Update to the Dry Creek Watershed Flood Control Plan

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Placer County Flood Control and Water Conservation District

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UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

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Executive Summary

EXECUTIVE SUMMARY

ES-1 PURPOSE

The primary purposes of this Update to the Dry Creek Watershed Flood Control Plan (Plan Update), prepared for the Placer County Flood Control and Water Conservation District (District), are to update the hydrologic analysis of the watershed, provide recommendations for feasible means to reduce future flood damages, identify possible means to mitigate development impacts on flooding, and recommend an updated funding plan. The 1992 Dry Creek Watershed Flood Control Plan (1992 Plan) recommended structural and non-structural measures to correct existing deficiencies and mitigate for impacts of future development. Some of the recommendations have been implemented while many have not due to environmental and/or economic constraints. This Plan Update evaluates the hydrology of the watershed and provides recommendations to correct existing deficiencies and mitigate impacts of future development using an overall watershed approach with the objective of identifying measures that will be both feasible and effective.

ES-2 BACKGROUND

The Dry Creek watershed covers an area of 101 square miles in Placer and Sacramento Counties. The majority of the watershed (82 percent) is contained within the limits of Placer County. Some of the Sacramento County area drains through Placer County before draining back into Sacramento County. The Cities of Rocklin and Roseville and the Town of Loomis are wholly or partially contained within the watershed. Other unincorporated communities in the watershed include Granite Bay, Penryn, Newcastle, Orangevale, and Rio Linda. A vicinity map of the watershed is provided on Plate 1 and a watershed overview is provided on Plate 2.

The purpose of the 1992 Plan was to provide the District and other governmental agencies (in both Placer and Sacramento Counties) with the information and policies necessary to manage the storm waters within the Dry Creek watershed. The 1992 Plan was intended to provide an approach for meeting existing and future flood control needs in the watershed. In addition, the 1992 Plan recommended structural and non-structural measures to correct existing deficiencies and mitigate for impacts of future development within the watershed. The 1992 Plan was formally adopted by the District Board in June 1995.

The 1992 Plan focused on the ability of on-channel regional detention basins to mitigate both existing flooding problems and the increase in flood flows due to upstream development. Based on costs and corresponding flood flow reduction efficiency at Vernon Street in Roseville, seven detention basin sites were selected for inclusion in the 1992 Plan. These sites could have provided peak 100-year flood flow reduction of nearly 4,000 cubic feet per second (cfs) at Vernon Street. However, none of the on-channel regional detention basins included in the 1992 Plan have been, nor are currently expected to be, implemented due to environment and permitting constraints.

ES-3 CURRENT CONDITIONS

From a hydrologic standpoint, imperviousness of a watershed, which is directly linked to land use, is the single most important factor used in determining stormwater runoff rates and volumes. Establishing current runoff quantities is a required step in the preparation of this Plan Update. The 1992 Plan evaluated existing conditions based on 1989 land use and future conditions based on General Plan build-out data available at the time it was prepared. This Plan Update uses available aerial imagery and information about development to estimate how much of the watershed was covered with impervious surfaces. This estimate forms the basis for a hydrologic evaluation of impacts that have occurred since the 1992 Plan was implemented, and what impacts may be associated with development from the current conditions moving forward to build-out based on current General Plans. It is estimated that 43 percent of the impervious area expected to be added to the portion of the watershed within, and upstream from, Placer County from 1992 to build-out had already occurred through 2007.

Though there has been significant progress towards reducing flood risks in the Dry Creek watershed through the implementation of local improvement projects including bridge replacements, flow bypasses, building elevation projects and residential buy-outs, there are still numerous flood hazard areas and roadway stream crossings that do not have adequate capacity. One regional flood control project, Miners Ravine Off-Channel Detention Basin, was completed in 2007. The Miners Ravine project does provide some peak discharge reductions, but these reductions generally just provide partial mitigation for development that has already occurred. Since the 1992 Plan, flood damages occurred in January 1995, January 1997, February 1998 and December 2005. Other than some local bridge improvements, no flood hazard reduction projects are currently planned, although the City of Rocklin is in the process of investigating the feasibility of a flood damage reduction project along Sucker Ravine and the District has applied for grant funding for use on a project on Antelope Creek that is recommended in this Plan Update.

ES-4 HYDROLOGY

A major component of this Plan Update is a new hydrologic modeling system that provides the tools necessary to evaluate the dynamics of stream flow routing throughout the watershed. With this new modeling system, it is possible to quantify project impacts and benefits that could not be evaluated with the technologies available at the time that the 1992 Plan was prepared. The new modeling system has been calibrated to reproduce measured stream flows based on rainfall gage records, thereby establishing the validity of the models. The District's Stormwater Management Manual provides procedures for applying design storm rainfall. These procedures were followed in the Plan Update, but do not match the rainfall and rainfall to runoff transformation process used in the 1992 Plan. Therefore, results based on the new modeling system are not consistent with results from the 1992 Plan. The Plan Update provides a new 1992 baseline model that is consistent with the other models used in the Plan Update so that valid comparisons between 1992 and future conditions can be made. A series of

models were developed to determine impacts from 1992 through 2010 and expected impacts that expected due to development from 2010 conditions through general plan build-out. Build-out scenarios were computed for unmitigated development, development with an assumed amount of Low Impact Development (LID) benefit because firm LID requirements have not yet been established, and for build-out with LID and identified potential projects. Tables ES-1 and ES-2 summarize peak flows and impacts in cubic feet per second (cfs) at Vernon Street for key scenarios for the 100-year storm event. Vernon Street is used as the primary reference location, consistent with the 1992 Plan.

Table ES-1: Peak Flows (cfs) at Vernon Street

Description	Scenario	Discharge (cfs)
1992 Baseline	A	12,635
2010 Current Conditions	B	12,908
Future Impacts w/o Mitigation	C	13,535
Build-out with LID	D	13,361
Build-out with LID and All Projects	E	12,276

Table ES-2: Impacts (cfs) at Vernon Street

Description	Scenarios		Difference (cfs)
Impacts to Date	B	A	273
Future Impacts w/o Mitigation	C	B	627
Total Impacts	C	A	900
LID Benefit	D	C	-174
Project Benefits (all)	E	D	-1,085

Flow rate impact and mitigation values contain a degree of uncertainty, and there is flexibility in what potential mitigation measures will ultimately be implemented. The amount of LID benefit that is ultimately realized depends on criteria that have yet to be established and the effectiveness of the measures as actually installed and maintained.

ES-5 RECOMMENDATIONS

To manage the risks and reduce potential hazards associated with existing local and regional flooding deficiencies, the Plan Update provides the following recommendations:

1. Implement the two phases of the Antelope Creek at Atlantic Street project and ALERT system upgrades to mitigate for development impacts as funding becomes available.
2. Pursue other regional flood flow reduction projects with consideration for additional multi-objective components along with stream corridor if and when opportunities for funding develop.
3. Implement bridge and culvert improvements in a manner that does not exacerbate flooding at other locations in the watershed. Stream crossing modifications may provide opportunities for additional projects that could improve the flood control benefit of the existing floodplain.

4. Support building elevation and floodplain property buy-outs as these programs are expected to be the most effective means available to reduce future flood damage to existing structures.
5. Require onsite (local) detention where mitigation is necessary due to local flood impact considerations.
6. Incorporate LID measures into future development design that promotes infiltration.

Five potential flood flow reduction projects are identified in the Plan Update. The two most effective of these projects include weirs that span the stream channels to limit the impacts of the proposed projects on typical flows in the streams while increasing floodplain storage during major floods. The goal of all of the projects is to modify flood flow timing to reduce peak downstream discharges at key locations.

Table ES-3 summarizes the planning level cost estimates for the five projects and each project's reduction in peak discharge at Vernon Street in Roseville based on the single design storm that generates the 100-year discharge at Vernon Street. The expected flow reduction benefit of each project taken individually and the expected net flow reduction benefit of all five projects together are listed. The combination of all of the projects would result in a slightly greater benefit than the sum of the individual projects due to flow timing. Evaluations based on other design storms (other storm centerings) could indicate greater or lesser benefits. Information about potential project benefits based on other design storms is presented in the report and its appendices.

Table ES-3: Potential Mitigation Measures Identified by the Plan Update

Description	**Cost**	**Flow Reduction (cfs)**	**Cost/Benefit (cfs flow reduction)**
Antelope Creek at Atlantic Street	$ 3,367,000	825	$4,000/cfs
Secret Ravine at Sierra College Boulevard	$ 3,234,000	175	$18,000/cfs
Linda Creek at Old Auburn Road	$ 932,000	28	$33,000/cfs
Linda Creek at Wedgewood Drive	$ 1,019,000	13	$78,000/cfs
Linda Creek near Auburn-Folsom Road	$ 1,008,000	12	$84,000/cfs
Total Cost and Net Flow Reduction @ Vernon	**$ 9,560,000**	**1085**	

The District and City of Roseville have a flood warning ALERT System that monitors numerous precipitation and stream gages and provides a good source of advance flood warning information. Enhancing the flood warning system with flood forecasting software based on rainfall predictions and the modeling system developed for this Plan Update is recommended. The Plan Update recommends $234,000 in upgrades to the ALERT system including new gages and enhanced flood forecasting capabilities.

Three options for the basis of a funding plan are provided with each consecutive option providing a slightly higher amount of peak flow mitigation at Vernon Street. Each option can be reasonably justified and the District can select which option they determine is most appropriate.

Option 1: Implementation of the Antelope Creek flood flow reduction project plus the ALERT system upgrades for an expected cost of $3,601,000. This option provides an estimated 999 cfs of peak flow reduction and assumes low impact development (LID) measures are fully implemented.

Option 2: Implementation of the Antelope Creek and Secret Ravine flood flow reduction projects plus the ALERT system upgrades for an expected cost of $6,835,000. This option provides a more consecutive total amount of peak flow reduction as compared to Option 1, with up to 1,174 cfs of reduction at Vernon Street, including the benefit assumed from LID measures.

Option 3: Implementation of all five flood flow reduction projects plus the ALERT system upgrades for an expected cost of $9,794,000. This option provides the largest amount of peak flow reduction of all three options at up to 1,127 cfs at Vernon Street, including the benefit assumed from LID measures.

ES-6 FUNDING

The funding plan identifies a potential set of funding sources to adequately fund the capital improvements envisioned in the Plan Update and to fund ongoing costs of operations and maintenance. Potential sources include government grants, development impact fees, general funds, and fees collected through County Service Areas (CSAs), Mello Roos Community Facility Districts (CFDs) and utility districts. The recommendations in this Plan Update are intended to both correct existing deficiencies in the drainage system and to accommodate future development based on build-out conditions identified in the current General Plans of the various governmental jurisdictions within the Dry Creek watershed. Development impact fees are proposed to cover the costs of mitigating for impacts of future development, not to pay for correcting existing deficiencies.

1.0 Project Background

1.0 PROJECT BACKGROUND

1.1 PURPOSE

The primary purposes of this Update to the Dry Creek Watershed Flood Control Plan (Plan Update) are to update the hydrologic analysis of the watershed, to identify possible means to mitigate development impacts on flooding and reduce flood damages, to provide new analytical tools to evaluate projects, and to present funding options. The 1992 Dry Creek Watershed Flood Control Plan (1992 Plan) recommended structural and non-structural measures to correct existing deficiencies and mitigate for impacts of future development. Some of the recommendations of the 1992 Plan have been implemented, though many have not been implemented due to environmental and/or economic constraints. This Plan Update evaluates the hydrology of the watershed and provides recommendations based on an overall watershed approach with the objective of identifying improvements that will be both feasible and effective.

1.2 WATERSHED DESCRIPTION

The Dry Creek watershed covers an area of 101.4 square miles in Placer and Sacramento Counties. The majority of the watershed (82 percent) is contained within the limits of Placer County. The Cities of Rocklin and Roseville, and the Town of Loomis are wholly or partially contained within the watershed. Other unincorporated communities in the watershed include Granite Bay, Penryn, Newcastle, Orangevale, and Rio Linda. A vicinity map of the watershed is provided on Plate 1 and a watershed overview is provided on Plate 2. Of the 101.4 square miles that cover the watershed, 88.4 square miles are within, or are tributary to, parts of Placer County. The remaining 13.0 square miles are within Sacramento County, along Dry Creek, downstream from the Sacramento County – Placer County line.

The headwaters of Dry Creek are located in the upper portions of the Loomis Basin, in the vicinity of Penryn and Newcastle, in unincorporated Placer County, in the Granite Bay area near Folsom Lake, and in Orangevale in Sacramento County. Antelope Creek and Clover Valley Creek form the northwest boundary of the watershed, and Secret Ravine and Miners Ravine comprise the northeast portion of the watershed. Antelope Creek and Miners Ravine, downstream from their confluences with Clover Valley Creek and Secret Ravine, respectively, combine near Interstate 80 and Atlantic Street in Roseville to form Dry Creek. Cirby Creek, made up of the combination of Cirby and Linda Creeks and Strap Ravine, joins Dry Creek just upstream from Riverside Avenue in Roseville. Downstream of Roseville, just downstream of Elverta Road, Dry Creek branches into North Dry Creek and Dry Creek and forms Cherry Island in the Rio Linda area.[1] (See Plate 2)

[1] James M. Montgomery, Dry Creek Watershed Flood Control Plan, 1992.

Watershed topography, soil types and ground cover, and land use (imperviousness and drainage systems) are the basic elements that determine the portion of rainfall that becomes runoff and the timing of the runoff flowing through the watershed. These elements are introduced in this section and are elaborated upon in a subsequent section of the Plan Update. Additional descriptive information about the watershed is available in the various sources referenced in the Plan Update.

1.2.1 Topography

The lower end of the Dry Creek watershed is on the Sacramento Valley floor and the headwaters are located in the Sierra Nevada foothills. The mouth of Dry Creek, at its confluence with the Natomas East Main Drainage Canal, is at an elevation of about 30 feet above mean sea level (msl). Antelope Creek, Secret Ravine, and Miners Ravine have headwaters in the vicinity of Newcastle and Penryn at elevations of 900 to 1,200 feet msl, in hilly topography typical of the foothills. Linda Creek, Cirby Creek, and Strap Ravine have headwaters in Orangevale in Sacramento County, and in the Granite Bay area at elevations of 300 to 500 feet msl, with less relief than is found in the other Dry Creek tributaries.[2]

The upper portions of the Dry Creek watershed are characterized by relatively steep slopes and moderate relief. The lower reaches of the Dry Creek watershed, especially downstream of Roseville, are characterized by very gentle slopes. The stream channels throughout the watershed are generally well defined, but are not especially wide or deep.[3]

1.2.2 Soils

Soils within the Dry Creek watershed are variable, depending upon landscape position and underlying geology. Most soils are formed from either granitic or volcanic parent material, and often include a clay pan, or other consolidated layer that impedes water permeability. Shallow soils and rock outcrops are fairly common at higher elevations.[4] The United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS) has given each soil type a hydrologic classification based on infiltration rates. Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four hydrologic soil groups (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The hydrologic soil groups are defined as follows:

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel, and have high rates of water transmission, greater than 0.30 inches per hour (in/hr).

[2] James M. Montgomery, Dry Creek Watershed Flood Control Plan, 1992.
[3] James M. Montgomery, Dry Creek Watershed Flood Control Plan, 1992.
[4] ECORP Consulting, Inc., Dry Creek Watershed Coordinated Resource Management Plan, 2003.

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have moderate rates of water transmission (0.15-0.36 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water, and soils with moderately fine to fine texture. These soils have low rates of water transmission (0.05-0.20 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have very low rates of water transmission (0-0.09 in/hr).[5]

Table 1 lists the hydrologic soil groups found within the Dry Creek watershed for Placer and Sacramento Counties.

Table 1. Dry Creek Watershed Hydrologic Soil Types

Watershed Name	Hydrologic Soil Type (acres)			
	A	B	C	D
Antelope Creek	0	3,278	529	3,501
Cirby Creek	42	8	172	1,506
Clover Valley	0	602	179	1,543
Dry Creek	796	1,057	1,799	12,221
Linda Creek	64	2,318	351	5,234
Miners Ravine	0	9,155	694	3,249
Secret Ravine	18	8,106	1,371	4,667
Strap Ravine	31	750	53	1,611
Total	951	25,273	5,148	33,532
Percentage	1.5%	38.9%	7.9%	51.7%

A map depicting the hydrologic soil group for the soils in the Dry Creek watershed is shown in Plate 3. For additional information, an extensive listing of the soil names and classifications for the soils located in the Dry Creek watershed can be found in the 2003 Dry Creek Watershed Coordinated Resource Management Plan (DCWCRMP).

1.2.3 Land Use and Development Projections

The types of land use that occur in a watershed are significant in determining the amount of runoff that results from a given amount of rainfall. Much of the difference in runoff from different land uses can be attributed to the difference in the percentage of the land that is impervious (paved or covered by buildings). Another important factor that is determined by the type of land use is the condition, or hydraulic efficiency, of the

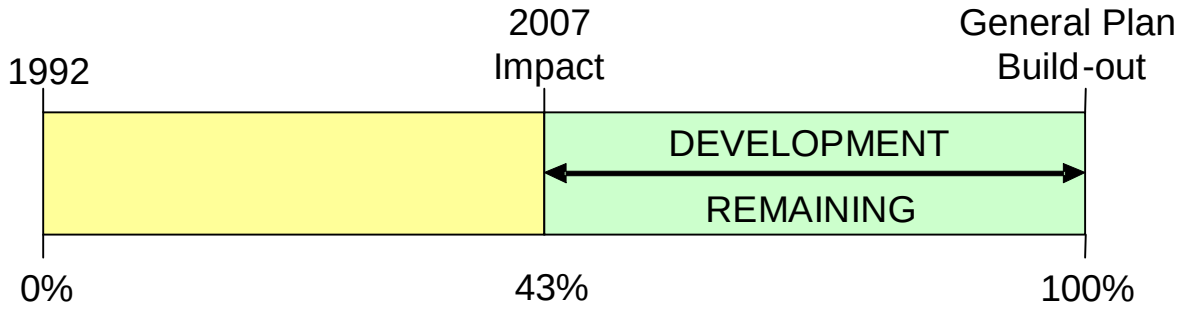
[5] USDA NRCS, Urban Hydrology for Small Watersheds, TR-55, 1986.

smaller tributaries and streams in the area and what portion of the flows are convey in along streets and in storm drains. The land uses in the Dry Creek watershed vary widely, from mixed urban, suburban, rural, and open space land.

From the completion of the 1992 Plan through 1997, land development within the Dry Creek watershed was relatively slow due to an economic recession. Development activities began to accelerate in 1998, and by 2002, development was occurring at record levels. Another recession slowed land development down in late 2002 and early in 2003. From 2004 and continuing into 2007, land development activity was high again, but by late 2007 the pace of land development dropped dramatically due to a severe recession. Due to the slow pace of development since 2007, it was determined that the estimate of 2007 land use could be considered as new baseline from which to move forward for the purposes of this Plan Update. This Plan Update anticipates that development to the build-out conditions described in the various municipal General Plans will eventually occur.

It is estimated that approximately 43 percent of the projected total impacts (within the 88.4square miles within and tributary to Placer County, based on impervious area estimates, prior to considering mitigation measures) of development on runoff expected to occur between 1992 and the General Plan build-out condition, occurred prior to 2007 (refer to Figure 1). These development status values are presented relative to the initiation of the mitigation impact fee program.

Figure 1: Development Scenario



Estimates of imperviousness were used to indicate the amount of development that has occurred. Plate 4 identifies the imperviousness for the watershed in the 1992 (baseline) conditions. Plate 5 identifies the imperviousness for the watershed in the 2007 conditions, and Plate 6 identifies the imperviousness for the watershed for the General Plan (build-out) conditions. Plate 7, Plate 8 and Plate 9 illustrate land use for the baseline, 2007 and build-out conditions, respectively. The upper portion of Table 2 lists the estimated impervious area within the Dry Creek watershed and its major sub-basins for the baseline 1992, 2007 and build-out conditions. The lower portion of Table 2 shows the results of calculations based on the listed impervious area values. These calculations show that 43 percent of the impervious area expected to be added between 1992 and build-out had already been constructed by 2007. {(17.63-14.35)/(21.96-14.35)=43.1}

Of the 88.4 square miles within and tributary to Placer County, approximately 6 percent is within Sacramento County, and this area, generally within Orangevale, accounts for approximately 1.9 percent of the expected increases in imperviousness within and tributary to Placer County. Specifically, 0.08 square miles of the expected increase of 3.79 square miles of imperviousness within the 88.4 square mile portion of the Dry Creek watershed upstream from the Placer County line is expected to occur within Sacramento County.

Table 2: Watershed Imperviousness

Watershed	Area (sq. mi)	Impervious Area (sq. mi)		
		1992	2007	Build-out
Antelope Creek	11.41	2.36	2.53	3.02
Cirby Creek	2.70	1.16	1.45	1.49
Clover Valley	3.63	0.24	0.33	0.88
Dry Creek	11.82	3.25	3.45	4.39
Linda Creek	12.45	1.29	2.29	2.56
Miners Ravine	20.47	1.92	2.56	3.09
Secret Ravine	22.13	3.45	3.93	5.29
Strap Ravine	3.82	0.68	1.09	1.24
Grand Total	**88.43**	**14.35**	**17.63**	**21.96**
Percent build-out from 1992 baseline		0.0%	43.0%	100.0%
Percent build-out in absolute terms		65.4%	80.3%	100.0%
Percent impervious		16.2%	19.9%	24.8%

1.3 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

The purpose of 1992 Plan was to provide the District and other governmental agencies (in both Placer and Sacramento Counties) with the information and policies necessary to manage stormwater runoff within the Dry Creek watershed from a flood control perspective. The 1992 Plan was intended to provide an approach for meeting existing and future flood control needs in the watershed. In addition, the 1992 Plan recommended structural and non-structural measures to correct existing deficiencies and mitigate for impacts of future development within the watershed. The 1992 Plan was formally adopted by District Board in June 1995.

The 1992 Plan focused on the ability of on-channel regional detention basins to both correct existing flooding problems and mitigate for the increase in flood flows due to development. The 1992 Plan studied 25 potential detention basin sites throughout the Dry Creek watershed and identified 16 sites that might be feasible. The 16 sites were evaluated to determine both local and regional flood reduction capacity. Regional flood reduction capacity was measured based on flow rates at Vernon Street in Roseville. Seven sites were selected for inclusion in the 1992 Plan based on costs and flood flow reduction efficiency at Vernon Street. If implemented, these sites could have provided peak 100 year flood flow reduction of nearly 4,000 cubic feet per second (cfs) at Vernon Street. However, none of the on-channel regional detention basins included in the 1992

Plan have been, nor are currently expected to be, implemented.

In 1997-1998, the District studied the feasibility and began planning efforts for an on-channel regional structural flood control project on Miners Ravine upstream of Sunrise Avenue as recommended in the 1992 plan. However, that project was met with strong public opposition, and significant permitting and environmental constraints were identified. The District Board voted to abandon that project and evaluate other types of flood control projects more acceptable to the public, the environmental community and permitting agencies.

The 1992 Plan also included an extensive evaluation of bridge and culvert replacement needs, and an evaluation of three channel improvement projects. Furthermore, the 1992 Plan addressed non-structural alternatives and included sections on local stormwater detention, floodplain management and a flood warning system.

1.4 INFORMATION SOURCES

Numerous information sources were referenced in the preparation of this Plan Update, including the following hydrologic and environmental reports. Additional references can be found in Appendix A. Data sources used in the direct development of the computer models prepared as part of the Plan Update are described in Sections 1.5 and 1.7.

1.4.1 Hydrologic Reports

1.4.1.1 1988 Hydrology Office Report, Dry Creek Basin, Placer and Sacramento Counties (United States Army Corps of Engineers [USACE])

The 1988 Hydrology Office Report was an update of a 1984 study prepared by the Sacramento District of the USACE for use in the feasibility study for flood control projects with the Dry Creek watershed. The study provides flood history data, performed both general storm and cloudburst storm hydrology, and evaluated existing land use conditions and projected 2040 flood flows. Standard Project Flood (SPF), 100-year, 50-year, 25-year, and 10-year discharges were tabulated.

1.4.1.2 1992 Dry Creek Watershed Flood Control Plan (JMM)

The 1992 Dry Creek Watershed Flood Control Plan has been the basis of flood control planning in the Dry Creek watershed used by the District, Placer County, the City of Roseville, the City of Rocklin and other local communities. This Plan Update will supersede the 1992 Plan.

1.4.1.3 2000 Dry Creek Watershed Flood Detention and Stream Restoration Feasibility Study (Swanson & EDAW)

The Dry Creek Watershed Flood Detention and Stream Restoration Feasibility Study investigated 19 potential sites for regional flood detention projects based on project

feasibility, relative cost, and environmental issues. Two sites, Miners Ravine below Sierra College Boulevard and Secret Ravine above Sierra College Boulevard, were examined conceptually as example projects to produce preliminary cost estimates for multi-use regional flood detention projects.

1.4.1.4 2001 Flood Insurance Study (Federal Emergency Management Agency [FEMA])

The Placer County Flood Insurance Study (FIS) provided an update to the FEMA 100-year floodplain maps, and baseline FEMA hydrology. The FIS was largely based on the hydrology of the 1992 Plan; however, some updates were made for various areas of the watershed, where new studies with better calibrations had been made.

1.4.1.5 2001 Town of Loomis Drainage Master Plan (West Yost)

The Town of Loomis Drainage Master Plan describes the existing storm drain system for the Town of Loomis and provides recommendations for upgrades to the system to decrease localized flooding problems. The localized flooding issues are due primarily to inadequate storm drain infrastructure, and not necessarily flood flows from streams in the Dry Creek Watershed. It also lists several crossings of Antelope Creek, Sucker Ravine, and Secret Ravine that are inundated by flood flows. The crossings are presented in the Existing Flood Hazard section of this report.

1.4.1.6 2004 Alternative Regional Detention Sites (URS)

The Alternative Regional Detention Sites report documents analysis of four potential sites for regional detention basins: Strap Ravine immediately upstream of McLaren Drive next to Maidu Park in Roseville; Miners Ravine upstream of East Roseville Parkway; Linda Creek west of Rocky Ridge Drive and south of Meadowlark Way in Roseville; and Miners Ravine immediately downstream of Sierra College Boulevard. The report uses the hydrology information developed for the 1992 Plan and created an unsteady-state HEC-RAS hydraulic model from various existing hydraulic models. The report recommended the construction of the Miners Ravine detention basin immediately downstream of Sierra College Boulevard and reported that “although the other three sites did reduce peak discharges immediately downstream of their locations, their hydraulic benefits were localized and only minor positive impacts downstream near Riverside Ave. and Vernon St. Bridges (E-1).” The only regional detention basin that was recommended in this report, Miners Ravine Off-Channel Detention Basin, was completed in 2007.

1.4.1.7 2006 Central Rocklin Drainage Master Plan (West Yost)

The Central Rocklin Drainage Master Plan documents analysis of the urban drainage through storm drain systems and also includes sections on stream flooding. The District’s HEC-2 models used for the 1992 report and the 1998 FEMA Flood Insurance Studies (FIS) were converted to HEC-RAS and used to analyze flooding in the Dry Creek tributary streams in the City of Rocklin. Three locations along Antelope Creek and four locations along Sucker Ravine were identified where City of Rocklin roadways

would be expected to be overtopped during a 100-year storm event.

1.4.1.8 2007 Miners Ravine Off-Channel Detention Basin Hydrology and Hydraulic Design Report (RBF Consulting)

The Miners Ravine Off-Channel Detention Basin Hydrology and Hydraulic Design Report contains the methodology and calculations used to design the Miners Ravine Off-Channel Detention Basin for the District. The report outlines the baseline hydrology for key points in the Dry Creek Watershed. Hydraulic design methods and calculations are also documented, including spillway design, sediment transport, and failure scenarios.

1.4.2 Environmental Documents

1.4.2.1 1994 Dry Creek Watershed Flood Control Program Programmatic Environmental Impact Report (Jones & Stokes)

The Dry Creek Watershed Flood Control Program Programmatic Environmental Impact Report (PEIR) describes the potential environmental impacts of the proposals of the 1992 Plan and presents mitigation measures to be used while implementing the recommendations of the 1992 Plan.

1.4.2.2 2001 Secret Ravine Adaptive Management Plan (Dry Creek Conservancy)

The Secret Ravine Adaptive Management Plan describes remedial actions for increasing natural salmonid production and satisfying a wide range of stakeholder interests.

1.4.2.3 2002 Miners Ravine Restoration Project (EDAW)

The Miners Ravine Restoration Project report describes the plan for improvements of the Miners Ravine Nature Reserve near the intersection of Oak Glen Lane and Auburn-Folsom Road to enhance floodplain function and habitat value. The plan includes channel excavation to restore natural floodplain function, removal of debris, bank re-vegetation, and removal of barriers to fish passage.

1.4.2.4 2002 Miners Ravine Habitat Assessment (State of California, The Resources Agency, Department of Water Resources)

The Miners Ravine Habitat Assessment report describes the biological habitat survey of Miners Ravine with special attention given to salmon habitat.

1.4.2.5 2003 Dry Creek Watershed Coordinated Resources Management Plan (Dry Creek Conservancy, Harding Lawson Associates, Swanson Hydrology & Geomorphology, ECORP Consulting, Inc.)

The broad scope of the Dry Creek Watershed Coordinated Resources Management Plan offered a comprehensive review of the Dry Creek watershed covering hydrology,

biology and wildlife, population growth and development projections, and policy implementation plans.

1.5 COMPUTER MODELING

This Plan Update provides a new hydrologic modeling system that is a significant technological advance over the 1992 Plan. Though the 1992 Plan was state-of-the-art at the time it was prepared, the new modeling system is better able to evaluate flood flow timing and backwater impacts on flow routing that are significant to development impact and project analysis than the 1992 Plan model. Computer programs, including the USACE's "Flood Hydrograph Package" (HEC-1), "Hydrologic Modeling System" (HEC-HMS) and "River Analysis System" (HEC-RAS) software developed by the U.S. Army Corps of Engineers (USACE); GIS software; and other software, referred to as the Dry Creek Desktop software (DCDESKTOP) (see Appendix J) developed specifically for this Plan Update, were employed to develop a new basis for watershed runoff and flood flow evaluations. The new modeling system includes substantially more detail than the 1992 modeling system, thereby allowing it to be used on smaller tributaries which will facilitate its application on smaller projects. Furthermore, the new modeling system has been calibrated using precipitation and stream flow gage data from December 1995, January 2007 and December 2005 storm events to ensure the validity of the results.

This Plan Update uses more than seven times the number of sub-watersheds than included in the 1992 Plan HEC-1 model to facilitate evaluation of smaller features and the effects of routing along tributaries. Also, whereas the 1992 Plan developed some HEC-1 flow (Modified Puls) routing parameters using steady-state flood profiles calculated in HEC-2, the Plan Update HEC-1 and HEC-HMS models include far more detailed flow routing parameters developed using steady-state HEC-RAS models. Additionally, an unsteady-state hydraulic routing model that covers the streams in the lower (downstream) two-thirds of the watershed was prepared and used to perform critical routing analysis. The unsteady-state hydraulic model was used to calibrate the system model and to perform realistic evaluations of project impacts that would otherwise not be feasible. The watershed details, improved hydrologic routing, implementation of hydraulic (unsteady-state HEC-RAS) routing, and event calibrations form the basis of this Plan Update. This Plan Update uses HEC-HMS that is replacing HEC-1, to take advantage of its capabilities and to modernize the analysis procedure.

1.5.1 Application of HEC-1 and HEC-HMS

The District's procedures for using HEC-1 to perform hydrology studies are provided in the District's Stormwater Management Manual (SWMM) dated September 1, 1990 which were formally adopted in 1994. Historically, the District's methodology for using HEC-1 requires the use of the Placer County Design Precipitation Program (PDP) dated August 15, 1994. A key element of the District's hydrology procedures requires the use of multiple storm centerings to identify the appropriate design rainfall distribution for each unique condition.

The 1992 Plan was based on modeling of multiple storm center locations generally

consistent with, but not equivalent to, the subsequently adopted procedures. Various storm centering model runs established the peak flow rates at key locations throughout the watershed. Hydrology for local benefit analysis was performed for each of the projects included in the 1992 Plan was based on a storm center within each project's tributary watershed. Hydrology was also performed for each project based on the storm centering that generated the peak discharge along Dry Creek at Vernon Street to measure regional benefit. In the 1992 Plan, the storm used to measure regional benefit of projects was centered in the Miners Ravine watershed. Numerous subsequent studies relied on using this single storm centering.

In the process of applying the PDP for this Plan Update, it was determined that there was an error in the programming code that became significant under some circumstances. As a result, the District's PDP software was updated to Version 2.0 (PDP2) with this Plan Update, to correct a precipitation generation error and to provide a smoother precipitation intensity distribution based on interpolation of rainfall depths.

The DCDESKTOP software provides an improved means to prepare HEC-1 input files based on District approved methodologies, to perform multiple storm centering analyses, to convert HEC-1 files to HEC-HMS and to perform some other functions such as creating summary output tables. HEC-HMS offers more GIS mapping capabilities, input data error detection and other advantages over HEC-1. The DCDESKTOP software provides a much more efficient means to apply the PDP in HEC-HMS than is possible using HEC-1 input file conversion tools built into HEC-HMS. DCDESKTOP software may be downloaded from www.pcdrycreek.org.

1.5.2 Application of HEC-RAS

This Plan Update used HEC-RAS to calculate Modified Puls routing parameters used in the hydrology models and to perform hydraulic routing to account for varying backwater conditions that cannot be simulated using HEC-1 or HEC-HMS. Varying backwater infers that there is not a one-to-one correlation between stage and discharge, a condition that is typical at structures and in the vicinity of stream confluences. HEC-RAS has replaced the USACE's HEC-2 "Water Surface Profiles" and UNET "One-Dimensional Unsteady Flow through a Full Network of Open Channels" computer programs. The Modified Puls routing parameters were calculated using steady-state HEC-RAS and were included in the HEC-1 and HEC-HMS models which only allow a one-to-one stage vs. discharge relationship. Unsteady-state HEC-RAS was used for evaluations that are sensitive to backwater conditions.

Initially, the baseline project model was compiled in HEC-RAS version 4.0 for the lower two-thirds of the watershed. The model was built based on the assembly of existing hydraulic models for the various main tributaries of Dry Creek including: Miners Ravine, Secret Ravine, Sucker Ravine, Strap Ravine, Linda Creek, Cirby Creek, Antelope Creek, and Clover Valley. Modifications to the model were made as determined to be appropriate for the new system model to run in the unsteady-state mode. The model was also run in the steady-state mode to calculate Modified Puls routing parameters. However, HEC-RAS version 4.0 did not provide correct storage parameters for Modified

Puls, so version 4.0.1 beta was obtained from USACE and was used for the Modified Puls calculations and preliminary unsteady-state analyses. Additionally, simple (no structures) steady-state HEC-RAS models were created for some of the upstream reaches using the topographic data obtained for the Plan Update for the sole purpose of calculating Modified Puls routing parameters for Plan Update hydrology. Hydrographs from the HEC-HMS model output were input into the unsteady-state models using USACE's "Data Storage System" (HEC-DSS). Software tools within the DCDESKTOP were also developed specifically for this Plan Update to assist in the organization and retrieval of the results of the HEC-RAS and HEC-HMS hydrology analyses. Ultimately, multiple combinations of hydrology and hydraulics were evaluated to consider appropriate land use and project scenarios necessary for Plan Update development. Final unsteady-state HEC-RAS model runs were all made using HEC-RAS version 4.1.0.

1.5.3 Topographic Data

The primary source of topographic data used for watershed delineations in this Plan Update was interferometric synthetic aperture radar (IFSAR) data acquired from Intermap Technologies Inc. The Intermap data is proprietary and was licensed to the District. The Intermap data was provided in NAD83 horizontal datum and NAVD88 vertical datum, with measurement units in feet.

The Intermap data represents a higher point density of data than typically found in the USGS Digital Elevation Model (DEM), with a slightly better vertical resolution. The data set used in this Plan Update also included some artifact terrain areas near bridges and overpasses which did not correctly represent the ground surface. However, this data exceeds the accuracy requirements for determining watershed boundaries (with other supplemental data sources and limited field investigation) and watershed overland response factors, but is limited in its usefulness for detailed hydraulic studies or other purposes requiring higher resolution data. The topographic mapping and watershed delineations based on the Intermap data are provided in Appendix B.

Supplemental data sources used to define watershed boundaries included a digital terrain model (DTM) provided by the City of Roseville, previous detailed drainage studies and some field investigations. Though the City of Roseville's DTM was not well documented and may have absolute accuracy issues, it was developed as part of the City's 2007 aerial imagery ortho-rectification process and it included breaklines that were useful in defining grade breaks and flow directions in some locations where it was unclear from other sources. Also, sub-watersheds within the Cirby Creek watershed were based on a previous detailed delineation provided by the City of Roseville. Other supplemental data included Placer County Water Agency (PCWA) water distribution canal maps, municipal drainage master plans, and other storm drainage system layout information. Field investigations were performed to refine boundaries at a few locations.

The Plan Update used HEC-RAS unsteady-state hydraulic models to perform flow routing and project benefit analysis. These unsteady-state models where assembled for the Plan Update from various sources (see Section 3.5.2), though these are primarily

from FEMA models. Therefore, this Plan Update indirectly used other sources of topographic data, including topography developed for FEMA and some private development projects. The datum of existing models used in this Plan Update were not researched, but can reasonably be expected to be consistent with NGVD29 vertical datum, as was used for the original Flood Insurance Studies.

1.5.4 Land Use

For the purpose of this Plan Update, land use data mapping (GIS) was assembled for three conditions: 1992, 2007, and the General Plan build-out. The 1992 Plan included land use maps (AutoCAD) for the estimated 1989/1992 land use conditions. These maps were converted to GIS files to establish the 1992 baseline land use areas. The 1992 Baseline Land Use is shown in detail in Plate 7.

A high resolution aerial map taken in 2005 was used to compare each parcel to the General Plan build-out land use map. If the aerial showed a lower density land use than called for in the build-out condition, the land use type visible in the aerial image was applied. A color orthorectified radar image (CORI) obtained from Intermap, also from 2005, was also used to establish current conditions impervious area. Other information was used to have the impervious area estimate reflect what was built through 2007. Specifically, data from the City of Rocklin Master Plan dated February 2006 was used to update areas in Rocklin and information from the City of Roseville website provided "current uses" data. Field inspection of some properties was performed, and observed conditions were incorporated into the impervious area estimates. In many cases the known site land uses, and field inspected land uses conflicted with the land use identified in the applicable Master Plan. In these cases the known land use was used as a basis for “current condition” studies. The 2007 (current) Land Use is shown in Plate 8.

Updated General Plan build-out land use files were requested from various agencies in the Dry Creek watershed. Information was obtained and converted into a GIS file type (shape file). In many cases, the various agencies had overlapping information which conflicted with each other. To resolve these issues, information from the agency responsible for mapping that area or the current land use observed in the field was used, as determined to be appropriate. The General Plan Build-Out Land Use is shown in Plate 9.

1.6 HISTORIC FLOODING

Floods in the Dry Creek watershed generally occur from October through April. The floods are usually caused by a combination of prolonged rainfall leading to saturated soils, and a short period of one to six hours of intense precipitation associated with frontal convection or severe thunderstorms.

Dry Creek and its tributaries have an extensive record of flood conditions, especially in the Roseville area. Streamflow records are available for a gage in Roseville beginning

in 1950. Damaging floods occurred in December 1955, April 1958, October 1962, December 1964, March 1983 and February 1986. The floods of 1983 and 1986 were the largest and most damaging on record before 1992. Hydrologic studies have shown that the recurrence interval of the March 1983 flood was approximately 10 years and the recurrence interval of the February 1986 flood was from 50 to 100 years, depending on the specific location in the Dry Creek watershed.[6] Flood events also occurred in 1995 and 2005, with the 1995 flood event causing extensive damage. Descriptions of flood events since 1983 are provided because information is available and the data from some of these events was used to calibrate the hydrology model.

Figure 2 is a photograph of Dry Creek flows inundating portions of downtown Roseville, including Royer Park, Douglas Boulevard, and Saugstad Park, during the 1995 flood event.

Figure 2: Portions of downtown Roseville during the 1995 flood event

1.6.1 March 1983

The March 1983 event was estimated to have an average exceedance recurrence interval of about 10 years and "damaged approximately 25 residences along Linda and Cirby Creeks in Roseville. Portions of Royer Park were under water was well as areas in the Sierra Lakes Mobile Home Park. Dry Creek overflowed the Darling Way and Riverside Avenue bridges, disrupting traffic and flooding six businesses along Riverside Avenue.[7]

1.6.2 February 1986

The February 1986 event was classified as an approximately 70 year event, and Placer

[6] James M. Montgomery, Dry Creek Watershed Flood Control Plan, 1992.
[7] James M. Montgomery, Dry Creek Watershed Flood Control Plan, 1992.

County was designated as a Federal Disaster Area. Nearly all bridges and culverts were overtopped with 30 crossings sustaining embankment damage including Rocky Ridge Drive washing out. Two bridges over Dry Creek were damaged and street cave-ins occurred at a number of locations. Flooding caused the closure of many major streets in the watershed, including Riverside Avenue, Darling Way, Douglas Boulevard, Vernon Street, Sierra College Boulevard, and others. Around 100 homes in Roseville along Dry Creek, Linda Creek, and Cirby Creek were flooded with water levels up to five feet above floor levels.

Ten homes along Antelope Creek and Secret Ravine tributaries in Rocklin and about sixteen homes along Miners Ravine in Placer County, in the area of Joe Rodgers Road, were flooded. Roseville City Hall and libraries were temporarily closed when their basements flooded. Downstream of Roseville, several residences along Dry Creek in Placer County were flooded. Flooding occurred along most of Elkhorn Boulevard near Dry Creek in Sacramento County, including many residences, schools, and businesses. Available gaged flow rates and stream stages from the February 1986 storm event were used to calibrate the 1992 model. Total damages within Placer County were estimated at $7.5 million. Based upon application for disaster assistance, 62 homes were damaged or destroyed within the watershed, although the actual number of damaged homes is thought to have been higher. Dozens of businesses in downtown Roseville were damaged or destroyed, and one fatality was associated with this flood event.

1.6.3 March 25, 1989

The March 1989 event was estimated to have an average exceedance recurrence interval of between 1 and 2 years. Available gaged flow rates and stream stages from the March 1989 storm event were used to calibrate the 1992 model.

1.6.4 January 1995

The January 1995 event had been classified as being approximately a 100 year event prior to this Plan Update. Further analysis of available data indicated that the January 1995 event was statistically closer to a 200-year storm event than a 100 year event at some key locations. (Identification of the 1995 storm event as potentially being significantly more severe than a 100-year storm event in no way limits municipality's ability to regulate to this maximum storm of record instead of a 100-year event.) The January 1995 storm resulted in the most severe recorded flooding to date occurring in the Dry Creek watershed, with Placer County being designated as a Federal Disaster Area.

The storm included two high precipitation storm events spaced about 12 hours apart. The first event delivered approximately a 10-year storm event. The second storm event delivered even higher intensities of precipitation. As with the 1986 flood, numerous bridges were overtopped. Total damages within Placer County were estimated at $8.3 million, with 750 damaged or destroyed structures ($4.2 million estimated damages for the Roseville area alone). Of the $4.2 million in damages, one million was for road and bridge repairs, and two million was for utility repairs. Within the Roseville area, 385

homes, businesses, apartments, and mobile homes were damaged or destroyed. In addition, two sewage treatment plants were overtopped, and one landfill was damaged. No injuries or fatalities were associated with this flood event.

Figure 3 shows a photograph of flows from Miners Ravine overtopping Sierra College Boulevard during the January 1995 event.

Figure 3: Miners Ravine overtopping Sierra College Boulevard during the January 1995 storm event

1.6.5 January 1997

The flood events of 1997 were some of the most severe on record for the region. An isolated storm event typical for the Roseville area occurred on top of soils saturated from repetitive storm events causing a flash flood. This flooding resulted in 21 structures being inundated with floodwaters. The impact of this event was significantly reduced by a partially completed Cirby-Linda-Dry Creek Flood Control project. No injuries or fatalities were associated with this flood event.[8]

1.6.6 February 1998

A small flood event occurred on February 3, 1998, resulting in eight structures being inundated by floodwaters in the Dry Creek Basin. Once again, this event was caused by an isolated storm event centered over the watershed. No injuries or fatalities were associated with this flood event.[9]

[8] City of Roseville, *Draft Flood Risk Assessment*, 2004.
[9] City of Roseville, *Draft Flood Risk Assessment*, 2004.

1.6.7 December 2005

The December 2005 event was estimated to have an average exceedance recurrence interval of between 10 and 25 years. This event, often referred to as the "New Years Eve" event, occurred in the early morning hours of December 31, 2005. Most gages reported peak 6 hour precipitation between the 10-year and 25-year precipitation depths listed in the SWMM. Flooding was most noticeable in the lower watershed where the overtopping of Walerga Road made news as vehicles and drivers attempting to cross the bridge during overtopping flows required emergency assistance to have their stalled vehicles pulled to safety. One vehicle was pushed by the velocities in the overtopping flows onto the guardrail, and against a tree, requiring a helicopter rescue.

Roadways that were overtopped included Champion Oaks Drive on Linda Creek as shown on Figure 4 and Barton Road on Miners Ravine as shown on Figure 5.

Figure 4: Linda Creek overtopping Champion Oaks Drive in 2005

Figure 5: Miners Ravine overtopping Barton Road during the 2005 flood event

In addition to the events listed above, flooding has occurred in numerous other events for storms in 1950, 1952, 1963, 1969, 1970, and 1973. However insufficient historic data are available to precisely define the geographic extent of flooding and the impact of these events.[10]

1.7 GAGE DATA

The District, the City of Roseville, and Sacramento County own and maintain 23 precipitation gages and 20 stream gages distributed throughout the Dry Creek watershed. These gages, the location of which are shown on Plate 10, contain ALERT type transmitters and are used to record, forecast and predict flooding in critical flood hazard areas of Placer and Sacramento County. The real-time gage data is transmitted to base station servers in Auburn, Roseville and Sacramento where the data is recorded and stored for either real-time or historical use. Additionally, the base stations located in Auburn and Roseville act as redundant data storage servers since both systems receive a majority of the Western Placer County gage data. All data received by the Auburn and Roseville base stations is also uploaded to a server in Colorado maintained by OneRain, Inc. This data is available via the internet through the Contrail Web system. Plate 10 indicates whether the stream gage provides only stage values or if a rating curve based on flow measurements is available to provide a direct estimate of discharge.

[10] City of Roseville, *Draft Flood Risk Assessment*, 2004.

