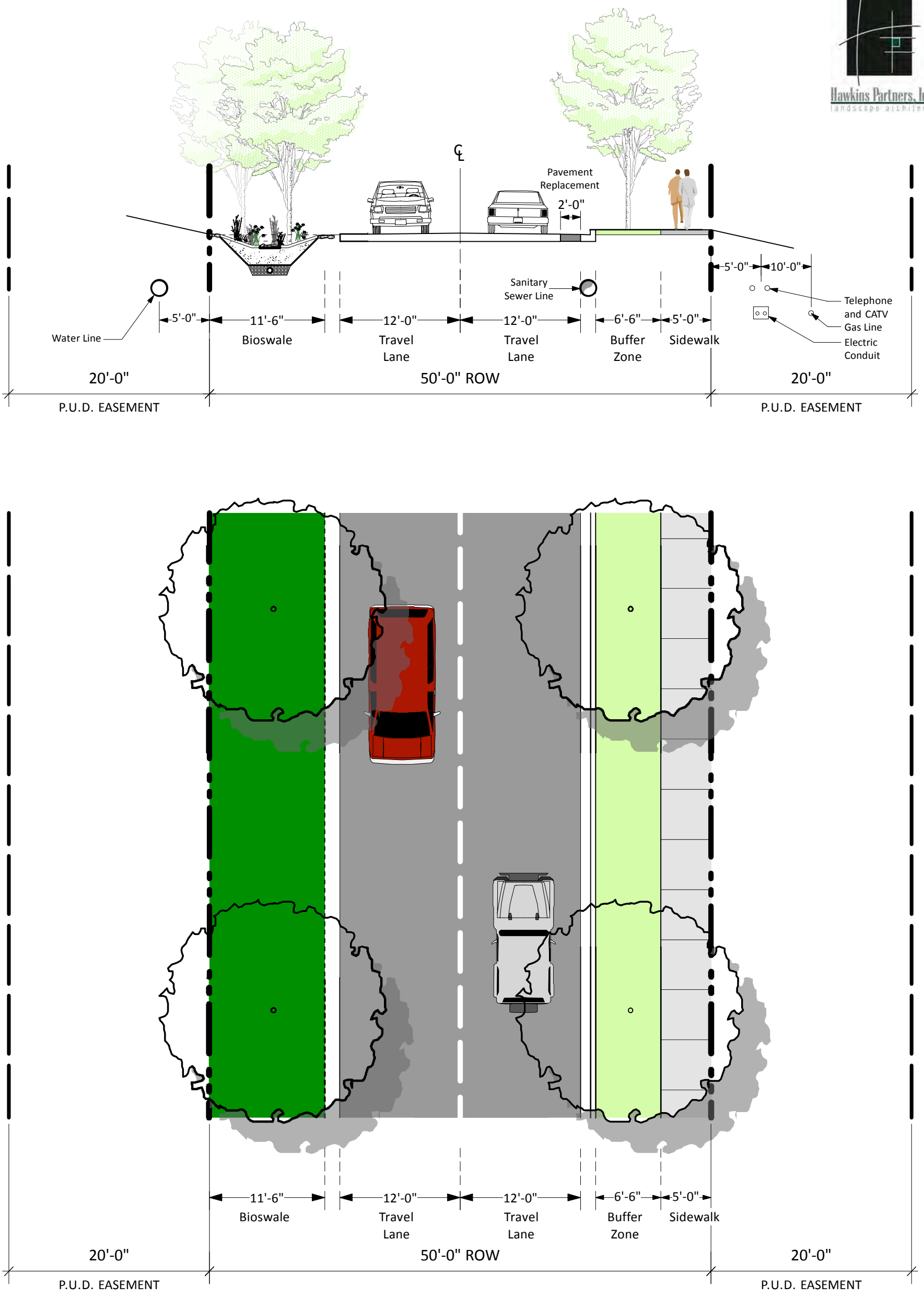


SECTION: Standard City Cross-section (50'-0" ROW)

