ENGINEERING REPORT

SANITARY SEWER SYSTEM MASTER PLAN

FOR THE

CITY OF PIPERTON, TENNESSEE

DECEMBER 2015

JRWCO 3598

BY

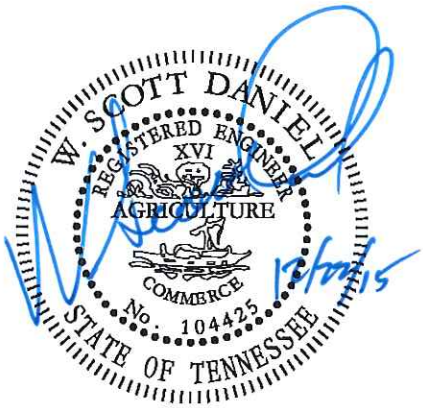
J. R. WAUFORD & COMPANY,
CONSULTING ENGINEERS, INC.
529 OLD HICKORY BOULEVARD
JACKSON, TENNESSEE 38305

ENGINEERING REPORT

SANITARY SEWER SYSTEM MASTER PLAN

FOR THE

CITY OF PIPERTON, TENNESSEE



DECEMBER 2015

JRWCO 3598

BY

J. R. WAUFORD & COMPANY, CONSULTING ENGINEERS, INC.

529 OLD HICKORY BOULEVARD
JACKSON, TENNESSEE 38305

TABLE OF CONTENTS

Section		Page
I.	General	1
	A. Purpose	1
	B. Scope	1
	C. Existing Facilities	2
	D. Design Criteria	3
II.	Sewer Flow Projections	5
III.	Commercial Development Along Major Corridors	5
	A. Highway 57 Corridor	6
	B. Highway 72 Corridor	7
IV.	Wastewater Treatment Plant Locations	8

Exhibits

Appendix A – Basin Flow Projections

Appendix B – Cost Estimates

I. General

A. Purpose

The City of Piperton, Tennessee is located in the southwest corner of Fayette County, bordering Shelby County, Tennessee and Marshall County, Mississippi. The City of Piperton's Urban Growth Boundary and City limits are shown on Exhibit 1. The purpose of this Sanitary Sewer Master Plan is to present the City of Piperton with the results of recent flow projection calculations and recommendations for major sewer collection lines and pumping stations to serve the study area. This plan addresses providing sewer service to currently unsewered areas within the study area.

This Master Plan is to also act as a guide or road map to allow the City of Piperton to map out a strategy to develop and expand the system to serve the study area. This will allow the City to develop the new sewer system in a way that as future developments are built they are not limited by capacity constraints that would constrict development of the City of Piperton.

B. Scope

The study area of concern for this Sewer Master Plan is limited to the southern part of the City of Piperton (See Exhibit 2). Specifically this area is bounded on the west by the Fayette County line, the south by the Tennessee State line, east by the urban growth boundary, and the north by the Wolf River.

This study will evaluate the three primary concerns listed below:

- Sewer flow projections within the study area. This will look at projected flows for the study area and develop a general layout of a piping network to transport the flows.
- Commercial development along interstate connections. This will look at possible phased sewer development needed to spur development while not constructing the full build out scenario.
- Wastewater treatment plant location. This will evaluate the wastewater treatment plant currently under construction to confirm that it is in an optimal location for the City of Piperton's sewer needs and if a second plant is required or beneficial for full build-out of the city.

C. Existing Facilities

1. Wastewater Treatment Plant

The City of Piperton does not currently have a centralized wastewater treatment plant. The developments that have been built have utilized a decentralized system which treats grey water from Septic Tank Effluent Pump (STEP) units at each service location. Recently a developer, Mr. William Adair, began building a centralized wastewater treatment plant (Adair plant) to serve his future development as well as the city per an agreement between the city and the developer dated August 7, 2009. This plant is a sequencing batch reactor (SBR) style of plant and is designed to

have a rated capacity of .5 million gallons per day (MGD). The Adair plant can be expanded to a build out capacity of 3 MGD. This plant has not been completed at this time. The City of Piperton has obtained a NPDES permit to discharge up to 3 MGD of treated effluent into the Wolf River for the SBR wastewater treatment plant.

2. Wastewater Collection System

With no centralized wastewater treatment plant the City sewer infrastructure is limited to the STEP systems that were installed for each individual development. There have been a few gravity lines installed by Mr. Adair in conjunction with his construction of the wastewater treatment plant. While these lines have not been tested or accepted by the City, this could be accomplished and play a part in the overall sewer collection system. Additionally on the south end of the City along Highway 72, some development has taken place allowing for the construction of a few gravity sewer lines as well as a sewage pumping station. This sewage flows into Marshall County, Mississippi per the city's agreement with Marshall County Industrial Development Authority.

D. Design Criteria

In developing the required pipe network to serve the study area, the projected sewer flows must be calculated. To do this a uniform approach must be used. Starting with the drainage basins and then applying the land use plan, the area within a certain drainage basin and land use can be calculated. Then applying a

sewer flow rate for each land use category in that area will establish the estimated flows for the area. For the purpose of this report sewer flows will be estimated as shown in Table 1.

Table 1 Average Sewer Flows	
Land Use	Flow
Commercial	500 Gallons/Acre/Day
Industrial	1,000 Gallons/Acre/Day
Office	300 Gallons/Acre/Day
Mixed Use	300 Gallons/Acre/Day
Low Density Residential	1.5 Homes/Acre & 2.7 Persons/Home 100 Gallons/Person/Day

Once total flows for an area are known a peaking factor must be applied before sizing of the pipes. This peaking factor accounts for fluctuations in the time of concentration of flow from the area. The larger an area is the less substantial the peaking factor is, as the flow will collect over a larger area and will be slower to concentrate. Below are the peaking factors that will be used in this report.

Less than 300 Acres	3.0
300 to 999 Acres	2.5
More than 1,000 Acres	2.0

II. Sewer Flow Projections

In evaluating the study area, the first task is to establish the drainage basins. These are natural drainage basins that will assist in the development of the sewer system. As the preferred means of sewage collection is gravity sewer, if we develop the system to mimic the natural drainage of the area we can minimize the number of sewage pumping stations. On Exhibit 3 the eight (8) major basins are identified. Some of the major basins can be sub-divided to further project flows and develop laterals to the sewer interceptors. With the basins identified, the land use plan can be overlaid to calculate the areas of different land uses within a given basin. Exhibit 4 shows this. With the land use areas within each basin calculated, twenty (20) percent of the area is subtracted to allow for roads and open space within the area. Then the appropriate flow rate is applied to that area to establish the total daily flow in gallons per day. For the design of pipes and pumping stations, the flow is converted to a flow rate in gallons per minute (GPM). Then to simulate the peaks that the system will see during a typical day a peaking factor is applied. This peaked flow rate is then used to size the pipes and sewage pumping stations that are needed. Exhibit 5 shows the projected pipe sizes in each of the basins, this creates the sewer master plan. The flow calculations for each basin are attached in Appendix A.

