

# CITY OF BREA

## MASTER PLAN OF DRAINAGE 2013

PREPARED FOR

THE CITY OF BREA  
DEPARTMENT OF PUBLIC WORKS  
1 CIVIC CENTER CIRCLE  
BREA, CA 92821

DATE: DECEMBER 2013

PREPARED BY  
WILLDAN ENGINEERING  
2401 E. KATELLA AVENUE, SUITE 450  
ANAHEIM, CA 92806

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RAY WELLINGTON, PE



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## MASTER PLAN OF DRAINAGE 2013

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## **ABBREVIATIONS/ACRONYMS**

ACP	Asbestos Cement Pipe
BCW	Brea Creek Watershed
BMP	Best Management Practice
CCW	Carbon Creek Watershed
CFD	Community Facilities District
CIP	Capital Improvement Program or Plan
CIPP	Cast in Place Pipe
CMP	Corrugated Metal Pipe
DAMP	Drainage Area Management Plan
DEM	Digital Elevation Model
DIP	Ductile Iron Pipe
ENR-CCI	Engineering News-Record – Construction Cost Index
FCW	Fullerton Creek Watershed
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GIS	Geographical Information System
HCDA	Housing and Community Development Act
HDPE	High Density Polyethylene Pipe
ICW	Imperial Creek Watershed
OCDPW	Orange County Department of Public Works
OCFCD	Orange County Flood Control District
MPD	Master Plan of Drainage

NFIP	National Flood Insurance Program
NPDES	National Pollutant Discharge Elimination System
NRCS STATSGO	National Resource Conservation Services – General Soils Data
PVC	Polyvinyl Chloride (pipe)
RCB	Reinforced Concrete Box
RPMP	Reinforced Plastic Mortar Pipe
R/W	Right of Way
RWQCB	Regional Water Quality Control Board (Santa Ana Region)
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
USGS	United States Geological Survey
WMS	Watershed Modeling System

# CITY OF BREA

## MASTER PLAN OF DRAINAGE 2013

### EXECUTIVE SUMMARY

In October 2011, the City of Brea (City) authorized Willdan Engineering to develop a city wide Master Plan of Drainage (MPD). In accordance with the approved scope of work, this report presents the MPD and identifies existing drainage deficient facilities that are not in conformance with current design practices. These capacity deficient facilities may contribute to localized flooding in the future. This report also recommends drainage improvements to reduce to a level of insignificance or eliminate existing deficiencies within the City's storm drain system. The recommended drainage improvements are ranked from higher to lower risk for failure or localized flooding, and have budget level cost figures for each ranked segment.

To determine those locations that may require drainage improvements, extensive records search and discovery of existing drainage system features were conducted. During this activity a geographical information system (GIS) reference map of the drain system was compiled. Utilizing the GIS map and data, a hydrologic analysis was completed for the entire City, and planning level hydraulic analyses were performed for existing and recommended drainage improvements. These analyses were based on the Orange County ten-year, twenty four-hour, fourth-day storm event which is an accepted, basic planning level approach. The criteria for determining deficiencies in the existing storm drain pipes are outlined in Section 4 of this report. However, in general, locations where runoff from a ten-year frequency storm exceeded the carrying capacity of the existing storm drain pipe, these were given additional analysis to identify the degree of capacity exceedance. This additional analysis helped define the potential for surface flooding during the ten-year storm event.

Based on studies and investigations made for this report, it has been determined that 6.9 percent of the existing storm drain pipes have exceeded the design capacity for conveying storm water runoff produced by a ten-year design storm event (described in Section 4). Specifically, twenty-one (21) storm drain pipe segments were identified as over design capacity to some degree. However, this does not mean the pipe segments are spilling water back into the streets, but they are flowing under slight pressure which may become a future concern. Although several of these storm drains were possibly designed for a 10-year storm event prior to 1986, it was at that time the hydrology methods and criteria were substantially updated countywide to more accurately match experienced storm conditions.

Further evaluation determined the degree of capacity exceedance, and revealed only limited pipe segments and their system components may not fully contain the design storm event. Those pipe segments that are flowing under slight pressure warrant monitoring during storm events to assess the flow conditions and possible spilling of water back onto the streets.

Another evaluation factor taken into consideration was the closed circuit video inspection of ten percent (10%) of the older system pipe segments. Limited structural and maintenance defects were identified which warrant repair and/or some focused debris clean up. Some older corrugated metal pipes had visible corrosion, but limited deflection evident.

These findings, along with identified surface water runoff ponding along the north curb line of Lambert Road in three locations, contributed to the identified drainage deficiencies that have been prioritized and recommended for design and construction in a capital improvement project (CIP) plan. In light of the minor degree of deficiency identified in some pipe segments, the City may elect to revise the schedule (timing) for accomplishing upgrades after conducting additional internal investigations of the pipe's conditions. For definitive information on the deficient pipe reaches, please refer to Sections 4 and 5 of this report. Also, please refer to Appendix 'G' for a general description and cost breakdown for each project and to Table 5-A for the CIP Ranking criteria. The estimated total cost for the recommended improvement projects is approximately 1.67 million in 2012 dollars, excluding potential access issues that may occur with existing storm drains located within easements.

This MPD is a conceptual (planning level) study, which identifies facilities needed to effectively control and convey storm runoff in the City of Brea. This document will be a beneficial guide for planning and undertaking future storm drain facility improvements, and ensuring private development activities are built to be compatible with the community drainage patterns and needs. This plan does not contain all the detail data necessary for final design purposes, and it should be updated periodically to reflect: construction of new facilities, changes in watershed development, revised facility locations, changes in rainfall-runoff data, and changes in hydraulic modeling.

It is recommended that the City adopt the comprehensive MPD as its drainage planning and system CIP guide. It is further recommended that an implementation program be initiated, which includes an internal investigation of those pipes that have exceeded half (50%) of their expected service life, and appropriate financing methods be pursued as presented in Section 6.

# CITY OF BREA

## MASTER PLAN OF DRAINAGE 2013

### SECTION 1 – INTRODUCTION AND HISTORY

#### 1.1 Authorization and Scope

The City of Brea has an existing system of drainage pipes and facilities, some of which may be undersized for the volume of storm water runoff emanating from the developed community and the abutting jurisdictions. In order to evaluate the current drainage conditions and pipe capacities, on October 4, 2011 the City retained Willdan Engineering to prepare a comprehensive Master Plan of Drainage for the City.

The project scope of services was presented in the written proposal dated June 30, 2011 and consisted of the following key tasks:

Task 1 – Data Research, GIS Mapping, Site Reviews and CCTV Inspections

Task 2 -- Hydrologic Assessment

Task 3 – Hydraulic Assessment

Task 4 – Capital Improvement Program Development

Task 5 – Master Plan of Drainage Report

#### 1.2 Description of Study Area and Facilities

##### Location

The City of Brea is located along the northern border of Orange County, California and is bordered by Unincorporated Orange County and Los Angeles County to the north, the cities of La Habra to the west, Fullerton to the southwest, Placentia to the south, Yorba Linda to the southeast, and Chino Hills State Park to the east. The City was incorporated February 23, 1917 and currently encompasses 12.4 square miles. The land area is approximately 95-percent developed, in accordance with its adopted 2010 Zoning Map as included in Appendix 'A'.

##### Land Use & Zoning

The City of Brea General Plan Land Use policy establishes a comprehensive community vision focused on balancing housing, circulation, safety, open space / conservation, noise, growth management, and economic development. The City is comprised of Low, Medium, Medium-High, and High Density Residential, Neighborhood Commercial, Business / Employment, Mixed Use, Public / Institutional, Public Open Space, and Private Open Space Land Use. The City's Zoning Map (February 2010) was obtained from the City web site, and a copy is provided for reference (See Appendix 'A').

##### Climate

The climate in the area has mild temperatures (62°F is the mean temperature). The average annual precipitation for the City is 15.9-inches, with nearly all (95%) of the

precipitation occurring during the months of October through April. Periodic major storms consist of one or more frontal systems originating in the North Pacific and occasionally last two days or longer. Precipitation during summer months is infrequent and rainless periods of several months are common.

### Topography

The City elevations, above mean sea level, vary from a minimum of 282 feet to a maximum elevation of 1,379 feet. The south and west areas of the City are generally flatter terrain with increasingly steeper hillside areas in the north and eastern areas. Five regional watersheds overlie the City's boundaries. These include: Coyote Creek, Imperial Creek, Brea Creek, Fullerton Creek and Carbon Creek (depicted in Appendix 'B'). In the higher elevations (northerly and easterly), runoff is characterized by overland flow in hilly terrain, whereas runoff in lower elevations occurs in a suburban setting through streets and 53.5 miles of constructed storm drain conduits and trapezoidal channels. Within the developed areas of the City, storm water is conveyed within curbs and gutters to catch basins and occasionally sumps prior to entering storm drain conduits. Stormwater runoff flows generally in a southwesterly direction through the City.

This master plan used topography derived by importing terrain surface contours from Google Earth in Civil 3d to model the existing ground.

### Geology and Soils

The soil types used in this study are based on the soil group classifications derived from the NRCS STATSGO database developed for the State of California. This data guided the development of Impervious area percentages for land use types as defined in Table 4-A in this report.

The major factor affecting infiltration of water is the nature of the soil itself. The soil surface characteristics, its ability to transmit water to subsurface layers and total storage capacity are all major factors in the infiltration capabilities of a particular soil. WMS uses the soil group classification infiltration rates (loss parameters) or the impervious fraction based upon land use (as was employed in this analysis) in combination with the computed rainfall intensity to calculate runoff from the various soil permeability classes in the watershed areas.

### Drainage Patterns & Regional Facilities

Some of the storm water flowing through the City originates in the unincorporated Orange County area, within the City's sphere of influence, and within the County of Los Angeles to the north and the County of San Bernardino to the east. Five (5) separate drainage boundaries (OC Watersheds) overlie the City and adjacent areas, and were incorporated in the mapped area for modeling (analysis) purposes. Storm runoff from these areas and the City flows into OCFCD facilities of Coyote Creek, Imperial Creek, Brea Creek, Fullerton Creek and Carbon Creek. The respective drainage boundaries are indicated on the drainage area map exhibits of Appendix 'B' and Appendix 'C'. Four of these regional drain facilities conduct runoff flows southwesterly to the Coyote Creek Channel (along the County's westerly boundary). The fifth regional drain (Carbon Creek) carries drainage southerly through the carbon canyon diversion channel to the Santa Ana River.

Table No. 1-Watershed Acreages

<b>Watershed Name</b>	<b>Watershed Area (Acres)</b>	<b>Area within City (Acres)</b>	<b>Percentage within City</b>
Brea Creek Watershed	13,775.52	1,412.10	10.3
Carbon Creek Watershed	12,601.81	2,454.19	19.5
Coyote Creek Watershed	1,269.21	319.63	25.2
Fullerton Creek Watershed	3,114.30	2,545.54	81.7
Imperial Creek Watershed	756.83	680.16	89.9
Southerly Subareas	n/a	667.78	100.0

### City Drainage Facilities

According to the record drawings received, the majority of existing storm drain improvements were constructed between the years 1960 and 1990. According to those same drawings, there are ten (10) different types of pipe material utilized within the storm drain system. Most of the pipe appears to be reinforced concrete pipe (RCP). The design life for the typical RCP material is considered to be between 50 and 90 years, depending upon construction placement, adjacent or crossing utility work, constituency of drainage flows, quality of initial pipe materials, etc. For this report evaluation we selected a 75-year service life for RCP, and a 45-year service life for CMP. Therefore, a portion of the storm drain facilities in the City are approaching the later stages of their design life which may be reflected in the maintenance service condition. Hence, consideration should be given to developing a scheduled internal inspection program, such as CCTV investigations and personal inspection reports, followed by a drainage asset rehabilitation and/or replacement plan as findings indicate. This plan should then be incorporated into the next MPD update or as a supplement.

### Inventory of City Facilities

In summary, the following is a general inventory of the City's Storm Drain System, as determined from data within the compiled GIS mapping files.

Total length of Pipe	282,566 LF (53.5 miles)
Pipe size Ranges	8" to > 78"
Number of Manholes and Junction Structures	1,076
Conduit Materials (Ten identified)	ACP, CIPP, CMP, DIP, Gunitite, HDPE, PVC, RCB, RCP & RPMP

### Pump Stations

None in the existing system.

### Caltrans Facilities

There are Caltrans drainage facilities which are part of the SR-57 freeway, SR-142 Carbon Canyon Road, and SR-90 Imperial Highway improvements within the City.

### Private Facilities

Any existing private drainage facilities are not shown on the storm drain facilities maps. Only those of record that are owned operated or maintained by the City, County or State.

## **SECTION 2 - RESEARCH DESCRIPTIONS**

### **2.1 Available Records**

City provided copies of the October 1981 master plan system maps and digital file copies of available record drawings of constructed storm drain facilities within the city. We also obtained County flood control facility maps which were used to define the regional system features. Where system information was not located, reasonable assumptions of probable facilities were made, based on adjacent known abutting data, thereby allowing capacity analysis calculations to be accomplished. The regional, local and assumed system information was placed into a new geographic information system (GIS) file developed as part of this master plan report. The GIS mapping and data files were used for system analysis and will provide a system reference library for subsequent use by the city personnel. The completed system map, including locations where system data was assumed, is contained in the appendix (See Appendix 'C').

### **2.2 Field Visits, Drainage Boundary/Pattern Observation**

Two field reconnaissance reviews were conducted where initial mapping information and hydrology subareas were not fitting together in order to verify existing drainage patterns and locations of visible surface drainage facilities in some areas of the City. In some areas more facilities were observed than were identified from available as-built drawings. The additional facilities and observed existing conditions were also considered in making further reasonable assumptions as described in Section 4 of this report.

### **2.3 Closed Circuit Television Investigation**

During initial contract discussions on the degree of each service element to be undertaken, City personnel elected to limit the initial CCTV investigation work to encompass about five (5) miles, or about ten percent (~10%) of the existing system. The selected extent and locations of pipe investigation included mostly older pipe segments in the community. The investigation results gave City personnel an indicator of what may be expected from future CCTV inspections elsewhere within the system.

Once a listing of pipe segments was established for the CCTV investigation work, the GIS mapping data of the system was shared with the investigating sub-consultant such that identified and logged findings could be linked to the GIS files of reference use. The in-field investigation involved propelled and articulated cameras used to record internal structural and maintenance characteristics of each pipe. When an obstruction in the pipe was encountered, such that the camera unit could not pass, the camera unit was reinserted from a downstream manhole and the investigation was continued upstream to the prior obstruction location where possible.

The internal pipeline investigation work involved observation of existing conditions and application of condition ratings by a certified inspection rater using Pipeline Assessment and Certification Program (PACP) codes as developed by The National Association of Sewer Service Companies (NASSCO). This rating system is applicable to gravity flow drainage pipelines. Upon completion of the CCTV investigation work, the findings were reviewed and ranked by rated deficiencies (both structural and maintenance) as identified by the certified inspection rater. The condition ratings are ranked from 1 to 5 for both structural and maintenance defects, as follows:

Grade 5	Defects requiring immediate attention	(Unsuitable)
Grade 4	Severe defects that could become grade 5 defects within foreseeable future.	(Poor)
Grade 3	Moderate defects that will continue to deteriorate over time.	(Fair)
Grade 2	Defects that have not begun to deteriorate	(Good)
Grade 1	Minor defects	(Excellent)

The mechanisms and rates of pipeline deterioration are highly dependent on local conditions, materials and construction methods used. However, the following guidelines are provided to help in estimating the amount of time before the defect(s) cause complete pipeline failure. These guidelines should be verified by actual research under local prevailing conditions.

Grade 5	Pipe has failed or will likely fail within the next five years. Missing material with large voids and soil is visible.
Grade 4	Pipe will probably fail in five to ten years or will become category 5 in foreseeable future.
Grade 3	Pipe may fail in ten to twenty years and should be monitored for further deterioration, and repaired/replaced as conditions warrant.
Grade 2	Pipe unlikely to fail for at least twenty years.
Grade 1	Pipe failure unlikely in the foreseeable future.

The pipe rating is based on the number of occurrences for each observed condition grade identified, and ratings are calculated separately for Structural and Maintenance defects. Several ways of expressing pipe segment condition are used by the PACP condition grading system to assist in the overall evaluation process and conclusions.

On the following Table 2-A, the 'PACP Quick Rating' (a four character code) is shown under both the Structural and Maintenance rating columns. This is a shorthand way of expressing the number of occurrences for the two highest severity grades, and is described as follows:

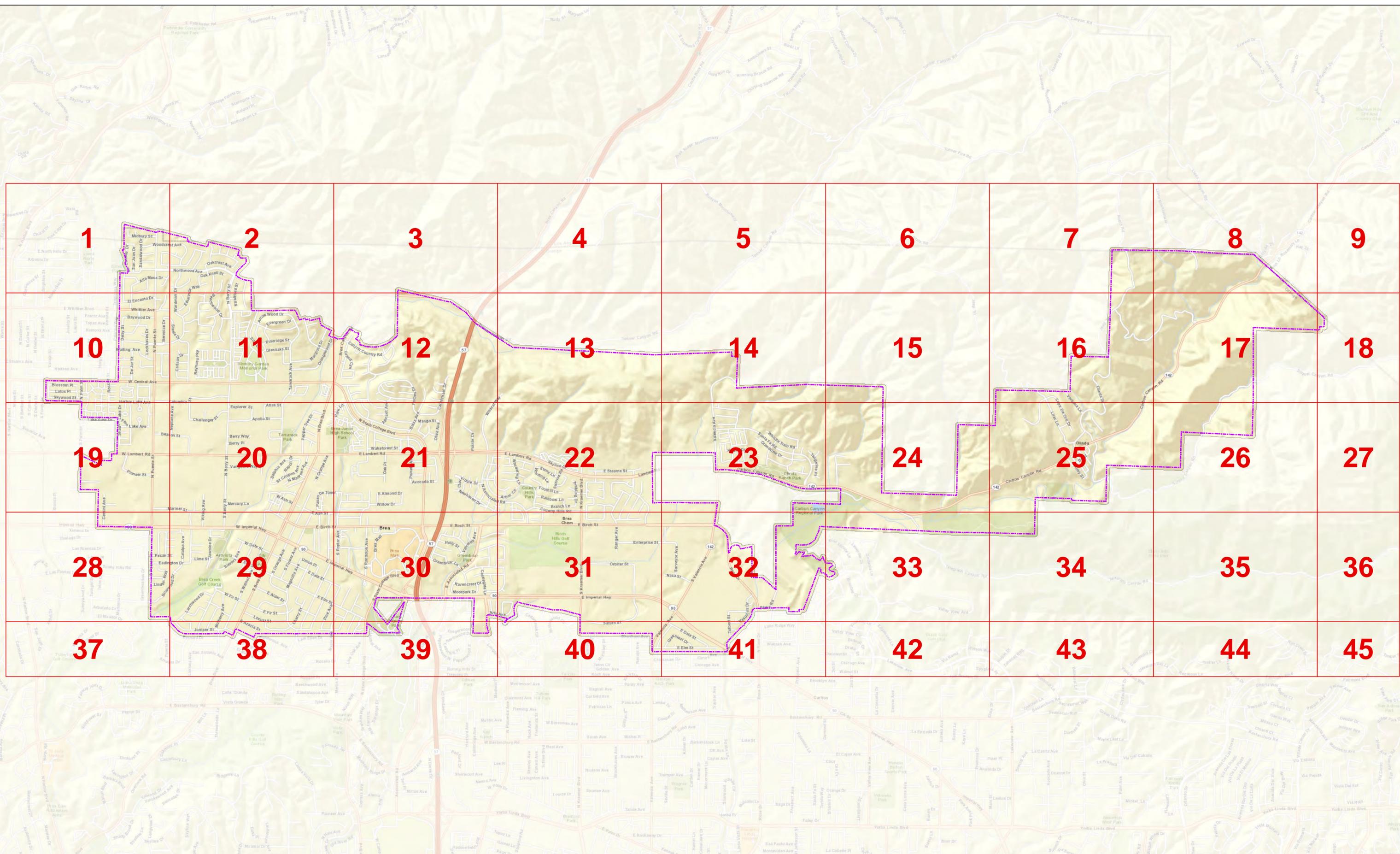
1. The first character is the highest severity grade occurring along the segment length.
2. The second character is the total number of occurrences of the highest severity grade. If the total number exceeds 9, then alphabetic characters are used as follows - '0 to 14 - A; 15 to 19 - B; 20 to 24 - C; etc.
3. The third character is the next highest severity grade occurring along the pipe length.
4. The fourth character is the total number of the second highest severity grade occurrences, derived as in item 2 above.

The City Grid plot map, immediately following Table 2-A, shows the layout of a numbered grid pattern covering the entire City. The grid is used to assist in identifying numbered facilities within the City's infrastructure systems. In this case the storm drain manholes are first identified with the grid number within which they are located. Then a slash (/) is used to separate the grid location from the sequence number assigned by the GIS mapping instructions in order to identify each specific manhole within the grid location. The numbering of each manhole then allows the respective pipe segment, between manholes, to be identified by the following format: xx / yy – xx / zz. Table 2-A utilizes this identifier means for pipe segment references.

Table 2A – CCTV Investigation Results Summaries (November 2011)

Pipe Segment Ref.	Street / Esmt.	Pipe Material	Diameter (inches)	Structural Rating	Description	Maintenance Rating	Description	Notes
20/49 - 29/27	Berry St.	RCP	36	5100	Hole	1100	Not significant	
29/152 - 29/157	Laurel Ave.	RCP	30	4100	Sag	4128	Align Curves	Abandoned survey
29/135 - 29/136	Alley-btw Magnolia & Sycamore	CMP	18	?	Non accessible	?	Non accessible	Abandoned survey
29/136 - 29/137	Alley-btw Magnolia & Sycamore	CMP	18	3L00	Corrosion	3E21	Deposits Obstacles	Abandoned survey
22/71 - 22/72	Flower Hill	RCP	18	2200	Longitudinal Cracks	4100	Align Curves	
29/152 - 29/153	Elm St.	RCP	30	0		5142	Deposits Debris	Abandoned survey
29/137 - 29/140	Elm St.	RCP	36	0		4900	Align Curves	
21/30 - 21/31	Lambert Rd.	RCP	48	0		4731	Rock & Align Curves	
12/102 - 12/103	Coyote Canyon Way	RCP	24	0		4621	Align Curves	
21/14 - 21/15	Easement-w/o Brockwood	RCP	30	0		4500	Align Curves	
29/134 - 29/137	Elm St.	RCP	36	0		4500	Align Curves	
22/75 - 22/76	Starflower	RCP	18	0		4200	Align Curves	
20/37 - 20/38	Berry St.	RCP	18	0		4200	Trash/Debris	Abandoned survey
20/38 - 20/37 rev	Berry St.	RCP	18	0		413A	Deposits & Obstacle	Abandoned survey
20/25 - 20/26	Easement-e/o Delta	RCP	18	0		413E	Deposits & Rocks	
12/95 - 12/97	Easement-s/o Santiago Cyn.	RCP	18	0		4133	Deposits & Align Curves	
12/98 - 12/99	N. Desert Canyon Rd	RCP	18	0		4131	Deposits, Align curves & Obstacles	Abandoned survey
20/33 - 20/34	Lambert Rd.	RCP	24	0		4121	Align Curves Debris & Obstacles	Abandoned survey
29/123 - 29/183	Imperial Hwy	RCP	24	0		4A31	Deposits & Align Curves	
29/28 - 29/30	Imperial Hwy	RCP	48	0		4A31	Deposits & Align Curves	
21/25 - 21/26	Cliffwood Ave.	RCP	48	0		4A00	Align Curves	
22/86 - 22/88	Easement-n/o Bluegrass	RCP	60	0		4B00	Align Curves	
29/143 - 29/144	Magnolia Ave	RCP	48	0		4A00	Align Curves	

Pipe Segment Ref.	Street / Esmt.	Pipe Material	Diameter (inches)	Structural Rating	Description	Maintenance Rating	Description	Notes
22/65 - 22/66	Easement-n/o Sunflower	RCP	42	0		4100	Align Curves	
22/66 - 22/67	Sunflower	RCP	48	0		4100	Align Curves	
22/78 - 22/79	Easement-e/o Starflower	RCP	60	0		4100	Align Curves & MH bury	
22/89 - 22/90	Easement-Foxglove to Morning Glory	RCP	66	0		4100	Align Curves	
25/32 - 25/33	Easement-s/o Buckthorn	RCP	18	0		4100	Align Curves	
21/36 - 21/37	Lambert Rd.	CMP	18	0		4100	Deposits	Abandoned survey
21/38 - 21/39	Easement-w/o Thor	RCP	54	0		4100	Align Curves	
12/97 - 12/98	Easement-s/o Santiago Cyn.	RCP	18	0		4100	Align Curves & MH Bury	
12/99 - 12/100	N. Desert Canyon Rd	RCP	18	0		4100	Obstacle	
38/11 - 38/13	Laurel Ave.	RCP	60	0		4100	Align Curves	
29/148 - 29/150	Elm St. Easement	PVC	8	0		4100	Align Curves	Abandoned survey
22/67 - 22/68	Sunflower	RCP	37 Oval	0		3A00	Debris & Obstacles	
20/48 - 20/49	Berry St.	RCP	36	0		3700	Deposits	
29/29 - 29/30	Easement-Oleander to Imperial	RCP	18	0		332A	Align Curves Deposits Roots	Abandoned survey
12/103 - 12/104	Easement-w/o Coyote Cyn.	RCP	24	0		3321	Align Curves Deposits & MH Bury	
21/10 - 21/11	Easement-w/o Silver Cyn.	RCP	18	0		3221	Deposits & MH Bury	
38/8 - 38/9	Cherry St.	RCP	30	0		3221	Align Curves Obstacles Deposits	
29/126 - 29/129	Sycamore Ave.	RCP	24	0		3121	Obstacles Deposits	Abandoned survey
29/129 - 29/130	Sycamore Ave.	RCP	24	0		3111	Debris	
29/130 - 29/132	Sycamore Ave.	RCP	36	0		3111	Deposits Debris	



## 2.4 FEMA Flood Insurance Rate Maps

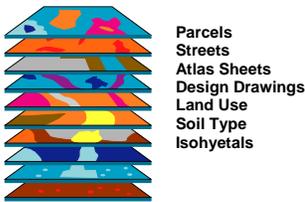
FEMA provides guidelines and standards for flood hazard mapping and requirements to meet the National Flood Insurance Program (NFIP) level of protection. As of December 2009, the FEMA Flood Insurance Rate Maps (FIRM) that encompass the City, defines the vast majority of the city area as in Flood Zone X, with a few narrow areas along the regional storm water channels as in Flood Zone AE. Zone X is defined as an area determined to be outside the 0.2% annual chance flood, while Zone AE is defined as the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood height. Both zones are statistically low risk potential of flooding.

## SECTION 3 - GIS BASE MAPPING AND FEATURES

### 3.1 Base Map

The County's GIS street and parcel level base map was obtained and used for the master plan rights-of-way in which to locate drainage system pipelines.

### 3.2 Storm Drain Database



The storm drain database was developed, using the base map, by including data from available storm drain design drawings and records received. Pipes included the main storm drain lines, any open pipe inlets and outlets, connections to regional drain facilities, and the pipe material. The system structures included manholes, junction structures, inlets, outlets and transition structures.

Geometric data included pipe diameter and material, upstream and downstream invert elevations, pipe slope, manhole size, manhole bottom elevation, manhole rim elevation and construction plan file name. Empty fields were created for future information as may be needed by the City such as date last inspected or condition.

The storm drain facilities database contains the data necessary for future analysis and management use by the City in a GIS database utilizing Environmental Systems Research Institute (ESRI) geospatial file formats. As project design work is accomplished and improvements constructed the facilities data base must be updated for full benefit use.

### 3.3 Location Data

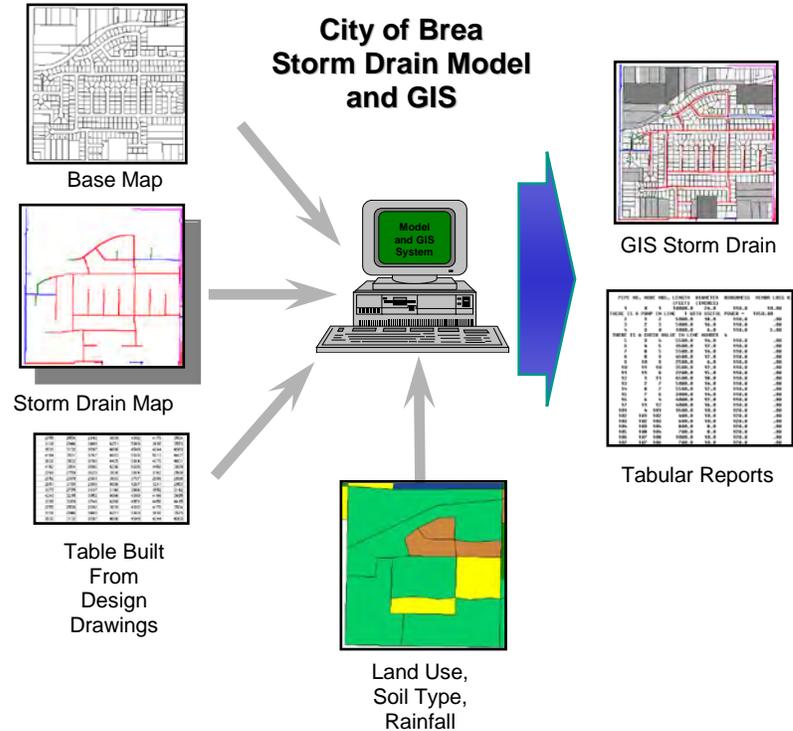
In order to produce an accurate map of the system, the locations of system structures were determined using as-built plans, and some focused field visits.

Existing street maps or design drawings were used to determine the placement locations of the pipelines and structures. This method is the least expensive and meets the GIS mapping criteria and requirements for hydraulic modeling of the system. Since the base map is only a right-of-way map, the placement accuracy of pipelines shown is to the nearest plus or minus five feet. Catch basins files provided by the City show the basins at the right-of-way line since that is the common method of display in a GIS system. Unique manhole and pipe codes were used to join the drawing entities to the database.

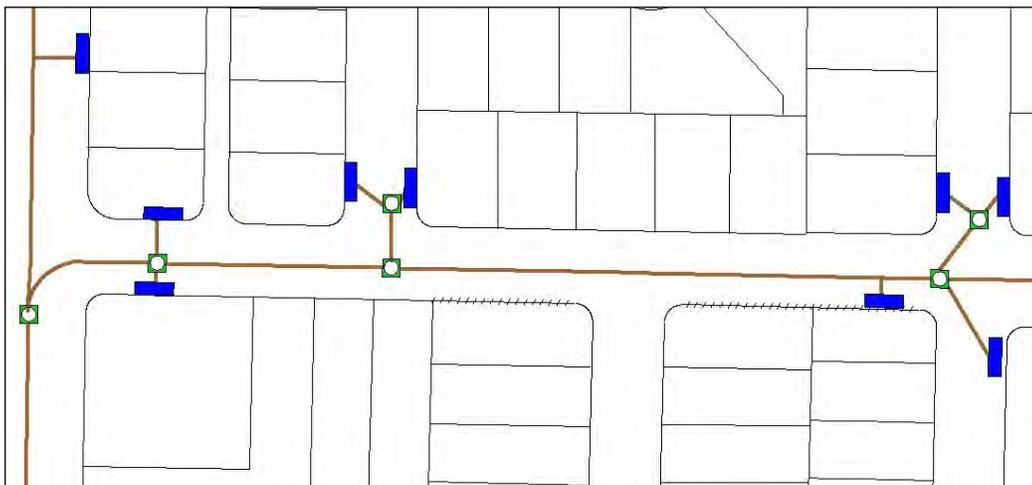
By clicking on the pipe segments, the attached source drawing file can be viewed for technical features and details as may be needed.

### 3.4 Hydraulic Modeling GIS Data

As mentioned in the section on collecting the data, a GIS feature class contains the pipes and all the hydraulic properties. The hydrologic model uses some of the storm drain layout that also serves as the GIS features for the pipes. The modeling results were saved as a database table and linked to the pipes and nodes (manholes and junctions).



### Example of a Screen Display of Completed Storm Drain GIS



## SECTION 4 - HYDROLOGY STUDY DATA AND HYDRAULIC CALCULATIONS

### 4.1 Introduction

The objective of the Master Plan of Drainage is to analyze existing storm water runoff handling systems, specifically the conduits, and develop a comprehensive set of prioritized project segments to meet storm runoff criteria to the benefit of the community.

Since a large percentage of existing storm drain segments in the City were constructed prior to 1986, a majority of those drains may not meet the current drainage design standards. Although the storm drain system does function, a portion of the system (6.9%) was identified as being capacity deficient by current standards for storm runoff handling and area protection.

As local rain events occurred during this study period, three (3) recurring water ponding locations were identified by city personnel. These locations are on Lambert Rd. and have been noted on the map in Appendix 'D' and included in project Tables 5-A and 5-B.

Another problematic area, requiring regular debris removal, is the open channel and 84-inch inlet structure in the northwest quadrant of Northwood Avenue and La Canada Drive. This open area and drainage channel is east of Estelí Park in the City of La Habra, and serves as an open flood channel, which also receives storm flows from two existing storm drains in the City of Brea. Although this open channel was not identified as being capacity deficient, it warrants further evaluation for an upstream solution in the interest of reducing overflow risk potential due to debris accumulation. This location is identified as city CIP project #7525 and is included as priority #6 in the Table No. 5-B

Further drainage issues or history of past actions taken were not obtained during this study, and if available, should be given consideration prior to finalizing design decisions on any project segment within the City.

Analyzing the system involved using the currently approved Orange County standards for hydrology and hydraulic analysis and design practices in identifying drainage deficiencies throughout the City. In developing the comprehensive MPD, the general practices, design criteria, and research and analysis findings were compiled into a set of prioritized solutions for improving storm drain capacity needs. A corresponding estimate of implementation costs was prepared, including design, construction and administration necessary for correcting the capacity deficiencies. Piping and inlet solutions for the three identified local on-street ponding areas are also included.

### 4.2 Assumptions Utilized

*Missing pipe data* - In those locations where physical system information/data were not available of record (e.g. pipe size, slope, material, length, depth below ground), assumed pipe data was inserted to establish system continuity. This was done by considering pipe information from the next known upstream and downstream pipes, and then assuming a technically reasonable connection in order to infill where system data was missing. This method was employed in 34 locations throughout the system in order to establish system continuity for modeling and evaluation purposes.

*Local Detention Conditions* – Although one recently new detention basin facility was designed into one of the Tonner Hills development phases, there were no other

designed detention facilities identified in the drainage system records. However, during the system mapping activities there were thirteen (13) locations identified where the pipe system was discontinuous and flows exited onto the open ground. Then further downstream (space/length varied) the flows were intercepted again by other pipes in the system. These flow-through basins actually result in a change downstream in the conduit flow characteristics, but absent applicable data it was assumed that pipe data was continuous and that downstream flows were not affected.

*Areas not within the defined regional watersheds* – There are two smaller areas along the southern boundary of the City that do not reside within one of the five regional watersheds (see Appendix B) identified as overlying the city in this study. One of these two areas lies west of SR-57 and south of Imperial Highway. The second area lies east of SR-57 and is both north and south of Imperial Highway. The modeling analysis of these two smaller areas is reported under the identifier of “Extra Subareas” in this report. Both of these contributing areas have gentle slopes to the south and have connections to the drainage systems in the cities of Fullerton and Placentia.

### **4.3 Flood Frequency**

In determining the level of protection from storm water runoff (flooding) desired for a community, it is essential to have an understanding of the term “flood frequency.” Or in other words: “how often will we experience the risk of flooding.” One such definition of flood frequency is as follows:

“Flood events (frequencies) of magnitude which are expected to be equaled or exceeded once on the average during any 10-, 25-, 50-, 100-, and 200-year storm event, have a 10, 4, 2, 1, and 0.5 percent chance, respectively of being equaled or exceeded during any year. Although the recurrence interval statistically is long term for the larger event storms, the actual period between floods could occur in shorter term intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered.”

#### 10-year and 25-year Recurring Frequency Design Storm Application

Drainage facilities are typically designed to provide capacity for storm runoff of a specified intensity. The analysis used in this study was based on the storm intensity of a ten (10) year event as specified in the Orange County Drainage Manual. However, where sump conditions exist (low point collection condition) the intensity of a twenty-five (25) year event is utilized. These time periods are a common practice for community system facilities planning in Orange County with its southwestern coastal climate and the smaller drainage subareas common to suburban and urban development.

### **4.4 Criteria for the Hydrology and Hydraulics Evaluation**

#### Methodology

The approach used to study the existing City drainage system is based upon the hydrology and hydraulic criteria and methods defined in the Orange County Flood Control District adopted practice documents. The study area consists of all acreage within the incorporated City limits plus those drainage areas beginning outside the City’s limits which drain into the City. Data on land use, drainage patterns, drainage areas

(Watersheds), rainfall intensities, and existing topography were input into the hydrologic computer model.

Watershed models of each major watershed and the two “Extra Subareas” were developed based on the Orange County Rational Method using the Watershed Modeling System (WMS) version 9.1, a pre- and post- processor for Orange County hydrology methods. The 10-year rainfall recurrence interval was analyzed. Cumulative peak flow rates at each sub-watershed outlet were routed through reaches consisting of open channels, standard street cross-sections, and subsurface pipes. The WMS then uses computed peak flow rates and given reach dimensions to identify those conduits that are undersized based upon design capacity criteria.

### Model Setup

Watershed boundaries were developed using a combination of aerial imagery, digital elevation data and original watershed boundaries established in the 1981 Storm Drain Master Plan maps. In accordance with Orange County methods (Orange County, 1986), all sub-watersheds were less than 640 acres in size. Final sub-watershed boundaries for each major watershed are shown in Appendix F.

### Loss Parameters (Runoff Coefficients)

The runoff coefficient is a factor relating the quantity of storm water runoff to the quantity of rainfall striking the earth. The runoff coefficient is a function of several factors, the most significant of which is the type of overlying development and the infiltration capacity of the soil. The type of overlying development affects the runoff coefficient since the percentage of impervious area varies significantly with the type of development.

Loss parameters for the Orange County Rational method consist of a modified runoff coefficient that takes into account soil infiltration rates (Fp) and impervious and pervious area fractions (ai and ap). Infiltration rates for pervious areas are a function of hydrologic soil group, which was derived from the NRCS STATSGO database developed for the State of California. Impervious area percentages were derived from a high resolution land use shapefile developed in 2005 by Aerial Information Systems, Inc. on behalf of the Southern California Association of Governments (SCAG). The percent impervious values used for each land use are shown in Table 4-A.

*Table 4-A. Impervious Fractions based on Land Use*

Land Use ID	Description	Impervious Fraction
1111	High-Density Single Family Residential	0.55
1112	Low-Density Single Family Residential	0.2
1122	Duplexes, Triplexes, Condos and Townhouses	0.65
1123	Low-Rise Apartments, Condos, and Townhouses	0.65
1124	Medium-Rise Apartments and Condos	0.9
1131	Trailer Parks and Mobile Home Courts, High Density	0.85
1140	Mixed Residential	0.45
1152	Rural Residential, Low-Density	0.2
1211	Low- and Medium-Rise Major Office Use	0.8

Land Use ID	Description	Impervious Fraction
1221	Regional Shopping Center	1
1222	Retail Centers (Non-Strip with Parking Lot)	1
1223	Modern Strip Development	1
1224	Older Strip Development	1
1231	Commercial Storage	1
1232	Commercial Recreation	0.8
1233	Hotels and Motels	0.9
1241	Government Offices	0.9
1242	Police and Sheriff Stations	0.9
1243	Fire Stations	0.9
1244	Major Medical Health Care Facilities	0.9
1245	Religious Facilities	0.9
1246	Other Public Facilities	0.9
1247	Non-Attended Public Parking Facilities	1
1252	Special Care Facilities	0.9
1253	Other Special Use Facilities	0.9
1261	Pre-Schools/Day Care Centers	0.5
1262	Elementary Schools	0.5
1263	Junior or Intermediate High Schools	0.4
1264	Senior High Schools	0.3
1265	Colleges and Universities	0.3
1311	Manufacturing, Assembly, and Industrial Services	1
1313	Packing Houses and Grain Elevators	1
1314	Research and Development	1
1323	Open Storage	1
1325	Chemical Processing	1
1332	Mineral Extraction - Oil and Gas	0
1340	Wholesaling and Warehousing	1
1412	Railroads	1
1413	Freeways and Major Roads	1
1414	Park-and-Ride Lots	1
1415	Bus Terminals and Yards	1
1416	Truck Terminals	1
1420	Communication Facilities	1
1431	Electrical Power Facilities	0.5
1432	Solid Waste Disposal Facilities	0
1434	Water Storage Facilities	1
1435	Natural Gas and Petroleum Facilities	0.5
1436	Water Transfer Facilities	1
1437	Improved Flood Waterways and Structures	0
1440	Maintenance Yards	1

Land Use ID	Description	Impervious Fraction
1450	Mixed Transportation	1
1460	Mixed Transportation and Utility	1
1500	Mixed Commercial and Industrial	1
1700	Under Construction	1
1810	Golf Courses	0
1821	Developed Local Parks and Recreation	0
1822	Undeveloped Local Parks and Recreation	0
1831	Developed Regional Parks and Recreation	0
1832	Undeveloped Regional Parks and Recreation	0
1840	Cemeteries	0
1880	Other Open Space and Recreation	0
2110	Irrigated Cropland and Improved Pasture Land	0
2120	Non-Irrigated Cropland and Improved Pasture Land	0
2200	Orchards and Vineyards	0
2300	Nurseries	0
2600	Other Agriculture	0
2700	Horse Ranches	0
3100	Vacant Undifferentiated	0
3300	Vacant With Limited Improvements	0
4100	Water, Undifferentiated	1

### Rainfall Intensity (Precipitation)

Rainfall intensity is expressed in inches per hour and is developed by statistical methods from 75 years of recorded rainfall records. Rainfall intensity rates are the result of many factors, the most significant of which is the duration of the storm and the statistical average recurrence interval (10-, 25-, 50-, and 100-year). A 10-year rainfall return period was analyzed in the study. In accordance with Orange County Hydrology Manual Addendum No. 1 (Orange County, 1996), expected value (50% confidence interval) criteria were applied for the models. As stated in Addendum No. 1, expected value discharges should be used for evaluating protection level provided by existing facilities.

### Channel Routing

Several channel routing options are available within the Orange County Rational Method. Those most commonly used for this study included trapezoidal channels, V-gutters, street cross-sections, and subsurface conduits such as circular pipes or rectangular boxes.

### Time of Concentration

Time of concentration ( $T_c$ ) refers to the time it takes for rainfall to travel from the most hydraulically remote part of the watershed to the concentration point. The  $T_c$  is a function of many variables in addition to the travel distance including the slope(s) of the area, the type of development within the area, and the infiltration rates of the soils. For

Orange County Rational studies, one of the most significant factors leading to the Tc computation of a watershed is the Tc computed for the initial sub-area. In accordance with Orange County 1996 requirements for initial subareas, all initial subareas were determined to be less than 10 acres with flow lengths of less than 300 feet. Computed Tc's used by the model are contained in the results tables in Appendix E.