Historical record event data was supplied for this Plan Update from data stored by the City of Roseville. Some of the gage records for the calibration events used in this plan were missing either because the data was corrupted or the gages were not installed or functioning properly. The application of the valid record gage data is explained in Appendix C for each record event of the calibration analysis.

1.8 RELATED FLOOD MANAGEMENT PROGRAMS

Floodplain management is the operation of a community program providing corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose floodplain ordinances. A community's agreement to adopt and enforce floodplain management ordinances, particularly with respect to new construction, is an important element to provide flood loss reduction building standards for new and existing development.

1.8.1 FEMA

FEMA plays a particularly prominent role in floodplain management. FEMA is charged with overseeing disaster assistance and mapping floodplains. One of FEMA's programs is the National Flood Insurance Program (NFIP). Nearly 20,000 communities across the United States and its territories participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities. Community participation in the NFIP is voluntary; however, Placer and Sacramento Counties, including the Cities of Lincoln, Rocklin and Roseville and the Town of Loomis, are participants in the Flood Insurance Program. In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the Nation's floodplains.

Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance.[11] These Flood Insurance Rate Maps (FIRMs) identify floodplains in the watershed that are used to assign risk and insurance rates for homeowners and businesses. FIRMs denote the location of the federal 100-year flood area, 500-year flood area, and the Base Flood Elevation. In a 100-year floodplain, there is a 1 percent chance of flooding in a given year, and in a 500-year floodplain, there is a 0.2 percent chance of flooding in a given year. If an area is within a 100-year floodplain, flood insurance is required by most mortgage companies. FEMA is also responsible for the accreditation of levee systems.

[11] FEMA Website. Available at: http://www.fema.gov/hazard/flood/index.shtm. Accessed: July 10, 2010.

1.8.2 Roseville[12]

The City of Roseville joined the NFIP on August 2, 1974. By implementing good floodplain management practices, Roseville became the first (and currently, only) community in the nation to receive the FEMA's Community Rating System (CRS) highest rating of Class #1. This rating allows Roseville property owners up to a 45 percent discount on their flood insurance premiums.[13]

Flood protection is a major concern in Roseville as well as the remainder of the Sacramento/South Placer region. Flooding in Roseville is associated with storm runoff exceeding creek and storm drainage capacities. As a result, flooding in the City is generally confined to limited areas of low elevation adjacent to the creek systems.

The City of Roseville is involved in several flood control projects and mitigation programs designed to protect residents and lessen the potential for flooding both within the City and within neighboring communities:

The City has initiated the Cirby-Linda-Dry Creek Flood Control Project to reduce storm water back up at constrictions and increase the overall capacity of the floodplain. Of the seven work packages described in the project study, five have been completed. As a result of those improvements, the number of structures in the floodplain has been reduced to about 90. Most of the structures remaining in the floodplain are near Cirby Creek in the Zien Court and Trimble Way area and along Dry Creek upstream of Folsom Road.

The City is currently collecting drainage mitigation fees within the Pleasant Grove and Dry Creek watersheds to be used to alleviate potential downstream drainage problems in these basins. Roseville is also involved, through the District, in the Auburn Ravine, Coon Creek, and Pleasant Grove Creeks Flood Mitigation Plan dated June 1993, as well as the Dry Creek Watershed Flood Control Plan.

The City presently has a flood alert system in place. After the '86 flood, the City installed an alert warning system with 18 rain gauges, 19 stream level gauges, and a computer monitoring system. During high stream flows, the City broadcasts stream levels on Roseville Cable TV Channel 14/73 and monitors Doppler radar and satellite imaging of incoming storms to assist in advance notification efforts in the event evacuation of flood-prone areas is deemed necessary. In summer 2001, we put real-time stream gauge data on the City's website.

After the '86 flood, the City entered into a Memorandum of Understanding with the State

[12] City of Roseville General Plan, 2025, adopted by the City Council on May 5, 2010. Available at: http://www.roseville.ca.us/planning/general_plan_n_development_guidelines.asp. Accessed: July 14, 2010.

[13] City of Roseville Website. Available at: http://www.roseville.ca.us/pw/engineering/floodplain_management/flood_facts.asp. Accessed: May 8, 2011.

Department of Fish & Game to allow clearing creeks of fallen trees and debris which could otherwise float downstream and block culverts and bridges.

1.8.3 Rocklin[14]

The City of Rocklin joined the NFIP on July 19, 1974. The City currently has a CRS Class of 10 with an application pending to improve its CRS Class to 8.[15] In addition, the City of Rocklin participates in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. City of Rocklin Municipal Code *Section 15.16 Flood Hazard Areas* addresses floodplain management. In exchange for this voluntary participation, the NFIP make federally-backed flood insurance available to homeowners, renters, and business owners in the City

On October 26, 2010 the City adopted Ordinance 967 Repealing and Reenacting Chapter 15.16 of the Rocklin Municipal Code Relating to Flood Hazard Areas within the City of Rocklin.

The City of Rocklin has a Floodplain Management Program established as part of a community effort of corrective and preventive measures for reducing flood damage. These measures include zoning, subdivision or building requirements, and special-purpose floodplain ordinances. Specifically, the City has a Recreation-Conservation (R-C) designation for all established floodplain areas, and restricts development which would have an adverse impact on flood control. The City also requires new development to detain drainage to maintain peak flow runoff at pre-development levels.

The City currently is identifying sites for storm water detention basins along Sucker Ravine between Dominguez Road and Rocklin Road. Completion of the project study report is anticipated in 2012.

1.8.4 Loomis[16]

The Town of Loomis joined the NFIP on December 29, 1986. The Town does not currently participate in the Community Rating System (CRS) but will probably join soon.[17]

The Town's Municipal Code Chapter 11.08,"Flood Damage Prevention" covers building guidelines in the floodplain and restricts development in the floodway. Chapter 12.04,"Grading, Erosion and Sediment Control" covers preventive measures of erosion and sediment into the creek systems. The Town currently follows the California Stormwater Quality Association (CASQA) Handbooks for Stormwater Best Management

[14] City of Rocklin Flood Zone Information, 2010. Available at: http://www.rocklin.ca.us/government/development/engineering/tools_n_resources/flood_zone_information.asp. Accessed: July 14, 2010.
[15] E-mail from Jee Choy, City of Rocklin, March 17, 2011.
[16] Town of Loomis General Plan, Adopted July 31, 2001. Available at: http://www.loomisca.gov/uploads/final%20general%20plan.pdf. Accessed: July 14, 2010.
[17] E-mail from Brian Fragiao, City of Loomis, March 10, 2011.

Practices.

The Town has a five year agreement with Fish & Game to keep the creek channels clear. The Public Works Department field inspects the channels twice a year during the dry season and after every rain storm during the winter. Resident call-ins are the most effective way of finding out about creek problems.

Creek channel maintenance to alleviate flooding potential has been an ongoing concern in Loomis. The majority of the properties that line the major creek systems in Loomis are privately owned, but the Town has made every effort to get site access from homeowners when vegetation, debris and/or downed trees have restricted rainfall flows. All future developments along the creek systems are required to include easements to the Town to facilitate maintenance.

1.8.5 Unincorporated Placer County

Placer County floodplain maps (FIRM) have been available since 1983. The County has been a part of the CRS since 1990 and a part of the National Flood Insurance Program (NFIP) since 1983. Placer County as of 2010 has a CRS Class of 5 and currently in good standing with both the CRS and NFIP. The County's floodplain management program is continuing to improve to better serve the community and lower the CRS rating for lower insurance premiums for residents and business owners.

The County has the following ordinances governing development and activity in the floodplain. They are:

1. Grading Ordinance, Placer County Code Article 15.48 Grading, Erosion and Sediment Control
2. Flood Damage Prevention Ordinance, Placer County Code Article 15.52 Flood Damage Prevention Regulations
3. Storm Water Quality Protection Ordinance, Placer County Code Article 8.28 Stormwater Quality

Through the Flood Control District, annual stream maintenance, which removes debris and trash to open the channel for flood flows, is completed on several stream reaches in the Western County area. Streams usually included are Dry Creek, Secret Ravine, and Miners Ravine.

1.8.6 Sacramento County[18]

Sacramento County has a Floodplain Management Ordinance which regulates floodplain management activities, such as setting construction standards in floodplain areas, and establishing permitting and floodplain mapping criteria as required for participation in the NFIP. The County is required to permit all activities within federally

[18] Sacramento County General Plan. Available at: http://www.dera.saccounty.net/portals/0/docs/EnvDocs_Notices/20020105102010041908 3507.pdf. Accessed: July 14, 2010.

designated special flood hazard areas prior to any new construction. The Floodplain Management (FPM) Ordinance creates a Floodplain Management Permit for this purpose. In order to accomplish its purposes, the Ordinance includes methods and provisions to:

1. Restrict or prohibit development which is dangerous to health, safety, and property due to flood hazards, or which result in damaging increases in flood heights or velocities;
2. Require that development vulnerable to floods, including facilities which serve such development, be protected against flood damage at the time of initial construction;
3. Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;
4. Control filling, grading, dredging, and other development which may increase flood damage; and
5. Prevent or regulate the construction of flood barriers which will unnaturally divert floodwater or which may increase flood hazards in other areas.[19]

[19] Sacramento County Floodplain Management Ordinance. Available at: http://www.msa.Saccounty.net/waterresources/files/Drainage/FloodplainMgmtOrd-1993.pdf. Accessed: July 14, 2010.

2.0 Existing Conditions

2.0 EXISTING CONDITIONS

2.1 MAIN CHANNEL AND TRIBUTARIES

The main channels and tributaries associated with the Dry Creek watershed are described below based on information in the Dry Creek Watershed Coordinated Resource Management Plan.

2.1.1 Dry Creek

Dry Creek is a second-order perennial stream that is approximately 17.6 miles long. The immediate sub-watershed area is 24.4 square miles. From the confluence of Miners Ravine and Secret Ravine, Dry Creek has relatively few meanders until Watt Avenue, after which it returns to more natural channel configurations. Dry Creek has four main tributaries consisting of nine streams, namely Miners Ravine and False Ravine; Sucker and Secret Ravines; Antelope Creek and Clover Valley; and Linda Creek, Cirby Creek, and Strap Ravine.

2.1.2 Miners Ravine and False Ravine

Miners Ravine is a perennial tributary whose main channel is approximately 15.2 miles long. It is entrenched within an alluvial valley floor, and serves to drain approximately 20.1 square miles of mixed-use land. The upper reaches of Miners Ravine are composed of intermittent drainages (8.0 miles) and the lower reach are primarily intermittent (12.1 miles) with some perennial first-order reaches (2.9 miles) and some second-order reaches (0.6 miles).

False Ravine, an approximately 1.5 mile long tributary, empties into Miners Ravine just west of East Roseville Parkway, upstream of North Sunset Avenue.

2.1.3 Secret Ravine and Sucker Ravine

Secret Ravine is a 7.8-mile long perennial stream. The contributing sub-watershed area is approximately 22.3 square miles. The upper reaches of Secret Ravine are all intermittent drainage ways (12.7 miles) and the lower reaches are intermittent (8.1 miles) and perennial (6.3 miles).

Sucker Ravine is a perennial stream and a tributary of Secret Ravine. Sucker Ravine flows from northeast to southwest within the City of Rocklin and is part of the Dry Creek watershed. The approximately five mile stream joins Secret Ravine after crossing under Interstate-80 and China Garden Road, near Greenbrae Road.

2.1.4 Antelope Creek and Clover Valley Creek

Antelope Creek is a perennial creek draining the northeast portion of the Dry Creek watershed. The mainstem is approximately 9.5 miles long and the watershed area is 21.4 square miles. The Antelope Creek system is composed of approximately 12.4 miles of intermittent tributaries in addition to a major tributary, Clover Valley Creek (7.1 miles long; watershed area of 10.2 square miles). The Aitken Reservoir is located within the Antelope Creek sub-watershed.[20]

Clover Valley Creek drains the northwest portion of the Dry Creek watershed. Recent development in Clover Valley, including on-channel ponds and urbanization has altered the timing and quantity of streamflows. The 6.5 mile stream is bounded by hills in a narrow valley. The Clover Valley Creek joins with Antelope Creek downstream of Argonaut Avenue near Midas Avenue.

2.1.5 Cirby Creek, Linda Creek and Strap Ravine

Cirby Creek is a perennial stream approximately 2.7 miles long with a watershed area of approximately 3.4 square miles. Linda Creek comprises the upstream sub-watershed and Cirby Creek outflows directly into Dry Creek. The Cirby Creek watershed is almost entirely within the urbanized area of the City of Roseville.

Linda Creek is a perennial stream, approximately 10.8 miles long. The sub-watershed drainage area is 12.2 square miles and there are 7.3 miles of intermittent drainageways and 11.2 miles of perennial, first-order streams. Other waterbodies within this sub-watershed are Swan Lake, an unnamed reservoir, and approximately 10 unnamed ponds.

Strap Ravine is a perennial waterway that is approximately 3.6 miles long and drains an area of approximately 4.8 square miles. There are four unnamed ponds located on the USGS topographic map for this sub-watershed. Strap Ravine is a tributary to Linda Creek, and joins Linda Creek near North Cirby Way, just downstream of McLaren Drive.

2.2 LOCAL AND REGIONAL STRUCTURAL FLOOD CONTROL PROJECTS COMPLETED SINCE 1992

The Miners Ravine Off-Channel Detention Basin is the only regional flood control project that has been implemented within the Dry Creek watershed. Numerous local structural flood control projects, including stream crossings and conveyance improvements have been implemented since 1992. Selected earlier projects are listed for historical reference. On-site detention associated with specific development projects are categorized as non-structural floodplain management measures and are not listed in this section.

[20] ECORP Consulting, Inc., Dry Creek Watershed Coordinated Resource Management Plan, 2003.

2.2.1 Miners Ravine Off-Channel Detention Basin

The District completed the Miners Ravine Off-Channel Detention Basin in 2007. This project includes a basin that covers approximately 12 acres on a 26-acre parcel just west of Sierra College Boulevard near the intersection of Olympus Drive. The project includes an embankment that is approximately 18 feet high that is designed to impound up to 122 acre-feet of flood flows below the basin's spillway crest. The project provides mitigation for some of the increased flows within the Dry Creek watershed caused by development since the 1992 Plan. The project uses an off-channel detention basin to temporarily detain a portion of peak flood flows for a few hours in order to slow the release of the waters back into Miners Ravine. The gravity-draining design did not raise floodplain elevations outside of the basin, and limits the potential for trapping fish. Stormwater runoff in the main channel of Miners Ravine flows through the area unimpeded by the project when high water flows are not present.

The Miners Ravine Off-Channel Detention Basin project was designed to provide flood control benefit over a wide range of flow conditions along Miners Ravine, from the 2-year up to the 100-year event. The design report indicated that the project would provide a 263 cfs reduction in the 100-year storm event peak discharge at Vernon Street based on a modified 1992 Plan hydrology model with the storm centered to produce the maximum discharges at Vernon Street and the project hydraulic model simulations.[21] The model that was used as a basis for design of the Miners Ravine project indicated a peak 100-year discharge at Sierra College Boulevard of 3,788 cfs, which happens to correspond closely to the flow capacity of the Sierra College Boulevard culvert before roadway overtopping. This flow rate of 3,788 cfs is lower than the 1992 Plan 100-year future conditions flow rate of 4,465 cfs and the FEMA 100-year flow rate of 4,900 cfs. The basin is configured to provide maximum flood attenuation for a storm event with a maximum flood stage that would almost overtop Sierra College Boulevard.

2.2.2 Local Structural Flood Control Projects

Sixteen flood control projects within the Dry Creek watershed have been completed since 1986. These flood control projects consisted of various culvert improvements, replacements, and/or removals; channel modifications; bridge replacements; and floodwall installations. Table D.1, included in Appendix D, provides a chronological listing of local flood control projects.

2.3 NON-STRUCTURAL IMPROVEMENTS SINCE 1992

Non-structural improvements that have been implemented and/or maintained since 1992 include building elevation projects, residential buy-outs, an ALERT flood warning

[21] RBF Consulting, Miners Ravine Off-Channel Detention Basin Hydrology and Hydraulic Design Report, September 2007, p. 31-32.

system, streambed maintenance and local detention. Local detention projects are discussed in Section 3.9.1.2.

2.3.1 Building Elevation Projects

In 2001, FEMA funded 75 percent of this $1 million program to elevate flood-prone homes. These are structures that would not be brought completely out of the floodplain by construction of our flood control project. Homeowner participation was voluntary. 27 of 44 homeowners on the list elevated their homes via this program. Most of those 27 are located in the Folsom/Maciel neighborhood along Dry Creek.

2.3.2 Residential Buy-outs

In 2001, flood control improvements were completed in two areas on Linda Creek: the Champion Oaks/West Colonial Parkway area, and the Sunrise/Oakridge area. This project reduced the size of the floodplain resulting in 233 homes no longer being located in the floodplain, and reducing the risk of flooding for 44 additional homes. Cost = $16.1 million ($8.7 million FEMA funds, $7.4 million City funds).[22]

2.3.3 ALERT Flood Warning System

The District, the City of Roseville, and Sacramento County each own and maintain ALERT flood warning response systems within the Dry Creek watershed. The ALERT system is a radio telemetry system licensed by the Federal Communication Commission. Remote stations transmit real-time precipitation and stream level data to base stations located in Auburn, Roseville and Sacramento. Detailed information about the existing ALERT system can be found in Section 1.7 and on Plate 10.

2.3.4 Annual Streambed Maintenance Program

Placer County has a stream channel maintenance program that is managed by the District. The County's program includes up to 2 miles per year of stream channel work at critical locations to maintain channel capacity, reduce debris and reduce invasive species.

After the 1986 flood, the City of Roseville entered into a Memorandum of Understanding with the State Department of Fish & Game, to allow fallen trees and debris to be cleared from creeks, which could otherwise float downstream and block culverts and bridges. Annual cost = $100,000.[23] The City operates a stream cleaning program in the flood prone areas of Roseville each year. Details of this program can be found in the City's Creek Maintenance Guidelines dated February 2001 and the Stream Clearing Inspection Report dated July 2001.

[22] City of Roseville Website, 2010. Available at: http://www.roseville.ca.us/
[23] City of Roseville Website, 2010. Available at: http://www.roseville.ca.us/

The City of Rocklin does not have a maintenance program for our stream channels, but rather a series of "Check Lists" used by City maintenance staff. The maintenance work focuses more on the engineered drainage systems that drain, retain, or detain storm runoff. Detention and retention basins are inspected each year and necessary maintenance is scheduled. Storm drain and culvert outlets are inspected during dry months and vegetation is cleared in the area 15 to 20 feet from the pipe outlets and 10 to 15 feet from culvert inlets. Inspection of critical infrastructure occurs before, during and after rain events. The primary objective is to remove any loose or floatable debris that will obstruct flow through box culverts, culverts, drain ditches. The type of material usually removed can vary from large tree limbs, tires, pieces of plywood and discarded pallets. The inspections begin in the fall and end in the spring.[24]

2.4 EXISTING FLOOD HAZARDS

Plate 11 illustrates the locations of identified significant flood hazards within the Dry Creek watershed. This section provides a description of key locations, but does not indicate each roadway known to have been, or expected to be, overtopped during a major flooding event. Section 4.2 and Appendix E provide information about, and listing of, the structures with known or expected overtopping issues. The numbers listed in each section correspond to locations on Plate 11.

2.4.1 Rocklin[25]

Sucker Ravine at Dominguez Road (1): Smaller crossings downstream of Dominguez Road cause backwater problems upstream, including the Dominguez road crossing which may impact future developments.

Pacific Street near Brace Road (2): Sheet flooding in the roadway due to backwater in the western part of Sucker Ravine and inadequately sized culverts forces road closures.

Brace Road on the eastern tributary of Sucker Ravine (3): Overtopped due to an inadequately sized 24-foot corrugated metal pipe (CMP) culvert.

Sucker Ravine at Racetrack Road (4): A house adjacent to Sucker Ravine on Racetrack Road lies in the floodplain. Future development may increase flood depths and frequencies at the house.

Sucker Ravine at Sierra Meadows (5): The water surface elevations are close to overtopping the road, although it has historically not been overtopped.

Antelope Creek / Antelope Creek Tributary / Sierra Meadows / Circuit Court (6): A small creek starts west of Sierra Meadows Drive, crosses Circuit Drive, passes under Pacific

[24] E-mail from Kent Foster, Director of General Service, City of Rocklin
[25] West Yost & Associates, *City of Rocklin Drainage Master Plan*, February 2006.

Street and continues west where it enters Antelope Creek near Yankee Hill Road. Culverts under Circuit Drive are undersized for the current runoff from an industrial area on Sierra Meadows Drive. If a larger culvert is constructed under Circuit Court, channel restoration and enlarged culverts between Circuit Drive and Antelope Creek need to be constructed.

Sucker Ravine at Rocklin Road (including I-80, Lakeside Drive, and Sierra Lakes Mobile Home Park) (7): Sierra Lakes Mobile Home Park flooded in the February 1986 storm, resulting in the need to evacuate residents under emergency conditions.[26] Extensive flooding may occur in the Sierra Lakes Mobile Home Park due to backwater from the I-80 culvert. The *City of Rocklin Drainage Master Plan* indicates that Rocklin Road may be overtopped by one to two feet causing disruption to a major artery.

Midas Avenue upstream to Del Mar Avenue (8): All the bridges including, and between, these two bridges are overtopped by 2.25-6.47 feet of water in 100-year event.

2.4.2 Roseville

Royer Park on Dry Creek (9): Multiple houses are adjacent to the FEMA floodplain and are subject to flooding.

Folsom Road on Dry Creek (10): The houses upstream from Folsom Road have been subject to historical flooding. Several have been elevated.

Riverside Avenue on Dry Creek (11): Several parcels are within the FEMA floodplain and are subject to flooding.

Oakridge Drive between Cirby Creek and Linda Creek (12): Over 100 homes flooded in the February 1986 storm event. Several of the flooded homes have been elevated. Channel modifications, including an added floodwall, bypass pipes, and a bypass channel were completed on Cirby and Linda Creeks in the 1990's.

2.4.3 Loomis[27]

Sucker Ravine (13): Sucker Ravine's major crossings are at King Road, Saunders Avenue, Sierra College Boulevard, and Bankhead Road. The culvert at Kings Road backs floodwater. At Saunders Avenue, the road is overtopped flood flow; and Sierra College Boulevard backs water up during flood runoff.

Secret Ravine (14): Secret Ravine crosses Horseshoe Bar Road, Brace Road, and Gade Lane. Each of these bridges is overtopped during at 100-year event. Brace Road would be overtopped by about three feet.

[26] City of Rocklin, Request for Proposal Engineering Deisgn Services for Central Rocklin Drainage Improvements (Sucker Ravine), August 2010.
[27] West Yost & Associates, *Town of Loomis Drainage Master Plan*, November 2001.

Antelope Creek (15): Antelope Creek has major crossings at King Road, Sierra College Boulevard, and Delmar Avenue. Two or three homes are located in the flood plain upstream of King Road. The 100-year runoff will overtop the road. The floodplain widens upstream of Sierra College Boulevard during a 100-year runoff event; however, the road is not overtopped. At Delmar Road, the 100-year runoff will overtop the road; however, no homes are within the floodplain.

2.4.4 Placer County

Miners Ravine (16): Problem areas for flooding are upstream of Sierra College Boulevard, near Joe Rodgers Road, and at the bridges of Leibinger Lane, Carolinda Drive, and Itchy Acres Road.[28]

Secret Ravine (17): Three properties on Rustic Hills Drive have reported flood damages.

Linda Creek below Auburn-Folsom Road (18): Numerous properties in the Troy/Purdy Lane area are adjacent to the 100-year floodplain and are subject to flooding.

Lower Dry Creek between Roseville and Sacramento County (19): Several homes were flooded during the February 1986 storm event.

2.4.5 Sacramento County

Dry Creek (20): Flooding has occurred along most of Elkhorn Boulevard, including many residences, schools and businesses. Over 200 homes and business were flooded along Elkhorn Boulevard during the February 1986 storm event.[29]

[28] ECORP Consulting, Inc., Dry Creek Watershed Coordinated Resource Management Plan, 2003.
[29] James M. Montgomery, Dry Creek Watershed Flood Control Plan, 1992,

3.0 Updated Hydrology

3.0 UPDATED HYDROLOGY

3.1 MODELING SYSTEM DEVELOPMENT

The Plan Update provides a new hydrologic modeling system that has significant technological advances over that used in the 1992 Plan. Though the 1992 Plan was state-of-the-art at the time it was prepared, the new modeling system is better able to evaluate flood flow timing that is significant to development impact and project analyses. Computer programs, including HEC-HMS and HEC-RAS, GIS software, and the DCDESKTOP software were employed to develop a new basis for watershed runoff and flood flow evaluation. The new modeling system includes substantially more detail than the 1992 modeling system allowing it to be used on smaller tributaries which will facilitate its application on smaller projects. Furthermore, the new modeling system has been calibrated using precipitation and stream flow gage data from the December 1995, December 2005, and January 2007 storm events to ensure the validity of the results. The new modeling system provides capabilities to evaluate Dry Creek hydrology in ways that were not possible with the models from the 1992 Plan, but are now necessary to adequately evaluate the potential impacts of projects on flooding conditions and provide a valid quantification of the benefits of mitigation measures.

The process that led to the development of the new modeling system started with updating the 1992 Plan hydrology model by applying the District's procedures in the SWMM. Application of PDP2 to the updated 1992 Plan model results in peak flow rates in excess of those expected based on rainfall and measured stream flows. In other words, updating the model from the 1992 Plan model using SWMM voids the calibration performed as part of the 1992 Plan and would not provide a model that could be calibrated using storm data that has been collected since 1992. This conclusion led to the decision to create a new hydrology model and to calibrate it using a substantial set of rainfall and runoff data that was not available in 1992. The new hydrology model is also based on more accurate topographic data than was available in 1992. In addition to the new hydrology model using the USACE programs HEC-1 and HEC-HMS, the new modeling system includes an unsteady-state hydraulic model (HEC-RAS) for the lower two-thirds of the watershed that is a key tool necessary to accurately determine potential project benefits. The new hydrology model and unsteady-state hydraulic model together are the new modeling system that forms the basis for this Plan Update.

The following sections describe the general process used to create the updated modeling system with additional detail provided in referenced appendices.

3.1.1 Key Locations for Summary Comparisons

To simplify data review, only a sampling of the data produced by the models is presented in the main body of this Plan Update. Peak flow rates for the 100-year event at key locations of interest are presented in tables in Sections 3 and 4, while additional data is included in appendices. All of the final work product models and results have

been provided to the District on an external hard drive. Recommendations for key locations of interest were requested from local agencies and District staff. The key locations were selected because of known flooding issues or because local agencies use the point as a basis for flood impact evaluation purposes. These locations are the 26 locations listed on the summary tables included in the main body of this report. (Comparisons based on Point No. 23, located on Dry Creek downstream from its confluence with Linda Creek, are complicated by split flow conditions with flows diverting across Riverside Avenue that are not included in the Plan Update Point No. 23 flow rate values. Comparisons at Point No. 76 are similarly complicated by split flow conditions near Champion Oaks Drive.) The 1992 point numbering scheme has been carried forward into this project, and new points added during this study have been given point numbers greater than 1000. Point Numbers are identified on the watershed maps included in Appendix B.

3.2 UPDATE OF THE 1992 PLAN MODEL TO CURRENT DISTRICT METHODOLOGY

The first step of the hydrologic analyses performed for this Plan Update was to adapt the 1992 Plan HEC-1 model to methodologies consistent with current SWMM procedures. This adaptation included:

1. Replacing the rainfall distribution that was applied in the 1992 Plan model with a distribution based on the SWMM, and

2. Replacing the sub-watershed rainfall to runoff transformation method from Snyder unit hydrograph with kinematic wave.

The adapted model was run with a storm centering similar to that used in the 1992 Plan which generated the peak flow rates at Vernon Street. The adapted model results were compared at key locations to the results from the 1992 Plan model. This comparison (both models were based on Future Unmitigated conditions) is provided in Table 3.

The results of the comparison indicate that the adapted model produces slightly higher flows at Vernon Street. Wider variations at other locations are due to differences in storm centering. The storm centering for the 1992 Plan was based on calibration to actual events (February 1986 and March 1989) while the adapted model used SWMM based centering. Plate 12 illustrates the differences in precipitation between the 100-year event used in the 1992 Plan to model peak flows at Vernon Street and the 100-year SWMM based centering used to calculate peak flows at Vernon Street with the adapted model. Based on a detailed review of the timing of runoff indicated in the adapted model results, it was determined that adapting the 1992 Plan model to SWMM requirements would not result in reasonably calibrated results. Therefore, it was concluded that a new hydrology model would be necessary to achieve calibrated results with a HEC-1 model developed generally according to the requirements of the SWMM.

Table 3: Peak Flow (cfs) Comparison of Original 1992 Plan Baseline Model to 1992 Plan Model Adapted to SWMM

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / 1992 Adapted to SWMM / Not Applicable	100-year / 1992 Plan / Not Applicable	Difference / cfs
Miners Ravine						
UR15K2	MR15	207	Dick Cook Road	2005	915	1090
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1746	1423	323
YMR29I	MR29R	202	Cottonwood Lake	4029	2910	1119
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	4210	3084	1126
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	9359	8864	495
Secret Ravine						
YE50F2	SE50R	235	Brace Road	3404	3038	366
YSE51K	SE51R	232	Sierra College Blvd.	3641	3272	369
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	3725	3345	380
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	4527	4422	105
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	961	724	237
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2207	1986	221
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2303	2093	210
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3449	2963	486
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3446	2970	476
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	900	912	-12
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	935	948	-13
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1214	972	242
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	940	775	165
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2042	1827	215
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2920	2788	132
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	3757	3629	128
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3965	3895	70
Dry Creek						
UDC5B	DC5R	26	Royer Park	12323	11489	834
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	16141	15447	694
YDC10D	VERNON	21	Vernon Street Crossing	15484	15051	433
YDC71B	DCC11	9	Sacramento County/Placer County Line	15568	15622	-54

Flow comparison impacted by bypass, in channel discharge listed.

Additional details related to the model adaptation process are provided in Appendix F.

3.3 WATERSHED DELINEATION AND SUBDIVISION

The first step in developing a new hydrology model for this Plan Update was to delineate new watershed boundaries. The boundaries from the 1992 Plan were reviewed with IFSAR (Intermap) data and it was determined that some boundaries required significant revision. The new watershed delineations were primarily developed using Intermap data obtained for this purpose supplemented by other sources of information as described in Section 1.5.3. Watersheds were subdivided based on hydrologically significant boundaries, such as where portions of the watershed have different lengths of flow indicating different timing of runoff. Smaller sub-watersheds allow the Plan Update model to support evaluations on smaller tributaries, to quantify the impact of numerous surface lake storage features throughout the watershed, and to correctly reflect the runoff timing of different sub-stream areas within the 172 larger watersheds used in the 1992 Plan. The average watershed size in the Plan Update is approximately 100 acres. Ultimately, 1,288 sub-watersheds were delineated for the Plan Update. The new sub-watersheds use a naming convention that correlates to the 1992 Plan designations. Plate 13 illustrates the refinements made to the major watershed boundaries as a part of this Plan Update.

Concurrent with this Plan Update, an update of the hydrology for the adjacent Pleasant Grove Creek watershed was performed by the City of Roseville. The boundary between the Dry Creek and Pleasant Grove Creek watersheds was reconciled and used for the final analyses in both projects.

It was also observed that many canals passing through the Dry Creek watershed have a hydrologic impact on the location and routing of the tributaries with natural flow paths that cross the canals. Data was obtained from Placer County Water Agency regarding their canal system and its overflow discharge points which aided in establishing watershed boundaries.

Appendix B illustrates the watershed boundaries delineated for this Plan Update and the locations where boundaries were revised from the 1992 Plan.

3.4 LAND USE HYDROLOGIC FACTORS FOR 1992, 2007, AND GENERAL PLAN BUILD-OUT

3.4.1 Land Use

Land use provides key information about the amount and rate of runoff from each watershed. Impervious area is used to define that portion of the watershed from which the models assume all incident rainfall becomes runoff. Impervious area was also used to determine appropriate parameters for overland flow length and slope that impact

watershed runoff response time. Land use was used to determine loss rates from the pervious portions of each watershed.

Plate 7, Plate 8 and Plate 9 show estimated land use types based on estimated 1992 (baseline), 2007 (current), and General Plan (build-out) conditions respectively. The baseline conditions were largely obtained from the 1992 Plan; however, some corrections were made to the drawing file sets provided from the 1992 Plan for areas of overlap and areas without data during the conversion to GIS file type. The build-out land use comes from the combined layers from the General Plans of the various City and County agencies within the watershed. Corrections were also made to this dataset as the data was combined from the various entities. The 2007 (current) conditions land use was derived from General Plan build-out land use, 2005 aerial imagery and other data as described in Section 1.5.4.

Table 4 summarizes the basic land use types (summarized from 480 classifications assigned to the source data) that were assigned for each of the scenarios. Appendix F provides detailed land use summary information for the baseline, current and build-out scenarios, respectively.

Table 4: Land Use by Scenario

Land Use Code	Description	1992 Areas (acres)	2007 Areas (acres)	General Plan (acres)
OS	OPEN SPACE	27,748	19,002	3,703
AG	AGRICULTURAL	1,297	1,516	2,463
RR	RURAL RESIDENTIAL	9,944	12,321	17,202
RE	RURAL ESTATES	8,229	8,397	10,986
LDR	LOW DENSITY RESIDENTIAL	8,868	13,117	16,191
MDR	MEDIUM DENSITY RESIDENTIAL	2,665	3,030	3,464
HDR	HIGH DENSITY RESIDENTIAL	441	529	604
RES	RESERVE	4	4	8
REC	RECREATIONAL/PARKS	452	600	2,013
PQP	PUBLIC/QUASI PUBLIC	408	598	886
COMM	COMMERCIAL	1,547	1,740	2,392
IND	INDUSTRIAL	1,575	1,725	2,301
BP	BUSINESS PROFESSIONAL	552	887	1,047
ROAD	ROADWAYS	1,136	1,416	1,598
CITY	CITY UNKNOWN	38	44	67
	TOTAL	64,903	64,924	64,924

Appendix F also provides a complete summary of the land use hydrologic factors used in preparing this Plan Update. The same factors were used for the baseline (1992), current (2007) and build-out scenarios.

3.4.2 Impervious Area

One key hydrologic factor derived directly from the land use is the percentage of impervious cover. Rainfall landing on impervious surfaces is generally assumed to

runoff directly into the gutters and storm drain systems, thereby discharging into the streams without an opportunity for infiltration, evapotranspiration or local storage to occur. Generally, certain types of land use will have similar amounts of impervious cover no matter where they are built. However, in some cases, the impervious cover for similar land uses can vary due to local agency requirements.

To determine appropriate percentages of impervious cover by land use for the Plan Update, several documented and published rates were researched and tested in the calibration events. Most notably, the imperviousness rates documented in the SWMM and the DCWCRMP were used. Some adjustments were made based on the final calibrations of the model. The final rates used in the analysis are indicated in Appendix F for all 480 land use types applied in the Plan Update. Plate 4, Plate 5 and Plate 6 illustrate the imperviousness within the Dry Creek watershed for the 1992 baseline, current (2007) and build-out conditions, respectively.

3.4.3 Loss Rates

A second key hydrologic factor derived from the land use and the hydrologic soils types is the constant infiltration rate. The hydrologic soils types are shown on Plate 3. Generally, similar types of land use will have similar types of landscaping. While each project may have different landscaping, the assumed factors are for typical conditions and will balance out over the watershed. The constant infiltration rate applies to the non-impervious areas only and indicates the estimated combined effect of all constant losses, such as infiltration and evapotranspiration. Infiltration is the main component, which is why this factor is dependent on the hydrologic soil group. Development does not usually degrade this factor to a lesser value. In fact, in a number of cases, development may change this factor to a larger value, such as in the conversion of grasslands to park, where the density of grass and tree vegetation is substantially increased, slowing down runoff rates and providing an increased opportunity for infiltration to occur.

The SWMM procedures account for rainfall losses in two forms: an initial loss and a constant loss rate. The initial loss (amount reported in inches and applied to all areas of the watershed) indicates an amount of rainfall which goes into the wetting and filling of shallow storage in the watershed. Generally, this amount of rainfall must occur before any runoff will begin. The constant loss rate (or constant infiltration rate) simulates the combined effects of infiltration and evapotranspiration in the watershed.

The SWMM specifies the use of an initial loss of 0.1 inches for flood studies. Historically, because of the widespread use of HEC-1, the methodology of “initial and constant” losses has been applied. However, for this Plan Update, it was found that the application of “deficit and constant” loss rates calibrated better (especially for smaller events) than the previously applied methodology. This methodology can be applied with the use of HEC-HMS, but is not available in HEC-1.

For “deficit and constant” losses, the constant loss rate is applied exactly the same as in the application of initial and constant loss rate methodology. The initial loss is replaced

by factors for a total loss amount, an initial amount of the total loss which is occupied at the start of the event and a recovery rate. It was found that a total loss amount of 0.2 inches for urbanized areas, and 0.4 inches for non-urbanized areas worked best in the calibration events. To initiate each event with the 0.1 inches consistent with the SWMM requirements, 0.1 inches was specified for the initial deficit, meaning 0.3 inches was assumed to be full for non-urban areas, and 0.1 inches was assumed to be full for the urban areas. Because the calibration events went for long periods of time, this methodology allowed for significant drying to occur between rainfall events, and more loss to occur in the initial rainfall of subsequent events, providing a better calibration.

A detailed discussion of the hydrologic calibration procedures used in this Plan Update is included in Appendix C.

3.4.4 Response Time Factors

For this Plan Update, a significant amount of effort was expended calibrating hydrologic parameters according to SWMM procedures. Initially, overland response factors (slope and length) were determined for every watershed in the updated models, based on the Intermap topography. Based on several early calibration tests, it was concluded that application of measured response factors significantly under-estimates the response time for the non-urban areas and results in peak hydrograph timing several hours in advance of stream gage data.

It was ultimately discovered that setting values for the slope and length overland response factors based solely on watershed imperviousness, and not actual slope and length, provided better overall model calibration, with timing of the peaks of recorded flooding closely matching model predictions. The relationships between imperviousness and the slope and length used to determine overland flow response time in the calibrated models are provided in Appendix F.

3.5 CHANNEL ROUTING

Routing of runoff through the channels in the hydrology model can be performed using various methods, including Muskingham-Cunge, kinematic wave routing, and Modified Puls routing. Muskingham-Cunge and kinematic wave routing are limited to a simplified cross section per reach. The Modified Puls routing method uses a storage-discharge relationship for each reach. Storage-discharge relationships can be developed using steady-state hydraulic modeling in HEC-RAS for a range of discharges. Routing of runoff in HEC-1 and HEC-HMS does not account for situations where varying tailwater conditions can result in multiple water surface elevations at the same discharge.

A more accurate method to perform channel routing is to use an unsteady-state hydraulic model that can account for situations where a single storage-discharge relationship does not adequately represent actual conditions. These situations commonly occur at structures such as bridges and confluences, and are even more pronounced in off-channel storage configurations such as the Miners Ravine Off-

Channel Detention Basin. It was therefore determined that an unsteady-state hydraulic routing model would be required to evaluate current conditions and potential future projects.

3.5.1 Channel Routing in the Hydrology Models

It was found that Modified Puls routing factors more closely represented the measured runoff response characteristics than the Muskingham-Cunge and kinematic wave routing options developed in the base models. A steady-state hydraulic model was developed using the Intermap topography for the significant upper reaches of the watersheds not covered by the main hydraulic routing model. Modified Puls routing parameters were developed from both the Intermap-based upper watershed model (developed specifically to provide channel routing parameters for the hydrology model) and a steady-state version the composite hydraulic model developed for the lower watershed. These parameters were used in the hydrology model for the most significant routing features. Including Modified Puls routing parameters for the reaches in the lower watershed covered by the unsteady-state hydraulic model allows the HEC-HMS simulation to provide reasonable results in many locations, but the results are significantly different from the unsteady HEC-RAS model in some key locations.

3.5.2 Unsteady-State Hydraulic Routing Model

Unsteady-state hydraulic models of the streams in the lower two-thirds of the Dry Creek watershed were used as the primary means of performing flow routing in the area it covers. Models were created to simulate 1992 and 2007 conditions and to model potential regional flood control projects. One HEC-RAS model was prepared with 2006 conditions to assess the effectiveness of the Miners Ravine Off-Channel Detention Basin project using the Plan Update models. Also, a 2010 model was prepared that included recent modifications to the Sierra College Boulevard culvert at Secret Ravine to provide an appropriate baseline for evaluating potential future projects. The 1992 condition composite unsteady-state HEC-RAS model of the Dry Creek watershed was developed using the sources of cross section and reach information listed in Table 5.

Table 5: Composite Unsteady-State HEC-RAS Model Data Sources

River	Reach	Data Sources
Antelope Creek	AntelopeBlwClove	PWA FIS above 10725.49 (old 320), Allnew Composite[30]
Antelope Creek	Reach 1	PWA FIS
Cirby Creek	Above Linda	PWA FIS previously converted with adjustments made for City of Roseville study by RBF
Cirby Creek	Below Linda	Allnew Composite
Clover Valley	Clover Valley 1	PWA FIS
Dry Creek	Above Cirby	Allnew Composite modified by RBF for City of Roseville redevelopment studies
Dry Creek	Below Cirby	Allnew Composite and Placer Vineyards models
False Ravine	Reach 1	Allnew Composite
Linda Creek	Above S Branch	Nolte Restudy 2004
Linda Creek	South Branch	Nolte Restudy 2004
Linda Creek	Below S Branch	Nolte Restudy 2004 revised by RBF based on Champion Oaks study for City of Roseville
Linda Creek	Below Strap	PWA FIS
Miners Ravine	Below Secret	Allnew Composite
Miners Ravine	Above False	PWA FIS above 13180.5 (old 308), 14146.17 to 18310.19 new model from RBF Miners Ravine and Sierra College Blvd evaluations
Miners Ravine	Bet Secret-False	Allnew Composite
Secret Ravine	Below Sucker	PWA FIS above 6488.499 (old 260), Allnew Composite below
Secret Ravine	Reach 1	PWA FIS
Strap Ravine	Reach 1	Allnew Composite
Sucker Ravine	Reach 1	PWA FIS

Each of the reaches was imported into HEC-RAS. Bridge definitions, where applicable, were adjusted to match existing conditions as observed during field investigation. The cross sections and structures were adjusted as appropriate to achieve stable unsteady-state performance without significantly altering effective conveyance. Other changes in the model to achieve unsteady-state function included establishing HTab parameters at each structure, appropriate application of permanent ineffective flow areas, select use of pilot channels and interpolated cross sections at various intervals.

The baseline composite model was constructed to match the approximate 1992 conditions by removing flood control improvements that had been implemented to reflect conditions without the improvements realized since that time. Significant projects implemented since 1992 were added based on record drawings to create the 2007 conditions model.

Appropriately configured unsteady-state hydraulic models were used in the calibration process, determinations of 100-year discharges at key locations for impact analyses and project alternative evaluations. A steady-state version of the composite model was

[30] Spink (Stantec), Model Combination for City of Roseville, 2005.

used to determine storage versus discharge relationships for reach routing (Modified Puls parameters) in the hydrology models.

3.6 HYDROLOGIC COMPUTER MODEL CALIBRATIONS

The refined watershed and new sub-watershed delineations, plus new the channel routing tools, provide the basis for the Plan Update models. To ensure that the models will produce appropriate response to incident rainfall, the parameters that affect the amount and timing of runoff need to be adjusted to demonstrate that the model reproduces known conditions. Calibration of a model is the process used to ensure that the model predicts actual system behavior as closely as possible. In model calibration, known input data for a historical event is entered into the model, and the output from the model is compared with the known flood conditions. Parameters in the model are then adjusted until the model output matches historic data for the event.[31] Once a model is calibrated, application of rainfall of a know recurrence interval can be used to estimate the flood levels corresponding to the same interval, though one needs to verify that the rainfall duration and distribution is the critical set for that recurrence interval to generate the peak discharge at the location of concern.

Four historic floods were selected to be used in the calibration process based on the significance of the events and the availability of rainfall and stream gage records. The events used for calibration of the models were the January 1995 event, the December 1995 event, the January 1997 event, and the December 2005 event.

The details of the processes used to perform the calibration analysis are provided in Appendix C.

The results of the calibration process are a hydrologic modeling system that includes hydrology calculations performed using HEC-HMS and hydraulic routing calculations performed using unsteady-state HEC-RAS that has been thoroughly validated to be able to accurately transform rainfall to runoff within the Dry Creek watershed.

3.7 COMPARATIVE ANALYSIS SCHEME

The Plan Update compares scenarios of various hydrology models combined with various hydraulic models. These Scenarios were used to evaluate what has occurred since 1992 and the potential of future changes as determined to be appropriate, to identify appropriate flood impact mitigation measures and support associated funding plans. Land use conditions that were evaluated include: 1992 conditions; 2007 conditions, with and without local detention; and build-out conditions, with and without incorporation of Low Impact Development (LID) features. (LID features are simulated in the hydrology model by reducing the effective impervious area that would otherwise be

[31] James M. Montgomery, Dry Creek Watershed Flood Control Plan, 1992.

associated with the land use.) Hydraulic models were used to simulate 1992 conditions, 2006 conditions (pre-Miners Ravine), 2007 conditions including the Miners Ravine Off-Channel Detention Basin Project, 2010 conditions that reflect modifications to Sierra College Boulevard at Secret Ravine, and conditions with the potential projects identified in this Plan Update.

Table 6 identifies the scenarios used to perform the primary analyses used to prepare the Plan Update. Additional scenarios were used to evaluate the potential projects individually. The scenarios are identified with numbers one (1) through nine (9).