GOODLETTSVILLE DRAINAGE STUDY

1 - Area 3 Ditch/ Curb and Gutter

2010-8-16

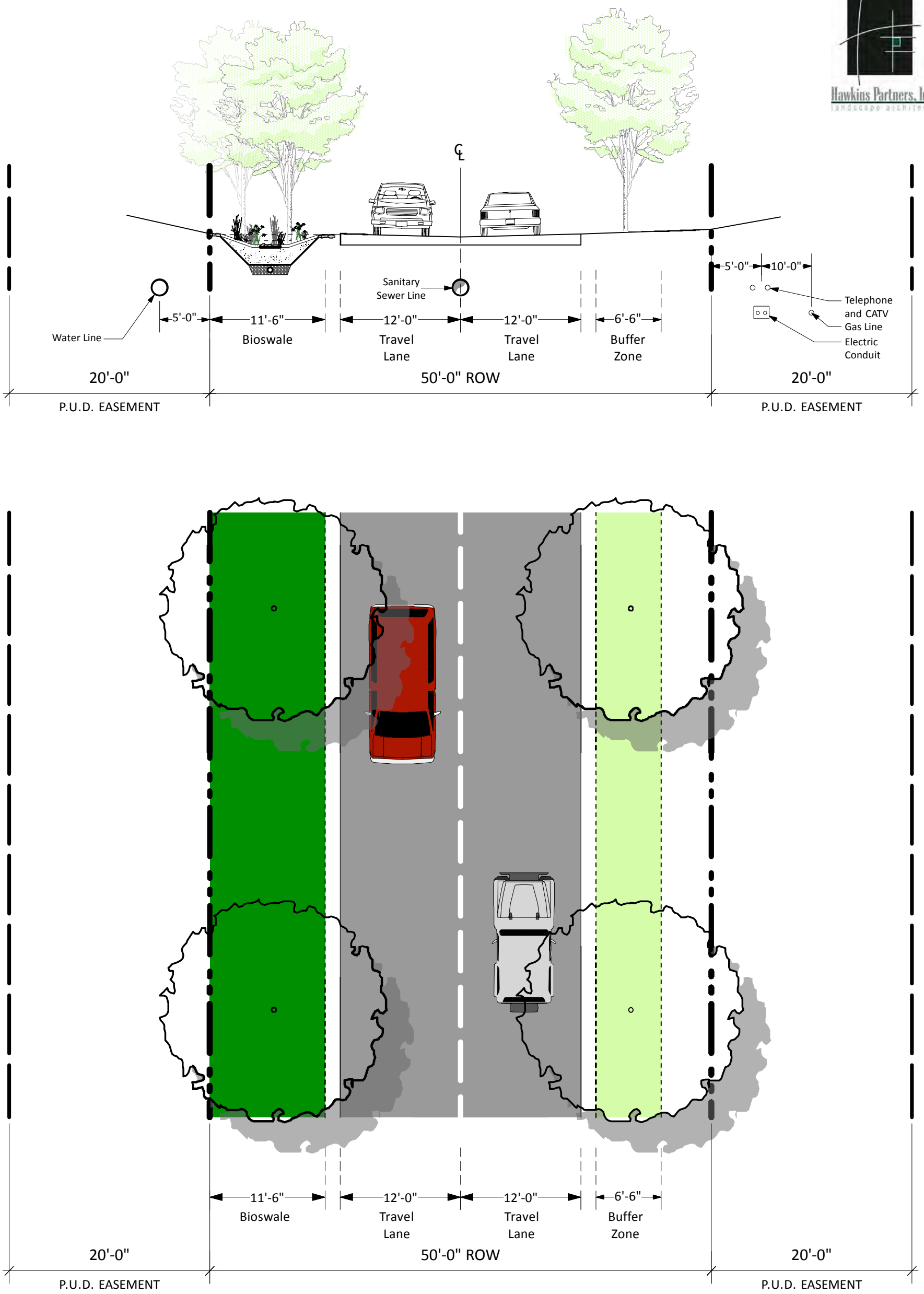


SECTION: Bioswale (Standard 50'-0" ROW)

GOODLETTSVILLE DRAINAGE STUDY

2 - Area 3 Bioswale/ Curb and Gutter

2010-8-16



SECTION: Bioswale (Standard 50'-0" ROW)

GOODLETTSVILLE DRAINAGE STUDY

3 - Area 3 Inverted Crown

2010-8-16

SECTION V

RECOMMENDATIONS

SECTION V
RECOMMENDATIONS

A. COST ESTIMATES

Cost estimates were prepared for each separation alternate. The estimates include all project costs such as administrative fees, engineering fees, and construction costs (including contingencies) of the proposed improvements. The table below summarizes the total project costs for each alternate.

Estimated Project Costs for Alternates

Area 1	Total Project Cost	
Alternative	25 Year Event	100 Year Event
1	$1,600,000	$2,200,000
2	$1,300,000	$1,800,000
3	$1,800,000	$2,400,000
Area 2		
Alternative	25 Year Event	100 Year Event
1	$1,600,000	$1,700,000
2	$2,100,000	$2,300,000
3	$2,400,000	$2,800,000

Area 3	Total Project Cost	
Project	10 Year Event	25 Year Event
1	$1,400,000	$1,500,000
2	$1,900,000	$2,100,000
3	$900,000	$1,000,000
4	$1,200,000	$1,300,000
5	$1,000,000	$1,200,000
6	$1,500,000	$1,700,000
7	$900,000	$1,000,000
7a	$1,200,000	$1,300,000

Note: Estimated costs are in 2010 dollars

B. COMPARISON OF ALTERNATES

Advantages and disadvantages of the alternates for each area were evaluated based on the anticipated solution goals, cost, constructability, effectiveness, and environmental factors, including water quality. Low Impact Development components were included in all alternates to assist in addressing storm water quantity and quality issues.

C. RECOMMENDATIONS

Area 1

Alternate 3 is recommended for Area 1 for a 100-year design flow. This is due to the positive public perception of removing all of the upstream flow south of Frances Avenue by a combination of a bioretention/detention area and rerouting the remaining storm water flow around the complaint areas. This alternate also provides for a significant increase in storm water quality in the area.

Area 2

Alternate 3 is recommended for Area 2 for a 100-year design flow. This is due to the environmental advantage of avoiding disturbing the existing stream south of Main Street and addressing the drainage issues resulting from excessive storm water flow from Main Street. This alternate also incorporates the most efficient hydraulic design of the new system due to allowing most of the storm flow to maintain a straight path at the existing bend in the stream. All alternates include LID components to enhance water quality.

Area 3

The recommended solutions to address known existing storm drainage issues in the Gateway Subdivision for both the 10-year and 25-year storm events, including Low Impact Development components, are shown on Exhibit C at the end of this report. Either the 10-year or 25-year design storm can be utilized as the basis of design for the systems, based on budgetary guidelines of the City. Normally, in localized drainage systems for most subdivision design, a 10-year design storm is used. The proposed improvements have been grouped into several areas. Each area should be constructed in its entirety. Some areas will require other ones be constructed before they are and are denoted by using the same area number along with a suffix of a, b, etc. in order to indicate the sequencing required.