III. Commercial Development Along Major Corridors

The City of Piperton is uniquely situated with access to major roadways. On the west side of the City is SR 385 (Future I-269), State Highway 57 running east and west through the city and US 72 on the south side of the city. With this access to major corridors it is reasonable that commercial growth along these highways will occur. With

these highly developable areas, the City would like to look at these as priority areas in order to spur growth in the City. The two commercial/industrial priority areas the City is most interested in promoting for development are the Highway 57 corridor and the Highway 72 corridor. The following discussions are related to these two priority areas and how to best serve them now, before the city's sewer system is fully developed.

A. Highway 57 Corridor

The Highway 57 corridor begins at the western city limits and extends along Highway 57 to the intersection of State Route 196. Included in this area is the interchange with Highway 57 and State Route 385, the new bypass around Memphis and future I-269. This intersection of SR 385 and Highway 57 is a very developable intersection and will only be enhanced with the completion of I-269. This corridor consists of primarily commercial, industrial and mixed use and is located in Basins 4 & 1. Basin 4 naturally drains into Shelby County and thus is shown on the sewer master plan to have a proposed sewer pumping station to transport the sewage to the Adair plant. This is good because the final buildout plan is to have a sewage pumping station at this location and could be installed now. The only design concerns would be to design the sewage pumping station for both current and future pumping needs. In looking at the flows for both buildout and the beginning of development an eight (8) inch forcemain can be utilized. In the early days the pumping station would be rated at 320 gpm in order to maintain the minimum velocities needed. Then at buildout the capacity of the sewage pumping station would have been increased to approximately 650 gpm.

With this area the pumping station could be installed as shown on the master plan and the gravity sewer lines extended to serve the development as needed. The east end of the Highway 57 corridor, at the intersection of SR 196, is in Basin 1 that naturally flows to the north towards the Wolf River. This area will need to be served by a temporary sewage pumping station as this area is on the upper end of the basin. Gravity sewer lines would be constructed as needed to serve the growth and a sewage pumping station would be constructed near William Road. This sewage pumping station would then pump into the eight-inch forcemain previously discussed. Exhibit 6 illustrates an enlarged view of this area along with the proposed sewer pumping stations and basic gravity sewer lines. Additionally, there is an opinion of probable cost in the Appendix B for the sewer development in this corridor.

B. Highway 72 Corridor

This area begins at the intersection of I-269 and Highway 72 and continuing along Highway 72 to the Mississippi state line. With the completion of I-269 this intersection and surrounding area will continue to be prime for development. This corridor is primarily in Basin 8. As development advances north of Highway 72 natural drainage begins to flow to the north. For this priority area the focus is on the frontage of Highway 72 to a depth of approximately 400 feet. This area can be directed into Basin 8 so that multiple basins are not needed to be developed in order to spur growth. Basin 8 is primarily industrial and commercial and flows naturally into Mississippi. The City currently has a gravity sewer line

along the western side of this basin that flows into Mississippi. According to drawings provided by the City, this 12" gravity line with a 0.3% slope can carry the basins build out flow. There has also been some development on the eastern end of this corridor. This development included the construction of gravity sewer lines installed collecting sewage to a sewage pumping station. The sewage pumping station is currently rated at 280 gpm. At complete build out this station will need to be renovated to a higher capacity, approximately 360 gpm. The sewage is then pumped through a six-inch forcemain into the 12" gravity line on the western side of the basin. The existing six-inch forcemain is adequately sized for build out. Any development along the western side of this corridor will simply tie into the existing gravity line that flows into Mississippi. Any developments along the eastern side of the corridor will tie into the existing gravity lines and sewage pumping station currently serving this area. As development occurs within the middle of this corridor additional gravity lines will be needed. The developments on the north side of Highway 72 will need to be collected together in an effort to minimize the number of Highway 72 crossings. Exhibit 7 shows an enlarged view of this area with the existing sewer on both the east and west ends of the corridor as well as proposed new gravity sewer lines to serve the middle of the corridor.

IV. Wastewater Treatment Plant Location

The City of Piperton requested an evaluation of the study area to confirm the best location for the construction of a wastewater treatment plant. This will include

evaluating the location of the partially completed Adair plant as well as other possible locations to find the best location to serve the City of Piperton. Additionally, the City would like to see if an additional plant is needed to serve the northwest portion City.

In selecting the location of a wastewater treatment plant many factors are important such as proximity to development, proximity to the receiving stream and the ability to transport the raw sewage to the plant. Looking at the City of Piperton's natural drainage (See Exhibit 3), there are several distinct ridge lines that prevent the entire city from gravity flow to any one location. Basin 8 flows south into Mississippi, Basins 4 & 7 flow into Shelby County. All of these basins will have to be pumped if the City is going to provide sewer service to them regardless of the treatment plant location. This leaves Basins 1, 2, 3, 5 & 6 that drain to the Wolf River. All except Basin 1 can be collected at a common location, at or near the current Adair treatment plant that has begun construction. Basin 1 is divided by a distinct ridge and would have to be pumped to the Adair location. The current Adair wastewater treatment plant site is a good location for the treatment plant as most of the City drains to this location and a minimal number of sewer pumping stations would be required.

Looking into a two plant scenario would involve the construction of the plant discussed above along with a second plant constructed in the northwest corner of the study area. This would serve Basin 1 and thus all areas that could be served by natural drainage in the city would be served. The City has discussed the possibility of this plant being a lagoon type of treatment system. Paul Higgins and Wade Murphy, in the permit section for TDEC were contacted about the possibility of dividing the existing 3 MGD discharge

NPDES permit into two discharges. They both have said it would be highly unlikely and would require a new NPDES permit for the second location. Also, TDEC is currently in the process of adding nutrient limits to permits as EPA has been pressuring them for several years for this. Unfortunately lagoons are not able to remove nutrients and will probably not be permitted for new construction in the future if the location requires nutrient removal. A one plant scenario is recommended, given the option, as a sewer pumping station in Basin 1 would be less operation, maintenance and reporting than a required treatment plant.