Table 6: Model Scenario Matrix

	Land Use & Hydrology				
Hydraulic Model	**1992**	**2007 w/o Detention**	**2007 w/ Local Detention**	**Build-out no LID**	**Build-out with LID**
1992 Baseline	(1) 1992 Corrected Original Baseline	(2) 2007 Runoff- 1992 System	(3) 2007 Runoff with Local Detention, 1992 System	X	X
2006 (without Miners Ravine Project)	X	X	(4) 2006 Pre-Miners Ravine with Local Detention	X	X
2007 (with Miners Ravine Project)	X	X	(5) 2007 Conditions	X	X
2010 Updated Baseline	X	X	(6) 2010 Updated Baseline	(7) Unmitigated Build-out	(8) Build-out w/ LID but no Projects
2010 with potential projects	X	X	X	X	(9) Build-out w/ LID & Projects

Note: "X" = not modeled

1. The *1992 Corrected Original Baseline* scenario uses Plan Update model methodology to provide a consistent basis for evaluating what has occurred since the preparation of the 1992 Plan. It uses 1992 hydrology and 1992 hydraulic conditions. (All recurrence intervals were evaluated and presented in Appendix G)
2. The *2007 Runoff-1992 System* scenario uses 2007 hydrology and 1992 hydraulic conditions to simulate conditions that would have existed in 2007 without the implementation of any mitigation measures. (Only 100-year recurrence interval evaluated was evaluated)

3. The 2007 Runoff with Local Detention-1992 System scenario uses 2007 hydrology that includes routing parameters to approximate the function of local detention basins and 1992 hydraulic conditions to simulate conditions that would have existed in 2007 if the only changes to the watershed were development and local detention. (Only 100-year recurrence interval evaluated was evaluated)
4. The *2006 – Pre-Miners Ravine* scenario uses 2007 hydrology and 2006 hydraulic conditions to provide a basis for separately evaluating the effectiveness of local detention and other projects from the regional detention basin project. (Only 100-year recurrence interval evaluated was evaluated)
5. The *2007 Conditions* scenario uses 2007 hydrology and 2007 hydraulics to provide a baseline for evaluating changes that have occurred since completion of the Miners Ravine Off-channel Detention Basin Project. (Only 100-year recurrence interval evaluated was evaluated)
6. The 2010 Updated Baseline is the same as the 2007 Conditions scenario with the addition of the changes that have occurred to Sierra College Boulevard at Secret Ravine. (Only 100-year recurrence interval evaluated was evaluated)
7. The *Unmitigated Build-out* scenario (updated from 2010 baseline) uses build-out hydrology without LID features and 2010 hydraulic conditions to provide a basis for potential impacts if build-out were to occur without any new mitigation measures. (All recurrence intervals were evaluated and presented in Appendix G)
8. The *Build-out with LID but no Projects* scenario uses build-out hydrology with LID and 2010 hydraulic conditions to provide a basis for determining how much additional regional attenuation would be required in addition to inclusion of LID features. (All recurrence intervals were evaluated and presented in Appendix G)
9. The *Build-out with LID and Projects* scenario uses build-out hydrology with LID and hydraulic conditions that reflect 2010 conditions plus the five potential projects identified in this Plan Update. (All recurrence intervals were evaluated and presented in Appendix G)

Twelve different comparative evaluations where made to quantify current and potential impacts and mitigation using these nine scenarios. (Note that minor anomalies in the HEC-RAS unsteady-state modeling cause small changes of less than one-half percent of peak discharge to be indicated in the comparisons where none would be expected.) The comparisons that include potential projects and mitigation are described in Section 4.

Table 7: Comparison Summary

Report Table No.	Scenario Comparison	Description	Purpose
Table 9	N/A	Plan Update 1992 Baseline compared to 1992 Plan Baseline	Provide a reference for determining what portion of flow differences from the 1992 Plan are due to the new models
Table 10	2-1	Development impacts from 1992 to 2007 without any mitigation	Provide background information that shows how development can increase and decrease peak flow rates (increases are due to accelerating added runoff volume ahead of the peak)
Table 11	3-2	Impact of local detention through 2007	Show that detention designed for local peak flow attenuation can cause negative impacts downstream
Table 12	3-1	Net impact of develop and local detention through 2007	Show the impact of development separately from the impact of system changes from 1992 to 2007
Table 13	4-3	Impact of Linda Creek Bypass and SPRR projects	Isolate the impacts of major physical changes to the system from impacts due to development
Table 14	5-4	Benefit from Miners Ravine Detention Basin	Quantify the benefit of the Miners Ravine Basin consistent with the Plan Update analysis
Table 15	6-5	Impact of modifications to Sierra College Blvd at Secret Ravine	Quantify the impact of a completed project to provide an appropriate baseline for moving forward
Table 16	6-1	Net impacts of development and system changes from 1992 through 2010	Shows what impacts have not been mitigated from the time of initial plan development to the preparation of the Plan Update
Table 17	7-6	Potential unmitigated impacts of future development	Provide a justification for requiring mitigation measures
Table 18	N/A	Unmitigated build-out and regulatory flows	Lists unmitigated build-out, 1992 Plan Future and FEMA FIS flows at key locations
Table 22	8-7	Potential benefit from LID	Estimate the expected benefit incorporating LID runoff reduction features compared to traditional development
Table 23	9-8	Potential benefit from the identified projects	Quantify the benefit of the identified projects
Table 24	9-6	Net impacts of potential future development and identified projects from 2010 through build-out	Shows what peak flow changes would be expected from a 2010 baseline through build-out with the project identified in the Plan Update
Table 25	9-1	Net impacts of potential future development and identified projects from 1992 through build-out	Shows what peak flow changes would be expected from a 1992 baseline through build-out with the project identified in the Plan Update

3.8 UPDATED 1992 BASELINE CONDITIONS MODELING IN HEC-HMS

Updated 1992 baseline peak flows were calculated to provide an appropriate baseline for impact analysis. Design rainfall events based on procedures in the SWMM were applied to the new calibrated hydrologic models (HEC-1 and HEC-HMS) to compute runoff from 2-, 10-, 25-, 50-, 100-, 200- and 500-year recurrence interval storm events. The SWMM storm centering approach was used to determine peak flow conditions at key locations as described in the following section. The outflow hydrographs from HEC-HMS were applied to the HEC-RAS model that represents 1992 conditions to complete the updated 1992 baseline conditions modeling. The updated 1992 baseline condition is referred to as scenario 1 in this study.

3.8.1 Storm Centering Analysis for Key Locations of Interest (HEC-1)

Application of SWMM requires determination of what cloudburst centering location and angle combination would result in peak discharge conditions for each location of concern. By using automated capabilities of the DCDESKTOP, storm centering analyses was performed using HEC-1 for the 100-year event with 0, 30, 60, and 90 degree storm angles at all sub-watershed locations within the Plan Update models. The full set of cloudburst center and angle analyses were run with the 1992 baseline HEC-1 model.

The results of the centering analysis were compared for all of the approximately 3,800 nodes in the analysis, but special attention was paid to the key locations. It was found that the following seven storm centering locations and storm angles (refer to Table 8) produce the peak flows, or nearly (within a few percent) the peak flows, for every key location in the watershed. Plate 14 illustrates where the seven centerings control the key peak flow rates.

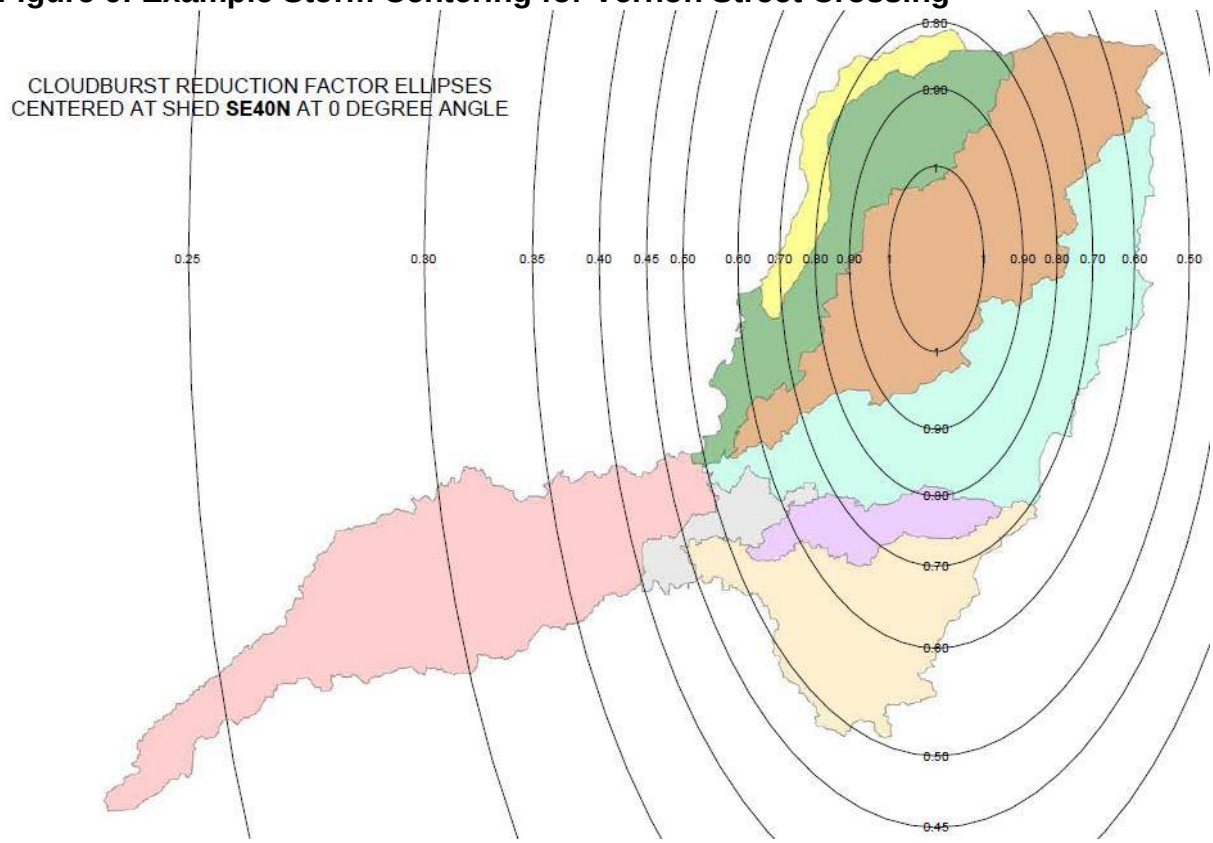
Table 8: Summary of Storm Centering Locations and Angles

Watershed Center Location	In Watershed	Storm Angle
LC5A	Linda Creek	0
SE40N	Secret Ravine	0
LC40L	Linda Creek	30
MR15J	Miners Ravine	30
SE40M	Secret Ravine	30
AC5I	Antelope Creek	60
CC5G	Cirby Creek	90

These seven centering location and angle combinations are used in this Plan Update to evaluate project alternatives and impacts at key locations throughout the watershed.

Figure 6 illustrates the storm centering adjustment ellipses with adjustment factors for the peak 1-hour precipitation of the event.

Figure 6: Example Storm Centering for Vernon Street Crossing



Storm centering and cloudburst reduction factor adjustments for all seven events are shown on Plates 15 through 21.

Watershed outflow hydrographs from HEC-HMS based on the seven centerings were linked to the *1992 Baseline* hydraulic routing model and run to generate *1992 Corrected Original Baseline* flow conditions (Scenario 1).

A comparison of the baseline peak flow rates between the 1992 Plan and this Plan Update at key locations for the 100-year event is shown in Table 9 to illustrate the differences between the 1992 Plan and Plan Update model results.

3.9 CURRENT CONDITIONS MODELING

A number of factors need to be considered to evaluate the hydrologic changes to the Dry Creek watershed that have occurred between 1992 and 2010. These include:

1. The added impervious area due to development and associated reduction in times of concentration,
2. The local detention that has been constructed to mitigate for development impacts, and

3. Hydrologically significant changes to the drainage system.

Hydrologically significant changes to the drainage system include the Linda Creek bypass systems, improvements to the Southern Pacific Railroad crossing of Dry Creek and the Miners Ravine Off-channel Detention Basin. These factors were evaluated both individually and cumulatively to assess the causes and effects of changes to the watershed on runoff from the watershed.

Current conditions modeling was developed by starting with the *1992 Corrected Original Baseline* models and making changes to the HEC-HMS models simulate development and local detention and the HEC-RAS models to simulate the impacts of regional projects. First, development that has occurred between 1992 and 2007 was simulated without local detention basins to determine what the impact of development would have been without local detention. Second, local detention was added to the HEC-HMS models to calculate its effects and the net impact of development. After the hydrologic changes from development were calculated, changes to the 1992 Baseline HEC-RAS model were made to evaluate changes that had occurred prior to construction of the Miners Ravine Off-channel Detention Project in 2006 and after its completion in 2007. Current conditions modeling was completed by modifying the HEC-RAS model to simulate improvements to Sierra College Boulevard at Secret Ravine thereby providing a *2010 Updated Baseline* for the evaluation of potential future changes to watershed hydrology and the physical drainage system.

3.9.1 Current Condition HEC-HMS Modeling

Hydrologic parameters for the Plan Update current condition HEC-HMS models were estimated from land use as described in Section 1.5.4 and shown on Plate 8. Land use summary tables for the 2007 baseline conditions are provided in Appendix F. Impervious area values were extracted from the data illustrated on Plate 5.

3.9.1.1 Impact from Development from 1992 to 2007 without any Mitigation

Watershed outflow hydrographs from HEC-HMS models that included development through 2007 without local detention were linked to the *1992 Baseline* hydraulic routing model and run to generate Scenario 2. Peak flow impacts from development from 1992 to 2007 are presented in Table 10 which compares Scenario 2 to Scenario 1. The results indicate some locations where flows increase and some locations where flows decrease. A review of the flow hydrographs indicates the increase in runoff volume from development, which has been largely concentrated in the lower portion of the watershed, flowing out ahead of runoff from undeveloped areas. The net result actually indicates that unmitigated development, though causing approximately a four percent increase in 100-year runoff volume would have caused essentially no change in peak runoff at Vernon Street (the results indicate a 0.06 percent decrease).

3.9.1.2 Impact of Local Detention from 1992 through 2007

Details of the various detention basins that were identified in the Plan Update process

are included in Appendix I.

Within HEC-HMS, Modified Puls routing tables were added downstream of each watershed affected by a detention basins to approximate the impacts of the detention facilities.

Watershed outflow hydrographs from HEC-HMS models that included development through 2007 with local detention were linked to the *1992 Baseline* hydraulic routing model and run to generate Scenario 3. Peak flow impacts of local detention from 1992 to 2007 are presented in Table 11 which compares Scenario 3 to Scenario 2. Consistent with the findings based on the comparison of Scenario 2 to Scenario 1, the results indicate that while local detention can provide some benefit, detaining increased runoff volume so that it discharges occur closer to the peak runoff from undeveloped areas can, in some cases, increase peak flows compared to an unmitigated condition. The net impact of development and local detention is presented in Table 12 which compares Scenario 3 to Scenario 1.

3.9.2 Hydraulic Routing for Pre-Miners Ravine – 2006 Conditions Evaluation

For the pre-Miners Ravine Off-channel Detention Basin (2006) conditions model, the 1992 hydraulic routing model was adjusted to include the following three projects of significance that were constructed between 1992 and 2006:

3.9.2.1 Southern Pacific Railroad Bridge

The 1992 Baseline HEC-RAS model was modified to reflect Southern Pacific Railroad Bridge project. In the 1992 model, the crossing was represented by four elliptical culverts, each with a span of 12.5 feet and a rise of 17.5 feet, and two box culverts, one with a span of 12 feet and a rise of 16 feet and the other with a span of 23 feet and a rise of 14 feet. The current conditions HEC-RAS model replaced the culverts with a bridge that spans approximately 100 feet with a low nearly 20 feet above the channel bed.

3.9.2.2 Linda Creek Bypass Channel

The 1992 Baseline HEC-RAS model was modified to reflect the Linda Creek Bypass Channel project by modifying cross sections on Linda Creek below Strap Ravine. Based on the construction plans for the project, a trapezoidal channel was added to cross section 9541.7 and sections downstream from it. The bypass channel has a bottom width of about 25 feet, side slopes of about three horizontal to one vertical and a depth of about 4 feet.

3.9.2.3 Linda Creek Bypass Piping

The 1992 Baseline HEC-RAS model was modified to reflect the Linda Creek Bypass Piping by adding a lateral weir at River Station 3019.3 on the “Below Strap” reach on Linda Creek. The points on the channel bottom were lowered according to the

construction drawings for the project. Two parallel, nine-foot diameter circular culverts, 860 feet in length, were connected from the lateral weir to River Station 1235.899 downstream on Linda Creek, in the same reach.

Watershed outflow hydrographs from HEC-HMS models that included development through 2007 with local detention were linked to the 2006 hydraulic routing model and run to generate Scenario 4. Peak flow impacts of the Linda Creek Bypass and Southern Pacific Railroad projects are presented in Table 13 which compares Scenario 4 to Scenario 3. The analysis performed for this Plan Update indicates that these projects caused a three percent increase in the 100-year peak discharge at Vernon Street.

3.9.3 Miners Ravine Off-channel Detention Basin – 2007 Conditions Evaluation

The site of the Miners Ravine Off-channel Detention Basin included the remnant basins from a historic sewage treatment plan from 1992 until 2006. The 1992 Baseline HEC-RAS model included the features as these existing prior to construction of the detention basin as two storage basins with appropriate capacity curves and interconnects between the stream and the basins and between the basins. For the 2007 model to reflect the construction of the detention basin, the capacity curves were replaced with post-construction capacity curves based on record drawings. An additional small storage area was included upstream, east of Sierra College Boulevard, to simulate the inlet structure with a weir and flap gates to connect the upstream structure to the stream and a culvert to connect it to the new detention basin. The Sierra College Boulevard culvert size was revised to match extended culverts with fish passage enhancements. The spillway of the detention facility was added as a storage area connection to the downstream storage area. The lateral weirs connecting the channel to the detention basin were also adjusted to reflect the post-construction embankment elevation.

Watershed outflow hydrographs from HEC-HMS models that included development through 2007 with local detention were linked to the 2007 hydraulic routing model and run to generate Scenario 5. The peak flow attenuation benefit of the Miners Ravine Off-Channel Detention Basin is presented in Table 14 which compares Scenario 5 to Scenario 4. The analysis performed for this Plan Update indicates that basin provides slightly less that 100 cfs of peak flow reduction at Vernon Street. The *Miners Ravine Off-Channel Detention Basin Hydrology & Hydraulic Design Report* indicated an expected benefit of a 263 cfs flow reduction at Vernon Street. This Plan Update indicates a lower 100-year benefit value than what had been expected because the 100-year peak discharge on Miners Ravine at the project site is significantly lower based on the Plan Update models (2,480 cfs) as compared to what was used for basin design (3,788 cfs). The detention basin can be expected to provide greater benefit in an event with a peak discharge close to what had been used during design.

Though Sierra College Boulevard overtopped in 1995 with at an estimated discharge in excess of 4,000 cfs, precipitation records indicate that this storm may have been more severe that a 200-year event on Miners Ravine. The Plan Update analysis indicates a 2007 baseline condition 100-year discharge of 2,480 cfs. The lower flow rates are

primarily due to the routing parameters used in the new model that were based on an extensive calibration process. Because the Plan Update flow rates are lower than the design flow rate, the indicated benefit is lower than that identified in the project design process.

3.9.4 Sierra College Boulevard at Secret Ravine – 2010 Conditions Evaluation

The 2007 conditions HEC-RAS model was revised to reflect modification to the Sierra College Boulevard crossing of Secret Ravine. The only change that was modeled was to change the profile of the road which changes the roadway overtopping condition. It was necessary to model this detail to provide a baseline for future project evaluation because one of the potential project locations is on Secret Ravine just upstream from Sierra College Boulevard and the roadway modifications impact how the potential project would function.

Watershed outflow hydrographs from HEC-HMS models that included development through 2007 with local detention were linked to the 2010 hydraulic routing model and run to generate Scenario 6. The peak flow impacts of the improvements made to Sierra College Boulevard at Secret Ravine are presented in Table 15 which compares Scenario 6 to Scenario 5. The net peak flow impacts from 1992 thought 2010 are presented in Table 16 which compares Scenario 6 to Scenario 1.

3.10 GENERAL PLAN BUILD-OUT MODELING

The projected General Plan land use data sets from various planning agencies within the watershed were assembled as shown in Plate 9. Build-out imperviousness is illustrated on Plate 6. Land use summary tables for the general plan build-out condition are provided in Appendix F.

Hydrology models were prepared and run for two different future condition evaluations, one with and one without LID features expected to be required in new development. The model without LID was used to evaluate Future Unmitigated conditions and the model with LID was used to evaluate the benefit of LID and was used to perform project evaluations.

3.10.1 General Plan with Current Mitigation

Watershed outflow hydrographs from HEC-HMS models that included general plan build-out but not LID were linked to the 2010 Updated Baseline hydraulic routing model and run to generate Scenario 7. This model represents the expected build-out flows that would results if no additional mitigation were placed in the watershed. The potential unmitigated peak flow impacts of future development are presented in Table 17 which compares Scenario 7 to Scenario 6. The potential impacts of future development on peak discharges are much greater than the impacts from development that occurred prior to 2007 because of the location of the future development being higher in the watershed which would result in the increase in runoff volume discharging closer to the

overall peak instead of before it.

3.10.2 General Plan with LID

It is anticipated that LID features will be required of all significant new development. Because LID features are considered to be mitigation measures, the detailed LID discussion is provided in Section 4.5.4.

3.10.3 Future Fully Developed Unmitigated Other Regulatory Flows

It is expected that the District will require that the Future Unmitigated results be used for floodplain evaluations, though additional requirements may also apply. For comparison, Table 18 lists the values from the 1992 Plan which have been used for District evaluations and the effective Flood Insurance Study (FIS) used for FEMA regulatory issues. The District should be consulted to verify that appropriate discharge rates and floodplain elevations are selected for any project evaluation.

3.11 PEAK FLOW TABLES FOR VARIOUS RECURRENCE INTERVALS

Tables of peak flows for the 500-year, 200-year, 100-year, 50-year, 25-year, 10-year and 2-year events, for the selected modeled scenarios are included in Appendix G. The scenarios for which the full spectrum of recurrence interval has been included are:

1. Scenario 1, the 1992 Corrected Original Baseline to provide a consistent base for quantifying impacts from the time of the 1992 Plan,
2. Scenario 6, 2010 Updated Baseline conditions to provide a consistent base for quantifying impacts from the time of this Plan Update,
3. Scenario 7, Unmitigated Build-out conditions to provide maximum flow conditions, and
4. Scenario 9, Build-out with LID and all identified projects to provide an estimate of the likely maximum feasible mitigation.

Scenarios 5 and 8 have also been fully calculated and delivered with the project digital files. Scenario 5 provides a 2007 baseline and Scenario 8 provides the LID evaluation.

Table 9: Peak Flow (cfs) Comparison of Plan Update Baseline to Original 1992 Plan Baseline

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / 1992 Baseline Inflows / 1992 Baseline System	100-year / 1992 Plan Baseline / Not Applicable	Difference / cfs
Miners Ravine			Scenario:	1	1992 Plan 1992	
UR15K2	MR15	207	Dick Cook Road	1714	1684	30
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1899	2468	-569
YMR29I	MR29R	202	Cottonwood Lake	2402	2680	-278
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2268	2881	-613
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7427	7844	-417
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4219	3090	1129
YSE51K	SE51R	232	Sierra College Blvd.	4681	3375	1306
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4679	3374	1305
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5447	4197	1250
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	987	857	130
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2819	2180	639
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2982	2330	652
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3630	3086	544
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3605	3075	530
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	758	842	-84
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3096	4113	-1017
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	919	920	-1
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	545	473	72
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2044	2489	-445
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2158	3297	-1139
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2682	3972	-1290
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3024	4126	-1102
Dry Creek						
UDC5B	DC5R	26	Royer Park	10663	10476	187
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8582	13825	-5243
YDC10D	VERNON	21	Vernon Street Crossing	12635	13706	-1071
YDC71B	DCC11	9	Sacramento County/Placer County Line	12571	14048	-1477

Flow comparison impacted by bypass, in channel discharge listed.

Table 10: Peak Flow (cfs) Impacts from Development from 1992 to 2007 without any Mitigation

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / 2007 Undetained Inflows / 1992 Baseline System	100-year / 1992 Baseline Inflows / 1992 Baseline System	Difference / cfs
Miners Ravine			Scenario:	2	1	
UR15K2	MR15	207	Dick Cook Road	1732	1714	18
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1919	1899	20
YMR29I	MR29R	202	Cottonwood Lake	2376	2402	-26
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2285	2268	17
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7260	7427	-167
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4286	4219	67
YSE51K	SE51R	232	Sierra College Blvd.	4688	4681	7
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4642	4679	-37
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5412	5447	-35
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	957	987	-30
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2834	2819	15
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2989	2982	7
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3611	3630	-19
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3581	3605	-24
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	932	758	174
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3243	3096	147
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1200	919	281
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	560	545	15
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2279	2044	235
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2202	2158	44
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2721	2682	39
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3202	3024	178
Dry Creek						
UDC5B	DC5R	26	Royer Park	10427	10663	-236
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8528	8582	-54
YDC10D	VERNON	21	Vernon Street Crossing	12627	12635	-8
YDC71B	DCC11	9	Sacramento County/Placer County Line	12608	12571	37

Flow comparison impacted by bypass, in channel discharge listed.

Table 11: Peak Flow (cfs) Impacts of Local Detention from 1992 through 2007

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / 2007 Locally Detained Inflows / 1992 Baseline System	100-year / 2007 Undetained Inflows / 1992 Baseline System	Difference / cfs
Miners Ravine			Scenario:	2	1	3
UR15K2	MR15	207	Dick Cook Road	1729	1732	-3
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1912	1919	-7
YMR29I	MR29R	202	Cottonwood Lake	2367	2376	-9
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2275	2285	-10
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7288	7260	28
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4286	4286	0
YSE51K	SE51R	232	Sierra College Blvd.	4688	4688	0
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4642	4642	0
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5431	5412	19
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	958	957	1
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2834	2834	0
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2989	2989	0
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3610	3611	-1
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3581	3581	0
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	932	932	0
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3237	3243	-6
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1191	1200	-9
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	560	560	0
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2279	2279	0
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2208	2202	6
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2721	2721	0
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3191	3202	-11
Dry Creek						
UDC5B	DC5R	26	Royer Park	10458	10427	31
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8534	8528	6
YDC10D	VERNON	21	Vernon Street Crossing	12647	12627	20
YDC71B	DCC11	9	Sacramento County/Placer County Line	12638	12608	30

Flow comparison impacted by bypass, in channel discharge listed.

Table 12: Peak Flow (cfs) Impacts of Development and Local Detention from 1992 through 2007

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / 2007 Locally Detained Inflows / 1992 Baseline System	100-year / 1992 Baseline Inflows / 1992 Baseline System	Difference / cfs
Miners Ravine			Scenario:	3	1	
UR15K2	MR15	207	Dick Cook Road	1729	1714	15
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1912	1899	13
YMR29I	MR29R	202	Cottonwood Lake	2367	2402	-35
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2275	2268	7
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7288	7427	-139
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4286	4219	67
YSE51K	SE51R	232	Sierra College Blvd.	4688	4681	7
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4642	4679	-37
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5431	5447	-16
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	958	987	-29
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2834	2819	15
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2989	2982	7
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3610	3630	-20
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3581	3605	-24
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	932	758	174
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3237	3096	141
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1191	919	272
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	560	545	15
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2279	2044	235
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2208	2158	50
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2721	2682	39
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3191	3024	167
Dry Creek						
UDC5B	DC5R	26	Royer Park	10458	10663	-205
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8534	8582	-48
YDC10D	VERNON	21	Vernon Street Crossing	12647	12635	12
YDC71B	DCC11	9	Sacramento County/Placer County Line	12638	12571	67

Flow comparison impacted by bypass, in channel discharge listed.

Table 13: Peak Flow (cfs) Impacts of Linda Creek Bypass and Southern Pacific Railroad Projects

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year 2007 Locally Detained Inflows 2006 System (no Miners)	100-year 2007 Locally Detained Inflows 1992 Baseline System	Difference cfs
Miners Ravine			Scenario:	4	3	
UR15K2	MR15	207	Dick Cook Road	1728	1729	-1
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1909	1912	-3
YMR29I	MR29R	202	Cottonwood Lake	2363	2367	-4
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2272	2275	-3
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7288	7288	0
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4287	4286	1
YSE51K	SE51R	232	Sierra College Blvd.	4689	4688	1
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4642	4642	0
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5432	5431	1
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	957	958	-1
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2834	2834	0
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2989	2989	0
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3608	3610	-2
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3577	3581	-4
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	931	932	-1
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3259	3237	22
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1191	1191	0
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	559	560	-1
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2330	2279	51
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2229	2208	21
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2728	2721	7
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3223	3191	32
Dry Creek						
UDC5B	DC5R	26	Royer Park	10454	10458	-4
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8755	8534	221
YDC10D	VERNON	21	Vernon Street Crossing	13066	12647	419
YDC71B	DCC11	9	Sacramento County/Placer County Line	12679	12638	41

Flow comparison impacted by bypass, in channel discharge listed.

Table 14: Peak Flow (cfs) Impacts of Miners Ravine Off-Channel Detention Facility

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year 2007 Locally Detained Inflows 2007 System (w/ Miners)	100-year 2007 Locally Detained Inflows 2006 System (no Miners)	Difference cfs
Miners Ravine			Scenario:	5	4	
UR15K2	MR15	207	Dick Cook Road	1727	1728	-1
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1910	1909	1
YMR29I	MR29R	202	Cottonwood Lake	2366	2363	3
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2275	2272	3
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7203	7288	-85
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4285	4287	-2
YSE51K	SE51R	232	Sierra College Blvd.	4687	4689	-2
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4641	4642	-1
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5431	5432	-1
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	958	957	1
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2834	2834	0
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2989	2989	0
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3616	3608	8
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3586	3577	9
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	932	931	1
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3258	3259	-1
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1191	1191	0
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	559	559	0
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2330	2330	0
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2229	2229	0
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2728	2728	0
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3225	3223	2
Dry Creek						
UDC5B	DC5R	26	Royer Park	10362	10454	-92
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8753	8755	-2
YDC10D	VERNON	21	Vernon Street Crossing	12970	13066	-96
YDC71B	DCC11	9	Sacramento County/Placer County Line	12616	12679	-63

Flow comparison impacted by bypass, in channel discharge listed.

Table 15: Peak Flow (cfs) Impacts of Modification to Sierra College Boulevard at Secret Ravine

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / 2007 Locally Detained Inflows / 2010 Baseline (SCB@Secret)	100-year / 2007 Locally Detained Inflows / 2007 System (w/ Miners)	Difference / cfs
Miners Ravine			Scenario:	6	5	
UR15K2	MR15	207	Dick Cook Road	1728	1727	1
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1913	1910	3
YMR29I	MR29R	202	Cottonwood Lake	2366	2366	0
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2275	2275	0
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7152	7203	-51
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4286	4285	1
YSE51K	SE51R	232	Sierra College Blvd.	4617	4687	-70
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4598	4641	-43
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5377	5431	-54
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	958	958	0
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2829	2834	-5
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2985	2989	-4
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3624	3616	8
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3593	3586	7
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	932	932	0
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3258	3258	0
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1191	1191	0
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	559	559	0
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2330	2330	0
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2229	2229	0
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2728	2728	0
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3229	3225	4
Dry Creek						
UDC5B	DC5R	26	Royer Park	10314	10362	-48
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8738	8753	-15
YDC10D	VERNON	21	Vernon Street Crossing	12908	12970	-62
YDC71B	DCC11	9	Sacramento County/Placer County Line	12595	12616	-21

Flow comparison impacted by bypass, in channel discharge listed.

Table 16: Net Peak Flow (cfs) Impacts from 1992 through 2010

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / 2007 Locally Detained Inflows / 2010 Baseline (SCB@Secret)	100-year / 1992 Baseline Inflows / 1992 Baseline System	Difference / cfs
Miners Ravine			Scenario:	6	1	
UR15K2	MR15	207	Dick Cook Road	1728	1714	14
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1913	1899	14
YMR29I	MR29R	202	Cottonwood Lake	2366	2402	-36
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2275	2268	7
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7152	7427	-275
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4286	4219	67
YSE51K	SE51R	232	Sierra College Blvd.	4617	4681	-64
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4598	4679	-81
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5377	5447	-70
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	958	987	-29
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2829	2819	10
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	2985	2982	3
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	3624	3630	-6
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3593	3605	-12
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	932	758	174
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3258	3096	162
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1191	919	272
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	559	545	14
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2330	2044	286
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2229	2158	71
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2728	2682	46
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3229	3024	205
Dry Creek						
UDC5B	DC5R	26	Royer Park	10314	10663	-349
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8738	8582	156
YDC10D	VERNON	21	Vernon Street Crossing	12908	12635	273
YDC71B	DCC11	9	Sacramento County/Placer County Line	12595	12571	24

Flow comparison impacted by bypass, in channel discharge listed.

Table 17: Unmitigated Peak Flow (cfs) Impacts of Future Development from 2010 to Build-out

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year Unmitigated Build-out / 2010 Baseline (SCB@Secret)	100-year 2007 Locally Detained Inflows / 2010 Baseline (SCB@Secret)	Difference cfs
Miners Ravine			Scenario:	7	6	
UR15K2	MR15	207	Dick Cook Road	1791	1728	63
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1984	1913	71
YMR29I	MR29R	202	Cottonwood Lake	2562	2366	196
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2456	2275	181
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7322	7152	170
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4856	4286	570
YSE51K	SE51R	232	Sierra College Blvd.	5011	4617	394
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4697	4598	99
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5497	5377	120
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	1135	958	177
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2914	2829	85
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	3026	2985	41
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	4095	3624	471
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3918	3593	325
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	943	932	11
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3376	3258	118
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1250	1191	59
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	595	559	36
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2503	2330	173
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2245	2229	16
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2755	2728	27
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3303	3229	74
Dry Creek						
UDC5B	DC5R	26	Royer Park	10880	10314	566
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8811	8738	73
YDC10D	VERNON	21	Vernon Street Crossing	13535	12908	627
YDC71B	DCC11	9	Sacramento County/Placer County Line	13079	12595	484

Flow comparison impacted by bypass, in channel discharge listed.

Table 18: Plan Update Unmitigated Build-out and Regulatory Peak Flows (cfs)

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / Unmitigated Build-out / 2010 Baseline (SCB@Secret)	100-year / 1992 Plan Future / Not Applicable	100-year / FEMA FIS / Not Applicable
Miners Ravine			Scenario:	7	1992 Plan Future	FEMA FIS
UR15K2	MR15	207	Dick Cook Road	1791	2277	3150
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1984	2967	None listed
YMR29I	MR29R	202	Cottonwood Lake	2562	3202	None listed
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2456	3421	4900
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7322	8428	7840
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4856	3649	3080
YSE51K	SE51R	232	Sierra College Blvd.	5011	3814	3710
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4697	3820	4150
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5497	4332	4200
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	1135	934	860
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2914	2541	865
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	3026	2703	2330
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	4095	3500	None listed
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3918	3486	3080
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	943	1113	720
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3376	4614	4340
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1250	1054	920
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	595	640	None listed
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2503	2774	None listed
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2245	3612	3300
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2755	4464	4160
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3303	4613	4130
Dry Creek						
UDC5B	DC5R	26	Royer Park	10880	11358	None listed
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8811	15181	14000
YDC10D	VERNON	21	Vernon Street Crossing	13535	14830	14000
YDC71B	DCC11	9	Sacramento County/Placer County Line	13079	15414	14000

Flow comparison impacted by bypass, in channel discharge listed.

4.0 Potential Improvement Projects and Mitigation Measures

4.0 POTENTIAL IMPROVEMENT PROJECTS AND MITIGATION MEASURES

4.1 PLANNED BRIDGE AND CULVERT IMPROVEMENTS

The 1992 Plan evaluated 208 crossings (bridges and culverts) on streams in the watershed and concluded that 130 would be overtopped during the 100-year flood event based on 1989 land use conditions. Each jurisdiction reviewed the list of inadequately sized bridges and culverts and prepared a list of the crossings with the highest priority for replacement. Several factors were included in this decision, including:

1. Potential for injury or loss of life
2. Potential for property damage or damage to the bridge or culvert
3. Emergency access to isolated areas
4. Inconvenience caused by road closure
5. Exclusion of privately owned structures

Since the 1992 Plan, several bridge and culvert crossings have been modified or replaced, or have been scheduled for replacement, and are listed in Table 19:

Table 19: Scheduled and Completed Bridge and Culvert Projects

Bridge Location	Replacement Status	Recommended for Replacement in 1992 Plan
Dry Creek at Walerga Road	Not Completed	Yes
Dry Creek at Cook Riolo Road	Not Completed	Yes
Dry Creek at Watt Avenue	Not Completed	No
Miners Ravine at Barton Road	Completed	Yes
Miners Ravine at Dick Cook Road	Completed; No As-Builts Received	Yes
Dry Creek at PFE/Atkinson Street	Completed	Yes
Dry Creek Railroad Crossing near PFE/Atkinson Street	Completed	No
Miners Ravine at Sierra College Boulevard	Completed	Yes
Secret Ravine at Sierra College Boulevard	Completed	No

4.2 BRIDGE AND CULVERT PROJECT RECOMMENDATIONS

Bridge and culvert improvement recommendations need to consider the risks associated with the existing condition, what risk reduction would likely be feasible, and the potential negative impacts of the recommended improvements. In some circumstances, removing a restriction at a bridge could reduce effective floodplain storage and increase downstream peak discharges. Detailed analyses of bridge and culvert modification projects using the modeling system developed for this Plan Update can quantify the potential impacts of proposed projects on regional flooding and can, if necessary, be used to evaluate mitigation measures to offset potential increases in discharge due to stream crossing modifications. This Plan Update recommends

pursuing roadway improvement projects to reduce roadway overtopping, with the caveat that special features be constructed so that bridge enlargements do not reduce the effectiveness of existing floodplain areas at reducing downstream discharges. Special features could include weirs upstream from the replacement to maintain the efffectiveness of existing floodplain storage.

Lists of structures that may be overtopped during a 100-year storm event are included in Appendix E.

The 1992 Plan recommended replacement of 42 structures, six of which have been replaced as listed previously in Table 19. Of the 36 structures that have not been replaced, 17 are not included in the Plan Update HEC-RAS model because the model does not include all of the smaller tributaries and corresponding structures that were addressed in the 1992 Plan. Table E.2 lists the 17 structures recommended for replacement in the 1992 Plan that are not included in the Plan Update HEC-RAS model, and this Plan Update does not revise the recommendations for these structures. The other 19 structures that were recommended for replacement in the 1992 Plan that have not been replaced are included in the Plan Update HEC-RAS model and recommendations are made based on the model results and potential project feasibility.

The Plan Update HEC-RAS model includes 67 public roadways that are overtopped by at least one of the seven critical 100-year storm centerings, including 14 of the 19 structures recommended for replacement in the 1992 Plan. The other five structures that were recommended for replacement in the 1992 plan that are not shown to be overtopped by any of the seven critical storm centerings in the Plan Update HEC-RAS model are: Linda Creek at Sunrise Avenue, Strap Ravine at Sierra College Boulevard, Dry Creek at Darling Way, Miners Ravine at Auburn Folsom Road, and Miners Ravine at King Road.

It is important to note that the seven critical centerings do not necessarily represent the 100-year storm event at each structure, which could be somewhat greater if the critical storm centering for each structure were to be evaluated. However, the differences are not expected to be significant.

This Plan Update recommends replacing a total of 23 of the 67 structures that are overtopped, including 12 structures that were previously recommended for replacement in the 1992 Plan. A complete listing of the overtopped structures and structures recommended for replacement can be found in Table E.1.

4.3 REGIONAL DETENTION BASIN PROJECT OPTIONS

As identified in the 1992 Plan, Regional detention basin projects have the potential to reduce peak flows at significant locations in the watershed. In the 1992 Plan, Vernon Street was used as the key location to compare the impact of potential projects and continues to be used for this purpose in the Plan Update. Two of the projects included

in this Plan Update are at selected regional detention basin sites identified in the 1992 Plan. The sites, on Antelope Creek upstream from Atlantic Street and on Secret Ravine upstream from Sierra College Boulevard still have potential for beneficial projects. Instead of traditional dams, the Plan Update recommends use of structures configured as slightly undersized bridge crossings that span the main stream channel with an arch and are designed to be overtopped during major storm events. Analysis for the Plan Update determined that it could be feasible to provide over 800 cfs of 100-year peak flow reduction at Vernon Street by constructing two similarly configured (but differently sized) structures in series on Antelope Creek upstream from Atlantic Street.

For the Plan Update, information from previous studies and suggestions made by the District, review of topographic data and aerial imagery, and limited field observations were used to identify potential project locations. Ten potential project sites were analyzed to determine peak flow reduction benefits. The storm centering that produces the peak 100-year flow at Vernon Street, SE40N at 0, was used as the design storm to analyze the potential benefits of each of these potential projects. The selection process considered the volume in the peak of the hydrograph and the potential to build a facility to detain a significant enough part of that peak to provide worthwhile benefit. All ten potential project sites, including those deemed infeasible, are described in detail in Appendix H. Of the ten potential projects, five have the potential to reduce peak flow rates at Vernon Street for the design storm centering. Plate H.1 shows the locations the ten potential project sites within the Dry Creek watershed. Table 20 lists the five potentially feasible regional detention basin projects and the calculated peak flow reduction at Vernon Street for each for the design storm. The net combined benefit does not equal the sum of the benefits of the individual projects due to the effect of the projects on the timing of flows.

It is possible that additional locations could be identified for local or regional flood control projects that were not evaluated as part of this Plan Update. For example, the City of Rocklin is currently investigating the feasibility of a flood damage reduction project along Sucker Ravine to reduce localized flooding. Such a project may have some regional benefit that could be considered by the District in the context of meeting Plan Update objectives.

Table 20: Potential Regional Detention Basin Projects

Project Location	Project Type	Peak Flow Reduction at Vernon Street (cfs)
Antelope Creek at Atlantic Street & Bike Trail	Weirs	825
Secret Ravine at Sierra College Boulevard	Weir	175
Linda Creek at Old Auburn Road	Off-channel	28
Linda Creek at Wedgewood Drive	Weir	13
Linda Creek at Auburn-Folsom Road	Off-channel	12
Net Combined Benefit of Five Listed Projects		1085

4.3.1 Antelope Creek at Atlantic Street

One potential project site is located adjacent to westbound Interstate 80, north of

Atlantic Street on Antelope Creek. The majority of the project site is owned by the City of Roseville. A capped landfill exists adjacent to the stream at the location of this potential project site. A flood easement may be negotiated with the City of Roseville for most of the areas impacted by the potential project. A few land owners would be slightly impacted.

The potential flood detention project that was evaluated consists of constructing two weirs or embankments spanning the main channel to allow passage of low flows while detaining higher flows. This concept was evaluated with one weir 200 feet upstream from the railroad bridge that runs adjacent to Atlantic Street and a second weir that would replace the bicycle path bridge downstream from Roseville Parkway. The calculations show that the project has the potential to reduce peak flows at Vernon Street by 825 cfs for the design storm. For the purposes of this planning level analysis and cost estimate the evaluated project consisted of two earthen embankments stabilized to withstand the overtopping flows that would span the main channel with arch structures. The details of the potential project would be addressed in a future design level evaluation.

4.3.2 Secret Ravine at Sierra College Boulevard

Another potential project site is located upstream (east) from Sierra College Boulevard on Secret Ravine. This potential project involves construction of an in-channel weir just upstream from Sierra College Boulevard that would allow the low flows to pass, but detain the high flows. This project was evaluated for construction in 2007 but could not be constructed at that time due to funding constraints. This potential project could reduce peak flow rates by 175 cfs at Vernon Street for the design storm by raising flood levels upstream from Sierra College Boulevard. Although this planning level analysis and cost estimate considered a wall with an opening that spans the main channel, a different project configuration may be evaluated as part of a future design level evaluation.

4.3.3 Linda Creek at Old Auburn Road

Just upstream (south) of Old Auburn Road on Linda Creek is a potential project site that was previously studied by the City of Roseville for possible future development. A portion of the site was found to be infeasible for development purposes due to the current extent of the floodplain. However, this portion of the site may be used for detention purposes by excavating approximately 5,000 cubic yards, and depositing it on the right bank, above the existing floodplain. This potential project would include a berm constructed along the left (west) bank to increase effective detention volume in the off-channel detention basin. This project has the potential of reducing peak flow at Vernon Street by 28 cfs.

4.3.4 Linda Creek at Wedgewood Drive

Just upstream (north) from Wedgewood Drive on Linda Creek is a steep, narrow ravine between residential developments that could potentially be used as a flood detention

project site. The surface area of the potential project site is approximately 2.5 acres that is covered by riparian vegetation and trees. The project concept would be to construct an in-channel weir, allowing low flow passage, but detaining the peak flows by increasing the water surface elevation. Based on the evaluated configuration, the potential project could decrease peak flows by 13 cfs at Vernon Street.

4.3.5 Linda Creek near Auburn-Folsom Road

Another potential project site is located on the upper portion of Linda Creek, upstream (east) from Auburn-Folsom Road, adjacent to Cavitt Junior High School. The project site is approximately 6.5 acres and is currently undeveloped open space with some tree coverage. The potential project site is within the preliminary FEMA floodplain.[32] The project concept would be to add a berm on the right bank of Linda Creek, creating an off-channel detention basin to divert and attenuate peak flows. The project has the potential of reducing peak flows at Vernon Street by 12 cfs.

Each of the potential regional projects could be implemented independently. The two weirs identified as a potential project on Antelope Creek could be considered two phases of a single project or could be considered as two separate projects.

4.4 CHANNEL IMPROVEMENT AND RESTORATION OPPORTUNITIES, AND POTENTIAL PROJECT CONSTRAINTS

Restoration Resources performed field investigations at each of the five potential regional detention basin sites described in this Plan Update to provide a preliminary review of environmental considerations without the benefit of formal environmental surveys. In each case, US Army Corp of Engineers (USACE) Clean Water Act (CWA), Section 404, California Department of Fish and Game (CDFG) Section 1600 Streambed Alteration Agreement and State Water Resources Control Board (SWRCB) Section 401 permit requirements would need to be met. Additionally, any project that involves placement of fill within the FEMA regulatory floodway must satisfy FEMA requirements. A brief summary of potential constraints and opportunities at each of the five sites is included below. The full report is included as 5.4Appendix K.

4.4.1 Antelope Creek at Atlantic Street

Locating a weir near the railroad overcrossing would need to address an underground gas and sewer line. A project along Antelope Creek upstream from Atlantic Street would need to avoid or mitigate for impacts to Oregon Ash and Valley Oak trees, some other woody and riparian habitat, and a few elderberry shrubs. Detailed analysis and coordination with the landfill managers will be required to ensure that the project would not negatively impact the landfill. This potential site provides opportunities for stream habitat enhancements by constructing an oxbow channel. Potential locations for oak

[32] Nolte and Associates, Preliminary Sacramento County Flood Insurance Study, 2006.

tree and oak woodland habitat mitigation also are present upstream from Atlantic Street.

The upstream weir location at the bicycle path overcrossing could impact well-developed stream zone waters of the U.S. and wetlands, along with riparian habitat which developed as a result of beaver damming activities. A sewer line is also present in the vicinity of the upstream weir location. Removal of the beaver dam and beaver control may enhance stream function. Increased flood storage may be achieved through modification of the bicycle path configuration to minimize potential impacts to upstream habitat. Though increased flood depths would be infrequent and for short duration, the impact of these changes would need to be evaluated and addressed.