EXHIBITS

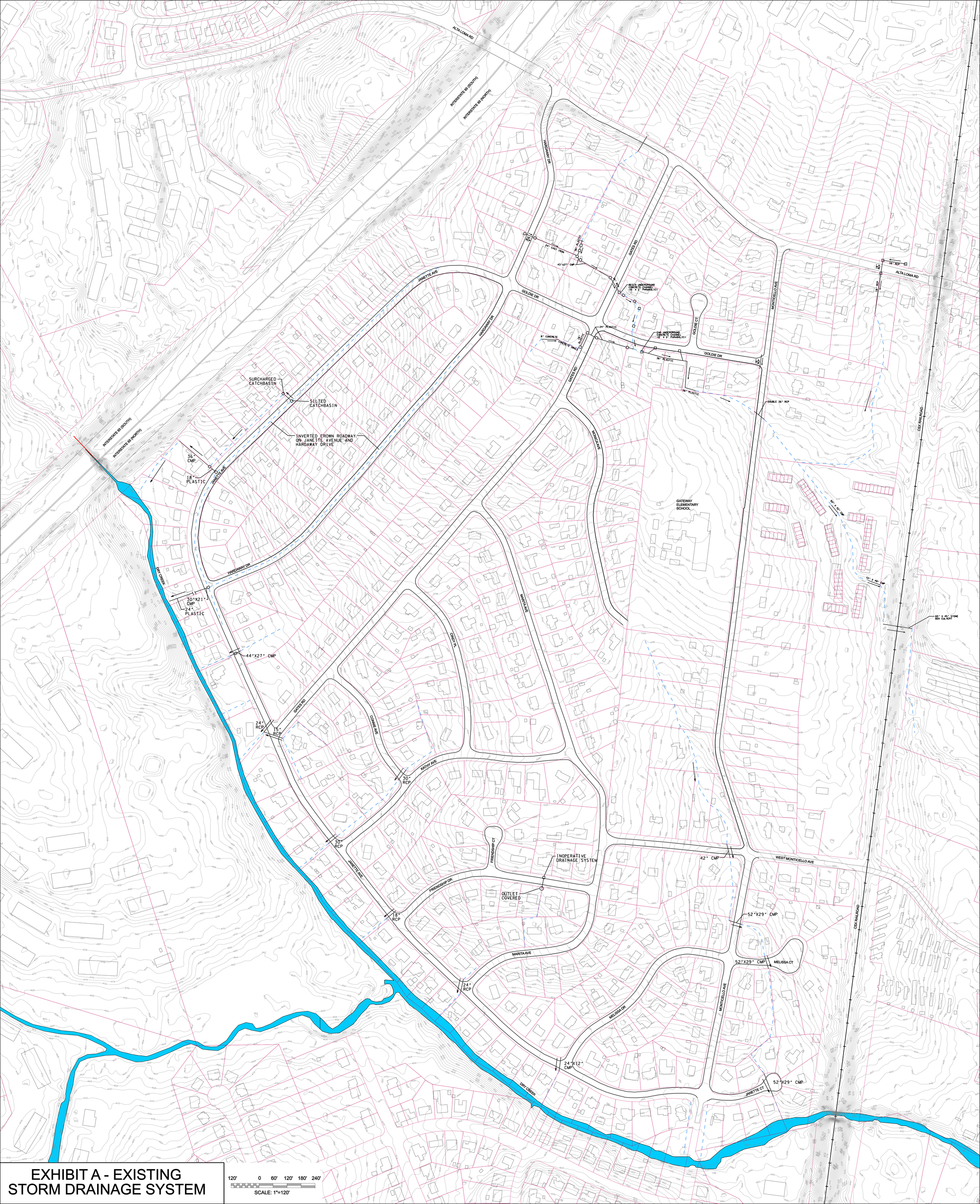


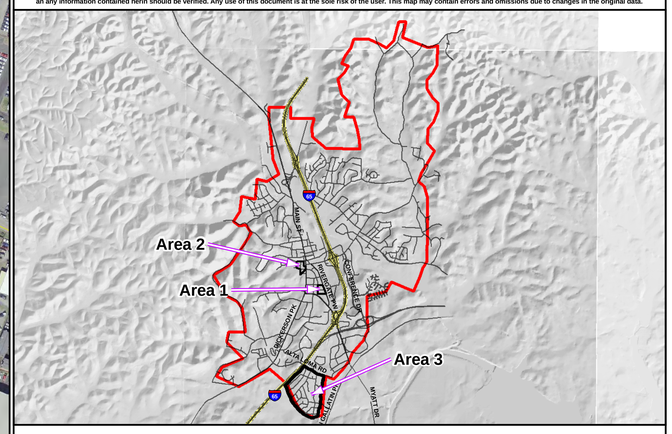
EXHIBIT A - EXISTING STORM DRAINAGE SYSTEM