#### Modeling Results and Maps

A Rational Method Confluence analysis was conducted for each watershed using the parameter inputs described above. The confluence analysis reports cumulative peak flow rates at each sub-watershed outlet and determines which conduits, if any, are operating as pressurized pipes. The WMS modeling program also determined the minimum size of pipes that are necessary to contain the desired storm frequency flows. Pipes that are reported to be pressurized are listed in Tables 4-B to 4-F. The results for each confluence analysis and corresponding maps are contained in Appendices E and F.

There were no reported pressurized conduits within the Coyote Creek Watershed. The three trapezoidal channel segments listed in Carbon Creek Watershed are downstream of Carbon Canyon Regional Dam and are maintained by the Orange County Flood Control District. In addition to being outside the jurisdiction of the City of Brea, the steady state analysis does not take into account any watershed storage from dams or detention ponds, meaning that all conduits downstream of this facility would likely experience smaller peak flow rates than the model predicts. An undersized trapezoidal channel in Fullerton Creek watershed, which was included in the model to maintain connectivity within Fullerton Creek watershed, also resides outside Brea City limits and can be neglected.

*Table 4-B - Pressurized Pipes in Brea Creek Watershed*

Beg. Node	Ending Node	Qin (cfs)	Pipe Diam. (in)	Min. Req. Diam.	Segment Length (ft)	Segment Slope (ft/ft)	Section	Description
220Q	222Q	85.6	36	47	1191.3	0.00439	Circular	Along N Berry St, Between Lambert Rd and Pacific Electric Railway line
222Q	224Q	112	36	40	1332.2	0.01654	Circular	Along N Berry St, Between Pacific Electric Railway line and Imperial Hwy
123H	125AF	78.6	36	46	569.4	0.00401	Circular	Along Central Ave, between N Brea Blvd and channel
81D	83AD	84.2	24	27	715.5	0.07424	Circular	Along Canyon Country Rd, Near intersection of Brea Canyon Rd and Country Canyon Rd

Table 4-C - Pressurized Pipes in Carbon Creek Watershed

Beg. Node	Ending Node	Qin (cfs)	Bottom Width / Diam.	Min. Req. Diam.	Side Slope	Segment Length (ft)	Segment Slope (ft/ft)	Section	Description
180AH	182A	5,712	10 ft	N/A	0.25	1429.8	0.06325	Trap.	Ending at N Rose Rd (County Facility)
190A	192A	5,727	10ft	N/A	0.25	348.1	0.00231	Trap.	Ending at Imperial Hwy (County Facility)
192A	194A	5,727	10ft	N/A	0.25	874.9	0.02401	Trap.	Ending at Imperial Hwy (County Facility)
138HJ	140H	398.5	78 in	87 in	-	662.1	0.00329	Circular	Along Carbon Canyon Rd, near intersection of with Santa Fe Rd

Table 4-D - Pressurized Pipes in Fullerton Creek Watershed

Beg. Node	Ending Node	Qin (cfs)	Bottom Width / Diam.	Min. Req. Diam.	Side slope	Segment Length (ft)	Segment Slope (ft/ft)	Section	Description
352O	354AX	34.7	1.5 ft	N/A	1	494.5	0.00335	Trap.	From N Associated Rd to pond in Craig Regional Park (Outside City Limits)
314I	320XI	15.7	12 in	14 in	-	773.8	0.109	Circular	From Cedar Ave to S State College Blvd
308H	309XH	32.6	18 in	25 in	-	1149.2	0.02079	Circular	From Pine Ave to S Randolph Ave (Through the parking lot)
293F	295XF	55.7	24 in	29 in	-	1057.9	0.0228	Circular	Along E Birch St, between S Redwood Ave and N Poplar Ave

Beg. Node	Ending Node	Qin (cfs)	Bottom Width / Diam.	Min. Req. Diam.	Side slope	Segment Length (ft)	Segment Slope (ft/ft)	Section	Description
283D	288XD	38.2	30 in	33 in	-	661.5	0.00597	Circular	Along N Poplar Ave, between Ash St and E Birch St
324K	326K	38.4	21 in	33 in	-	1404	0.00711	Circular	Underneath Brea Marketplace Shopping center, ends at E Birch St
146N	148N	140	30 in	36 in	-	1230.5	0.0467	Circular	Starting at Mango St, Along Balsa Ave and N State College Blvd, Ending at E Lambert Rd
148N	150N	153	36 in	41 in	-	1328.3	0.02714	Circular	Along N State College Blvd, Starting at E Lambert Rd and ending at Pacific Electric Railway line
85H	87H	95.4	27 in	31 in	-	434.7	0.05012	Circular	Along N Kraemer Blvd and Santa Fe Rd, starting at
43E	44AE	68.2	24 in	35 in	-	2755.4	0.01366	Circular	Along Valencia Ave, starting at E Birch St and ending into the channel just SW from Bank of America

Table 4-E - Pressurized Pipes in Imperial Creek Watershed

Beginning Node	Ending Node	Qin (cfs)	Pipe Diam. (in)	Min. Req. Diam.	Segment Length (ft)	Segment Slope (ft/ft)	Section	Description
82J	85J	67	21	36	910	0.0069	Circular	Along Arovista Ave and Mariner St, Starting Near Arovista

Beginning Node	Ending Node	Qin (cfs)	Pipe Diam. (in)	Min. Req. Diam.	Segment Length (ft)	Segment Slope (ft/ft)	Section	Description
								Circ and ending at Imperial Hwy
52G	54G	58	18	30	1335.8	0.02313	Circular	Along Columbia St, a segment between N Puente St and Berry St
38A	40A	272	78	86	727.9	0.00169	Circular	Along N Puente St, Beginning at Bacon St and ending at W Lambert Rd

Table 4-F - Pressurized Pipes in the two "Extra Subareas" Watershed

Beginning Node	Ending Node	Qin (cfs)	Pipe Diameter (in)	Req. Diameter (in)	Segment Length (ft)	Segment Slope (ft/ft)	Section	Description
8A	10A	102.4	30	40	697.2	0.01512	Circular	Along Magnolia Ave. beginning at Elm St. and ending at Alder St.
28AB	30A	204.7	60	66	142	0.00394	Circular	Along Laurel Ave. beginning at Alder St. and ending just before Hanmaum Presbyterian Church property
72H	74H	19.3	30	43	286.7	0.00035	Circular	Along Saturn St., just east of Kraemer Blvd

#### Deficiencies based upon hydraulic analysis

The following criteria were used to determine if a system is capacity deficient, and if so, what replacement pipe size would be necessary to eliminate the identified deficiency.

The existing drain systems within each of the five (5) watershed boundaries and the two smaller "Extra Subareas" were modeled (using assumptions and criteria described in the

preceding section) to define impacts of the 10-year frequency storm runoff on the carrying capacity of the systems. Where existing pipe capacity was classed inadequate and the water level exceeded the rated carrying capacity (above 82% of pipe diameter), the model was rerun with instructions to define the needed pipe diameter to carry the flow while keeping the hydraulic grade line at least 0.5-feet below the adjoining catch basin inlets elevation per the OC Drainage Manual. The results are shown in Tables 4-B to 4-F.

A listing of deficient storm drain pipe segments and those locations where local runoff ponds in the street are identified in Table 4-G below, and these correlate with the hydrology and hydraulics analysis output results in Appendix 'E'.

**TABLE 4-G**

SEGMENT NO.	STUDY AREA	MODEL CONDUIT NAME	LENGTH (FEET)	LOCATION	LIMITS		
1	ICW	82J-85J	910	Arovista Ave. & Mariner St.	Arovista Cir.	to	Imperial Hwy.
2	ICW	52G-54G	1336	Columbia St.	Neptune Ave.	to	W/O Berry St.
3	ICW	38A-40A	728	N. Puente St.	Bacon St.	to	Lambert Rd.
4	BCW	220Q-222Q	1191	N. Berry St.	Lambert Rd	to	PE RxR R/W
5	BCW	222Q-224Q	1332	N. Berry St.	PE RxR line	to	Imperial Hwy.
6	BCW	123H-125AF	569	Central Ave.	N. Brea Blvd.	to	Channel
7	BCW	81D-83AD	716	Canyon Country Rd.	Glen Cyn. Way	to	Channel
8	BCW	Curbside ponding	570	N/S Lambert Rd.	Tamarack	to	Berry St.
9	FCW	352O-354AX	495	Outside of City	N. Associated Rd	to	Pond in Craig Pk
10	FCW	314I-320XI	774	Easement n/o Elm	Cedar Ave.	to	So. State College Blvd
11	FCW	308H-309XH	1149	Easement s/o Imperial	Pine Ave/Date St.	to	So. Randolph Ave. (thru parking lot)
12	FCW	293F-295XF	1058	E. Birch St.	Alley w/o Redwood Ave.	to	Poplar Ave.
13	FCW	283D-288XD	662	Easement w/s of N. Poplar Ave.	Ash St.	to	E. Birch St.
14	FCW	324K-326K	1404	Easement & E. Birch St.	Willow Dr.	to	N/S Brea Mall
15	FCW	146N-148N	1231	Balsa Ave & N. State College Blvd.	Mango	to	Lambert Rd.
16	FCW	148N-150N	1328	N. State College Blvd.	E. Lambert Rd.	to	PE RxR R/W
17	FCW	85H-87H	435	N. Kraemer Blvd. & Santa Fe Rd.	Woodfield	to	Lambert Rd.
18	FCW	43E-44AE	2755	S. Valencia Ave. & in Easement	E. Birch St.	to	Loftus Channel

SEGMENT NO.	STUDY AREA	MODEL CONDUIT NAME	LENGTH (FEET)	LOCATION	LIMITS		
19	FCW	Curbside ponding	625	N/S Lambert Rd.	Cliffwood Ave.	to	Cashew
20	FCW	Curbside ponding	625	N/S Lambert Rd.	Cashew	to	State College Blvd.
21	CCW	138HJ-140H	662	Carbon Cyn Rd.	400 ft w/o Santa Fe Rd.	to	1,000 ft w/o Santa Fe Rd.
22	S'ly Subarea	8A-10A	697	Magnolia Ave.	Elm St.	to	Alder St.
23	S'ly Subarea	28AB-30A	142	Laurel Ave.	Alder St.	to	City Bdy.
24	S'ly Subarea	72H-74H	287	Saturn St.	E/O Kraemer Blvd.	to	E/O Kraemer Blvd.

#### 4.5 Drainage Summary

Evaluation of the various existing system elements involved using the City's five primary watershed areas as the basis of segmenting of the study. Each watershed area has multiple sub-drainage areas based upon existing topography and constructed systems in order to reasonably define the systems flow carrying performance. Please refer to the watershed maps within Appendix 'F'.

As a result of the investigations undertaken only 6.9% of the now existing system exceeds its main pipe capacity, but does not exceed the system capacity as defined in the Orange County capacity criteria (It is staying within the main pipes, manholes, laterals and lower parts of the catch basins below the 0.5 feet limit beneath the catch basin inlet). The resulting system provides storm water carrying capacity of a storm having a return frequency of ten-years (10-years), and for existing sump (low points) conditions for a storm having a return frequency of twenty-five years (25 years). In other words, those components of the system are not spilling water back into the overlying streets or easements under the analysis criteria applied.

Those locations where storm water is ponding in Lambert Rd and the two identified corrugated metal pipe (CMP) segments that are under capacity (and have exceeded their useful life expectancy) are rated as capacity deficient locations/facilities. Each of the five locations were prioritized on the basis of their local impact, their cost effectiveness, and their locations relative to or within the system. These locations and facilities are presented as the recommended CIP projects, and are described in Tables 5-A and 5-B of Section 5 in this report.

Our analyses of the hydrology and hydraulic calculation results, and extent of the improvements and cost associated with those improvements necessary to convey the 10-year runoff volumes, are presented in Section 5 of this report (Capital Improvement Program Development). Should the estimated cost be beyond the City's current CIP budgetary resources, we've also included Section 6 – Financial Strategy Plan showing funding options and sources for City consideration.

When storm drain design is to be pursued, detailed final hydrologic studies should be conducted in conjunction with each final design of storm drain facilities. Final hydrologic

studies should include such items as catch basin hydrology, detailed field investigation of drainage patterns, and determination of impacting physical details and any changes in criteria as used in this planning level study.

## REFERENCES

Reports pertinent to the City of Brea Storm Water Master Plan Hydrology Study are as follows:

1. Orange County Hydrology Manual, prepared by Orange County Environmental Management Agency, October 1986
2. Orange County Hydrology Manual Addendum No. 1, prepared by Orange County Environmental Management Agency, 1996

## SECTION 5 – CAPITAL IMPROVEMENT PROGRAM DEVELOPMENT

### 5.1 Localized Water Ponding during Storms

Various size local storm events have been reported to result in water ponding within the northerly curb side traffic lane of Lambert Road, in three (3) locations (8, 19 & 20 as noted in Table 4-G and as shown on the two aerial exhibit maps following this page. These locations have a relatively flat grade (slope) or slight sump, but they appear to be drainable by installing suitable inlets and connector pipes to the closest adjacent storm drain. These locations should be given consideration for inclusion by connecting with nearby pipeline projects when related infrastructure work is to be accomplished.

### 5.2 Deficiency Causes and Solutions

There are several causes for a deficient storm drain system: undersized catch basin inlets, undersized catch basin lateral, undersized mainlines, and street slopes flatter than the desired minimum value. In order to correct such deficiencies, the recommended improvement projects within this Section are necessary to protect properties and reduce street flooding during a 10-year frequency storm event. Three locations of confirmed runoff water ponding are addressed with the recommended CIP projects. Areas of localized ponding events and chronic maintenance can be addressed during design of nearby drainage or street facility improvements.

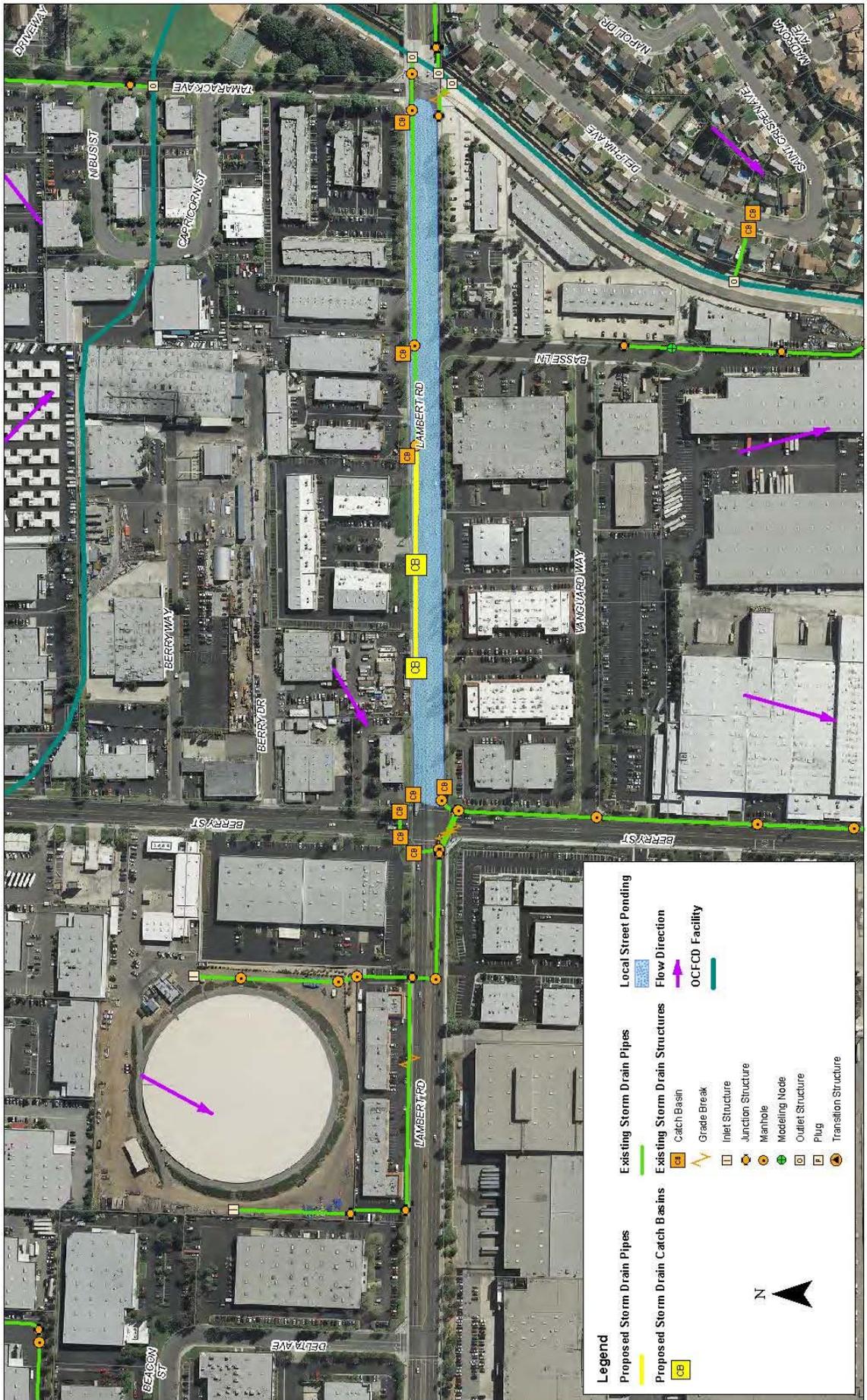
### 5.3 Basis of Prioritizing Projects

Each capacity deficient pipe segment was categorized using the following factors to establish scheduling priorities (see Table 5-A):

1. Overlying surface segments are critical to the traffic utilization in the City.
2. Identified by City maintenance crews as a recurring problem area.
3. Conduit material.
4. Expected material longevity.
5. Conduit age based upon construction date.
6. Current condition rating from CCTV inspection results (where available).

**Table 5-A**

BREA STORM DRAINS - CAPACITY DEFICIENT												
Ranked using age, percent of material service life expended, and CCTV internal overall rating as indicators of risk assessment.												
The higher the project rating the higher the risk of a pending failure.												
Segment No.	Model Conduit I.D.	Location	Length	Material	Rated Service Life (yrs)	Year Constructed	Existing Pipe Dia.	Required Dia.	Age (in years)	Percent of Service Life Expended	Structural and Maint. Condition Rating	Project Rating
19	Curbside	N/S Lambert(ponding)	0	RCP	75	n/a	0		n/a	n/a	n/a	0
20	Curbside	N/S Lambert(ponding)	0	RCP	75	n/a	0		n/a	n/a	n/a	0
8	Curbside	N/S Lambert(ponding)	0	RCP	75	n/a	0		n/a	n/a	n/a	0
10	314I-320XI	Easement	774	CMP	45	1960	12	18	53	1.178	n/a	54.18
11a A partial of # 11	309XH	Pine Ave	168	CMP	45	1961	18	30	52	1.156	n/a	53.16
CIP#7525	n/a	NW of La Canada & Northwood Ave.	n/a	TBD	35	To be Const.	n/a	TBD	n/a	0	n/a	0



**PROPOSED STORM DRAINS: LAMBERT RD. FROM DELTA AVE. TO TAMARACK AVE. - SEGMENT NO. 8**

February 22, 2013





February 22, 2013

**PROPOSED STORM DRAINS: LAMBERT RD. FROM TAMARACK AVE. TO STATE COLLEGE BLVD. - SEGMENTS NOS. 10 & 20**



## **5.4 Mitigation Measures and Design Alternatives**

### Storm Drain Extensions

The extension of an existing storm drain system is an acceptable mitigation measure when excessive flooding/ponding is identified upstream of an existing storm drain system, as long as the receiving system has available flow carrying capacity.

### Parallel Storm Drain Systems

The addition of a parallel storm drain system is an acceptable mitigation measure when excessive flooding (or potential) is identified in the vicinity of an existing storm drain system, and pipe slope or grade or adjacent buried facilities are a challenge in accomplishing upsizing of a single pipe

### Upsizing Existing Catch Basin Inlets and/or Connector Pipes

Upsizing of existing catch basin inlets and/or connector pipes can also be used as a mitigation measure when excessive flooding is identified in the vicinity of existing storm drain inlets. This is a detail usually addressed during the design phase.

### Coordination with Other CIP Projects

Whenever possible, storm drain improvement projects should be scheduled such that either the overlying street/alley improvement project follows or is undertaken concurrently with the storm drain improvement project. This planning approach leads to a complete, efficient project that maximizes the community resources, and can reduce maintenance impacts. It is critical that future storm drain improvement project schedules consider any pavement cut moratorium policy that restricts utility cuts on recently paved streets.

## **5.5 Countywide Drainage Handling Criteria**

City drainage projects are subject to the OCFCD Drainage Area Management Plan (DAMP) and the Local Implementation Plan (LIP). The DAMP provides the guidelines for compliance with the current county National Pollution Discharge Elimination System (NPDES) permit with the Water Quality Control Board – Santa Ana Region (WQCB-SAR). The LIP is a collectively developed and more specific local implementation guideline that supplements the DAMP. Each CIP project and development application approval within the City must incorporate the appropriate non-structural and structural Best Management Practices (BMP's) into the contract specification special provisions. It is the City's obligation to enforce compliance with the DAMP for all new projects and developments within the City.

## **5.6 National Pollution Discharge Elimination System (NPDES)**

The City must enforce compliance with the NPDES criteria/regulations applicable to each CIP project and land development project within the City. The appropriate Notices of Intent (NOI) must be filed with the SWRCB, and Storm Water Pollution Prevention Plans (SWPPP's) must be reviewed and kept on file at the City as well as at the project sites by the builder/contractor.

## 5.7 Detention Basins

The identified flow-through basins should be evaluated for possible detention application benefits to the respective downstream system elements. If not identified as a benefit under the storm water regulations or downstream capacity utilization, they should be considered for other application within the system in order to avoid possible health or safety risks.

## 5.8 Proposed Storm Drain System Improvements - CIP

The goal of the Capital Improvement Program (CIP) is to provide the City with a planning tool for scheduling and financing future storm drain capacity improvement projects. The proposed CIP has ranked/scheduled the design and construction of the capacity improvement projects in a priority sequence. The three projects (#8, #19, #20) to address local ponding problems can be considered as stand-alone projects or in concert with other pipe capacity improvement projects.

Recommendations are ranked and presented to mitigate each of the identified capacity constraints or ponding in traffic lanes within the drainage system. Each project includes a summary of the recommended improvements accompanied by cost estimates based on recent experiences with similar projects and cost data.

**TABLE 5-B**

Priority No.	Segment No.	Study Area	Location	Lengths (feet)	Cost Estimate	Conditions	Recommendations
1	19	FCW	Lambert Rd.	625	\$ 334,782	Ponding along N. curb lane	Install CB's & Pipe to existing
2	20	FCW	Lambert Rd.	625	\$ 342,580	Ponding along N. curb lane	Install CB's & Pipe to existing
3	8	BCW	Lambert Rd.	570	\$ 255,753	Ponding along N. curb lane	Install CB's & Pipe to existing
4	10	FCW	Easement n/o Elm	774	\$ 252,023	Serv Life & Cap Def.	Incse cap. to equiv. 18"
5	11a	FCW	Easement s/o Imperial	168	\$ 80,929	Serv Life & Cap Def.	Incse cap. to equiv. 30"
6	CIP#7525	CCW	NW of Northwood & La Canada	n/a	\$ 400,000	Debris & Ponding Obstructs Inlet	Check Dams, Reconst. Inlets, Access roads.

The average ENR 1967-Construction Cost Index for 2012 is 866.51.

The CIP projects for pipe and capacity improvements totals \$1.67 million as presented above in Table 5-B. Costs were estimated for the proposed improvements on the basis of construction pricing as of 2012. [Note: This period of time was selected due to availability of completed project and available bid results in the limited construction activity marketplace]. Local impact fees, available program revenues, and construction costs should be reviewed prior to project scheduling for potential escalation or reduction of costs based on the Engineering News Record's Construction Cost Index (ENR-CCI). Because most of the recommended facilities are located in the existing public rights-of-way (including easements), right-of-way acquisition costs were not included.

The engineering design, and construction administration and inspection was estimated at 17% of the construction cost, and an additional 15% contingency added for other bidding unknowns such as, utility relocation, permitting expenses, and materials pricing variance.

## SECTION 6 - FINANCIAL STRATEGY ALTERNATIVES

### 6.1 General Discussion

Funding of capital facility improvements can take separate or mixed approaches to accomplish the needed result. A responsible evaluation of the options available can result in a structured and cost effective plan with long-term service benefits. Depending upon the timing and scope of the project need, funding options can vary from *pay-as-you-go* financing whereby a certain portion of annual operating revenues (usually fees and tax revenues) would be allocated each year to the accomplishment of specific capital improvements. When timing and/or scope do not allow for funding accumulation, the options can involve use of *issuing debt* (typically bonds, notes, certificates) backed by a secure revenue stream in order to raise the funds necessary to finance construction of a project. A more recently used option involves the attraction of *private sector funds* whereby the project involves a design-build-purchase or design-build-operate agreement that is again secured by a guaranteed revenue stream and within a statutory term of time.

While drainage fees, the Mello-Roos Act (CFD), assessment districts, and general obligation bonds could possibly account for a sizable portion of drainage system funding, these sources of financing are each subject to community debate and discussion. Drainage fees, for example, may be collected from developments as they occur, but must be placed in accounts specifically designated for facilities to serve the drainage basin in which the development is located. The number and timing of development projects is largely beyond the control of the permitting agency and, thus, the availability of funds from this source is by no means assured. Assessment districts are challenging to implement when developed properties are involved, and CFD's, assessment districts and general obligation bonds all require either property owner or electorate balloting action.

Given the high cost identified with capital drainage improvements, it is probable that no single method will be sufficient to provide the funding to implement the Master Plan. Although a detailed financial plan is beyond the scope of this report, possible methods of funding for the required drainage facilities have been identified and described below. Therefore, it is recommended that the City consider various combinations of methods when implementing the local program.

Once the master plan is adopted, pursuit of a feasible funding program to assure adequate monies are available to construct the identified facilities, within a reasonable time frame, should be the next process undertaken. The following descriptions outline a number of possible funding methods. Many of these methods are commonly known and, consequently, are discussed only briefly. More lengthy narratives are devoted to those methods, which may be most appropriate for the City.

## 6.2 Funding Programs

### General Fund

A traditional source of funds, which can be used for drainage facility construction and maintenance, is the City's General Fund. This fund consists of revenues generated from a variety of sources, which are generally not restricted for use in just certain manners. However, this fund experiences significant demands due to the varied public services that are typically funded in whole or in part by these revenues.

### Drainage Fees

Under the provisions of Government Code section 66483 et seq. (the Subdivision Map Act), cities and counties may adopt a program for the collection of drainage fees. The code enables the City to enact a drainage fee program after certain prerequisites have been satisfied. The requirements for the drainage fee program include:

1. Adoption of a master drainage plan for each local drainage area;
2. Certification of the master drainage plan by the legislative body of the Public Agency having a county-wide and/or district-wide drainage plan;
3. Adoption of a fee structure based on the cost of the required facilities for each drainage area and equitably proportioned to all affected properties; and
4. Establishment of local drainage facilities funds.

Following adoption of appropriate local ordinances, drainage fees can be collected from developers as a condition of approval of final subdivision maps. Funds are then deposited in the appropriate local drainage facilities fund where they may be expended for engineering, administration, and construction of drainage facilities within a particular drainage area.

This financing method is usually of benefit to the public agency that has developable land area where subdivisions can occur and needed capital facilities in the related drainage area can be accomplished. Otherwise the resulting generation of revenue is minimal.

### Federal Housing and Community Development Act of 1974

The Housing and Community Development Act of 1974 (HCDA) provides federal grant funds for community development programs. Storm drains are among the projects eligible for funding.

Construction grant funds could be used to implement portions of the Master Plan of Drainage if the City can demonstrate that construction of such facilities is part of a program designed to meet community development needs and objectives and to provide for a new or continued supply of housing for low and moderate income families.

In applying for HCDA funds, the City can determine annually, at its option, to either:

1. File a joint application with the County under the Urban Counties Program; or

2. File an independent application to compete for monies from HCDA's discretionary fund when the minimum population requirement of 50,000 can be met.

In either case, the City must demonstrate that funding assistance for storm drain facilities is not available from other federal programs. Since no other federal agency presently provides assistance for drainage facilities, it would appear that the HCDA program has some potential as a source of funding for drainage facilities in some parts of the City. If HCDA funding is received, the City will be required to establish a housing assistance program. Similar programs have been successfully implemented throughout the nation.

### Special Assessments

Special assessments allow for the financing and construction or acquisition of public works improvements, including storm drains, by assessing the cost of such improvements to all benefiting properties. Such assessments create a lien (obligation) on the benefiting properties which are used to pay the debt service over time. Proceeds from the authorized debt are used to construct or acquire the specific improvements. The assessment liens are incurred and payable over time until the debt is fully repaid (usually a period of about twenty years). Assessments thus provide the advantage to property owners of a loan to accomplish the capital improvements and deferred payments while obtaining the benefits of the improvements.

Assessment district proceedings may be initiated by a petition of the property owners within the boundaries of the proposed assessment district, or by direct action of the City Council using the steps and provisions of the Special Assessment Investigation, Limitation, and Majority Protest Act of 1931, which requires a public hearing. Also, proceedings may be initiated by the City Council where a County Health Officer's letter has been obtained recommending that assessment district proceedings be instituted to install storm drains as a health measure.

With the passage of Proposition 218 by California voters on November 5, 1996, all new or increasing assessments that are parcel-based must now be submitted to benefiting property owners in an assessment ballot proceeding whereby property owners can approve or defeat the imposition of the assessment. Assessments are considered approved with a simple majority of ballots cast in favor of the assessment as measured by the dollar value of the assessments. A public meeting and a public hearing are also required in addition to a mailed notice to each affected property owner of record.

### Municipal Improvement Act of 1913

The most commonly used procedural act for formation of an assessment district is the Municipal Improvement Act of 1913. The 1913 Act is most often used in conjunction with the Improvement Bond Act of 1915. Under the 1915 Act, all or a portion of the assessment is payable each year in an amount sufficient to pay the principal and interest on the bonds when due. The assessment is most often included on the property tax bill which is payable in the same manner and time as the general taxes of the public agency.

Formation of an assessment district may be difficult where properties have already developed. Therefore, prior to undertaking the formation of an assessment district, the City should test property owner support.

#### Benefit Assessment Act of 1982

The Benefit Assessment Act of 1982 (beginning with Section 54703 of the Government Code) authorizes local agencies to impose assessments on benefited property to finance the operation and maintenance of drainage, flood control, and street lighting services, and the installation and improvement of drainage and flood control facilities. The act provides for the creation of a special assessment district which can be, if necessary, divided into zones. Zones can be exempted from the district or assessed differently depending on the type of service to be provided. In the case of an assessment for flood control services, the 1982 Act provides that the benefit may be determined on the basis of the proportionate storm water runoff from each parcel.

The proposed assessment must be submitted to the eligible voters within the area of benefit, and be approved by a majority of those voting. The amount of the assessment must be evaluated and re-imposed annually.

#### Highway Improvement Projects

A potential source of funding for at least a portion of the storm drain facilities is gas tax monies which are allocated by Federal and State statutes and come directly to the City and may be used for roadway improvement drainage facilities. All proposed highway projects should be carefully reviewed with regard to the possibility of incorporating portions of the storm drain system, mainly catch basins and connector pipes, in their design. One major provision would be that such drainage elements render the highway free from excess flooding during major storms.

#### Mello-Roos Community Facilities Act of 1982

On January 2, 1983, the Mello-Roos Community Facilities Act of 1982 became law as Government Code Sections 53311 et seq. This statute enables cities, counties, special districts, and school districts to establish community facilities districts (CFD's) to provide certain public services or facilities, including storm drains, to be financed through elector-approved special taxes.

Facilities which can be financed by a CFD include the purchase, construction, expansion, or rehabilitation, of any governmental facilities the legislative body is authorized to construct, own, or operate.

The question of a special tax levy must be submitted to each registered voter within the proposed district. Approval requires a two-thirds affirmative vote.

If long-term bonded indebtedness is required, a resolution and public hearing is also required on the necessity to incur the debt. Bonds are secured by the voted special taxes within the CFD and this special tax is levied in the same manner as general taxes with the funds paid to the CFD.

#### General Obligation Bonds

General obligation bonds are a source of capital improvement funds and can be issued if the City's financial position and projections for its future revenues (e.g., sales taxes) support the proposed bond debt service without the power to levy ad valorem property taxes, or other special taxes prohibited under Article XIII A of the California Constitution. General obligation bonds must be approved by two-thirds of the electorate.

## **APPENDICIES INDEX**

APPENDIX A - GENERAL PLAN ZONING MAP - Adopted February 2010

APPENDIX B - COUNTY OF ORANGE WATERSHEDS overlying the City

APPENDIX C - CITY DRAINAGE AREAS (showing CIP Project locations and Pressurized Pipe segments)

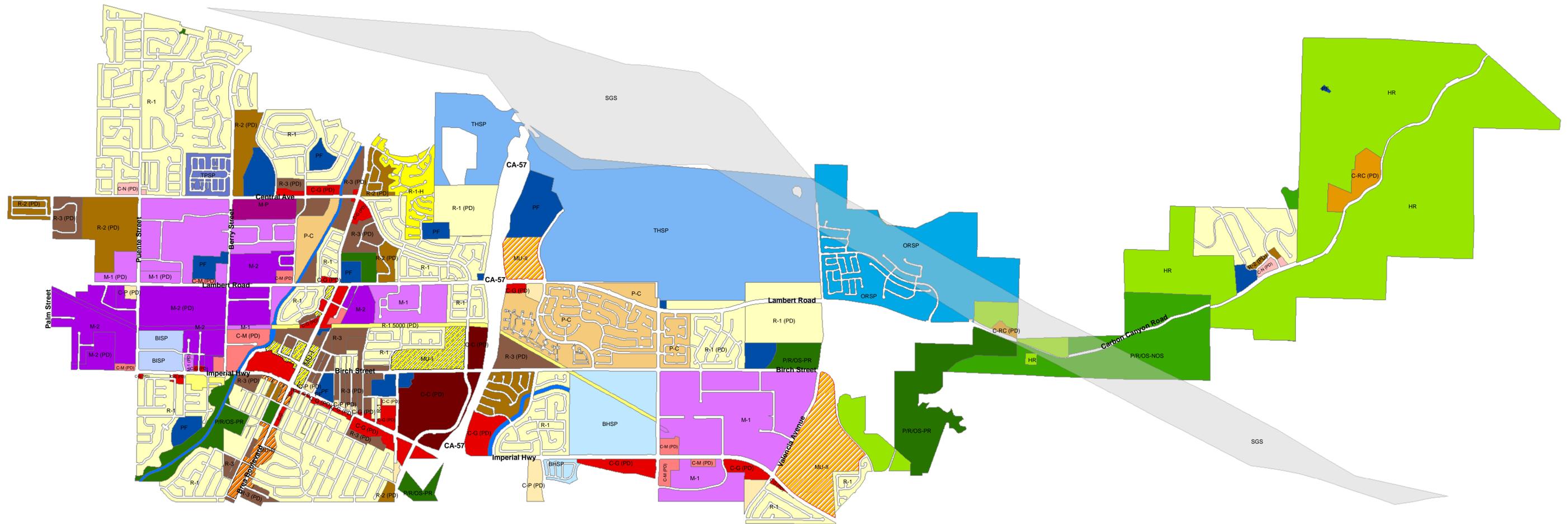
APPENDIX D - CCTV INSPECTION – Identified Structural and Maintenance Deficiencies & Local Street Ponding areas

APPENDIX E - HYDROLOGY/HYDRAULIC CALCULATIONS – 10 YEAR STORM EVENT  
[Maps in Appendix F correlate with these output sheets]

APPENDIX F – WATERSHED MAPS WITH MODELING SUBZONES & COLLECTION POINTS  
[Correlates with Appendix E]

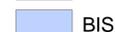
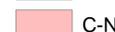
APPENDIX G - CONSTRUCTION COST ESTIMATING SHEETS FOR CIP PROJECTS

# City of Brea Zoning Map

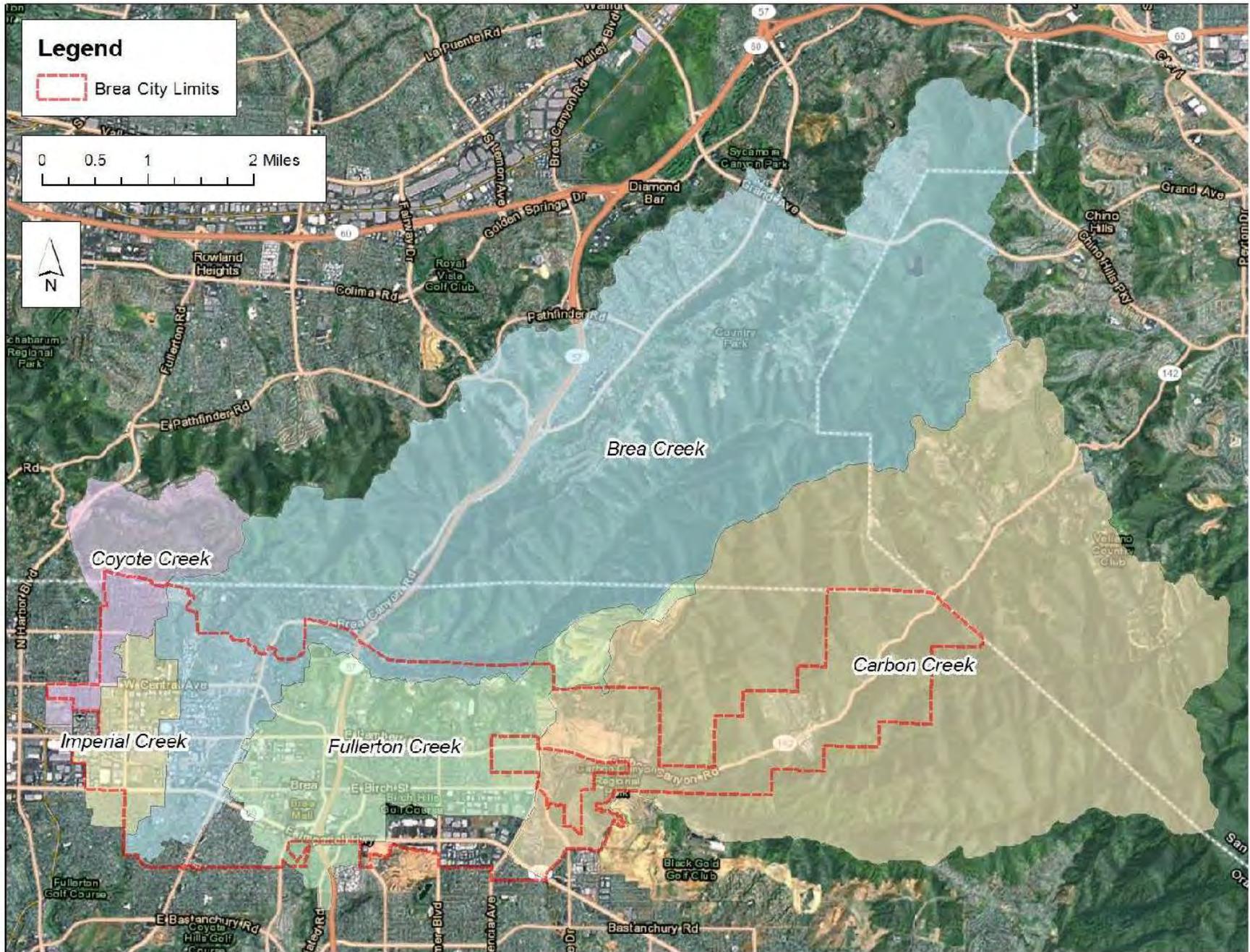


## Legend

### ZONING

 BHSP BIRCH HILLS SPECIFIC PLAN	 C-RC RECREATIONAL COMMERCIAL	 ORSP OLINDA RANCH SPECIFIC PLAN	 R-1-H SINGLE-FAMILY RESIDENTIAL-HILLSIDE
 BISP BREA INDUSTRIAL SPECIFIC PLAN	 FP FLOOD PLAIN	 PC-PLANNED COMMUNITY	 R-2 MULTIPLE FAMILY
 C-C MAJOR SHOPPING CENTER	 M-1 LIGHT INDUSTRIAL	 PARKS/RECREATION/OPEN SPACE-NATURAL OPEN SPACE	 R-3 MULTIPLE FAMILY
 C-G GENERAL COMMERCIAL	 M-2 GENERAL INDUSTRIAL	 PARKS/RECREATION/OPEN SPACE-PARKS/RECREATION	 SGS SPECIAL GEOLOGICAL STUDIES
 C-M INDUSTRIAL COMMERCIAL	 M-P PLANNED INDUSTRIAL	 PF PUBLIC FACILITIES	 THSP TONNER HILLS SPECIFIC PLAN
 C-N NEIGHBORHOOD COMMERCIAL	 MIXED USE-I	 HR HILLSIDE RESIDENTIAL	 TPSP TOMLINSON PARK SPECIFIC PLAN
 C-P ADMINISTRATIVE AND PROFESSIONAL OFFICE	 MIXED USE-II	 R-1 SINGLE-FAMILY RESIDENTIAL	
	 MIXED USE-III	 R-1 SINGLE-FAMILY RESIDENTIAL 5000	





Appendix B: Major watersheds crossing Brea City limits

COUNTY OF LOS ANGELES

COUNTY OF ORANGE

COUNTY OF ORANGE

COUNTY OF ORANGE

CHINO HILLS STATE PARK

COUNTY OF ORANGE

YORBA LINDA

FULLERTON

PLACENTIA

LA HABRA

Coyote Creek Watershed

Brea Creek Watershed

Fullerton Creek Watershed

Imperial Creek Watershed

Carbon Creek Watershed

**Legend**

- Watershed Boundaries
- Drainage Sub-Basin Areas
- CIP Project Locations
- Pressurized Pipe Sections
- Storm Drain Pipes
- Storm Drain Structures
  - Catch Basin
  - Grade Break
  - Inlet Structure
  - Junction Structure
  - Manhole
  - Outlet Structure
  - Plug
  - Transition Structure
- OCFCD Facility
- City Boundaries

DRAINAGE AREAS EAST OF THIS LOCATION ARE TRIBUTARY TO CARBON CREEK.  
NO CITY-MAINTAINED STORM DRAINS EAST OF THIS LOCATION.