4.4.2 Secret Ravine at Sierra College Boulevard

The potential project site upstream from Sierra College Boulevard contains some wetlands, elderberry shrubs and Northwestern Pond turtle habitat. Although there are some potential habitat impacts, there are significant opportunities for oak woodland, riparian, and grassland enhancements.

This site is privately owned and the project would cause the existing regulatory base flood elevation to increase by approximately three feet. Land acquisition is a significant constraint on this project. Though FEMA requirements for causing a rise in floodplain elevations would need to be addressed, obtaining rights to flood the areas of potential impacted should satisfy the most significant aspect of FEMA requirements.

Recent modifications to Sierra College Boulevard at Secret Ravine raised the elevation at which the roadway would be overtopped. The 2007 conditions evaluations considered the roadway to be in its 2007 configuration while the project evaluations are based on the modified configuration.

4.4.3 Linda Creek at Old Auburn Road

The site along Linda Creek upstream from Old Auburn Road has become completely occupied by oak tree mitigation and is maintained by the City of Roseville. Use of this site would be challenging because it would require offsetting the current mitigation uses.

4.4.4 Linda Creek at Wedgewood Drive

The site along Linda Creek upstream from Wedgewood Drive supports extensive mature riparian woodland and riparian wetland communities. The creek corridor is relatively narrow and confined by the steep local topography. The potential rise in water level could impact adjacent upland oak woodlands and would need to be addressed. Construction of the modifications would also need to address any impacts on surrounding private properties.

4.4.5 Linda Creek near Auburn-Folsom Road

Potential constraints on the identified potential project site on Linda Creek upstream

from Auburn-Folsom Road include existing oak trees, wetland habitat, riparian habitat, mitigation plantings, elderberry shrubs, and salmonid habitat in stream and juvenile entrapment issues. Existing water and sewer lines would need to be accommodated in site planning. Potential opportunities at this site include oak, wetland and riparian wetland, woodland, and elderberry mitigation.

4.5 NON-STRUCTURAL FLOOD HAZARD REDUCTION MEASURES

4.5.1 Local Storage and Detention Facilities

Historically, local detention basins were used in an attempt to mitigate for the increase in peak runoff from development. However, as this study has demonstrated, in some cases detaining the increase volume of runoff resulting from new development can cause higher peak flows than if no detention was used. As part of upcoming storm water quality requirements, development projects will be required to include LID features and some will be required to meet hydromodification management requirements, which are not yet defined. Hydromodification management features retain and detain site runoff to try to mimic pre-project hydrology to meet specific criteria. Inclusion of LID features and systems to meet hydromodification management objectives into site design limit the need for local detention with flood control objectives that are often not effective at meeting regional objectives, anyway. Therefore, one recommendation of the Plan Update is for future use of local detention to be limited to situations where it is designed to meet specific localized mitigation objectives. Some onsite (local) detention may be a necessary part of mitigation plan for a project, but the size and configuration of detention necessary to meet mitigation objectives depends on the location of the project in the watershed and the effectiveness of LID measures.

Some LID features and hydromodification management measure detain runoff long enough, or retain and infiltrate runoff, so that mitigation for potential impacts from development can be realized. Major projects should include LID features and hydromodification management measures and evaluate how the proposed system will perform in the event of major storm events.

4.5.2 Elevation and Buy-Out Projects

Elevation and buy-out projects would be a feasible means to relieve some of the remaining flood problems in the watershed.

Retrofitting existing structures through elevation projects can reduce the risk of flood damage. Communities may apply to FEMA's Hazard Mitigation Assistance (HMA) grant programs for funding for elevation projects. The HMA grant applications are submitted by State emergency management agencies on behalf of local sub-applicants for projects for individual properties.

Elevation above flood hazard levels may reduce the risk to the elevated property.

Project costs for elevation, as estimated by FEMA, are shown in Table 21.

Table 21. Approximate Square Foot Costs of Elevating a Home (2009 Dollars)[33]

Construction Type	Existing Foundation	Retrofit	Cost (per square foot of house footprint)
Frame (for frame house with brick veneer on wall, add 10 percent)	Basement or Crawlspace	Elevate **2** Feet on Continuous Foundation Walls or Open Foundation	$29
		Elevate **4** Feet on Continuous Foundation Walls or Open Foundation	$32
		Elevate **8** Feet on Continuous Foundation Walls or Open Foundation	$37
	Slab-on-Grade	Elevate **2** Feet on Continuous Foundation Walls or Open Foundation	$80
		Elevate **4** Feet on Continuous Foundation Walls or Open Foundation	$83
		Elevate **8** Feet on Continuous Foundation Walls or Open Foundation	$88
Masonry	Basement or Crawlspace	Elevate **2** Feet on Continuous Foundation Walls or Open Foundation	$60
		Elevate **4** Feet on Continuous Foundation Walls or Open Foundation	$63
		Elevate **8** Feet on Continuous Foundation Walls or Open Foundation	$68
	Slab-on-Grade	Elevate **2** Feet on Continuous Foundation Walls or Open Foundation	$88
		Elevate **4** Feet on Continuous Foundation Walls or Open Foundation	$91
		Elevate **8** Feet on Continuous Foundation Walls or Open Foundation	$96

Buyouts represent a final mitigation solution to remove existing structures from flood hazard areas and may be an effective mitigation strategy when flood reduction methods are more costly than the value of the property that is at risk.

FEMA provides funding to the State and local community buyout projects in flood hazard areas when money is available. The buyout process is entirely voluntary by the homeowner.[34]

4.5.3 ALERT Flood Warning Response System

Implementation of an ALERT flood warning response system has been successful in

[33] FEMA 347 Above the Flood: Elevating Your Flood Prone House and FEMA 312 Homeowner's Guide to Retrofitting: Six ways to Protect Your House from Flooding.
[34] FEMA 317: Property Acquisition Handbook for Local Communities.

providing flood warnings within the Dry Creek watershed. This Plan Update recommends that the current ALERT flood warning response system be maintained and that seven gages be added. It is also recommended that flood forecasting capabilities be added to the flood warning system. As technology continues to advance, it is expected that a system that links real time (or possibly even predicted rainfall data) to a hydrologic model, in order to predict flood conditions will become feasible. Such a system could provide more warning than is currently available. Benefits of additional flood warning include increased opportunities for sandbagging, evacuation, and quicker emergency response and road closures. Improving the ALERT system can provide mitigation for accelerating flows into the creeks which can reduce the time to peak flood stage.

4.5.4 Low Impact Development

An analysis was performed to evaluate the potential peak flow impacts to the watershed from the expected use of LID measures as a result of the State Water Resources Control Board's expected future updates to the Municipal Separate Storm Sewer Systems (MS4) Phase II permit standards.

The Plan Update considered the alternative LID measures identified in the Construction General Permit. It was found that some measures such as "Rain Barrels" are effective for the small, frequent events they are designed for, but would not be expected to add any benefits during flood events when they would be expected to full long before peak flow conditions. Other similarly functioning LID devices such as typical detention storage and some bio-swale configurations do not offer significant flood benefits for large events. However, it was determined that LID features, such as permeable pavement and bio-retention facilities which promote infiltration and provide substantial storage would have some potential to impact flood flows by effectively reducing the imperviousness of proposed developments.

For this evaluation, it was assumed LID mitigation measures would be effective at reducing the imperviousness of developments to half of what would have occurred with traditional development approaches. It was also assumed that the LID measures would not slow down runoff compared to non-LID projects because it is expected that the capacity of the LID features below overflow connections to the storm drain system would fill during the major storm events.

LID measures can be effective in areas of any hydrologic soil group. Though more than half of the Dry Creek watershed is underlain with Type D soils, the retention and runoff delay in undeveloped areas is highly significant in general, and more so during frequent storm events. LID measures that promote infiltration attempt to make the developed watershed mimic the undeveloped hydrologic conditions, to the extent practicable. Plate 9 shows that a significant amount of future development is expected to occur in the area shown to be hydrologic soil group B on Plate 3. Increased impervious area on soil group B areas can dramatically increase runoff and this increase can be mitigated using LID principles and other techniques. However, LID can be challenging in areas where there are shallow zones of hydrologic soil group B over less permeable material.

The permeability of the native material under LID features must be considered when assessing effectiveness at reducing runoff.

The results of the analysis of implementing LID on new developments found that the impacts of future development on peak discharge at Vernon Street could be reduced by 32 percent for a 2-year flood. For the 100-year event, the analysis demonstrated that impacts could be reduced through the use of LID by 28 percent at the Vernon Street crossing. Varying degrees of benefit were noted for various locations and recurrence intervals. (The unexpectedly high benefit indicated at study Point No. 92 was determined to be due to a flow timing issue where the model differences resulted in a double peak instead of superposed hydrographs.)

Watershed outflow hydrographs from HEC-HMS models that included general plan build-out with LID were linked to the 2010 Updated Baseline hydraulic routing model and run to generate Scenario 8. This model represents the expected build-out flows that would result if LID were implemented in a manner consistent with the assumptions made for this evaluation. The potential peak flow reduction benefits from LID features are presented in Table 22 which compares Scenario 8 to Scenario 7.

Watershed outflow hydrographs from HEC-HMS models that included general plan build-out with LID were linked to the hydraulic routing model with all identified projects and run to generate Scenario 9. This model represents the potential benefit that could be realized from implementation of all five potentially feasible projects that were identified. The potential total peak flow reduction benefits from five identified projects are presented in Table 23 which compares Scenario 9 to Scenario 8.

The potential net peak flow impacts from 2010 to build-out with all identified projects are presented in Table 24 which compares Scenario 9 to Scenario 6. The potential net peak flow impacts from 1992 to build-out with all identified projects are presented in Table 25 which compares Scenario 9 to Scenario 1.

Table 22: Potential Peak Flow (cfs) Reduction Benefits from LID Features

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year Build-out with LID 2010 Baseline (SCB@Secret)	100-year Unmitigated Build-out 2010 Baseline (SCB@Secret)	Difference cfs
Miners Ravine			Scenario:	8	7	
UR15K2	MR15	207	Dick Cook Road	1779	1791	-12
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1977	1984	-7
YMR29I	MR29R	202	Cottonwood Lake	2554	2562	-8
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2451	2456	-5
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7244	7322	-78
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4804	4856	-52
YSE51K	SE51R	232	Sierra College Blvd.	4972	5011	-39
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4691	4697	-6
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5441	5497	-56
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	1103	1135	-32
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2912	2914	-2
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	3017	3026	-9
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	4035	4095	-60
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3883	3918	-35
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	942	943	-1
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3347	3376	-29
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1227	1250	-23
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	397	595	-198
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2441	2503	-62
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2213	2245	-32
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2749	2755	-6
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3276	3303	-27
Dry Creek						
UDC5B	DC5R	26	Royer Park	10746	10880	-134
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8740	8811	-71
YDC10D	VERNON	21	Vernon Street Crossing	13361	13535	-174
YDC71B	DCC11	9	Sacramento County/Placer County Line	12865	13079	-214

Flow comparison impacted by bypass, in channel discharge listed.

Table 23: Potential Peak Flow (cfs) Reduction Benefits from Identified Projects

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year Build-out with LID All Identified Projects	100-year Build-out with LID 2010 Baseline (SCB@Secret)	Difference cfs
Miners Ravine			Scenario:	9	8	
UR15K2	MR15	207	Dick Cook Road	1780	1779	1
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1978	1977	1
YMR29I	MR29R	202	Cottonwood Lake	2562	2554	8
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2452	2451	1
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7203	7244	-41
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4803	4804	-1
YSE51K	SE51R	232	Sierra College Blvd.	4916	4972	-56
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4682	4691	-9
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5401	5441	-40
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	1103	1103	0
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2912	2912	0
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	3017	3017	0
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	4035	4035	0
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3557	3883	-326
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	941	942	-1
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3274	3347	-73
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1227	1227	0
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	331	397	-66
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2377	2441	-64
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2191	2213	-22
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2731	2749	-18
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3256	3276	-20
Dry Creek						
UDC5B	DC5R	26	Royer Park	10058	10746	-688
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8648	8740	-92
YDC10D	VERNON	21	Vernon Street Crossing	12276	13361	-1085
YDC71B	DCC11	9	Sacramento County/Placer County Line	12237	12865	-628

Flow comparison impacted by bypass, in channel discharge listed.

Table 24: Potential Net Peak Flow (cfs) Impacts from 2010 to Build-out with All Identified Projects and LID Measures

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / Build-out with LID / All Identified Projects	100-year / 2007 Locally Detained Inflows / 2010 Baseline (SCB@Secret)	Difference / cfs
Miners Ravine			Scenario:	9	6	
UR15K2	MR15	207	Dick Cook Road	1780	1728	52
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1978	1913	65
YMR29I	MR29R	202	Cottonwood Lake	2562	2366	196
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2452	2275	177
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7203	7152	51
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4803	4286	517
YSE51K	SE51R	232	Sierra College Blvd.	4916	4617	299
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4682	4598	84
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5401	5377	24
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	1103	958	145
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2912	2829	83
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	3017	2985	32
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	4035	3624	411
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3557	3593	-36
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	941	932	9
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3274	3258	16
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1227	1191	36
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	331	559	-228
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2377	2330	47
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2191	2229	-38
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2731	2728	3
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3256	3229	27
Dry Creek						
UDC5B	DC5R	26	Royer Park	10058	10314	-256
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8648	8738	-90
YDC10D	VERNON	21	Vernon Street Crossing	12276	12908	-632
YDC71B	DCC11	9	Sacramento County/Placer County Line	12237	12595	-358

Flow comparison impacted by bypass, in channel discharge listed.

Table 25: Potential Net Peak Flow (cfs) Impacts from 1992 to Build-out with All Identified Projects and LID Measures

2007 NODE	1992 HEC-1 NODE	1992 Study Point #	Recurrence Interval: / Model Hydrology: / Description / Model Geometry:	100-year / Build-out with LID / All Identified Projects	100-year / 1992 Baseline Inflows / 1992 Baseline System	Difference / cfs
Miners Ravine			Scenario:	9	1	
UR15K2	MR15	207	Dick Cook Road	1780	1714	66
UR20P2	MR20R	205	Moss Lane (Gages 1609/1610)	1978	1899	79
YMR29I	MR29R	202	Cottonwood Lake	2562	2402	160
UR30H3	MR30R	197	Joe Rodgers Area - Leibenger Lane	2452	2268	184
UMR40E	MR40R	178	Upstream of Confluence with Antelope Creek	7203	7427	-224
Secret Ravine						
YE50F2	SE50R	235	Brace Road	4803	4219	584
YSE51K	SE51R	232	Sierra College Blvd.	4916	4681	235
USE52D	SE52R	231	China Gardens Near Rustic Hills/Rocklin Road (Gage 1618)	4682	4679	3
YSE85Q	SE85R	227	Upstream of Confluence with Miners Ravine	5401	5447	-46
Clover Valley						
UCV10B	CV10R	155	Upstream of Confluence with Antelope Creek	1103	987	116
Antelope Creek						
YAC30B	AC30R	140	Sierra College Blvd. (Gage 1573)	2912	2819	93
UC35G3	AC35R	134	Upstream of Confluence with Clover Valley - Midas Avenue	3017	2982	35
UC41E4	AC41R	126	Antelope Creek Road - Downstream of SR-65 (Gage 1583)	4035	3630	405
UDC4D	AC45R	122	Upstream of Confluence with Miners Ravine	3557	3605	-48
Cirby Creek						
YCC40C	CC40R	51	Coloma Way (Gage 1635)	941	758	183
YCC45E	CCC5	49	Upstream of Confluence with Linda Creek	3274	3096	178
Strap Ravine						
UR20A4	SR20R	96	Upstream of Confluence with Linda Creek @ McClaren (Gage 1611)	1227	919	308
Linda Creek						
ULC5B	LCC1	92	Troy Purdee Lane	331	545	-214
UC45J2	LC45R	82	@ Sacramento County/Placer County Line	2377	2044	333
ULC80I	LC80R	76	Champion Oaks/Sanoma Way (Gage 1626/1628)	2191	2158	33
ULC95C	LC95R	67	Upstream of Confluence with Cirby Creek	2731	2682	49
YCC45G	CC45R	45	Upstream of Confluence with Dry Creek	3256	3024	232
Dry Creek						
UDC5B	DC5R	26	Royer Park	10058	10663	-605
YDCCC	RYCOMB	23	Confluence with Linda Creek/Cirby Creek	8648	8582	66
YDC10D	VERNON	21	Vernon Street Crossing	12276	12635	-359
YDC71B	DCC11	9	Sacramento County/Placer County Line	12237	12571	-334

Flow comparison impacted by bypass, in channel discharge listed.

4.6 COST ESTIMATES

Planning level costs estimates (in 2010 dollars, Engineering New Record 20-City Construction Cost Index is 8865) for the five flood control project sites within the Dry Creek watershed (discussed in Section 4.3) that have the potential to reduce peak flow rates at Vernon Street for the design storm centering are listed below in Table 26. (Peak flow reduction for the combination of the five projects does not equal the sum of the flow reduction values for the five individual projects due to timing of runoff.)

Table 26: Project cost estimates and peak flow reduction summary for regional mitigation projects.

Description	Cost	Flow Reduction (cfs)	Cost/Benefit (cfs flow reduction)
Antelope Creek at Atlantic Street	$ 3,367,000	825	$4,000/cfs
Secret Ravine at Sierra College Boulevard	$ 3,234,000	175	$18,000/cfs
Linda Creek at Old Auburn Road	$ 932,000	28	$33,000/cfs
Linda Creek at Wedgewood Drive	$ 1,019,000	13	$78,000/cfs
Linda Creek near Auburn-Folsom Road	$ 1,008,000	12	$84,000/cfs
Total Cost and Net Flow Reduction @ Vernon	**$ 9,560,000**	**1085**	

It is estimated that upgrading the ALERT system will cost approximately $234,000, for seven additional gages plus some rainfall gage or prediction based flood forecast capabilities, bringing the total cost of the identified projects to $9,794,000. Inclusion of just the Atlantic Street project and ALERT system upgrades would bring the project cost to $3,601,000.

In addition to funding the capital costs associated with the mitigation projects and ALERT system improvements, funding for on-going maintenance and life cycle replacement costs (present value of cost to replace those portions of the projects that should be considered to have a 50-year service life) should also be considered. Table 27 lists estimates for on-going maintenance and replacement costs.

Table 27: Estimated Maintenance and Replacement Costs

Project	Annual Maintenance Cost	Present Value of Replacement Cost	Annualized value of replacement for i=6%, 50-year
Miners Ravine Off-Channel Detention Basin	$ 32,000	$ 500,000	$ 32,000
Antelope Creek at Atlantic Street	$ 21,000	$ 684,000	$ 43,000
Secret Ravine at Sierra College Boulevard	$ 13,000	$ 437,000	$ 28,000
Linda Creek at Old Auburn Road	$ 4,000	$ 130,000	$ 8,000
Linda Creek at Wedgewood Drive	$ 5,000	$ 172,000	$ 11,000
Linda Creek near Auburn-Folsom Road	$ 4,000	$ 123,000	$ 8,000
Alert System (including upgrades)	$ 44,000	-	-
Total	$ 123,000		$ 130,000

4.7 PROJECT RECOMMENDATIONS

To manage the risks and reduce potential hazards associated with existing local and regional flooding deficiencies, the following recommendations are provided:

1. Implement the two phases of the Antelope Creek at Atlantic Street project and ALERT system upgrades to mitigate for development impacts as funding becomes available.
2. Pursue other regional flood flow reduction projects with consideration for additional multi-objective components along with stream corridor if and when opportunities for funding develop.
3. Implement bridge and culvert improvements in a manner that does not exacerbate flooding at other locations in the watershed. Stream crossing modifications may provide opportunities for additional projects that could improve the flood control benefit of the existing floodplain.
4. Support building elevation and floodplain property buy-outs as these programs are expected to be the most effective means available to reduce future flood damage to existing structures.
5. Require onsite (local) detention where mitigation is necessary due to local flood impact considerations.
6. Incorporate LID measures into future development design that promotes infiltration.

Five development impact flood flow mitigation projects were identified as part of the Plan Update. The two most significant of these projects, those on Antelope Creek and Secret Ravine, include weirs that span the stream channels without impacting frequent flows to limit the impacts of the proposed projects on the streams while enhancing floodplain storage and modifying flood flow timing to reduce peak downstream discharges at key locations. As listed in Table 20, two of the three smaller projects use on off-channel configurations. The Plan Update recommends pursuing implementation of the Antelope Creek project. The other four projects are included as options because opportunities and future needs may make it necessary or beneficial to do more than the one project on Antelope Creek.

The District and City of Roseville have a flood warning ALERT System that monitors numerous precipitation and stream gages and provides a good source of flood warning information. Enhancing the flood warning system with flood forecasting based on rainfall predictions and the modeling system developed for this Plan Update would be worthwhile. The Plan Update recommends $234,000 in upgrades to the ALERT system including new gages and enhanced predictive capabilities.

Depending on what assumptions that the District decides to make regarding pursuit of flood flow mitigation projects, the District has options of selecting a funding plan based on a plan to implement: 1) only the Antelope Creek project, 2) the Antelope Creek and Secret Ravine projects, or 3) all five identified potential projects.

The cost of the Antelope Creek project plus the ALERT system upgrades are expected to be $3,601,000. The District may select this option if the assumed benefits of anticipated LID requirements are considered as part of the overall mitigation of development impacts.

The cost of the Antelope Creek and Secret Ravine projects plus the ALERT system upgrades are expected to be $6,835,000. The District may select this option if the assumed benefits of anticipated LID requirements are not considered as part of the overall mitigation of development impacts due to uncertainty in the implementation criteria and long term effectiveness because of maintenance considerations.

The cost of all five projects plus the ALERT system upgrades are expected to be $9,794,000. The District may select this option based on various combinations of considerations related to: 1) uncertainty in the anticipated LID requirements and LID effectiveness, 2) appropriateness to consider mitigation for impacts at locations other than Vernon Street, and 3) uncertainty in the ability to achieve the amount of peak flow mitigation from the Antelope Creek and Secret Ravine projects indicated as being potentially feasible in the planning level evaluation performed for the Plan Update.

4.8 POLICY RECOMMENDATIONS

The Plan Update identified that local on-site detention basins typically do not provide regional mitigation for increases in runoff and can actually exacerbate regional flood flows by delaying the increased runoff from the development to coincide with the surrounding natural flows. As a result of superposition, the detained and natural flows can be higher than had the increased development flows been released earlier. However, removal of local detention requirements can only be permitted if it is confirmed that there would not be any localized unacceptable increase in discharge rate. This Plan Update recommends application of Low Impact Design (LID) principles that promote infiltration as a primary means of on-site mitigation, and the system modeling tools developed for this Plan Update provide a means to assess the impacts of major developments on the regional system to determine if credits are justified based on impacts differing from that assumed in the mitigation element of this Plan Update. Local on-site detention basins may be necessary in some circumstances to mitigate for local impacts that are not addressed through the application of LID measures. The impact of any proposed significant local detention on the regional system should be considered in the project planning process.

5.0 Funding Plan

5.0 FUNDING PLAN

This section presents the funding plan options for the Plan Update. The purpose of these options is to identify a potential set of funding sources to adequately fund the capital improvements envisioned in the Plan Update and to fund ongoing costs of operations and maintenance. The drainage facilities recommended in this Plan Update are designed to mitigate for future new development based on General Plan build-out conditions of the various governmental jurisdictions comprising the Dry Creek watershed. As detailed in other sections of this Plan Update, the Antelope Creek at Atlantic Street project could, by itself, mitigate for expected future peak flow impacts at Vernon Street. Other projects are presented to provide options for the District in the event that all of the expected potential benefits from the Antelope Creek project turn out to not be achievable, or if the District decides to pursue projects to further reduce flooding or to mitigate for potential flow increases at locations other than Vernon Street. Additionally, the funding plan considers the existing balance of development impact fees that have been collected and the impacts that have occurred from 1992 through 2010 that have not yet been fully mitigated.

In addition to the regional drainage impacts addressed in this update, in many cases there will be a need for additional on-site drainage improvements for individual properties. Both the costs to correct pre-1992 existing deficiencies and to address on-site drainage improvements on individual properties are not included in this funding plan because these costs have not been quantified.

Due to the fact that the Dry Creek watershed overlaps several jurisdictions it is important that each jurisdiction contributes its fair share of funding for the necessary drainage improvements. Each jurisdiction's fair share includes collection of the regional development impact fees described in this section. Because the proposed projects do not mitigate for impacts from development downstream from Placer County, only the portion of Sacramento County in the Dry Creek watershed that is upstream from Placer County (portions of Orangevale along Linda Creek) is considered in the calculations of the potential fees.

5.1 FUNDING MECHANISMS UTILIZED TO DATE

Since the original flood control plan was prepared in 1992, drainage improvements in Dry Creek have been funded with a combination of government grants and development impact fees. As they are collected, one time fees on new development are held in the Dry Creek Trust Fund and continue to be a part of the current funding plan. Due to the uncertainty of both the availability and amount of government grants, the primary options in this funding plan do not assume any grant funding.

5.2 FUNDING TO MITIGATE IMPACTS FROM NEW DEVELOPMENT

This funding plan update is based upon the principle that new development is responsible for mitigating, as much as possible, the drainage impacts it creates. A summary of current and future peak flow increases (impacts) due to development is provided in Table 28.

Table 28: Summary of Current and Future Peak Flow Increases due to Development

Timeframe	Net Impacts at Vernon Street (cfs increase)	Comments
1992 – Current	273	Net remaining impact after including completed mitigation measures
Current – Build-out	627	Estimated future impacts due to development
1992 – Build-out	900	

Potential mitigation measures and their associated estimated costs are presented in Table 29.

Table 29: Potential Mitigation Measures Identified by the Dry Creek Plan Update

Plan Identified Mitigation Measure	Estimated CFS Reduction at Vernon Street	Cost	Cost/Benefit
Antelope Creek @ Atlantic Street	825	$ 3,367,000	$4,000 / CFS Reduction
Secret Ravine @ Secret College Blvd	175	$ 3,234,000	$18,000 / CFS Reduction
Linda Creek @ Old Auburn Road	28	$ 932,000	$33,000 / CFS Reduction
Linda Creek @ Wedgewood Drive	13	$ 1,019,000	$78,000 / CFS Reduction
Linda Creek @ Auburn-Folsom Road	12	$ 1,008,000	$84,000 / CFS Reduction
Low Impact Development	174	Developer Provided	Not Applicable
ALERT System Upgrades	Not Applicable	$ 234,000	Not Applicable

Three options for the basis of a funding plan are provided with each consecutive option providing a slightly higher amount of peak flow mitigation at Vernon Street. Each option can be reasonably justified and the District can select which option they determine is most appropriate.

Option 1: Implementation of the Antelope Creek flood flow reduction project plus the ALERT system upgrades for an expected cost of $3,601,000. This option provides an estimated 999 cfs of peak flow reduction and assumes low impact development (LID) measures are fully implemented.

Option 2: Implementation of the Antelope Creek and Secret Ravine flood flow reduction projects plus the ALERT system upgrades for an expected cost of $6,835,000. This option provides a more conservative total amount of peak flow reduction as compared to Option 1, with up to 1,174 cfs of reduction at Vernon Street, including the benefit assumed from LID measures.

Option 3: Implementation of all five flood flow reduction projects plus the ALERT system upgrades for an expected cost of $9,794,000. This option provides the largest amount of peak flow reduction of all three options at up to 1,227 cfs at Vernon Street, including the benefit assumed from LID measures.

Development impact fees are presented for each of these three options considering that the existing Dry Creek Trust fund balance will pay for a portion of the Antelope Creek project to mitigate for unmitigated impacts to-date.

As such, three primary funding plan options are provided based on an assumption that new development pays one time fees in a sufficient amount, once combined with current remaining fees in the Dry Creek Trust fund, to fund the costs of the option selected. A fourth funding plan option, Option 1A, is based on Option 1, but assumes costs are reduced by $500,000, an amount of aid expected to be obtained from Proposition 84 grant funding specifically for the Antelope Creek flood flow reduction project. This Plan Update provides four alternative funding plan schedules of development fees (and two additional alternative schedules could also be calculated for Options 2 and 3 reduced by expected grant funding); the one selected by the District would replace the fee schedule that is currently in place in each of the jurisdictions of the Dry Creek watershed.

Currently, each of the jurisdictions in the watershed has its own set of development fees; and, those fees vary depending on the sub-basin in which the development is located. Each of the alternative updated funding plans is a uniform schedule of fees across all sub-basins in the watershed. The reason for this change is that the updated hydrology models indicate that it would be more appropriate for the costs of drainage facilities to be shared equally for properties throughout the watershed upstream from the point where Dry Creek crosses the Placer County and Sacramento County line. The potential projects were conceived using a watershed-wide approach and the potential benefits of the projects were also considered based on regional benefits, not only benefits local to the projects. Therefore, it would not be appropriate to have a variable allocation of the costs of the recommended drainage facilities among the various sub-basins in the Dry Creek watershed. Furthermore, a uniform fee schedule will provide for easier administration by the multiple jurisdictions.

Each jurisdiction currently collects a separate development fee for single family residential (defined as four dwelling units per acre and less), high density residential (greater than four dwelling units per acre), and commercial/industrial uses. The development fees vary for each of these land uses due to the relative drainage impacts, measured by impervious surface area, and adjusted for typical densities of development. Sacramento County has a fee schedule that is structured differently than the other jurisdictions.

On a preliminary basis, the development fees for the four options are listed in Table 30, and compared to the current fee.

Table 30: 2010 Development Fees and Development Fees for Three Options

Use Category	Current Development Fee[1] (2010)	Option 1	Option 1A	Option 2	Option 3
Single Family Residential	$224 to $826/unit	$174/unit	$134/unit	$430/unit	$664/unit
High Density Residential	$113 to $231/unit	$71/unit	$55/unit	$177/unit	$274/unit
Commercial/ Industrial	$1,350 to $2,763/acre	$360/acre	$278/acre	$890/acre	$1,374/acre

Note 1: 2010 fee schedule for all jurisdictions except Sacramento County. Sacramento County collects fees differently than the other jurisdictions.

These preliminary development fee estimates have been prepared consistent with AB 1600 (Government Code §66000 et. seq.) requirements based on the estimated impervious area applicable to each land use. A final set of development fees for the selected option will be fully documented by an AB 1600 nexus study, which will be completed before a new fee schedule is formally adopted.

One challenge of development fees as a source of funding is that they fluctuate over time – fee revenues are high when real estate conditions are strong and low when real estate conditions are weak, as is the case today. However, because the basis for collecting development fees is to mitigate impacts from new development, the variability of development fee revenues is not necessarily problematic for the funding of those drainage facilities mitigating new development impacts. In some cases, private development can provide up-front funding for regional drainage facilities if those facilities are required in order for a specific development project to proceed, such as a large subdivision. In these cases, the private developer might be eligible for future fee credits and/or reimbursements from other developments that benefit from these improvements. Fees can be adjusted over time based on the Engineering News Record Construction Cost Index to address future project cost increases.

5.3 FUNDING TO CORRECT EXISTING DEFICIENCIES AND O&M COSTS

The Plan Update determined that the mitigation to-date has not fully mitigated for impacts to-date and that existing deficiencies remain in the flood control system from pre-1992 Plan condition. Using the existing development fee balance to fund part of the Antelope Creek flood flow reduction project could essentially fully mitigate for the

impacts from 1992 to 2010 that have not been fully mitigated. The Plan Update concludes that non-structural flood control measures, such as the elevation and buy-out program, will be the most cost effective method to correct pre-1992 existing deficiencies. Elevation and buy-out programs are typically funded through federal or state grant programs that require local matching funds from the private property owner for up to 25 percent of the total cost. The number of private properties that may ultimately participate in an elevation and buy-out program is not known and, considering this and potential federal funding sources, the costs of such a program has not been quantified.

The District's costs for ongoing operations and maintenance (O&M) will increase as additional drainage facilities are built and as upgrades are made to the ALERT system. Current annual maintenance costs for the ALERT system and the Miners Ravine Off-Channel Detention Basin are approximately $46,000 per year. Additionally, the estimated life cycle replacement cost for the Miners Ravine Off-Channel Detention Basin is $32,000 per year, for total O&M and capital replacement costs of $78,000 per year. Inclusion of the Antelope Creek flood flow reduction project and ALERT system upgrades would result in total O&M and capital replacement costs of $174,000 per year (see Appendix L for further detail).

The funding mechanisms that are potentially available to the jurisdictions to fund the costs to correct existing deficiencies and ongoing O&M costs include the following:

- County Service Areas (CSA)
- Mello Roos Community Facilities Districts (CFD)
- Utility Fees
- Government Grants
- General Funds
- In-kind services from local jurisdictions

Since each jurisdiction in the Dry Creek watershed faces a unique set of local circumstances, the funding solutions that are utilized by one jurisdiction may not necessarily be ideal for another. For example, Mello Roos CFD financing is often utilized in large land development projects because in those projects land is typically controlled by a small number of property owners and, therefore, the voting requirements needed to adopt the district are more easily satisfied. Thus, jurisdictions that have the potential for large land development projects are more likely to be able to utilize CFD financing than those that do not.

The costs to fund ongoing O&M and life cycle replacement costs should be shared equitably among the jurisdictions that comprise the Dry Creek watershed. One approach to such an allocation is to spread the costs based on a proportionate share of impervious area. Table 31 presents two options for making the allocations. Option 1 is to base the allocation on the change in impervious area from 1992 to build-out, considering the time frame of the 1992 Plan and this Plan Update. Option 2 is to base the allocation on the total impervious area that is expected at build-out. Actual O&M

and life cycle costs would need to be adjusted over time as the projects are implemented. Table 32 lists the allocation of current O&M and facilities replacement costs ($78,000 per year) based on the options presented in Table 31 and Table 33 similarly lists the allocation of O&M and facilities replacement costs with the implementation of the Antelope Creek flood flow reduction project and ALERT system upgrades ($174,000 per year).

A final set of allocation options for O&M will be fully documented by the future AB 1600 nexus study described in Section 5.2.

Table 31: Basis for O&M Cost Allocation Options

Jurisdiction	Added Impervious Area 1992 to Build-out (sq. mi)	Option 1 Percent of Total	Impervious Area at Build-out (sq. mi)	Option 2 Percent of Total
Placer County	4.98	36	7.74	35
City of Roseville	4.78	28	6.94	32
Sacramento County	0.49	3	0.74	3
City of Rocklin	3.06	27	5.08	23
Town of Loomis	1.04	6	1.46	7
Total: Dry Creek Watershed	**14.35**	**100**	**21.96**	**100**

Table 32: Allocation Options for Current O&M and Capital Replacement Costs[1]

Jurisdiction	Option 1 Allocation (%)	Option 1 Allocation ($/yr)	Option 2 Allocation (%)	Option 2 Allocation ($/yr)
Placer County	36	$ 28,080	35	$ 27,300
City of Roseville	28	$ 21,840	32	$ 24,960
Sacramento County	3	$ 2,340	3	$ 2,340
City of Rocklin	27	$ 21,060	23	$ 17,940
Town of Loomis	6	$ 4,680	7	$ 5,460
Total: Dry Creek Watershed	**100**	**$ 78,000**	**100**	**$ 78,000**

Note 1: Costs expressed in 2010 dollars.

Table 33: Allocation Options for O&M and Capital Replacement Costs after Completion of Antelope Creek Project and ALERT Upgrades

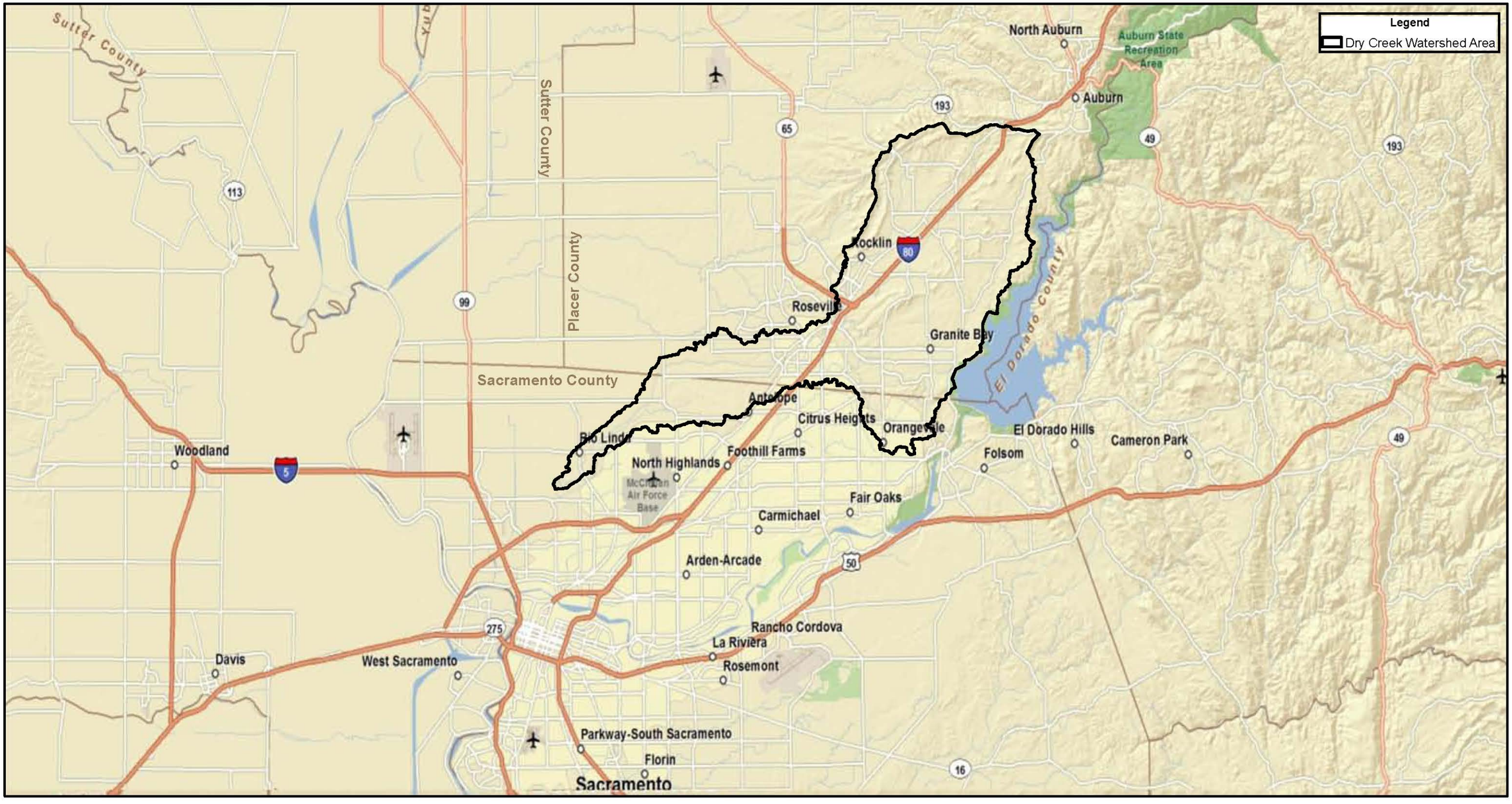
Jurisdiction	Option 1 Allocation (%)	Option 1 Allocation ($/yr)	Option 2 Allocation (%)	Option 2 Allocation ($/yr)
Placer County	36	$ 62,640	35	$ 60,900
City of Roseville	28	$ 48,720	32	$ 55,680
Sacramento County	3	$ 5,220	3	$ 5,220
City of Rocklin	27	$ 46,980	23	$ 40,020
Town of Loomis	6	$ 10,440	7	$ 12,180
Total: Dry Creek Watershed	**100**	**$174,000**	**100**	**$174,000**

5.4 IMPLEMENTATION ROLES

The District will continue to have responsibility for administering the flood control plan including planning, design, and construction of regional flood control facilities, and maintaining the hydrologic computer models. Each of the independent jurisdictions comprising the Dry Creek watershed will also play an important role in implementing the plan; each will be responsible for updating and collecting development fees consistent with this plan update so that the fee revenue will be adequate to construct drainage facilities as new development occurs. In addition, local solutions will be needed to fund the costs to correct existing deficiencies and ongoing operations and maintenance. As discussed, there are various funding mechanisms that could be utilized to fund these costs and the appropriate solution will depend on the particular circumstances facing each jurisdiction. As is always the case with regional drainage plans involving multiple jurisdictions, coordination and cooperation among the jurisdictions is essential to successful implementation of the plan.

Plates

DRY CREEK WATERSHED VICINITY MAP



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

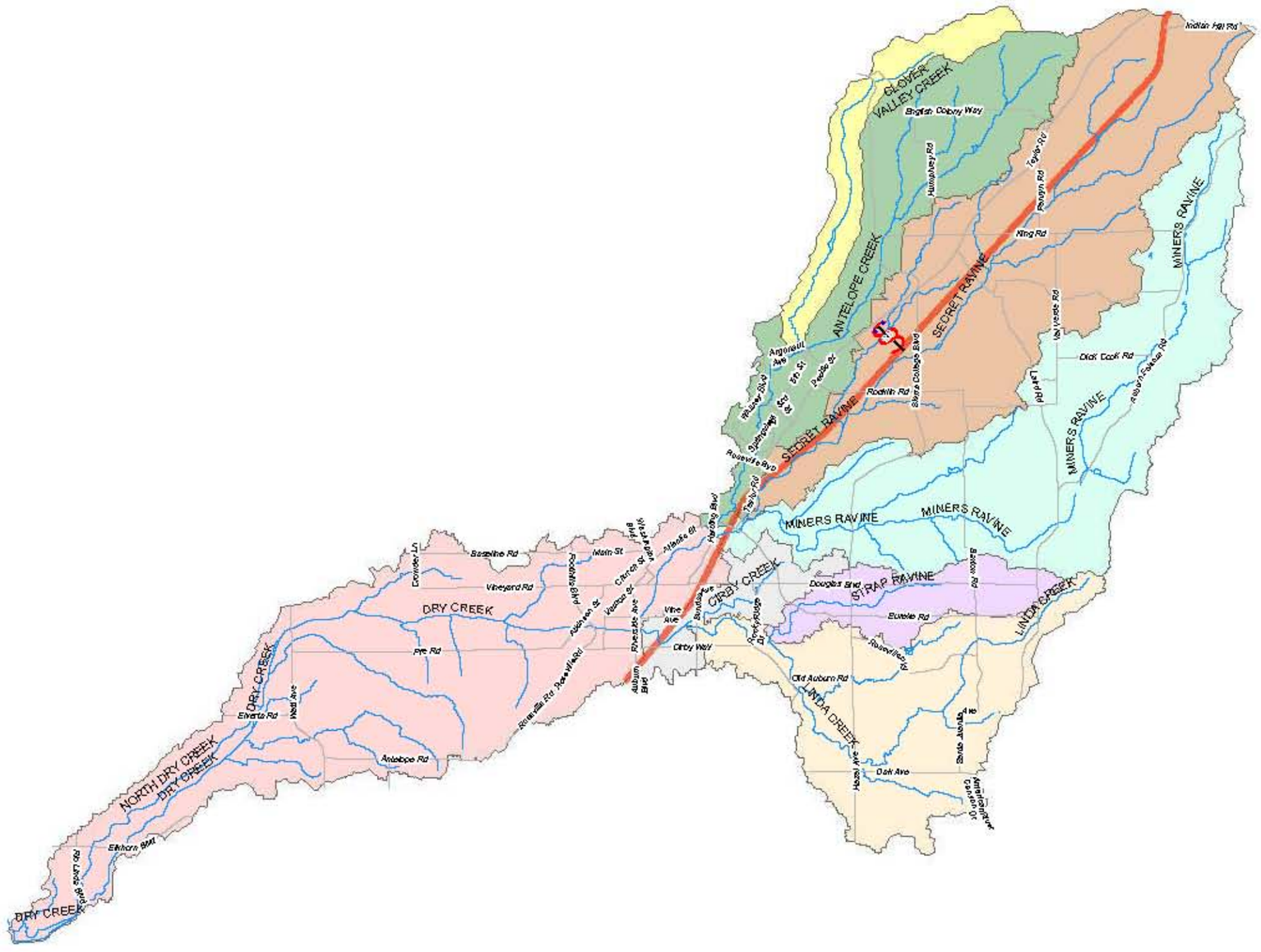
CIVIL ENGINEERING SOLUTIONS, INC.

0 2 4 Miles

1 inch = 4 miles

PLATE 1

DRY CREEK WATERSHED GROUPS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

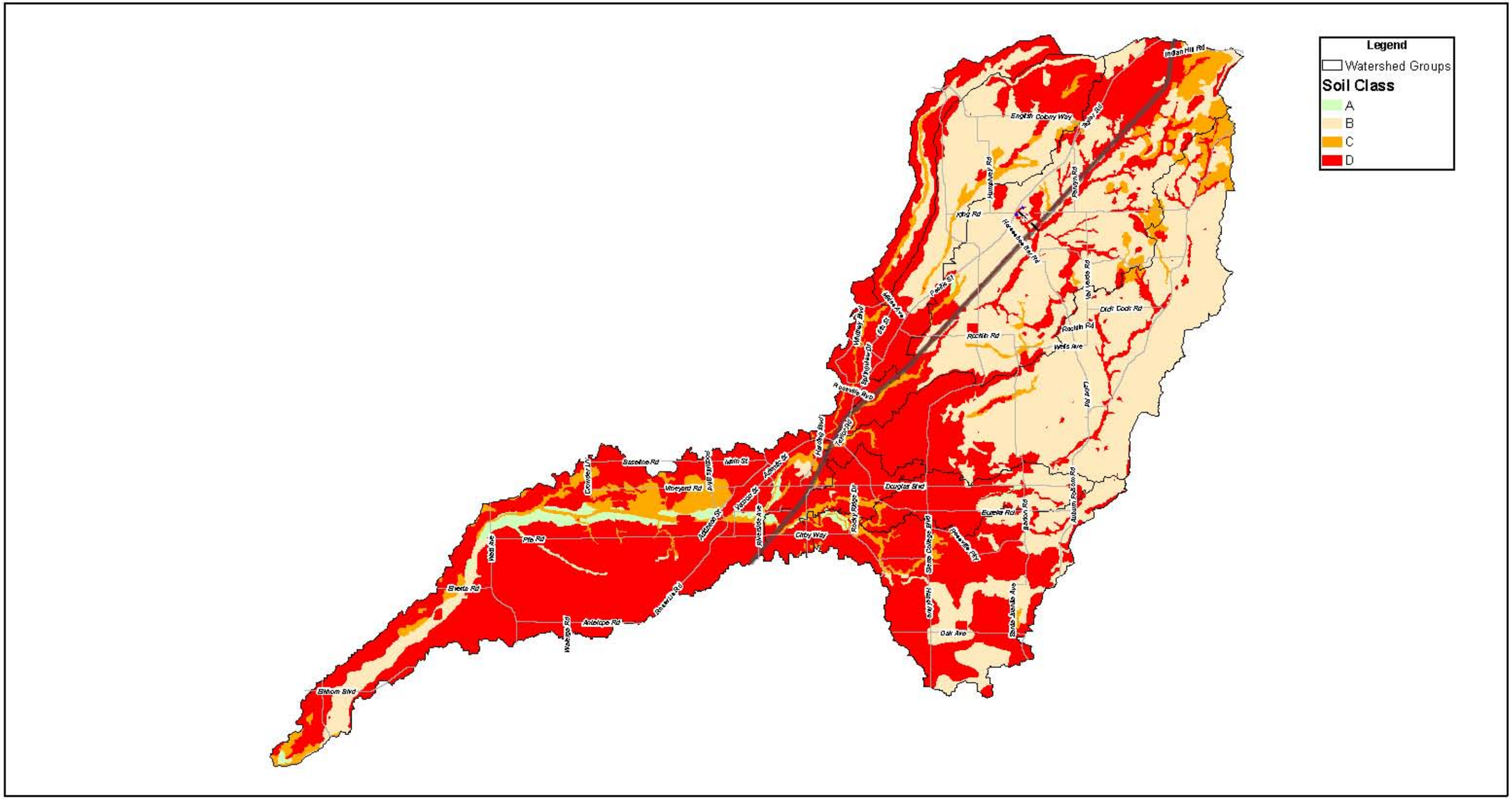
CIVIL ENGINEERING SOLUTIONS, INC.