Address	Complaint
300 Alta Loma Rd	Resident states water is overflowing ditch, ditch is filled in.
304 Alta Loma Rd	Resident states water is overflowing ditch.
310 Connie Ave	Resident states that rain is causing flooding due to ditch and states water runoff in the ditch between 310 and 312 Connie Ave is ponding and drawing mosquitoes.
311 Connie Ave	Drainage ditch beside his house needs to be cleaned out.
312 Connie Ave	Ditch along rear of property overflows, yard remains soggy.
202 Friendship Dr	Resident states that they have a drainage problem.
204 Friendship Dr	Basement gets water in it through walls, water drains across front yard from street during heavy rain, erosion along fence on side line.
305 Gates Rd	Resident would like to have curb installed to direct water away from her yard. Also back yard remains soggy after rains.
309 Gates Rd	Resident states that the ditch behind her home needs to be cleaned out it is clogged up and causing flooding.
317 Gates Rd	Resident says that since new curbing was installed water cannot properly drain from front yards and would like clean topsoil added with seed and straw.
307 Goldie Dr	Resident states that drainage pipe is damaged and causing ground to erode. Pipe goes underground in front yard and is next to mailbox.
309 Goldie Dr	Resident is having some ponding occuring.
311 Goldie Dr	Resident states there is a drainage issue on his property from water off the street, also drainage ditch in rear.
107 Hardaway Dr	Area drain needs repair and drainage ditch in front of residence is falling in and needs repair. Water sheets across back yard from I-65.
114 Hardaway Dr	Water from road and neighbor on south side causing erosion along rear lot line.
341 Janette Ave	Resident says drains in the street are never sufficient enough during heavy rains. Inlets in yard need to be cleaned out.
343 Janette Ave	Resident states the drainage ditch the City maintains is stopped up with debris and leaves and needs to be cleaned out.
359 Janette Ave	Resident States that it floods when there is heavy rains.
363 Janette Ave	Resident states that curbs installed at upper streets feed water directly to his property.
367 Janette Ave	Resident states that ditches to the east and west side of their property need to be cleaned out.
403 Janette Ave	Resident states all of the water coming down from Gates Rd is flooding 402 Janette Ave
410 Janette Ave	Resident states that titch running along Kathy Ave. to their property is undersized. Also flow comes down the hill from Gates Rd, Marita Ave and Friendship Dr to their property.
411 Janette Ave	Drainage ditch along side of property a problem, tree growing in ditch.
419 Janette Ave	Resident states water runs down Monticello Ave which floods yard and crawl space of house.
420 Janette Ave	Water running from Kathy through their yard.
421 Janette Ave	Resident states the ditch that drains to the creek is stopped up and water run off from Friednship Dr is causing flooding.
423 Janette Ave	Resident states storm drain near property is clogged and causing this drain to overflow into her yard. Resident states that the ditch between 421 and 423 Janette needs to be cleaned out, it is stopped up and is causing flooding. Resident states neighbor had sewer repairs done to property and this has resulted in drainage issues on her property.
425 Janette Ave	Resident states, she would like the City to install an asphalt curb to keep runoff water from flooding her yard and no drainage pipe between 423 and 425 which causes water to pond in yard.
431 Janette Ave	Clean out culvert.
450 Janette Ave	Resident states that curb on runs around part of property and that the yard floods and does not drain. Water from Melissa Dr fills front and side yard and stands in side yard for several days.
451 Janette Ave	Water running under house from road area (never has done it before)
453 Janette Ave	Resident states when it rains the water runs through his yard and ultimately underneath his home due to no curbing being installed at the street. Also, after each heavy rain water comes across neighbors drive to his front yard.
456 Janette Ave	Residents states water drains across back yard, ponds, and gets into crawl space.
458 Janette Ave	Water drains across back yard and gets into crawl space, back yard remains soggy.
461 Janette Ave	Resident stated that the culvert was blocked with debris and ditch has been filled in. Resident is requesting culvert be cleaned out and ditch be redug.
419 Janette Ct	Resident states that since sewer work was done in Gateway that their yard is flooded due to heavy rains.
504 Kathy Ave	Resident states that the drainage ditch needs to be dug out deeper and that the culvert under driveway is clogged full of dirt and debris, therefore water is not draining that is ponding and causing flooding to the yards along Kathy Ave.
126 Marita Ave	Resident states that 2 ft. of the curb was washed away and that they still have a drainage problem.
305 Marita Ave	Clean culvert, install grate.
314 Marita Ave	Curb used to keep water from eroding yards and or flooding.All of the neighbors are having drainage problems. Resident at 316 said, her driveway has washed away due to drainage problem. Resident at 312 has had erosion due to drainage.
401 Melissa Ct	Clean culvert, install grate
413 Melissa Ct	Drainage ditch that runs behind 202 Monticello through Melissa Ct. that needs work done to it, a drainage pipe needs to be installed. Drainage is causing stagnant water and mosquitos.
313 Melissa Dr	Request to meet with this resident to look at drainage concerns.
316 Melissa Dr	Resident states that they have a lot of water build up after heavy rain. the covers are raising up with water bubbling out from the sewer covers and draining through yards and washing away yards.
318 Melissa Dr	Resident states due to street work there is a large amount of water building up in her yard and her basement could possibly flood.
104 Monticello Ave	Requesting storm drain to be cleaned, water has come close to corner of house.
1537 Monticello Ave	Logs are in drain.

Legend

- School
- Service Request
- Water
- Streets
- Study Area
- Property Boundary
- 100-Year Floodplain
- Floodway

**In preparation of this map, an effort has been made to offer the most current, correct, and clearly expressed information as possible and/or available. The information contained within this map is derived from multiple sources. Because the source data contained in these maps is dynamic and subject to change at any time, this map should be considered a working document an any information contained herin should be verified. Any use of this document is at the sole risk of the user. This map may contain errors and omissions due to changes in the original data.