Exhibits

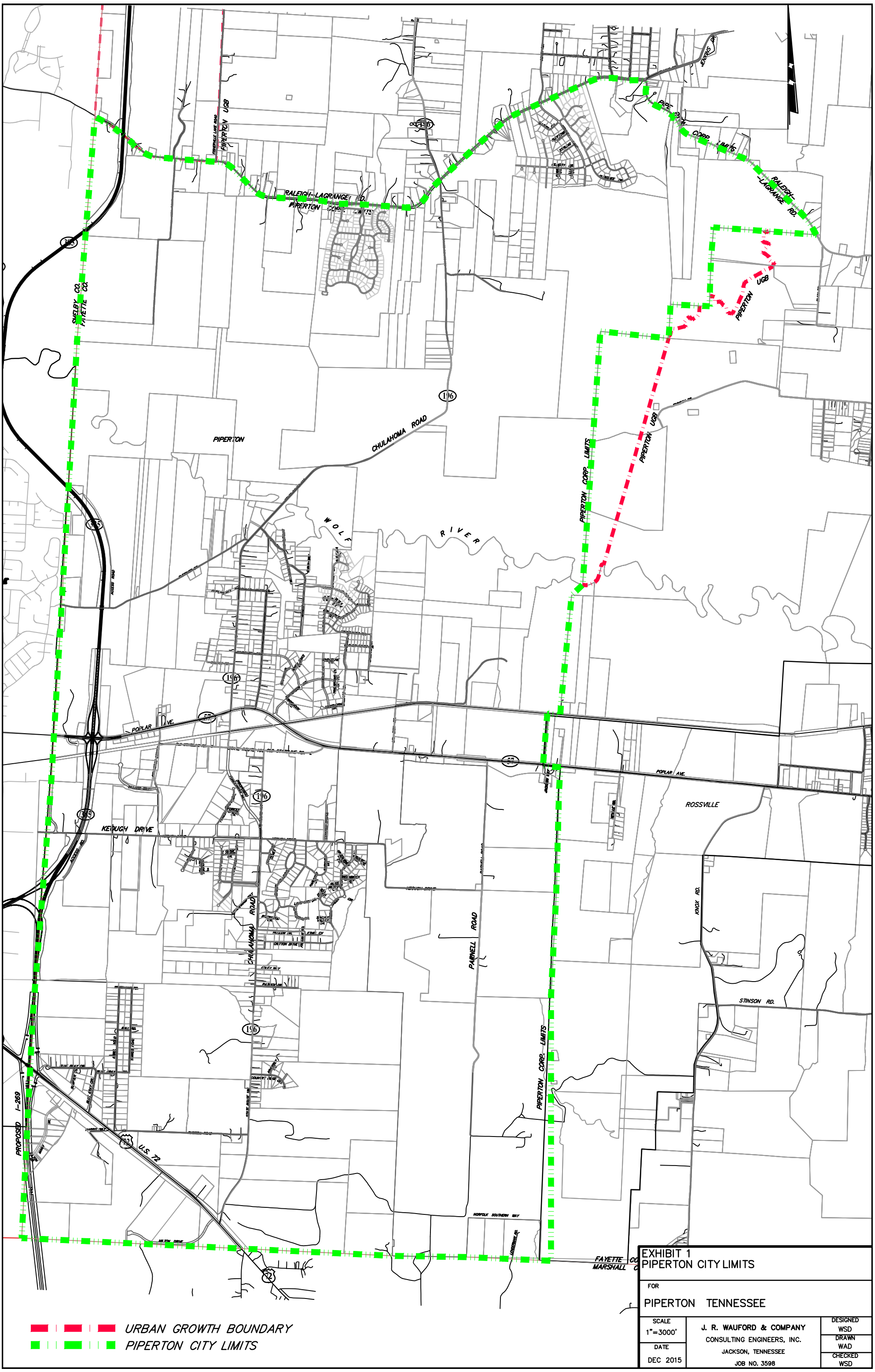


EXHIBIT 1
PIPERTON CITY LIMITS

FOR

PIPERTON TENNESSEE

SCALE	J. R. WAUFORD & COMPANY	DESIGNED
1"=3000'	CONSULTING ENGINEERS, INC.	WSD
	JACKSON, TENNESSEE	DRAWN WAD
DATE DEC 2015	JOB NO. 3598	CHECKED WSD

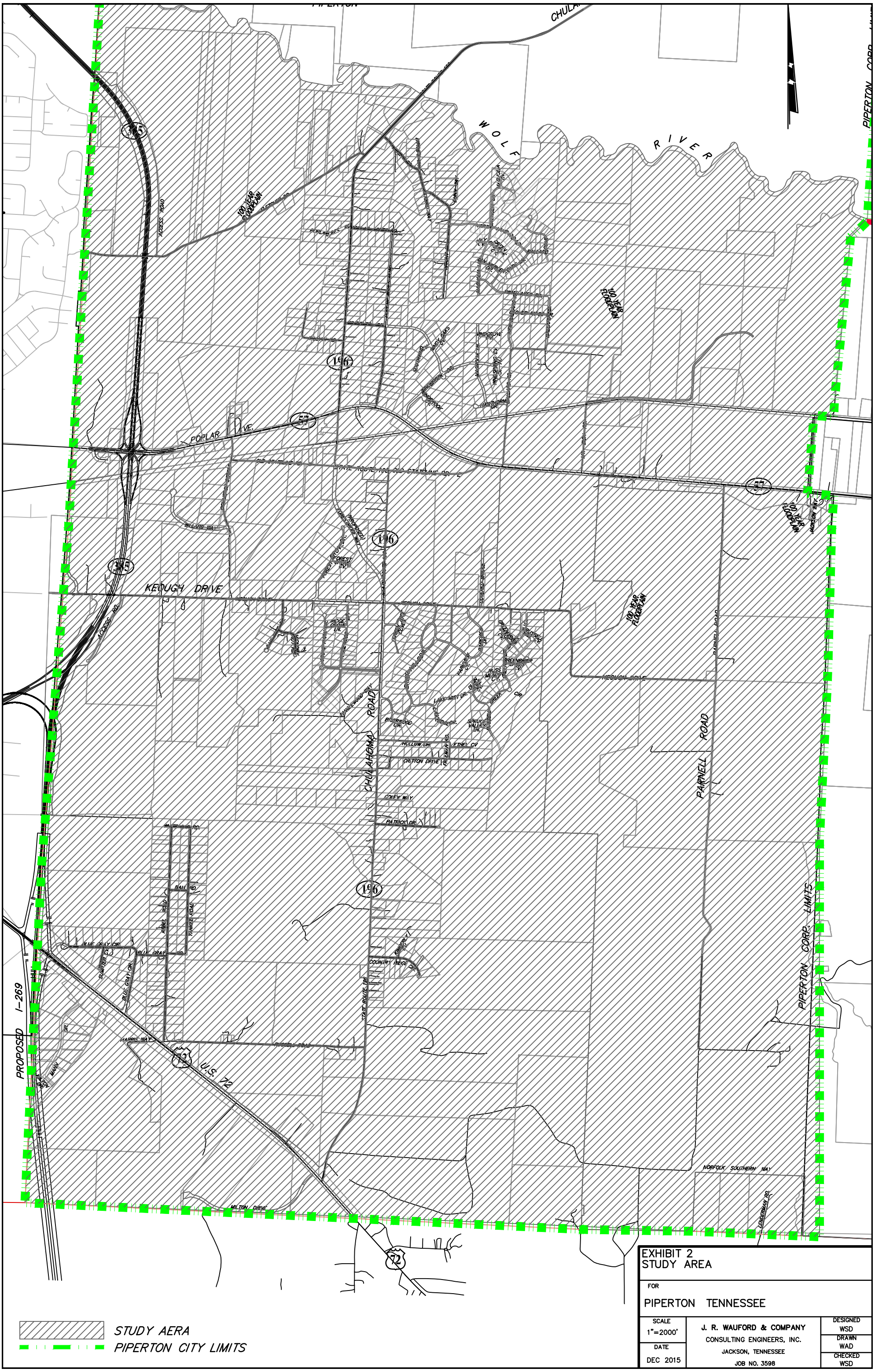


EXHIBIT 2
STUDY AREA

FOR

PIPERTON TENNESSEE

SCALE	J. R. WAUFORD & COMPANY	DESIGNED
1"=2000'	CONSULTING ENGINEERS, INC.	WSD
	JACKSON, TENNESSEE	DRAWN
DATE	JOB NO. 3598	WAD
DEC 2015		CHECKED
		WSD