**APPENDIX C**  
**CITY OF BREA STORM DRAIN SYSTEM**  
CITY DRAINAGE AREAS SHOWING CIP PROJECT LOCATIONS AND PRESSURIZED PIPE SEGMENTS

**WILDAN Engineering**  
extending your reach  
December 3, 2013

COUNTY OF LOS ANGELES

COUNTY OF ORANGE

COUNTY OF ORANGE

COUNTY OF ORANGE

YORBA LINDA

**Legend**

<b>Structural Defects</b>	<b>Storm Drain Pipes</b>	<b>Local Street Ponding</b>
<b>PACP Category</b>	Storm Drain Pipes of Record	Local Flow-Through Basin
● 3 - Average	Pipes Included in 2013 CCTV Inspection Program	OCFCD Facility
● 4 - Heavy	<b>Storm Drain Structures</b>	<b>Watershed Boundaries</b>
● 5 - Severe	Catch Basin	City Boundaries
	Grade Break	
<b>Maintenance Defects</b>	Inlet Structure	
<b>PACP Category</b>	Junction Structure	
■ 2 - Moderate	Manhole	
■ 3 - Average	Outlet Structure	
■ 4 - Heavy	Plug	
■ 5 - Severe	Transition Structure	
● N/A - Manhole Buried		

NO STRUCTURAL OR MAINTENANCE DEFICIENCIES, NO LOCAL STREET PONDING PROBLEMS IDENTIFIED EAST OF THIS LOCATION

**APPENDIX D**  
**CITY OF BREA STORM DRAIN SYSTEM**  
**CCTV INSPECTION-IDENTIFIED STRUCTURAL AND MAINTENANCE DEFICIENCIES**  
**LOCAL STREET PONDING LOCATIONS**

WILLDAN Engineering  
 extending your reach  
 December 3, 2013

APPENDIX D: CITY OF BREA STORM DRAIN SYSTEM - CCTV INSPECTION IDENTIFIED STRUCTURAL AND MAINTENANCE DEFICIENCIES - LOCAL STREET PONDING LOCATIONS

## APPENDIX E: RATIONAL METHOD CONFLUENCE ANALYSIS RESULTS

*Column Label Explanations for Rational Method Results*

Result Table Column Label	Description
Concentration Point / Outlet	ID of the collection point to which all other row parameters correspond
Subarea / Basin Area (ac)	Area in acres of catchment immediately upstream of concentration point
Effective Area (ac)	The portion of the total upstream watershed area in acres contributing to the subject peak flow rate
Total Area (ac)	The total upstream watershed area in acres
Fp	Maximum infiltration rate for pervious areas (inches/hour)
Ap	Ratio of pervious area to total area (decimal fraction)
Tt (min)	Travel time in minutes of catchment immediately upstream of concentration point
Tc (min)	Total time of concentration in minutes
I (in/hr)	Rainfall intensity (inches/hour)
Fm	Maximum loss rate for the catchment ( $F_m = A_p F_p$ )
Fm avg.	Area averaged maximum loss rate, or the loss rate for the total watershed tributary to the concentration point
Q Total (cfs)	Rational method peak flow rate at the concentration point
Flow Path Length (ft)	Flow path length in feet used to compute travel time for upstream catchment
Slope (ft/ft)	Flow path slope used to compute travel time for upstream catchment
Velocity (fps)	Flow velocity in feet per second along flow path length
Depth of Flow (ft)	Maximum flow depth in feet in catchment immediately upstream of concentration point (AG = above ground, PUG = primary underground, SUG = secondary underground)
Comments	Hydraulics Notes, Warnings, other comments

Brea Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
255V	1	1	1	0.3	0.45		17.1	1.59	0.14	0.14	1.3	148.1	0.0106			
257V	7.5	8.5	8.5	0.3	0.46	6.74	23.9	1.32	0.14	0.14	9.1	1008.4	0.01656	3.0(AG)	0.35(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
259V	11.9	20.4	20.4	0.3	0.45	3.44	27.3	1.23	0.14	0.14	20.1	643.6	0.00933	3.5(AG)	0.47(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
272AV		20.4		0.3	0.46	2.07	29.4	1.18		0.14	20.1	1242	0.019	10.0(PUG)	1.07(PUG)	
267X	1.8	1.8	1.8	0.3	0.45		22.4	1.37	0.14	0.14	2	255.6	0.00833			
269X	8.7	10.5	10.5	0.3	0.45	11.34	33.7	1.09	0.14	0.14	9.1	738.2	0.00109	1.2(AG)	0.52(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
272AV		10.5		0.3	0.45	6.84	40.6	0.98		0.14	9.1	3049.7	0.01539	7.4(PUG)	0.74(PUG)	
261W	2.4	2.4	2.4	0.3	0.15		20.6	1.44	0.04	0.04	3.1	267.7	0.01378			
263W	8.1	10.5	10.5	0.3	0.15	6.21	26.8	1.24	0.05	0.05	11.4	681	0.00577	2.1(AG)	0.43(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
265W	6.9	17.4	17.4	0.3	0.33	1.85	28.7	1.19	0.1	0.07	17.8	614.3	0.00583	5.5(PUG)	1.24(PUG)	
272AV		17.4		0.3	0.22	18.44	47.1	0.9		0.07	17.8	2800.8	0.01717	2.5(AG)	0.25(AG)	
240U	1.2	1.2	1.2	0.3	0.23		22.7	1.36	0.07	0.07	1.4	261.1	0.00801			
242U	8.1	9.3	9.3	0.3	0	6.75	29.5	1.18	0	0.01	9.8	667	0.004	2.0(AG)	0.43(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
244U	13.3	22.6	22.6	0.3	0.11	2.14	31.6	1.13	0.03	0.02	22.7	850.2	0.0109	6.6(PUG)	0.79(PUG)	
245TU		22.6		0.3	0.08	0.38	32	1.12		0.02	22.7	167.6	0.00829	7.4(PUG)	1.62(PUG)	
233T	1	1	1	0.3	0		22.7	1.36	0	0	1.2	129.5	0.00201			
235T	10.5	11.5	11.5	0.3	0.22	9.32	32	1.12	0.07	0.06	11.1	1042.9	0.00593	2.3(AG)	0.42(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
237T	12.7	24.2	24.2	0.3	0	2.26	34.3	1.08	0	0.03	23.1	857	0.00879	6.3(PUG)	0.89(PUG)	
245TU	8.5	32.7	32.7	0.3	0.33	1.11	35.4	1.06	0.1	0.05	30.1	680.3	0.01865	10.2(PUG)	1.07(PUG)	
Head Node - 244U		52.2		0.3	0.12	0	32	1.12		0.04	51.5					Confluence Details
Head Node - 237T		55.3		0.3	0.12	0	35.4	1.06		0.04	51.5					Confluence Details
245TU - Confluence		52.2	55.3	0.3	0.12	0	32	1.12		0.04	51.5					Confluence Results
Head Node - 244U		62.4		0.3	0.21	0.91	32.9	1.1		0.06	59.1					Confluence Details
Head Node - 237T		65.6		0.3	0.2	0.91	36.3	1.05		0.06	58.5					Confluence Details
247T	10.3	62.4	65.6	0.3	0.64	0.91	32.9	1.1	0.19	0.06	59.1	670.1	0.01749	12.3(PUG)	1.58(PUG)	
Head Node - 244U		73.5		0.3	0.23	0.88	33.8	1.09		0.07	68.1					Confluence Details
Head Node - 237T		76.7		0.3	0.23	0.88	37.2	1.03		0.07	67.1					Confluence Details
249T	11.1	73.5	76.7	0.3	0.35	0.88	33.8	1.09	0.1	0.07	68.1	559.2	0.01075	10.6(PUG)	1.97(PUG)	
217R	0.6	0.6	0.6	0.3	0		16.6	1.62	0	0	0.9	134.5	0.01018			
219R	8.7	9.3	9.3	0.3	0.02	3.96	20.6	1.44	0.01	0.01	12.1	901.3	0.02732	4.4(AG)	0.43(AG)	
220QR	19.2	28.5	28.5	0.3	0	0.55	21.1	1.42	0	0	36.5	263.4	0.01633	8.0(PUG)	1.19(PUG)	

Brea Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
210Q	1.2	1.2	1.2	0.3	0.1		29.3	1.18	0.03	0.03	1.3	287.8	0.00274			
212Q	8.1	9.3	9.3	0.3	0.43	9.16	38.4	1.01	0.13	0.12	7.5	1112.3	0.00492	2.3(AG)	0.87(AG)	
214Q	7.3	16.5	16.5	0.3	0.27	1.82	40.2	0.99	0.08	0.1	13.3	865.7	0.01951	7.9(PUG)	0.80(PUG)	
220QR		16.5		0.3	0.34	0.7	40.9	0.98		0.1	13.3	420.5	0.0276	10.0(PUG)	0.73(PUG)	
Head Node - 219R		37		0.3	0.08	0	21.1	1.42		0.03	46.8					Confluence Details
Head Node - 214Q		45		0.3	0.13	0	40.9	0.98		0.04	38.4					Confluence Details
220QR - Confluence		37	45	0.3	0.08	0	21.1	1.42		0.03	46.8					Confluence Results
Head Node - 219R		72.9		0.3	0.07	3	24.1	1.32		0.02	85.6					Confluence Details
Head Node - 214Q		80.9		0.3	0.1	3.01	44	0.94		0.03	66.8					Confluence Details
222Q	35.9	72.9	80.9	0.3	0.05	3	24.1	1.32	0.02	0.02	85.6	1191.3	0.00439	6.6(PUG)	2.46(PUG)	Warning: Pipe OVERFLOW
Head Node - 219R		99.3		0.3	0.08	1.73	25.9	1.27		0.02	112					Confluence Details
Head Node - 214Q		107.4		0.3	0.09	1.76	45.7	0.92		0.03	86.7					Confluence Details
224Q	26.4	99.3	107.4	0.3	0.09	1.73	25.9	1.27	0.03	0.02	112	1332.2	0.01654	12.8(PUG)	2.46(PUG)	Warning: Pipe OVERFLOW
226S	2	2	2	-1	0		23.5	1.33	0	0	2.4	287.3	0.00818			
228S	3.2	5.2	5.2	-1	0	4.33	27.9	1.21	0	0	5.8	496.4	0.00592	2.1(AG)	0.43(AG)	
230AQ	6.1	11.3	11.3	0.3	0.01	1	28.9	1.19	0	0	12.2	559.8	0.03964	9.4(PUG)	0.50(PUG)	
200P	1.6	1.6	1.6	0.3	0.44		15.3	1.7	0.13	0.13	2.3	170.9	0.02487			
202P	5.9	7.5	7.5	0.3	0.33	4.63	19.9	1.46	0.1	0.11	9.2	971.5	0.03184	4.2(AG)	0.32(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
204AP		7.5		0.3	0.35	0.97	20.9	1.43		0.11	9.2	70.5	0.01338	1.2(AG)	0.15(AG)	
195O	1.8	1.8	1.8	-1	0		15.9	1.66	0	0	2.7	206.7	0.02984			
197O	7.7	9.5	9.5	0.3	0	2.51	18.4	1.53	0	0	13.2	464	0.02139	3.5(AG)	0.38(AG)	
204AP	10.9	20.4	20.4	0.3	0.02	2.17	20.6	1.44	0.01	0	26.5	831.3	0.00786	6.4(PUG)	1.00(PUG)	
187N	1.4	1.4	1.4	-1	0		30	1.16	0	0	1.5	288.9	0.00246			
189N	5.4	6.9	6.9	0.3	0.01	4.87	34.9	1.07	0	0	6.6	681.8	0.00998	2.6(AG)	0.42(AG)	
191N	5.9	12.7	12.7	0.3	0.04	0.22	35.1	1.07	0.01	0.01	12.2	81.6	0.01054	6.0(PUG)	0.76(PUG)	
193AN	7.1	19.8	19.8	0.3	0.3	2.26	37.3	1.03	0.09	0.04	17.8	1231.1	0.02224	9.1(PUG)	0.74(PUG)	
179M	1.2	1.2	1.2	0.3	0.45		23.9	1.32	0.14	0.14	1.3	312.1	0.00888			
181M	5.7	6.9	6.9	0.3	0.44	3.01	26.9	1.24	0.13	0.13	6.9	651.9	0.033	3.0(AG)	0.26(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
183AJ		6.9		0.3	0.44	0.76	27.7	1.22		0.13	6.9	316.1	0.01487	6.9(PUG)	0.71(PUG)	
168L	0.6	0.6	0.6	-1	0		14.9	1.72	0	0	0.9	180.2	0.03124			
170L	12.9	13.5	13.5	-1	0	6.16	21.1	1.42	0	0	17.4	1175.2	0.01394	4.1(AG)	0.42(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
172L	20.4	33.9	33.9	0.3	0.17	1.99	23.1	1.35	0.05	0.03	40.5	1109.6	0.01747	9.3(PUG)	1.01(PUG)	
174L	38.3	72.2	72.2	0.3	0.02	1.32	24.4	1.31	0.01	0.02	84.5	953	0.02008	12.1(PUG)	1.62(PUG)	
175JL		72.2		0.3	0.06	0.4	24.8	1.3		0.02	84.5	401.6	0.02965	16.9(PUG)	1.89(PUG)	
151K	1.2	1.2	1.2	0.3	0.45		11.8	1.96	0.14	0.14	2	133.9	0.05536			

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153K	11.9	13.1	13.1	0.3	0.45	3.3	15.1	1.71	0.14	0.14	18.7	1040.4	0.07535	6.6(AG)	0.34(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
155K	22	35.1	35.1	0.3	0.45	2.32	17.4	1.58	0.14	0.14	46	1416.2	0.02095	10.2(PUG)	1.14(PUG)	
157JK	7.3	42.4	42.4	0.3	0.45	1.65	19.1	1.5	0.14	0.14	52.5	719.1	0.00475	7.3(PUG)	2.19(PUG)	
135J	1.4	1.4	1.4	0.3	1		11.7	1.98	0.3	0.3	2.2	275.2	0.25142			
137J	16.5	18	18	0.3	1	2.11	13.8	1.8	0.3	0.3	24.5	883.4	0.11546	8.2(AG)	0.82(AG)	
140J	226.8	244.8	244.8			4.58	18.3	1.53		0.3	274.1	2230.8	0.05212	9.2(AG)	1.97(AG)	
142J	133.2	378	378	0.3	1	9.08	27.4	1.22	0.3	0.3	316.9	3593	0.01683	6.5(AG)	3.93(AG)	
144J	184.4	562.4	562.4	0.3	0.99	3.1	30.5	1.15	0.3	0.3	435.5	1884.9	0.05583	10.4(AG)	4.43(AG)	
146J	101.1	663.5	663.5	0.3	0.87	7.15	37.7	1.02	0.26	0.29	439.8	3687.4	0.03246	8.4(AG)	4.25(AG)	
148J	58.9	722.4	722.4	0.3	0.61	4.05	41.7	0.97	0.18	0.28	447.4	2024.5	0.03327	8.3(AG)	3.49(AG)	
157JK	14.9	737.4	737.4	0.3	0.46	2.92	44.6	0.93	0.14	0.28	447.4	1122.3	0.0161	6.4(AG)	4.30(AG)	
Head Node - 148J		779.7		0.3	0.91	0	44.6	0.93		0.27	478					Confluence Details
Head Node - 155K		357.7		0.3	0.88	0	19.1	1.5		0.26	411.6					Confluence Details
157JK - Confluence		779.7	779.7	0.3	0.91	0	44.6	0.93		0.27	478					Confluence Results
Head Node - 148J		799.5		0.3	0.9	1.02	45.7	0.92		0.27	478					Confluence Details
Head Node - 155K		377.5		0.3	0.85	1.07	20.2	1.46		0.25	411.6					Confluence Details
159J	19.8	799.5	799.5	0.3	0.27	1.02	45.7	0.92	0.08	0.27	478	1396	0.03135	22.9(PUG)	1.74(PUG)	
Head Node - 148J		803.9		0.3	0.89	1.09	46.7	0.91		0.27	478					Confluence Details
Head Node - 155K		381.9		0.3	0.84	1.14	21.3	1.41		0.25	411.6					Confluence Details
161J	4.4	803.9	803.9	-1	0	1.09	46.7	0.91	0	0.27	478	1472.4	0.02424	22.6(PUG)	2.65(PUG)	
Head Node - 148J		820.9		0.3	0.87	1.37	48.1	0.89		0.26	478					Confluence Details
Head Node - 155K		398.8		0.3	0.8	1.43	22.7	1.36		0.24	411.6					Confluence Details
163J	17	820.9	820.9	-1	0	1.37	48.1	0.89	0	0.26	478	1301.9	0.00965	15.9(PUG)	3.01(PUG)	
Head Node - 148J		828.2		0.3	0.86	0.57	48.7	0.89		0.26	478					Confluence Details
Head Node - 155K		406.1		0.3	0.79	0.59	23.3	1.34		0.24	411.6					Confluence Details
165J	7.3	828.2	828.2	-1	0	0.57	48.7	0.89	0	0.26	478	479.7	0.00688	14.1(PUG)	3.40(PUG)	
Head Node - 148J		905.2		0.3	0.8	0	49.1	0.88		0.24	535.1					Confluence Details
Head Node - 155K		480.1		0.3	0.68	0	23.7	1.33		0.2	494.5					Confluence Details
Head Node - 174L		500.9		0.3	0.75	0	24.8	1.3		0.22	498.9					Confluence Details
175JL - Confluence		905.2	905.2	0.3	0.8	0	49.1	0.88		0.24	535.1					Confluence Results
Head Node - 148J		909.3		0.3	0.8	0.36	49.4	0.88		0.24	535.1					Confluence Details
Head Node - 155K		484.1		0.3	0.68	0.37	24.1	1.32		0.2	494.5					Confluence Details
Head Node - 174L		504.9		0.3	0.75	0.37	25.2	1.28		0.22	498.9					Confluence Details
177J	4	909.3	909.3	0.3	0.95	0.36	49.4	0.88	0.28	0.24	535.1	345.1	0.01044	16.0(PUG)	2.40(PUG)	
128I	2.2	2.2	2.2	0.3	0.35		17.4	1.58	0.11	0.11	3	310.1	0.04311			
130I	40.6	42.8	42.8	0.3	0.37	5.61	23	1.35	0.11	0.11	48.1	1925.8	0.02098	5.7(PUG)	0.36(PUG)	
131AI		42.8		0.3	0.37	1.03	24	1.32		0.11	48.1	829.6	0.02306	13.4(PUG)	1.52(PUG)	
115H	1	1	1	0.3	0.99		12	1.95	0.3	0.3	1.5	273.4	0.21387			
118H	9.7	10.7	10.7			3.02	15	1.72		0.24	14.3	848.5	0.06678	5.4(AG)	0.29(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)

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120H	9.1	19.8	19.8	0.3	0.47	0.71	15.7	1.67	0.14	0.2	26.5	677	0.08397	15.8(PUG)	0.66(PUG)	
123H	29.3	49	49			0.94	16.7	1.62		0.16	65	838.4	0.04592	14.8(PUG)	0.98(PUG)	
125AF	12.5	61.5	61.5	0.3	0.15	1.5	18.2	1.54	0.04	0.13	78.6	569.4	0.00401	6.3(PUG)	2.46(PUG)	Warning: Pipe OVERFLOW
108G	0.8	0.8	0.8	0.3	0.88		17.9	1.56	0.27	0.27	0.9	168	0.01107			
110G	5	5.9	5.9	0.3	0.84	4.02	21.9	1.39	0.25	0.25	6	894.3	0.03331	4.6(AG)	0.28(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
112G	20.4	26.2	26.2	0.3	0.91	3.24	25.1	1.29	0.27	0.27	24.2	1012.6	0.01921	6.2(AG)	0.49(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
113FG		26.2		0.3	0.9	1.38	26.5	1.25		0.27	24.2	935.4	0.02331	11.3(PUG)	1.12(PUG)	
97F	0.8	0.8	0.8	0.3	1		11.7	1.97	0.3	0.3	1.2	202.8	0.13294			
99F	8.3	9.1	9.1	0.3	1	2.12	13.8	1.8	0.3	0.3	12.3	740.6	0.12007	6.9(AG)	0.57(AG)	
101F	32.1	41.2	41.2	0.3	0.97	3.9	17.7	1.56	0.29	0.29	47.5	1705.5	0.07224	8.2(AG)	1.19(AG)	
103F	48.2	89.4	89.4	0.3	0.98	1.87	19.6	1.48	0.29	0.29	96.1	957	0.05996	9.1(AG)	1.66(AG)	
105F	49.8	139.2	139.2	0.3	0.48	1.7	21.3	1.41	0.14	0.24	147.8	1835	0.03241	18.0(PUG)	2.00(PUG)	
113FG	36.1	175.4	175.4	0.3	0.38	1.55	22.9	1.36	0.12	0.21	181.6	1783.1	0.02916	19.2(PUG)	2.47(PUG)	
Head Node - 105F		198		0.3	0.74	0	22.9	1.36		0.22	204.8					Confluence Details
Head Node - 112G		201.6		0.3	0.74	0	26.5	1.25		0.22	188.6					Confluence Details
113FG - Confluence		198	201.6	0.3	0.74	0	22.9	1.36		0.22	204.8					Confluence Results
86E	0.6	0.6	0.6	0.3	1		13.6	1.81	0.3	0.3	0.8	184.7	0.05237			
88E	3.4	4	4	0.3	1	1.12	14.7	1.74	0.3	0.3	5.3	408.8	0.28306	7.3(AG)	0.28(AG)	
90E	10.9	14.9	14.9	0.3	0.98	1.82	16.5	1.63	0.29	0.3	18	769.6	0.14006	8.0(AG)	0.61(AG)	
92AE	54.1	69	69	0.3	0.47	1.87	18.4	1.53	0.14	0.17	85	1863.8	0.07969	16.6(PUG)	0.89(PUG)	
77D	1	1	1	0.3	1		8.5	2.36	0.3	0.3	1.9	133.9	0.28867			
79D	3.6	4.6	4.6	0.3	0.97	2.3	10.8	2.07	0.29	0.29	7.5	841.5	0.18611	7.0(AG)	0.39(AG)	
81D	38.7	43.4	43.4	0.3	0.75	1.51	12.3	1.92	0.23	0.23	66.4	1288.7	0.09621	14.2(PUG)	0.51(PUG)	
83AD	12.9	56.3	56.3	0.3	0.64	0.57	12.9	1.87	0.19	0.22	84.2	715.5	0.07424	20.8(PUG)	1.64(PUG)	Warning: Pipe OVERFLOW
49C	1.6	1.6	1.6	0.3	0.83		13	1.86	0.25	0.25	2.4	298.2	0.16974			
51C	13.1	14.7	14.7	0.3	0.92	1.74	14.8	1.73	0.28	0.27	19.5	900.1	0.2433	10.1(AG)	0.60(AG)	
53C	180.2	194.9	194.9	0.3	0.65	4.96	19.7	1.47	0.2	0.2	225.1	3802.8	0.04174	12.8(PUG)	0.76(PUG)	
55C	469.2	664.1	664.1	0.3	0.52	3.36	23.1	1.35	0.16	0.17	710.8	3256.2	0.01367	16.2(PUG)	2.96(PUG)	
57C	584.4	1248.5	1248.5	0.3	0.59	4.64	27.7	1.22	0.18	0.17	1182.1	5639.4	0.01479	20.3(PUG)	2.92(PUG)	
59C	621.7	1870.2	1870.2	0.3	0.66	2.02	29.7	1.17	0.2	0.18	1677.2	3106	0.0152	26.6(AG)	4.90(AG)	
61C	460.9	2331.1	2331.1	0.3	0.63	2.32	32.1	1.12	0.19	0.18	1984.4	2995.9	0.00792	21.8(AG)	6.34(AG)	
63C	253.7	2584.8	2584.8	0.3	0.57	1.87	33.9	1.09	0.17	0.18	2120.3	3174.9	0.01552	28.5(AG)	5.51(AG)	
65C	562.8	3147.6	3147.6	0.3	0.93	5.07	39	1	0.28	0.2	2298.4	3540.4	0.01097	11.6(AG)	9.29(AG)	
67C	527.7	3675.3	3675.3	0.3	0.95	4.42	43.4	0.95	0.29	0.21	2446.3	3940.9	0.02117	14.9(AG)	7.12(AG)	
69C	184.6	3859.9	3859.9	0.3	0.98	1.75	45.2	0.92	0.29	0.22	2483.1	1406.5	0.01655	13.4(AG)	6.89(AG)	
72C	136.4	3996.3	3996.3			0.99	46.2	0.91		0.22	2523.2	1366.8	0.01107	22.8(AG)	3.58(AG)	
74AC	33.5	4029.8	4029.8	0.3	0.59	0.86	47	0.9	0.18	0.22	2523.2	1309.1	0.01522	25.5(AG)	3.27(AG)	

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39B	1.4	1.4	1.4	0.3	1		10.5	2.1	0.3	0.3	2.3	197	0.21892			
41B	9.7	11.1	11.1	0.3	1	2.03	12.5	1.9	0.3	0.3	16.1	782.3	0.1224	7.5(AG)	0.65(AG)	
43B	34.9	46	46	0.3	1	3.07	15.6	1.68	0.3	0.3	57.7	1464.7	0.0788	8.9(AG)	1.28(AG)	
45B	89	135	135	0.3	1	6.52	22.1	1.38	0.3	0.3	132.5	3892.4	0.07549	10.7(AG)	1.68(AG)	
46AB		135		0.3	1	14.56	36.7	1.04		0.3	132.5	3374.1	0.01122	3.9(AG)	1.62(AG)	
2A	1.8	1.8	1.8	0.3	1		10.2	2.14	0.3	0.3	3	209.1	0.28782			
4A	12.7	14.5	14.5	0.3	1	2.11	12.3	1.92	0.3	0.3	21.4	964	0.15702	8.9(AG)	0.71(AG)	
7A	70.2	84.8	84.8			3.05	15.3	1.7		0.3	107.5	1276.5	0.05294	7.6(AG)	1.39(AG)	
9A	231.5	316.2	316.2	0.3	1	7.4	22.7	1.36	0.3	0.3	304.2	3456.5	0.02221	8.5(AG)	3.36(AG)	
11A	552.3	868.5	868.5	0.3	0.9	6.92	29.7	1.17	0.27	0.28	701.8	3177.5	0.01175	8.2(AG)	5.20(AG)	
13A	385.4	1253.9	1253.9	0.3	0.71	6.52	36.2	1.05	0.21	0.26	896.2	2938.7	0.00851	7.6(AG)	5.23(AG)	
15A	635.4	1889.4	1889.4	0.3	0.96	6.23	42.4	0.96	0.29	0.27	1180.8	3621.2	0.01369	9.9(AG)	5.98(AG)	
17A	485.9	2375.3	2375.3	0.3	0.98	1.73	44.1	0.94	0.29	0.27	1428.3	1101.4	0.01557	10.8(AG)	5.99(AG)	
19A	341.6	2716.9	2716.9	0.3	1	3.26	47.4	0.9	0.3	0.28	1535	2576.4	0.02524	13.2(AG)	5.52(AG)	
21A	523	3240	3240	0.3	1	8.43	55.8	0.82	0.3	0.28	1587.2	4504.6	0.01322	8.8(AG)	6.62(AG)	
24A	926.8	4166.8	4166.8			5.72	61.5	0.78		0.28	1877.1	2717.8	0.00813	7.9(AG)	7.54(AG)	
26A	525.1	4691.9	4691.9	0.3	0.96	6.07	67.6	0.74	0.29	0.28	1940.2	4058.4	0.01409	11.1(AG)	5.01(AG)	
28A	550.7	5242.6	5242.6	0.3	0.92	5.71	73.3	0.7	0.28	0.28	2014.5	3039.6	0.00901	8.8(AG)	9.94(AG)	
30A	497	5739.6	5739.6	0.3	0.96	6.82	80.1	0.67	0.29	0.28	2022.8	3730.1	0.0095	9.0(AG)	9.82(AG)	
32A	577.9	6317.6	6317.6	0.3	1	8.37	88.5	0.63	0.3	0.28	2022.8	3572	0.00608	7.0(AG)	8.82(AG)	
35A	664.9	6982.5	6982.5			14.2	102.7	0.58		0.28	1890.3	7751.5	0.00983	9.0(AG)	8.48(AG)	
46AB	149.9	7132.4	7132.4	0.3	1	7.28	110	0.56	0.3	0.28	1890.3	3644.1	0.01032	8.3(AG)	7.07(AG)	
Head Node - 45B		2575.2		0.31	0.94	0	36.7	1.04		0.29	1761.9					Confluence Details
Head Node - 35A		7330.8		0.3	0.94	0	110	0.56		0.29	1833.4					Confluence Details
46AB - Confluence		7330.8	7330.8	0.3	0.94	0	110	0.56		0.29	1890.3					Confluence Results
Head Node - 72C		7062.8		0.3	0.82	0	47	0.9		0.25	4290.9					Confluence Details
Head Node - 45B		6163.4		0.3	0.82	0	41	0.98		0.25	4194.6					Confluence Details
Head Node - 35A		11430.8		0.3	0.87	0	114.3	0.55		0.26	3050.8					Confluence Details
74AC - Confluence		7062.8	11430.8	0.3	0.82	0	47	0.9		0.25	4290.9					Confluence Results
Head Node - 72C		7528.7		0.3	0.82	0	57.2	0.81		0.25	4320.9					Confluence Details
Head Node - 45B		6629.3		0.3	0.82	0	51.2	0.86		0.25	4227.2					Confluence Details
Head Node - 35A		11896.7		0.3	0.87	0	125.4	0.52		0.26	3066					Confluence Details
Head Node - 81D		1741.8		0.3	0.82	0	12.9	1.87		0.25	2882.1					Confluence Details
83AD - Confluence		7528.7	11896.7	0.3	0.82	0	57.2	0.81		0.25	4320.9					Confluence Results
Head Node - 72C		7607.2		0.3	0.82	0	58.3	0.8		0.25	3817.4					Confluence Details
Head Node - 45B		6707.8		0.3	0.82	0	52.4	0.85		0.25	3666.7					Confluence Details
Head Node - 35A		11975.2		0.3	0.87	0	126.7	0.52		0.26	2787.6					Confluence Details
Head Node - 81D		1804.4		0.3	0.81	0	14.2	1.77		0.25	2503					Confluence Details
Head Node - 90E		2362.5		0.3	0.81	0	18.4	1.53		0.25	2754.9					Confluence Details
92AE - Confluence		7607.2	11975.2	0.3	0.82	0	58.3	0.8		0.25	4320.9					Confluence Results
Head Node - 105F		3278.5		0.3	0.8	0	23.9	1.32		0.24	3182.3					Confluence Details
Head Node - 112G		3751.3		0.3	0.8	0	27.5	1.22		0.24	3256.9					Confluence Details
Head Node - 123H		2314.2		0.3	0.81	0	18.2	1.54		0.24	2775.2					Confluence Details

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 72C		7922.4		0.3	0.81	0	59	0.8		0.25	3979.9					Confluence Details
Head Node - 45B		7023		0.3	0.81	0	53.1	0.84		0.25	3842.3					Confluence Details
Head Node - 35A		12290.4		0.3	0.86	0	127.4	0.52		0.26	2875.1					Confluence Details
Head Node - 81D		2018.8		0.3	0.79	0	15	1.72		0.24	2774.6					Confluence Details
Head Node - 90E		2628.5		0.3	0.79	0	19.2	1.5		0.24	3048.2					Confluence Details
125AF - Confluence		7922.4	12290.4	0.3	0.81	0	59	0.8		0.25	4320.9					Confluence Results
Head Node - 105F		3358		0.3	0.79	0	27.1	1.23		0.24	3227					Confluence Details
Head Node - 112G		3830.8		0.3	0.8	0	30.7	1.15		0.24	3298.2					Confluence Details
Head Node - 123H		2389.2		0.3	0.79	0	21.5	1.4		0.24	2821.4					Confluence Details
Head Node - 72C		8001.9		0.3	0.81	0	62	0.77		0.24	4006.4					Confluence Details
Head Node - 45B		7102.5		0.3	0.81	0	56.1	0.82		0.24	3870.5					Confluence Details
Head Node - 35A		12370		0.3	0.86	0	130.7	0.51		0.26	2891					Confluence Details
Head Node - 81D		2088.1		0.3	0.77	0	18.3	1.54		0.23	2817.9					Confluence Details
Head Node - 90E		2705.1		0.3	0.78	0	22.4	1.37		0.24	3095.1					Confluence Details
Head Node - 130I		2933.2		0.3	0.79	0	24	1.32		0.24	3142.8					Confluence Details
131AI - Confluence		8001.9	12370	0.3	0.81	0	62	0.77		0.24	4320.9					Confluence Results
Head Node - 148J		7155.3		0.3	0.79	0	50	0.87		0.24	4121.3					Confluence Details
Head Node - 155K		3422.3		0.3	0.77	0	24.7	1.3		0.23	3309.6					Confluence Details
Head Node - 174L		3591.2		0.3	0.78	0	25.7	1.27		0.24	3364.9					Confluence Details
Head Node - 181M		3156.7		0.3	0.79	0	27.7	1.22		0.24	2804.4					Confluence Details
Head Node - 105F		3926.3		0.3	0.79	0	27.9	1.21		0.24	3472.2					Confluence Details
Head Node - 112G		4459.6		0.3	0.79	0	31.5	1.13		0.24	3613.2					Confluence Details
Head Node - 123H		2854.4		0.3	0.77	0	22.4	1.37		0.23	2950.9					Confluence Details
Head Node - 72C		8938.9		0.3	0.8	0	62.7	0.77		0.24	4265.3					Confluence Details
Head Node - 45B		8039.4		0.3	0.8	0	56.8	0.81		0.24	4156.9					Confluence Details
Head Node - 35A		13306.9		0.3	0.85	0	131.5	0.51		0.26	3021.4					Confluence Details
Head Node - 81D		2488.9		0.3	0.75	0	19.1	1.5		0.23	2870.5					Confluence Details
Head Node - 90E		3187.2		0.3	0.76	0	23.2	1.34		0.23	3222.5					Confluence Details
Head Node - 130I		3447.3		0.3	0.79	0	24.8	1.29		0.24	3304.7					Confluence Details
183AJ - Confluence		8938.9	13306.9	0.3	0.8	0	62.7	0.77		0.24	4320.9					Confluence Results
Head Node - 148J		7177.9		0.3	0.79	1.46	51.4	0.86		0.24	4121.3					Confluence Details
Head Node - 155K		3444.9		0.3	0.77	1.54	26.2	1.26		0.23	3309.6					Confluence Details
Head Node - 174L		3613.8		0.3	0.78	1.53	27.3	1.23		0.24	3364.9					Confluence Details
Head Node - 181M		3179.3		0.3	0.78	1.6	29.3	1.18		0.24	2804.4					Confluence Details
Head Node - 105F		3948.9		0.3	0.79	1.52	29.4	1.18		0.24	3472.2					Confluence Details
Head Node - 112G		4482.2		0.3	0.79	1.5	33	1.1		0.24	3613.2					Confluence Details
Head Node - 123H		2877		0.3	0.77	1.58	23.9	1.32		0.23	2950.9					Confluence Details
Head Node - 72C		8961.5		0.3	0.8	1.44	64.1	0.76		0.24	4265.3					Confluence Details
Head Node - 45B		8062		0.3	0.8	1.45	58.3	0.8		0.24	4156.9					Confluence Details
Head Node - 35A		13329.5		0.3	0.85	1.57	133.1	0.5		0.26	3021.4					Confluence Details
Head Node - 81D		2511.5		0.3	0.75	1.59	20.7	1.43		0.23	2870.5					Confluence Details
Head Node - 90E		3209.8		0.3	0.76	1.55	24.8	1.3		0.23	3222.5					Confluence Details
Head Node - 130I		3469.9		0.3	0.79	1.54	26.4	1.25		0.24	3304.7					Confluence Details

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
185A	22.6	8961.5	13329.5	0.3	0.44	1.44	64.1	0.76	0.13	0.24	4320.9	1290.5	0.00171	14.9(AG)	13.47(AG)	
Head Node - 191N		5131.2		0.3	0.79	0	37.3	1.03		0.24	3749.6					Confluence Details
Head Node - 148J		7197.7		0.3	0.79	0	51.5	0.86		0.24	4136.1					Confluence Details
Head Node - 155K		3458.8		0.3	0.77	0	26.2	1.25		0.23	3325					Confluence Details
Head Node - 174L		3628.3		0.3	0.78	0	27.3	1.23		0.23	3380.5					Confluence Details
Head Node - 181M		3194.9		0.3	0.78	0	29.3	1.18		0.24	2820.5					Confluence Details
Head Node - 105F		3964.5		0.3	0.78	0	29.4	1.18		0.24	3488.4					Confluence Details
Head Node - 112G		4499.7		0.3	0.79	0	33	1.1		0.24	3630.1					Confluence Details
Head Node - 123H		2889.7		0.3	0.77	0	24	1.32		0.23	2965.7					Confluence Details
Head Node - 72C		8981.2		0.3	0.8	0	64.2	0.76		0.24	4278.2					Confluence Details
Head Node - 45B		8081.8		0.3	0.8	0	58.3	0.8		0.24	4170.6					Confluence Details
Head Node - 35A		13349.3		0.3	0.85	0	133.2	0.5		0.26	3029.8					Confluence Details
Head Node - 81D		2522.5		0.3	0.75	0	20.8	1.43		0.23	2884.4					Confluence Details
Head Node - 90E		3222.9		0.3	0.76	0	24.8	1.3		0.23	3237.5					Confluence Details
Head Node - 130I		3483.9		0.3	0.78	0	26.4	1.25		0.24	3320.1					Confluence Details
193AN - Confluence		8981.2	13349.3	0.3	0.8	0	64.2	0.76		0.24	4320.9					Confluence Results
Head Node - 197O		2891.3		0.3	0.78	0	20.6	1.44		0.24	3227.4					Confluence Details
Head Node - 202P		2934		0.3	0.78	0	20.9	1.43		0.24	3242.7					Confluence Details
Head Node - 191N		5159		0.3	0.78	0	37.7	1.02		0.24	3774.9					Confluence Details
Head Node - 148J		7225.5		0.3	0.78	0	51.8	0.86		0.24	4157.1					Confluence Details
Head Node - 155K		3486.6		0.3	0.76	0	26.6	1.25		0.23	3355.9					Confluence Details
Head Node - 174L		3656.1		0.3	0.77	0	27.6	1.22		0.23	3410.7					Confluence Details
Head Node - 181M		3222.7		0.3	0.78	0	29.7	1.17		0.23	2849.5					Confluence Details
Head Node - 105F		3992.4		0.3	0.78	0	29.7	1.17		0.24	3517.3					Confluence Details
Head Node - 112G		4527.6		0.3	0.78	0	33.4	1.1		0.24	3657.2					Confluence Details
Head Node - 123H		2917.5		0.3	0.76	0	24.3	1.31		0.23	2998.2					Confluence Details
Head Node - 72C		9009.1		0.3	0.8	0	64.5	0.76		0.24	4296.7					Confluence Details
Head Node - 45B		8109.7		0.3	0.8	0	58.6	0.8		0.24	4190.1					Confluence Details
Head Node - 35A		13377.1		0.3	0.85	0	133.5	0.5		0.26	3041.8					Confluence Details
Head Node - 81D		2550.3		0.3	0.74	0	21.1	1.42		0.22	2919.7					Confluence Details
Head Node - 90E		3250.7		0.3	0.75	0	25.1	1.29		0.23	3269.4					Confluence Details
Head Node - 130I		3511.7		0.3	0.78	0	26.7	1.24		0.23	3350.9					Confluence Details
204AP - Confluence		9009.1	13377.1	0.3	0.8	0	64.5	0.76		0.24	4320.9					Confluence Results
Head Node - 197O		2904.4		0.3	0.78	0.63	21.2	1.41		0.23	3227.4					Confluence Details
Head Node - 202P		2947.1		0.3	0.78	0.63	21.5	1.4		0.23	3242.7					Confluence Details
Head Node - 191N		5172.1		0.3	0.78	0.59	38.3	1.02		0.24	3774.9					Confluence Details
Head Node - 148J		7238.6		0.3	0.78	0.57	52.4	0.85		0.24	4157.1					Confluence Details
Head Node - 155K		3499.7		0.3	0.76	0.62	27.2	1.23		0.23	3355.9					Confluence Details
Head Node - 174L		3669.2		0.3	0.77	0.62	28.2	1.2		0.23	3410.7					Confluence Details
Head Node - 181M		3235.8		0.3	0.77	0.66	30.3	1.16		0.23	2849.5					Confluence Details
Head Node - 105F		4005.5		0.3	0.78	0.61	30.4	1.16		0.23	3517.3					Confluence Details
Head Node - 112G		4540.7		0.3	0.78	0.6	34	1.09		0.24	3657.2					Confluence Details
Head Node - 123H		2930.7		0.3	0.76	0.65	25	1.29		0.23	2998.2					Confluence Details

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Head Node - 72C		9022.2		0.3	0.8	0.57	65	0.75		0.24	4296.7					Confluence Details
Head Node - 45B		8122.8		0.3	0.8	0.57	59.2	0.79		0.24	4190.1					Confluence Details
Head Node - 35A		13390.2		0.3	0.85	0.64	134.1	0.5		0.26	3041.8					Confluence Details
Head Node - 81D		2563.4		0.3	0.74	0.65	21.7	1.39		0.22	2919.7					Confluence Details
Head Node - 90E		3263.8		0.3	0.75	0.63	25.7	1.27		0.23	3269.4					Confluence Details
Head Node - 130I		3524.8		0.3	0.77	0.62	27.3	1.23		0.23	3350.9					Confluence Details
206A	13.1	9022.2	13390.2	0.3	0.09	0.57	65	0.75	0.03	0.24	4320.9	787.4	0.02143	23.2(AG)	3.48(AG)	
Head Node - 228S		3343.8		0.3	0.07	0	28.9	1.19		0.02	3299.7					Confluence Details
Head Node - 197O		3022.7		0.3	0.75	0	24.1	1.32		0.23	3345.8					Confluence Details
Head Node - 202P		3066.6		0.3	0.75	0	24.4	1.31		0.23	3361.7					Confluence Details
Head Node - 191N		5307.9		0.3	0.76	0	40.9	0.98		0.23	3878.7					Confluence Details
Head Node - 148J		7376.7		0.3	0.77	0	55	0.83		0.23	4244.3					Confluence Details
Head Node - 155K		3631.1		0.3	0.73	0	30	1.16		0.22	3475.7					Confluence Details
Head Node - 174L		3801		0.3	0.74	0	31	1.14		0.23	3528.9					Confluence Details
Head Node - 181M		3368.5		0.3	0.75	0	33.3	1.1		0.23	2964.3					Confluence Details
Head Node - 105F		4138.1		0.3	0.75	0	33.1	1.1		0.23	3632.4					Confluence Details
Head Node - 112G		4674.7		0.3	0.76	0	36.7	1.04		0.23	3767.1					Confluence Details
Head Node - 123H		3060.8		0.3	0.73	0	27.9	1.21		0.22	3120.7					Confluence Details
Head Node - 72C		9160.2		0.3	0.79	0	67.6	0.74		0.24	4374					Confluence Details
Head Node - 45B		8260.8		0.3	0.79	0	61.8	0.78		0.24	4271.6					Confluence Details
Head Node - 35A		13528.3		0.3	0.84	0	137	0.5		0.25	3092.8					Confluence Details
Head Node - 81D		2684.3		0.3	0.71	0	24.7	1.3		0.21	3039.4					Confluence Details
Head Node - 90E		3394.5		0.3	0.72	0	28.6	1.2		0.22	3391.2					Confluence Details
Head Node - 130I		3656.3		0.3	0.75	0	30.1	1.16		0.23	3470.4					Confluence Details
Head Node - 219R		2925.5		0.3	0.75	0	26.7	1.24		0.23	3093.3					Confluence Details
Head Node - 214Q		6136.7		0.3	0.76	0	46.6	0.91		0.23	4023.7					Confluence Details
230AQ - Confluence		9160.2	13528.3	0.3	0.79	0	67.6	0.74		0.24	4374					Confluence Results
Head Node - 244U		4121.9		0.3	0.09	0	35.4	1.06		0.03	3665.5					Confluence Details
Head Node - 237T		4374.6		0.3	0.09	0	38.8	1.01		0.03	3575.4					Confluence Details
Head Node - 228S		3471.2		0.3	0.09	0	32.2	1.12		0.03	3440.1					Confluence Details
Head Node - 197O		3137.7		0.3	0.74	0	27.4	1.23		0.22	3418					Confluence Details
Head Node - 202P		3182.4		0.3	0.74	0	27.7	1.22		0.22	3434.2					Confluence Details
Head Node - 191N		5446.7		0.3	0.75	0	44.1	0.94		0.23	3950.8					Confluence Details
Head Node - 148J		7515.5		0.3	0.76	0	58	0.8		0.23	4304.9					Confluence Details
Head Node - 155K		3761.2		0.3	0.72	0	33.2	1.1		0.22	3553.5					Confluence Details
Head Node - 174L		3933.8		0.3	0.73	0	34.3	1.08		0.22	3607.7					Confluence Details
Head Node - 181M		3505.4		0.3	0.73	0	36.7	1.04		0.22	3043.4					Confluence Details
Head Node - 105F		4274.6		0.3	0.74	0	36.3	1.04		0.22	3711.7					Confluence Details
Head Node - 112G		4813.6		0.3	0.75	0	39.9	0.99		0.23	3843.9					Confluence Details
Head Node - 123H		3185.7		0.3	0.72	0	31.2	1.14		0.22	3196.7					Confluence Details
Head Node - 72C		9299.1		0.3	0.78	0	70.7	0.72		0.24	4427.4					Confluence Details
Head Node - 45B		8399.6		0.3	0.78	0	64.9	0.75		0.24	4328					Confluence Details
Head Node - 35A		13667.1		0.3	0.84	0	140.4	0.49		0.25	3126.5					Confluence Details