Area 3 Existing Drainage Complaint Locations

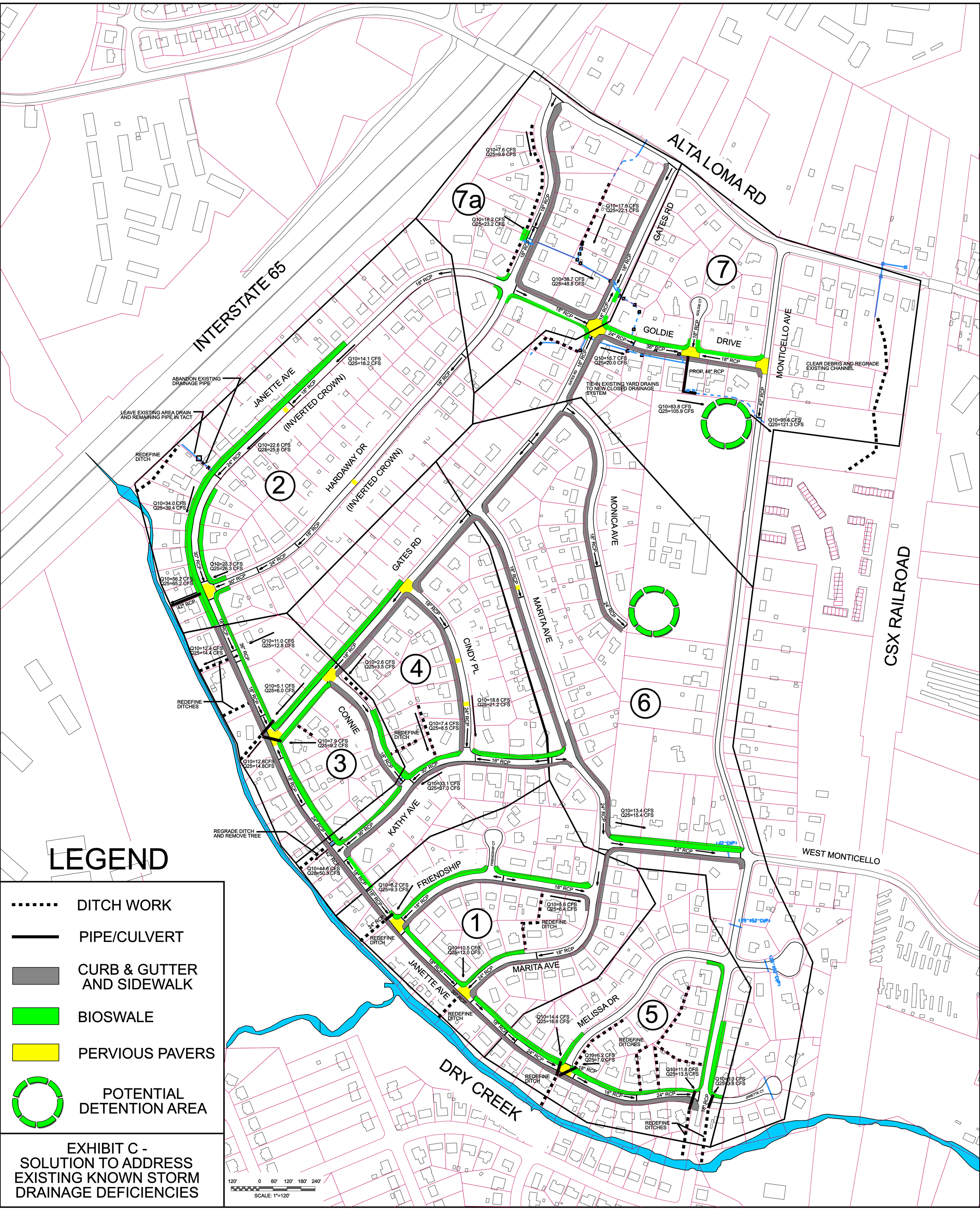
1 inch = 150 feet

0 75 150 300 450 600 750

Feet

N W E S

Exhibit B

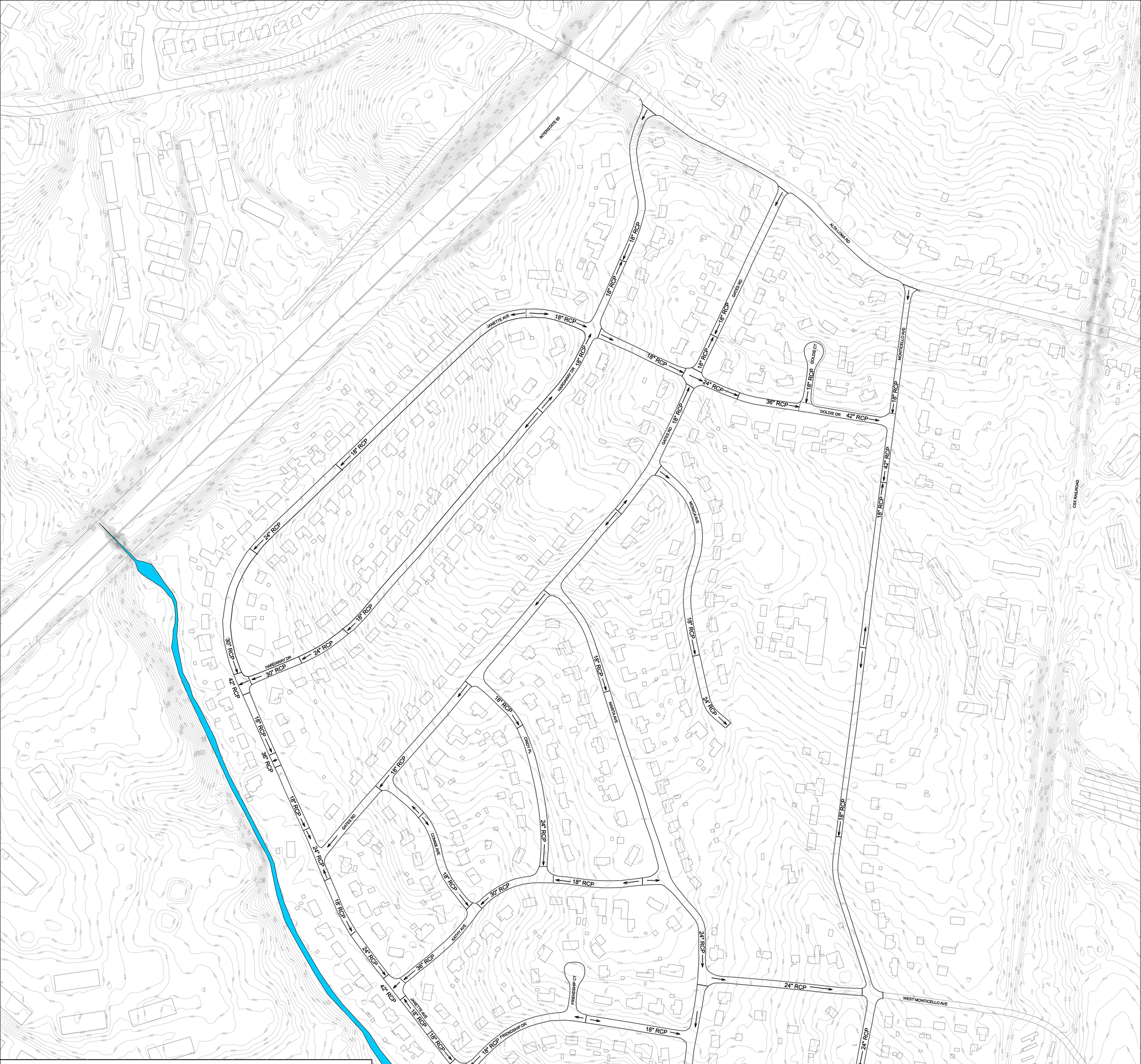


LEGEND

- DITCH WORK
- PIPE/CULVERT
- CURB & GUTTER AND SIDEWALK
- BIOSWALE
- PERVIOUS PAVERS
- POTENTIAL DETENTION AREA

EXHIBIT C - SOLUTION TO ADDRESS EXISTING KNOWN STORM DRAINAGE DEFICIENCIES

APPENDIX

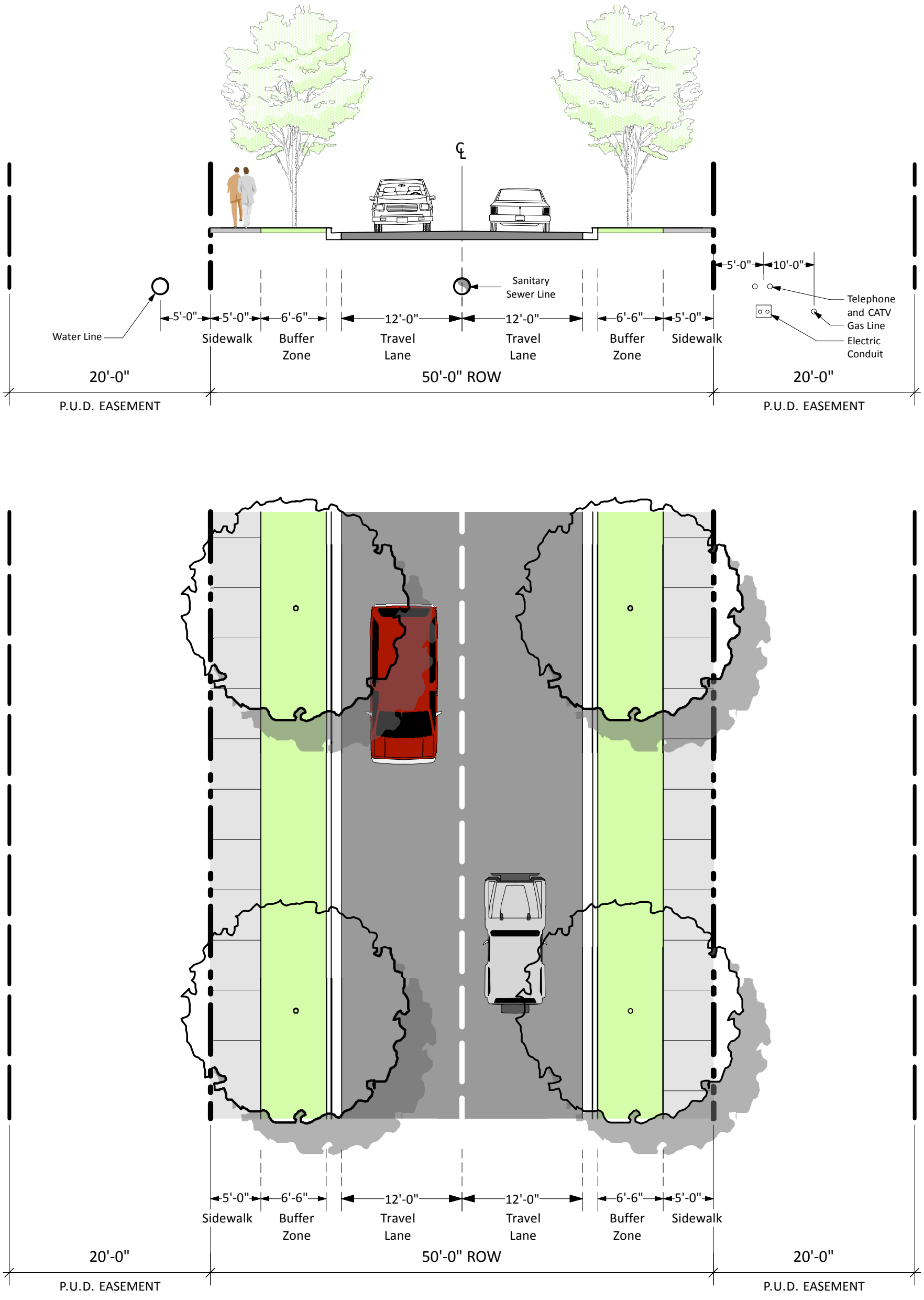


TYPICAL	FEATURES	COST PER LF (NO PIPE)	WITH 15" RCP	WITH 18" RCP	WITH 24" RCP	WITH 30" RCP	WITH 36" RCP	WITH 42" RCP	WITH 48" RCP
1	SIDEWALK (BOTH SIDES)	$325	$482	$502	$528	$554	$587	$625	$663
	C & G (BOTH SIDES)								
2	SIDEWALK (BOTH SIDES)	$413	$569	$589	$615	$642	$674	$713	$750
	C & G (BOTH SIDES)								
	6.5 FT BIOSWALE (ONE SIDE)								
3	SIDEWALK (ONE SIDE)	$407	$563	$583	$609	$635	$668	$707	$744
	C&G (BOTH SIDES)								
	11.5 FT BIOSWALE								
4	SIDEWALK (ONE SIDE)	$432	$588	$608	$634	$660	$693	$732	$769
	C&G (BOTH SIDES)								
	14 FT BIOSWALE								

Appendix - Area 3 Master Plan for Ultimate Build-Out

120' 0 60' 120' 180' 240'