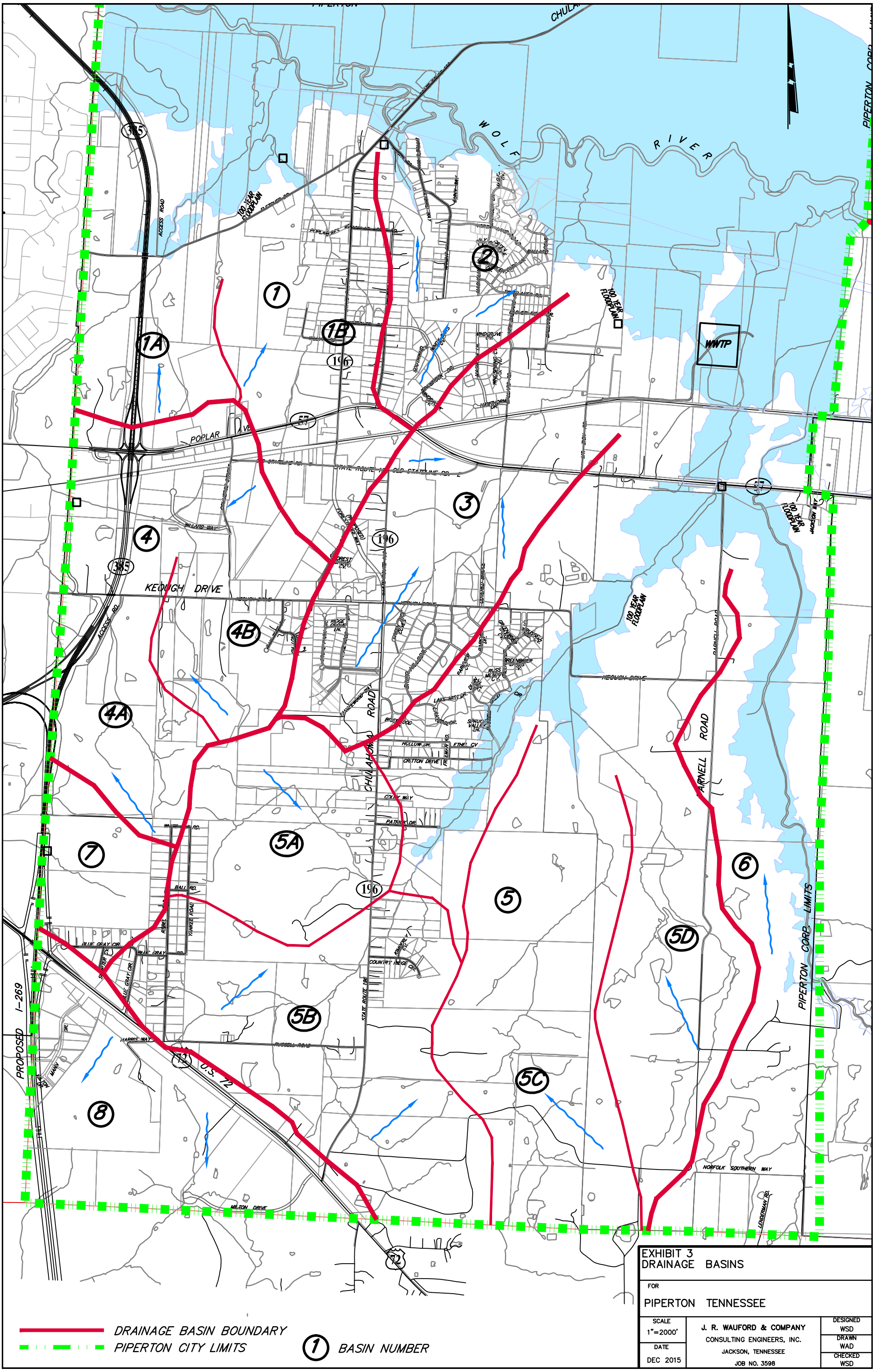


EXHIBIT 3
DRAINAGE BASINS

FOR

PIPERTON TENNESSEE

SCALE	J. R. WAUFORD & COMPANY	DESIGNED
1"=2000'	CONSULTING ENGINEERS, INC.	WSD
DATE	JACKSON, TENNESSEE	DRAWN
DEC 2015	JOB NO. 3598	WAD
		CHECKED
		WSD