0 1 2 4 Miles

1 inch = 2 miles

PLATE 2

DRY CREEK WATERSHED HYDROLOGIC SOIL GROUPS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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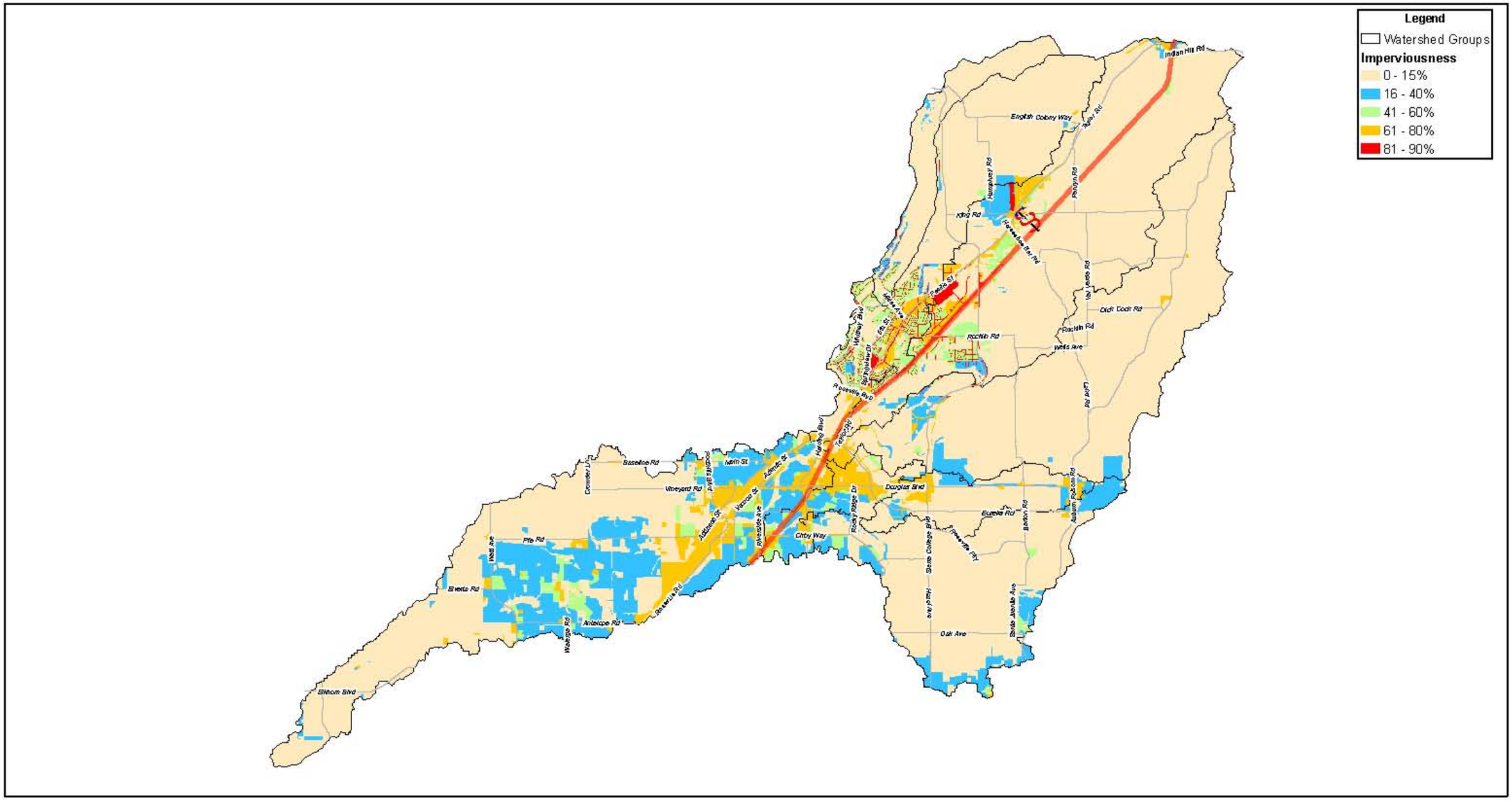
CIVIL ENGINEERING SOLUTIONS, INC.

0 1 2 4 Miles

1 inch = 2 miles

PLATE 3

DRY CREEK WATERSHED 1992 LAND USE IMPERVIOUSNESS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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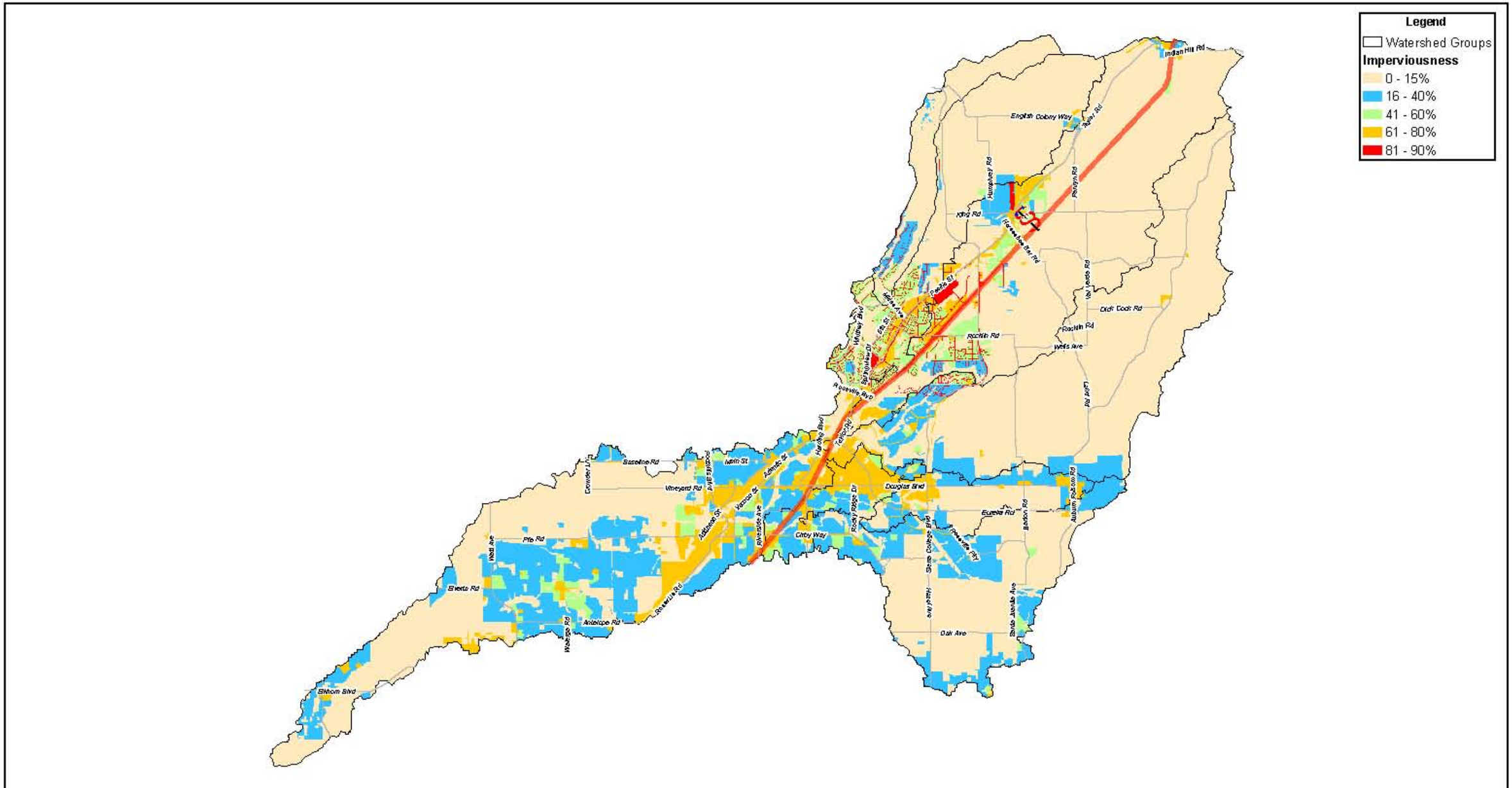
0 1 2 4 Miles

1 inch = 2 miles

PLATE 4

DRY CREEK WATERSHED 2007 LAND USE IMPERVIOUSNESS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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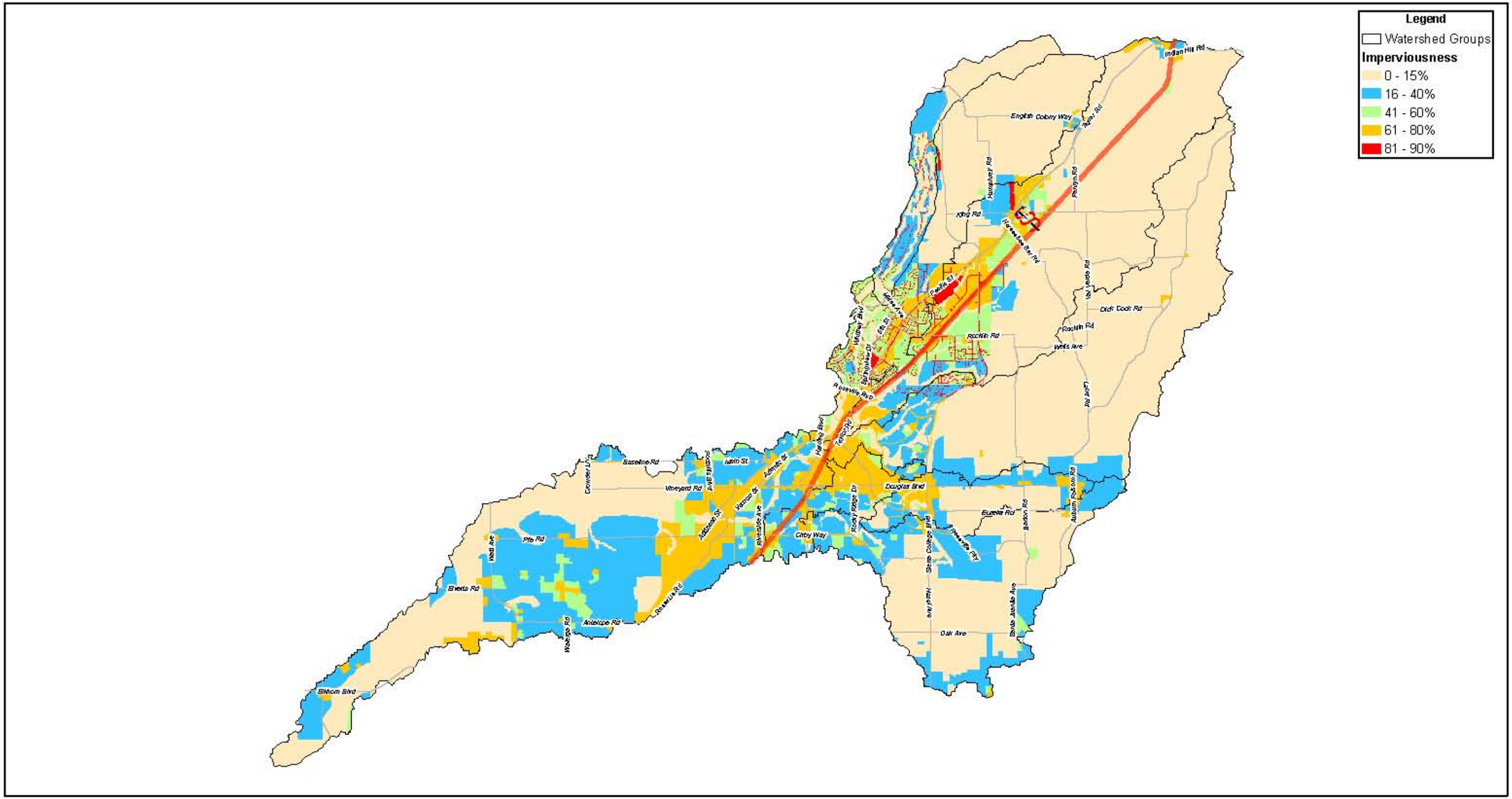
0 1 2 4 Miles

1 inch = 2 miles

PLATE 5

DRY CREEK WATERSHED GENERAL PLAN BUILD-OUT IMPERVIOUSNESS



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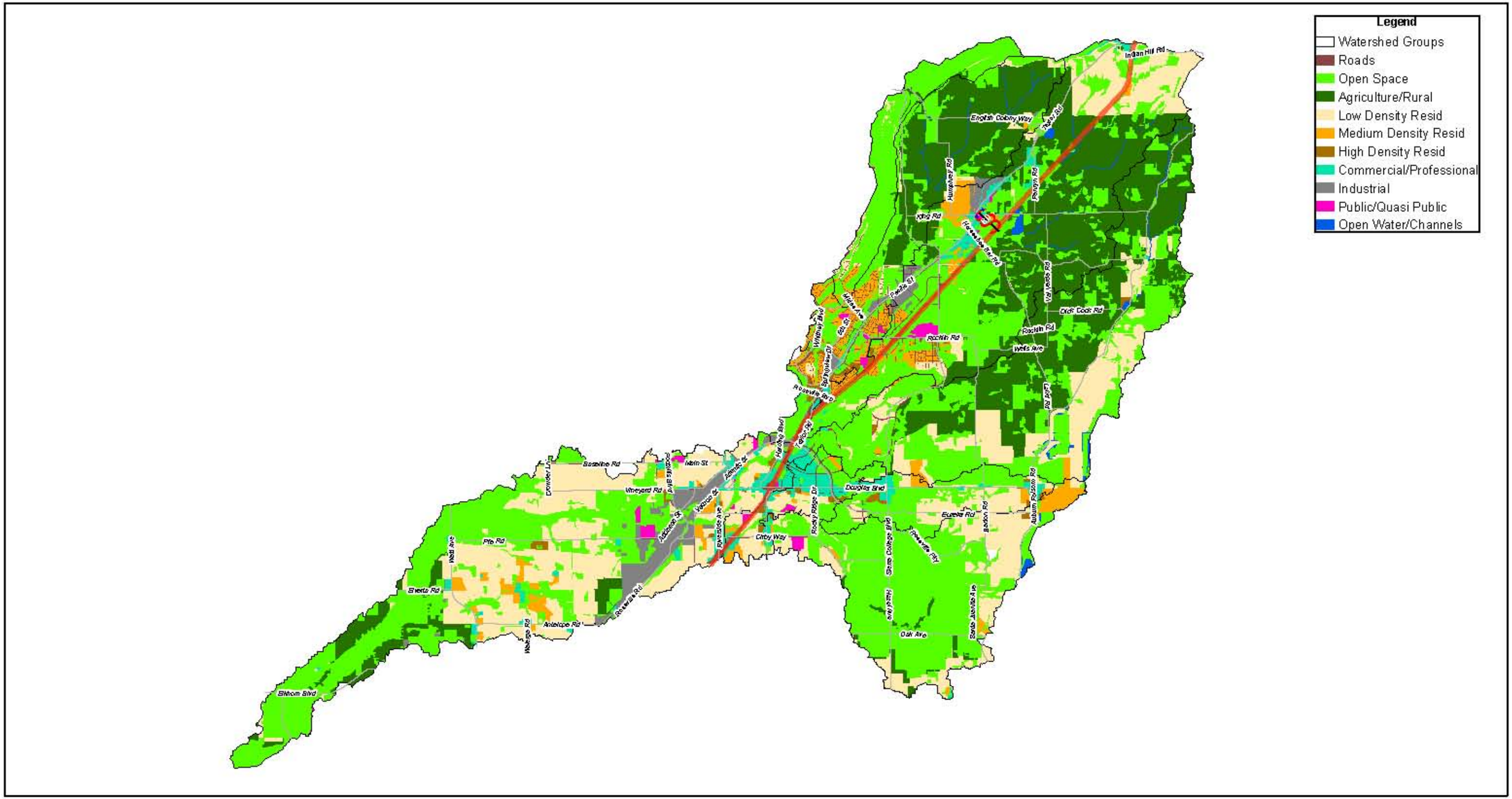
0 1 2 4 Miles

1 inch = 2 miles

PLATE 6

DRY CREEK WATERSHED 1992 BASELINE LAND USE



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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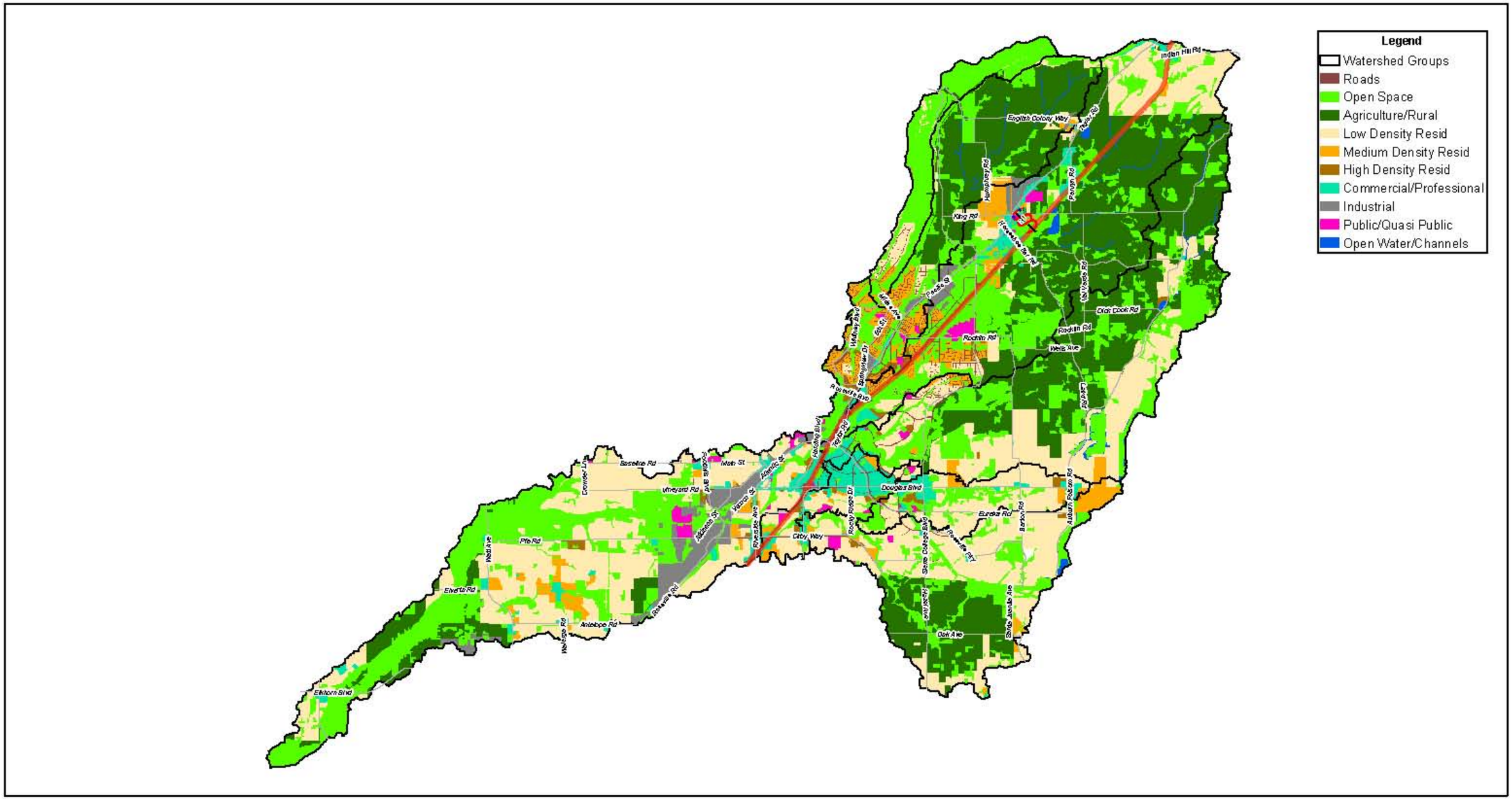
0 1 2 4 Miles

1 inch = 2 miles

PLATE 7

DRY CREEK WATERSHED 2007 CURRENT LAND USE



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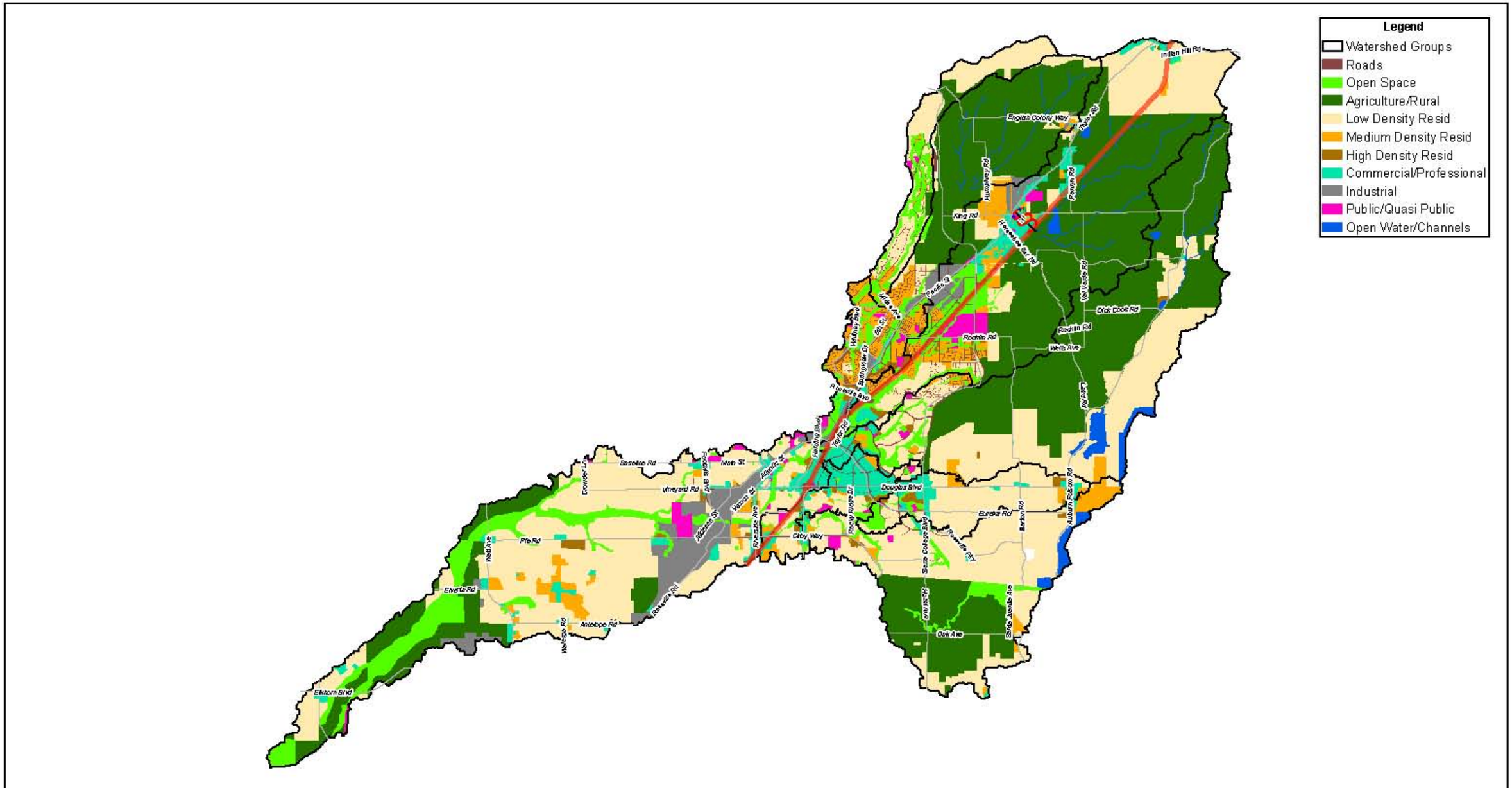
0 1 2 4 Miles

1 inch = 2 miles

PLATE 8

DRY CREEK WATERSHED GENERAL PLAN BUILD-OUT LAND USE



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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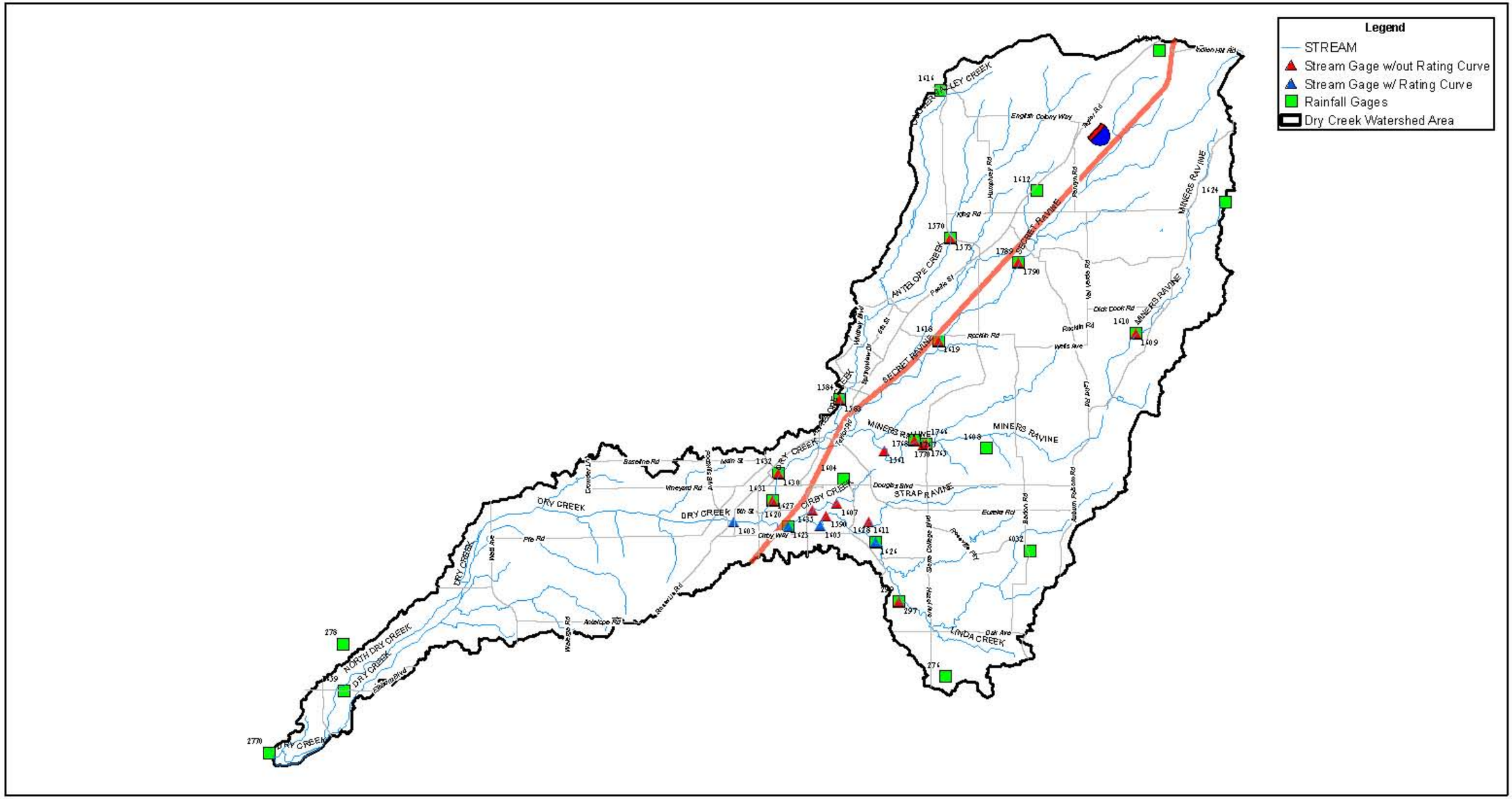
0 1 2 4 Miles

1 inch = 2 miles

PLATE 9

DRY CREEK WATERSHED STREAM AND RAINFALL GAGES



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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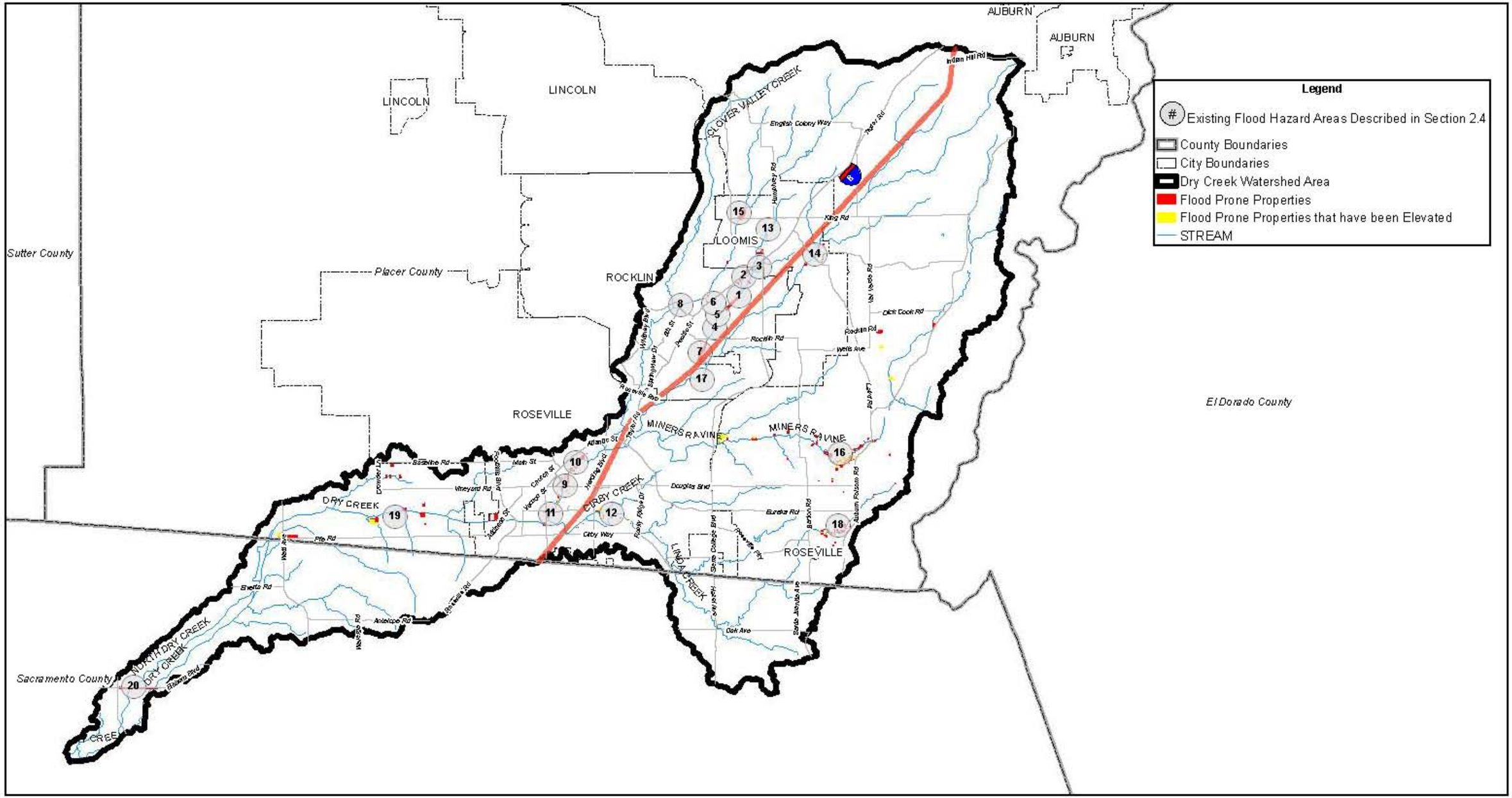
0 1 2 4 Miles

1 inch = 2 miles

PLATE 10

DRY CREEK WATERSHED FLOOD HAZARD LOCATIONS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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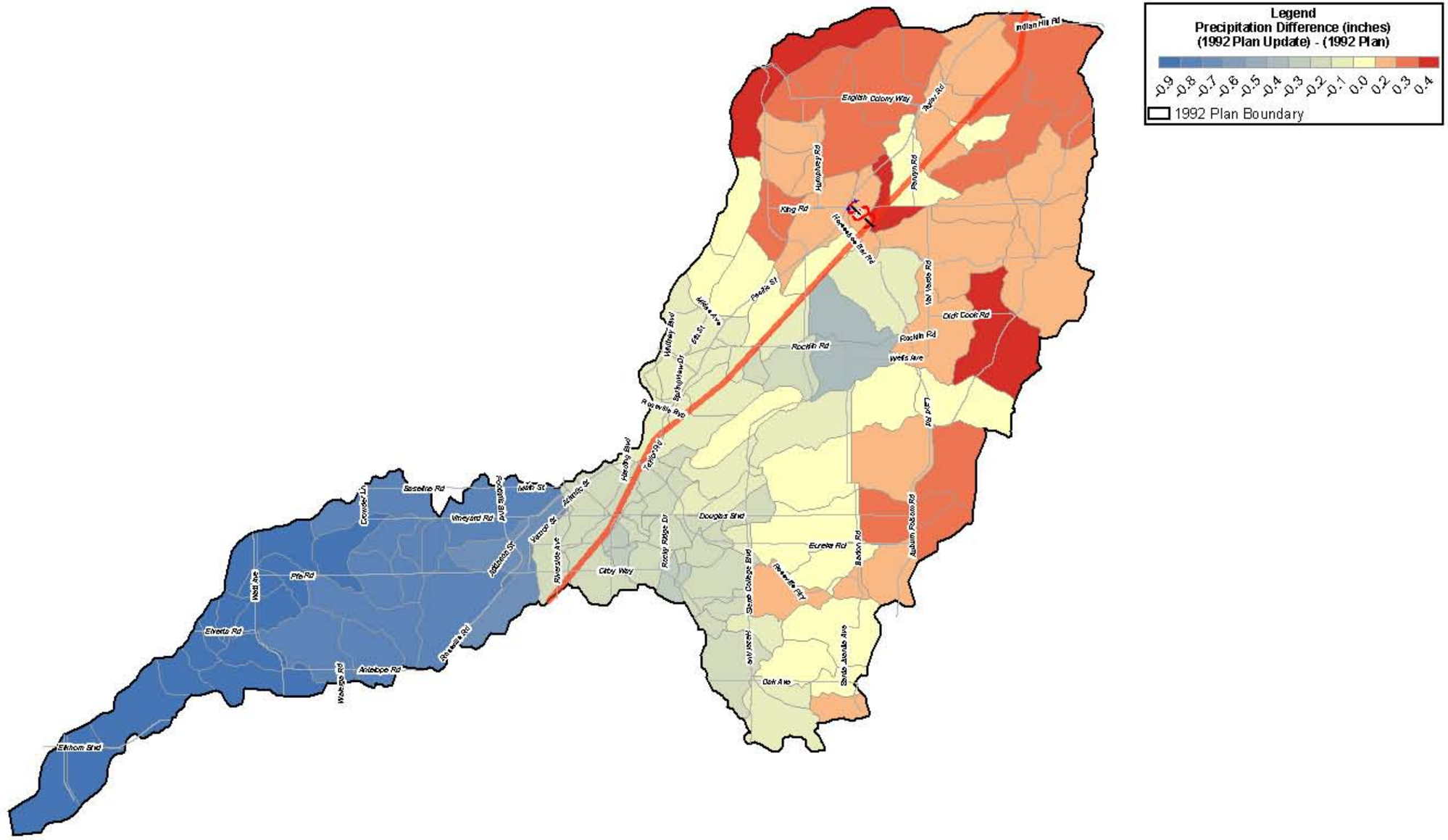
0 1 2 4 Miles

1 inch = 2 miles

PLATE 11

DRY CREEK WATERSHED PRECIPITATION COMPARISON BETWEEN PLAN UPDATE AND 1992 PLAN



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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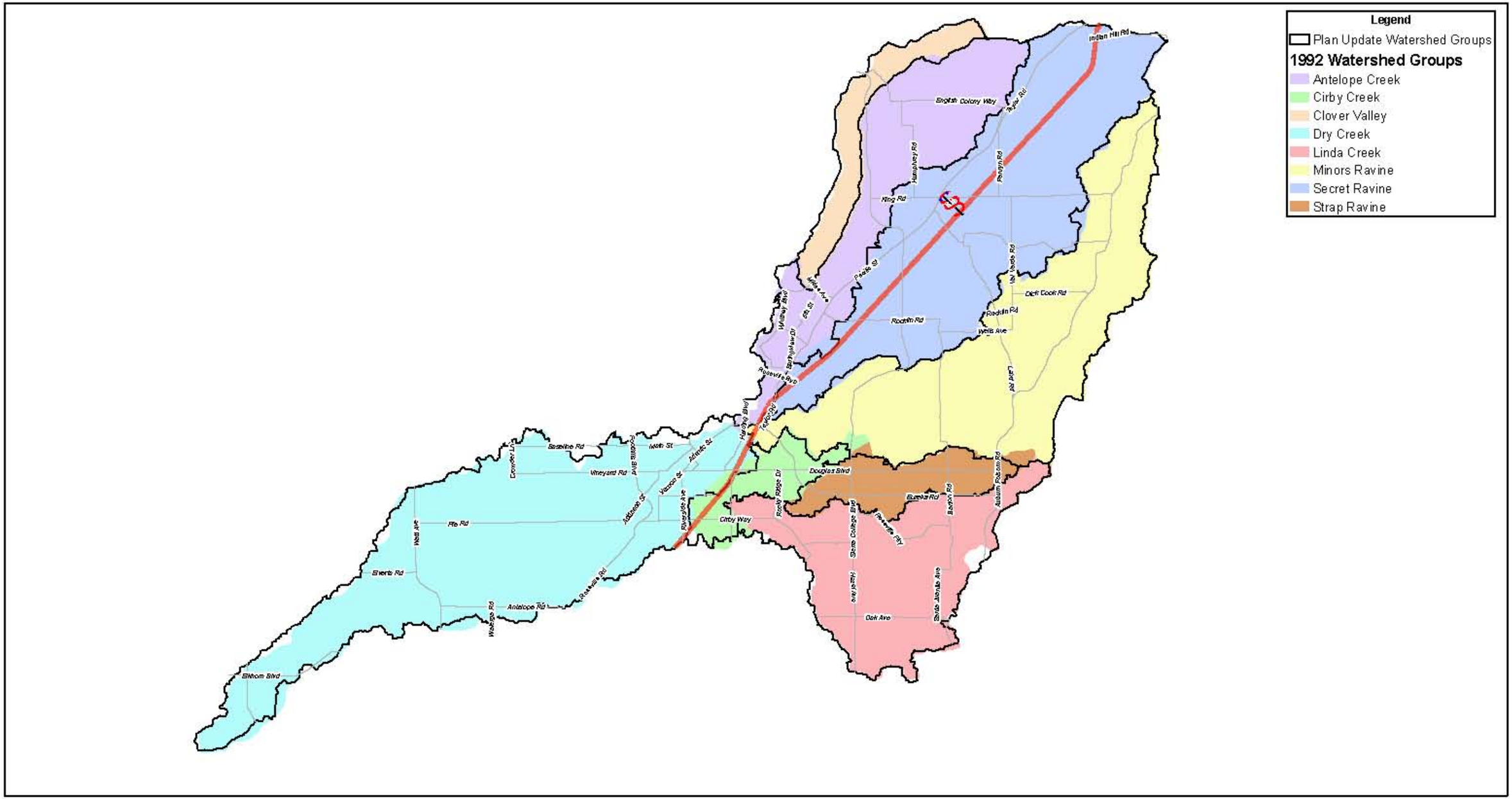
0 1 2 4 Miles

1 inch = 2 miles

PLATE 12

DRY CREEK WATERSHED DELINEATION COMPARISON BETWEEN 1992 PLAN AND PLAN UPDATE



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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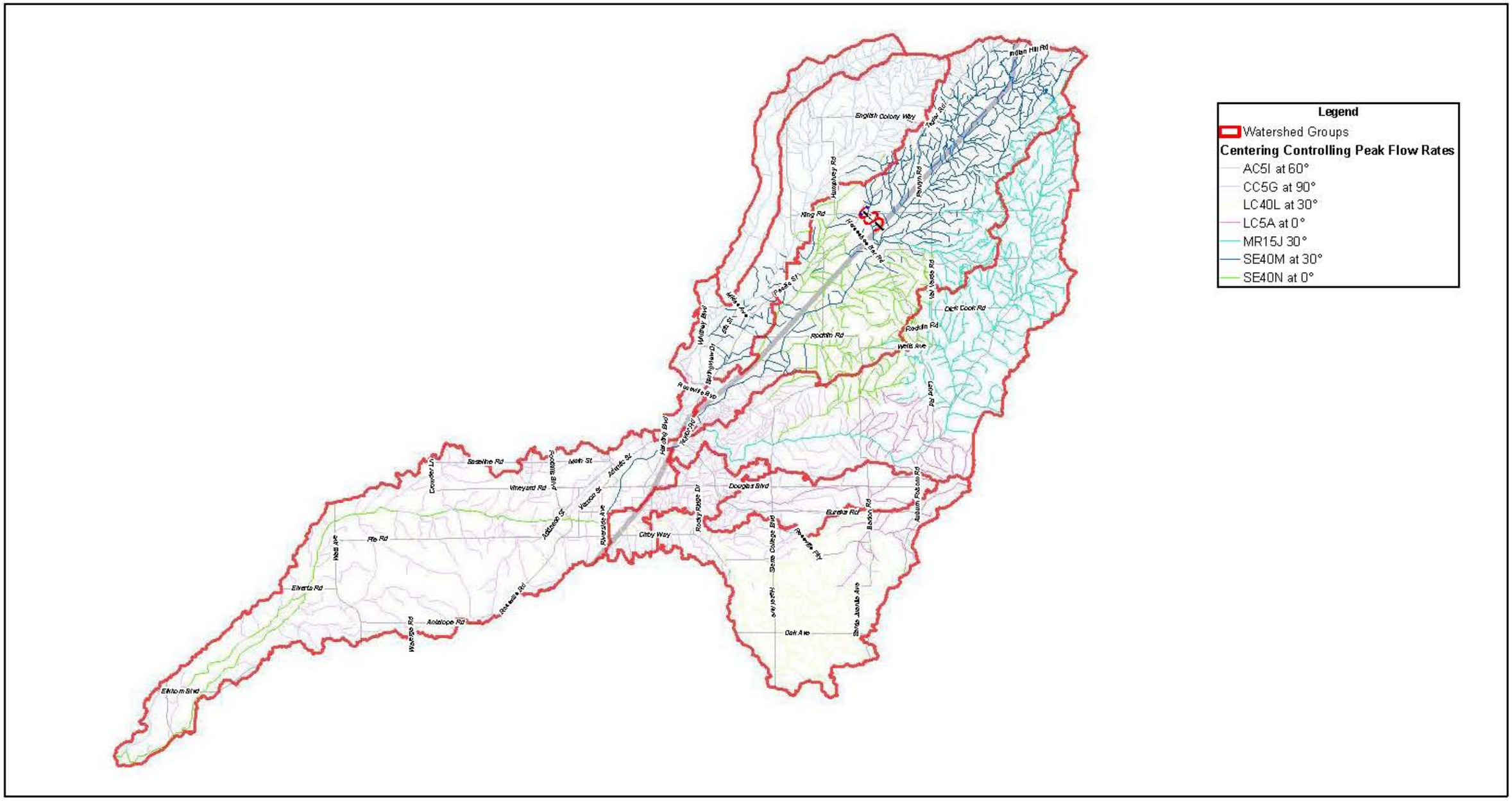
0 1 2 4 Miles