Brea Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 81D		2801		0.3	0.7	0	28.1	1.21		0.21	3112.3					Confluence Details
Head Node - 90E		3521.1		0.3	0.71	0	31.9	1.13		0.22	3467.7					Confluence Details
Head Node - 130I		3786.8		0.3	0.74	0	33.4	1.1		0.22	3548.4					Confluence Details
Head Node - 219R		3047.4		0.3	0.73	0	30.1	1.16		0.22	3168.2					Confluence Details
Head Node - 214Q		6275.5		0.3	0.75	0	49.7	0.88		0.23	4090.6					Confluence Details
251AT - Confluence		9299.1	13667.1	0.3	0.78	0	70.7	0.72		0.24	4427.4					Confluence Results
Head Node - 259V		3777.5		0.3	0.78	0	29.4	1.18		0.24	3227.7					Confluence Details
Head Node - 244U		4233.7		0.3	0.1	0	38.6	1.01		0.03	3761.8					Confluence Details
Head Node - 237T		4488.1		0.3	0.1	0	42	0.96		0.03	3796.9					Confluence Details
Head Node - 228S		3581		0.3	0.1	0	35.4	1.06		0.03	3340.6					Confluence Details
Head Node - 197O		3244.4		0.3	0.73	0	30.6	1.15		0.22	2732.3					Confluence Details
Head Node - 202P		3289.3		0.3	0.74	0	30.9	1.14		0.22	2751.5					Confluence Details
Head Node - 191N		5562.2		0.3	0.75	0	47.2	0.9		0.23	3405.3					Confluence Details
Head Node - 148J		7630.9		0.3	0.76	0	61.1	0.78		0.23	3809.7					Confluence Details
Head Node - 155K		3871.7		0.3	0.72	0	36.5	1.04		0.22	2897.2					Confluence Details
Head Node - 174L		4044.8		0.3	0.73	0	37.5	1.03		0.22	2957.6					Confluence Details
Head Node - 181M		3618.1		0.3	0.73	0	40.1	0.99		0.22	2521.8					Confluence Details
Head Node - 105F		4387		0.3	0.74	0	39.5	1		0.22	3076.4					Confluence Details
Head Node - 112G		4927.5		0.3	0.75	0	43	0.95		0.23	3237.7					Confluence Details
Head Node - 123H		3294.9		0.3	0.71	0	34.6	1.07		0.22	2567.6					Confluence Details
Head Node - 72C		9414.5		0.3	0.78	0	73.7	0.7		0.24	3982.6					Confluence Details
Head Node - 45B		8515.1		0.3	0.78	0	67.9	0.74		0.23	3865.6					Confluence Details
Head Node - 35A		13782.5		0.3	0.83	0	143.8	0.48		0.25	2888.4					Confluence Details
Head Node - 81D		2908.3		0.3	0.69	0	31.4	1.13		0.21	2437.5					Confluence Details
Head Node - 90E		3630.7		0.3	0.71	0	35.1	1.07		0.21	2803.2					Confluence Details
Head Node - 130I		3897.4		0.3	0.74	0	36.6	1.04		0.22	2892.2					Confluence Details
Head Node - 219R		3155.9		0.3	0.73	0	33.4	1.1		0.22	2504.4					Confluence Details
Head Node - 214Q		6391		0.3	0.75	0	52.8	0.85		0.23	3599.5					Confluence Details
Head Node - 269X		3824.9		0.3	0.1	0	40.6	0.98		0.03	3302.3					Confluence Details
Head Node - 265W		5542.3		0.3	0.1	0	47.1	0.9		0.03	4387.9					Confluence Details
272AV - Confluence		5542.3	13782.5	0.3	0.1	0	73.7	0.7		0.03	4427.4					Confluence Results

Carbon Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
215R	1.2	1.2	1.2	0.3	0.03		21.5	1.4	0.01	0.01	1.5	318.3	0.00204			
217R	2.6	3.8	3.8	0.3	0.84	14.74	36.3	1.05	0.25	0.17	3	961.5	0.00186	1.1(AG)	0.45(AG)	
219R	7.5	11.3	11.3	0.3	0.87	7.85	44.1	0.94	0.26	0.23	7.2	1178	0.01027	2.7(AG)	0.45(AG)	
221R	3.2	14.5	14.5	0.3	0.81	3.29	47.4	0.9	0.24	0.23	8.8	1004.6	0.00658	5.1(PUG)	0.79(PUG)	
231AP		14.5		0.3	0.78	1.25	48.6	0.89		0.23	8.8	599.3	0.02253	8.0(PUG)	0.57(PUG)	
223S	0.4	0.4	0.4	0.3	0.84		11.2	2.03	0.25	0.25	0.7	78.7	0.02554			
225S	3.8	4.2	4.2	0.3	0.99	2.77	13.9	1.79	0.3	0.29	5.8	158.4	0.0014	1.1(AG)	1.19(AG)	
227S	14.3	18.6	18.6	0.3	0.99	7.23	21.2	1.42	0.3	0.3	18.8	1078	0.00702	2.7(AG)	1.42(AG)	
231AP	9.5	28	28	0.3	0.78	2.88	24.1	1.32	0.23	0.28	26.5	1525	0.01456	8.8(PUG)	1.03(PUG)	
204Q	1.2	1.2	1.2	0.3	1		14.8	1.73	0.3	0.3	1.6	319.7	0.10222			
206Q	14.1	15.3	15.3	0.3	1	4.16	19	1.51	0.3	0.3	16.8	1293.6	0.03783	6.1(AG)	0.78(AG)	
207PQ		15.3		0.3	1	0.68	19.7	1.48		0.3	16.8	284.9	0.0559	7.0(AG)	0.70(AG)	
196P	1.4	1.4	1.4	0.25	1		16.5	1.63	0.25	0.25	1.8	286.7	0.04761			
198P	6.5	7.9	7.9	0.25	1	2.68	19.2	1.5	0.25	0.25	8.9	624.9	0.07242	4.5(AG)	0.62(AG)	
201P	77.3	85.2	85.2			4.93	24.1	1.31		0.24	82.8	1552.8	0.04492	6.0(AG)	1.52(AG)	
207PQ	39.8	124.9	124.9	0.26	1	2.48	26.6	1.24	0.26	0.25	112.9	740.1	0.01877	5.1(AG)	2.14(AG)	
Head Node - 201P		140.2		0.26	0.98	0	26.6	1.24		0.25	126.4					Confluence Details
Head Node - 206Q		107.5		0.26	0.98	0	19.7	1.48		0.26	119.5					Confluence Details
207PQ - Confluence		140.2	140.2	0.26	0.98	0	26.6	1.24		0.25	126.4					Confluence Results
Head Node - 201P		167.7		0.26	0.96	1.84	28.5	1.2		0.25	143.8					Confluence Details
Head Node - 206Q		135		0.26	0.96	1.87	21.5	1.4		0.25	140.6					Confluence Details
209P	27.4	167.7	167.7	0.29	0.86	1.84	28.5	1.2	0.25	0.25	143.8	1252.4	0.011	11.4(PUG)	1.39(PUG)	
Head Node - 201P		178.8		0.26	0.9	0.94	29.4	1.18		0.24	152.4					Confluence Details
Head Node - 206Q		146.1		0.26	0.89	0.94	22.5	1.37		0.24	150.2					Confluence Details
211P	11.1	178.8	178.8	0.3	0.02	0.94	29.4	1.18	0.01	0.24	152.4	587	0.00583	10.5(PUG)	2.71(PUG)	
Head Node - 201P		223		0.26	0.77	3.37	32.8	1.11		0.2	182.7					Confluence Details
Head Node - 206Q		190.3		0.26	0.73	3.38	25.8	1.27		0.2	184.5					Confluence Details
213P	44.2	190.3	223	0.3	0.23	3.38	25.8	1.27	0.07	0.2	184.5	2281.2	0.00691	11.2(PUG)	2.65(PUG)	
185O	1	1	1	0.3	1		13	1.86	0.3	0.3	1.4	316.4	0.19203			
187O	18.2	19.2	19.2	0.3	1	6.77	19.8	1.47	0.3	0.3	20.4	721.2	0.00331	2.1(AG)	1.58(AG)	
189O	19	38.1	38.1	0.3	0.99	3.75	23.5	1.33	0.3	0.3	35.8	1052.7	0.01281	4.9(AG)	1.30(AG)	
190AO		38.1		0.3	1	1.05	24.6	1.3		0.3	35.8	619.1	0.03685	9.9(AG)	0.36(AG)	
152L	1	1	1	0.25	1		11.2	2.02	0.25	0.25	1.6	202.1	0.16322			
155L	36.1	37.1	37.1			3.69	14.9	1.72		0.25	49.6	2105.6	0.24738	11.3(AG)	0.73(AG)	
157L	42.2	79.3	79.3	0.25	1	1.25	16.2	1.65	0.25	0.25	100.6	882	0.14198	12.7(AG)	1.38(AG)	
159L	98.1	177.4	177.4	0.25	1	2.83	19	1.5	0.25	0.25	202	1673.9	0.05526	10.6(AG)	2.08(AG)	
161L	102.1	279.5	279.5	0.25	0.93	6.42	25.4	1.28	0.23	0.24	262.3	3562.2	0.03786	9.4(AG)	2.00(AG)	
180AH		279.5		0.25	0.97	13.86	39.3	1		0.24	262.3	4046.5	0.00797	4.9(AG)	2.42(AG)	
171N	1	1	1	0.25	1		12.3	1.92	0.25	0.25	1.5	290.6	0.21156			
173N	5.9	6.9	6.9	0.25	1	0.89	13.2	1.84	0.25	0.25	9.9	428.4	0.34534	9.4(AG)	0.38(AG)	
175N	39.4	46.2	46.2	0.25	1	5.51	18.7	1.52	0.25	0.25	53.1	2724.9	0.11064	9.5(AG)	0.95(AG)	
180AH		46.2		0.25	1	58.9	77.6	0.68		0.25	53.1	7526.6	0.00336	2.1(AG)	1.16(AG)	
142K	1.2	1.2	1.2	0.25	1		10.9	2.05	0.25	0.25	2	249.1	0.28484			

Carbon Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
144K	7.3	8.5	8.5	0.25	1	1.87	12.8	1.88	0.25	0.25	12.5	899.5	0.2826	9.4(AG)	0.46(AG)	
146K	28.7	37.1	37.1	0.25	0.98	3.38	16.2	1.65	0.25	0.25	47.2	1571	0.09281	8.8(AG)	0.99(AG)	
148K	19.8	56.9	56.9	0.25	0.72	0.34	16.5	1.63	0.18	0.22	72.5	356.3	0.04682	17.3(PUG)	1.23(PUG)	
150K	20.4	77.3	77.3	0.25	0.62	1.28	17.8	1.56	0.15	0.2	95.1	1597.3	0.05662	20.8(PUG) 6.0(AG)	1.49(PUG) 0.38(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
180AH		77.3		0.25	0.82	17.31	35.1	1.07		0.2	95.1	3683.7	0.00781	3.5(AG)	1.40(AG)	
133J	3.4	3.4	3.4	0.25	0.45		17.5	1.58	0.11	0.11	4.6	310.1	0.04208			
135J	4.4	7.9	7.9	0.25	0.39	1.7	19.2	1.5	0.1	0.1	9.9	428	0.05024	4.5(AG)	0.31(AG)	
137J	7.9	15.7	15.7	0.25	0.46	0.97	20.1	1.46	0.12	0.11	19.2	673.1	0.04691	11.6(PUG)	0.63(PUG)	
138HJ		15.7		0.25	0.44	1.91	22.1	1.38		0.11	19.2	1421.6	0.03452	12.4(AG)	0.00(AG)	
123I	0.6	0.6	0.6	0.25	1		9.7	2.2	0.25	0.25	1.1	142.4	0.16963			
125I	5	5.7	5.7	0.25	1	2.36	12	1.94	0.25	0.25	8.7	754.8	0.12361	6.3(AG)	0.47(AG)	
127I	15.5	21.2	21.2	0.25	1	2.12	14.2	1.77	0.25	0.25	29.3	1163	0.18456	10.2(AG)	0.80(AG)	
129I	12.9	34.1	34.1	0.25	0.52	0.72	14.9	1.73	0.13	0.2	47.1	750.8	0.06808	17.3(PUG)	0.87(PUG)	
130HI		34.1		0.25	0.82	1.41	16.3	1.64		0.2	47.1	1312.3	0.03686	15.5(PUG)	1.16(PUG)	
114H	1.2	1.2	1.2	0.25	1		10.6	2.09	0.25	0.25	2	251.5	0.33878			
116H	37.1	38.3	38.3	0.25	1	3.93	14.5	1.75	0.25	0.25	52.2	1636	0.03764	8.2(AG)	1.35(AG)	
118H	166.3	204.6	204.6	0.25	1	4	18.5	1.53	0.25	0.25	236.9	5190	0.07076	25.4(AG)	1.03(AG)	
120H	45.4	250	250	0.25	1	1.22	19.7	1.47	0.25	0.25	277.3	2391.7	0.13778	33.4(AG)	0.93(AG)	
130HI	51.9	301.9	301.9	0.25	0.86	2.77	22.5	1.37	0.21	0.24	307.9	1804.3	0.04359	10.9(AG)	2.89(AG)	
Head Node - 129I		252.7		0.25	0.95	0	16.3	1.64		0.24	324					Confluence Details
Head Node - 120H		336		0.25	0.96	0	22.5	1.37		0.24	346.1					Confluence Details
130HI - Confluence		336	336	0.25	0.96	0	22.5	1.37		0.24	346.1					Confluence Results
Head Node - 129I		301.8		0.25	0.92	0	17.6	1.57		0.23	368.6					Confluence Details
Head Node - 120H		388.3		0.25	0.93	0	23.7	1.33		0.23	386.8					Confluence Details
Head Node - 137J		365.5		0.25	0.92	0	22.1	1.38		0.23	382.9					Confluence Details
138HJ - Confluence		388.3	388.3	0.25	0.93	0	23.7	1.33		0.23	386.8					Confluence Results
Head Node - 129I		326.4		0.25	0.9	1.15	18.7	1.52		0.23	382.6					Confluence Details
Head Node - 120H		412.9		0.25	0.91	1.15	24.9	1.29		0.23	398.5					Confluence Details
Head Node - 137J		390.1		0.25	0.9	1.15	23.2	1.34		0.23	395.8					Confluence Details
140H	24.6	412.9	412.9	0.25	0.69	1.15	24.9	1.29	0.17	0.23	398.5	662.1	0.00329	9.6(PUG)	5.33(PUG)	Warning: Pipe OVERFLOW
163M	1	1	1	0.25	1		10.3	2.12	0.25	0.25	1.7	225.3	0.31105			
165M	16.5	17.6	17.6	0.25	1	1.87	12.2	1.93	0.25	0.25	26.8	1189.3	0.3511	12.6(AG)	0.64(AG)	
167M	45	62.6	62.6	0.25	1	1.88	14.1	1.78	0.25	0.25	86.9	1143.3	0.11458	11.3(AG)	1.35(AG)	
169M	63.4	125.9	125.9	0.25	1	5.46	19.5	1.48	0.25	0.25	140.7	2471.2	0.03121	7.8(AG)	2.08(AG)	
180AH		125.9		0.25	1	22.66	42.2	0.96		0.25	140.7	4943	0.00589	3.6(AG)	1.88(AG)	
94F	0.6	0.6	0.6	0.25	1		7.1	2.61	0.25	0.25	1.3	115.4	0.51658			
96F	4.6	5.2	5.2	0.25	1	0.9	8	2.44	0.25	0.25	10.4	388.5	0.3187	8.7(AG)	0.33(AG)	
99F	34.9	40.2	40.2			2.28	10.3	2.12		0.25	68.2	1101.2	0.14566	9.2(AG)	0.66(AG)	
107FG	43	83.1	83.1	0.25	1	2.32	12.6	1.89	0.25	0.25	124	1467.6	0.09393	11.2(AG)	1.41(AG)	
102G	1	1	1	0.25	1		10.6	2.09	0.25	0.25	1.7	254.1	0.33994			

Carbon Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
105G	24.4	25.4	25.4			2.57	13.2	1.85		0.25	36.8	1011.3	0.17618	7.8(AG)	0.46(AG)	
107FG	82.9	108.4	108.4	0.25	1	5.3	18.5	1.53	0.25	0.25	125.6	3140.8	0.08272	11.0(AG)	1.67(AG)	
Head Node - 99F		157.1		0.25	1	0	12.6	1.89		0.25	234.2					Confluence Details
Head Node - 105G		191.5		0.25	1	0	18.5	1.53		0.25	221.9					Confluence Details
107FG - Confluence		157.1	191.5	0.25	1	0	12.6	1.89		0.25	234.2					Confluence Results
Head Node - 99F		381.9		0.25	1	8.46	21.1	1.42		0.25	405					Confluence Details
Head Node - 105G		416.3		0.25	1	8.54	27	1.23		0.25	371.6					Confluence Details
109F	224.8	381.9	416.3	0.25	1	8.46	21.1	1.42	0.25	0.25	405	6544.7	0.06317	13.4(AG)	2.84(AG)	
73E	1.6	1.6	1.6	0.25	1		9.4	2.24	0.25	0.25	2.9	192.5	0.36471			
75E	9.5	11.1	11.1	0.25	1	1.35	10.7	2.07	0.25	0.25	18.4	765	0.21871	11.2(AG)	0.43(AG)	
78E	54.1	65.2	65.2			3.33	14.1	1.78		0.25	90.9	1574.2	0.08308	8.5(AG)	1.18(AG)	
80E	127.5	192.7	192.7	0.25	0.99	2.89	17	1.6	0.25	0.25	237.3	1835.9	0.06034	11.5(AG)	2.45(AG)	
83E	390.9	583.6	583.6			5.19	22.1	1.38		0.25	601	2742.7	0.03503	9.3(AG)	3.83(AG)	
85E	515	1098.6	1098.6	0.25	1	7.14	29.3	1.18	0.25	0.25	929.7	5490.1	0.03495	13.3(AG)	4.61(AG)	
87E	498.6	1597.2	1597.2	0.25	1	7.87	37.1	1.03	0.25	0.25	1136.3	5186.6	0.01892	11.1(AG)	5.53(AG)	
89E	592.5	2189.7	2189.7	0.25	1	12.04	49.2	0.88	0.25	0.25	1258.1	8671.6	0.02143	11.9(AG)	5.64(AG)	
91E	271.2	2460.9	2460.9	0.25	1	8.8	58	0.8	0.25	0.25	1258.1	6034.3	0.01862	11.3(AG)	5.73(AG)	
111AE	139.2	2600.1	2600.1	0.25	0.82	6.07	64.1	0.76	0.2	0.25	1258.1	3965.1	0.01661	10.8(AG)	5.89(AG)	
47D	1	1	1	0.25	1		9.8	2.18	0.25	0.25	1.8	163.8	0.21155			
49D	10.7	11.7	11.7	0.25	1	1.34	11.1	2.03	0.25	0.25	18.9	474.9	0.07856	7.1(AG)	0.63(AG)	
52D	118.3	130	130			3.32	14.5	1.75		0.25	177.3	1560.1	0.06354	9.0(AG)	1.38(AG)	
55D	637.9	767.8	767.8			5.56	20	1.46		0.2	875.2	2660.1	0.02774	8.7(AG)	4.09(AG)	
57D	639.1	1406.9	1406.9	0.25	0.99	7.25	27.3	1.23	0.25	0.22	1281.2	4332.4	0.02206	10.2(AG)	6.17(AG)	
59D	397.3	1804.2	1804.2	0.25	0.98	7.77	35	1.07	0.25	0.23	1371.3	4675.4	0.01947	9.9(AG)	6.46(AG)	
61D	531.7	2336	2336	0.25	0.99	8.24	43.3	0.95	0.25	0.23	1513.7	4475.4	0.01409	9.0(AG)	7.19(AG)	
63D	370.3	2706.3	2706.3	0.25	1	12.37	55.7	0.82	0.25	0.24	1513.7	7489.2	0.0184	9.9(AG)	6.58(AG)	
65AD	127.3	2833.6	2833.6	0.25	1	4.58	60.2	0.79	0.25	0.24	1513.7	3260.6	0.01979	11.8(AG)	5.09(AG)	
23B	1.6	1.6	1.6	0.25	1		12.9	1.87	0.25	0.25	2.4	297.4	0.17358			
25B	6.5	8.1	8.1	0.25	1	1.82	14.8	1.73	0.25	0.25	10.9	652.6	0.1319	6.9(AG)	0.39(AG)	
27B	25.8	33.9	33.9	0.25	1	2.96	17.7	1.56	0.25	0.25	40.4	1122	0.05695	7.1(AG)	1.09(AG)	
29B	94.8	128.7	128.7	0.25	1	5.07	22.8	1.36	0.25	0.25	129.4	1862.4	0.03569	6.8(AG)	2.08(AG)	
31B	266.8	395.5	395.5	0.25	0.96	4.62	27.4	1.22	0.24	0.24	351.8	2441.4	0.06983	9.7(AG)	2.70(AG)	
42BC	205.6	601.1	601.1	0.25	0.99	9.57	37	1.03	0.25	0.25	430.5	4103.9	0.02709	7.2(AG)	3.52(AG)	
34C	0.6	0.6	0.6	0.25	0.96		13.6	1.82	0.24	0.24	0.9	323	0.16318			
36C	5.7	6.3	6.3	0.25	1	1.69	15.2	1.7	0.25	0.25	8.3	549.6	0.1529	6.6(AG)	0.37(AG)	
38C	47	53.3	53.3	0.25	1	4.4	19.6	1.48	0.25	0.25	59.3	1392.2	0.04977	6.2(AG)	1.27(AG)	
40C	146.1	199.4	199.4	0.25	1	5.34	25	1.29	0.25	0.25	188.1	1952	0.04088	6.8(AG)	2.36(AG)	
42BC	206	405.4	405.4	0.25	1	7.22	32.2	1.12	0.25	0.25	319.5	4672.4	0.05138	11.3(AG)	2.25(AG)	
Head Node - 31B		1006.5		0.25	0.99	0	37	1.03		0.25	719.1					Confluence Details
Head Node - 40C		928.6		0.25	0.99	0	32.2	1.12		0.25	734					Confluence Details
42BC - Confluence		928.6	1006.5	0.25	0.99	0	32.2	1.12		0.25	734					Confluence Results
2A	1.6	1.6	1.6	0.25	1		12.4	1.91	0.11	0.11	2.6	298.9	0.2197			
4A	8.3	9.9	9.9	0.25	0.63	1.25	13.6	1.81	0.16	0.15	14.9	795.7	0.10901	6.4(AG)	0.30(AG)	

Carbon Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
6A	28	37.9	37.9	0.25	0.93	0.94	14.6	1.75	0.23	0.21	52.9	1018.3	0.12889	20.8(AG)	0.51(AG)	
9A	201.6	239.5	239.5			2.72	17.3	1.59		0.2	301.1	2541.3	0.03234	15.6(PUG)	1.46(PUG)	
12A	446.4	685.9	685.9			6.33	23.6	1.33		0.21	697	4510.2	0.02597	12.4(AG)	2.99(AG)	
15A	753.5	1439.4	1439.4			3.67	27.3	1.23		0.23	1309.2	3117.4	0.02668	14.3(AG)	3.77(AG)	
18A	1164.3	2603.7	2603.7			10.97	38.3	1.01		0.23	1848.6	4610.3	0.01858	6.9(AG)	7.63(AG)	
20A	461.5	3065.2	3065.2	0.25	0.97	7.18	45.4	0.92	0.24	0.23	1912.4	3595.8	0.02017	8.3(AG)	9.46(AG)	
44AB	307.9	3373.2	3373.2	0.25	1	8.71	54.1	0.84	0.25	0.24	1912.4	5941	0.01826	11.2(AG)	7.55(AG)	
Head Node - 20A		4725.4		0.25	0.95	0	54.1	0.84		0.24	2644.8					Confluence Details
Head Node - 31B		3851.7		0.25	0.95	0	40.1	0.99		0.24	2699.6					Confluence Details
Head Node - 40C		3474.2		0.25	0.95	0	35.3	1.06		0.24	2671.8					Confluence Details
44AB - Confluence		3851.7	4725.4	0.25	0.95	0	40.1	0.99		0.24	2699.6					Confluence Results
Head Node - 63D		7620.9		0.25	0.94	0	60.2	0.79		0.24	3996.2					Confluence Details
Head Node - 20A		7404.1		0.25	0.94	0	55.6	0.82		0.24	4134					Confluence Details
Head Node - 31B		5870.2		0.25	0.94	0	41.6	0.97		0.24	4090.3					Confluence Details
Head Node - 40C		5266.6		0.25	0.94	0	36.8	1.04		0.24	4018					Confluence Details
65AD - Confluence		7404.1	7620.9	0.25	0.94	0	55.6	0.82		0.24	4134					Confluence Results
Head Node - 63D		7854		0.25	0.93	6.3	66.5	0.74		0.24	3617.8					Confluence Details
Head Node - 20A		7637.2		0.25	0.93	6.24	61.9	0.77		0.24	3732.9					Confluence Details
Head Node - 31B		6103.2		0.25	0.93	6.26	47.8	0.9		0.24	3649.1					Confluence Details
Head Node - 40C		5499.7		0.25	0.93	6.29	43.1	0.95		0.24	3560.5					Confluence Details
68A	233.1	7637.2	7854			6.24	61.9	0.77		0.24	4134	5055.8	0.01388	13.5(AG)	8.68(AG)	
Head Node - 63D		7999.5		0.25	0.93	6.69	73.2	0.7		0.24	3617.8					Confluence Details
Head Node - 20A		7782.7		0.25	0.93	6.64	68.5	0.73		0.24	3732.9					Confluence Details
Head Node - 31B		6248.7		0.25	0.93	6.68	54.5	0.83		0.24	3649.1					Confluence Details
Head Node - 40C		5645.2		0.25	0.93	6.72	49.8	0.88		0.24	3560.5					Confluence Details
70A	145.5	7782.7	7999.5	0.25	1	6.64	68.5	0.73	0.25	0.24	4134	4227.9	0.00777	10.9(AG)	10.00(AG)	
Head Node - 99F		4255		0.25	0.95	0	25.5	1.27		0.24	4362.7					Confluence Details
Head Node - 105G		5209.2		0.25	0.95	0	31.6	1.13		0.24	4588.8					Confluence Details
Head Node - 91E		9709.8		0.25	0.95	0	64.1	0.76		0.24	4951.4					Confluence Details
Head Node - 63D		11067.8		0.25	0.95	0	75.4	0.69		0.24	4900.2					Confluence Details
Head Node - 20A		10850.9		0.25	0.95	0	70.7	0.72		0.24	5089.3					Confluence Details
Head Node - 31B		9018		0.25	0.95	0	56.7	0.81		0.24	5117.5					Confluence Details
Head Node - 40C		8223		0.25	0.95	0	52	0.85		0.24	5024.6					Confluence Details
111AE - Confluence		9018	11067.8	0.25	0.95	0	56.7	0.81		0.24	5117.5					Confluence Results
Head Node - 150K		2146.1		0.25	0.95	0	35.1	1.07		0.24	2169.8					Confluence Details
Head Node - 175N		10492.9		0.25	0.95	0	77.6	0.68		0.24	5295.8					Confluence Details
Head Node - 161L		4856.5		0.25	0.95	0	39.3	1		0.24	4761.4					Confluence Details
Head Node - 129I		4243.3		0.25	0.95	0	27	1.23		0.24	4939.6					Confluence Details
Head Node - 120H		5213.1		0.25	0.95	0	33.1	1.1		0.24	5234.5					Confluence Details
Head Node - 137J		4947.9		0.25	0.95	0	31.4	1.13		0.24	5161.1					Confluence Details
Head Node - 99F		5410.8		0.25	0.95	0	39.5	1		0.24	5247.6					Confluence Details
Head Node - 105G		6376.5		0.25	0.95	0	45.4	0.92		0.24	5401.5					Confluence Details
Head Node - 91E		10896.4		0.25	0.95	0	77.6	0.68		0.24	5502.1					Confluence Details

Carbon Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 63D		12254.3		0.25	0.95	0	89	0.63		0.24	5388.6					Confluence Details
Head Node - 20A		12037.5		0.25	0.95	0	84.1	0.65		0.24	5602.7					Confluence Details
Head Node - 31B		10200.1		0.25	0.95	0	70.1	0.72		0.24	5712					Confluence Details
Head Node - 40C		9402.3		0.25	0.95	0	65.4	0.75		0.24	5650.2					Confluence Details
Head Node - 169M		5443.9		0.25	0.95	0	42.2	0.96		0.24	4986.4					Confluence Details
180AH - Confluence		10200.1	12254.3	0.25	0.95	0	70.1	0.72		0.24	5712					Confluence Results
Head Node - 150K		2158.4		0.25	0.95	0.49	35.6	1.06		0.24	2169.8					Confluence Details
Head Node - 175N		10505.3		0.25	0.95	0.39	78	0.68		0.24	5295.8					Confluence Details
Head Node - 161L		4868.8		0.25	0.95	0.4	39.7	0.99		0.24	4761.4					Confluence Details
Head Node - 129I		4255.6		0.25	0.95	0.4	27.4	1.22		0.24	4939.6					Confluence Details
Head Node - 120H		5225.4		0.25	0.95	0.39	33.5	1.09		0.24	5234.5					Confluence Details
Head Node - 137J		4960.2		0.25	0.95	0.39	31.8	1.13		0.24	5161.1					Confluence Details
Head Node - 99F		5423.1		0.25	0.95	0.39	39.9	0.99		0.24	5247.6					Confluence Details
Head Node - 105G		6388.8		0.25	0.95	0.39	45.8	0.92		0.24	5401.5					Confluence Details
Head Node - 91E		10908.7		0.25	0.95	0.39	78	0.68		0.24	5502.1					Confluence Details
Head Node - 63D		12266.6		0.25	0.95	0.39	89.3	0.63		0.24	5388.6					Confluence Details
Head Node - 20A		12049.8		0.25	0.95	0.39	84.5	0.65		0.24	5602.7					Confluence Details
Head Node - 31B		10212.4		0.25	0.95	0.38	70.5	0.72		0.24	5712					Confluence Details
Head Node - 40C		9414.6		0.25	0.95	0.38	65.8	0.75		0.24	5650.2					Confluence Details
Head Node - 169M		5456.2		0.25	0.95	0.4	42.6	0.96		0.24	4986.4					Confluence Details
182A	12.3	10212.4	12266.6	0.3	1	0.38	70.5	0.72	0.3	0.24	5712	1429.8	0.06325	62.1(AG)	7.71(AG)	Warning: Trapezoidal channel OVERFLOW
Head Node - 150K		2208.6		0.25	0.95	0	36	1.05		0.24	2196.7					Confluence Details
Head Node - 175N		10555.5		0.25	0.95	0	78.3	0.68		0.24	5309.4					Confluence Details
Head Node - 161L		4919.1		0.25	0.95	0	40	0.99		0.24	4786.1					Confluence Details
Head Node - 129I		4305.9		0.25	0.95	0	27.7	1.22		0.24	4972.4					Confluence Details
Head Node - 120H		5275.6		0.25	0.95	0	33.8	1.09		0.24	5262.7					Confluence Details
Head Node - 137J		5010.4		0.25	0.95	0	32.1	1.12		0.24	5190.4					Confluence Details
Head Node - 99F		5473.4		0.25	0.95	0	40.2	0.99		0.24	5272.2					Confluence Details
Head Node - 105G		6439.1		0.25	0.95	0	46.1	0.91		0.24	5423.5					Confluence Details
Head Node - 91E		10958.9		0.25	0.95	0	78.3	0.68		0.24	5515.7					Confluence Details
Head Node - 63D		12316.9		0.25	0.95	0	89.7	0.63		0.24	5400.4					Confluence Details
Head Node - 20A		12100		0.25	0.95	0	84.8	0.65		0.24	5615.2					Confluence Details
Head Node - 31B		10262.6		0.25	0.95	0	70.8	0.72		0.24	5727					Confluence Details
Head Node - 40C		9464.8		0.25	0.95	0	66.1	0.75		0.24	5666.2					Confluence Details
Head Node - 169M		5506.5		0.25	0.95	0	42.9	0.95		0.24	5009.7					Confluence Details
Head Node - 189O		3841.2		0.25	0.95	0	24.6	1.3		0.24	4799.3					Confluence Details
190AO - Confluence		10262.6	12316.9	0.25	0.95	0	70.8	0.72		0.24	5727					Confluence Results
Head Node - 150K		2220.5		0.25	0.95	0.42	36.4	1.04		0.24	2196.7					Confluence Details
Head Node - 175N		10567.4		0.25	0.95	0.35	78.7	0.68		0.24	5309.4					Confluence Details
Head Node - 161L		4931		0.25	0.95	0.35	40.3	0.99		0.24	4786.1					Confluence Details
Head Node - 129I		4317.8		0.25	0.94	0.35	28.1	1.21		0.24	4972.4					Confluence Details
Head Node - 120H		5287.5		0.25	0.95	0.35	34.1	1.08		0.24	5262.7					Confluence Details

Carbon Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 137J		5022.3		0.25	0.94	0.35	32.5	1.11		0.24	5190.4					Confluence Details
Head Node - 99F		5485.3		0.25	0.95	0.35	40.5	0.98		0.24	5272.2					Confluence Details
Head Node - 105G		6451		0.25	0.95	0.34	46.4	0.91		0.24	5423.5					Confluence Details
Head Node - 91E		10970.8		0.25	0.95	0.34	78.6	0.68		0.24	5515.7					Confluence Details
Head Node - 63D		12328.8		0.25	0.95	0.34	90	0.63		0.24	5400.4					Confluence Details
Head Node - 20A		12111.9		0.25	0.95	0.34	85.1	0.65		0.24	5615.2					Confluence Details
Head Node - 31B		10274.5		0.25	0.95	0.34	71.1	0.72		0.24	5727					Confluence Details
Head Node - 40C		9476.8		0.25	0.95	0.34	66.5	0.74		0.24	5666.2					Confluence Details
Head Node - 169M		5518.4		0.25	0.95	0.35	43.2	0.95		0.24	5009.7					Confluence Details
Head Node - 189O		3853.1		0.25	0.94	0.35	24.9	1.29		0.24	4799.3					Confluence Details
192A	11.9	10274.5	12328.8	0.3	0.45	0.34	71.1	0.72	0.14	0.24	5727	348.1	0.00231	17.1(AG)	21.74(AG)	Warning: Trapezoidal channel OVERFLOW
Head Node - 150K		2225.8		0.25	0.95	0.43	36.8	1.04		0.24	2196.7					Confluence Details
Head Node - 175N		10572.7		0.25	0.95	0.35	79	0.68		0.24	5309.4					Confluence Details
Head Node - 161L		4936.2		0.25	0.95	0.35	40.7	0.98		0.24	4786.1					Confluence Details
Head Node - 129I		4323		0.25	0.94	0.35	28.4	1.2		0.24	4972.4					Confluence Details
Head Node - 120H		5292.8		0.25	0.95	0.35	34.5	1.08		0.24	5262.7					Confluence Details
Head Node - 137J		5027.6		0.25	0.94	0.35	32.8	1.11		0.24	5190.4					Confluence Details
Head Node - 99F		5490.5		0.25	0.95	0.35	40.9	0.98		0.24	5272.2					Confluence Details
Head Node - 105G		6456.2		0.25	0.95	0.34	46.8	0.91		0.24	5423.5					Confluence Details
Head Node - 91E		10976.1		0.25	0.95	0.34	79	0.68		0.24	5515.7					Confluence Details
Head Node - 63D		12334		0.25	0.95	0.34	90.3	0.63		0.24	5400.4					Confluence Details
Head Node - 20A		12117.2		0.25	0.95	0.34	85.5	0.65		0.24	5615.2					Confluence Details
Head Node - 31B		10279.8		0.25	0.95	0.34	71.5	0.71		0.24	5727					Confluence Details
Head Node - 40C		9482		0.25	0.95	0.34	66.8	0.74		0.24	5666.2					Confluence Details
Head Node - 169M		5523.6		0.25	0.95	0.35	43.6	0.94		0.24	5009.7					Confluence Details
Head Node - 189O		3858.4		0.25	0.94	0.35	25.3	1.28		0.24	4799.3					Confluence Details
194A	5.2	10279.8	12334	0.3	0.44	0.34	71.5	0.71	0.13	0.24	5727	874.9	0.02401	42.8(AG)	10.57(AG)	Warning: Trapezoidal channel OVERFLOW
Head Node - 201P		5426.2		0.25	0.94	0	33.7	1.09		0.24	5439.3					Confluence Details
Head Node - 206Q		4304.7		0.25	0.94	0	26.8	1.24		0.24	5097.7					Confluence Details
Head Node - 227S		3720.2		0.25	0.94	0	24.1	1.32		0.24	4761.4					Confluence Details
Head Node - 221R		6774.5		0.25	0.95	0	48.6	0.89		0.24	5469.9					Confluence Details
Head Node - 150K		2487.8		0.26	0.93	0	36.9	1.04		0.24	2396					Confluence Details
Head Node - 175N		10838.2		0.25	0.95	0	79.1	0.67		0.24	5422.7					Confluence Details
Head Node - 161L		5199.4		0.25	0.94	0	40.8	0.98		0.24	4972.5					Confluence Details
Head Node - 129I		4557.6		0.25	0.94	0	28.5	1.2		0.24	5187.5					Confluence Details
Head Node - 120H		5554.1		0.25	0.94	0	34.5	1.07		0.24	5470.9					Confluence Details
Head Node - 137J		5284.3		0.25	0.94	0	32.9	1.11		0.24	5402.4					Confluence Details
Head Node - 99F		5753.8		0.25	0.94	0	40.9	0.98		0.24	5458.1					Confluence Details
Head Node - 105G		6721.3		0.25	0.94	0	46.8	0.91		0.24	5593.1					Confluence Details
Head Node - 91E		11241.6		0.25	0.94	0	79	0.68		0.24	5629					Confluence Details
Head Node - 63D		12599.6		0.25	0.94	0	90.4	0.63		0.24	5501.7					Confluence Details

Carbon Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 20A		12382.7		0.25	0.94	0	85.5	0.65		0.24	5721.4					Confluence Details
Head Node - 31B		10545.4		0.25	0.94	0	71.5	0.71		0.24	5849.9					Confluence Details
Head Node - 40C		9747.6		0.25	0.94	0	66.9	0.74		0.24	5795.8					Confluence Details
Head Node - 169M		5787.7		0.25	0.94	0	43.6	0.94		0.24	5187.7					Confluence Details
Head Node - 189O		4073.7		0.25	0.93	0	25.3	1.28		0.24	5013.2					Confluence Details
231AP - Confluence		10545.4	12599.6	0.25	0.94	0	71.5	0.71		0.24	5849.9					Confluence Results
Head Node - 201P		5432.7		0.25	0.94	0.13	33.9	1.09		0.24	5439.3					Confluence Details
Head Node - 206Q		4311.2		0.25	0.94	0.13	27	1.24		0.24	5097.7					Confluence Details
Head Node - 227S		3726.7		0.25	0.94	0.13	24.2	1.31		0.24	4761.4					Confluence Details
Head Node - 221R		6780.9		0.25	0.95	0.13	48.8	0.89		0.24	5469.9					Confluence Details
Head Node - 150K		2494.3		0.26	0.93	0.13	37	1.03		0.24	2396					Confluence Details
Head Node - 175N		10844.7		0.25	0.95	0.13	79.2	0.67		0.24	5422.7					Confluence Details
Head Node - 161L		5205.9		0.25	0.94	0.13	40.9	0.98		0.24	4972.5					Confluence Details
Head Node - 129I		4564.1		0.25	0.94	0.13	28.6	1.2		0.24	5187.5					Confluence Details
Head Node - 120H		5560.6		0.25	0.94	0.13	34.7	1.07		0.24	5470.9					Confluence Details
Head Node - 137J		5290.8		0.25	0.94	0.13	33	1.1		0.24	5402.4					Confluence Details
Head Node - 99F		5760.3		0.25	0.94	0.13	41.1	0.98		0.24	5458.1					Confluence Details
Head Node - 105G		6727.7		0.25	0.94	0.13	46.9	0.9		0.24	5593.1					Confluence Details
Head Node - 91E		11248.1		0.25	0.94	0.13	79.1	0.67		0.24	5629					Confluence Details
Head Node - 63D		12606.1		0.25	0.94	0.13	90.5	0.63		0.24	5501.7					Confluence Details
Head Node - 20A		12389.2		0.25	0.94	0.13	85.6	0.65		0.24	5721.4					Confluence Details
Head Node - 31B		10551.8		0.25	0.94	0.13	71.7	0.71		0.24	5849.9					Confluence Details
Head Node - 40C		9754		0.25	0.94	0.13	67	0.74		0.24	5795.8					Confluence Details
Head Node - 169M		5794.1		0.25	0.94	0.13	43.8	0.94		0.24	5187.7					Confluence Details
Head Node - 189O		4080.2		0.25	0.93	0.13	25.5	1.28		0.24	5013.2					Confluence Details
233A	6.5	10551.8	12606.1	0.3	0.35	0.13	71.7	0.71	0.11	0.24	5849.9	69.6	0.0013	8.7(PUG)	8.00(PUG)	Warning: Box culvert OVERFLOW