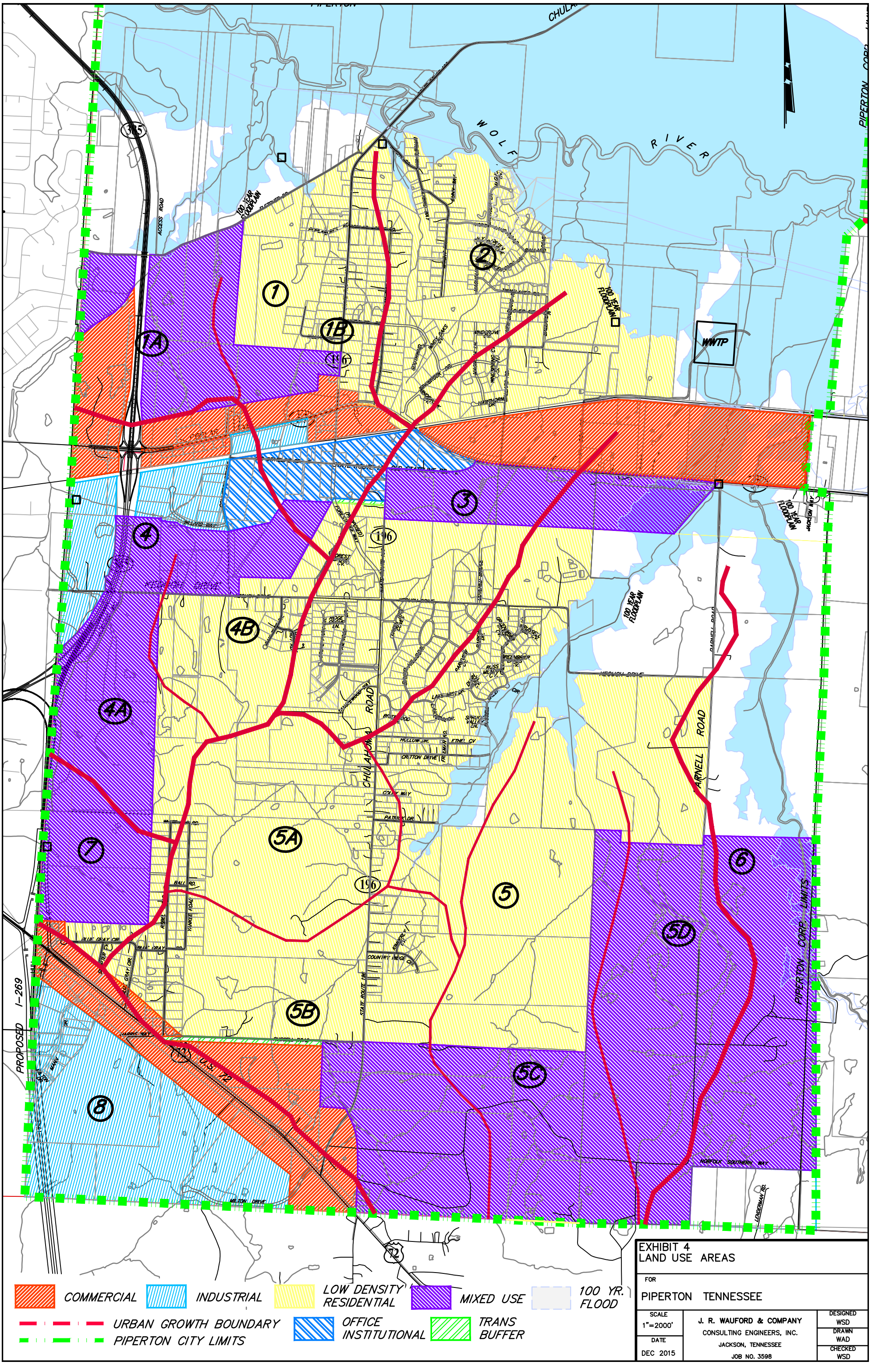


EXHIBIT 4
LAND USE AREAS

FOR

PIPERTON TENNESSEE

SCALE	J. R. WAUFORD & COMPANY	DESIGNED
1"=2000'	CONSULTING ENGINEERS, INC.	WSD
DATE	JACKSON, TENNESSEE	DRAWN
DEC 2015	JOB NO. 3598	WAD
		CHECKED
		WSD

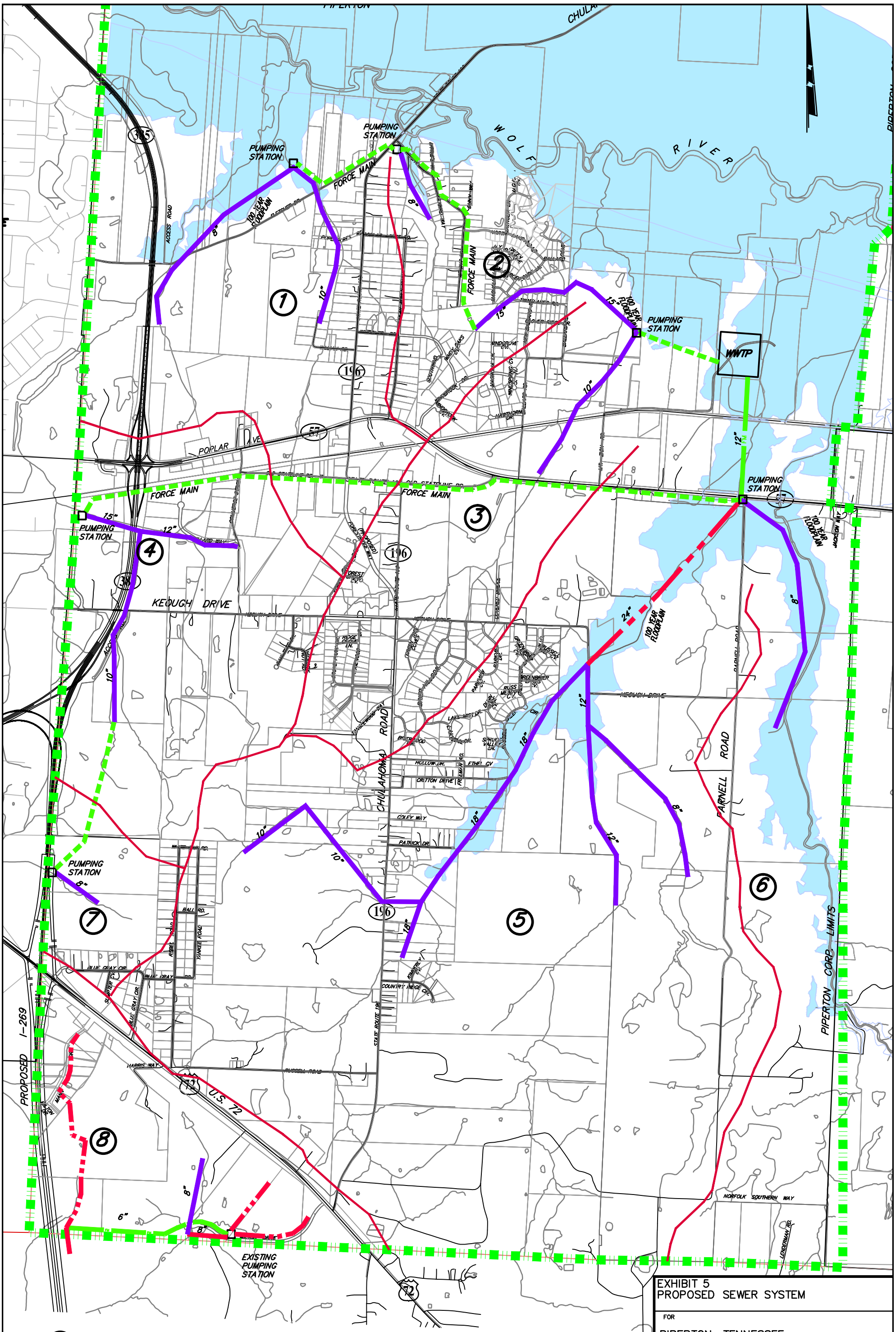


EXHIBIT 5
PROPOSED SEWER SYSTEM

FOR

PIPERTON TENNESSEE

SCALE 1"=2000'	J. R. WAUFORD & COMPANY CONSULTING ENGINEERS, INC. JACKSON, TENNESSEE JOB NO. 3598	DESIGNED WSD
DATE DEC 2015		DRAWN WAD
		CHECKED WSD