1 inch = 2 miles

PLATE 13

LOCATIONS WHERE STORM CENTERINGS CONTROL PEAK FLOW RATES



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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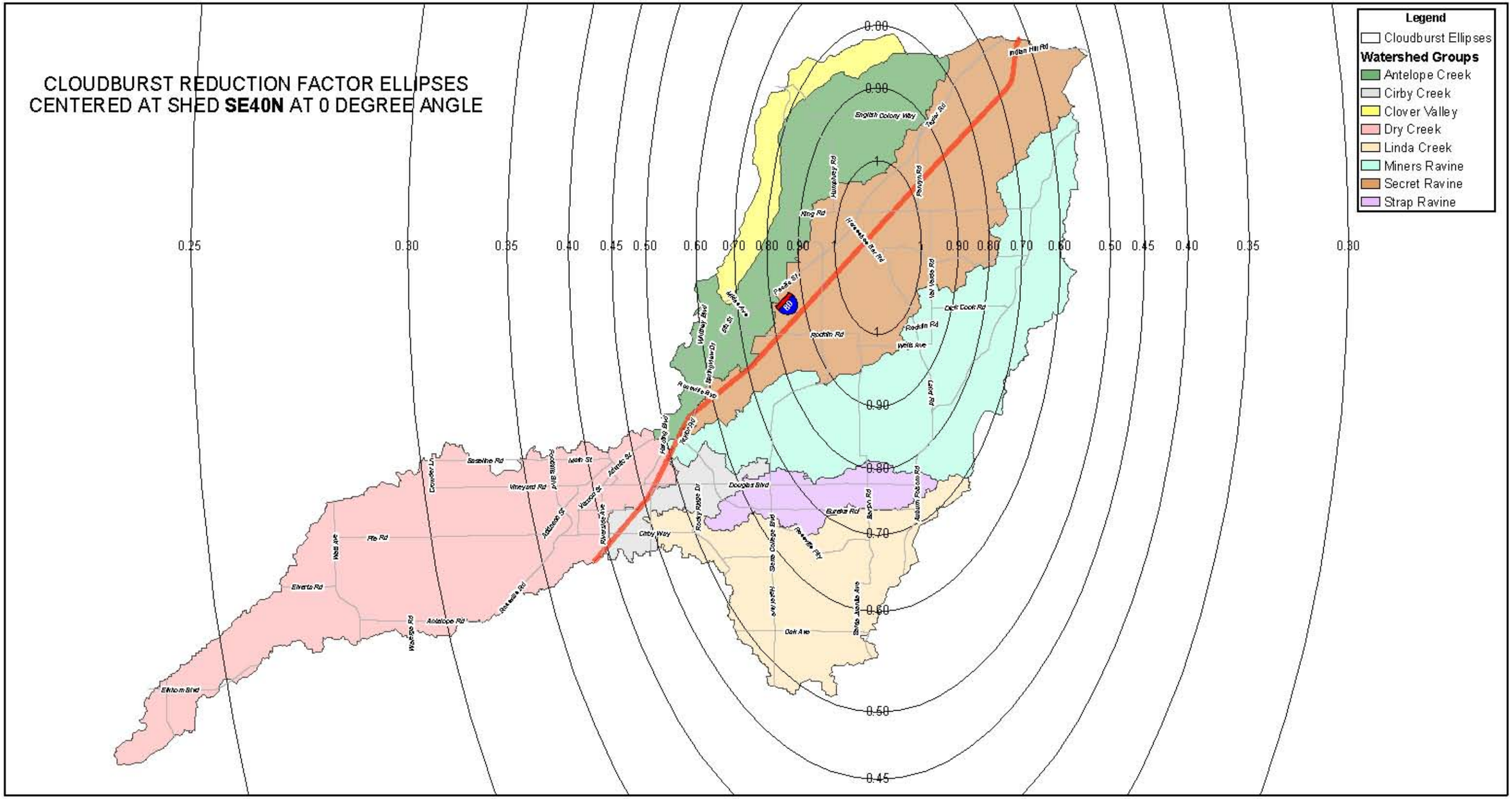
0 1 2 4 Miles

1 inch = 2 miles

PLATE 14

DRY CREEK WATERSHED STORM CENTERING - SE40N AT 0˚



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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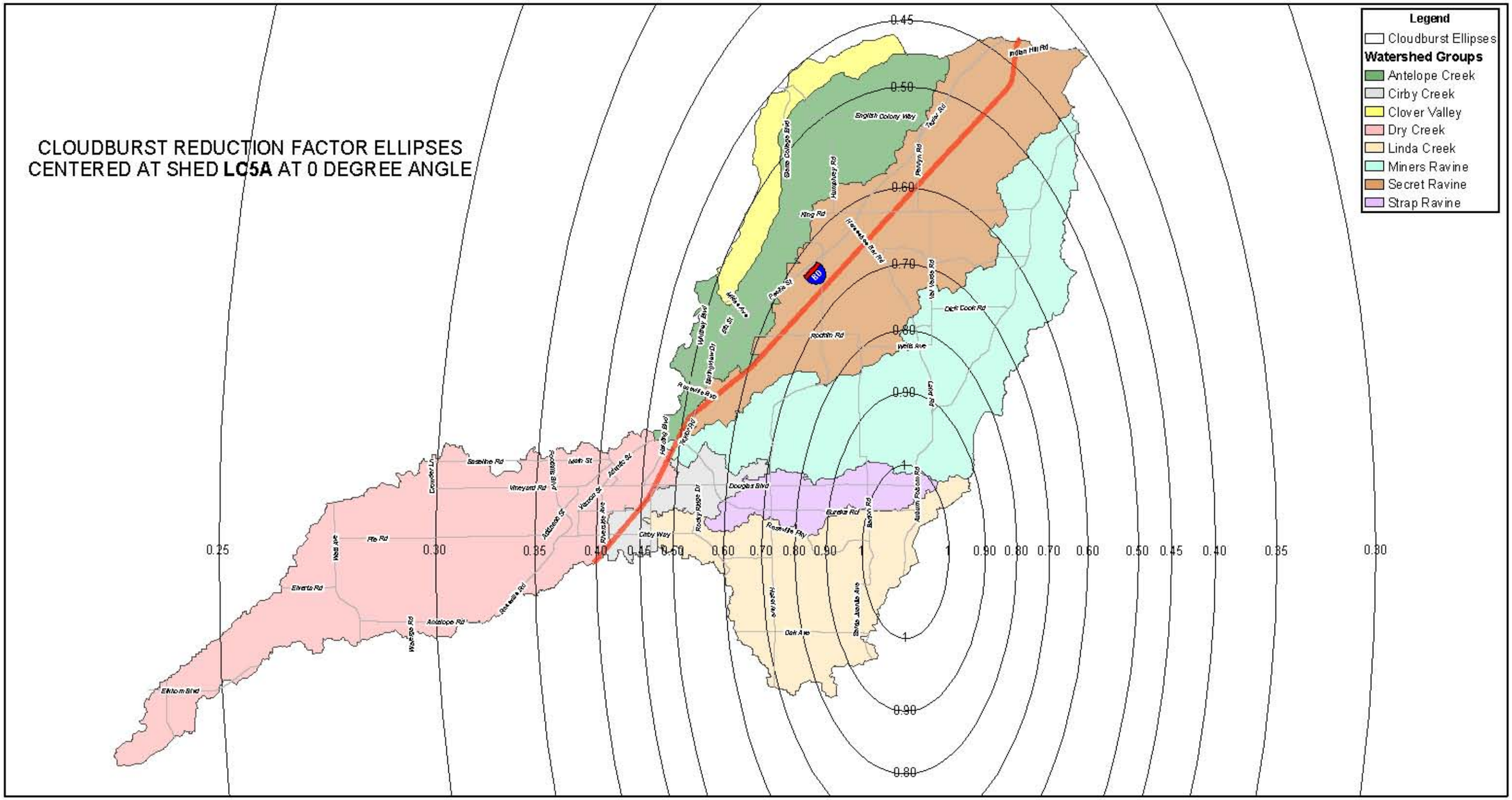
0 1 2 4 Miles

1 inch = 2 miles

PLATE 15

DRY CREEK WATERSHED STORM CENTERING -LC5A AT 0˚



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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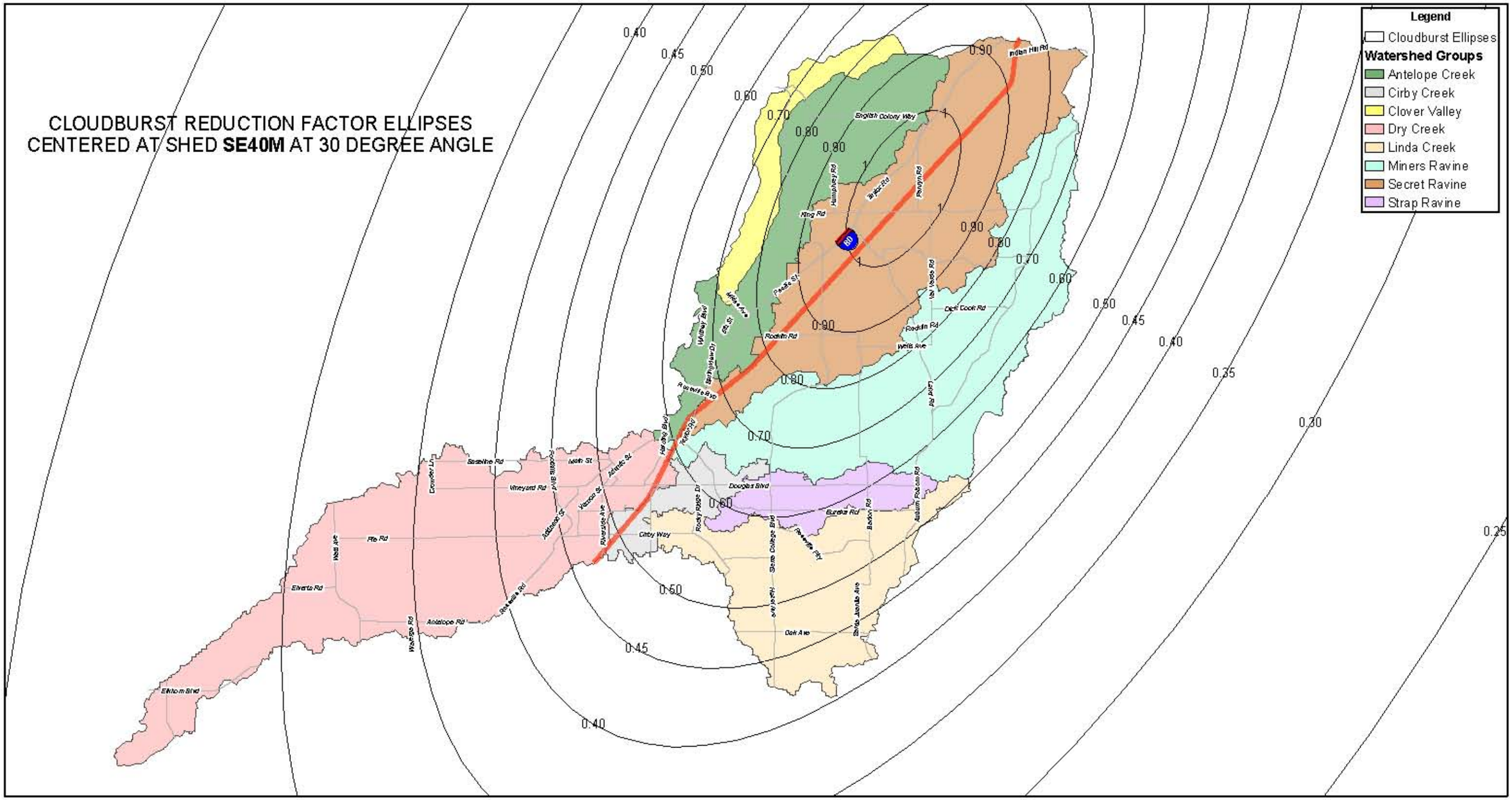
0 1 2 4 Miles

1 inch = 2 miles

PLATE 16

DRY CREEK WATERSHED STORM CENTERING -SE40M AT 30˚



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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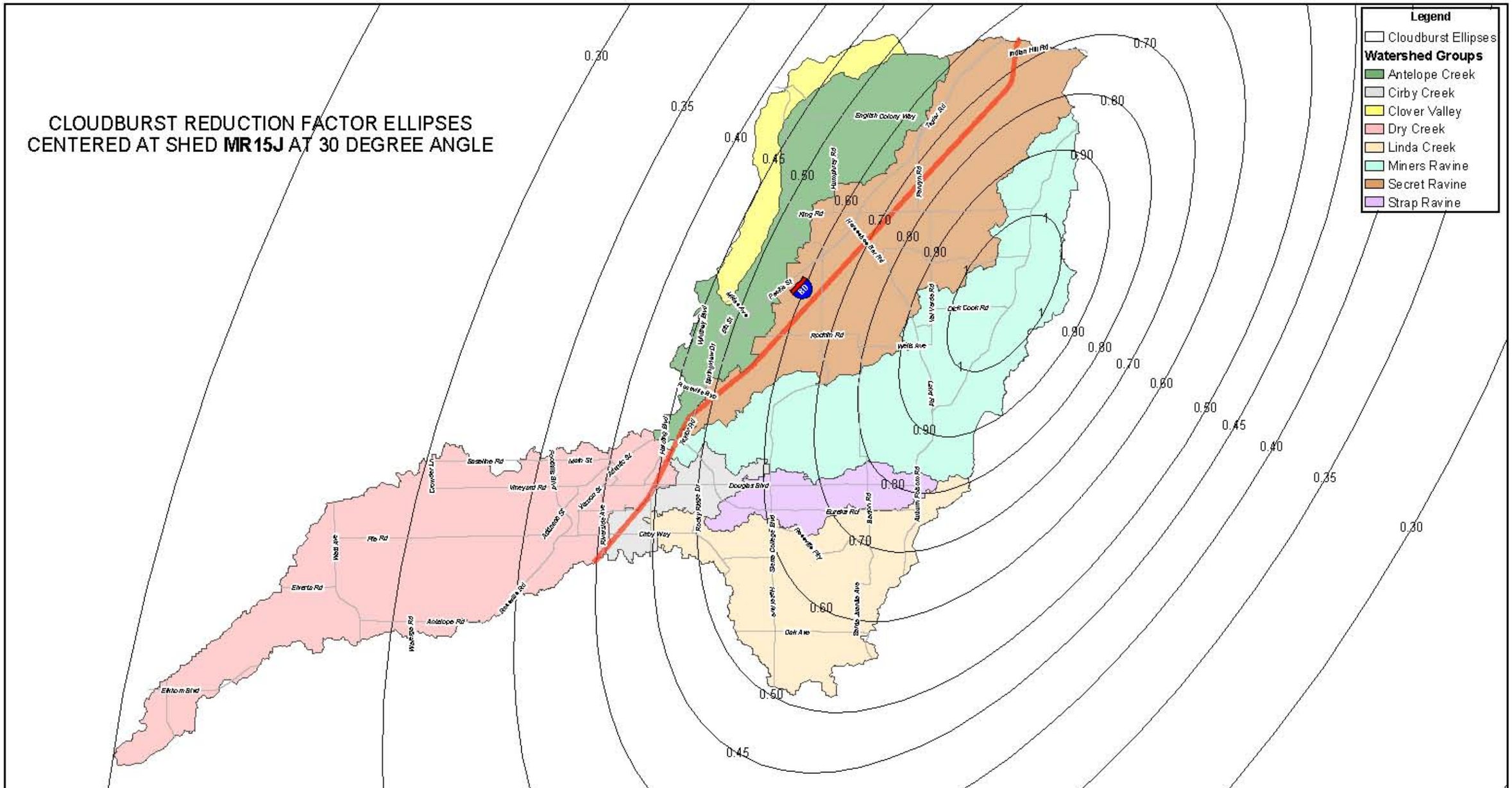
0 1 2 4 Miles

1 inch = 2 miles

PLATE 17

DRY CREEK WATERSHED STORM CENTERING - MR15J AT 30˚



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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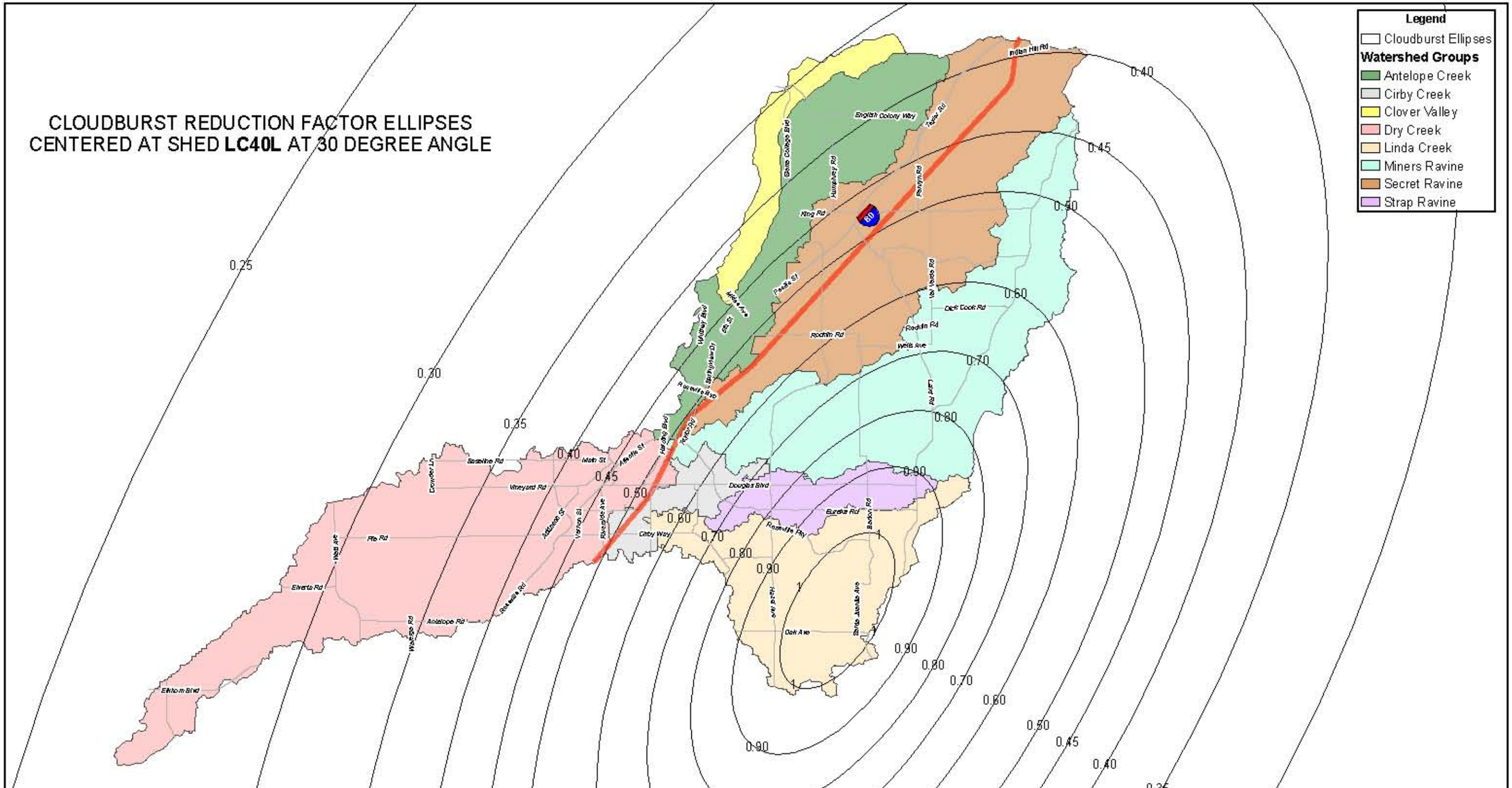
0 1 2 4 Miles

1 inch = 2 miles

PLATE 18

DRY CREEK WATERSHED STORM CENTERING - LC40L AT 30˚



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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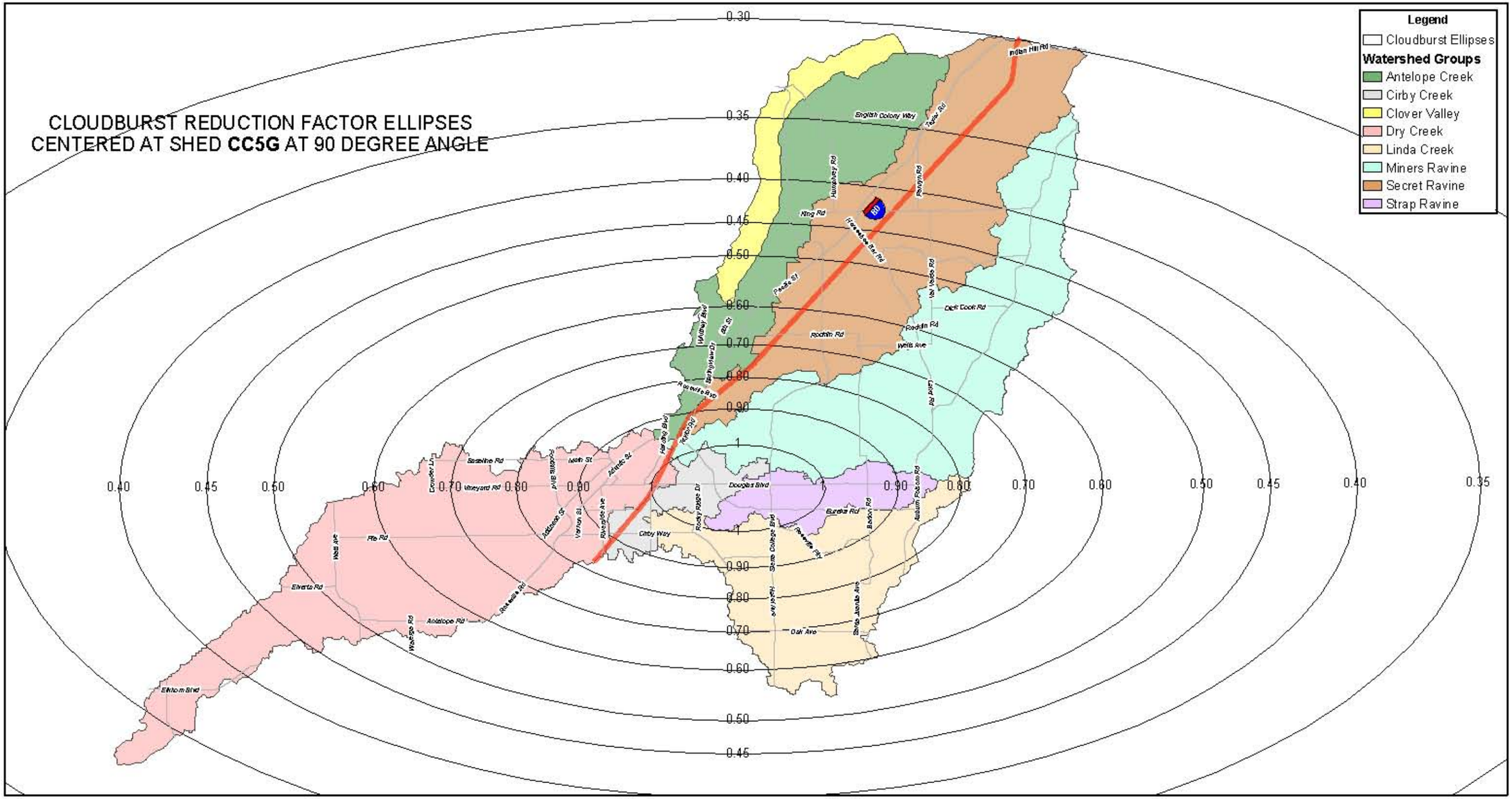
0 1 2 4 Miles

1 inch = 2 miles

PLATE 19

DRY CREEK WATERSHED STORM CENTERING - CC5G AT 90˚



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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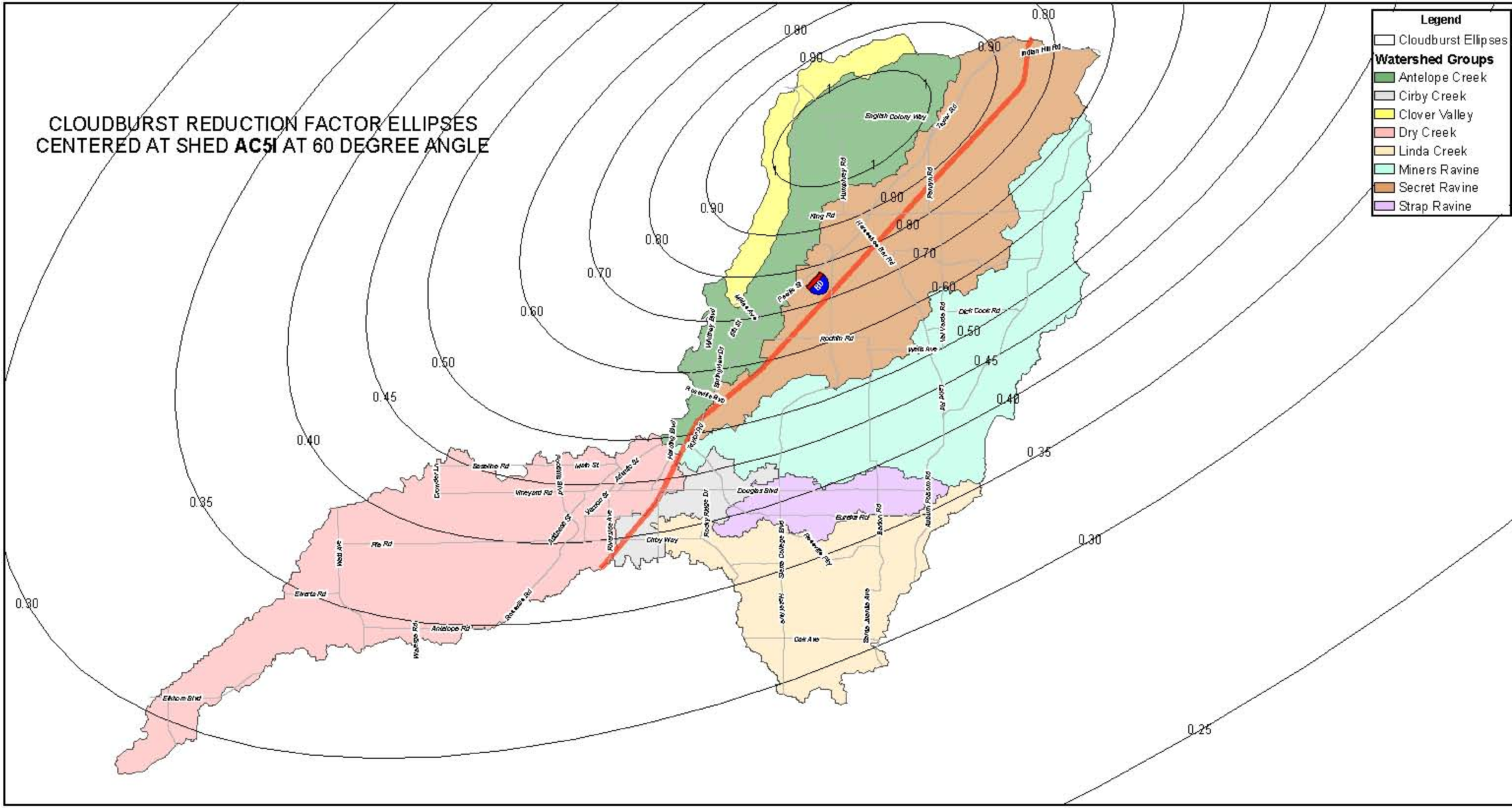
0 1 2 4 Miles

1 inch = 2 miles

PLATE 20

DRY CREEK WATERSHED STORM CENTERING - AC5I AT 60˚



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

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0 1 2 4 Miles

1 inch = 2 miles

PLATE 21

Appendix A - References

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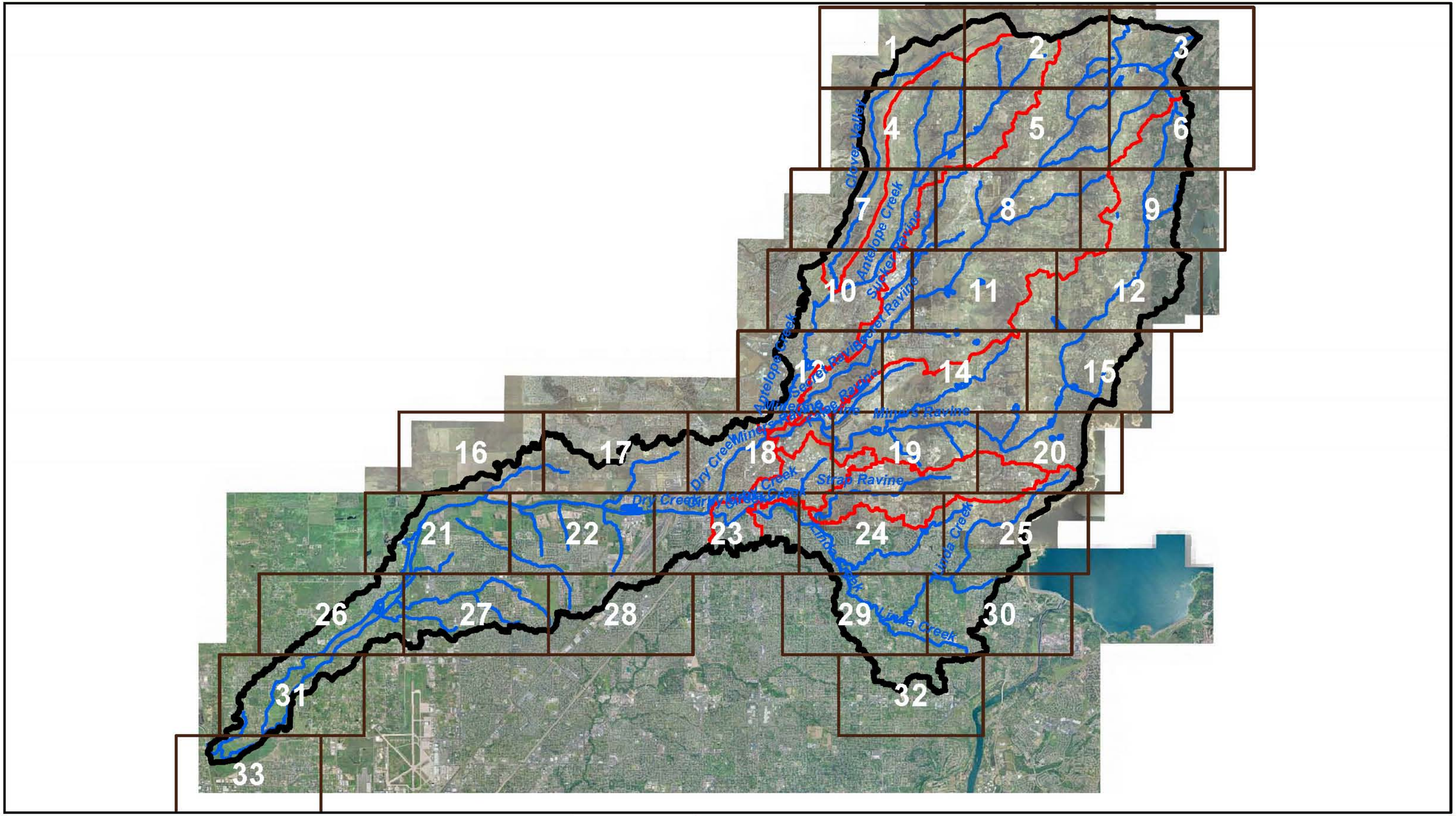
Appendix B - Topographic Mapping and Watersheds

WATERSHED MAPPING



Legend

- Sheet Index
- Dry Creek Watershed Boundary
- Sub-WatershedBoundary
- Streams

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

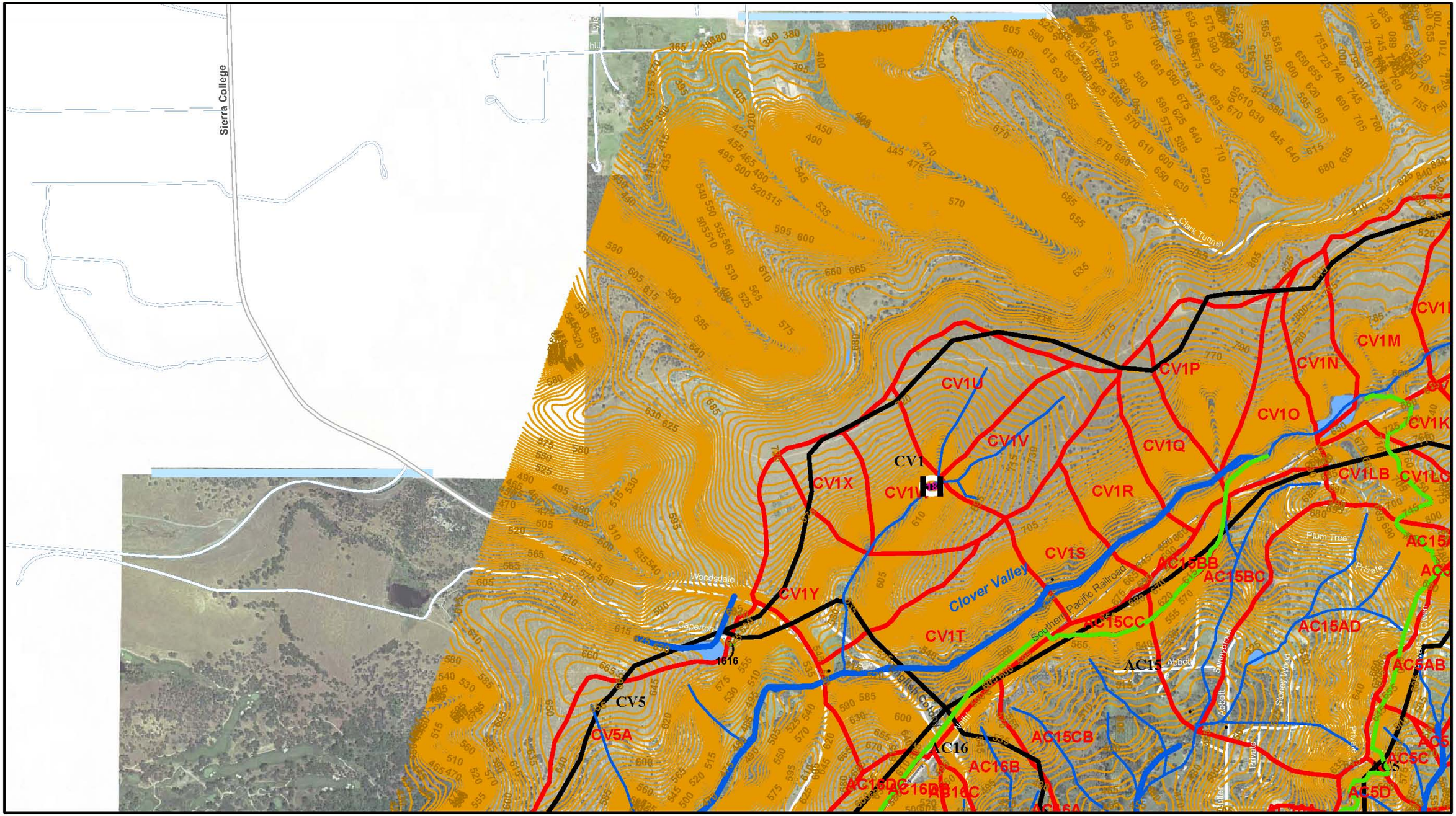
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 2,500 5,000 10,000 15,000 20,000 Feet

SHEET INDEX

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

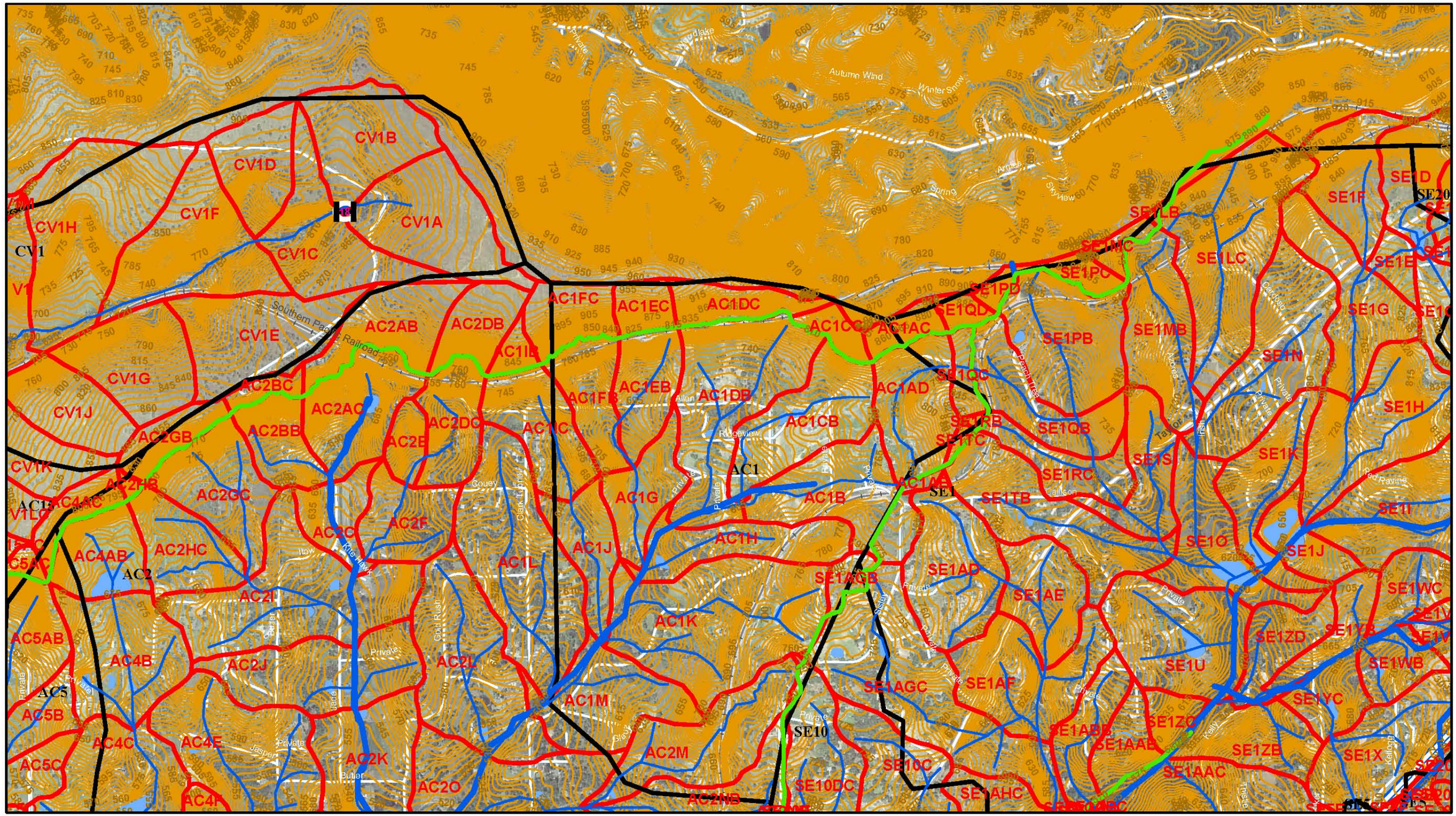
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.1

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

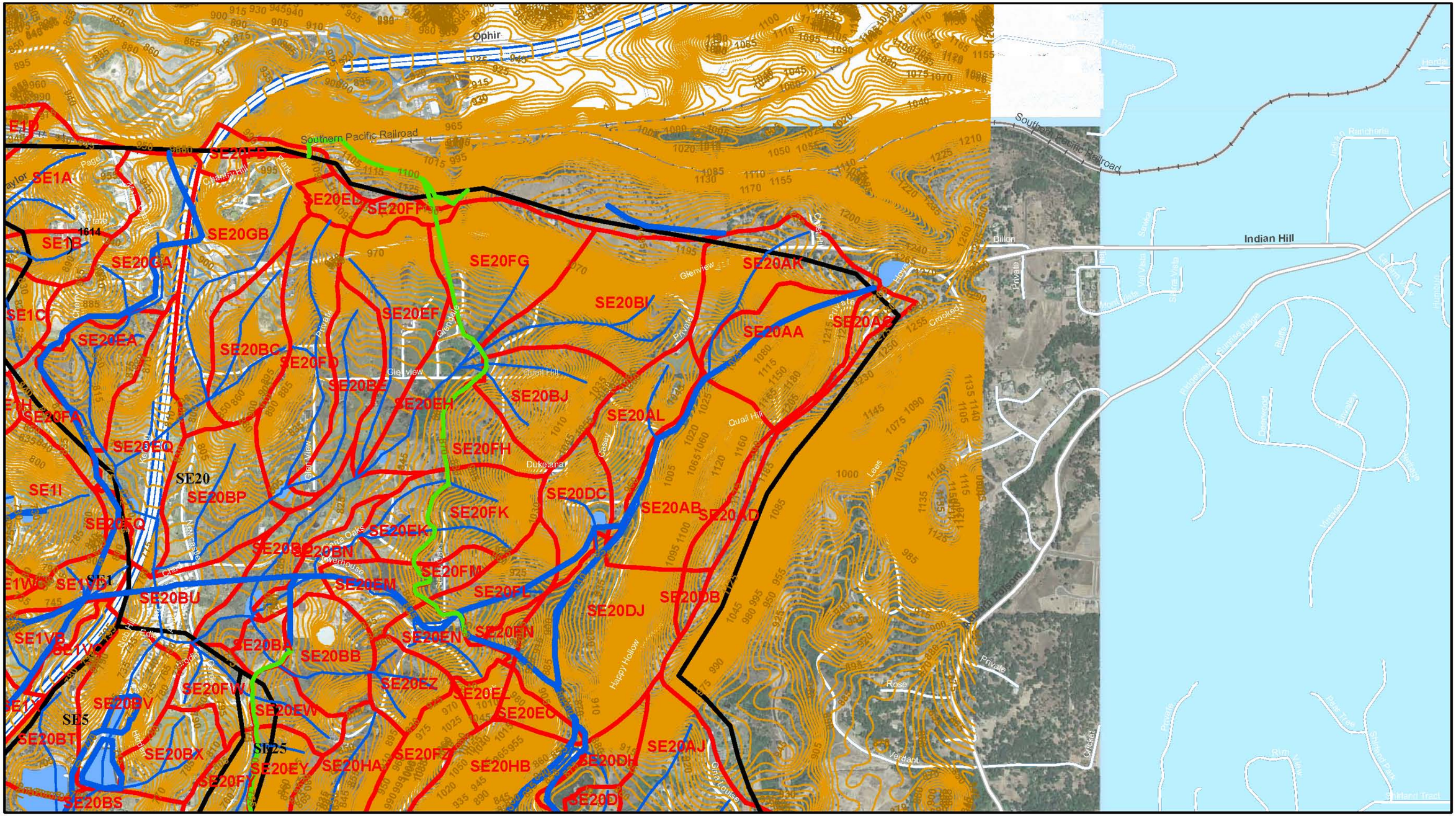
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.2

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

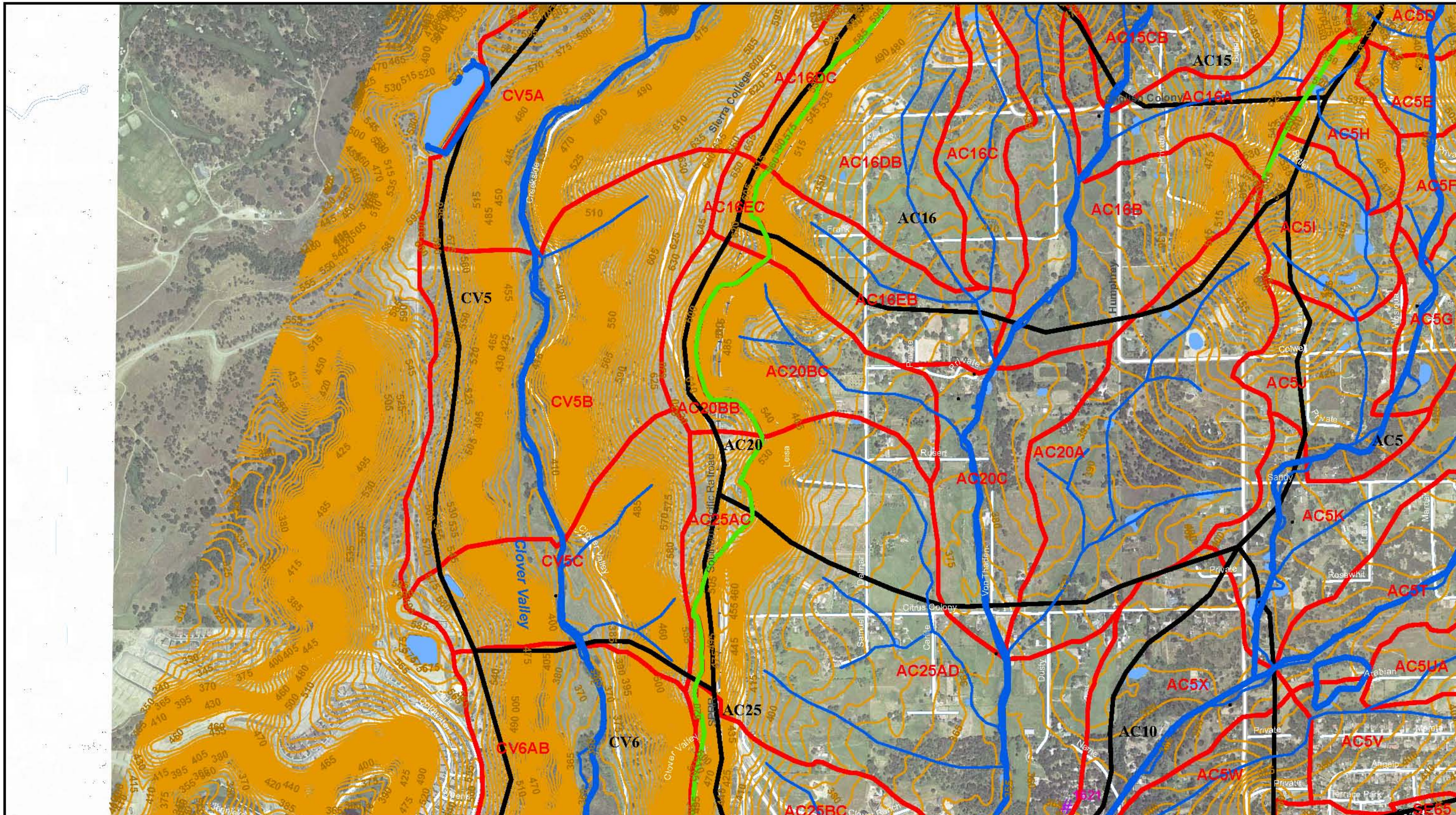
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.3