Fullerton Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
350O	2.2	2.2	2.2	0.3	0.35		14.8	1.73	0.11	0.11	3.3	303.9	0.09239			
352O	24.2	26.4	26.4	0.3	0.47	2.5	17.3	1.58	0.14	0.14	34.7	1067.1	0.02936	7.1(PUG)	0.41(PUG)	
354AX		26.4		0.3	0.46	1.43	18.7	1.52		0.14	34.7	494.5	0.00335	5.8(AG)	1.82(AG)	Warning: Trapezoidal channel OVERFLOW
343N	1.2	1.2	1.2	0.3	0.45		11.5	1.99	0.14	0.14	2	328	0.00424			
345N	13.7	14.9	14.9	0.3	0.41	10.7	22.2	1.38	0.12	0.12	17	1806.6	0.01034	3.5(AG)	0.45(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
348XK		14.9		0.3	0.42	8.22	30.5	1.15		0.12	17	1751.3	0.01027	3.6(AG)	0.79(AG)	
312I	1.4	1.4	1.4	0.3	0.45		11.8	1.97	0.14	0.14	2.3	284.9	0.00284			
314I	12.9	14.3	14.3	0.3	0.45	11.37	23.2	1.35	0.14	0.14	15.7	1543.7	0.00657	2.8(AG)	0.46(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
320XI		14.3		0.3	0.45	0.81	24	1.32		0.14	15.7	773.8	0.109	15.9(PUG)	0.82(PUG)	Warning: Pipe OVERFLOW
306H	1.4	1.4	1.4	0.3	0.45		6.1	2.84	0.14	0.14	3.5	201.2	0.03719			
308H	13.9	15.3	15.3	0.3	0.24	2.01	8.2	2.42	0.07	0.08	32.6	404.1	0.01015	3.8(AG)	0.57(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
309XH		15.3		0.3	0.26	2.11	10.3	2.13		0.08	32.6	1149.2	0.02079	9.1(PUG)	1.23(PUG)	Warning: Pipe OVERFLOW
299G	0.8	0.8	0.8	0.3	0.45		6	2.89	0.14	0.14	2	133.9	0.01935			
301G	10.3	11.1	11.1	0.3	0.34	9.02	15	1.72	0.1	0.11	16.3	834.6	0.00159	1.7(AG)	0.64(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
303G	11.7	22.8	22.8	0.3	0.29	1.65	16.6	1.62	0.09	0.1	31.6	723.2	0.00943	7.3(PUG)	1.16(PUG)	
304XG		22.8		0.3	0.32	0.76	17.4	1.58		0.1	31.6	650.9	0.03626	14.3(PUG)	1.15(PUG)	
290F	0.6	0.6	0.6	0.3	0.27		7	2.63	0.08	0.08	1.4	155.1	0.00645			
293F	22.2	22.8	22.8			6.86	13.9	1.79		0.1	35.1	1143.5	0.00758	3.3(AG)	0.55(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
295XF	15.9	38.7	38.7	0.3	0.4	1.53	15.4	1.69	0.12	0.11	55.7	1057.9	0.0228	11.5(PUG)	1.64(PUG)	Warning: Pipe OVERFLOW
285E	0.8	0.8	0.8	0.3	0.45		5.3	3.08	0.14	0.14	2.2	154.1	0.04509			
288XD	14.7	15.5	15.5	0.3	0.17	8.55	13.9	1.8	0.05	0.05	24.5	1624.2	0.01621	3.6(AG)	0.46(AG)	
279D	1.2	1.2	1.2	0.3	0.32		6.1	2.86	0.1	0.1	3	163.3	0.01788			
281D	4.8	6.1	6.1	0.3	0.24	3.48	9.5	2.22	0.07	0.08	11.8	336.2	0.01899	1.8(AG)	0.33(AG)	
283D	16.5	22.6	22.6	0.3	0.23	2.6	12.1	1.94	0.07	0.07	38.2	1337	0.01805	8.6(PUG)	0.90(PUG)	
288XD		22.6		0.3	0.24	1.61	13.7	1.8		0.07	38.2	661.5	0.00597	6.8(PUG)	2.05(PUG)	Warning: Pipe OVERFLOW
271C	1.8	1.8	1.8	0.3	0.2		7.3	2.58	0.06	0.06	4.1	226.1	0.00884			

Fullerton Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
274C	18.4	20.2	20.2			5.65	12.9	1.87		0.01	34.1	1361	0.02209	4.9(AG)	0.45(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
276XZ		20.2		0.3	0.02	1.05	14	1.79		0.01	34.1	703.8	0.01792	11.2(PUG)	1.34(PUG)	
243X	1	1	1	0.3	1		8.5	2.36	0.15	0.15	2	127	0.25669			
245X	13.9	14.9	14.9	0.3	0.47	1.71	10.2	2.13	0.14	0.14	26.9	1153.6	0.03786	13.3(AG)	0.86(AG)	
251XY		14.9		0.28	0.51	0.52	10.8	2.07		0.14	26.9	502.3	0.05622	16.1(PUG)	0.94(PUG)	
248Y	1.4	1.4	1.4	0.3	0.47		4	3.6	0.14	0.14	4.4	177.5	0.2537			
250Y	18.2	19.6	19.6	0.3	0.45	5.92	9.9	2.17	0.14	0.14	36.1	2209	0.05246	7.7(AG)	0.44(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
251XY	9.1	28.7	28.7	0.3	0.45	0.61	10.5	2.09	0.14	0.14	50.9	748.7	0.08753	20.4(PUG)	0.97(PUG)	
Head Node - 245X		43.6		0.29	0.47	0	10.8	2.07		0.14	77.3					Confluence Details
Head Node - 250Y		43.3		0.29	0.47	0	10.5	2.09		0.14	77.6					Confluence Details
251XY - Confluence		43.3	43.6	0.29	0.47	0	10.5	2.09		0.14	77.6					Confluence Results
Head Node - 245X		100.5		0.29	0.46	1.37	12.1	1.94		0.14	164.1					Confluence Details
Head Node - 250Y		100.2		0.29	0.46	1.37	11.9	1.96		0.14	165.4					Confluence Details
253X	56.9	100.2	100.5	0.3	0.45	1.37	11.9	1.96	0.14	0.14	165.4	1361.5	0.03009	16.6(PUG)	1.89(PUG)	
Head Node - 245X		127.7		0.32	0.44	0.81	12.9	1.87		0.14	200					Confluence Details
Head Node - 250Y		127.4		0.32	0.44	0.81	12.7	1.88		0.14	201.6					Confluence Details
256X	27.2	127.4	127.7			0.81	12.7	1.88		0.14	201.6	782.1	0.01787	16.1(PUG)	3.05(PUG)	
Head Node - 245X		143.1		0.32	0.4	1.23	14.2	1.77		0.13	213.9					Confluence Details
Head Node - 250Y		142.8		0.32	0.4	1.23	13.9	1.79		0.13	215.5					Confluence Details
258X	15.3	142.8	143.1	0.3	0.01	1.23	13.9	1.79	0	0.13	215.5	1301.3	0.01874	17.7(PUG)	2.82(PUG)	
261Z	0.8	0.8	0.8	0.3	0.2		6.7	2.69	0.06	0.06	1.9	231.9	0.01376			
263Z	9.9	10.7	10.7	0.3	0.05	16.82	23.6	1.33	0.01	0.02	12.8	1245.3	0.00967	1.4(AG)	0.34(AG)	
269ZB	17.2	27.8	27.8	0.3	0.02	1.91	25.5	1.28	0.01	0.01	32	955.4	0.01617	8.3(PUG)	0.88(PUG)	
266B	1.4	1.4	1.4	0.3	0.4		8.3	2.39	0.02	0.02	3	218.9	0.00863			
268B	4.6	6.1	6.1	0.3	0.11	1.94	10.3	2.12	0.03	0.03	11.5	452.7	0.00567	3.9(PUG)	0.59(PUG)	
269ZB		6.1		0.17	0.18	0.93	11.2	2.02		0.03	11.5	521	0.02337	9.4(PUG)	0.83(PUG)	
Head Node - 268B		18.3		0.21	0.08	0	11.2	2.02		0.02	33.9					Confluence Details
Head Node - 263Z		33.9		0.23	0.06	0	25.5	1.28		0.01	39.1					Confluence Details
269ZB - Confluence		33.9	33.9	0.23	0.06	0	25.5	1.28		0.01	39.1					Confluence Results
Head Node - 268B		159.5		0.32	0.31	0	11.9	1.96		0.1	272.4					Confluence Details
Head Node - 263Z		205		0.32	0.3	0	26.1	1.26		0.09	218.6					Confluence Details
Head Node - 245X		192.4		0.32	0.31	0	14.6	1.74		0.1	290					Confluence Details
Head Node - 250Y		191.9		0.32	0.31	0	14.4	1.76		0.1	291.8					Confluence Details
Head Node - 274C		149.3		0.32	0.34	0	14	1.79		0.11	226.7					Confluence Details
276XZ - Confluence		191.9	205	0.32	0.31	0	14.4	1.76		0.1	291.8					Confluence Results
Head Node - 268B		227		0.31	0.31	0	13	1.86		0.1	366.3					Confluence Details
Head Node - 263Z		274.6		0.31	0.3	0	27.3	1.23		0.09	284.5					Confluence Details
Head Node - 245X		262.1		0.31	0.31	0	15.7	1.67		0.1	377.2					Confluence Details
Head Node - 250Y		261.5		0.31	0.31	0	15.5	1.69		0.1	379.5					Confluence Details

Fullerton Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 274C		218.9		0.31	0.32	0	15.2	1.71		0.1	321.5					Confluence Details
Head Node - 283D		225.5		0.31	0.31	0	13.7	1.8		0.1	353					Confluence Details
Head Node - 285E		225.1		0.31	0.31	0	13.9	1.8		0.1	350.5					Confluence Details
288XD - Confluence		261.5	274.6	0.31	0.31	0	15.5	1.69		0.1	379.5					Confluence Results
Head Node - 293F		273.4		0.31	0.32	0	15.4	1.69		0.1	398.6					Confluence Details
Head Node - 268B		259.9		0.31	0.32	0	13.1	1.85		0.1	418.5					Confluence Details
Head Node - 263Z		313.4		0.31	0.3	0	27.4	1.22		0.09	323.8					Confluence Details
Head Node - 245X		300.8		0.31	0.32	0	15.9	1.67		0.1	432					Confluence Details
Head Node - 250Y		300.3		0.31	0.32	0	15.6	1.68		0.1	434.8					Confluence Details
Head Node - 274C		257.3		0.31	0.33	0	15.3	1.7		0.1	377					Confluence Details
Head Node - 283D		260.3		0.31	0.31	0	13.9	1.8		0.1	406.4					Confluence Details
Head Node - 285E		260.2		0.31	0.31	0	14	1.79		0.1	404					Confluence Details
295XF - Confluence		300.3	313.4	0.31	0.32	0	15.6	1.68		0.1	434.8					Confluence Results
Head Node - 293F		282.1		0.31	0.31	1.01	16.4	1.63		0.1	398.6					Confluence Details
Head Node - 268B		268.6		0.31	0.31	1	14.1	1.78		0.1	418.5					Confluence Details
Head Node - 263Z		322.1		0.31	0.3	1.05	28.5	1.2		0.09	323.8					Confluence Details
Head Node - 245X		309.5		0.31	0.31	1	16.9	1.61		0.1	432					Confluence Details
Head Node - 250Y		309		0.31	0.31	0.99	16.6	1.62		0.1	434.8					Confluence Details
Head Node - 274C		266		0.31	0.33	1.02	16.3	1.64		0.1	377					Confluence Details
Head Node - 283D		269		0.31	0.31	1.01	14.9	1.73		0.1	406.4					Confluence Details
Head Node - 285E		268.9		0.31	0.31	1.01	15	1.72		0.1	404					Confluence Details
297X	8.7	309	322.1	0.3	0.2	0.99	16.6	1.62	0.06	0.1	434.8	751	0.00477	12.6(PUG)	5.47(PUG)	
Head Node - 303G		353		0.31	0.27	0	17.4	1.58		0.08	479.7					Confluence Details
Head Node - 293F		367.9		0.31	0.27	0	18	1.55		0.08	489.1					Confluence Details
Head Node - 268B		352.2		0.31	0.27	0	15.7	1.67		0.08	508.4					Confluence Details
Head Node - 263Z		407.8		0.31	0.27	0	30.2	1.16		0.08	398.7					Confluence Details
Head Node - 245X		395.2		0.31	0.27	0	18.4	1.53		0.09	518.4					Confluence Details
Head Node - 250Y		394.7		0.31	0.27	0	18.2	1.54		0.09	521.4					Confluence Details
Head Node - 274C		351.8		0.31	0.28	0	17.9	1.55		0.09	468.3					Confluence Details
Head Node - 283D		353.6		0.31	0.27	0	16.5	1.63		0.08	496.5					Confluence Details
Head Node - 285E		353.6		0.31	0.27	0	16.6	1.62		0.08	494.2					Confluence Details
304XG - Confluence		394.7	407.8	0.31	0.27	0	18.2	1.54		0.09	521.4					Confluence Results
Head Node - 308H		249.2		0.31	0.26	0	10.3	2.13		0.08	466.5					Confluence Details
Head Node - 303G		383.8		0.31	0.26	0	17.8	1.56		0.08	517.7					Confluence Details
Head Node - 293F		398.7		0.31	0.26	0	18.5	1.53		0.08	526.3					Confluence Details
Head Node - 268B		383		0.31	0.26	0	16.1	1.65		0.08	548					Confluence Details
Head Node - 263Z		438.7		0.31	0.26	0	30.6	1.15		0.08	427.8					Confluence Details
Head Node - 245X		426.1		0.31	0.27	0	18.9	1.51		0.08	554.9					Confluence Details
Head Node - 250Y		425.6		0.31	0.27	0	18.6	1.52		0.08	558.1					Confluence Details
Head Node - 274C		382.7		0.31	0.27	0	18.4	1.53		0.08	505.7					Confluence Details
Head Node - 283D		384.4		0.31	0.26	0	16.9	1.61		0.08	535.3					Confluence Details
Head Node - 285E		384.5		0.31	0.26	0	17	1.6		0.08	532.9					Confluence Details
309XH - Confluence		425.6	438.7	0.31	0.27	0	18.6	1.52		0.08	558.1					Confluence Results

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
316J	0.6	0.6	0.6	0.3	0.38		3.7	3.79	0.11	0.11	2	133.9	0.1805			
318J	4.6	5.2	5.2	0.3	0.09	23.92	27.6	1.22	0.03	0.04	5.6	837.5	0.00188	0.6(AG)	0.34(AG)	
320XI		5.2		0.3	0.12	1.3	28.9	1.19		0.04	5.6	468.8	0.09635	6.0(AG)	0.32(AG)	
Head Node - 308H		274.1		0.31	0.27	0	12	1.94		0.08	482.5					Confluence Details
Head Node - 303G		414.6		0.31	0.27	0	19.6	1.48		0.08	537					Confluence Details
Head Node - 293F		430		0.31	0.27	0	20.2	1.45		0.08	545.8					Confluence Details
Head Node - 268B		412.5		0.31	0.27	0	17.8	1.56		0.08	566.7					Confluence Details
Head Node - 263Z		473.8		0.31	0.27	0	32.5	1.11		0.08	446.1					Confluence Details
Head Node - 245X		457.7		0.31	0.28	0	20.6	1.44		0.09	574.6					Confluence Details
Head Node - 250Y		457		0.31	0.28	0	20.3	1.45		0.09	577.7					Confluence Details
Head Node - 274C		413.9		0.31	0.28	0	20.1	1.46		0.09	525.3					Confluence Details
Head Node - 283D		414.5		0.31	0.27	0	18.6	1.52		0.08	554.2					Confluence Details
Head Node - 285E		414.6		0.31	0.27	0	18.7	1.52		0.08	551.9					Confluence Details
Head Node - 314I		464		0.31	0.27	0	24	1.32		0.08	539.1					Confluence Details
Head Node - 318J		470.1		0.31	0.27	0	28.9	1.19		0.08	485.4					Confluence Details
320XI - Confluence		457	473.8	0.31	0.28	0	20.3	1.45		0.09	577.7					Confluence Results
339M	1.4	1.4	1.4	0.3	0.2		5.7	2.97	0.06	0.06	3.7	169.5	0.01758			
341M	5.9	7.3	7.3	0.3	0.05	3.62	9.3	2.25	0.01	0.02	14.7	1258.3	0.01375	5.8(PUG)	0.59(PUG)	
348XK		7.3		0.3	0.08	9.67	19	1.51		0.02	14.7	1959.4	0.01176	3.4(AG)	0.60(AG)	
322K	1.4	1.4	1.4	0.3	0.45		7.6	2.52	0.14	0.14	3.1	206.7	0.01374			
324K	12.3	13.7	13.7	0.3	0.45	12.12	19.7	1.47	0.14	0.14	16.7	1080.6	0.00158	1.6(AG)	0.61(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
326K	19.6	33.3	33.3	0.3	0.01	3.98	23.7	1.33	0	0.06	38.4	1404	0.00711	5.9(PUG)	1.43(PUG)	Warning: Pipe OVERFLOW
332KL		33.3		0.3	0.19	2.16	25.9	1.27		0.06	38.4	1509	0.0184	11.6(PUG)	1.42(PUG)	
329L	1.2	1.2	1.2	0.3	0.58		23.7	1.33	0.17	0.17	1.3	220.2	0.00463			
331L	15.3	16.5	16.5	0.3	0.18	15.76	39.5	1	0.06	0.06	14	1255.3	0.01157	1.5(AG)	0.34(AG)	
332KL	34.5	51.1	51.1	0.3	0.01	1.91	41.4	0.97	0	0.02	44	1107.9	0.0222	9.6(PUG)	0.89(PUG)	
Head Node - 331L		84.3		0.3	0.12	0	41.4	0.97		0.04	73.1					Confluence Details
Head Node - 326K		65.2		0.3	0.13	0	25.9	1.27		0.04	74.4					Confluence Details
332KL - Confluence		65.2	84.3	0.3	0.13	0	25.9	1.27		0.04	74.4					Confluence Results
Head Node - 331L		108.4		0.3	0.1	1.17	42.5	0.96		0.03	91.2					Confluence Details
Head Node - 326K		89.2		0.3	0.1	1.17	27	1.23		0.03	97.5					Confluence Details
334K	24	89.2	108.4	0.3	0.01	1.17	27	1.23	0	0.03	97.5	997.6	0.02047	14.3(PUG)	1.79(PUG)	
Head Node - 331L		116.4		0.3	0.09	1.13	43.7	0.94		0.03	96.7					Confluence Details
Head Node - 326K		97.3		0.3	0.09	1.11	28.1	1.21		0.03	104					Confluence Details
336K	8.1	97.3	116.4	0.3	0.03	1.11	28.1	1.21	0.01	0.03	104	604.7	0.00517	9.1(PUG)	2.43(PUG)	
Head Node - 345N		480.8		0.31	0.27	0	30.5	1.15		0.08	597.4					Confluence Details
Head Node - 331L		644.6		0.31	0.29	0	57.3	0.81		0.09	508.2					Confluence Details
Head Node - 326K		634.3		0.31	0.29	0	41.5	0.97		0.09	587.9					Confluence Details
Head Node - 341M		303.6		0.31	0.27	0	19	1.51		0.08	518.8					Confluence Details
Head Node - 308H		365.3		0.31	0.29	0	21.8	1.39		0.09	596.2					Confluence Details

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 303G		533.7		0.31	0.29	0	29.1	1.18		0.09	660.4					Confluence Details
Head Node - 293F		551.4		0.31	0.29	0	29.7	1.17		0.09	669.9					Confluence Details
Head Node - 268B		524.5		0.31	0.29	0	27.2	1.23		0.09	687.7					Confluence Details
Head Node - 263Z		636.4		0.31	0.28	0	42.4	0.96		0.09	577.4					Confluence Details
Head Node - 245X		580		0.31	0.29	0	29.9	1.17		0.09	699					Confluence Details
Head Node - 250Y		578.4		0.31	0.29	0	29.7	1.17		0.09	701.8					Confluence Details
Head Node - 274C		535.4		0.31	0.3	0	29.7	1.17		0.09	649.4					Confluence Details
Head Node - 283D		529.7		0.31	0.29	0	28.1	1.21		0.09	676.3					Confluence Details
Head Node - 285E		530.4		0.31	0.29	0	28.2	1.2		0.09	674.2					Confluence Details
Head Node - 314I		598.6		0.31	0.29	0	33.5	1.09		0.09	666.1					Confluence Details
Head Node - 318J		622		0.31	0.29	0	38.7	1.01		0.09	615.6					Confluence Details
348XK - Confluence		578.4	654.4	0.31	0.29	0	29.7	1.17		0.09	701.8					Confluence Results
176R	1	1	1	0.3	0.45		20.4	1.45	0.14	0.14	1.2	207.3	0.00873			
178R	4.8	5.9	5.9	0.3	0.45	11.91	32.3	1.12	0.14	0.14	5.2	1010.4	0.00485	1.7(AG)	0.35(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
180QR		5.9		0.3	0.45	3.56	35.8	1.05		0.14	5.2	866.3	0.00552	4.1(PUG)	0.59(PUG)	
170Q	1.6	1.6	1.6	-1	0		11.4	2	0	0	2.9	315.3	0.01357			
172Q	16.5	18.2	18.2	0.3	0.2	5.98	17.4	1.58	0.06	0.05	25.2	1215.5	0.01905	4.0(AG)	0.45(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
174Q	29.5	47.6	47.6	0.3	0.33	3.63	21	1.42	0.1	0.08	57.9	1448.7	0.00553	6.7(PUG)	1.51(PUG)	
180QR	6.1	53.7	53.7	0.3	0.79	1.06	22.1	1.38	0.24	0.1	62.6	558	0.00671	8.8(PUG)	1.85(PUG)	
Head Node - 178R		59.5		0.3	0.34	0	35.8	1.05		0.1	51.7					Confluence Details
Head Node - 174Q		57.3		0.3	0.34	0	22.1	1.38		0.1	66.9					Confluence Details
180QR - Confluence		57.3	59.5	0.3	0.34	0	22.1	1.38		0.1	66.9					Confluence Results
138N	1	1	1	0.25	0.19		9	2.29	0.05	0.05	2.1	133.9	0.2186			
140N	6.9	7.9	7.9	0.25	0.48	6.53	15.5	1.69	0.12	0.11	11.2	866	0.04698	2.5(AG)	0.31(AG)	
142N	19.8	27.6	27.6	0.28	0.11	0.88	16.4	1.63	0.03	0.05	39.7	574.7	0.13469	12.2(AG)	0.87(AG)	
144N	29.7	57.3	57.3	0.3	0.79	2.72	19.1	1.5	0.24	0.15	70.3	1525.7	0.05074	9.9(AG)	1.45(AG)	
146N	37.3	94.6	94.6	0.3	0.65	1.55	20.7	1.44	0.2	0.17	108.9	896.6	0.0401	10.1(AG)	1.69(AG)	
148N	29.7	124.3	124.3	0.3	0.42	1.07	21.7	1.39	0.13	0.16	139.6	1230.5	0.0467	19.1(PUG)	2.05(PUG)	Warning: Pipe OVERFLOW
150N	17.2	141.5	141.5	0.3	0.49	1.35	23.1	1.35	0.15	0.16	153.1	1328.3	0.02714	16.5(PUG)	2.46(PUG)	Warning: Pipe OVERFLOW
182NO	19	160.4	160.4	0.3	0.19	1.49	24.6	1.3	0.06	0.14	168.5	1350.7	0.01488	15.1(PUG)	2.74(PUG)	
159P	1.2	1.2	1.2	0.25	1		9.9	2.16	0.25	0.25	2.1	138.4	0.14041			
161P	4.4	5.7	5.7	0.25	1	1.61	11.6	1.99	0.25	0.25	8.9	553	0.13452	6.6(AG)	0.46(AG)	
162OP	24	29.7	29.7	0.27	1	3.26	14.8	1.73	0.27	0.27	39.4	1172.5	0.04822	6.8(AG)	1.28(AG)	
154O	0.8	0.8	0.8	0.25	1		12.2	1.93	0.25	0.25	1.2	266.7	0.18911			
156O	3.2	4	4	0.25	1	1.37	13.6	1.82	0.25	0.25	5.7	272	0.00358	3.8(AG)	0.83(AG)	
162OP		4		0.25	1	2.95	16.5	1.63		0.25	5.7	1803.2	0.0873	10.2(AG)	0.23(AG)	
Head Node - 161P		33.3		0.27	1	0	14.8	1.73		0.27	44.9					Confluence Details

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Head Node - 156O		33.7		0.27	1	0	16.5	1.63		0.26	42.4					Confluence Details
162OP - Confluence		33.3	33.7	0.27	1	0	14.8	1.73		0.27	44.9					Confluence Results
Head Node - 161P		42		0.27	0.95	1	15.8	1.67		0.26	53.7					Confluence Details
Head Node - 156O		42.4		0.27	0.95	1.02	17.5	1.57		0.26	50.6					Confluence Details
164O	8.7	42	42.4	0.3	0.77	1	15.8	1.67	0.23	0.26	53.7	1229.4	0.07833	20.4(PUG)	1.01(PUG)	
Head Node - 161P		74.3		0.27	0.83	0.19	16	1.66		0.23	96.4					Confluence Details
Head Node - 156O		74.7		0.27	0.83	0.2	17.7	1.56		0.23	90.8					Confluence Details
166O	32.3	74.3	74.7	0.27	0.67	0.19	16	1.66	0.18	0.23	96.4	346.5	0.20224	30.0(PUG)	0.84(PUG)	
Head Node - 161P		91.2		0.27	0.68	1.01	17	1.6		0.19	117.1					Confluence Details
Head Node - 156O		91.6		0.27	0.68	1.03	18.7	1.52		0.19	110.6					Confluence Details
168O	17	91.2	91.6	0.3	0.04	1.01	17	1.6	0.01	0.19	117.1	1365.3	0.05882	22.5(PUG)	1.50(PUG)	
Head Node - 178R		343.9		0.29	0.47	0	37.6	1.03		0.14	279.3					Confluence Details
Head Node - 174Q		335.8		0.29	0.47	0	23.7	1.33		0.14	366.6					Confluence Details
Head Node - 161P		294.6		0.29	0.48	0	19.1	1.5		0.14	367					Confluence Details
Head Node - 156O		310.6		0.29	0.48	0	20.9	1.43		0.14	366.7					Confluence Details
Head Node - 150N		217.9		0.29	0.5	0	24.6	1.3		0.14	234.4					Confluence Details
182NO - Confluence		294.6	343.9	0.29	0.48	0	19.1	1.5		0.14	367					Confluence Results
Head Node - 178R		375.9		0.29	0.46	1.62	39.2	1		0.13	295.8					Confluence Details
Head Node - 174Q		367.9		0.29	0.46	1.52	25.2	1.28		0.13	383.7					Confluence Details
Head Node - 161P		326.7		0.29	0.46	1.52	20.6	1.44		0.13	385.9					Confluence Details
Head Node - 156O		342.7		0.29	0.46	1.52	22.4	1.37		0.13	384.8					Confluence Details
Head Node - 150N		249.9		0.3	0.46	1.69	26.3	1.25		0.14	252.7					Confluence Details
185N	32.1	326.7	375.9			1.52	20.6	1.44		0.13	385.9	1589.1	0.01226	17.5(PUG)	3.94(PUG)	
203U	1	1	1	0.25	1		18.4	1.53	0.25	0.25	1.2	228.3	0.01752			
205U	6.9	7.9	7.9	0.25	0.81	1.5	19.9	1.46	0.2	0.21	9	451.3	0.0695	5.8(AG)	0.58(AG)	
207U	11.5	19.4	19.4	0.26	0.73	2.69	22.6	1.36	0.19	0.2	20.5	1158.9	0.08579	7.7(AG)	0.42(AG)	
209U	11.1	30.5	30.5	0.3	0.67	1.46	24.1	1.32	0.2	0.2	30.9	1089.1	0.03406	13.0(AG)	0.84(AG)	
211SU	19	49.4	49.4	0.3	0.13	2.89	27	1.24	0.04	0.14	49.3	1311.2	0.0813	8.0(AG)	0.45(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
187S	1.6	1.6	1.6	0.25	1		14.5	1.75	0.25	0.25	2.2	311.8	0.1099			
189S	15.1	16.7	16.7	0.25	1	3.34	17.8	1.56	0.25	0.25	19.9	1258.1	0.09947	7.4(AG)	0.77(AG)	
191S	33.5	50.2	50.2	0.25	0.87	0.71	18.5	1.53	0.22	0.23	59.2	645.6	0.06006	15.1(PUG)	0.78(PUG)	
193S	22.4	72.6	72.6	0.29	0.75	0.91	19.4	1.49	0.22	0.23	83	1101.9	0.0602	20.2(PUG)	1.30(PUG)	
201ST	9.5	82.1	82.1	0.3	0.93	0.56	20	1.46	0.28	0.23	91.6	728.5	0.05795	21.7(PUG)	1.60(PUG)	
196T	1.8	1.8	1.8	0.25	1		9.7	2.2	0.25	0.25	3.2	206.7	0.36368			
198T	9.7	11.5	11.5	0.29	1	1.14	10.8	2.07	0.29	0.29	18.6	509.1	0.16287	8.7(AG)	0.65(AG)	
200T	11.3	22.8	22.8	0.3	1	2.57	13.4	1.83	0.3	0.29	31.9	1073.6	0.07128	7.3(AG)	0.98(AG)	
201ST		22.8		0.29	1	0.32	13.7	1.81		0.29	31.9	329.7	0.06085	17.3(PUG)	1.00(PUG)	
Head Node - 200T		79.1		0.28	0.91	0	13.7	1.81		0.25	112.3					Confluence Details
Head Node - 193S		104.9		0.27	0.9	0	20	1.46		0.25	116.2					Confluence Details
201ST - Confluence		104.9	104.9	0.27	0.9	0	20	1.46		0.25	116.2					Confluence Results
Head Node - 209U		154.4		0.27	0.77	0	27	1.24		0.21	145.6					Confluence Details

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Head Node - 200T		105.1		0.27	0.81	0	14.2	1.77		0.22	151					Confluence Details
Head Node - 193S		142.5		0.27	0.79	0	20.5	1.44		0.22	160.7					Confluence Details
211SU - Confluence		142.5	154.4	0.27	0.79	0	20.5	1.44		0.22	160.7					Confluence Results
214V	0.8	0.8	0.8	0.3	1		10.8	2.06	0.3	0.3	1.3	237.2	0.271			
216V	8.7	9.5	9.5	0.3	0.99	3.04	13.9	1.8	0.3	0.3	12.9	1076.8	0.11907	7.0(AG)	0.58(AG)	
218V	21.6	31.1	31.1	0.3	0.46	1.28	15.1	1.71	0.14	0.19	43	972.3	0.05187	12.7(PUG)	0.65(PUG)	
220V	25.8	56.9	56.9	0.3	0.45	1.47	16.6	1.62	0.13	0.16	75.4	1174.7	0.02437	13.3(PUG)	1.40(PUG)	
228SV		56.9		0.3	0.54	0.58	17.2	1.59		0.16	75.4	583.1	0.03048	16.6(PUG)	1.67(PUG)	
222W	1.6	1.6	1.6	0.3	0.4		8.3	2.39	0.12	0.12	3.3	267.7	0.0214			
224W	5	6.7	6.7	0.3	0.45	3.74	12.1	1.94	0.13	0.13	10.9	505.7	0.00709	2.6(AG)	0.41(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
226W	5	11.7	11.7	0.3	0.45	1.32	13.4	1.83	0.13	0.13	18.1	356	0.00341	4.5(PUG)	1.24(PUG)	
228SV		11.7		0.3	0.44	0.35	13.7	1.81		0.13	18.1	269.4	0.03987	12.7(PUG)	0.83(PUG)	
Head Node - 226W		180.7		0.28	0.63	0	13.7	1.81		0.18	268.2					Confluence Details
Head Node - 220V		221.2		0.28	0.64	0	17.2	1.59		0.18	285					Confluence Details
Head Node - 209U		266.2		0.28	0.65	0	29.2	1.18		0.18	242.5					Confluence Details
Head Node - 200T		214.5		0.28	0.64	0	16.5	1.63		0.18	283.8					Confluence Details
Head Node - 193S		254.3		0.28	0.65	0	22.7	1.36		0.18	272.9					Confluence Details
228SV - Confluence		221.2	266.2	0.28	0.64	0	17.2	1.59		0.18	285					Confluence Results
Head Node - 226W		202.9		0.28	0.6	0.61	14.3	1.76		0.17	292.6					Confluence Details
Head Node - 220V		243.4		0.28	0.61	0.6	17.8	1.56		0.17	306.3					Confluence Details
Head Node - 209U		288.4		0.28	0.62	0.62	29.9	1.17		0.18	259.2					Confluence Details
Head Node - 200T		236.7		0.28	0.61	0.6	17.1	1.6		0.17	305.7					Confluence Details
Head Node - 193S		276.5		0.28	0.63	0.61	23.4	1.34		0.18	291.5					Confluence Details
230S	22.2	243.4	288.4	0.3	0.35	0.6	17.8	1.56	0.11	0.17	306.3	776.7	0.0253	21.4(PUG)	3.20(PUG)	
109K	1.6	1.6	1.6	0.25	0.1		5.1	3.15	0.25	0.25	4.2	297.7	0.06576			
111K	9.1	10.7	10.7	0.25	1	3.73	8.8	2.31	0.25	0.25	20	1112.8	0.04709	5.6(AG)	0.93(AG)	
113K	30.5	41.2	41.2	0.25	1	1.66	10.5	2.1	0.25	0.25	69.1	933.1	0.10724	10.5(AG)	1.30(AG)	
119KL	53.5	94.6	94.6	0.26	1	2.91	13.4	1.83	0.26	0.26	135.2	1477.4	0.04514	9.0(AG)	2.09(AG)	
116L	1.6	1.6	1.6	0.25	1		11.1	2.03	0.25	0.25	2.6	210.2	0.18356			
118L	9.3	10.9	10.9	0.25	1	1.03	12.2	1.93	0.25	0.25	16.6	484.1	0.21	9.2(AG)	0.58(AG)	
119KL		10.9		0.25	1	4.57	16.7	1.62		0.25	16.6	1526.4	0.05789	5.6(AG)	0.68(AG)	
Head Node - 113K		103.4		0.26	0.99	0	13.4	1.83		0.25	150.6					Confluence Details
Head Node - 118L		105.5		0.26	0.99	0	16.7	1.62		0.25	133.5					Confluence Details
119KL - Confluence		103.4	105.5	0.26	0.99	0	13.4	1.83		0.25	150.6					Confluence Results
Head Node - 113K		141.5		0.3	0.88	2.69	16.1	1.65		0.27	177.8					Confluence Details
Head Node - 118L		143.7		0.3	0.88	2.77	19.5	1.48		0.27	158.5					Confluence Details
122K	38.1	141.5	143.7			2.69	16.1	1.65		0.27	177.8	1167.3	0.02276	7.4(AG)	2.60(AG)	
Head Node - 113K		166.1		0.3	0.81	0.25	16.4	1.64		0.24	209.9					Confluence Details
Head Node - 118L		168.3		0.3	0.81	0.26	19.8	1.47		0.24	187.4					Confluence Details
124K	24.6	166.1	168.3	0.3	0.39	0.25	16.4	1.64	0.12	0.24	209.9	313.9	0.03205	20.8(PUG)	2.57(PUG)	
Head Node - 113K		211.7		0.3	0.73	0.88	17.2	1.59		0.22	262.8					Confluence Details

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 118L		213.9		0.3	0.73	0.9	20.7	1.44		0.22	235.5					Confluence Details
126K	45.6	211.7	213.9	0.3	0.46	0.88	17.2	1.59	0.14	0.22	262.8	1185.3	0.03601	22.5(PUG)	2.78(PUG)	
129M	2	2	2	0.3	0.45		6.1	2.85	0.14	0.14	5	237.2	0.05476			
131M	6.7	8.7	8.7	0.3	0.49	2.93	9	2.29	0.15	0.14	16.9	807.1	0.04279	5.3(AG)	0.36(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
133M	33.5	42.2	42.2	0.3	0.5	1.45	10.5	2.1	0.15	0.15	74.8	1046.2	0.03729	12.1(PUG)	1.11(PUG)	
134KM		42.2		0.3	0.5	0.76	11.2	2.02		0.15	74.8	745.9	0.0299	16.5(PUG)	1.75(PUG)	
Head Node - 113K		270.1		0.3	0.67	0	18.7	1.52		0.2	324.7					Confluence Details
Head Node - 118L		272.2		0.3	0.68	0	22.1	1.38		0.2	292.8					Confluence Details
Head Node - 133M		179.2		0.3	0.66	0	11.2	2.02		0.2	299.7					Confluence Details
134KM - Confluence		270.1	272.2	0.3	0.67	0	18.7	1.52		0.2	324.7					Confluence Results
100J	1.8	1.8	1.8	0.3	0.45		7.6	2.51	0.14	0.14	3.9	310.1	0.0297			
102J	7.5	9.3	9.3	0.3	0.41	4.43	12.1	1.94	0.12	0.12	15.3	854.5	0.01554	3.8(AG)	0.40(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
103HJ		9.3		0.3	0.42	0.83	12.9	1.87		0.12	15.3	542.6	0.02912	11.0(PUG)	0.91(PUG)	
78H	0.6	0.6	0.6	0.25	1		28.7	1.19	0.25	0.25	0.5	133.9	0.00067			
81H	9.3	9.9	9.9			3.18	31.9	1.12		0.26	7.8	923.8	0.11488	5.8(AG)	0.25(AG)	
83H	16.3	26.2	26.2	0.3	1	1.34	33.2	1.1	0.3	0.28	19.5	575.6	0.12147	7.9(AG)	0.72(AG)	
85H	92	118.3	118.3	0.28	0.89	1.8	35	1.07	0.25	0.25	87.3	1107	0.06734	11.6(AG)	1.50(AG)	
87H	9.5	127.7	127.7	0.3	0.09	0.39	35.4	1.06	0.03	0.24	95.4	434.7	0.05012	18.5(PUG)	1.84(PUG)	Warning: Pipe OVERFLOW
89H	9.9	137.6	137.6	0.3	0.45	0.31	35.7	1.06	0.14	0.23	103.1	350.9	0.04024	18.9(PUG)	2.18(PUG)	
97HI	17.6	155.2	155.2	0.3	0.45	0.89	36.6	1.04	0.13	0.22	115.7	1106.7	0.04556	20.7(PUG)	1.99(PUG)	
92I	0.8	0.8	0.8	0.3	0.45		5.9	2.89	0.14	0.14	2	206.7	0.04687			
94I	3.8	4.6	4.6	0.3	0.45	4.11	10	2.15	0.14	0.14	8.5	732.2	0.0258	3.5(AG)	0.32(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
96I	14.5	19.2	19.2	0.3	0.45	2.31	12.4	1.92	0.13	0.13	31	1200.3	0.02288	8.6(PUG)	0.82(PUG)	
97HI		19.2		0.3	0.45	0.26	12.6	1.89		0.13	31	208.9	0.03161	13.5(PUG)	1.19(PUG)	
Head Node - 96I		72.6		0.28	0.69	0	12.6	1.89		0.2	112.3					Confluence Details
Head Node - 89H		174.3		0.28	0.75	0	36.6	1.04		0.21	131.7					Confluence Details
97HI - Confluence		174.3	174.3	0.28	0.75	0	36.6	1.04		0.21	131.7					Confluence Results
Head Node - 102J		92.3		0.28	0.61	0	12.9	1.87		0.17	142.6					Confluence Details
Head Node - 96I		94.6		0.28	0.61	0	13.3	1.84		0.17	143.6					Confluence Details
Head Node - 89H		196.3		0.28	0.7	0	37.2	1.03		0.2	148.7					Confluence Details
103HJ - Confluence		196.3	196.3	0.28	0.7	0	37.2	1.03		0.2	148.7					Confluence Results
49F	1.2	1.2	1.2	0.25	1		12	1.94	0.25	0.25	1.9	135.2	0.05177			
51F	4.4	5.7	5.7	0.25	1	2.04	14.1	1.78	0.25	0.25	7.8	642	0.06503	6.0(AG)	0.45(AG)	
53F	42.4	48	48	0.25	1	2.24	16.3	1.64	0.25	0.25	60.5	1366.2	0.12326	11.8(AG)	1.18(AG)	
55F	59.1	107.2	107.2	0.25	1	1.43	17.7	1.56	0.25	0.25	127.7	1431.6	0.03713	16.7(PUG)	1.73(PUG)	
57F	30.1	137.2	137.2	0.27	0.75	2.26	20	1.46	0.2	0.24	152.2	1898.4	0.014	14.0(PUG)	2.73(PUG)	