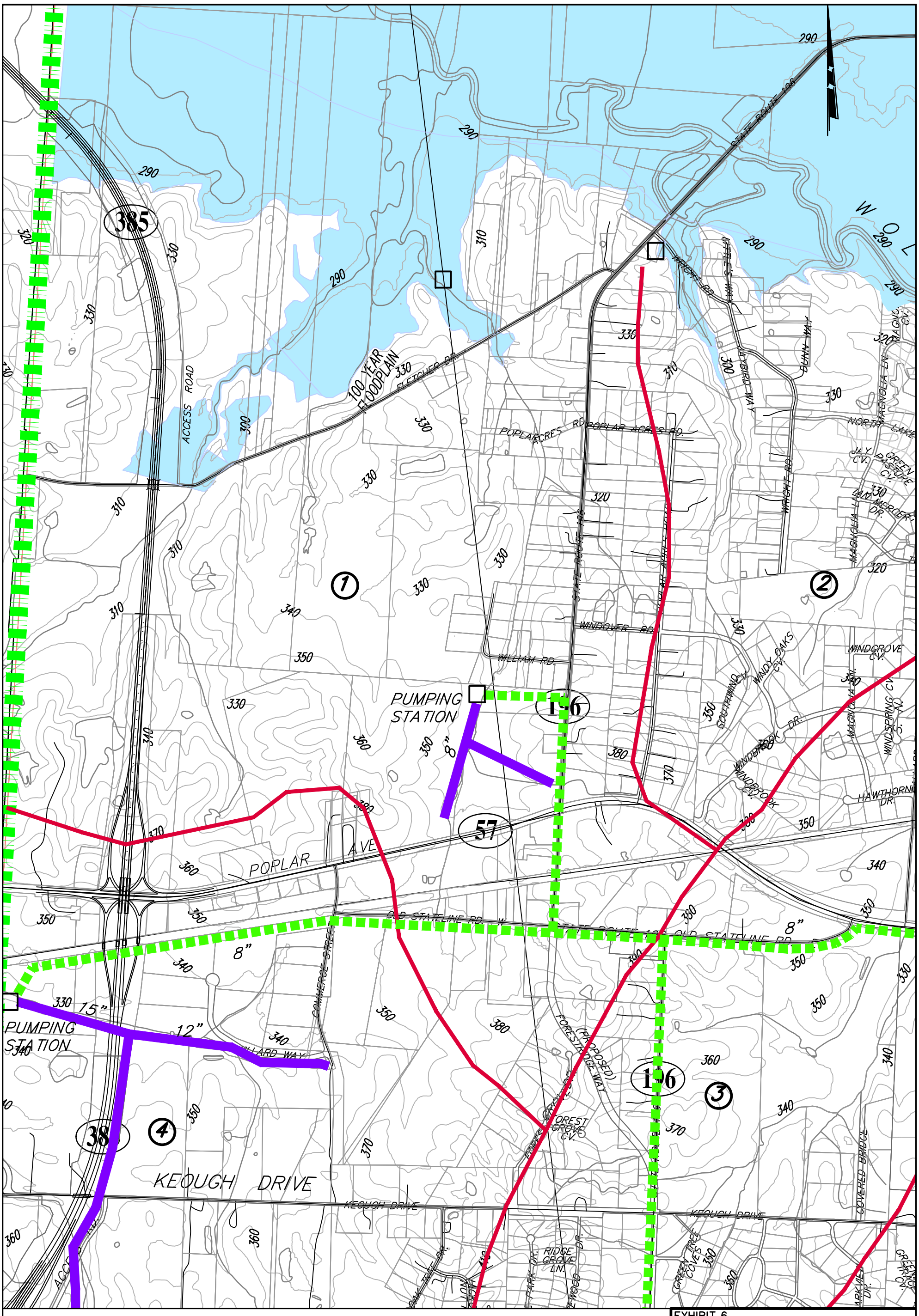


EXHIBIT 6
HIGHWAY 57 CORRIDOR

FOR

PIPERTON TENNESSEE

SCALE	J. R. WAUFORD & COMPANY	DESIGNED
1"=1000'	CONSULTING ENGINEERS, INC.	WSD
DATE	JACKSON, TENNESSEE	DRAWN
DEC 2015	JOB NO. 3598	WAD
		CHECKED
		WSD