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

RBF CONSULTING

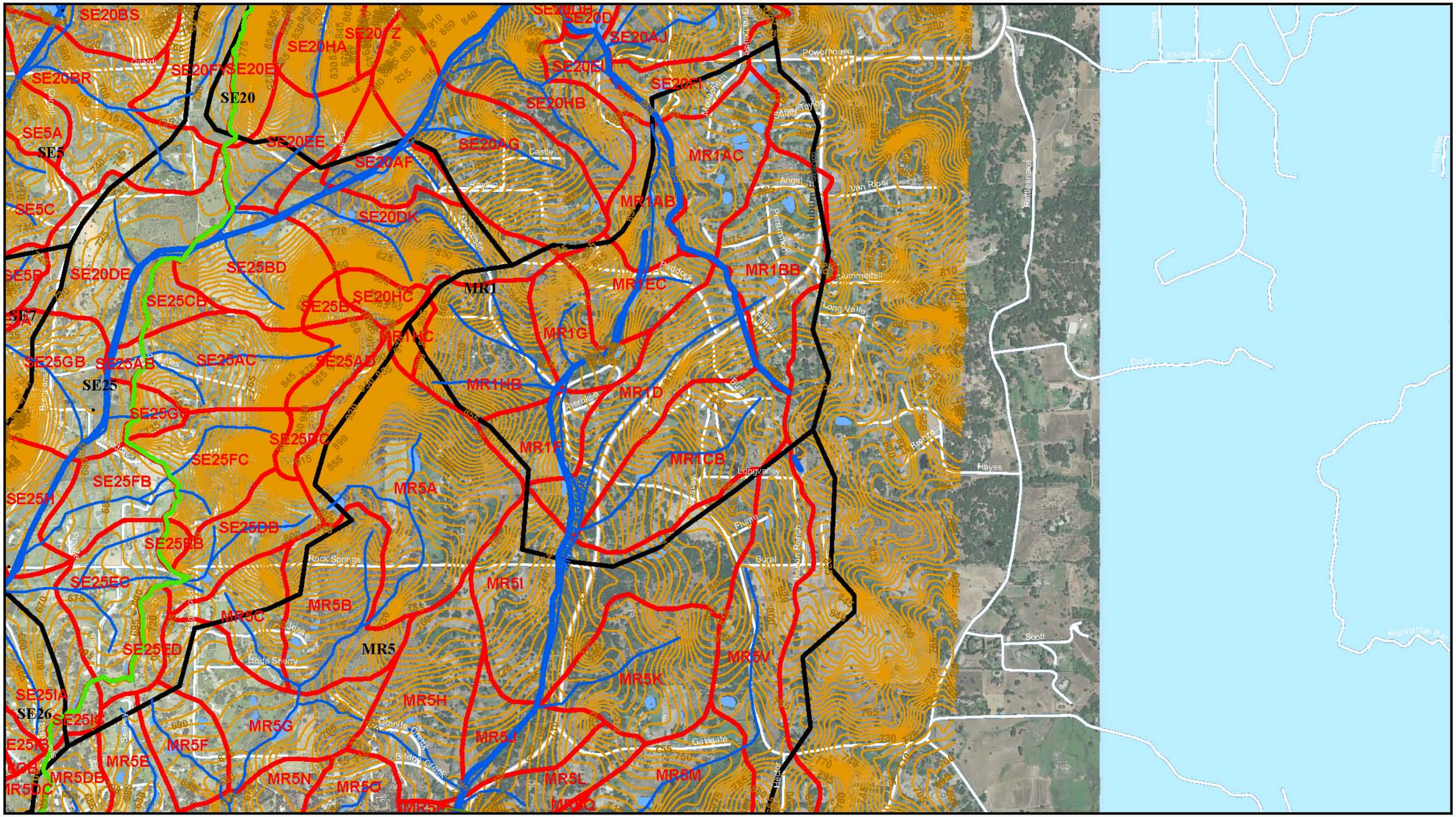
CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.4

WATERSHED MAPPING

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
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- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

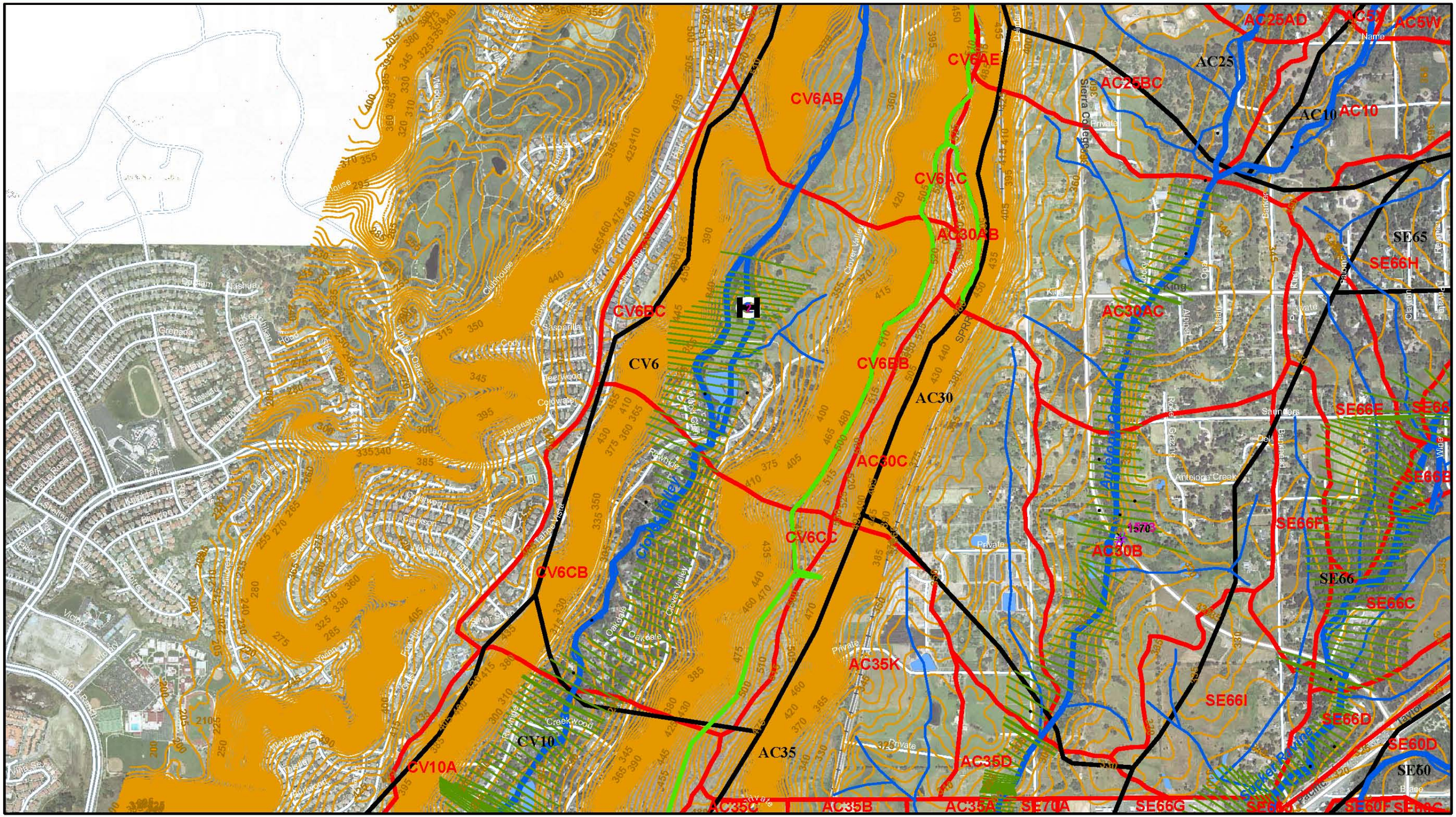
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.6

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

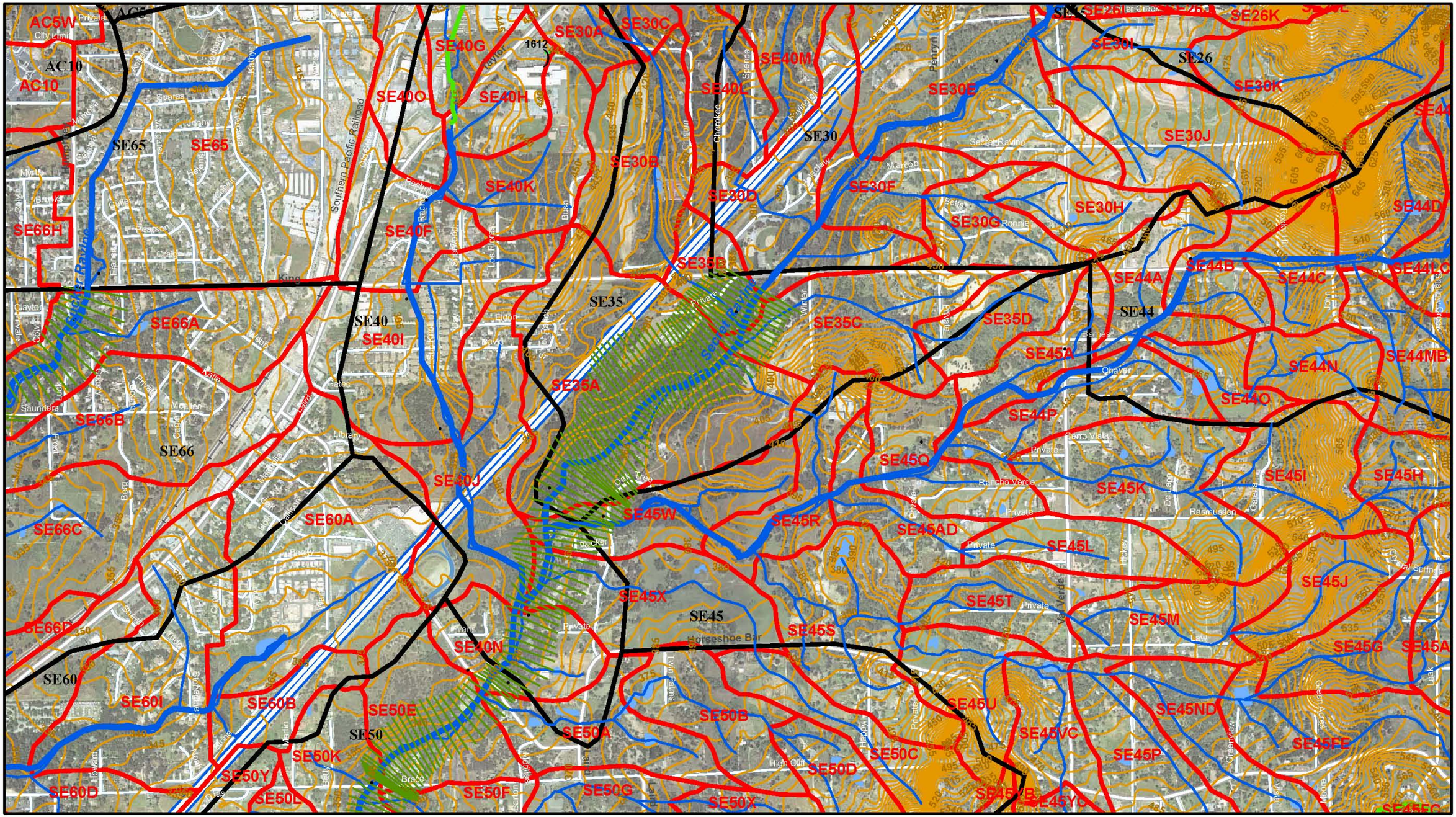
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.7

WATERSHED MAPPING



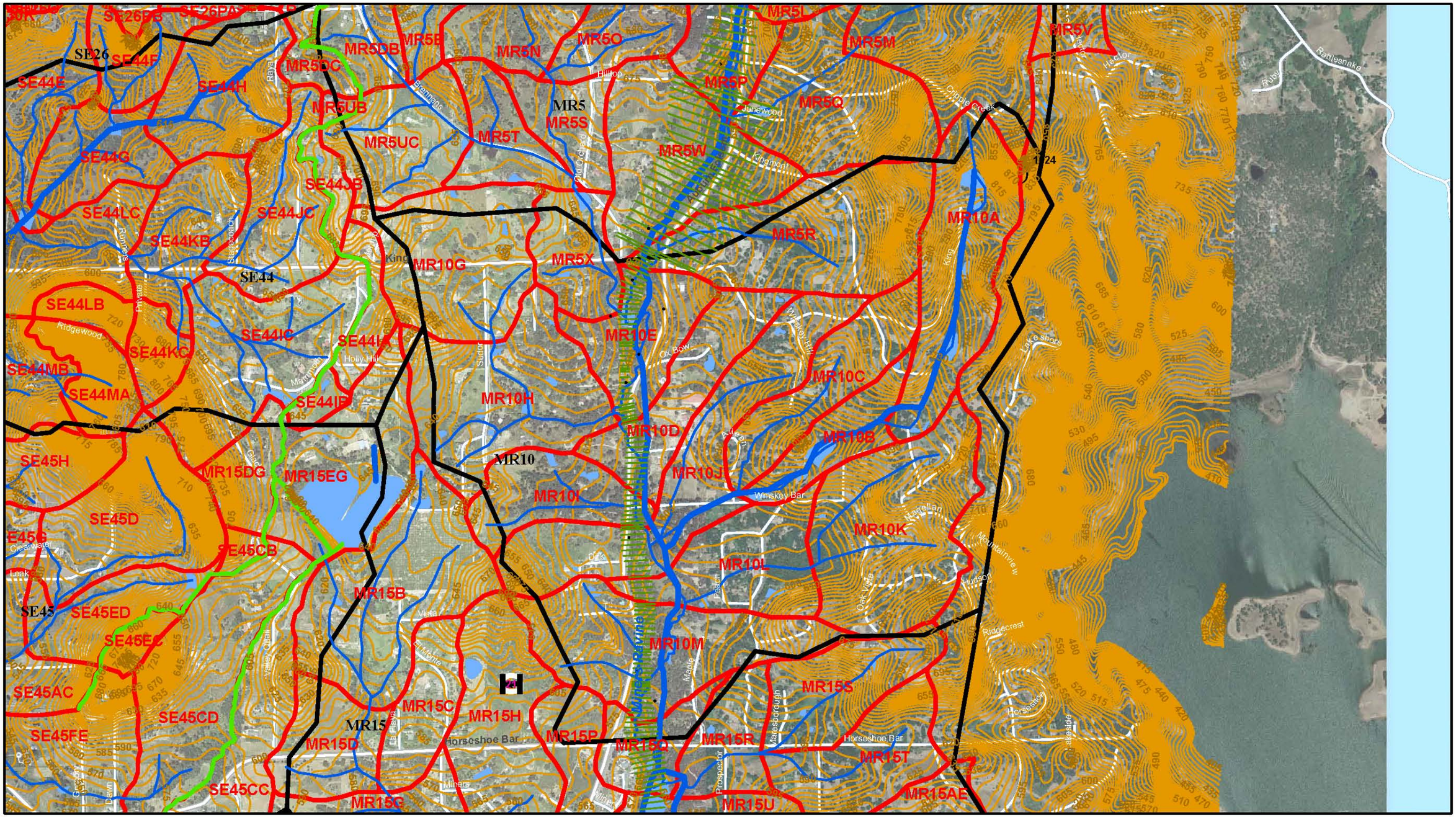
UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

PLATE B.8

WATERSHED MAPPING



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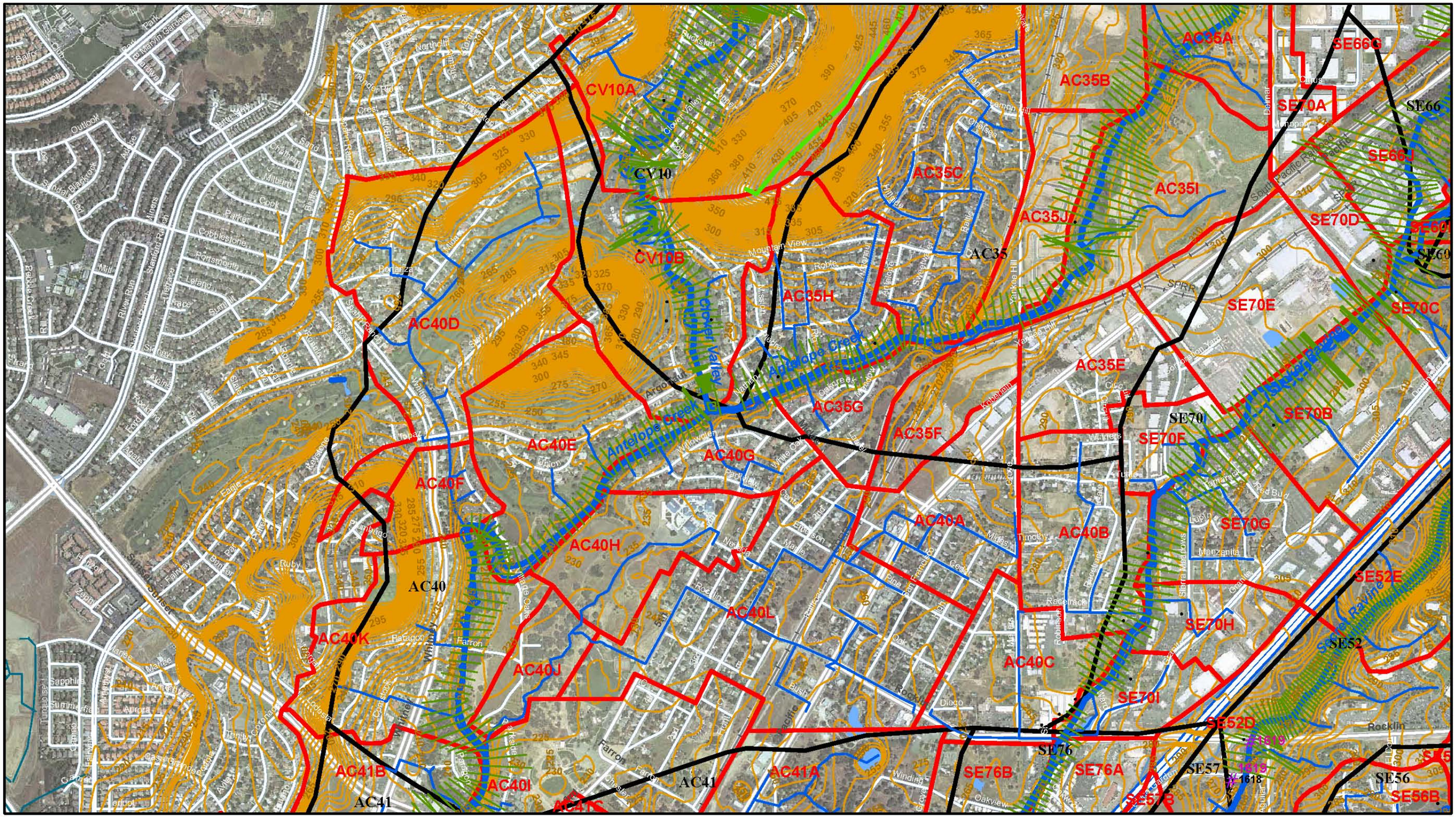
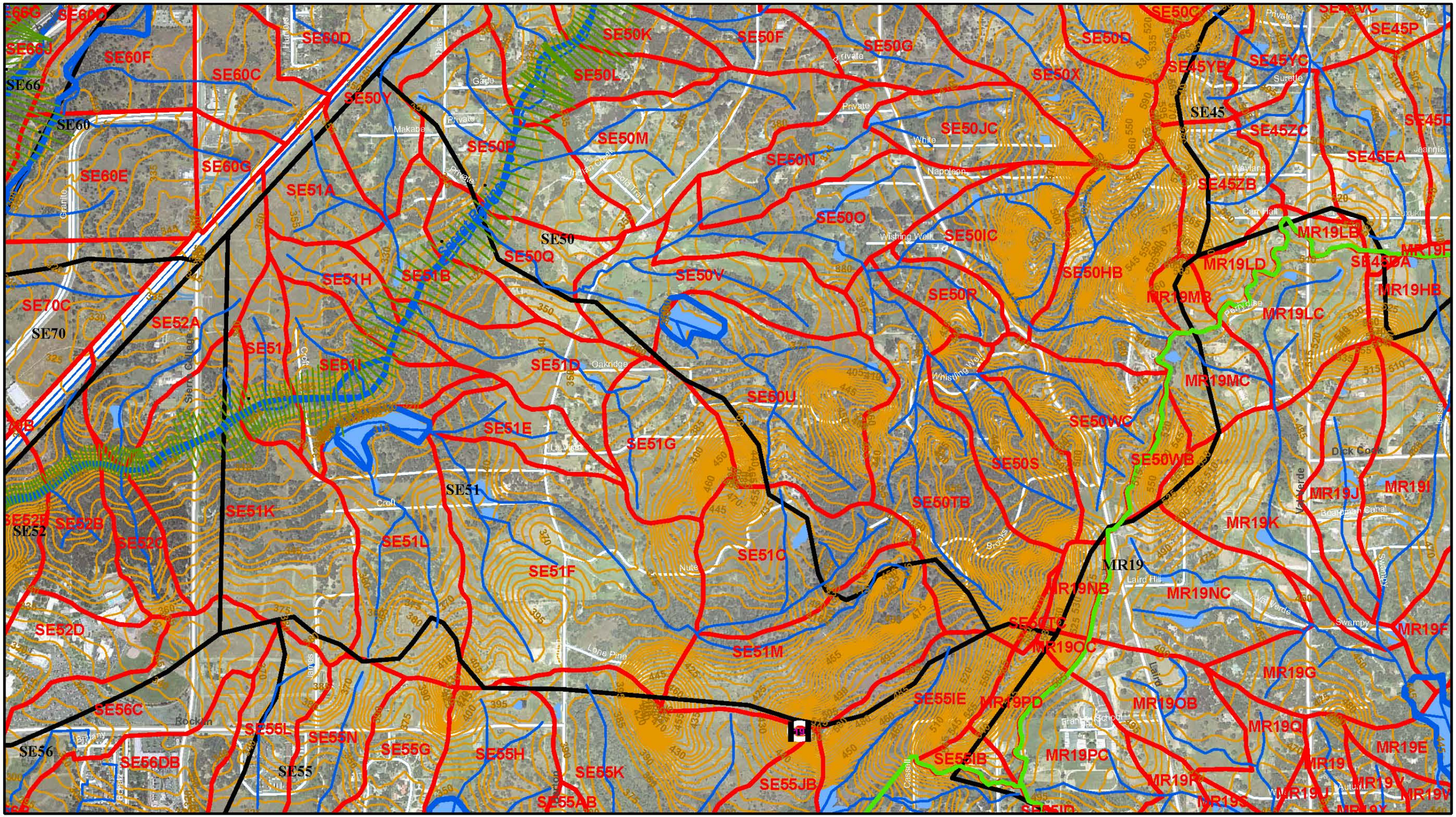


WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
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- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
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UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

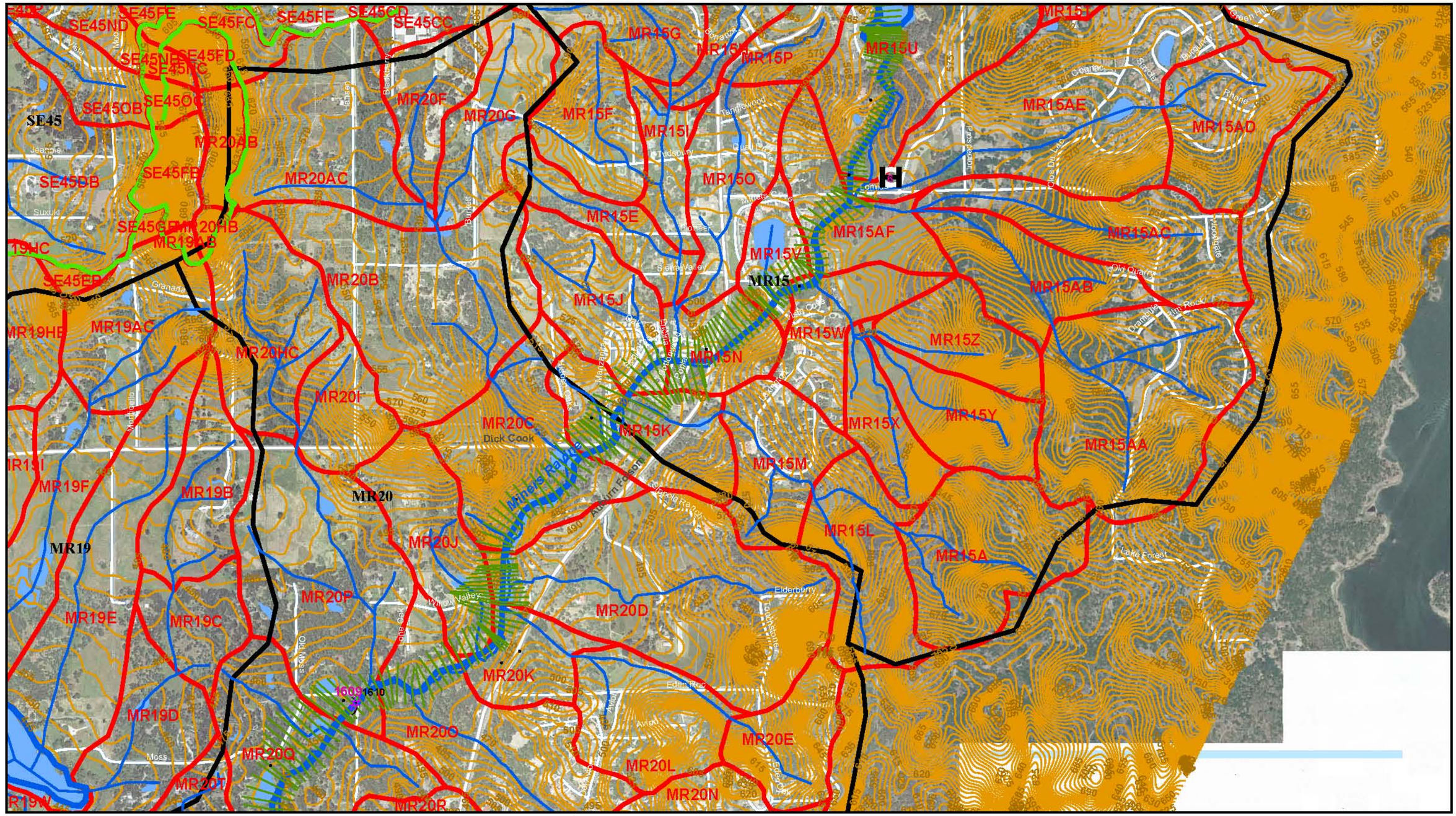
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.11

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
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- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

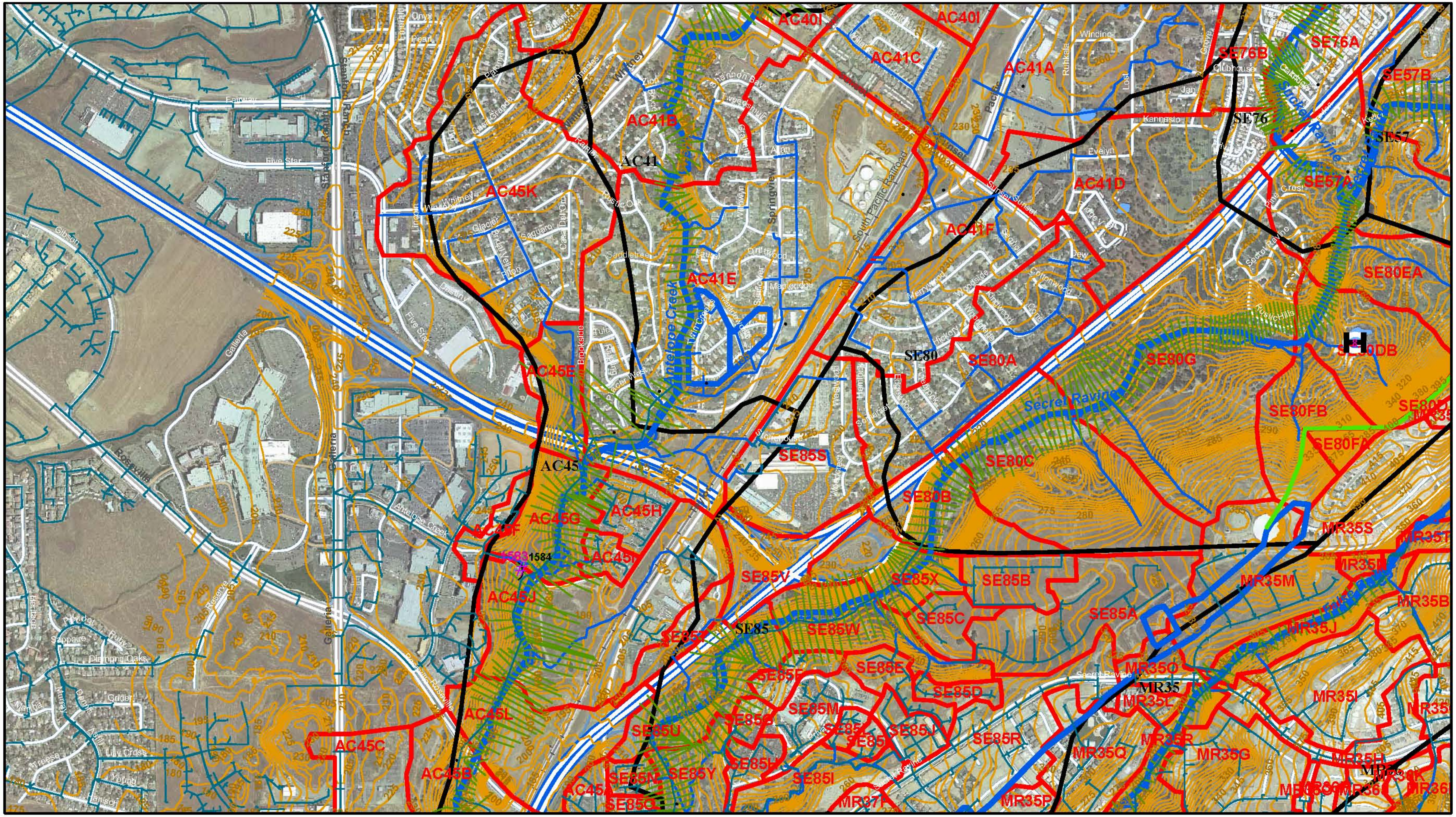
REBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.12

WATERSHED MAPPING



Legend
- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

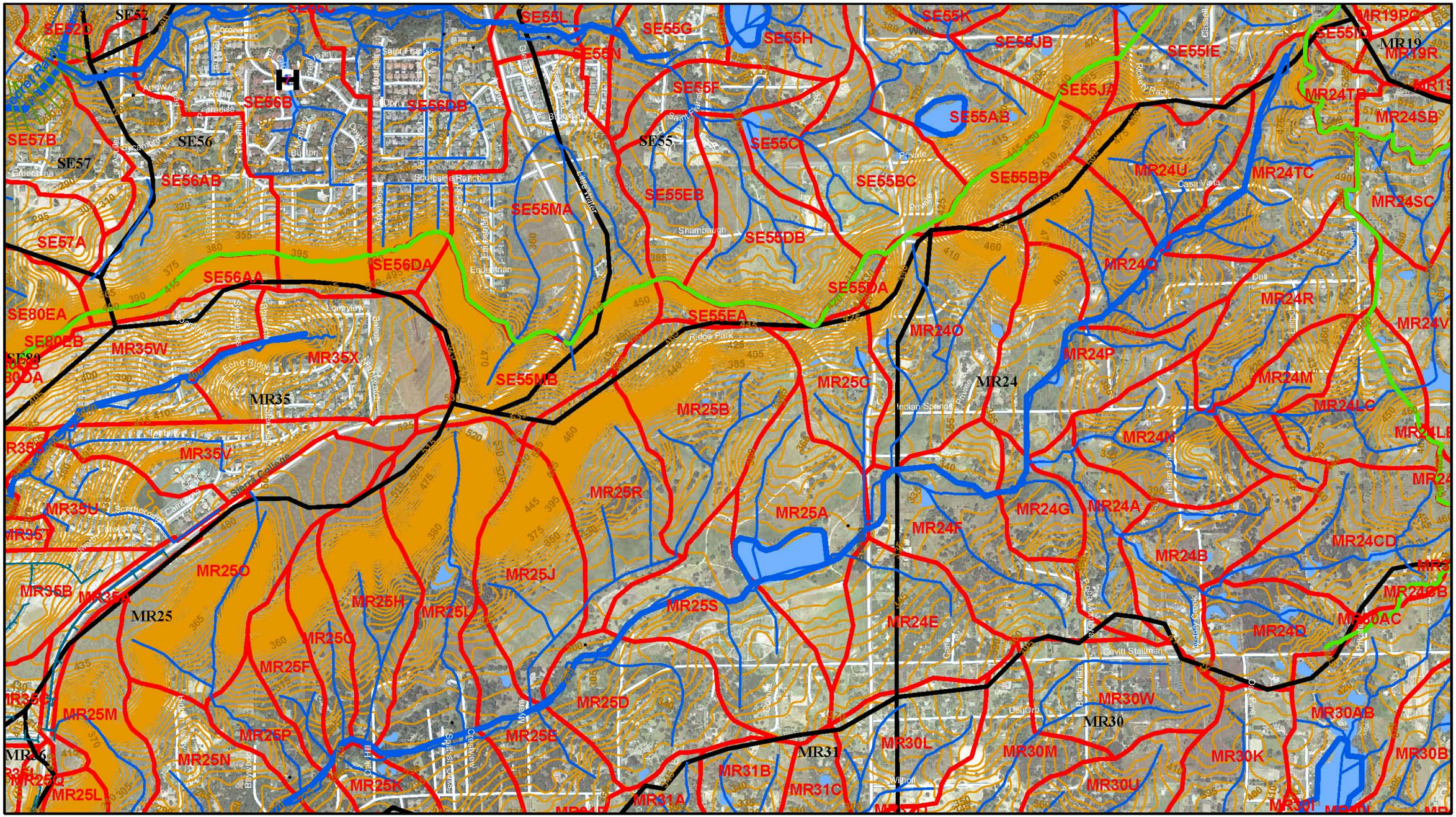
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.13

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

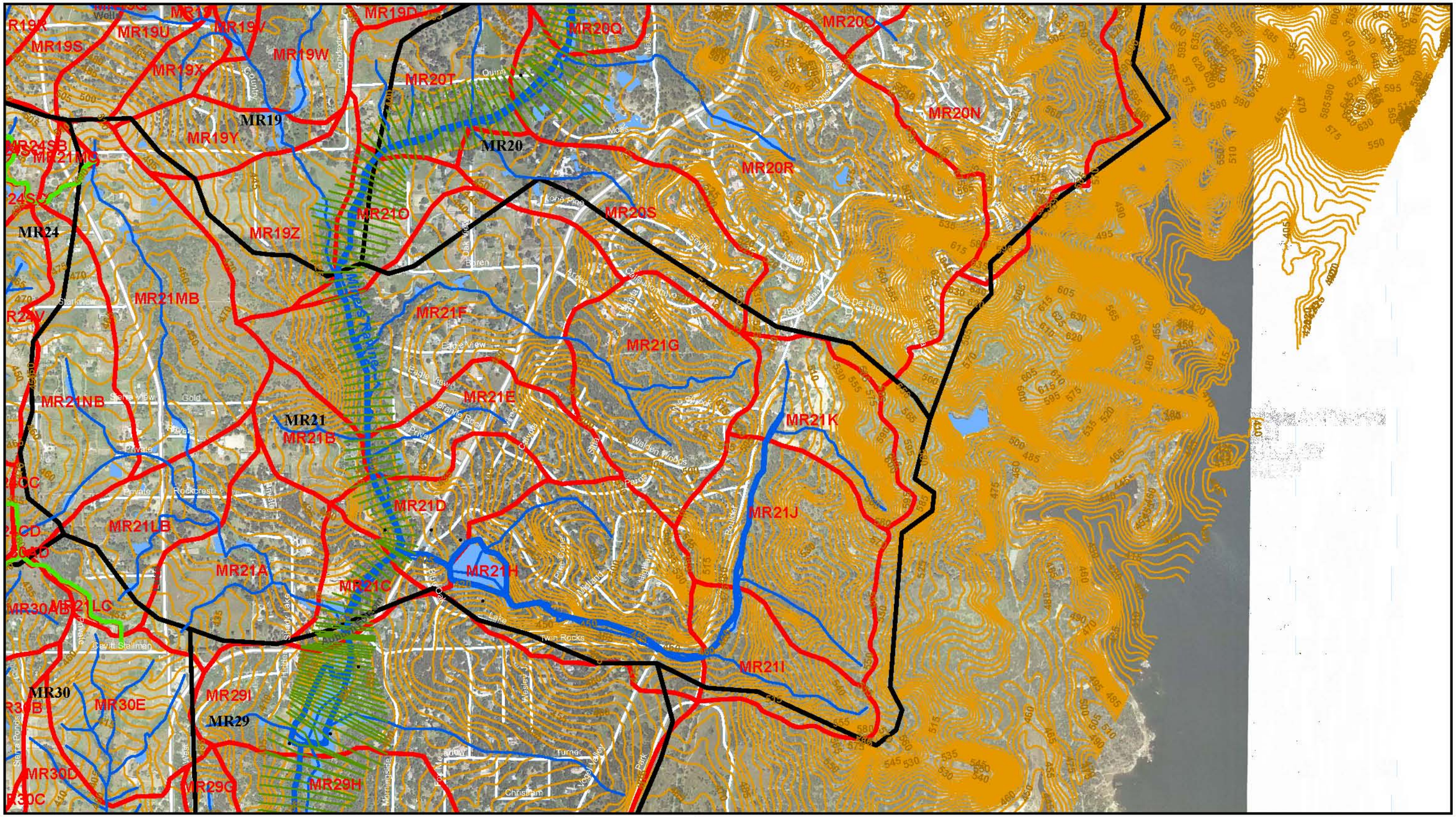
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.14

WATERSHED MAPPING



UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

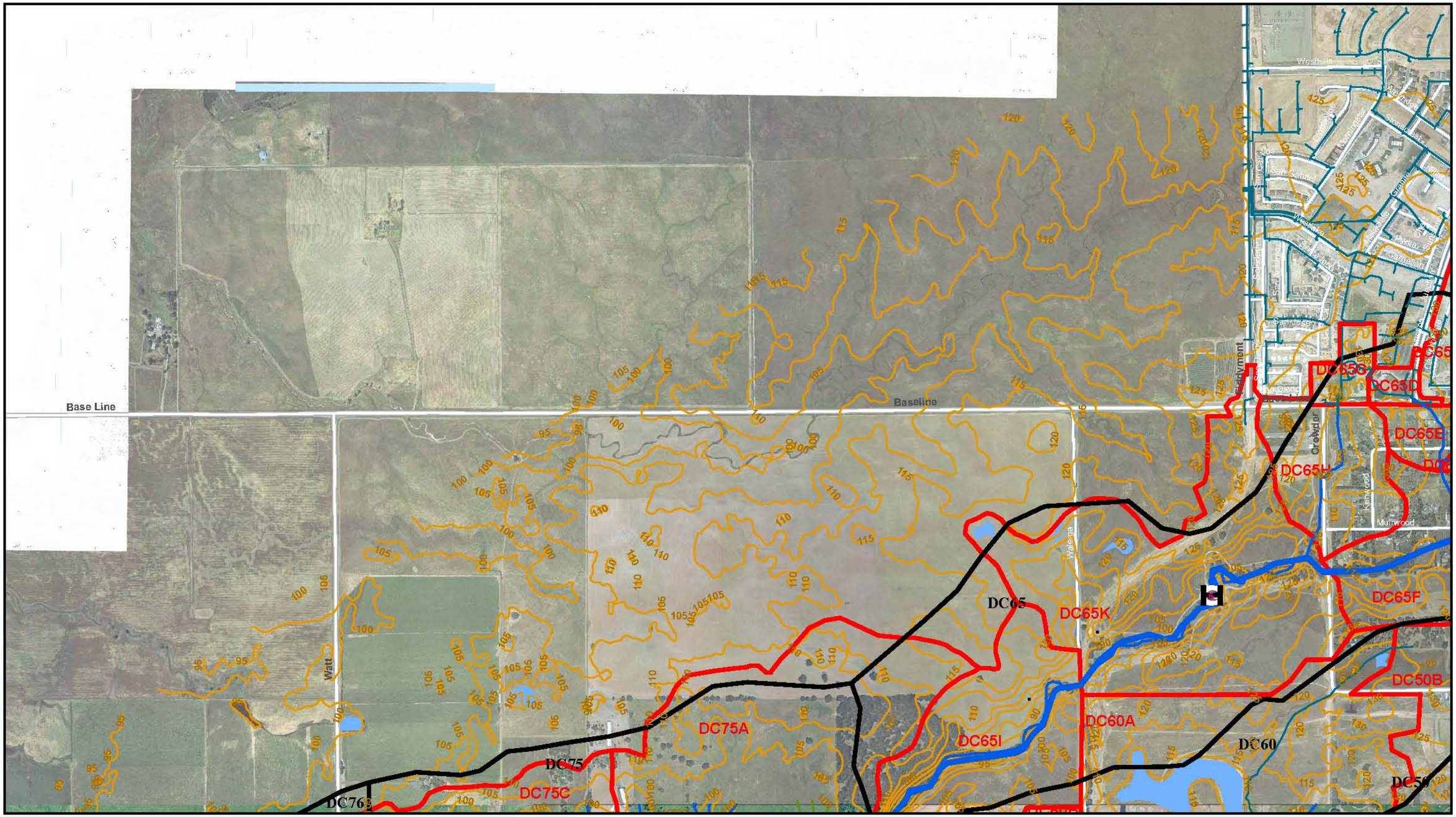
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.15

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

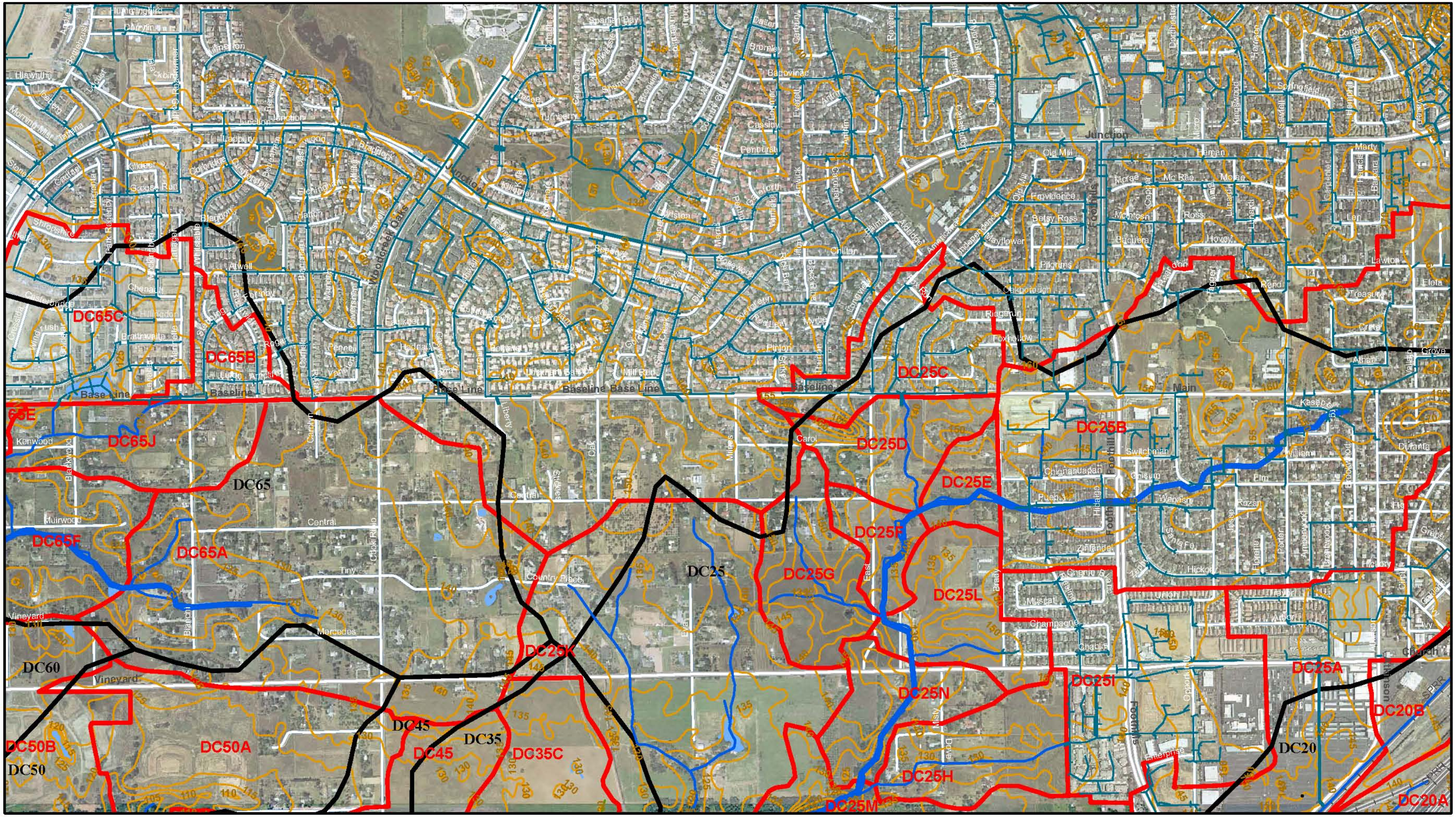
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.16

WATERSHED MAPPING



Legend
- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

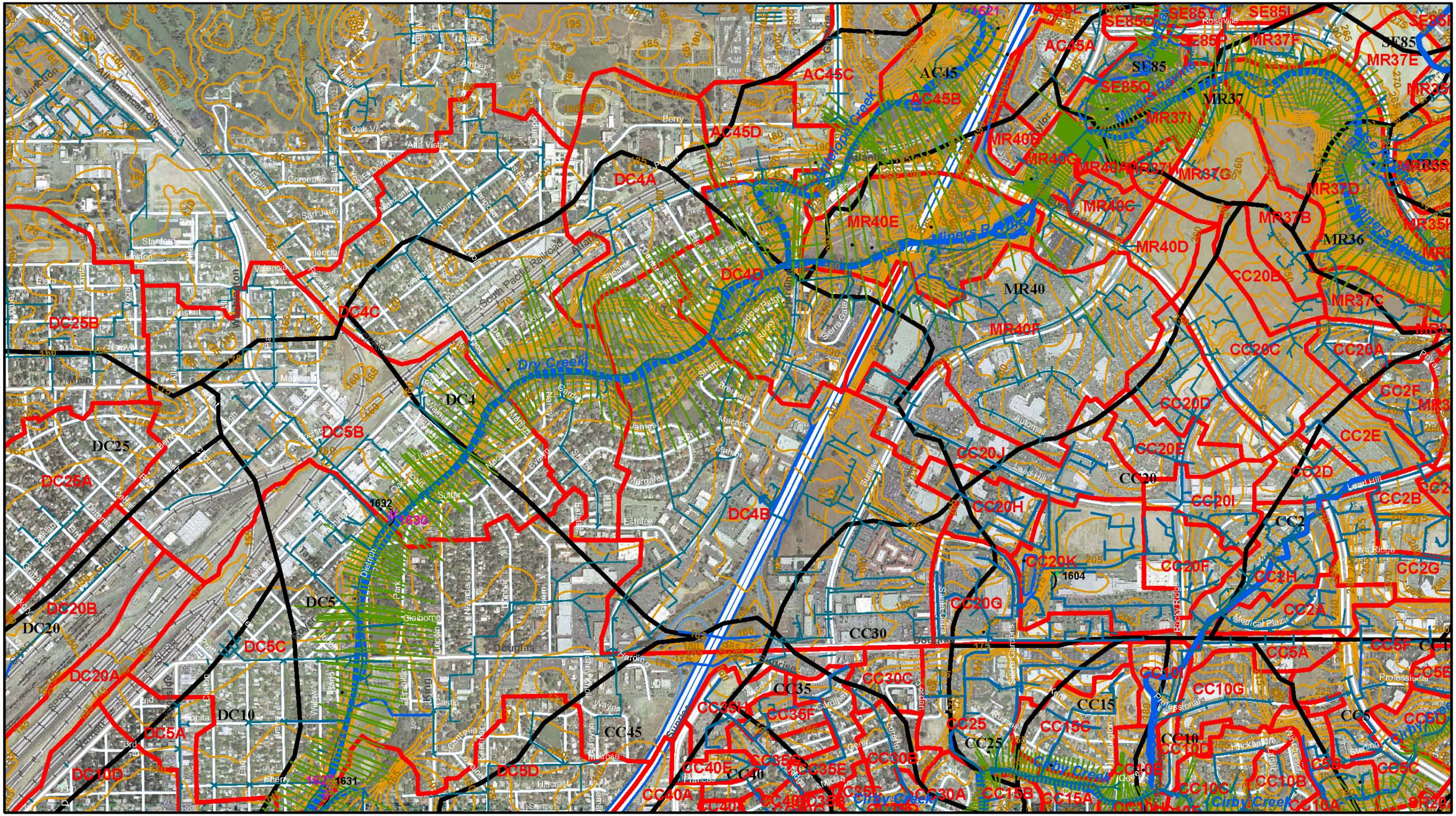
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.17