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
59F	28.9	166.1	166.1	0.25	0.83	0.13	20.1	1.46	0.21	0.23	184.2	267	0.12853	33.8(PUG)	1.55(PUG)	
70FG	40	206	206	0.28	0.8	2.1	22.2	1.38	0.23	0.23	214	2202.7	0.01918	17.5(PUG)	2.65(PUG)	
62G	1	1	1	0.3	0.26		3.4	3.96	0.08	0.08	3.6	103.4	0.10447			
64G	5.4	6.5	6.5	0.3	0.49	3.05	6.5	2.76	0.15	0.14	15.4	1159.8	0.01965	6.3(PUG)	0.47(PUG)	
66G	6.3	12.7	12.7	0.3	0.37	1.34	7.8	2.48	0.11	0.12	27.2	913.9	0.03502	11.4(PUG)	0.74(PUG)	
68G	10.5	23.2	23.2	0.3	0.02	1.02	8.8	2.32	0.01	0.07	47.3	443.2	0.00655	7.2(PUG)	1.45(PUG)	
70FG	23.8	47	47	0.3	0.46	1.66	10.5	2.1	0.14	0.1	85.2	1264.7	0.02207	12.7(PUG)	1.22(PUG)	
Head Node - 68G		144.1		0.26	0.72	0	10.5	2.1		0.19	249.9					Confluence Details
Head Node - 59F		253		0.26	0.8	0	22.2	1.38		0.21	268.3					Confluence Details
70FG - Confluence		253	253.1	0.26	0.8	0	22.2	1.38		0.21	268.3					Confluence Results
Head Node - 68G		172.3		0.26	0.68	1.15	11.6	1.98		0.18	281.2					Confluence Details
Head Node - 59F		281.3		0.26	0.77	1.13	23.4	1.34		0.2	290					Confluence Details
72F	28.3	281.3	281.3	0.3	0.5	1.13	23.4	1.34	0.15	0.2	290	781.9	0.00492	11.5(PUG)	4.09(PUG)	
39E	0.8	0.8	0.8	0.25	0.05		5.1	3.15	0.2	0.2	2.2	202.1	0.02628			
41E	1.6	2.4	2.4	0.25	0.83	2.18	7.3	2.58	0.21	0.21	5.2	400.8	0.02131	3.3(AG)	0.38(AG)	
43E	13.1	15.5	15.5	0.25	0.83	4.36	11.6	1.98	0.21	0.21	25	2259	0.03452	8.6(PUG)	0.49(PUG)	
44AE	34.1	49.6	49.6	0.3	0.16	5.15	16.8	1.61	0.05	0.1	68.2	2755.4	0.01366	8.9(PUG)	1.64(PUG)	Warning: Pipe OVERFLOW
33D	1	1	1	0.28	0.2		6.8	2.69	0.06	0.06	2.4	199.7	0.01001			
35D	2.2	3.2	3.2	0.3	0.2	1.59	8.4	2.39	0.06	0.06	6.8	496.8	0.01551	5.2(PUG)	0.41(PUG)	
36AD		3.2		0.29	0.2	3.37	11.7	1.97		0.06	6.8	1491.1	0.01903	7.4(PUG)	0.61(PUG)	
2A	1.6	1.6	1.6	0.25	1		13.7	1.81	0.25	0.25	2.3	189.6	0.05379			
4A	23.4	25	25	0.25	1	2.2	15.9	1.66	0.25	0.25	32.1	1116.4	0.16204	10.0(AG)	0.86(AG)	
6A	32.3	57.3	57.3	0.25	1	2.24	18.1	1.55	0.25	0.25	67.4	2133.8	0.0389	17.0(AG)	1.38(AG)	
9A	253.3	310.6	310.6			4.76	22.9	1.36		0.25	311.5	7532.7	0.07533	29.9(AG)	1.58(AG)	
11A	80.7	391.3	391.3	0.25	0.96	2.56	25.4	1.28	0.24	0.25	365.4	2544	0.05902	16.8(AG)	2.55(AG)	
13A	13.5	404.8	404.8	0.25	1	0.33	25.8	1.27	0.25	0.25	374.7	303.7	0.08686	15.6(AG)	2.52(AG)	
15A	6.7	411.5	411.5	0.25	1	0.41	26.2	1.26	0.25	0.25	376.6	436.9	0.018	17.6(PUG)	1.78(PUG)	
27AB	68	479.5	479.5	0.25	0.91	6.2	32.4	1.12	0.23	0.25	378.5	3267.5	0.02402	8.6(AG)	2.18(AG)	
23C	1.2	1.2	1.2	0.25	1		17.1	1.6	0.25	0.25	1.5	316.6	0.0493			
25C	5	6.3	6.3	0.25	0.58	5.73	22.8	1.36	0.15	0.17	6.8	1553.7	0.06402	5.4(AG)	0.26(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
26BC	9.5	15.7	15.7	0.25	0.46	2.53	25.3	1.28	0.12	0.14	16.3	808.9	0.00739	5.3(PUG)	0.85(PUG)	
18B	1	1	1	0.25	0.45		6.2	2.83	0.11	0.11	2.5	213.8	0.04518			
20B	8.9	9.9	9.9	0.25	0.46	4.12	10.3	2.12	0.11	0.11	18	969	0.03152	4.8(AG)	0.38(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
26BC		9.9		0.25	0.46	0.57	10.9	2.06		0.11	18	532.7	0.06822	15.6(PUG)	0.93(PUG)	
Head Node - 25C		25.6		0.25	0.51	0	25.3	1.28		0.13	27.1					Confluence Details
Head Node - 20B		16.6		0.25	0.49	0	10.9	2.06		0.12	29.8					Confluence Details
26BC - Confluence		16.6	25.6	0.25	0.49	0	10.9	2.06		0.12	29.8					Confluence Results
Head Node - 15A		505.1		0.25	0.96	0	32.4	1.12		0.24	404.3					Confluence Details

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Head Node - 25C		469.4		0.25	0.96	0	30	1.16		0.24	397.4					Confluence Details
Head Node - 20B		244.3		0.25	0.95	0	15.4	1.69		0.24	329.2					Confluence Details
27AB - Confluence		505.1	505.1	0.25	0.96	0	32.4	1.12		0.24	404.3					Confluence Results
Head Node - 15A		554.5		0.25	0.96	0.72	33.1	1.1		0.24	432.3					Confluence Details
Head Node - 25C		518.9		0.25	0.96	0.72	30.7	1.15		0.24	427					Confluence Details
Head Node - 20B		293.7		0.25	0.95	0.76	16.1	1.65		0.24	374.8					Confluence Details
29A	49.4	554.5	554.5	0.28	0.99	0.72	33.1	1.1	0.28	0.24	432.3	1142.7	0.0348	26.6(PUG)	3.04(PUG)	
Head Node - 15A		584.4		0.25	0.92	0	33.6	1.09		0.23	456.3					Confluence Details
Head Node - 25C		548.8		0.25	0.91	0	31.2	1.14		0.23	452.1					Confluence Details
Head Node - 20B		323.6		0.26	0.88	0	16.6	1.62		0.22	410.3					Confluence Details
Head Node - 35D		231.8		0.26	0.87	0	11.7	1.97		0.22	368.2					Confluence Details
36AD - Confluence		584.4	584.4	0.25	0.92	0	33.6	1.09		0.23	456.3					Confluence Results
Head Node - 43E		365.8		0.25	0.84	0	16.8	1.61		0.21	475.2					Confluence Details
Head Node - 15A		634		0.25	0.87	0	34.1	1.08		0.22	500.6					Confluence Details
Head Node - 25C		598.4		0.25	0.87	0	31.7	1.13		0.22	498.5					Confluence Details
Head Node - 20B		373.2		0.26	0.81	0	17.2	1.59		0.21	477.6					Confluence Details
Head Node - 35D		268.2		0.26	0.8	0	12.3	1.92		0.21	428.3					Confluence Details
44AE - Confluence		634	634	0.25	0.87	0	34.1	1.08		0.22	500.6					Confluence Results
Head Node - 43E		405.8		0.25	0.77	4.46	21.2	1.41		0.19	475.2					Confluence Details
Head Node - 15A		674		0.25	0.83	4.38	38.5	1.01		0.21	500.6					Confluence Details
Head Node - 25C		638.3		0.25	0.82	4.39	36.1	1.05		0.21	498.5					Confluence Details
Head Node - 20B		413.2		0.26	0.74	4.45	21.6	1.4		0.19	477.6					Confluence Details
Head Node - 35D		308.2		0.26	0.7	4.6	16.9	1.61		0.18	428.3					Confluence Details
46A	40	674	674	0.3	0.07	4.38	38.5	1.01	0.02	0.21	500.6	1734.7	0.00453	6.5(AG)	3.56(AG)	
Head Node - 68G		435.5		0.26	0.69	0	13.1	1.86		0.18	698.7					Confluence Details
Head Node - 59F		751.5		0.26	0.74	0	24.8	1.29		0.19	791.4					Confluence Details
Head Node - 43E		694.7		0.26	0.7	0	22.6	1.36		0.18	785.7					Confluence Details
Head Node - 15A		983.5		0.26	0.79	0	39.8	0.99		0.2	726.9					Confluence Details
Head Node - 25C		947.9		0.26	0.78	0	37.4	1.03		0.2	734.6					Confluence Details
Head Node - 20B		705.6		0.26	0.68	0	23	1.35		0.18	788.3					Confluence Details
Head Node - 35D		557.3		0.26	0.66	0	18.3	1.54		0.17	737.8					Confluence Details
73AF - Confluence		751.5	983.5	0.26	0.74	0	24.8	1.29		0.19	791.4					Confluence Results
Head Node - 68G		469.8		0.26	0.68	2.9	16	1.66		0.18	698.7					Confluence Details
Head Node - 59F		785.8		0.26	0.73	2.79	27.6	1.22		0.19	791.4					Confluence Details
Head Node - 43E		729		0.26	0.69	2.79	25.4	1.28		0.18	785.7					Confluence Details
Head Node - 15A		1017.8		0.26	0.78	2.86	42.7	0.95		0.2	726.9					Confluence Details
Head Node - 25C		982.2		0.26	0.77	2.85	40.3	0.99		0.2	734.6					Confluence Details
Head Node - 20B		739.9		0.26	0.67	2.79	25.8	1.27		0.18	788.3					Confluence Details
Head Node - 35D		591.6		0.26	0.65	2.85	21.2	1.42		0.17	737.8					Confluence Details
75A	34.3	785.8	1017.8	0.3	0.52	2.79	27.6	1.22	0.16	0.19	791.4	1443.1	0.00697	8.6(AG)	3.87(AG)	
Head Node - 102J		481.6		0.27	0.68	0	15.7	1.68		0.18	786.3					Confluence Details
Head Node - 96I		492.9		0.27	0.68	0	16	1.66		0.18	792.8					Confluence Details
Head Node - 89H		1136.6		0.27	0.69	0	40	0.99		0.19	900.6					Confluence Details

Fullerton Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 68G		597.2		0.27	0.68	0	19.6	1.48		0.18	843.1					Confluence Details
Head Node - 59F		962		0.26	0.72	0	31.1	1.14		0.19	938.3					Confluence Details
Head Node - 43E		895.8		0.27	0.68	0	28.9	1.19		0.18	932.1					Confluence Details
Head Node - 15A		1231.7		0.26	0.77	0	46.3	0.91		0.2	861					Confluence Details
Head Node - 25C		1196.1		0.26	0.76	0	43.9	0.94		0.2	874					Confluence Details
Head Node - 20B		908.3		0.27	0.67	0	29.3	1.18		0.18	934.7					Confluence Details
Head Node - 35D		740.8		0.27	0.65	0	24.7	1.3		0.18	883.3					Confluence Details
104AH - Confluence		962	1231.7	0.26	0.72	0	31.1	1.14		0.19	938.3					Confluence Results
Head Node - 102J		508		0.27	0.69	2.07	17.7	1.56		0.19	786.3					Confluence Details
Head Node - 96I		519.3		0.27	0.69	2.07	18.1	1.55		0.19	792.8					Confluence Details
Head Node - 89H		1163		0.27	0.7	1.98	42	0.96		0.19	900.6					Confluence Details
Head Node - 68G		623.7		0.27	0.69	2.02	21.6	1.4		0.19	843.1					Confluence Details
Head Node - 59F		988.4		0.26	0.72	1.95	33.1	1.1		0.19	938.3					Confluence Details
Head Node - 43E		922.2		0.27	0.69	1.96	30.8	1.15		0.19	932.1					Confluence Details
Head Node - 15A		1258.2		0.26	0.78	2.01	48.3	0.89		0.2	861					Confluence Details
Head Node - 25C		1222.5		0.26	0.77	2	45.8	0.92		0.2	874					Confluence Details
Head Node - 20B		934.8		0.27	0.68	1.96	31.2	1.14		0.18	934.7					Confluence Details
Head Node - 35D		767.2		0.27	0.66	1.99	26.7	1.24		0.18	883.3					Confluence Details
106A	26.4	988.4	1258.2	0.3	1	1.95	33.1	1.1	0.3	0.19	938.3	1413.8	0.01705	12.0(AG)	3.11(AG)	
Head Node - 113K		814.2		0.28	0.68	0	19.7	1.47		0.19	1115.6					Confluence Details
Head Node - 118L		920.2		0.28	0.68	0	23.2	1.34		0.19	1134					Confluence Details
Head Node - 133M		522.7		0.28	0.67	0	12.3	1.92		0.19	967					Confluence Details
Head Node - 102J		803.3		0.28	0.68	0	19.5	1.48		0.19	1110.2					Confluence Details
Head Node - 96I		817.7		0.28	0.68	0	19.8	1.47		0.19	1116.6					Confluence Details
Head Node - 89H		1463.5		0.28	0.69	0	43.6	0.94		0.19	1090.2					Confluence Details
Head Node - 68G		924.1		0.28	0.68	0	23.3	1.34		0.19	1134.8					Confluence Details
Head Node - 59F		1288.9		0.27	0.71	0	34.7	1.07		0.19	1161.2					Confluence Details
Head Node - 43E		1222.7		0.28	0.68	0	32.5	1.11		0.19	1165.4					Confluence Details
Head Node - 15A		1558.7		0.27	0.75	0	50	0.87		0.2	1032.9					Confluence Details
Head Node - 25C		1523		0.27	0.75	0	47.5	0.9		0.2	1052.2					Confluence Details
Head Node - 20B		1235.2		0.28	0.67	0	32.9	1.11		0.19	1166.2					Confluence Details
Head Node - 35D		1067.7		0.28	0.66	0	28.4	1.2		0.18	1139					Confluence Details
135AK - Confluence		1235.2	1558.7	0.28	0.67	0	32.9	1.11		0.19	1166.2					Confluence Results
Head Node - 226W		840		0.29	0.49	0	15.5	1.68		0.14	1313.9					Confluence Details
Head Node - 220V		1016		0.29	0.49	0	19	1.5		0.14	1396.7					Confluence Details
Head Node - 209U		1447.1		0.29	0.49	0	31.1	1.14		0.14	1412.9					Confluence Details
Head Node - 200T		981		0.29	0.49	0	18.3	1.54		0.14	1381.7					Confluence Details
Head Node - 193S		960.2		0.29	0.51	0	24.5	1.3		0.15	1090.7					Confluence Details
Head Node - 113K		1115.1		0.28	0.62	0	20.2	1.45		0.18	1474.2					Confluence Details
Head Node - 118L		1230.3		0.28	0.62	0	23.7	1.33		0.18	1466.4					Confluence Details
Head Node - 133M		723.3		0.28	0.61	0	12.8	1.88		0.17	1286.5					Confluence Details
Head Node - 102J		1094.4		0.28	0.62	0	20	1.46		0.18	1458.4					Confluence Details
Head Node - 96I		1122.8		0.28	0.62	0	20.3	1.45		0.18	1479.6					Confluence Details

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 89H		1839.5		0.28	0.64	0	44.1	0.94		0.18	1365					Confluence Details
Head Node - 68G		1230.3		0.28	0.62	0	23.8	1.32		0.18	1460.9					Confluence Details
Head Node - 59F		1624.4		0.28	0.66	0	35.2	1.06		0.18	1438.6					Confluence Details
Head Node - 43E		1537.2		0.28	0.64	0	33	1.1		0.18	1433.3					Confluence Details
Head Node - 15A		1934.6		0.27	0.69	0	50.5	0.87		0.19	1284.4					Confluence Details
Head Node - 25C		1899		0.27	0.69	0	48	0.89		0.19	1312.1					Confluence Details
Head Node - 20B		1553.3		0.28	0.63	0	33.4	1.1		0.18	1435.7					Confluence Details
Head Node - 35D		1341.8		0.28	0.62	0	28.9	1.19		0.17	1395.4					Confluence Details
Head Node - 178R		1747.7		0.28	0.63	0	39.4	1		0.18	1423.2					Confluence Details
Head Node - 174Q		811.7		0.29	0.58	0	25.4	1.28		0.17	847.5					Confluence Details
Head Node - 161P		1160.7		0.28	0.61	0	20.9	1.43		0.17	1505.2					Confluence Details
Head Node - 156O		1230		0.28	0.61	0	22.6	1.36		0.17	1513.2					Confluence Details
Head Node - 150N		889.2		0.29	0.62	0	26.5	1.25		0.18	928.1					Confluence Details
232AN - Confluence		1230	2231	0.28	0.61	0	22.6	1.36		0.17	1513.2					Confluence Results
Head Node - 226W		906.2		0.3	0.47	1.15	16.7	1.62		0.14	1213					Confluence Details
Head Node - 220V		1082.2		0.3	0.48	1.13	20.1	1.46		0.14	1289.6					Confluence Details
Head Node - 209U		1513.3		0.3	0.48	1.13	32.2	1.12		0.14	1339.4					Confluence Details
Head Node - 200T		1047.2		0.3	0.48	1.14	19.4	1.49		0.14	1276.3					Confluence Details
Head Node - 193S		1026.4		0.3	0.49	1.22	25.8	1.27		0.15	1044.2					Confluence Details
Head Node - 113K		1181.3		0.29	0.59	1.11	21.3	1.41		0.17	1325					Confluence Details
Head Node - 118L		1296.5		0.29	0.6	1.12	24.8	1.29		0.17	1318.5					Confluence Details
Head Node - 133M		789.5		0.3	0.58	1.16	14	1.79		0.17	1158.5					Confluence Details
Head Node - 102J		1160.5		0.29	0.59	1.12	21.1	1.42		0.17	1311.1					Confluence Details
Head Node - 96I		1188.9		0.29	0.59	1.11	21.4	1.41		0.17	1329.6					Confluence Details
Head Node - 89H		1905.6		0.28	0.63	1.14	45.3	0.92		0.18	1290.6					Confluence Details
Head Node - 68G		1296.5		0.29	0.6	1.12	24.9	1.29		0.17	1313.9					Confluence Details
Head Node - 59F		1690.6		0.28	0.64	1.12	36.3	1.05		0.18	1327.9					Confluence Details
Head Node - 43E		1603.4		0.28	0.62	1.12	34.1	1.08		0.18	1320.1					Confluence Details
Head Node - 15A		2000.8		0.28	0.68	1.16	51.6	0.86		0.19	1216.3					Confluence Details
Head Node - 25C		1965.1		0.28	0.67	1.15	49.2	0.88		0.19	1238.7					Confluence Details
Head Node - 20B		1619.5		0.28	0.61	1.12	34.5	1.08		0.17	1325.6					Confluence Details
Head Node - 35D		1408		0.29	0.6	1.13	30	1.16		0.17	1265.5					Confluence Details
Head Node - 178R		1813.9		0.29	0.61	1.13	40.6	0.98		0.18	1325.3					Confluence Details
Head Node - 174Q		877.9		0.3	0.55	1.32	26.7	1.24		0.16	858.7					Confluence Details
Head Node - 161P		1226.9		0.29	0.59	1.11	22	1.39		0.17	1351.1					Confluence Details
Head Node - 156O		1296.2		0.29	0.59	1.11	23.7	1.33		0.17	1358.4					Confluence Details
Head Node - 150N		955.4		0.3	0.59	1.29	27.8	1.21		0.17	902.3					Confluence Details
235A	66.2	1296.2	2297.2			1.11	23.7	1.33		0.17	1513.2	827.1	0.01148	12.5(AG)	4.88(AG)	
Head Node - 226W		964.3		0.31	0.45	2.39	19.1	1.5		0.14	1191.1					Confluence Details
Head Node - 220V		1140.3		0.31	0.46	2.34	22.5	1.37		0.14	1271.4					Confluence Details
Head Node - 209U		1571.4		0.3	0.46	2.31	34.5	1.08		0.14	1333					Confluence Details
Head Node - 200T		1105.4		0.31	0.46	2.35	21.7	1.39		0.14	1257.4					Confluence Details
Head Node - 193S		1084.5		0.31	0.47	2.52	28.3	1.2		0.14	1042.7					Confluence Details

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Head Node - 113K		1239.4		0.3	0.57	2.31	23.6	1.33		0.17	1305.5					Confluence Details
Head Node - 118L		1354.6		0.29	0.58	2.32	27.1	1.23		0.17	1304.1					Confluence Details
Head Node - 133M		847.6		0.3	0.55	2.43	16.4	1.63		0.17	1129.7					Confluence Details
Head Node - 102J		1218.7		0.3	0.57	2.32	23.4	1.34		0.17	1291.8					Confluence Details
Head Node - 96I		1247.1		0.3	0.57	2.31	23.7	1.33		0.17	1310.1					Confluence Details
Head Node - 89H		1963.8		0.29	0.61	2.34	47.6	0.9		0.17	1288.8					Confluence Details
Head Node - 68G		1354.6		0.29	0.58	2.32	27.3	1.23		0.17	1300					Confluence Details
Head Node - 59F		1748.7		0.28	0.62	2.31	38.6	1.01		0.18	1321.8					Confluence Details
Head Node - 43E		1661.5		0.29	0.6	2.32	36.4	1.04		0.17	1313.3					Confluence Details
Head Node - 15A		2058.9		0.28	0.66	2.39	54	0.84		0.18	1216.7					Confluence Details
Head Node - 25C		2023.3		0.28	0.66	2.37	51.6	0.86		0.18	1238.3					Confluence Details
Head Node - 20B		1677.6		0.29	0.59	2.31	36.8	1.04		0.17	1319					Confluence Details
Head Node - 35D		1466.1		0.29	0.58	2.35	32.4	1.11		0.17	1257.9					Confluence Details
Head Node - 178R		1872		0.29	0.6	2.31	42.9	0.95		0.17	1321.2					Confluence Details
Head Node - 174Q		936		0.3	0.52	2.7	29.4	1.18		0.16	864.1					Confluence Details
Head Node - 161P		1285		0.3	0.57	2.3	24.3	1.31		0.17	1331.6					Confluence Details
Head Node - 156O		1354.3		0.3	0.57	2.29	26	1.26		0.17	1341.2					Confluence Details
Head Node - 150N		1013.5		0.3	0.56	2.65	30.5	1.15		0.17	905.9					Confluence Details
238A	58.1	1354.3	2355.3			2.29	26	1.26		0.17	1513.2	1369.1	0.01012	10.3(AG)	3.39(AG)	
Head Node - 226W		1024		0.31	0.45	5.55	24.6	1.3		0.14	1191.1					Confluence Details
Head Node - 220V		1200		0.31	0.46	5.44	27.9	1.21		0.14	1271.4					Confluence Details
Head Node - 209U		1631.2		0.3	0.46	5.36	39.9	0.99		0.14	1333					Confluence Details
Head Node - 200T		1165.1		0.31	0.45	5.46	27.2	1.23		0.14	1257.4					Confluence Details
Head Node - 193S		1144.3		0.31	0.46	5.79	34.1	1.08		0.14	1042.7					Confluence Details
Head Node - 113K		1299.2		0.3	0.56	5.39	29	1.19		0.17	1305.5					Confluence Details
Head Node - 118L		1414.3		0.29	0.57	5.39	32.5	1.11		0.17	1304.1					Confluence Details
Head Node - 133M		907.4		0.3	0.54	5.65	22	1.38		0.16	1129.7					Confluence Details
Head Node - 102J		1278.4		0.3	0.56	5.41	28.8	1.19		0.17	1291.8					Confluence Details
Head Node - 96I		1306.8		0.3	0.56	5.39	29.1	1.18		0.17	1310.1					Confluence Details
Head Node - 89H		2023.5		0.29	0.61	5.41	53	0.84		0.17	1288.8					Confluence Details
Head Node - 68G		1414.3		0.29	0.57	5.4	32.7	1.11		0.17	1300					Confluence Details
Head Node - 59F		1808.4		0.28	0.61	5.37	44	0.94		0.17	1321.8					Confluence Details
Head Node - 43E		1721.3		0.29	0.59	5.38	41.8	0.97		0.17	1313.3					Confluence Details
Head Node - 15A		2118.6		0.28	0.66	5.51	59.5	0.79		0.18	1216.7					Confluence Details
Head Node - 25C		2083		0.28	0.65	5.48	57	0.81		0.18	1238.3					Confluence Details
Head Node - 20B		1737.4		0.29	0.59	5.38	42.2	0.96		0.17	1319					Confluence Details
Head Node - 35D		1525.9		0.29	0.57	5.46	37.8	1.02		0.17	1257.9					Confluence Details
Head Node - 178R		1931.7		0.29	0.59	5.37	48.2	0.89		0.17	1321.2					Confluence Details
Head Node - 174Q		995.7		0.3	0.52	6.15	35.6	1.06		0.16	864.1					Confluence Details
Head Node - 161P		1344.8		0.3	0.56	5.36	29.6	1.17		0.17	1331.6					Confluence Details
Head Node - 156O		1414		0.3	0.57	5.35	31.4	1.14		0.17	1341.2					Confluence Details
Head Node - 150N		1073.3		0.3	0.55	6.06	36.5	1.04		0.17	905.9					Confluence Details
240A	59.7	1414	2415.1	0.3	0.4	5.35	31.4	1.14	0.12	0.17	1513.2	1318.1	0.0007	4.2(AG)	7.51(AG)	

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 226W		1531		0.31	0.41	0	28.2	1.21		0.13	1862.5					Confluence Details
Head Node - 220V		1786.6		0.31	0.41	0	31.4	1.13		0.13	1974.8					Confluence Details
Head Node - 209U		2315.6		0.3	0.42	0	43.3	0.95		0.13	1958.3					Confluence Details
Head Node - 200T		1747.4		0.31	0.41	0	30.7	1.15		0.13	1970.2					Confluence Details
Head Node - 193S		1804.2		0.31	0.41	0	37.8	1.02		0.13	1723.3					Confluence Details
Head Node - 113K		1890.4		0.3	0.49	0	32.5	1.11		0.15	1991.4					Confluence Details
Head Node - 118L		2031.1		0.3	0.49	0	36	1.05		0.15	1970.2					Confluence Details
Head Node - 133M		1338.6		0.3	0.47	0	25.7	1.27		0.14	1759.2					Confluence Details
Head Node - 102J		1868.8		0.3	0.49	0	32.3	1.12		0.14	1980.9					Confluence Details
Head Node - 96I		1900.9		0.3	0.49	0	32.6	1.11		0.15	1997.5					Confluence Details
Head Node - 89H		2723.3		0.29	0.53	0	56.5	0.82		0.15	1834.9					Confluence Details
Head Node - 68G		2036.8		0.3	0.49	0	36.1	1.05		0.15	1969.3					Confluence Details
Head Node - 59F		2503.3		0.29	0.53	0	47.4	0.9		0.15	1911.9					Confluence Details
Head Node - 43E		2413.7		0.29	0.51	0	45.3	0.92		0.15	1919					Confluence Details
Head Node - 15A		2820.9		0.28	0.57	0	63.1	0.77		0.16	1730.2					Confluence Details
Head Node - 25C		2785.1		0.28	0.56	0	60.6	0.78		0.16	1764.9					Confluence Details
Head Node - 20B		2430.6		0.29	0.51	0	45.6	0.92		0.15	1920.6					Confluence Details
Head Node - 35D		2201.7		0.29	0.49	0	41.3	0.97		0.15	1903					Confluence Details
Head Node - 178R		2628.9		0.29	0.52	0	51.7	0.86		0.15	1890.6					Confluence Details
Head Node - 174Q		1663.5		0.3	0.43	0	39.5	1		0.13	1527.1					Confluence Details
Head Node - 161P		1977.9		0.3	0.48	0	33.1	1.1		0.14	2054.9					Confluence Details
Head Node - 156O		1983.1		0.3	0.5	0	34.8	1.07		0.15	1980					Confluence Details
Head Node - 150N		1744.8		0.3	0.46	0	40.4	0.98		0.14	1560.5					Confluence Details
Head Node - 345N		1921.7		0.31	0.41	0	34	1.08		0.13	1958.2					Confluence Details
Head Node - 331L		2791.4		0.31	0.42	0	61	0.78		0.13	1759					Confluence Details
Head Node - 326K		2404.8		0.31	0.42	0	45.1	0.93		0.13	1922.9					Confluence Details
Head Node - 341M		1272.7		0.3	0.5	0	22.6	1.36		0.15	1717.2					Confluence Details
Head Node - 308H		1448.1		0.3	0.5	0	25.4	1.28		0.15	1840.6					Confluence Details
Head Node - 303G		1895.4		0.31	0.41	0	32.5	1.11		0.13	1993.3					Confluence Details
Head Node - 293F		1956.8		0.31	0.41	0	33.1	1.1		0.13	2026.2					Confluence Details
Head Node - 268B		1745.9		0.31	0.41	0	30.7	1.15		0.13	1969.9					Confluence Details
Head Node - 263Z		2447.3		0.31	0.41	0	46	0.91		0.13	1916.6					Confluence Details
Head Node - 245X		1993.5		0.31	0.41	0	33.3	1.1		0.13	2056.3					Confluence Details
Head Node - 250Y		1982.3		0.31	0.41	0	33.1	1.1		0.13	2057.9					Confluence Details
Head Node - 274C		1942.7		0.31	0.42	0	33.2	1.1		0.13	2005.9					Confluence Details
Head Node - 283D		1799.2		0.31	0.41	0	31.5	1.13		0.13	1975.9					Confluence Details
Head Node - 285E		1812.3		0.31	0.41	0	31.7	1.13		0.13	1976.9					Confluence Details
Head Node - 314I		1931.9		0.31	0.41	0	37	1.03		0.13	1856.5					Confluence Details
Head Node - 318J		2252.1		0.31	0.41	0	42.2	0.96		0.13	1927.5					Confluence Details
Head Node - 352O		347.1		0.31	0.3	0	18.7	1.52		0.09	600.2					Confluence Details
354AX - Confluence		1982.3	3127.2	0.31	0.41	0	33.1	1.1		0.13	2057.9					Confluence Results

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
94L	1.4	1.4	1.4	0.3	0.46		6.5	2.75	0.14	0.14	3.3	141.2	0.01417			
96L	49.4	50.9	50.9	0.3	0.44	10.58	17.1	1.6	0.13	0.13	67.6	1884	0.004	3.8(AG)	0.86(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
98AJ		50.9		0.3	0.44	4.65	21.7	1.4		0.13	67.6	2773.8	0.00835	9.9(PUG)	2.13(PUG)	
80J	1.2	1.2	1.2	0.3	0.2		8.2	2.41	0.06	0.06	2.6	313	0.00935			
82J	9.9	11.1	11.1	0.3	0.01	4.28	12.5	1.9	0	0.01	19.1	764.1	0.0131	3.7(AG)	0.44(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
85J	23	34.1	34.1			2.62	15.1	1.71		0.04	51.5	910	0.0069	5.8(PUG)	1.43(PUG)	Warning: Pipe OVERFLOW
92JK	18.4	52.5	52.5	0.3	0.37	2.73	17.8	1.56	0.11	0.07	70.9	1334.9	0.00598	8.2(PUG)	2.19(PUG)	
89K	1	1	1	0.3	0.98		10	2.15	0.29	0.29	1.7	187.2	0.00304			
91K	21.8	22.8	22.8	0.3	0.26	67.6	77.6	0.68	0.08	0.09	12.3	1861.5	0.00071	0.5(AG)	0.40(AG)	
92JK		22.8		0.3	0.29	2.02	79.7	0.67		0.09	12.3	735.9	0.00782	6.1(PUG)	0.87(PUG)	
Head Node - 85J		67.7		0.3	0.2	0	17.8	1.56		0.06	92					Confluence Details
Head Node - 91K		85.4		0.3	0.22	0	79.7	0.67		0.07	47					Confluence Details
92JK - Confluence		67.7	85.4	0.3	0.2	0	17.8	1.56		0.06	92					Confluence Results
70I	1.2	1.2	1.2	0.3	0.01		7.2	2.6	0	0	2.9	328.8	0.01103			
72I	29.9	31.1	31.1	0.3	0	20.96	28.1	1.21	0	0	34	1718.3	0.00704	1.6(AG)	0.39(AG)	
74I	9.1	40.2	40.2	0.3	0.01	3.84	32	1.12	0	0	40.9	1193.6	0.00232	5.2(PUG)	2.07(PUG)	
76I	22.6	62.8	62.8	0.3	0.04	3.68	35.6	1.06	0.01	0	59.9	2007.1	0.00928	9.1(PUG)	1.55(PUG)	
77AI	16.1	78.9	78.9	0.3	0.02	2.49	38.1	1.02	0.01	0	72.5	1160.2	0.00471	7.8(PUG)	2.08(PUG)	
59H	1	1	1	0.3	0.15		6.5	2.74	0.04	0.04	2.5	267.7	0.01815			
61H	23	24	24	0.3	0.15	24.86	31.4	1.13	0.05	0.05	23.7	2265.6	0.01074	1.7(AG)	0.61(AG)	
63H	26.2	50.2	50.2	0.3	0.2	1.94	33.4	1.1	0.06	0.05	47.5	1110.1	0.0149	9.5(PUG)	1.26(PUG)	
64AH		50.2		0.3	0.18	2.09	35.4	1.06		0.05	47.5	878.3	0.00415	7.0(PUG)	2.12(PUG)	
43F	0.8	0.8	0.8	0.3	0.15		8.9	2.3	0.04	0.04	1.6	158	0.00133			
45F	9.9	10.7	10.7	0.3	0	4.8	13.7	1.8	0	0	17.5	850.1	0.01519	3.7(AG)	0.42(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
47F	25.8	36.5	36.5	0.3	0.01	2.76	16.5	1.63	0	0	53.9	1361.6	0.01259	8.2(PUG)	1.28(PUG)	
55FG	27.6	64.2	64.2	0.3	0.01	1.13	17.6	1.57	0	0	91.2	767.9	0.01377	11.3(PUG)	1.73(PUG)	
50G	0.6	0.6	0.6	0.3	0.5		4.7	3.29	0.15	0.15	1.7	103.4	0.04027			
52G	10.7	11.3	11.3	0.3	0.3	1.81	6.5	2.74	0.09	0.09	27.1	557.4	0.03622	4.9(AG)	0.42(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
54G	17.2	28.5	28.5	0.3	0.01	2.33	8.9	2.31	0	0.04	58.6	1335.8	0.02313	9.6(PUG)	1.23(PUG)	Warning: Pipe OVERFLOW
55FG		28.5		0.3	0.13	2.19	11.1	2.04		0.04	58.6	1479.1	0.01323	11.3(PUG)	2.07(PUG)	
Head Node - 47F		92.6		0.3	0.05	0	17.6	1.57		0.01	136					Confluence Details
Head Node - 54G		68.7		0.3	0.06	0	11.1	2.04		0.02	133					Confluence Details
55FG - Confluence		92.6	92.6	0.3	0.05	0	17.6	1.57		0.01	136					Confluence Results

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13B	0.8	0.8	0.8	0.3	0.45		7.8	2.48	0.13	0.13	1.7	216.4	0.01312			
15B	7.9	8.7	8.7	0.3	0.39	3.83	11.6	1.98	0.12	0.12	14.7	662.2	0.01227	3.6(AG)	0.42(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
21BC	20.2	28.9	28.9	0.3	0.5	1.07	12.7	1.89	0.15	0.14	45.7	720	0.03347	11.2(PUG)	0.78(PUG)	
18C	1.2	1.2	1.2	0.3	0.45		7.6	2.52	0.13	0.13	2.6	221.5	0.01576			
20C	6.9	8.1	8.1	0.3	0.57	3.85	11.4	2	0.17	0.17	13.4	758.8	0.01897	4.0(AG)	0.38(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
21BC		8.1		0.3	0.55	1.87	13.3	1.84		0.17	13.4	1271.7	0.03506	11.3(PUG)	0.81(PUG)	
Head Node - 20C		36.9		0.3	0.49	0	13.3	1.84		0.15	57.9					Confluence Details
Head Node - 15B		36.6		0.3	0.49	0	12.7	1.89		0.15	58.9					Confluence Details
21BC - Confluence		36.6	36.9	0.3	0.49	0	12.7	1.89		0.15	58.9					Confluence Results
Head Node - 20C		48		0.3	0.48	0.17	13.5	1.82		0.14	73.3					Confluence Details
Head Node - 15B		47.6		0.3	0.48	0.17	12.9	1.87		0.14	74.8					Confluence Details
23B	11.1	47.6	48	0.3	0.45	0.17	12.9	1.87	0.13	0.14	74.8	154.3	0.03151	15.5(PUG)	1.81(PUG)	
25D	0.8	0.8	0.8	0.3	0.45		5.6	3	0.13	0.13	2.1	206.7	0.06515			
27D	16.5	17.4	17.4	0.3	0.45	4.01	9.6	2.21	0.13	0.13	32.7	1231.9	0.04299	6.5(AG)	0.43(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
34AB		17.4		0.3	0.45	1.87	11.4	2		0.13	32.7	912.6	0.00849	8.1(PUG)	1.91(PUG)	
29E	1.4	1.4	1.4	0.3	0.45		7.1	2.62	0.13	0.13	3.2	310.1	0.04411			
31E	8.5	9.9	9.9	0.3	0.45	4.72	11.8	1.97	0.13	0.13	16.4	1089	0.0342	4.6(AG)	0.37(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
34AB		9.9		0.3	0.45	0.46	12.3	1.92		0.13	16.4	349.4	0.04129	12.5(PUG)	1.04(PUG)	
2A	1.2	1.2	1.2	0.3	0.45		6.7	2.7	0.13	0.13	2.8	267.7	0.04229			
4A	3.6	4.8	4.8	0.3	0.45	3.15	9.9	2.17	0.13	0.13	9	618	0.03038	3.6(AG)	0.33(AG)	
6A	29.5	34.3	34.3	0.3	0.45	5.26	15.1	1.71	0.14	0.14	49	1803.8	0.03102	6.7(AG)	0.53(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
8A	17.2	51.5	51.5	0.3	0.45	0.46	15.6	1.68	0.13	0.14	72.2	424.2	0.03358	15.5(PUG)	1.45(PUG)	
34AB	6.9	58.3	58.3	0.3	0.37	0.51	16.1	1.65	0.11	0.13	80.4	812.7	0.11197	26.8(PUG)	1.28(PUG)	
Head Node - 27D		116.4		0.3	0.41	0	11.4	2		0.12	198.2					Confluence Details
Head Node - 8A		146.9		0.3	0.42	0	16.1	1.65		0.13	203.5					Confluence Details
Head Node - 31E		123.1		0.3	0.41	0	12.3	1.92		0.12	201.2					Confluence Details
Head Node - 20C		144.2		0.3	0.42	0	15.3	1.7		0.12	205.7					Confluence Details
Head Node - 15B		141.6		0.3	0.41	0	14.7	1.74		0.12	207.1					Confluence Details
34AB - Confluence		141.6	146.9	0.3	0.41	0	14.7	1.74		0.12	207.1					Confluence Results
Head Node - 27D		135.8		0.3	0.37	0.54	12	1.95		0.11	226.6					Confluence Details
Head Node - 8A		166.3		0.3	0.38	0.53	16.6	1.62		0.11	227.6					Confluence Details
Head Node - 31E		142.5		0.3	0.37	0.54	12.8	1.88		0.11	228.6					Confluence Details
Head Node - 20C		163.6		0.3	0.38	0.53	15.9	1.66		0.11	230.2					Confluence Details

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 15B		160.9		0.3	0.38	0.53	15.2	1.7		0.11	232.1					Confluence Details
36A	19.4	160.9	166.3	0.3	0.09	0.53	15.2	1.7	0.03	0.11	232.1	721	0.03525	22.6(PUG)	2.52(PUG)	
Head Node - 27D		160		0.3	0.33	1.17	13.2	1.85		0.1	254.2					Confluence Details
Head Node - 8A		190.5		0.3	0.35	1.17	17.8	1.56		0.1	251.8					Confluence Details
Head Node - 31E		166.7		0.3	0.33	1.17	14	1.79		0.1	255.4					Confluence Details
Head Node - 20C		187.8		0.3	0.34	1.17	17	1.6		0.1	254.9					Confluence Details
Head Node - 15B		185.1		0.3	0.34	1.17	16.4	1.63		0.1	257.1					Confluence Details
38A	24.2	185.1	190.5	0.3	0.13	1.17	16.4	1.63	0.04	0.1	257.1	1129.3	0.01374	16.1(PUG)	3.44(PUG)	
Head Node - 27D		181.4		0.3	0.29	1.76	14.9	1.72		0.09	269.2					Confluence Details
Head Node - 8A		211.9		0.3	0.31	1.76	19.6	1.48		0.09	266.6					Confluence Details
Head Node - 31E		188.1		0.3	0.3	1.76	15.7	1.67		0.09	270.4					Confluence Details
Head Node - 20C		209.2		0.3	0.31	1.76	18.8	1.51		0.09	269.5					Confluence Details
Head Node - 15B		206.5		0.3	0.31	1.76	18.2	1.54		0.09	271.7					Confluence Details
40A	21.4	206.5	211.9	0.3	0.01	1.76	18.2	1.54	0	0.09	271.7	727.9	0.00169	6.9(PUG)	5.33(PUG)	Warning: Pipe OVERFLOW
Head Node - 27D		285.8		0.3	0.2	0	15.2	1.71		0.06	442					Confluence Details
Head Node - 8A		331.1		0.3	0.21	0	19.8	1.47		0.06	433.8					Confluence Details
Head Node - 31E		295.5		0.3	0.2	0	16	1.66		0.06	442.4					Confluence Details
Head Node - 20C		327.8		0.3	0.21	0	19.1	1.5		0.06	439.6					Confluence Details
Head Node - 15B		322.9		0.3	0.21	0	18.4	1.53		0.06	442.1					Confluence Details
Head Node - 47F		329.1		0.3	0.2	0	19.2	1.49		0.06	438.8					Confluence Details
Head Node - 54G		242.5		0.3	0.2	0	12.7	1.89		0.06	418.8					Confluence Details
56AF - Confluence		295.5	331.1	0.3	0.2	0	16	1.66		0.06	442.4					Confluence Results
Head Node - 27D		345.1		0.3	0.18	0	16.3	1.64		0.05	497.3					Confluence Details
Head Node - 8A		397		0.3	0.19	0	21	1.42		0.06	493.1					Confluence Details
Head Node - 31E		355.9		0.3	0.18	0	17.1	1.59		0.05	498.4					Confluence Details
Head Node - 20C		392.6		0.3	0.19	0	20.2	1.45		0.06	498.3					Confluence Details
Head Node - 15B		386.8		0.3	0.19	0	19.6	1.48		0.06	500.1					Confluence Details
Head Node - 47F		394.1		0.3	0.18	0	20.4	1.44		0.05	499					Confluence Details
Head Node - 54G		298.3		0.3	0.18	0	13.9	1.8		0.05	473.1					Confluence Details
Head Node - 63H		417.5		0.3	0.19	0	35.4	1.06		0.06	381.4					Confluence Details
64AH - Confluence		386.8	417.5	0.3	0.19	0	19.6	1.48		0.06	500.1					Confluence Results
Head Node - 27D		383.4		0.3	0.16	2.1	18.4	1.53		0.05	515.6					Confluence Details
Head Node - 8A		435.4		0.3	0.18	2.1	23.1	1.35		0.05	511.9					Confluence Details
Head Node - 31E		394.2		0.3	0.16	2.1	19.2	1.49		0.05	516.8					Confluence Details
Head Node - 20C		430.9		0.3	0.17	2.1	22.3	1.37		0.05	516.8					Confluence Details
Head Node - 15B		425.1		0.3	0.17	2.1	21.7	1.4		0.05	518.6					Confluence Details
Head Node - 47F		432.5		0.3	0.16	2.1	22.5	1.37		0.05	517.6					Confluence Details
Head Node - 54G		336.6		0.3	0.16	2.12	16	1.66		0.05	492.2					Confluence Details
Head Node - 63H		455.9		0.3	0.18	2.22	37.7	1.02		0.05	401.8					Confluence Details
66A	38.3	425.1	455.9	0.3	0	2.1	21.7	1.4	0	0.05	518.6	1288	0.00287	10.2(PUG)	6.11(PUG)	
Head Node - 27D		434.1		0.3	0.14	0	19.6	1.48		0.04	569.9					Confluence Details
Head Node - 8A		495.7		0.3	0.16	0	24.3	1.31		0.05	571.4					Confluence Details