(1) BASIN NUMBER

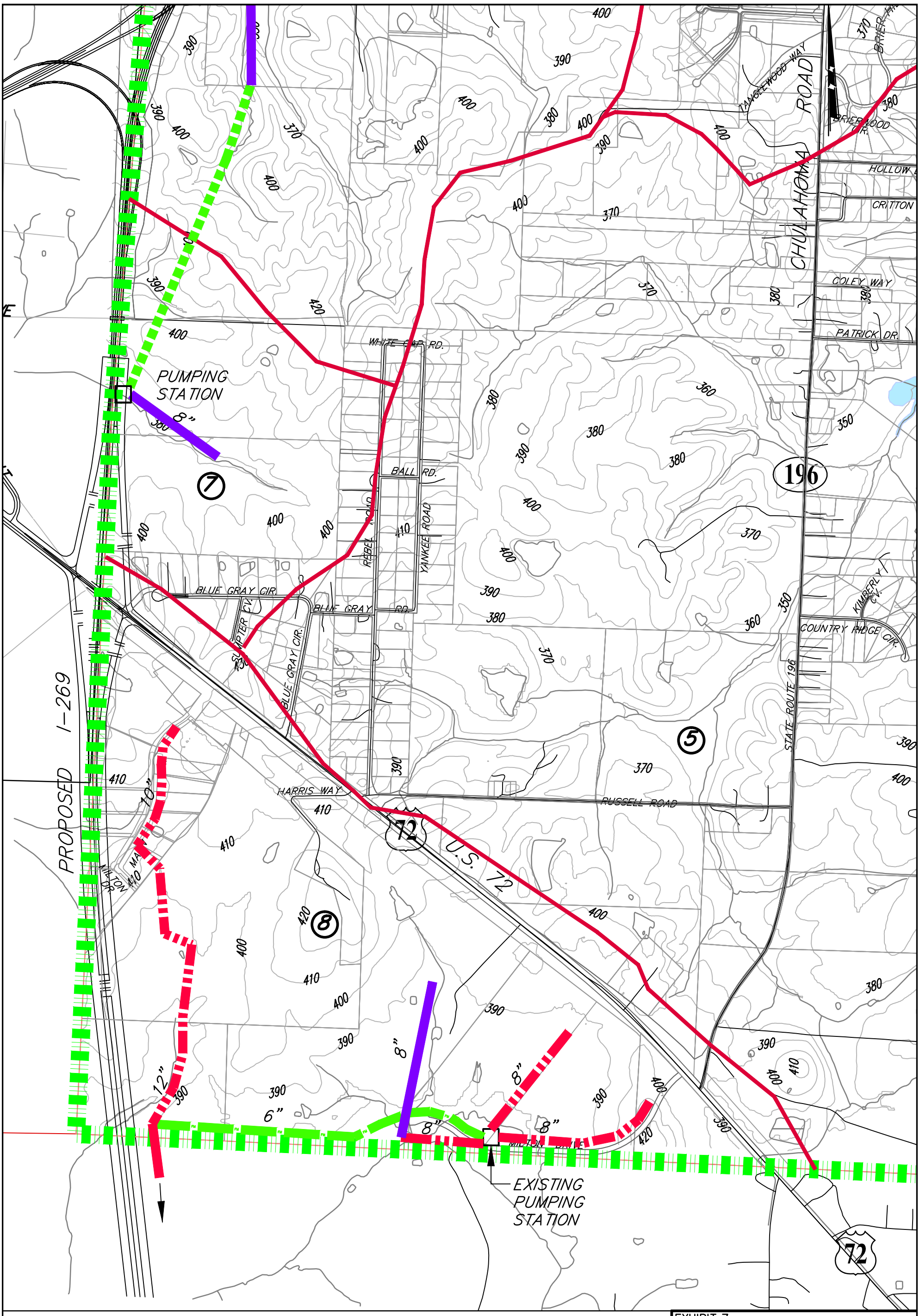
DRAINAGE BASIN BOUNDARY

PIPERTON CITY LIMITS

SEWER LINES

PROP SEWER

PROP. FORCE MAIN



1 BASIN NUMBER
DRAINAGE BASIN BOUNDARY
PIPERTON CITY LIMITS

SEWER LINES
PROP SEWER
EXIST. SEWER
PROP. FORCE MAIN
EXIST. FORCE MAIN

EXHIBIT 7
I-269 AND US72

FOR
PIPERTON TENNESSEE

SCALE 1"=1000'	J. R. WAUFORD & COMPANY CONSULTING ENGINEERS, INC. JACKSON, TENNESSEE JOB NO. 3598	DESIGNED WSD
DATE DEC 2015		DRAWN WAD
		CHECKED WSD

Appendix A

Basin Flow Projections

Flow @ Basin 1A

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	76	15	61	1	500	30,400
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	212	42	170	1	300	50,880
Existing Residential	0	0	0	0.67	270	0
Low Density Residential	91	18	73	1.5	270	29,484
Total Acres	379					
			TOTAL FLOW @ Basin 1A (GPD)			110,764
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 1A (GPM)			192

Flow @ Basin 1B

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	84	17	67	1	500	33,600
Industrial	28	6	22	1	1000	22,400
Office	75	15	60	1	300	18,000
Mixed Use	109	22	87	1	300	26,160
Existing Residential	300	60	240	0.67	270	43,416
Low Density Residential	120	24	96	1.5	270	38,880
Total Acres	716					
			TOTAL FLOW @ Basin 1B (GPD)			182,456
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 1B (GPM)			317

BASIN 1 Interceptor Flows

	Basin Daily Flow	Cumulative Daily Flow	Peaking Factor (Cumulative Area)	Cumulative Peaked Flow Rate (GPM)	Pipe Size
Basin 1A	110,764	110,764	2.5	192	8"
Basin 1B	182,456	293,220	2.0	407	10"
Proposed Basin 1 Pumping Station Rated Flow			407		

Flow @ Basin 2

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	0	0	0	1	500	0
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	0	0	0	1	300	0
Existing Residential	363	73	290	0.67	270	52,533
Low Density Residential	84	17	67	1.5	270	27,216
Total Acres	447					
			TOTAL FLOW @ Basin 2 (GPD)			79,749
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 2 (GPM)			138

BASIN 2 Interceptor Flows

	Basin Daily Flow	Cumulative Daily Flow	Peaking Factor (Cumulative Area)	Cumulative Peaked Flow Rate (GPM)	Pipe Size
Basin 2	79,749	79,749	2.5	138	8"
Basin 1 Pumping Station	407 GPM			546	
Proposed Basin 2 Pumping Station Rated Flow			546		

Flow @ Basin 3

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	123	25	98	1	500	49,200
Industrial	0	0	0	1	1000	0
Office	34	7	27	1	300	8,160
Mixed Use	126	25	101	1	300	30,240
Existing Residential	401	80	321	0.67	270	58,033
Low Density Residential	325	65	260	1.5	270	105,300
Total Acres	1009					
			TOTAL FLOW @ Basin 3 (GPD)			250,933
			PEAKING FACTOR			2.0
			TOTAL PEAKED FLOW @ Basin 3 (GPM)			349

BASIN 3 Interceptor Flows

	Basin Daily Flow	Cumulative Daily Flow	Peaking Factor (Cumulative Area)	Cumulative Peaked Flow Rate (GPM)	Pipe Size
Basin 3	250,933	250,933	2.0	349	10"
Basin 2 Pumping Station	546 GPM			894	15"
Proposed Basin 3 Pumping Station Rated Flow			894		

Flow @ Basin 4A

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	0	0	0	1	500	0
Industrial	87	17	70	1	1000	69,600
Office	0	0	0	1	300	0
Mixed Use	305	61	244	1	300	73,200
Existing Residential	8	2	6	0.67	270	1,158
Low Density Residential	70	14	56	1.5	270	22,680
Total Acres	470					
			TOTAL FLOW @ Basin 4A (GPD)			166,638
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 4A (GPM)			289

Flow @ Basin 4B

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	0	0	0	1	500	0
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	101	20	81	1	300	24,240
Existing Residential	65	13	52	0.67	270	9,407
Low Density Residential	186	37	149	1.5	270	60,264
Total Acres	352					
			TOTAL FLOW @ Basin 4B (GPD)			93,911
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 4B (GPM)			163

Flow @ Basin 4

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	93	19	74	1	500	37,200
Industrial	115	23	92	1	1000	92,000
Office	0	0	0	1	300	0
Mixed Use	4	1	3	1	300	960
Existing Residential	0	0	0	0.67	270	0
Low Density Residential	0	0	0	1.5	270	0
Total Acres	212					
			TOTAL FLOW @ Basin 4 (GPD)			130,160
			PEAKING FACTOR			3.0
			TOTAL PEAKED FLOW @ Basin 4 (GPM)			271

BASIN 4 Interceptor Flows

	Daily Basin Flow	Cumulative Daily Flow	Peaking Factor (Cumulative Area)	Cumulative Peaked Flow Rate (GPM)	Pipe Size
Basin 7 Pumping Station	52,371	52,371		91	
Basin 4A	166,638	219,009	2.5	380	10"
Basin 4B	93,911	312,920	2.5	543	12"
Basin 4	130,160	443,080	2.0	615	15"
Proposed Basin 4 Pumping Station Rated Flow			615		

Flow @ Basin 5A

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	0	0	0	1	500	0
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	0	0	0	1	300	0
Existing Residential	69	14	55	0.67	270	9,986
Low Density Residential	434	87	347	1.5	270	140,616
Total Acres	503					
			TOTAL FLOW @ Basin 5A (GPD)			150,602
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 5B (GPM)			261

Flow @ Basin 5B

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	128	26	102	1	500	51,200
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	295	59	236	1	300	70,800
Existing Residential	121	24	97	0.67	270	17,511
Low Density Residential	346	69	277	1.5	270	112,104
Total Acres	890					
			TOTAL FLOW @ Basin 5B (GPD)			251,615
			PEAKING FACTOR			2.0
			TOTAL PEAKED FLOW @ Basin 5A (GPM)			349