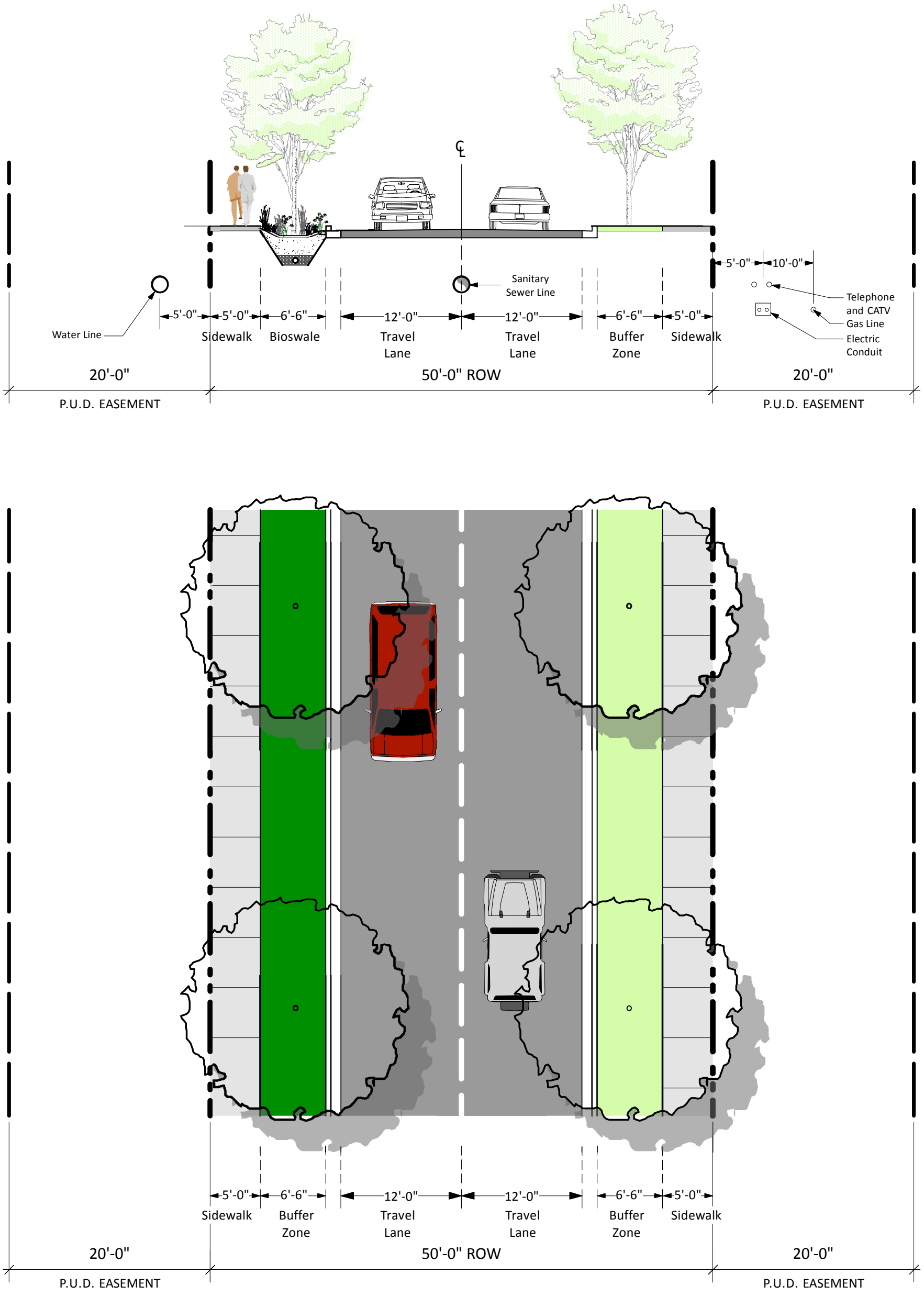
SCALE: 1"=120'



SECTION: Standard City Cross-section (50'-0" ROW)

GOODLETTSVILLE DRAINAGE STUDY

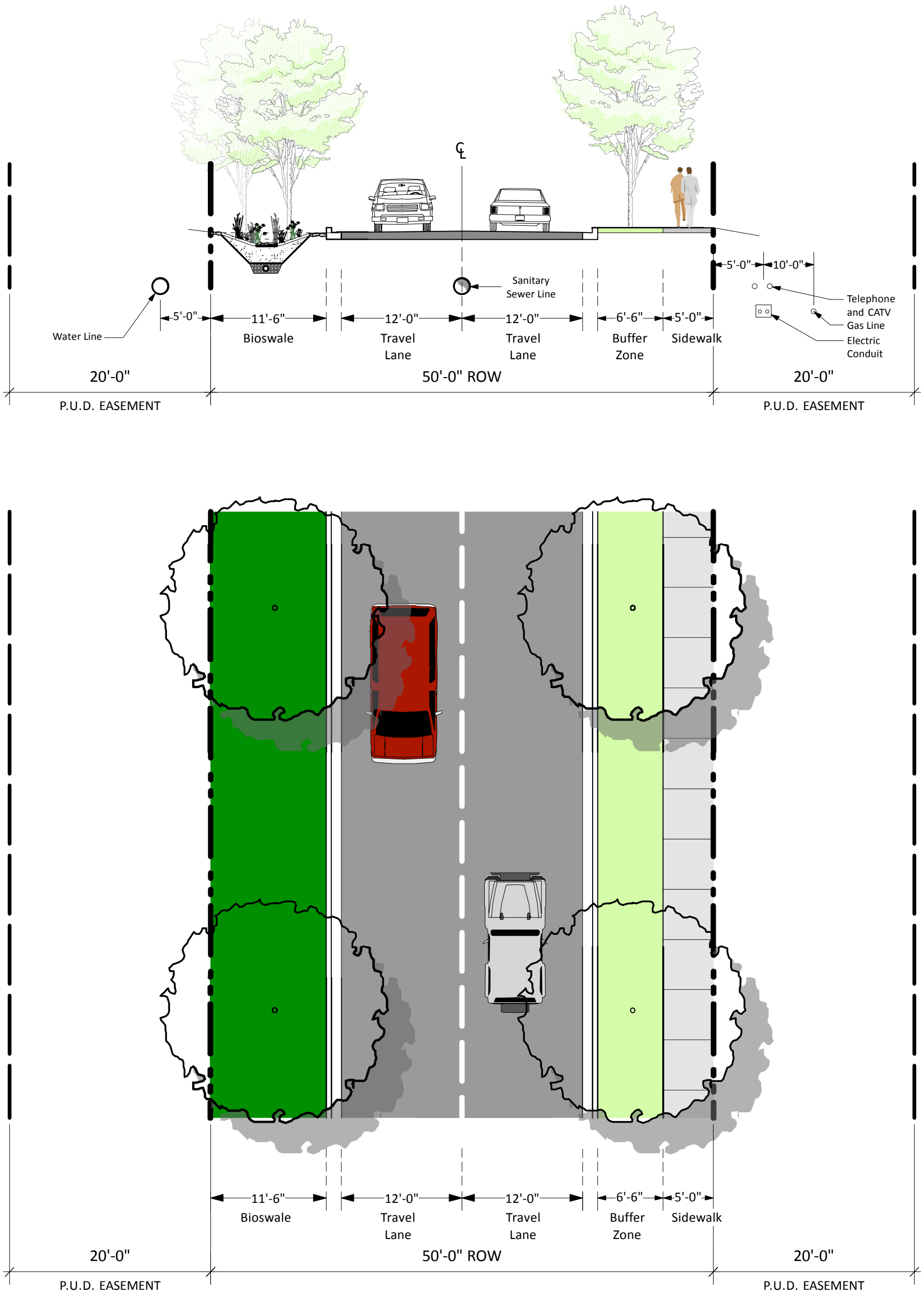
Area 3 Roadway Sections **Typical 1** **2010-8-10**