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Head Node - 31E		446.6		0.3	0.15	0	20.4	1.44		0.04	572					Confluence Details
Head Node - 20C		489.7		0.3	0.15	0	23.5	1.33		0.05	575.5					Confluence Details
Head Node - 15B		482.5		0.3	0.15	0	22.9	1.35		0.05	576.6					Confluence Details
Head Node - 47F		491.6		0.3	0.14	0	23.7	1.33		0.04	576.5					Confluence Details
Head Node - 54G		382.3		0.3	0.14	0	17.2	1.59		0.04	543.4					Confluence Details
Head Node - 63H		544.8		0.3	0.15	0	38.9	1.01		0.04	474.8					Confluence Details
Head Node - 76I		543.7		0.3	0.14	0	38.1	1.02		0.04	481.7					Confluence Details
77AI - Confluence		482.5	544.8	0.3	0.15	0	22.9	1.35		0.05	576.6					Confluence Results
Head Node - 27D		617.8		0.3	0.21	0	20.2	1.45		0.06	803.2					Confluence Details
Head Node - 8A		692.1		0.3	0.21	0	24.9	1.29		0.06	800.1					Confluence Details
Head Node - 31E		637.6		0.3	0.21	0	21	1.42		0.06	808.9					Confluence Details
Head Node - 20C		685.8		0.3	0.21	0	24.1	1.32		0.06	806.5					Confluence Details
Head Node - 15B		678.5		0.3	0.21	0	23.5	1.34		0.06	809.6					Confluence Details
Head Node - 47F		687.8		0.3	0.21	0	24.3	1.31		0.06	806.9					Confluence Details
Head Node - 54G		543.9		0.3	0.2	0	17.8	1.56		0.06	765.2					Confluence Details
Head Node - 63H		745.4		0.3	0.2	0	39.6	1		0.06	666.5					Confluence Details
Head Node - 76I		744		0.3	0.19	0	38.8	1.01		0.06	675.2					Confluence Details
Head Node - 96L		243		0.3	0.35	0	21.7	1.4		0.11	296.1					Confluence Details
Head Node - 85J		647.3		0.3	0.21	0	21.4	1.41		0.06	811.5					Confluence Details
Head Node - 91K		756.8		0.3	0.2	0	84	0.65		0.06	414.4					Confluence Details
98AJ - Confluence		647.3	757.9	0.3	0.21	0	21.4	1.41		0.06	811.5					Confluence Results

Coyote Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
147O	2	2	2	0.3	0.5		8.2	2.41	0.14	0.14	4.2	306.5	0.02205			
149O	19.6	21.6	21.6	0.3	0.45	7.26	15.5	1.69	0.14	0.14	30.4	1506.8	0.01751	4.2(AG)	0.48(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
150AO	41.8	63.4	63.4	0.3	0.68	2.54	18	1.55	0.2	0.18	78.7	1341.3	0.01054	8.8(PUG)	1.66(PUG)	
128M	1.6	1.6	1.6	0.3	0.6		9.2	2.27	0.13	0.13	3.1	289.4	0.01545			
130M	9.3	10.9	10.9	0.3	0.37	2.95	12.1	1.94	0.11	0.11	18	636.5	0.02664	4.1(AG)	0.40(AG)	
132M	21.6	32.5	32.5	0.3	0.44	1.51	13.6	1.81	0.13	0.13	49.8	899.7	0.02012	9.9(PUG) 4.3(AG)	1.12(PUG) 0.48(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
142AL	31.7	64.2	64.2	0.3	0.41	0.79	14.4	1.76	0.12	0.12	95.1	520.4	0.01532	10.9(PUG) 2.4(AG)	2.05(PUG) 0.79(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
134N	1.6	1.6	1.6	0.3	0.6		6.2	2.82	0.14	0.14	3.9	199	0.05019			
137N	16.7	24.6	18.4				5.79	12	1.95		40.5	1226.2	0.02825	3.8(AG)	0.36(AG)	
139N	8.7	33.3	27	0.3	0.45	2.08	14.1	1.78	0.14	0.14	49.7	609.9	0.01906	5.0(AG)	0.55(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
142AL	31.7	65	58.7	0.3	0.41	1.99	16.1	1.65	0.12	0.13	89.8	1703.7	0.02685	14.3(PUG)	1.48(PUG)	
106L	1.2	1.2	1.2	0.3	1		7	2.63	0.3	0.3	2.6	237.2	0.1303			
108L	9.7	10.9	10.9	0.3	1	1.88	8.9	2.3	0.3	0.3	19.8	584.5	0.08608	6.2(AG)	0.53(AG)	
110L	47.4	58.3	58.3	0.3	1	3.17	12.1	1.94	0.3	0.3	86.8	1246.9	0.07697	7.6(AG)	1.12(AG)	
113L	82.3	181.8	140.7				2.86	14.9	1.72		234.5	1274.1	0.09152	7.7(AG)	1.32(AG)	
115L	36.7	218.5	177.4	0.3	1	1.92	16.9	1.61	0.3	0.3	259.5	1076.4	0.09273	9.4(AG)	1.78(AG)	
117L	35.5	254.1	212.9	0.3	1	4.71	21.6	1.4	0.3	0.3	259.5	1296.8	0.02134	4.5(AG)	2.91(AG)	
119L	12.9	267	225.8	0.3	0.42	0.78	22.4	1.37	0.13	0.29	262	1148.9	0.03809	24.6(PUG) 3.3(AG)	2.65(PUG) 0.22(AG)	
121L	36.1	303.1	261.9	0.3	0.45	1.51	23.9	1.32	0.14	0.27	288.9	2056.6	0.03046	22.6(PUG) 4.9(AG)	2.85(PUG) 0.43(AG)	
124L	24.8	336	286.8				0.43	24.3	1.31		319.8	660.6	0.03953	25.3(PUG) 3.1(AG)	3.03(PUG) 0.28(AG)	
126L	8.7	344.7	295.4	0.3	0.45	1.34	25.6	1.27	0.14	0.26	319.8	1317.2	0.01844	16.4(PUG) 7.6(AG)	3.28(PUG) 0.74(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
142AL	31.7	376.3	327.1	0.3	0.41	2.42	28.1	1.21	0.12	0.25	328.5	2814.8	0.0269	19.4(PUG)	1.50(PUG)	
96K	0.6	0.6	0.6	0.3	0.6		9.5	2.23	0.11	0.11	1.2	216.7	0.00738			
98K	4.6	5.2	5.2	0.3	0.45	3.74	13.2	1.85	0.14	0.13	8.2	954.2	0.06517	4.8(AG)	0.29(AG)	
100HJ	16.1	21.4	21.4	0.3	0.45	2.44	15.6	1.68	0.14	0.13	30	1238.3	0.02849	8.5(PUG) 4.7(AG)	0.52(PUG) 0.40(AG)	
89J	0.8	0.8	0.8	0.3	1		7.9	2.45	0.3	0.3	1.6	222.5	0.06225			
91J	3.2	4	4	0.3	0.27	4.28	12.2	1.93	0.08	0.12	6.6	755.9	0.04324	3.4(AG)	0.34(AG)	

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Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
93J	29.1	33.1	33.1	0.3	0.46	5.81	18	1.55	0.14	0.14	42.4	1745	0.03736	6.0(AG)	0.47(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
100HJ	16.1	49.2	49.2	0.3	0.45	0.75	18.8	1.51	0.14	0.14	61.6	697.3	0.04027	15.6(PUG) 5.2(AG)	1.08(PUG) 0.37(AG)	
78I	1	1	1	0.3	1		7.3	2.57	0.3	0.3	2.1	284.7	0.15141			
80I	4	5	5	0.3	1	2.31	9.7	2.2	0.3	0.3	8.7	702.5	0.17448	6.0(AG)	0.26(AG)	
82I	6.5	11.5	11.5	0.3	1	1.89	11.5	1.99	0.3	0.3	17.6	533.6	0.12155	5.1(AG)	0.39(AG)	
84I	28	39.6	39.6	0.3	1	4.18	15.7	1.67	0.3	0.3	49.3	1544.8	0.17277	6.9(AG)	0.63(AG)	
87HI	40	79.5	79.5	0.3	0.92	4.27	20	1.46	0.27	0.29	84.7	1669.8	0.04971	6.9(AG)	0.89(AG)	
70H	1.2	1.2	1.2	0.3	1		6.1	2.85	0.3	0.3	2.8	214.1	0.21882			
72H	2.6	3.8	3.8	0.3	1	1.18	7.3	2.58	0.3	0.3	7.9	445.9	0.36085	7.2(AG)	0.20(AG)	
74H	8.1	11.9	11.9	0.3	1	1.99	9.2	2.25	0.3	0.3	21.1	647	0.17119	6.1(AG)	0.39(AG)	
76H	23.2	35.1	35.1	0.3	1	5.12	14.4	1.76	0.3	0.3	46.5	1671.7	0.11312	5.9(AG)	0.69(AG)	
87HI	9.9	45	45	0.3	0.89	3.17	17.5	1.57	0.27	0.29	52.3	1241.3	0.06928	6.5(AG)	0.61(AG)	
Head Node - 76H		164.6		0.38	0.76	0	17.5	1.57		0.28	192.5					Confluence Details
Head Node - 84I		174.3		0.37	0.77	0	20	1.46		0.28	186.2					Confluence Details
87HI - Confluence		164.6	124.5	0.38	0.76	0	17.5	1.57		0.28	192.5					Confluence Results
Head Node - 76H		251.3		0.36	0.65	0	18.8	1.51		0.23	292.2					Confluence Details
Head Node - 84I		261.1		0.35	0.66	0	21.3	1.41		0.23	279.1					Confluence Details
Head Node - 98K		212.7		0.36	0.65	0	15.6	1.68		0.23	279.4					Confluence Details
Head Node - 93J		251.3		0.36	0.65	0	18.8	1.51		0.23	292.2					Confluence Details
100HJ - Confluence		251.3	179	0.36	0.65	0	18.8	1.51		0.23	292.2					Confluence Results
46E	0.8	0.8	0.8	0.3	1		11.5	2	0.3	0.3	1.2	250.1	0.01248			
48E	5.7	6.5	6.5	0.3	1	1.49	13	1.86	0.3	0.3	9.2	536.8	0.32085	7.4(AG)	0.23(AG)	
50E	7.1	13.5	13.5	0.3	1	1.68	14.6	1.74	0.3	0.3	17.7	657.3	0.21719	7.2(AG)	0.29(AG)	
58EF	19.8	33.3	33.3	0.3	1	2.7	17.3	1.58	0.3	0.3	38.8	891.1	0.07919	6.1(AG)	0.49(AG)	
53F	3.2	3.2	3.2	0.3	1		8.2	2.42	0.3	0.3	6.2	312.6	0.10715			
55F	8.9	12.1	12.1	0.3	1	1.46	9.6	2.2	0.3	0.3	20.9	609.1	0.17331	8.0(AG)	0.44(AG)	
57F	21.2	33.3	33.3	0.3	1	3.7	13.3	1.84	0.3	0.3	46.4	1577.7	0.15135	7.8(AG)	0.64(AG)	
58EF	19.8	53.1	53.1	0.3	1	2.4	15.7	1.67	0.3	0.3	66.1	717.5	0.04186	5.2(AG)	0.92(AG)	
Head Node - 57F		83.3		0.3	1	0	15.7	1.67		0.3	103.7					Confluence Details
Head Node - 50E		86.4		0.3	1	0	17.3	1.58		0.3	100.6					Confluence Details
58EF - Confluence		83.3	66.6	0.3	1	0	15.7	1.67		0.3	103.7					Confluence Results
61G	0.8	0.8	0.8	0.3	1		8.5	2.36	0.3	0.3	1.5	133.9	0.07045			
63G	1.6	2.4	2.4	0.3	1	1.4	9.9	2.17	0.3	0.3	4.1	442.7	0.03737	5.8(AG)	0.42(AG)	Warning: Rural local (< 500 ADT) OVERFLOW (curb)
65G	5.7	8.1	8.1	0.3	0.45	1.18	11.1	2.04	0.14	0.19	13.6	634.6	0.05772	9.0(PUG) 4.4(AG)	0.33(PUG) 0.31(AG)	
67AE	3	11.1	11.1	0.3	0.47	0.96	12	1.94	0.14	0.17	17.8	671.9	0.04233	11.6(PUG) 4.2(AG)	0.64(PUG) 0.24(AG)	
24D	1.8	1.8	1.8	0.3	1		6.7	2.7	0.21	0.21	4.1	329.6	0.3192			

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26D	12.1	13.9	13.9	0.3	0.92	1.76	8.5	2.37	0.28	0.27	26.6	713.7	0.16353	7.9(AG)	0.75(AG)	
28D	25.4	39.4	39.4	0.3	0.96	3.99	12.5	1.91	0.29	0.28	58	1507.1	0.07051	6.8(AG)	1.05(AG)	
29AD	36.7	76.1	76.1	0.3	1	3.99	16.5	1.63	0.3	0.29	92.6	1353	0.07592	5.9(AG)	1.63(AG)	
7B	1.6	1.6	1.6	0.3	0.6		5.2	3.11	0.14	0.14	4.4	267.7	0.218			
9B	3	4.6	4.6	0.3	0.45	1.95	7.2	2.6	0.14	0.14	10.4	386	0.02597	3.5(AG)	0.34(AG)	
11B	11.5	16.1	16.1	0.3	0.45	2.4	9.6	2.21	0.14	0.14	30.4	798.5	0.05458	6.0(AG)	0.41(AG)	
13B	8.1	24.2	24.2	0.3	0.47	0.7	10.3	2.12	0.14	0.14	43.7	835.1	0.09029	19.9(PUG) 6.0(AG)	0.98(PUG) 0.31(AG)	
21AB	12.9	37.1	37.1	0.3	0.47	0.21	10.5	2.1	0.14	0.14	66.2	330.9	0.15671	26.8(PUG) 8.4(AG)	1.03(PUG) 0.33(AG)	
15C	1.2	1.2	1.2	0.3	0.45		3.9	3.67	0.14	0.14	3.9	155.9	0.32734			
17C	6.7	7.9	7.9	0.3	0.45	2.94	6.8	2.68	0.14	0.14	18.1	869.1	0.05835	5.5(AG)	0.36(AG)	
19C	8.5	16.3	16.3	0.3	0.45	2.9	9.7	2.19	0.14	0.14	30.5	971.2	0.04889	5.8(AG)	0.42(AG)	
21AB	12.9	29.3	29.3	0.3	0.47	1.1	10.8	2.06	0.14	0.14	51.2	342.9	0.00465	5.2(PUG) 2.8(AG)	1.64(PUG) 0.62(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
2A	1	1	1	0.3	0.5		4	3.59	0.14	0.14	3.2	133.9	0.14695			
4A	5.7	6.7	6.7	0.3	0.49	6.37	10.4	2.11	0.15	0.14	11.9	1021.4	0.01455	2.9(AG)	0.38(AG)	
21AB	12.9	19.6	19.6	0.3	0.47	3.06	13.5	1.82	0.14	0.14	29.9	1735.1	0.02325	9.4(PUG) 3.9(AG)	0.84(PUG) 0.40(AG)	
Head Node - 4A		86		0.3	0.46	0	13.5	1.82		0.14	131.5					Confluence Details
Head Node - 19C		82.1		0.3	0.46	0	10.8	2.06		0.14	143.6					Confluence Details
Head Node - 13B		80.7		0.3	0.46	0	10.5	2.1		0.14	143.8					Confluence Details
21AB - Confluence		80.7	60.1	0.3	0.46	0	10.5	2.1		0.14	143.8					Confluence Results
Head Node - 4A		198.8		0.3	0.76	0	17	1.6		0.23	248					Confluence Details
Head Node - 19C		184.7		0.3	0.75	0	14.2	1.77		0.22	258.8					Confluence Details
Head Node - 13B		181.8		0.3	0.75	0	13.9	1.79		0.22	258.6					Confluence Details
Head Node - 28D		198		0.3	0.76	0	16.5	1.63		0.23	252.6					Confluence Details
29AD - Confluence		184.7	136.2	0.3	0.75	0	14.2	1.77		0.22	258.8					Confluence Results
Head Node - 4A		221.2		0.3	0.78	2.43	19.4	1.49		0.23	251.3					Confluence Details
Head Node - 19C		207.1		0.3	0.78	2.4	16.6	1.62		0.23	260.8					Confluence Details
Head Node - 13B		204.2		0.3	0.78	2.4	16.3	1.64		0.23	260.5					Confluence Details
Head Node - 28D		220.4		0.3	0.78	2.42	18.9	1.51		0.23	255.3					Confluence Details
31A	22.4	207.1	158.6	0.3	1	2.4	16.6	1.62	0.3	0.23	260.8	1117.3	0.07061	7.7(AG)	2.68(AG)	
Head Node - 4A		282.5		0.3	0.81	4.95	24.4	1.31		0.24	272.9					Confluence Details
Head Node - 19C		268.5		0.3	0.81	4.9	21.5	1.4		0.24	282.3					Confluence Details
Head Node - 13B		265.5		0.3	0.81	4.9	21.2	1.41		0.24	282.1					Confluence Details
Head Node - 28D		281.7		0.3	0.81	4.92	23.8	1.33		0.24	276.7					Confluence Details
33A	61.3	268.5	220	0.3	0.93	4.9	21.5	1.4	0.28	0.24	282.3	2098.7	0.05637	7.1(AG)	2.71(AG)	
Head Node - 4A		336.8		0.3	0.81	4.72	29.1	1.18		0.24	287.4					Confluence Details
Head Node - 19C		322.7		0.3	0.81	4.67	26.2	1.26		0.24	296.4					Confluence Details
Head Node - 13B		319.8		0.3	0.81	4.67	25.9	1.26		0.24	296.3					Confluence Details
Head Node - 28D		336		0.3	0.81	4.7	28.5	1.2		0.24	291					Confluence Details

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35A	54.3	322.7	274.2	0.3	0.82	4.67	26.2	1.26	0.25	0.24	296.4	1762.1	0.04639	6.2(AG)	2.34(AG)	
Head Node - 4A		440.7		0.34	0.73	4.37	33.5	1.09		0.25	337.6					Confluence Details
Head Node - 19C		426.7		0.35	0.72	4.34	30.6	1.15		0.25	349.1					Confluence Details
Head Node - 13B		423.8		0.35	0.72	4.34	30.2	1.16		0.25	349.3					Confluence Details
Head Node - 28D		439.9		0.34	0.73	4.36	32.8	1.11		0.25	341.6					Confluence Details
38A	75.5	423.8	349.7			4.34	30.6	1.15		0.25	349.1	2156.4	0.02647	8.6(AG)	4.36(AG)	
Head Node - 4A		476		0.34	0.74	0.29	33.7	1.09		0.25	361.2					Confluence Details
Head Node - 19C		462		0.35	0.74	0.29	30.8	1.15		0.25	374.2					Confluence Details
Head Node - 13B		459.1		0.35	0.74	0.29	30.5	1.15		0.25	374.7					Confluence Details
Head Node - 28D		475.3		0.34	0.74	0.29	33.1	1.1		0.25	365.4					Confluence Details
40A	35.3	459.1	385	0.3	0.96	0.29	30.5	1.15	0.29	0.25	374.7	641	0.13862	37.2(PUG) 29.9(AG)	2.46(PUG) 0.83(AG)	
Head Node - 4A		522.2		0.34	0.76	3.57	37.3	1.03		0.26	366.8					Confluence Details
Head Node - 19C		508.2		0.35	0.76	3.53	34.4	1.08		0.26	379.4					Confluence Details
Head Node - 13B		505.3		0.35	0.76	3.53	34	1.08		0.26	379.8					Confluence Details
Head Node - 28D		521.5		0.34	0.76	3.56	36.7	1.04		0.26	370.9					Confluence Details
42A	46.2	505.3	431.2	0.3	0.93	3.53	34	1.08	0.28	0.26	379.8	1494.2	0.02156	7.0(AG)	2.42(AG)	
Head Node - 57F		446		0.35	0.76	0	18.8	1.51		0.26	506					Confluence Details
Head Node - 50E		473.7		0.35	0.76	0	20.4	1.44		0.26	507.5					Confluence Details
Head Node - 4A		715.6		0.34	0.76	0	38.8	1.01		0.26	484.9					Confluence Details
Head Node - 19C		701.5		0.34	0.76	0	35.8	1.05		0.26	504.5					Confluence Details
Head Node - 13B		698.6		0.34	0.76	0	35.5	1.06		0.26	505.8					Confluence Details
Head Node - 28D		714.8		0.34	0.76	0	38.2	1.02		0.26	490.4					Confluence Details
Head Node - 65G		240.4		0.39	0.65	0	12	1.94		0.25	368.9					Confluence Details
67AE - Confluence		473.7	555.3	0.35	0.76	0	35.5	1.06		0.26	505.8					Confluence Results
Head Node - 76H		596.3		0.35	0.71	0	19.4	1.49		0.25	722.8					Confluence Details
Head Node - 84I		686.6		0.35	0.72	0	21.8	1.39		0.25	762.7					Confluence Details
Head Node - 98K		547.6		0.35	0.71	0	16.2	1.65		0.25	743.7					Confluence Details
Head Node - 93J		596.1		0.35	0.71	0	19.3	1.49		0.25	722.7					Confluence Details
Head Node - 57F		738.2		0.35	0.72	0	23.4	1.34		0.25	783.7					Confluence Details
Head Node - 50E		765.9		0.35	0.72	0	25	1.29		0.25	772.6					Confluence Details
Head Node - 4A		1007.8		0.34	0.73	0	43.5	0.94		0.25	663.8					Confluence Details
Head Node - 19C		993.7		0.34	0.73	0	40.4	0.98		0.25	693.3					Confluence Details
Head Node - 13B		990.8		0.35	0.73	0	40.1	0.99		0.25	695.7					Confluence Details
Head Node - 28D		1007		0.34	0.73	0	42.8	0.95		0.25	671.3					Confluence Details
Head Node - 65G		495.1		0.37	0.65	0	17.1	1.6		0.24	665.6					Confluence Details
101AH - Confluence		738.2	749.9	0.35	0.72	0	23.4	1.34		0.25	783.7					Confluence Results
Head Node - 76H		627.6		0.35	0.69	1.03	20.4	1.45		0.24	722.8					Confluence Details
Head Node - 84I		717.8		0.35	0.7	1.03	22.9	1.36		0.24	762.7					Confluence Details
Head Node - 98K		578.9		0.35	0.69	1.03	17.2	1.59		0.24	743.7					Confluence Details
Head Node - 93J		627.3		0.35	0.69	1.03	20.4	1.45		0.24	722.7					Confluence Details
Head Node - 57F		769.4		0.35	0.71	1.03	24.4	1.31		0.25	783.7					Confluence Details
Head Node - 50E		797.2		0.35	0.71	1.03	26.1	1.26		0.25	772.6					Confluence Details

Coyote Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 4A		1039		0.34	0.72	1.03	44.5	0.93		0.25	663.8					Confluence Details
Head Node - 19C		1025		0.34	0.72	1.03	41.5	0.97		0.25	693.3					Confluence Details
Head Node - 13B		1022.1		0.35	0.72	1.03	41.1	0.97		0.25	695.7					Confluence Details
Head Node - 28D		1038.3		0.34	0.72	1.03	43.8	0.94		0.25	671.3					Confluence Details
Head Node - 65G		526.4		0.37	0.64	1.03	18.1	1.54		0.23	665.6					Confluence Details
103A	31.3	769.4	781.1	0.3	0.45	1.03	24.4	1.31	0.14	0.25	783.7	1196.6	0.01894	19.3(PUG) 12.3(AG)	4.10(PUG) 1.16(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown) Warning: depth*vel > 6.0
Head Node - 139N		854.1		0.33	0.68	0	16.1	1.65		0.22	1153.3					Confluence Details
Head Node - 126L		1333.6		0.33	0.7	0	28.1	1.21		0.23	1228.1					Confluence Details
Head Node - 132M		771.9		0.33	0.67	0	14.4	1.76		0.22	1119.2					Confluence Details
Head Node - 76H		1089.6		0.33	0.69	0	22.5	1.37		0.23	1175.3					Confluence Details
Head Node - 84I		1212.5		0.33	0.7	0	24.9	1.29		0.23	1216.2					Confluence Details
Head Node - 98K		998.3		0.33	0.68	0	19.3	1.49		0.22	1196					Confluence Details
Head Node - 93J		1089.3		0.33	0.69	0	22.4	1.37		0.23	1175.2					Confluence Details
Head Node - 57F		1285.1		0.33	0.7	0	26.5	1.25		0.23	1237.9					Confluence Details
Head Node - 50E		1334.4		0.33	0.71	0	28.1	1.21		0.23	1227.2					Confluence Details
Head Node - 4A		1576.2		0.33	0.72	0	46.6	0.91		0.24	981.5					Confluence Details
Head Node - 19C		1562.2		0.33	0.71	0	43.6	0.94		0.24	1027					Confluence Details
Head Node - 13B		1559.2		0.33	0.71	0	43.2	0.95		0.24	1031.4					Confluence Details
Head Node - 28D		1575.4		0.33	0.72	0	46	0.92		0.24	992.3					Confluence Details
Head Node - 65G		958.9		0.34	0.65	0	20.3	1.45		0.22	1117.8					Confluence Details
142AL - Confluence		1285.1	1167.8	0.33	0.7	0	26.5	1.25		0.23	1237.9					Confluence Results
Head Node - 139N		895.1		0.33	0.66	1	17.1	1.6		0.22	1153.3					Confluence Details
Head Node - 126L		1374.5		0.33	0.69	0.99	29	1.18		0.23	1228.1					Confluence Details
Head Node - 132M		812.8		0.33	0.66	1.01	15.4	1.69		0.22	1119.2					Confluence Details
Head Node - 76H		1130.5		0.33	0.68	1	23.5	1.34		0.22	1175.3					Confluence Details
Head Node - 84I		1253.4		0.33	0.69	0.99	25.9	1.26		0.23	1216.2					Confluence Details
Head Node - 98K		1039.3		0.33	0.67	0.99	20.3	1.45		0.22	1196					Confluence Details
Head Node - 93J		1130.2		0.33	0.68	1	23.4	1.34		0.22	1175.2					Confluence Details
Head Node - 57F		1326		0.33	0.69	0.98	27.4	1.22		0.23	1237.9					Confluence Details
Head Node - 50E		1375.4		0.33	0.7	0.99	29.1	1.18		0.23	1227.2					Confluence Details
Head Node - 4A		1617.2		0.33	0.71	1.05	47.7	0.9		0.23	981.5					Confluence Details
Head Node - 19C		1603.1		0.33	0.71	1.04	44.6	0.93		0.23	1027					Confluence Details
Head Node - 13B		1600.2		0.33	0.71	1.04	44.3	0.94		0.23	1031.4					Confluence Details
Head Node - 28D		1616.4		0.33	0.71	1.05	47	0.9		0.23	992.3					Confluence Details
Head Node - 65G		999.8		0.34	0.64	1.01	21.3	1.41		0.21	1117.8					Confluence Details
144A	41	1326	1208.7	0.3	0.38	0.98	27.4	1.22	0.11	0.23	1237.9	1532.8	0.01877	26.0(PUG) 3.6(AG)	3.97(PUG) 0.42(AG)	
Head Node - 149O		966.3		0.32	0.66	0	18	1.55		0.21	1217.8					Confluence Details
Head Node - 139N		1000.2		0.32	0.66	0	18.7	1.52		0.21	1230.1					Confluence Details

Coyote Creek 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 126L		1479.7		0.33	0.68	0	30.6	1.15		0.22	1283.8					Confluence Details
Head Node - 132M		914.6		0.32	0.66	0	17.1	1.6		0.21	1196.3					Confluence Details
Head Node - 76H		1235.7		0.33	0.67	0	25.1	1.29		0.22	1238.9					Confluence Details
Head Node - 84I		1358.6		0.33	0.68	0	27.5	1.22		0.22	1276.1					Confluence Details
Head Node - 98K		1144.4		0.33	0.67	0	21.9	1.39		0.22	1265.4					Confluence Details
Head Node - 93J		1235.4		0.33	0.67	0	25.1	1.29		0.22	1238.8					Confluence Details
Head Node - 57F		1431.2		0.33	0.69	0	29	1.19		0.22	1295.7					Confluence Details
Head Node - 50E		1480.5		0.33	0.69	0	30.7	1.15		0.23	1282.8					Confluence Details
Head Node - 4A		1722.3		0.33	0.7	0	49.4	0.88		0.23	1021.6					Confluence Details
Head Node - 19C		1708.3		0.33	0.7	0	46.3	0.91		0.23	1069					Confluence Details
Head Node - 13B		1705.3		0.33	0.7	0	46	0.92		0.23	1073.6					Confluence Details
Head Node - 28D		1721.5		0.33	0.7	0	48.7	0.89		0.23	1032.8					Confluence Details
Head Node - 65G		1105		0.33	0.64	0	22.9	1.35		0.21	1185.3					Confluence Details
150AO - Confluence		1431.2	1272.1	0.33	0.69	0	29	1.19		0.22	1295.7					Confluence Results

Extra Subareas 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
136R	0.7	0.7	0.7	0.3	0.48		7.7	2.49	0.14	0.14	1.4	328	0.03366			
138R	37	37.6	37.6	0.3	0.44	12.6	20.4	1.45	0.13	0.13	44.9	1765.4	0.0046	2.9(AG)	0.65(AG)	500 ADT) OVERFLOW
144T	0.6	0.6	0.6	0.3	0.06		8	2.45	0.02	0.02	1.2	297.4	0.00619			
146T	13.2	13.8	13.8	0.3	0.26	10.8	18.7	1.52	0.08	0.07	18	1402.1	0.00745	2.5(AG)	0.47(AG)	500 ADT) OVERFLOW
152V	0.5	0.5	0.5	0.3	0.05		6.9	2.66	0.01	0.01	1.2	300.7	0.0126			
154V	10.1	10.6	10.6	0.3	0.31	6.24	13.2	1.85	0.09	0.09	16.9	921.2	0.01077	2.8(AG)	0.44(AG)	
140S	0.6	0.6	0.6	0.3	0.45		7.9	2.46	0.14	0.14	1.3	312.2	0.02486			
142S	20.3	20.9	20.9	0.3	0.45	7.86	15.8	1.67	0.14	0.14	29.1	1388.3	0.01259	3.7(AG)	0.49(AG)	500 ADT) OVERFLOW
2A	0.6	0.6	0.6	0.3	0.4		9	2.29	0.12	0.12	1.1	284.2	0.01024			
4A	3.6	4.2	4.2	0.3	0.5	3.45	12.4	1.91	0.15	0.15	6.7	693.5	0.00841	3.4(PUG)	0.33(PUG)	
6A	13.9	18	18	0.3	0.41	2.67	15.1	1.71	0.12	0.13	25.9	1024	0.01225	6.4(PUG)	0.73(PUG)	
8A	26.7	44.7	44.7	0.3	0.43	1.24	16.3	1.64	0.13	0.13	61.2	685	0.01289	9.2(PUG)	1.26(PUG)	
10A	32.4	77	77	0.3	0.33	1.07	17.4	1.58	0.1	0.12	102.4	697.2	0.01512	10.9(PUG)	2.05(PUG)	Warning: Pipe OVERFLOW
12A	15.8	92.8	92.8	0.3	0.43	0.55	17.9	1.55	0.13	0.12	120.9	480.3	0.01736	14.5(PUG)	2.30(PUG)	
28AB	21.3	114.1	114.1	0.3	0.42	1.17	19.1	1.5	0.13	0.12	142.9	599	0.00392	8.6(PUG)	3.38(PUG)	
15B	0.6	0.6	0.6	0.3	0.45		7.8	2.48	0.14	0.14	1.2	257.8	0.01838			
17B	7.3	7.8	7.8	0.3	0.44	5.24	13.1	1.86	0.13	0.13	12.2	691.7	0.00975	2.5(AG)	0.41(AG)	
19B	11.8	19.6	19.6	0.3	0.45	3.47	16.5	1.63	0.14	0.13	26.5	683.4	0.01348	3.7(AG)	0.48(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
21B	4.8	24.3	24.3	0.3	0.45	1.18	17.7	1.57	0.14	0.13	31.6	550.4	0.00834	7.8(PUG)	1.63(PUG)	
27BC	5.4	29.7	29.7	0.3	0.45	1.64	19.3	1.49	0.14	0.13	36.5	1108.8	0.01922	11.2(PUG)	1.39(PUG)	
24C	0.6	0.6	0.6	0.3	0.45		7.8	2.48	0.14	0.14	1.3	226.2	0.01419			
26C	5.8	6.4	6.4	0.3	0.45	3.87	11.7	1.98	0.14	0.14	10.7	620.1	0.01732	3.0(AG)	0.37(AG)	
27BC		6.4		0.3	0.45	1.45	13.1	1.85		0.14	10.7	717.4	0.01808	8.3(PUG)	0.78(PUG)	
Head Node - 26C		26.6		0.3	0.45	0	13.1	1.85		0.13	42.1					Confluence Details
Head Node - 21B		36.1		0.3	0.45	0	19.3	1.49		0.13	45					Confluence Details
27BC - Confluence		36.1	36.1	0.3	0.45	0	19.3	1.49		0.13	45					Confluence Results
Head Node - 26C		109.7		0.3	0.41	0	13.9	1.79		0.12	168.3					Confluence Details
Head Node - 21B		150.2		0.3	0.41	0	20.1	1.46		0.12	183.4					Confluence Details
Head Node - 12A		148.7		0.3	0.41	0	19.1	1.5		0.12	187.4					Confluence Details
28AB - Confluence		148.7	150.2	0.3	0.41	0	19.1	1.5		0.12	187.4					Confluence Results
Head Node - 26C		126.5		0.3	0.42	0.27	14.2	1.77		0.12	189.1					Confluence Details
Head Node - 21B		167		0.3	0.41	0.27	20.4	1.45		0.12	200.2					Confluence Details
Head Node - 12A		165.4		0.3	0.41	0.27	19.4	1.49		0.12	204.7					Confluence Details
30A	16.8	165.4	167	0.3	0.45	0.27	19.4	1.49	0.14	0.12	204.7	142	0.00394	8.8(PUG)	4.10(PUG)	Warning: Pipe OVERFLOW
126P	0.3	0.3	0.3	0.3	0.2		7.7	2.51	0.06	0.06	0.7	249.7	0.00841			
128P	7.3	7.6	7.6	0.3	0.2	7.4	15.1	1.71	0.06	0.06	11.4	1097.9	0.0137	2.8(AG)	0.41(AG)	
134OP		7.6		0.3	0.2	0.68	15.7	1.67		0.06	11.4	284.3	0.01059	7.0(PUG)	0.97(PUG)	
121O	0.5	0.5	0.5	0.3	0.01		6.1	2.85	0	0	1.2	243	0.01338			
123O	5.7	6.2	6.2	0.3	0.23	2.54	8.6	2.34	0.07	0.06	12.7	445.1	0.01934	3.3(AG)	0.40(AG)	

Extra Subareas 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
134OP		6.2		0.3	0.22	2.84	11.5	2		0.06	12.7	1255	0.01144	7.4(PUG)	1.01(PUG)	
130Q	1.3	1.3	1.3	0.3	0.45		9.7	2.19	0.14	0.14	2.5	316.1	0.00917			
132Q	7.5	8.8	8.8	0.3	0.45	11.1	20.8	1.43	0.14	0.14	10.3	790.3	0.00192	1.4(AG)	0.48(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
134OP	29.4	38.2	38.2	0.3	0.45	14.1	34.9	1.07	0.13	0.13	32.4	2303.1	0.00639	2.9(AG)	0.57(AG)	Warning: Local street (< 500 ADT) OVERFLOW (crown)
Head Node - 132Q		52		0.3	0.38	0	34.9	1.07		0.12	46.2					Confluence Details
Head Node - 123O		24.3		0.3	0.33	0	11.5	2		0.1	44					Confluence Details
Head Node - 128P		31		0.3	0.34	0	15.7	1.67		0.1	46.1					Confluence Details
134OP - Confluence		52	52	0.3	0.38	0	34.9	1.07		0.12	46.2					Confluence Results
70H	0.3	0.3	0.3	0.3	0.2		5.5	3.01	0.06	0.06	0.7	166.5	0.01927			
72H	9.3	9.6	9.6	0.3	0.2	11.8	17.3	1.59	0.06	0.06	13.3	931.1	0.01207	1.5(AG)	0.21(AG)	
74H	5.5	15.1	15.1	0.3	0.08	2.89	20.2	1.45	0.02	0.05	19.3	286.7	0.00035	1.7(PUG)	2.05(PUG)	Warning: Pipe OVERFLOW
76DG		15.1		0.3	0.16	0.32	20.5	1.44		0.05	19.3	75.2	0.002	3.9(PUG)	1.23(PUG)	
47F	0.8	0.8	0.8	0.3	0.3		10.4	2.11	0.09	0.09	1.5	265.7	0.00294			
49F	8.6	9.4	9.4	0.2	1	2.3	12.7	1.88	0.2	0.19	14.4	494.2	0.00747	3.6(PUG)	0.42(PUG)	
51F	13.7	23	23	0.3	0.03	0.65	13.4	1.83	0.01	0.08	36.6	405.1	0.02809	10.4(PUG)	1.09(PUG)	
53DF		23		0.21	0.4	0.83	14.2	1.77		0.08	36.6	556.3	0.01711	11.2(PUG)	1.49(PUG)	
41E	0.6	0.6	0.6	0.2	0.1		7.6	2.52	0.02	0.02	1.4	320.5	0.01042			
43E	4	4.6	4.6	0.2	0.1	1.57	9.2	2.26	0.02	0.02	9.4	233.7	0.00953	2.8(AG)	0.49(AG)	
45E	7.1	11.8	11.8	0.3	0.04	5.51	14.7	1.74	0.01	0.02	18.4	879.1	0.00943	2.8(AG)	0.49(AG)	
53DF		11.8		0.24	0.06	0.18	14.9	1.73		0.02	18.4	108.3	0.0216	9.8(PUG)	0.83(PUG)	
32D	0.5	0.5	0.5	0.3	0.13		8.8	2.32	0.04	0.04	1	267.7	0.05391			
34D	6.9	7.4	7.4	0.3	0.6	2.68	11.5	2	0.18	0.17	12.2	309.2	0.00687	2.2(AG)	0.43(AG)	
36D	13.9	21.3	21.3	0.3	0.5	0.9	12.4	1.91	0.15	0.16	33.9	286.9	0.00498	5.3(PUG)	1.08(PUG)	
38D	11.2	32.4	32.4	0.3	0.18	1.55	13.9	1.79	0.05	0.12	49.1	771.6	0.00823	8.3(PUG)	1.68(PUG)	
53DF	10.9	43.4	43.4	0.3	0.18	1.5	15.4	1.69	0.05	0.1	62.4	963.2	0.01266	10.7(PUG)	1.76(PUG)	
Head Node - 45E		76.6		0.26	0.32	0	14.9	1.73		0.08	115.5					Confluence Details
Head Node - 38D		78.2		0.26	0.32	0	15.4	1.69		0.08	115.3					Confluence Details
Head Node - 51F		74.2		0.26	0.32	0	14.2	1.77		0.08	115					Confluence Details
53DF - Confluence		76.6	78.2	0.26	0.32	0	14.9	1.73		0.08	115.5					Confluence Results
Head Node - 45E		86.9		0.26	0.29	0.66	15.5	1.68		0.08	126.8					Confluence Details
Head Node - 38D		88.5		0.26	0.29	0.66	16.1	1.65		0.08	126.4					Confluence Details
Head Node - 51F		84.5		0.26	0.29	0.66	14.9	1.73		0.08	126.6					Confluence Details
55D	10.3	86.9	88.5	0.3	0.05	0.66	15.5	1.68	0.01	0.08	126.8	447.4	0.00823	11.3(PUG)	2.66(PUG)	
58G	0.5	0.5	0.5	0.3	0.2		7.6	2.51	0.06	0.06	1.2	326.4	0.01483			
60G	9.2	9.7	9.7	0.3	0.28	5.67	13.3	1.84	0.08	0.08	15.5	888.9	0.01285	3.0(AG)	0.45(AG)	
62G	13.4	23.1	23.1	0.3	0.36	0.64	13.9	1.79	0.11	0.1	35.5	359.5	0.0188	9.3(PUG)	0.98(PUG)	
64G	27.9	51.1	51.1	0.3	0.31	1.37	15.3	1.7	0.09	0.1	74.3	857.9	0.01455	10.4(PUG)	1.46(PUG)	
66G	6.9	58	58	0.3	0.18	0.53	15.8	1.67	0.05	0.09	82.9	371.7	0.012	11.7(PUG)	2.10(PUG)	