Flow @ Basin 5C

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	0	0	0	1	500	0
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	401	80	321	1	300	96,240
Existing Residential	0	0	0	0.67	270	0
Low Density Residential	519	104	415	1.5	270	168,156
Total Acres	920					
			TOTAL FLOW @ Basin 5C (GPD)			264,396
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 5C (GPM)			459

Flow @ Basin 5

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	75	15	60	1	500	30,000
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	63	13	50	1	300	15,120
Existing Residential	516	103	413	0.67	270	74,676
Low Density Residential	212	42	170	1.5	270	68,688
Total Acres	866					
			TOTAL FLOW @ Basin 5 (GPD)			188,484
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 5 (GPM)			327

Flow @ Basin 5D

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	0	0	0	1	500	0
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	472	94	378	1	300	113,280
Existing Residential	0	0	0	0.67	270	0
Low Density Residential	92	18	74	1.5	270	29,808
Total Acres	564					
			TOTAL FLOW @ Basin 5D (GPD)			143,088
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 5D (GPM)			248

BASIN 5 Interceptor Flows

	Basin Daily Flow	Cumulative Daily Flow	Peaking Factor (Cumulative Area)	Cumulative Peaked Flow Rate (GPM)	Pipe Size
Basin 5A	150,602	150,602	2.5	261	10"
Basin 8 Pumping Station*	450,000	600,602	2.0	834	
Basin 5B	251,615	852,217	2.0	1184	18"
Basin 5C	264,396	1,116,613	2.0	1551	18"
Basin 5D	143,088	1,259,701	2.0	1750	18"
Basin 5	188,484	1,448,184	2.0	2011	24"

* For planning purposes Basin 5 Interceptor has been sized to accommodate Basin 8 flow in the event that Marshall County ever refused service.

Flow @ Basin 6

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	0	0	0	1	500	0
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	360	72	288	1	300	86,400
Existing Residential	0	0	0	0.67	270	0
Low Density Residential	0	0	0	1.5	270	0
Total Acres	360					
			TOTAL FLOW @ Basin 6 (GPD)			86,400
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 6 (GPM)			150

BASIN 6 Interceptor Flows

	Basin Daily Flow	Cumulative Daily Flow	Peaking Factor (Cumulative Area)	Cumulative Peaked Flow Rate (GPM)	Pipe Size
Basin 6	86,400	86,400	2.5	150	8"

Flow @ Basin 7

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	4	1	3	1	500	1,600
Industrial	0	0	0	1	1000	0
Office	0	0	0	1	300	0
Mixed Use	182	36	146	1	300	43,680
Existing Residential	49	10	39	0.67	270	7,091
Low Density Residential	0	0	0	1.5	270	0
Total Acres	235					
			TOTAL FLOW @ Basin 7 (GPD)			52,371
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 7 (GPM)			91

BASIN 7 Interceptor Flows

	Basin Daily Flow	Cumulative Daily Flow	Peaking Factor (Cumulative Area)	Cumulative Peaked Flow Rate (GPM)	Pipe Size
BASIN 7 Interceptor Flows	52,371	52,371	2.5	91	8"
Proposed Basin 7 Pumping Station Rated Flow			91		

Flow @ Basin 8

Land Use	Acres	Allowance for Roads (20%)	Developable Area	Density	Flow (Gal./Unit)	Flow
Commercial	225	45	180	1	500	90,000
Industrial	450	90	360	1	1000	360,000
Office	0	0	0	1	300	0
Mixed Use	0	0	0	1	300	0
Existing Residential	0	0	0	0.67	270	0
Low Density Residential	0	0	0	1.5	270	0
Total Acres	675					
			TOTAL FLOW @ Basin 8 (GPD)			450,000
			PEAKING FACTOR			2.5
			TOTAL PEAKED FLOW @ Basin 8 (GPM)			781

BASIN 8 Interceptor Flows

	Basin Daily Flow	Cumulative Daily Flow	Peaking Factor (Cumulative Area)	Cumulative Peaked Flow Rate (GPM)	Pipe Size
BASIN 8 Interceptor Flows	450,000	450,000	2.5	781	15"

Appendix B

Cost Estimates

COST ESTIMATE
HIGHWAY 57 CORRIDOR SEWER SYSTEM IMPROVEMENTS
CITY OF PIPERTON, TENNESSEE
JRWCO 3598
SEPTEMBER 2015

ESTIMATED CONSTRUCTION COST

QUANTITY	DESCRIPTION	ESTIMATED COST
BASIN 4 IMPROVEMENTS		
1 L.S.	New Basin 4 Sewage Pumping Station with 320 gpm Pumps and Wetwell sized for Buildout @ $150,000.00 per Lump Sum	$150,000
15,500 L.F.	8-Inch PVC Forcemain Pipeline @ $22.00 per Linear Foot	341,000
400 L.F.	Bored 385 Road Crossing Including Steel Casing Pipe with 8" D.I.P. Carrier Pipe @ $175 per Linear Foot	70,000
2 L.S.	Air Release Valve and Vault @ $4,000.00 per Lump Sum	8,000
15,500 L.F.	Forcemain Restoration and Miscellaneous @ $3.00 per Linear Foot	46,500
	Estimated Construction Cost	$ 615,500.00
	Contingency (15%)	$ 92,500.00
	ESTIMATED BASIN 4 CONSTRUCTION COST	**$ 708,000.00**
BASIN 1 IMPROVEMENTS		
1 L.S.	New Basin 1 Sewage Pumping Station @ $100,000.00 per Lump Sum	$100,000
3,600 L.F.	4-Inch PVC Forcemain Pipeline @ $18.00 per Linear Foot	64,800
100 L.F.	Bored Highway 57 Road Crossing Including Steel Casing Pipe with 4" D.I.P. Carrier Pipe @ $150 per Linear Foot	15,000
100 L.F.	Bored Rail Road Crossing Including Steel Casing Pipe with 4" D.I.P. Carrier Pipe @ $175 per Linear Foot	17,500
1 L.S.	Air Release Valve and Vault @ $4,000.00 per Lump Sum	4,000

3,600 L.F.	Forcemain Restoration and Miscellaneous @ $3.00 per Linear Foot	10,800
	Estimated Construction Cost	$ 212,100.00
	Contingency (15%)	$ 31,900.00
	ESTIMATED BASIN 1 CONSTRUCTION COST	**$ 244,000.00**

Estimated Development Cost

Engineering:		
Survey, Design and Development of Construction Drawings, Specification and Contract Documents	$ 72,000	
Assistance with Bidding and Award of the Construction Contract	5,000	
General Engineering During Construction & Resident Construction Observation	65,000	
Tennessee Department of Environment and Conservation Review	2,000	
Advertisement	1,000	
Estimated Development Cost	$ 145,000	
BUDGETED FOR PROJECT DEVELOPMENT		$ 145,000
TOTAL ESTIMATED PROJECT COST		**$1,097,000**