SECTION: Standard City Cross-section w/ Bioswale (50'-0" ROW)

GOODLETTSVILLE DRAINAGE STUDY

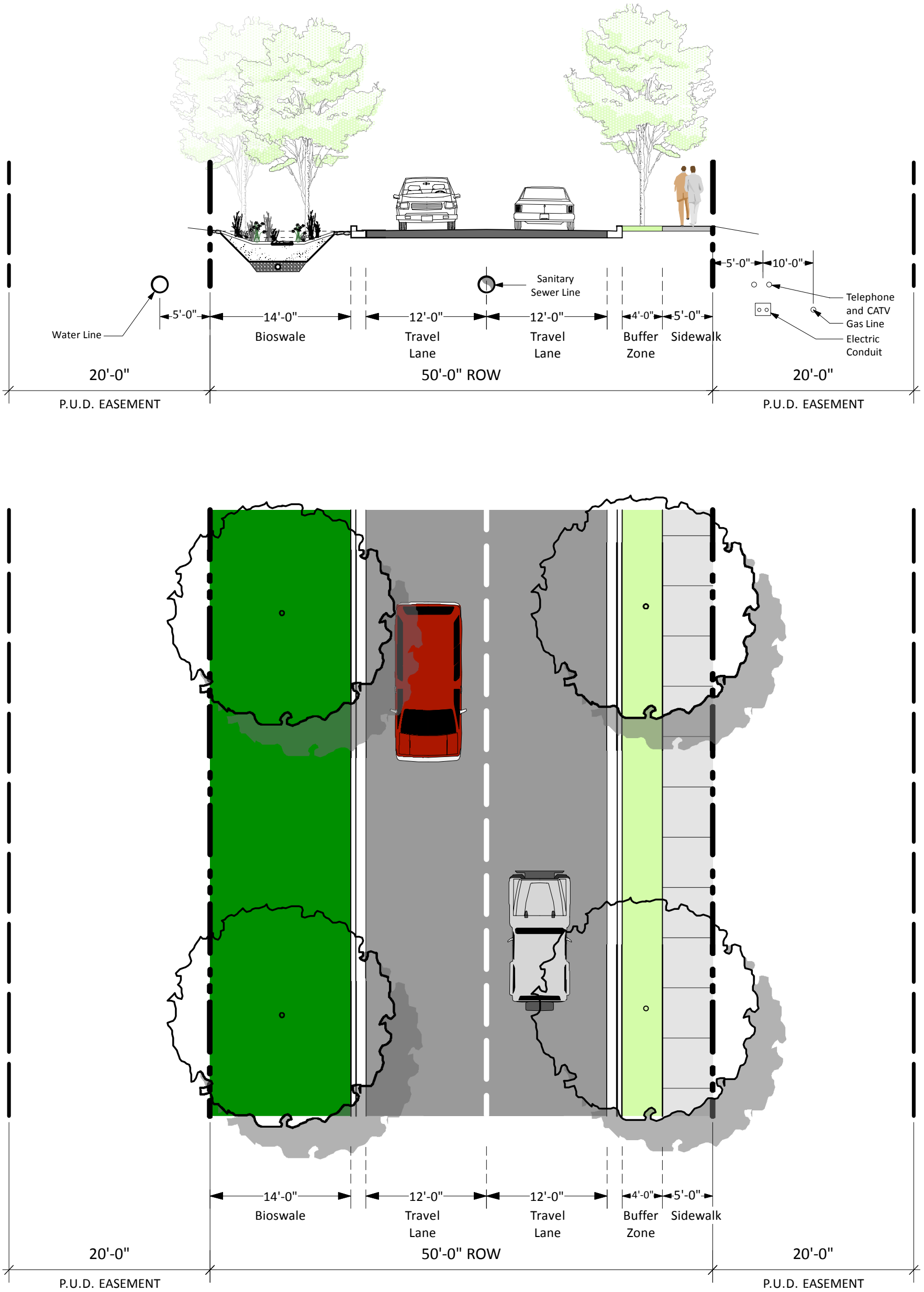
Area 3 Roadway Sections **Typical 2** **2010-8-10**



SECTION: Bioswale (Standard 50'-0" ROW)

GOODLETTSVILLE DRAINAGE STUDY

Area 3 Roadway Sections **Typical 3** **2010-8-10**



SECTION: Bioswale (Modified 50'-0" ROW)

GOODLETTSVILLE DRAINAGE STUDY

Area 3 Roadway Sections **Typical 4** **2010-8-10**