Extra Subareas 10-year Storm Rational Method Study

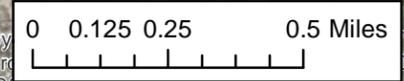
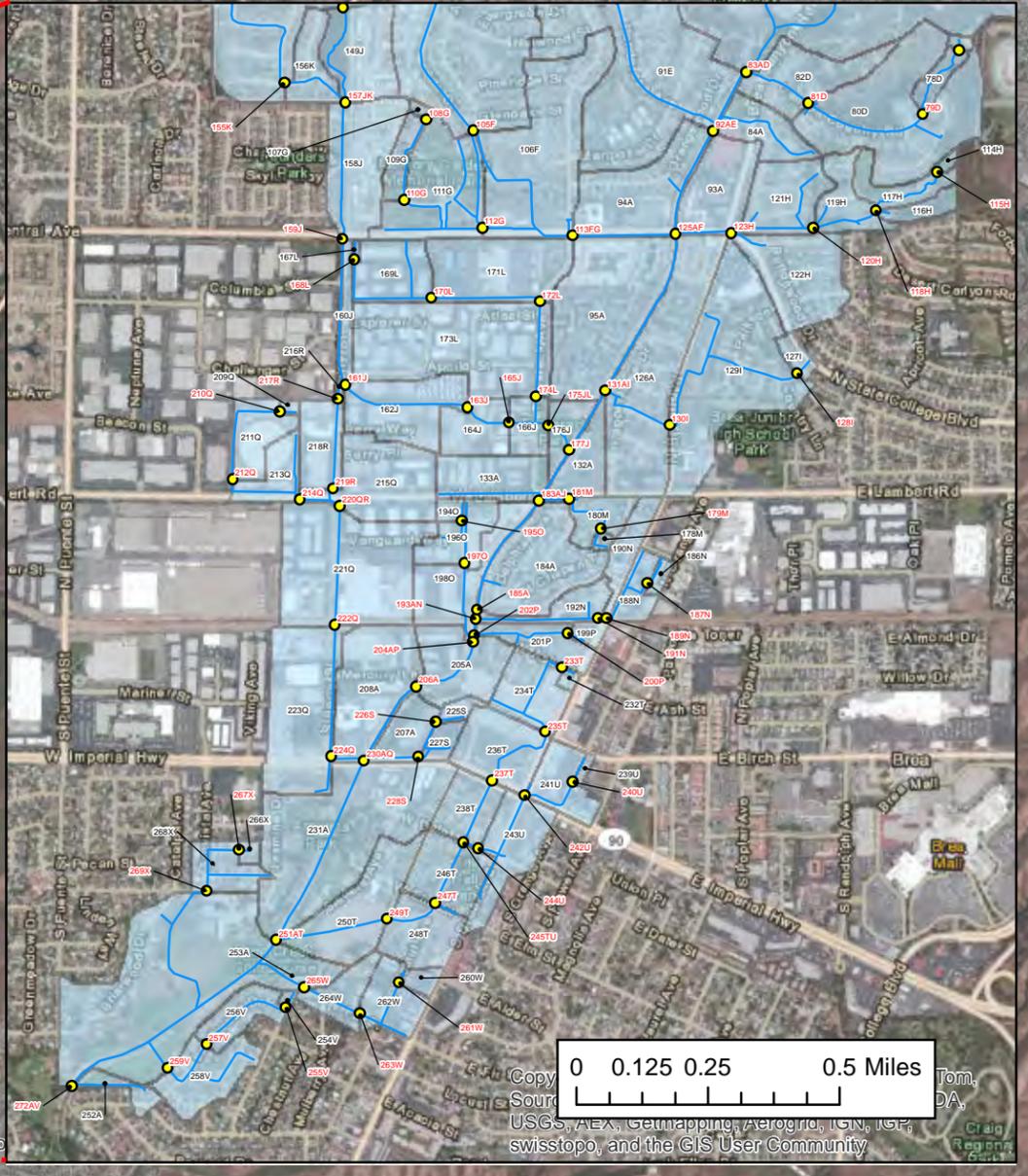
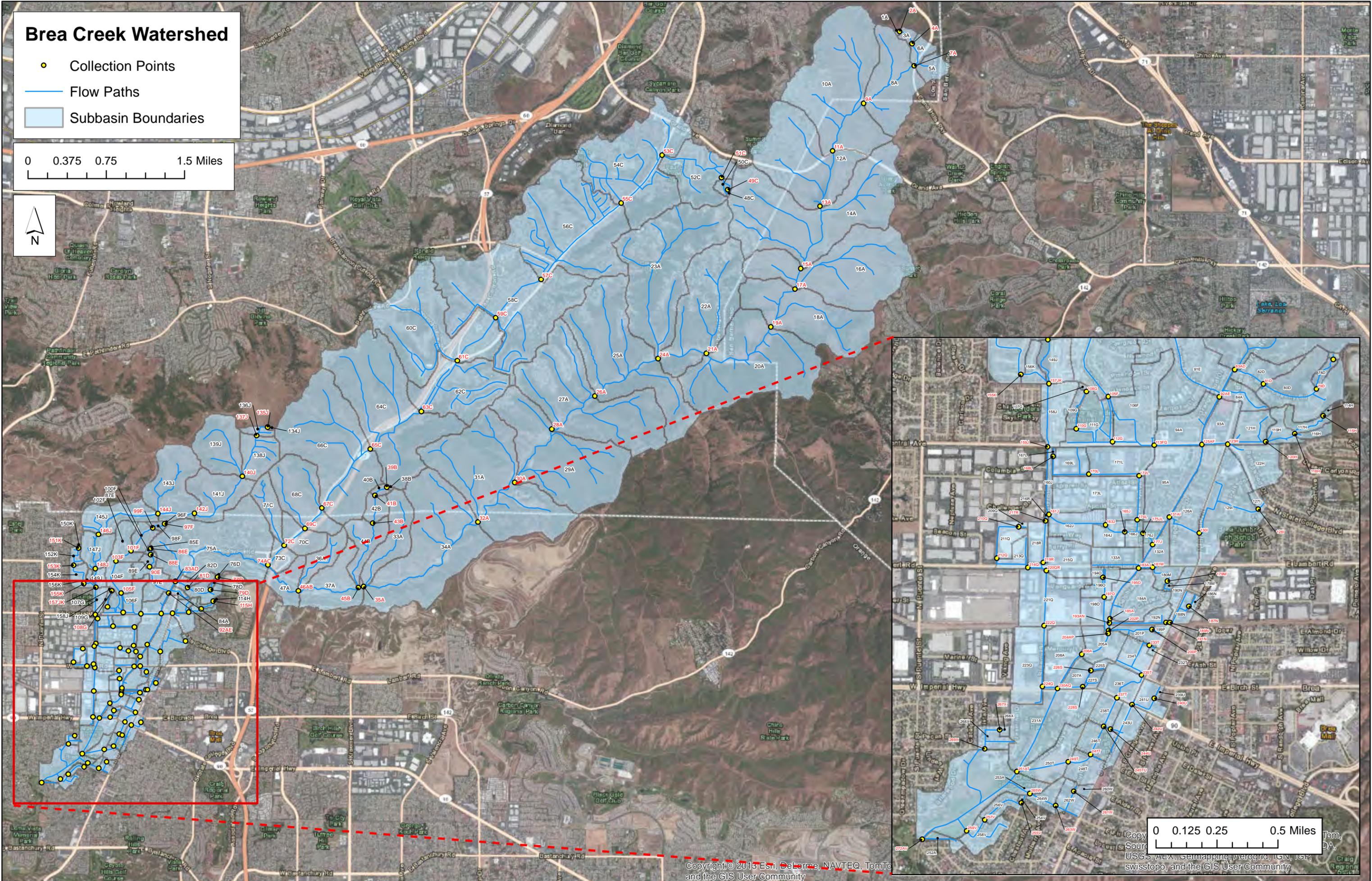
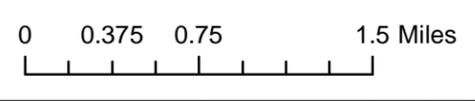
Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
68G	23.7	81.7	81.7	0.3	0.09	1.24	17.1	1.6	0.03	0.07	113.1	1036.6	0.0179	13.9(PUG)	1.99(PUG)	
76DG	21.5	103.2	103.2	0.3	0.04	2.04	19.1	1.5	0.01	0.06	134.8	1143.5	0.00525	9.3(PUG)	3.20(PUG)	
Head Node - 45E		185.5		0.28	0.24	0	16.1	1.65		0.07	269.6					Confluence Details
Head Node - 38D		190.4		0.28	0.24	0	16.6	1.62		0.07	271.3					Confluence Details
Head Node - 51F		178.8		0.28	0.24	0	15.4	1.69		0.07	266.8					Confluence Details
Head Node - 74H		206.7		0.28	0.23	0	20.5	1.44		0.07	260.2					Confluence Details
Head Node - 68G		205.7		0.28	0.23	0	19.1	1.5		0.07	269.9					Confluence Details
76DG - Confluence		190.4	206.7	0.28	0.24	0	16.6	1.62		0.07	271.3					Confluence Results
Head Node - 45E		189.6		0.28	0.23	0.63	16.7	1.62		0.07	269.6					Confluence Details
Head Node - 38D		194.5		0.28	0.23	0.63	17.2	1.59		0.07	271.3					Confluence Details
Head Node - 51F		182.9		0.28	0.23	0.63	16	1.66		0.07	266.8					Confluence Details
Head Node - 74H		210.9		0.28	0.23	0.63	21.1	1.42		0.06	260.2					Confluence Details
Head Node - 68G		209.8		0.28	0.23	0.63	19.7	1.47		0.07	269.9					Confluence Details
78D	4.1	194.5	210.9	0.3	0.04	0.63	17.2	1.59	0.01	0.07	271.3	308.3	0.00201	8.2(PUG)	5.00(PUG)	
148U	0.5	0.5	0.5	0.3	0.2		6	2.88	0.06	0.06	1.3	253	0.02933			
150U	14.2	14.7	14.7	0.3	0.21	4.47	10.5	2.1	0.06	0.06	27.2	1236.1	0.01789	4.6(PUG)	0.30(PUG)	
108M	0.6	0.6	0.6	0.3	0.83		6.2	2.83	0.25	0.25	1.4	202.2	0.11161			
110M	28.7	29.3	29.3	0.3	0.05	8.13	14.3	1.76	0.02	0.02	46.4	1858.8	0.01082	3.8(PUG)	0.33(PUG)	
112M	12.8	42.2	42.2	0.2	0.05	0.75	15.1	1.71	0.01	0.02	64.9	519.9	0.01593	11.5(PUG)	1.66(PUG)	
113LM	7.2	49.4	49.4	0.3	0.01	0.65	15.7	1.67	0	0.02	74.3	507.4	0.01787	13.0(PUG)	1.59(PUG)	
99L	0.6	0.6	0.6	0.3	0.06		6.2	2.84	0.02	0.02	1.4	294.7	0.02236			
101L	1	1.5	1.5	0.3	0.1	1.49	7.6	2.51	0.03	0.02	3.4	185.7	0.01325	2.2(AG)	0.30(AG)	
103L	7.8	9.3	9.3	0.3	0	2.89	10.5	2.09	0	0	17.6	739.3	0.00736	4.3(PUG)	0.53(PUG)	
105L	4.6	13.9	13.9	0.2	0.05	1.02	11.6	1.99	0.01	0.01	25	439.3	0.00854	7.2(PUG)	1.19(PUG)	
113LM		13.9		0.24	0.03	1.31	12.9	1.87		0.01	25	890.1	0.0243	11.3(PUG)	0.98(PUG)	
Head Node - 112M		63.2		0.27	0.05	0	15.7	1.67		0.01	96.6					Confluence Details
Head Node - 105L		54.3		0.27	0.05	0	12.9	1.87		0.01	93.1					Confluence Details
113LM - Confluence		63.2	63.2	0.27	0.05	0	15.7	1.67		0.01	96.6					Confluence Results
89K	0.3	0.3	0.3	0.3	0.98		15.9	1.67	0.29	0.29	0.4	254.4	0.04615			
91K	9.2	9.5	9.5	0.3	0.94	4.87	20.7	1.43	0.28	0.28	9.9	474	0.00352	1.9(AG)	0.40(AG)	
93IK		9.5		0.3	0.94	1.9	22.6	1.36		0.28	9.9	297.1	0.00815	2.6(AG)	0.35(AG)	
85J	0.7	0.7	0.7	0.3	1		18.6	1.52	0.3	0.3	0.8	322.8	0.00827			
87J	8.9	9.7	9.7	0.3	1	2.81	21.4	1.41	0.3	0.3	9.7	641.4	0.01581	3.8(PUG)	0.24(PUG)	
93IK		9.7		0.3	1	1.15	22.5	1.37		0.3	9.7	622.9	0.02377	9.0(PUG)	0.75(PUG)	
80I	0.6	0.6	0.6	0.3	0.69		6.4	2.78	0.21	0.21	1.4	254.7	0.09575			
82I	4.6	5.2	5.2	0.3	0.64	3.37	9.8	2.19	0.19	0.19	9.4	722.4	0.00851	3.6(PUG)	0.36(PUG)	
93IK	12.4	17.6	17.6	0.3	0.88	0.98	10.7	2.07	0.27	0.24	29.2	383.5	0.01027	6.5(PUG)	0.84(PUG)	
Head Node - 82I		26.7		0.3	0.87	0	10.7	2.07		0.26	44.7					Confluence Details
Head Node - 87J		36.8		0.3	0.89	0	22.5	1.37		0.27	37.6					Confluence Details
Head Node - 91K		36.8		0.3	0.89	0	22.6	1.36		0.27	37.5					Confluence Details
93IK - Confluence		26.7	36.8	0.3	0.87	0	10.7	2.07		0.26	44.7					Confluence Results
Head Node - 82I		38.3		0.3	0.6	0.87	11.6	1.98		0.18	62.7					Confluence Details
Head Node - 87J		48.4		0.3	0.68	0.91	23.4	1.34		0.2	49.7					Confluence Details

Extra Subareas 10-year Storm Rational Method Study

Concentration Point / Outlet	Subarea / Basin Area (ac)	Effective Area (ac)	Total area (ac)	Fp	Ap	Tt (min)	Tc (min)	I (in/hr)	Fm	Fm avg.	Q Total (cfs)	Flow Path Length (ft)	Slope (ft/ft)	Velocity (fps)	Depth of Flow (ft)	Comments
Head Node - 91K		48.4		0.3	0.68	0.91	23.5	1.33		0.2	49.6					Confluence Details
95I	11.6	38.3	48.4	0.3	0	0.87	11.6	1.98	0	0.18	62.7	552.7	0.01301	10.6(PUG)	1.58(PUG)	
Head Node - 82I		49.7		0.3	0.47	1.06	12.7	1.89		0.14	78.8					Confluence Details
Head Node - 87J		59.7		0.3	0.55	1.13	24.6	1.3		0.17	61.6					Confluence Details
Head Node - 91K		59.8		0.3	0.55	1.13	24.7	1.3		0.17	61.4					Confluence Details
97I	11.4	49.7	59.8	0.3	0.02	1.06	12.7	1.89	0.01	0.14	78.8	793.9	0.016	12.5(PUG)	1.81(PUG)	
115N	1	1	1	0.3	0.45		8.1	2.43	0.14	0.14	2.1	308.2	0.02216			
117N	9.3	10.3	10.3	0.3	0.45	2.11	10.2	2.13	0.14	0.13	18.7	708.7	0.01919	5.6(PUG)	0.40(PUG)	
119N	7.1	17.4	17.4	0.3	0.34	0.14	10.3	2.12	0.1	0.12	31.5	147.6	0.08997	17.2(PUG)	0.68(PUG)	

# Brea Creek Watershed

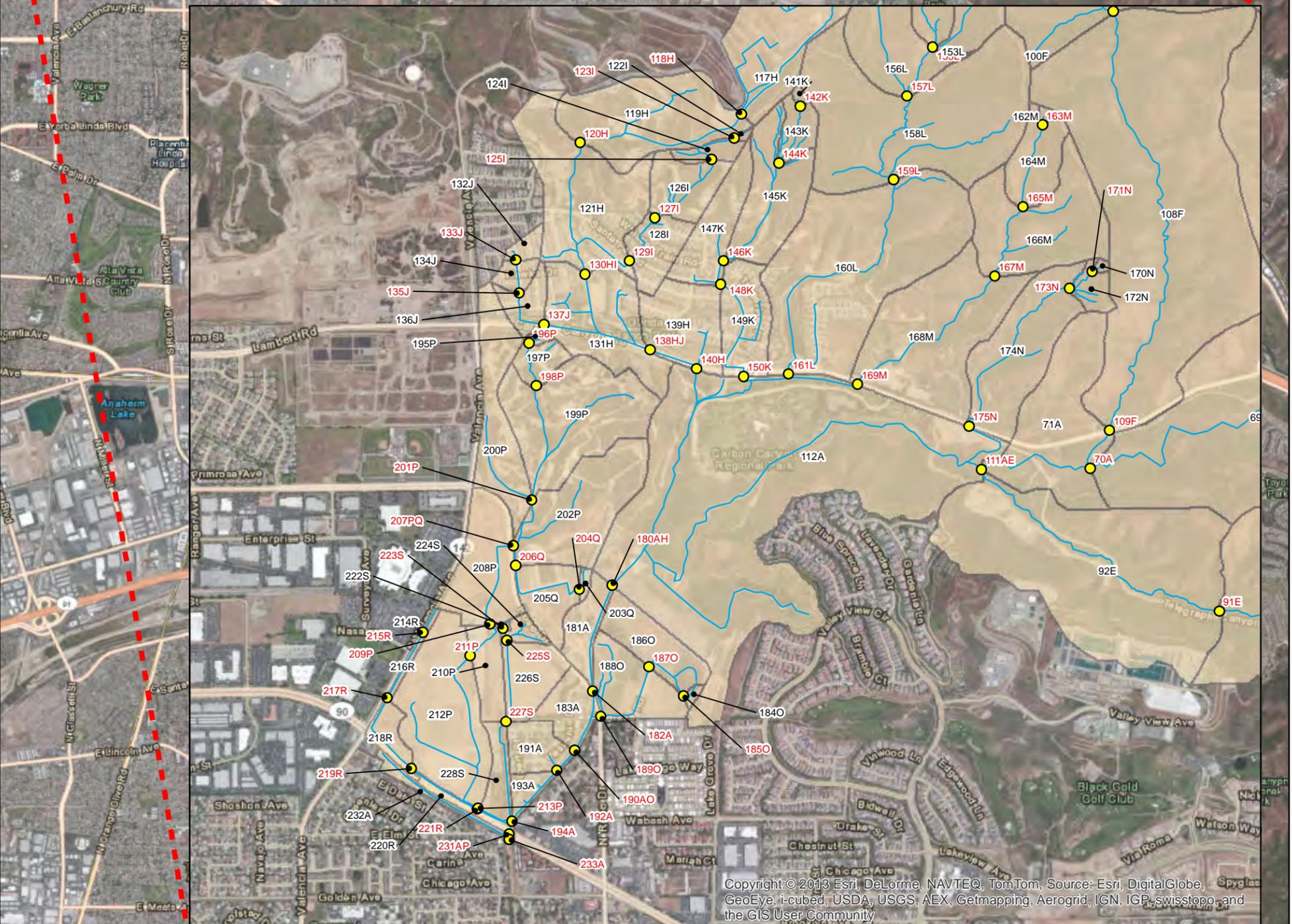
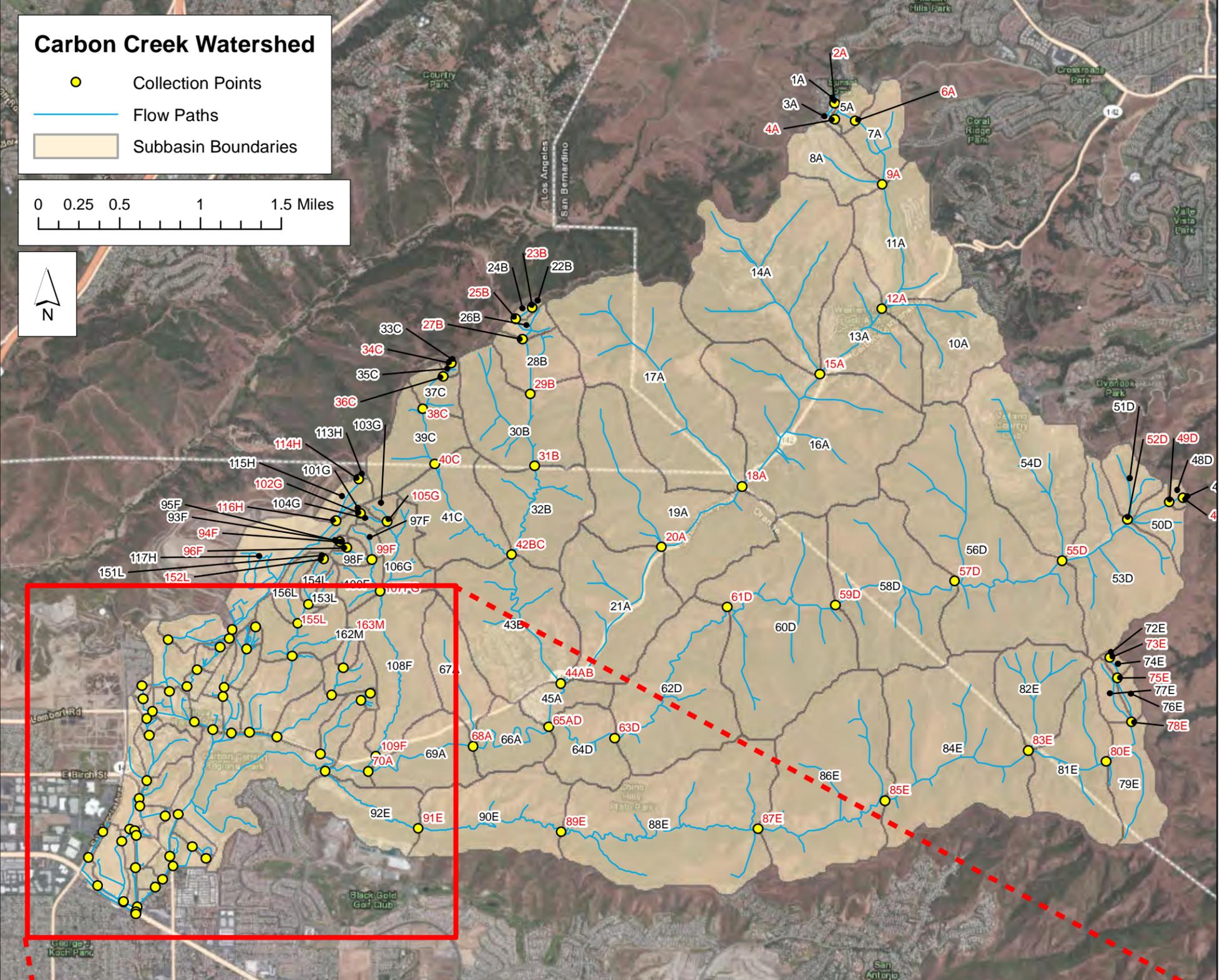
- Collection Points
- Flow Paths
- ▭ Subbasin Boundaries



# Carbon Creek Watershed

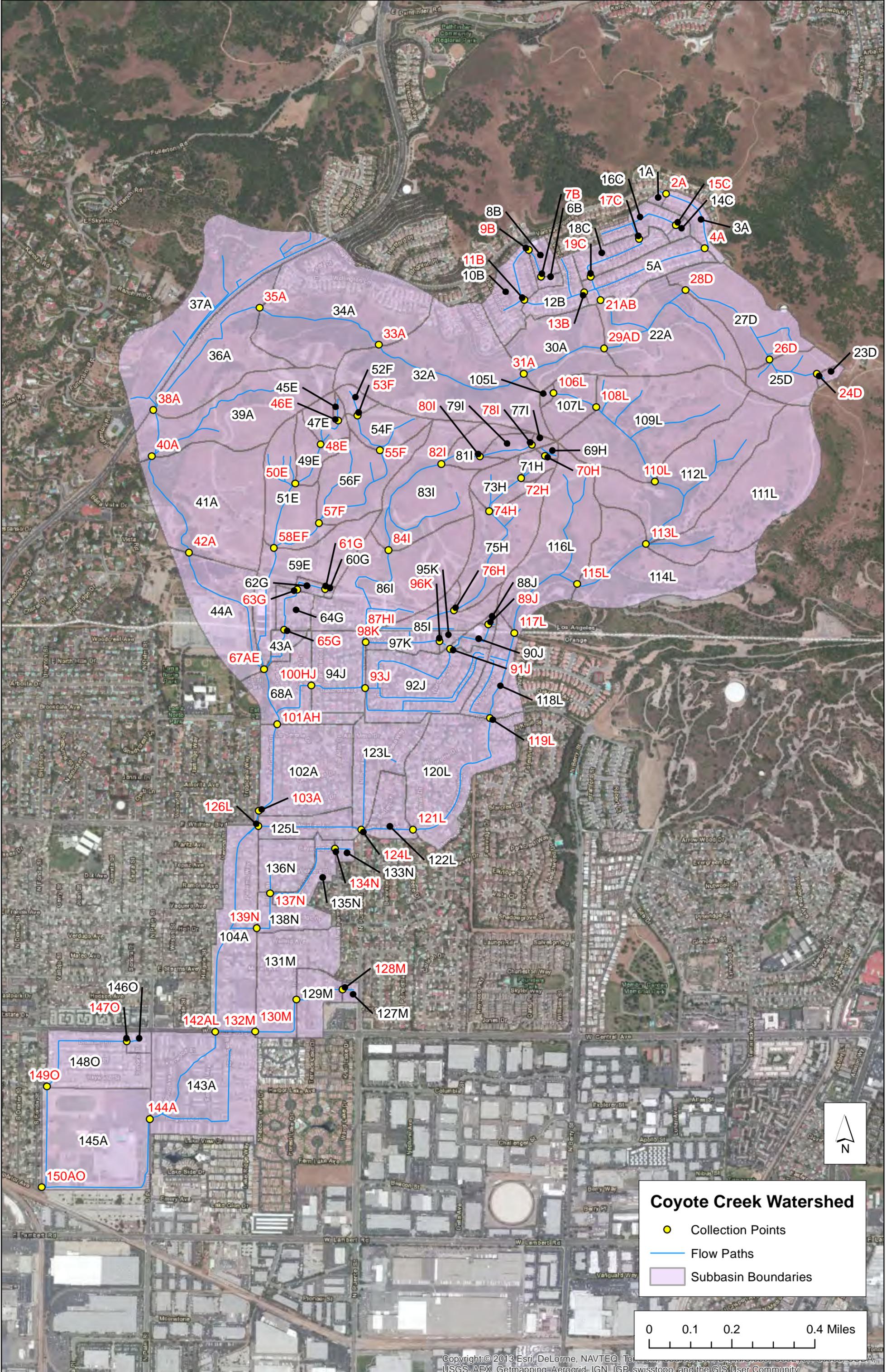
- Collection Points
- Flow Paths
- ▭ Subbasin Boundaries

0 0.25 0.5 1 1.5 Miles



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**Coyote Creek Watershed**

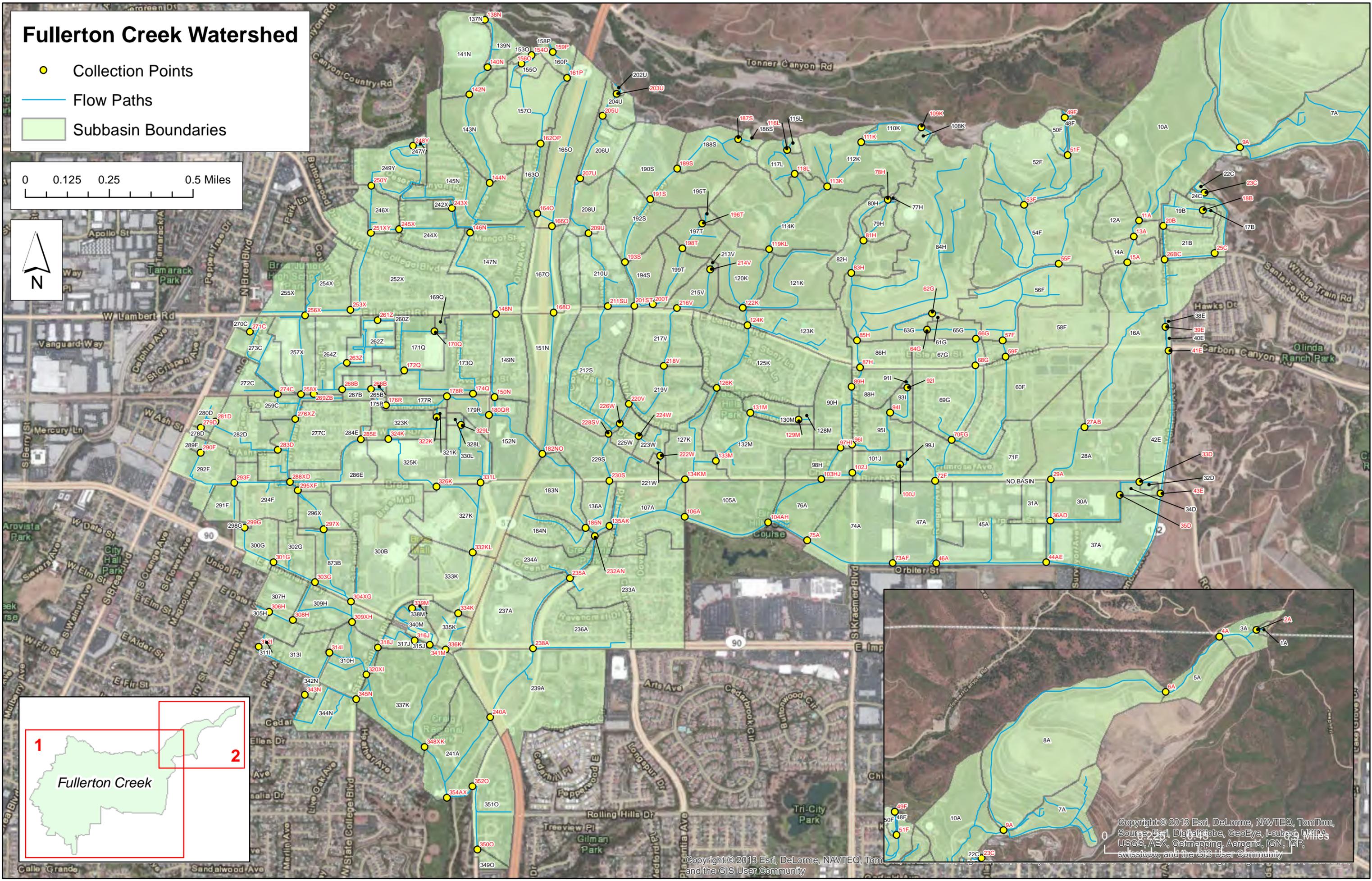
- Collection Points
- Flow Paths
- ▭ Subbasin Boundaries



# Fullerton Creek Watershed

- Collection Points
- Flow Paths
- ▭ Subbasin Boundaries

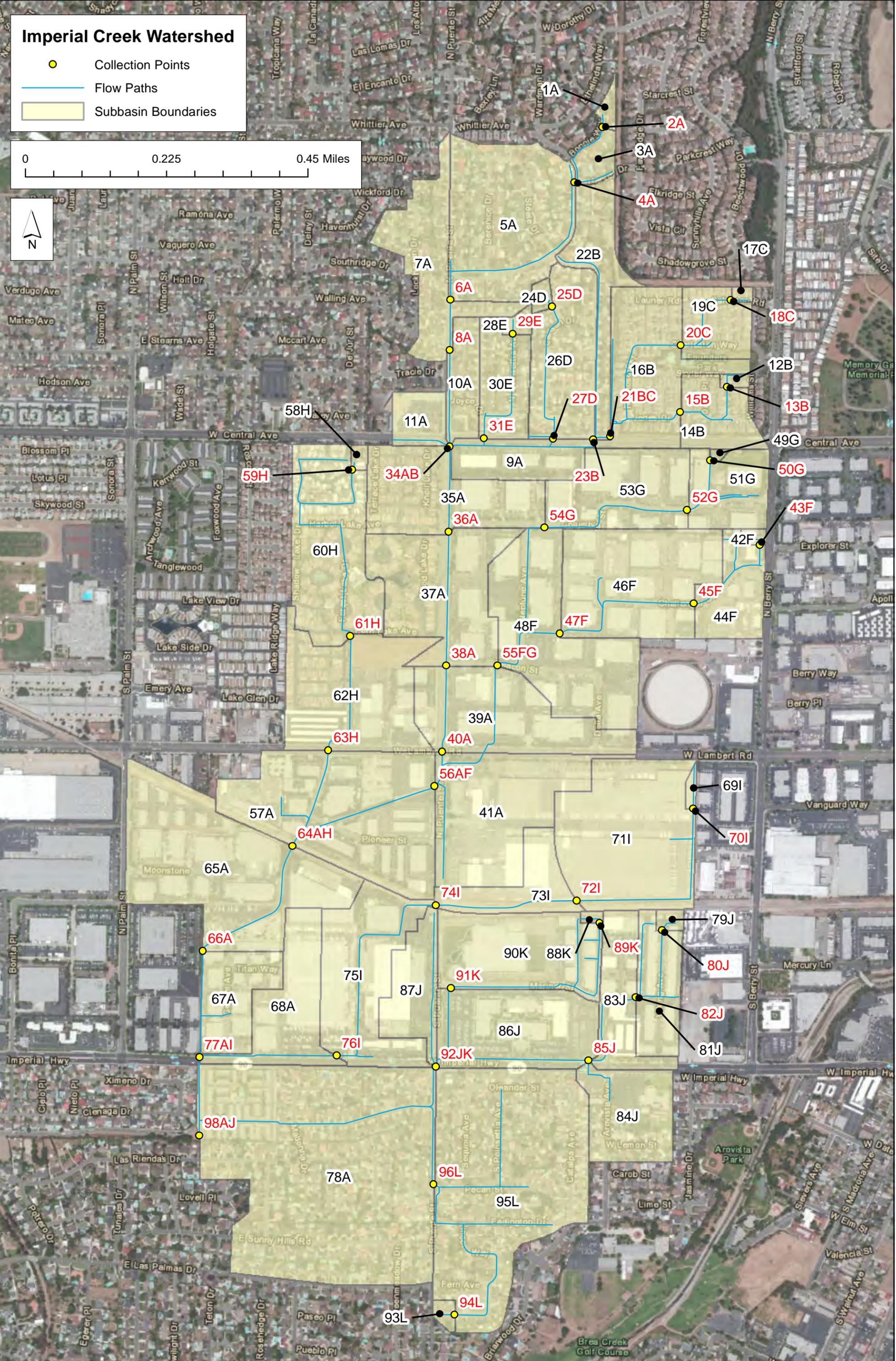
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# Imperial Creek Watershed

- Collection Points
- Flow Paths
- ▭ Subbasin Boundaries

0 0.225 0.45 Miles

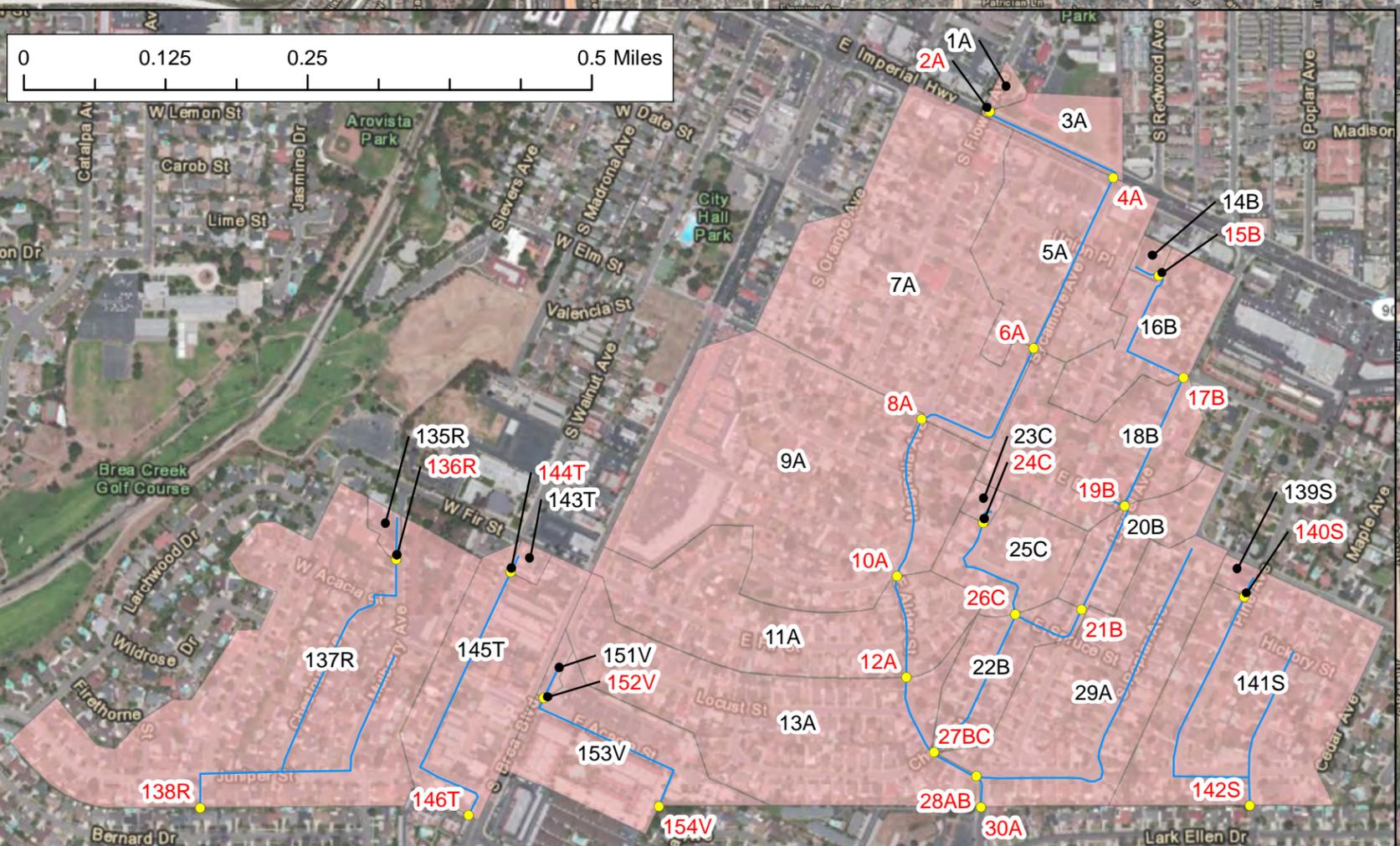
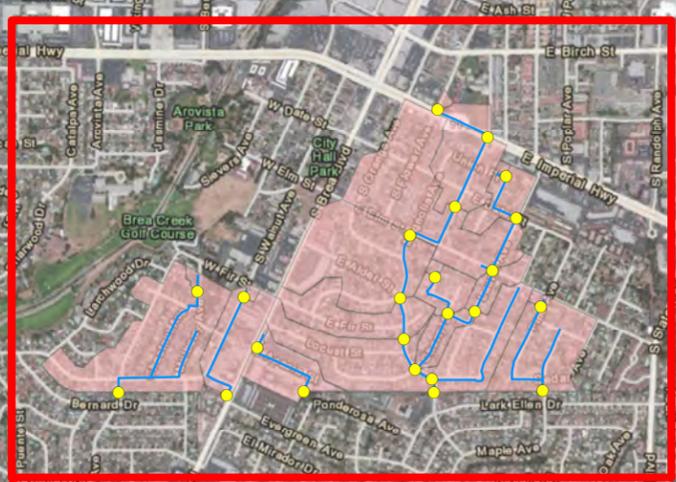


### Extra Subareas

- Collection Points
- Flow Paths
- Subbasin Boundaries



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APPENDIX G

**Brea Creek Watershed**

<b>Project # 8</b>		<b>Date:</b>	3/28/2014		
<b>Lambert Rd curbside ponding btw Tamarack &amp; Berry</b>		<b>Prepared by:</b>	KRK		
		<b>Checked by:</b>	R.W.		
ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	MOBILIZATION (10%)	1	LS	\$ 17,280	\$ 17,280
2	18-INCH RCP	250	LF	\$ 220	\$ 55,000
3	24-INCH RCP	320	LF	\$ 240	\$ 76,800
4	CATCH BASIN SPPWC 300-3 W=3.5' LD SPPWC CASE A	2	EA	\$ 8,000	\$ 16,000
5	MANHOLE PER SPPWC 321-1	2	EA	\$ 12,500	\$ 25,000
				<b>SUBTOTAL CONSTRUCTION:</b>	<b>\$ 190,080</b>
				(15% of Construction Cost) CONTINGENCY:	\$ 28,512
				<b>Site Total:</b>	<b>\$ 218,592</b>
				PS&E and Construction Services (17%):	\$ 37,161
				<b>Budget Total:</b>	<b>\$ 255,753</b>

**Fullerton Creek Watershed**

<b>Project # 10</b>		<b>Date:</b>	3/28/2014		
<b>Easement btw Cedar Ave &amp; So State College Blvd (314I - 320XI)</b>		<b>Prepared by:</b>	KRK		
		<b>Checked by:</b>	R.W.		
ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	MOBILIZATION (10%)	1	LS	\$ 17,028	\$ 17,028
2	18-Inch RCP in place and removal of existing 12" pipe	774	LF	\$ 220	\$ 170,280
				<b>SUBTOTAL CONSTRUCTION:</b>	<b>\$ 187,308</b>
				(15% of Construction Cost) CONTINGENCY:	\$ 28,096
				<b>Site Total:</b>	<b>\$ 215,404</b>
				PS&E and Construction Services (17%):	\$ 36,619
				<b>Budget Total:</b>	<b>\$ 252,023</b>

<b>Project # 11a (A partial length of the entire project # 11)</b>		<b>Date:</b>	3/28/2014		
<b>Easement btw Pine Ave/Date St to the North (part of 308H - 309XH)</b>		<b>Prepared by:</b>	KRK		
		<b>Checked by:</b>	R.W.		
ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	MOBILIZATION (10%)	1	LS	\$ 5,468	\$ 5,468
2	30-Inch RCP in place and removal of existing 18" CMP pipe	168	LF	\$ 260	\$ 43,680
3	MH 320	1	LF	\$ 6,000	\$ 6,000
4	MH 321	1	EA	\$ 5,000	\$ 5,000
				<b>SUBTOTAL CONSTRUCTION:</b>	<b>\$ 60,148</b>
				(15% of Construction Cost) CONTINGENCY:	\$ 9,022
				<b>Site Total:</b>	<b>\$ 69,170</b>
				PS&E and Construction Services (17%):	\$ 11,759
				<b>Budget Total:</b>	<b>\$ 80,929</b>

**APPENDIX G**

<b>Project # 19</b>		<b>Date:</b>	3/28/2014		
<b>Lambert Rd curbside ponding btw Cliffwood &amp; Cashew</b>		<b>Prepared by:</b>	KRK		
		<b>Checked by:</b>	R.W.		
ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	MOBILIZATION (10%)	1	LS	\$ 19,750	\$ 19,750
2	18-INCH RCP	300	LF	\$ 220	\$ 66,000
3	24-INCH RCP	325	LF	\$ 240	\$ 78,000
4	CATCH BASIN SPPWC 300-3 W=3.5' LD SPPWC CASE A	2	EA	\$ 8,000	\$ 16,000
5	MANHOLE PER SPPWC 321-1	3	EA	\$ 12,500	\$ 37,500
				<b>SUBTOTAL CONSTRUCTION:</b>	<b>\$ 217,250</b>
				(15% of Construction Cost) <b>CONTINGENCY:</b>	<b>\$ 32,588</b>
				<b>Site Total:</b>	<b>\$ 249,838</b>
				PS&E and Construction Services (17%):	\$ 42,472
				<b>Budget Total:</b>	<b>\$ 292,310</b>
				<b>Site Total:</b>	<b>\$ 334,782</b>

<b>Project # 20</b>		<b>Date:</b>	3/28/2014		
<b>Lambert Rd curbside ponding btw Cashew &amp; State College</b>		<b>Prepared by:</b>	KRK		
		<b>Checked by:</b>	R.W.		
ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	MOBILIZATION (10%)	1	LS	\$ 20,210	\$ 20,210
2	18-INCH RCP	270	LF	\$ 220	\$ 59,400
3	24-INCH RCP	355	LF	\$ 240	\$ 85,200
4	CATCH BASIN SPPWC 300-3 W=3.5' WITH MOD REAR OPENING PER SPPWC 314-3 AND LD SPPWC CASE A	2	EA	\$ 10,000	\$ 20,000
5	MANHOLE PER SPPWC 321-1	3	EA	\$ 12,500	\$ 37,500
				<b>SUBTOTAL CONSTRUCTION:</b>	<b>\$ 222,310</b>
				(15% of Construction Cost) <b>CONTINGENCY:</b>	<b>\$ 33,347</b>
				<b>Site Total:</b>	<b>\$ 255,657</b>
				PS&E and Construction Services (17%):	\$ 43,462
				<b>Budget Total:</b>	<b>\$ 299,118</b>
				<b>Site Total:</b>	<b>\$ 342,580</b>

**Coyote Creek Watershed**

**CITY CIP PROJECT 7525  
STORM DRAIN IMPROVEMENTS - LA CAÑADA STORM DRAIN**

This project will include a junction structure with associated piping at the NW corner of La Cañada and Northwood Ave.

	<b>Proposed</b>	
	<b>2014-15</b>	<b>Total Budget</b>
<b>Project 7525</b>		
Design	\$ 32,000.0	\$ 32,000.0
Right-of-Way	\$ -	\$ -
Construction	\$ 330,000.0	\$ 330,000.0
Construction Engineering	\$ 38,000.0	\$ 38,000.0
Total	\$ 400,000.0	\$ 400,000.0