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

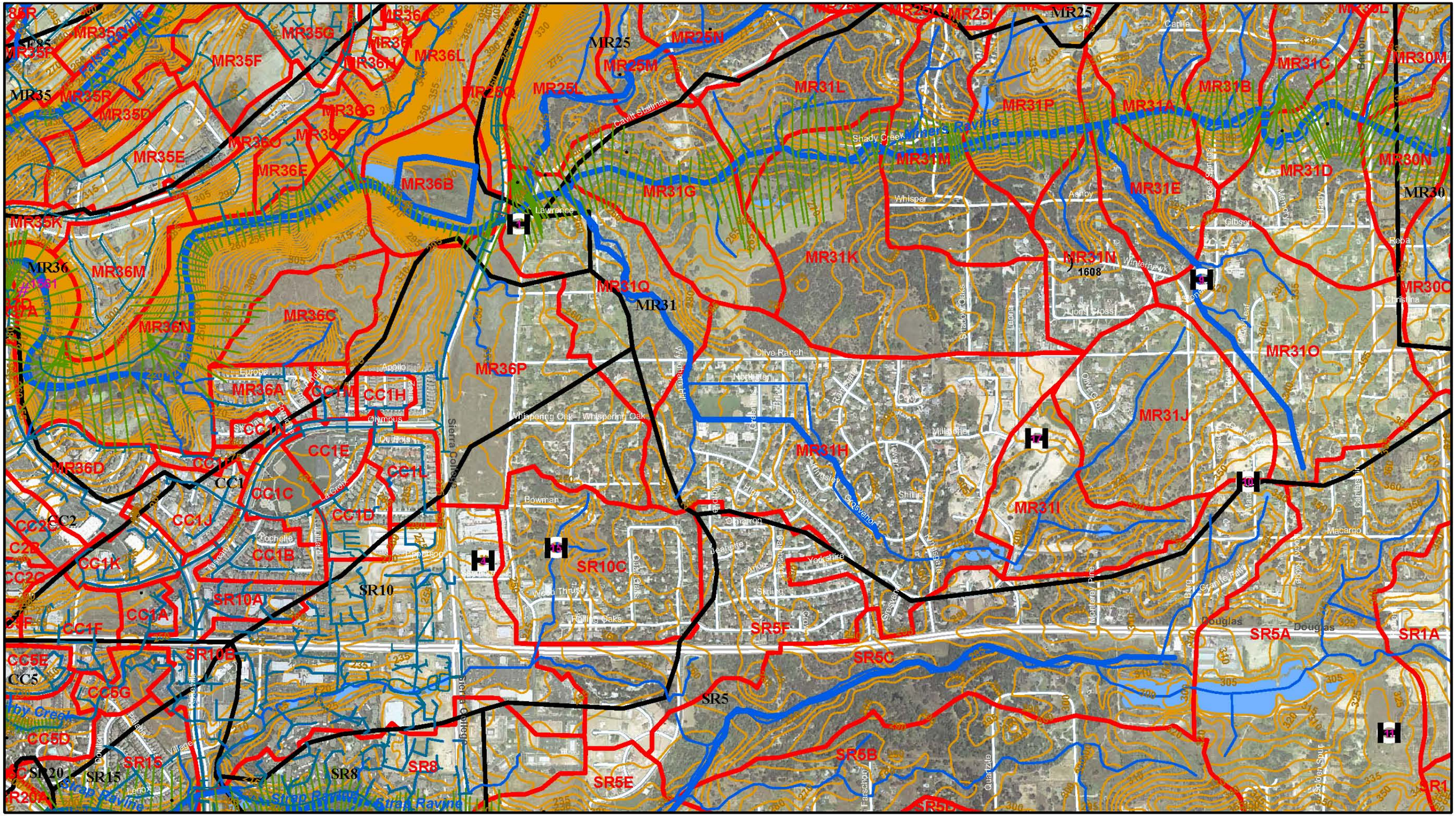
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.18

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

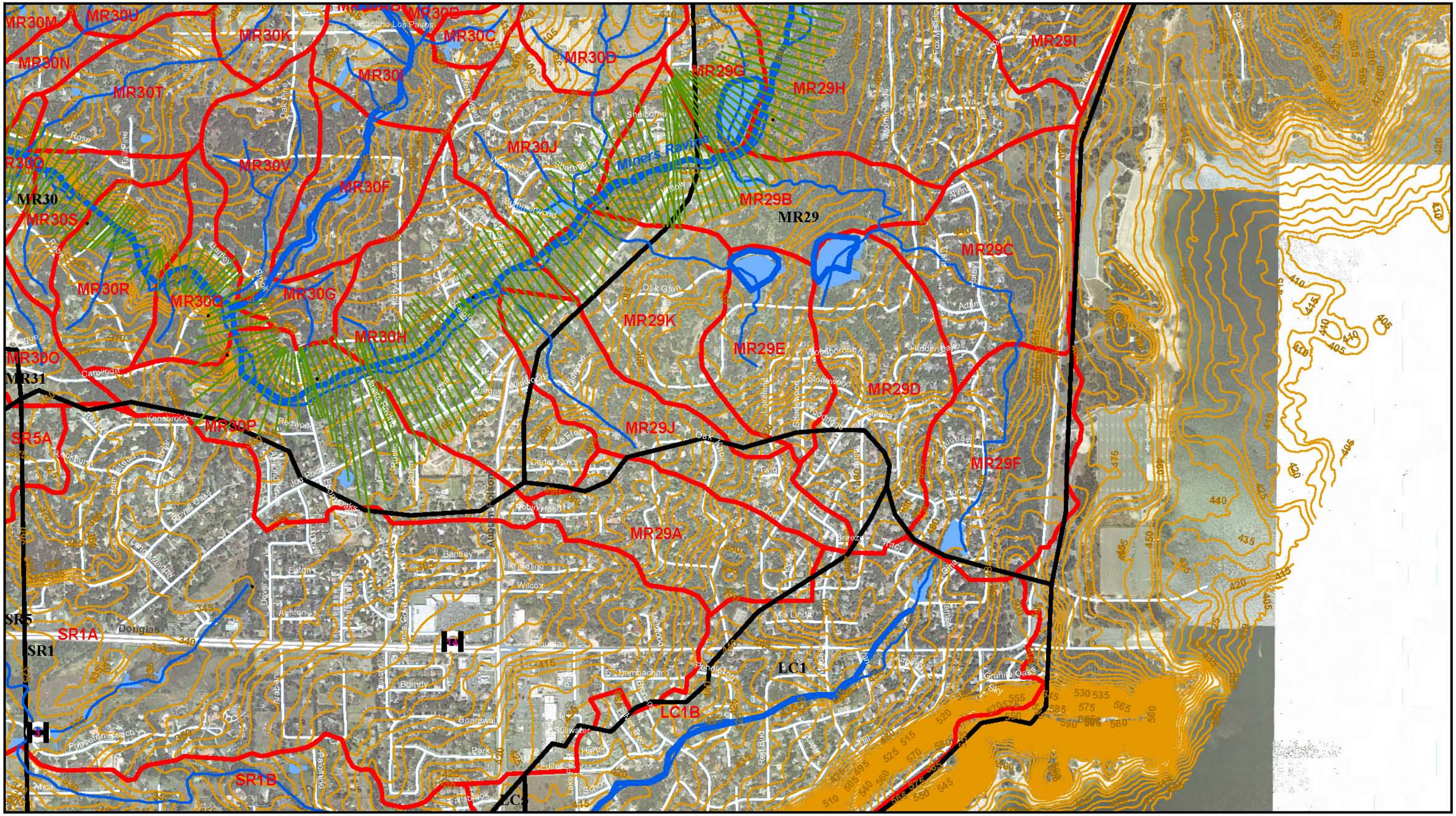
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.19

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

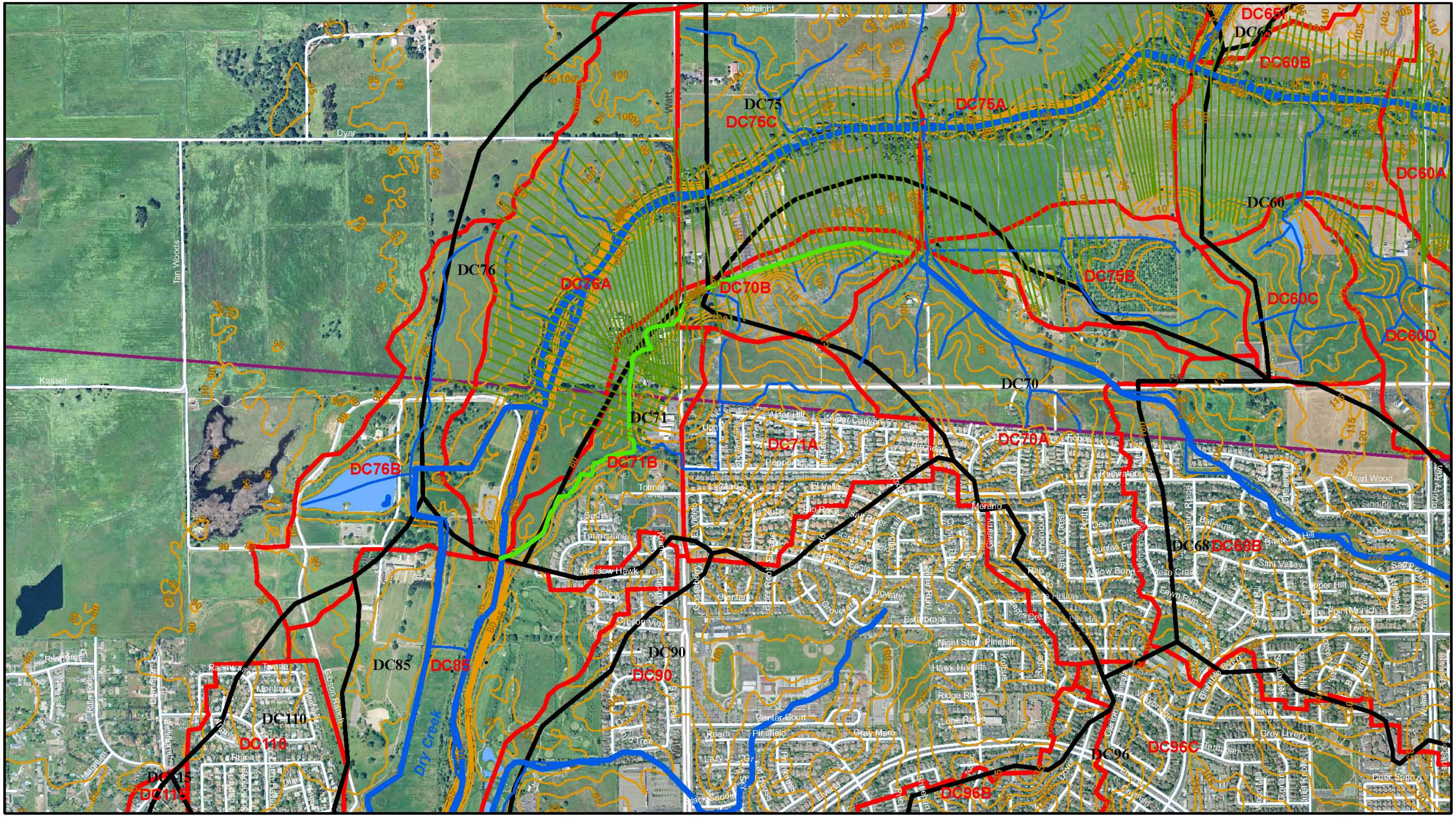
REF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.20

WATERSHED MAPPING



Legend
Points of Interest
Local Detention
Stream Gage
Rain Gage
Water Delivery Canals
Storm Drain Pipes
Hydraulic Routing Model X-sections
Swales
Streams
1992 Plan Watersheds
Update Plan Watersheds
Project Contour Elevations
Existing Ponds
County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

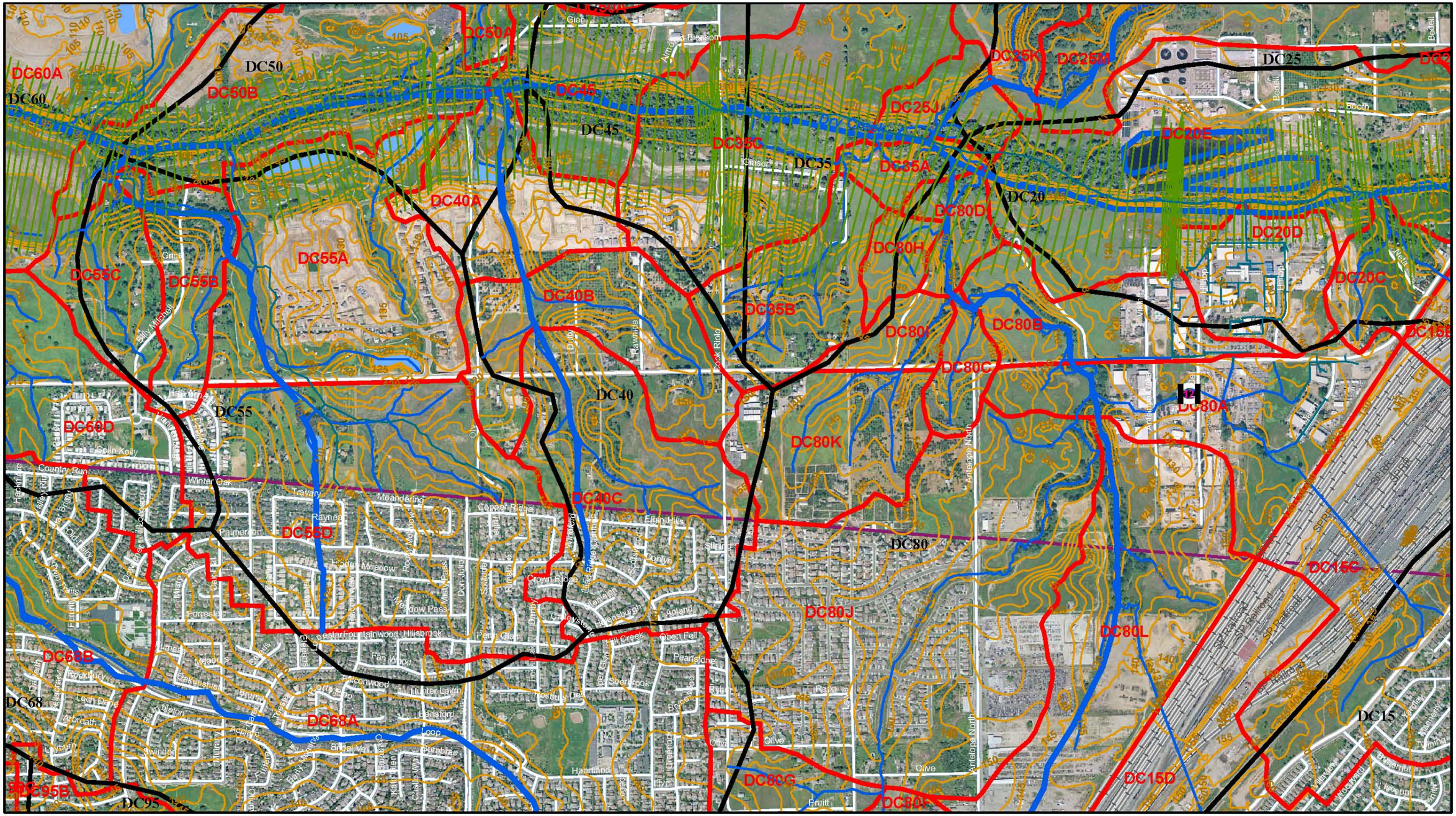
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.21

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

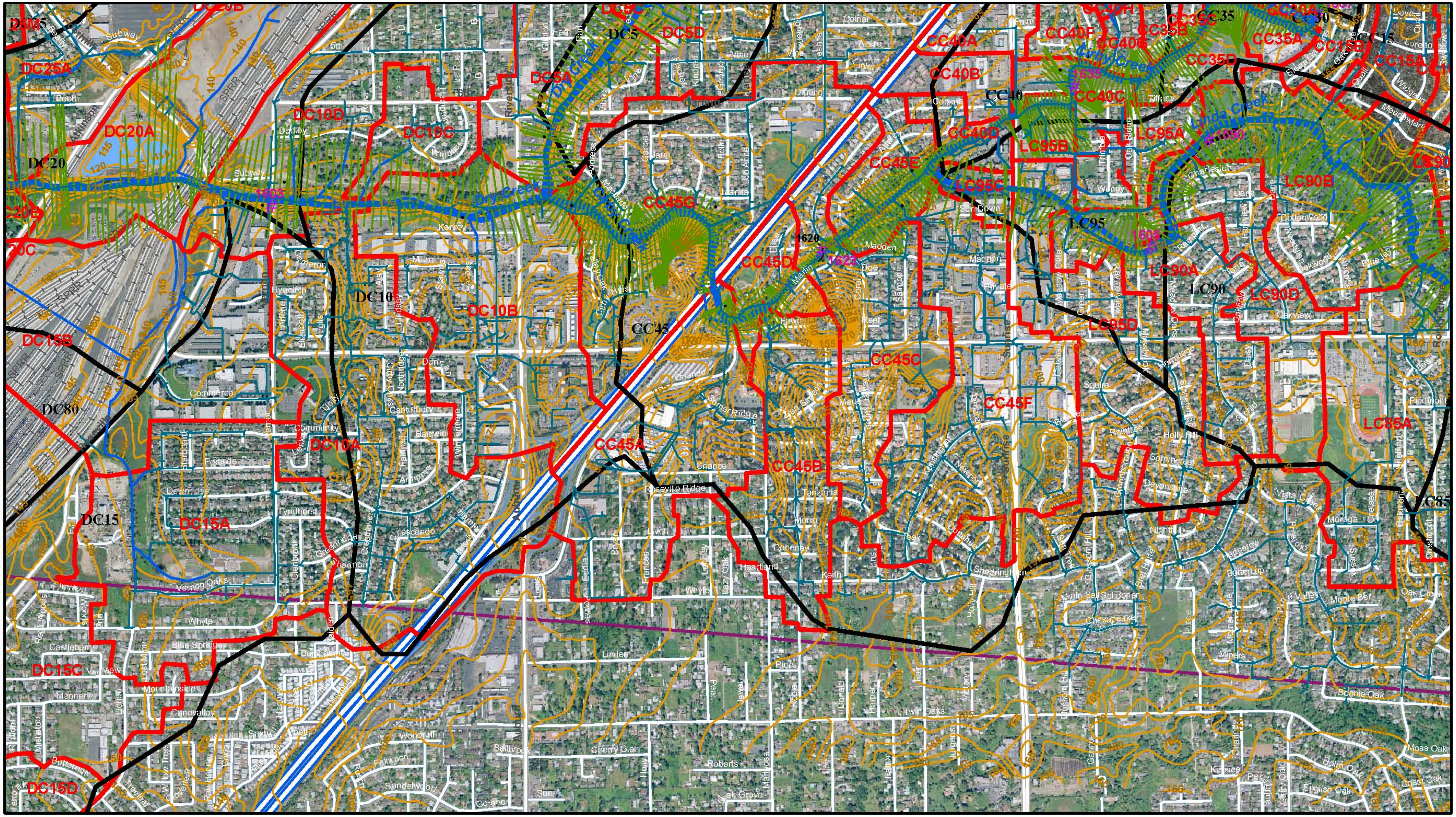
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.22

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.23

WATERSHED MAPPING

Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

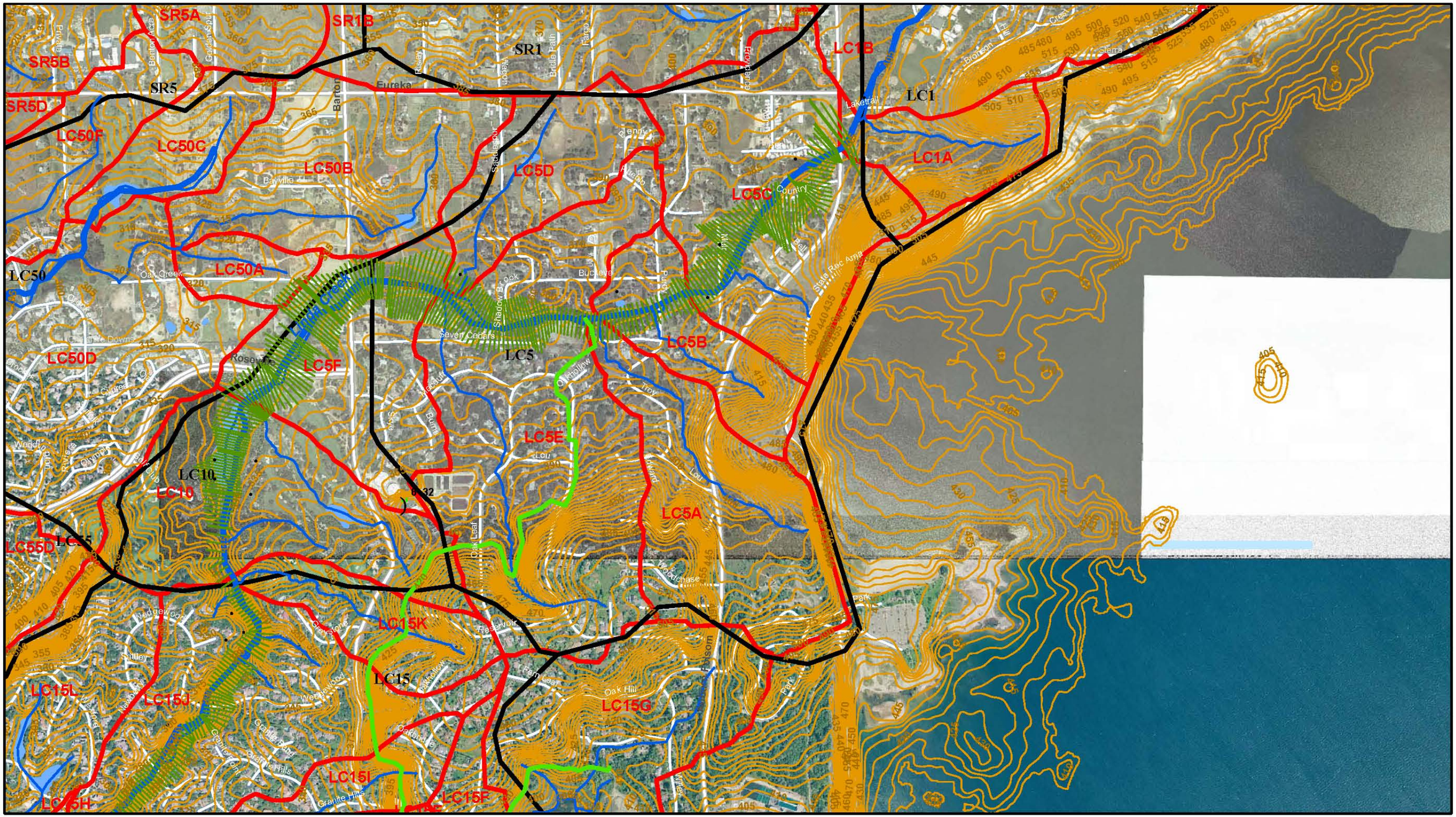
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.24

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

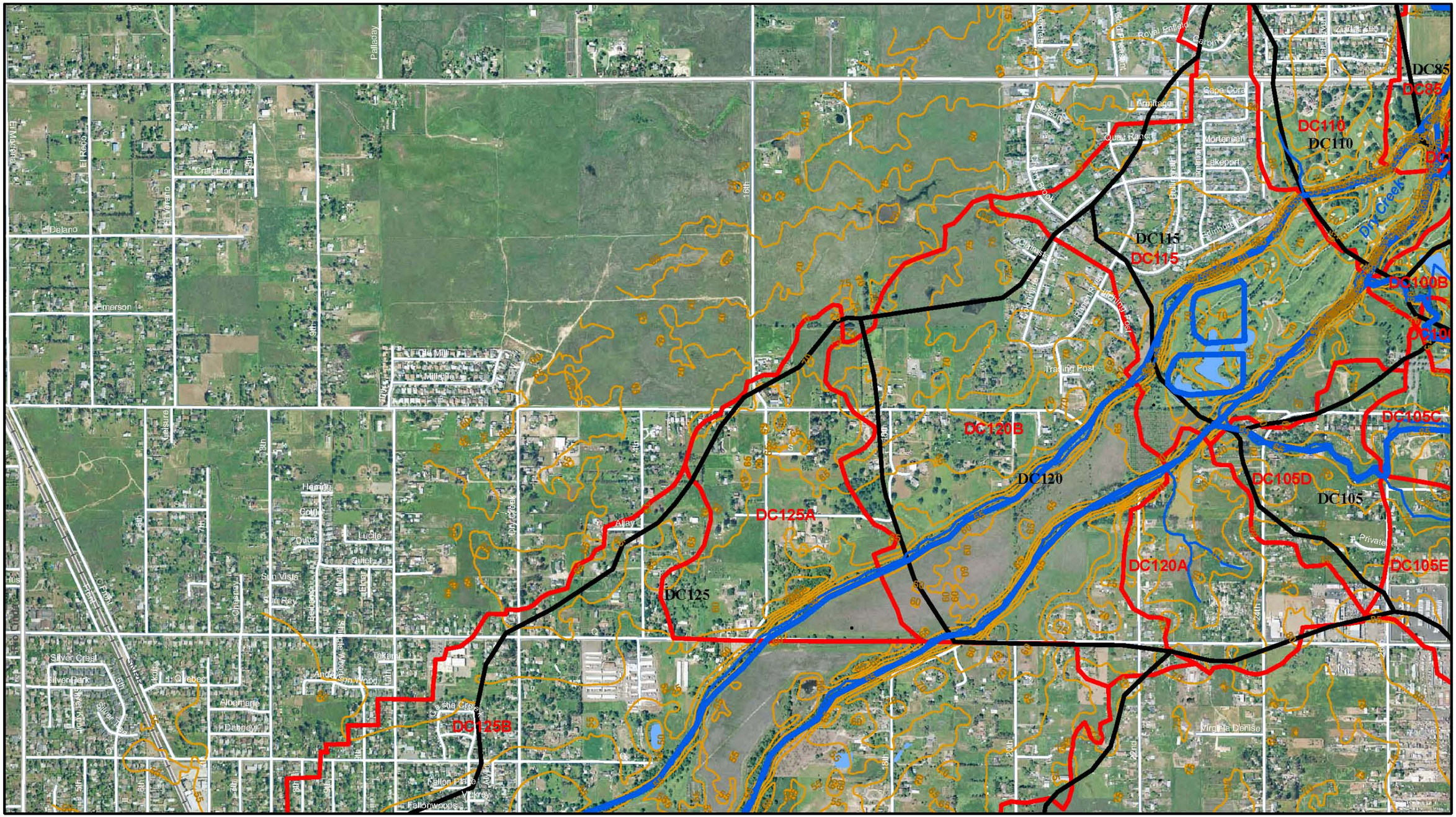
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.25

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

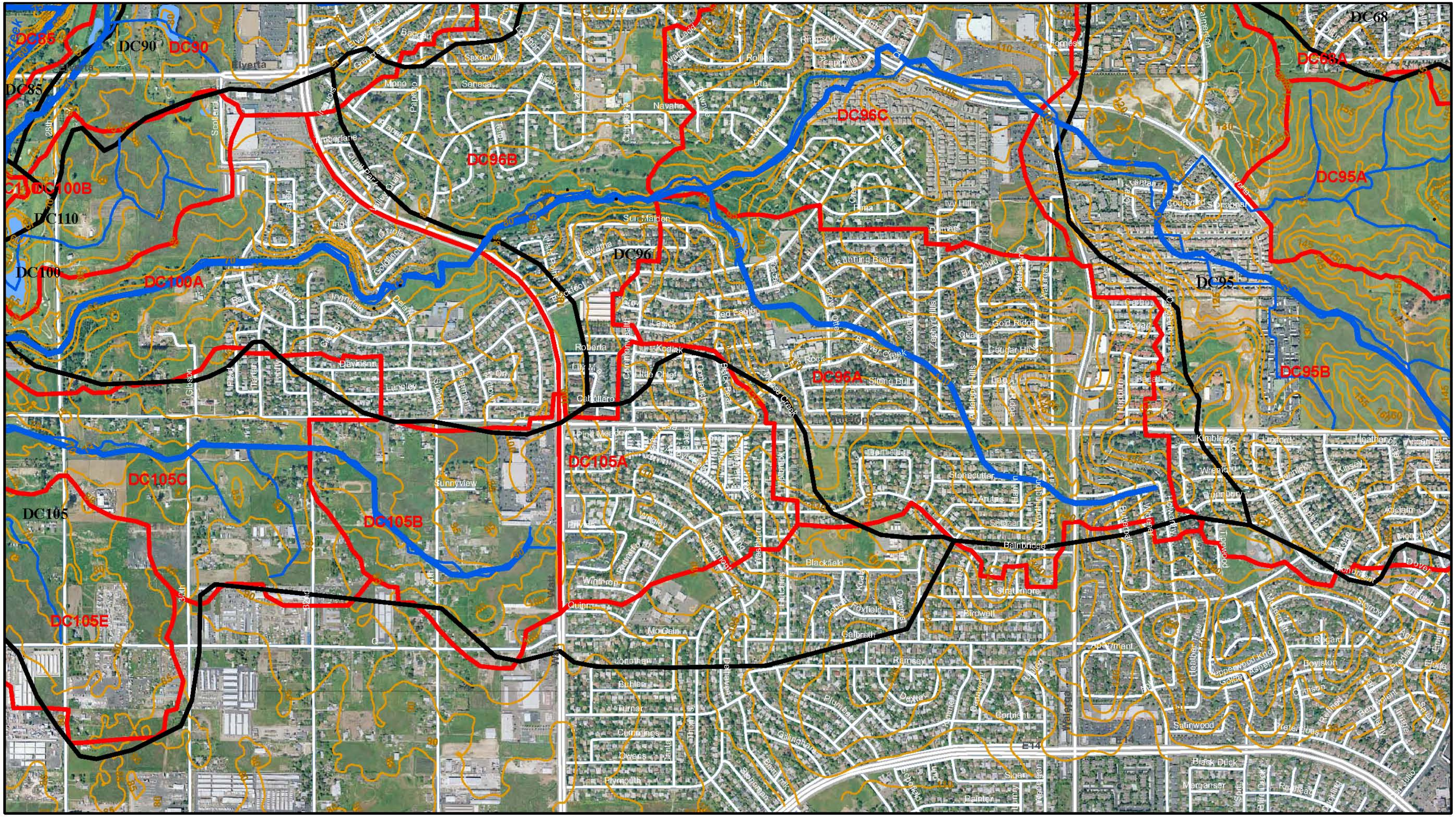
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.26

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

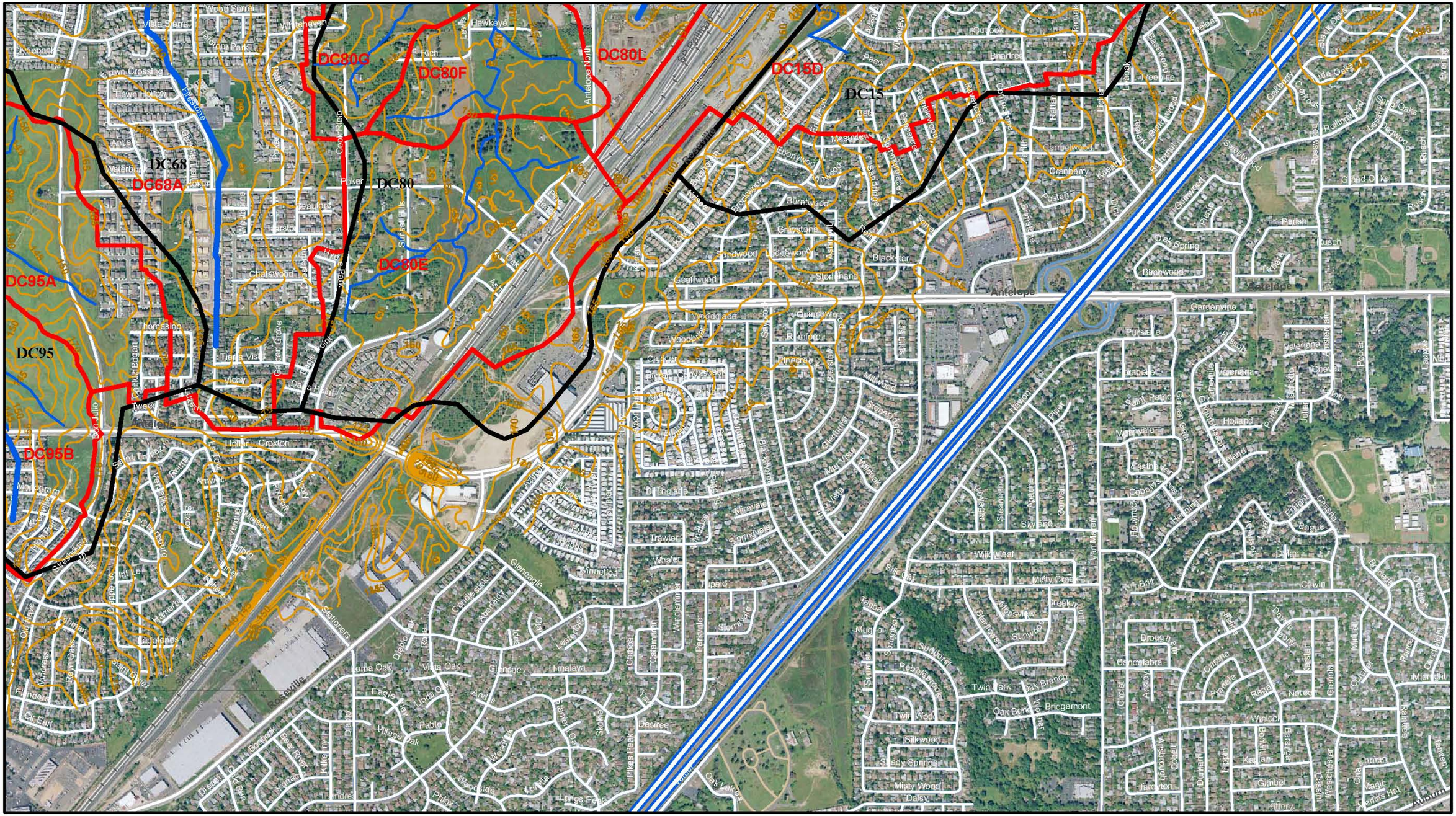
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.27

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

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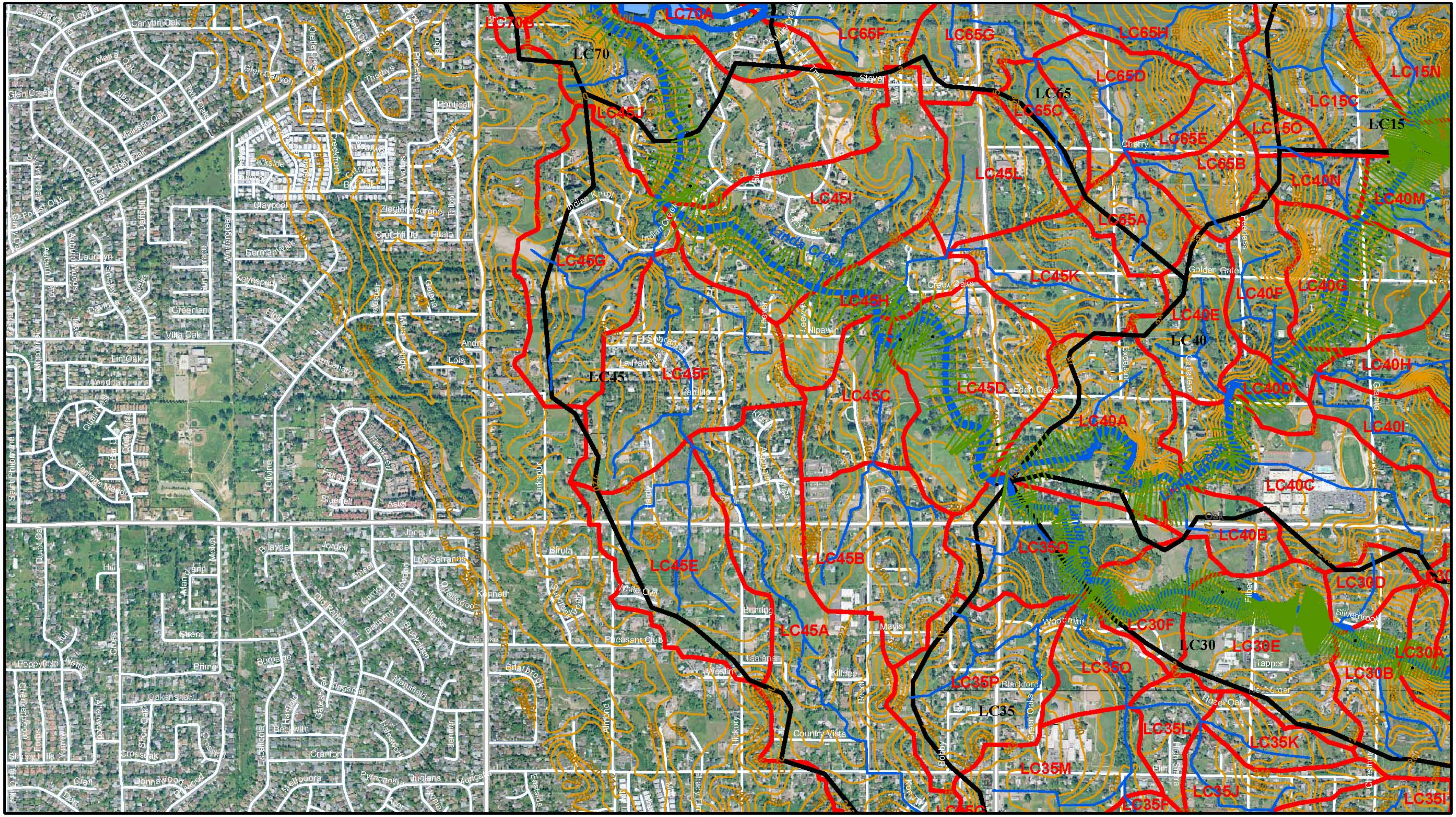
CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.28

WATERSHED MAPPING



Legend
- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

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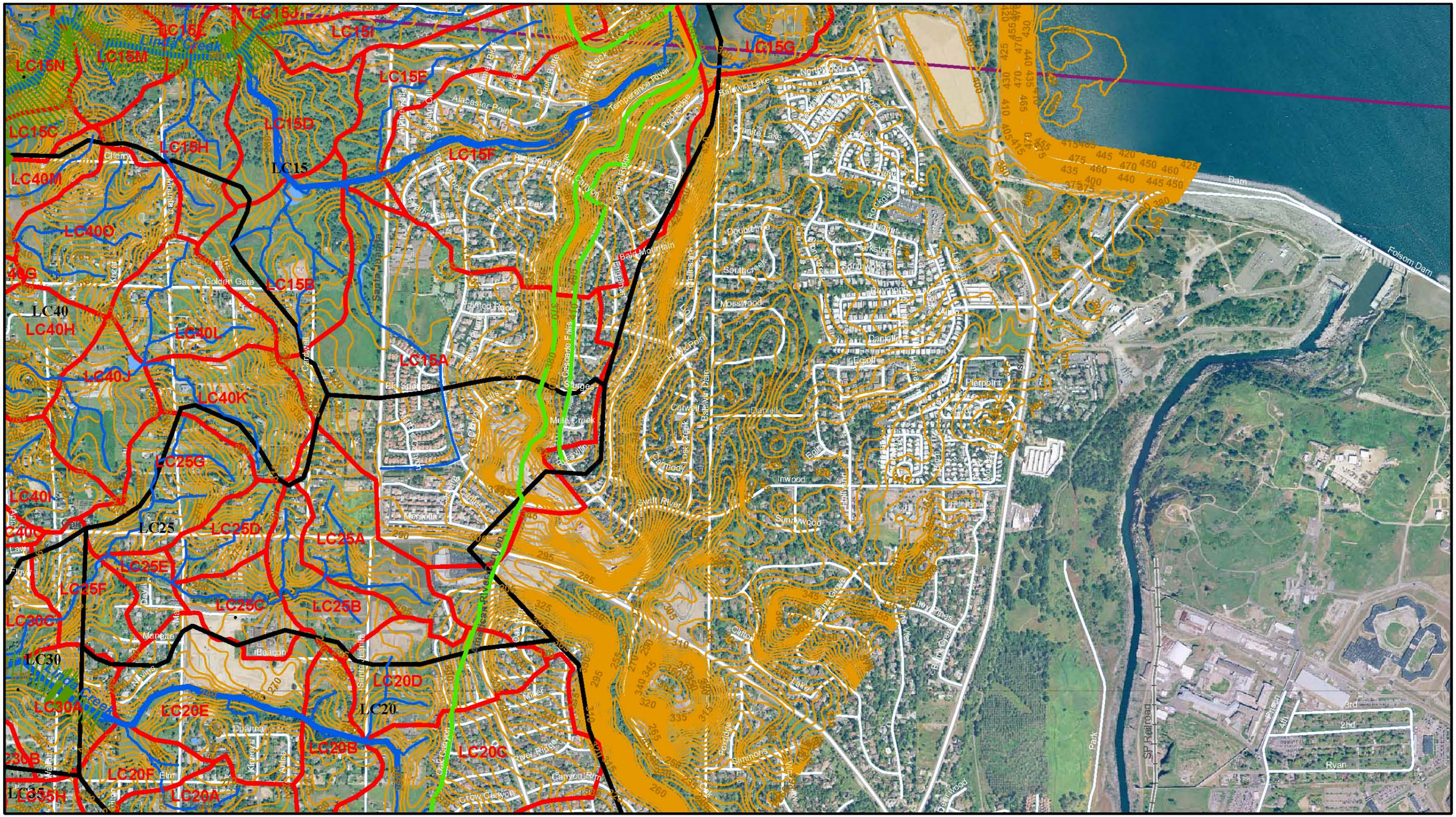
CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.29

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

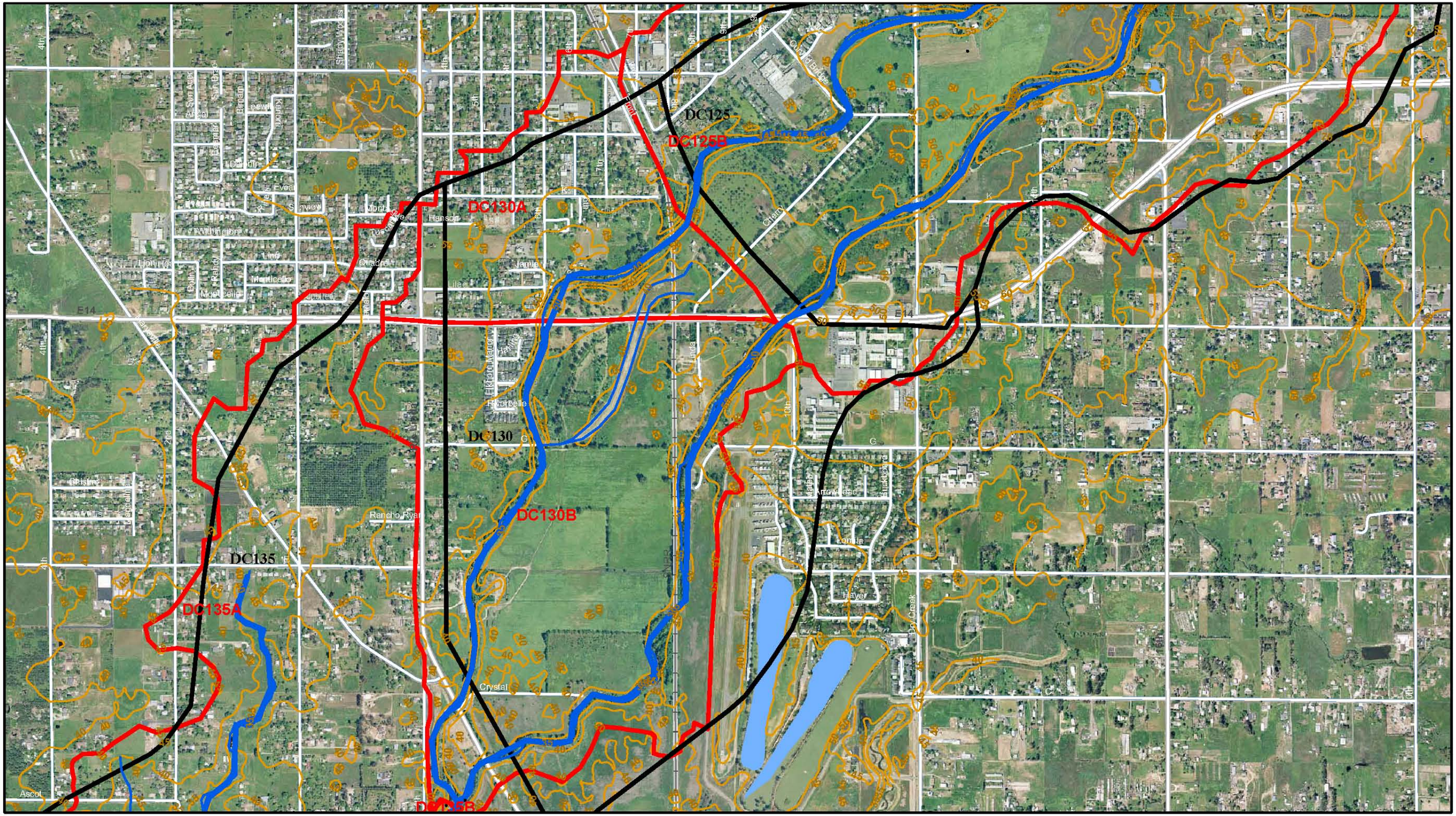
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.30

WATERSHED MAPPING



UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

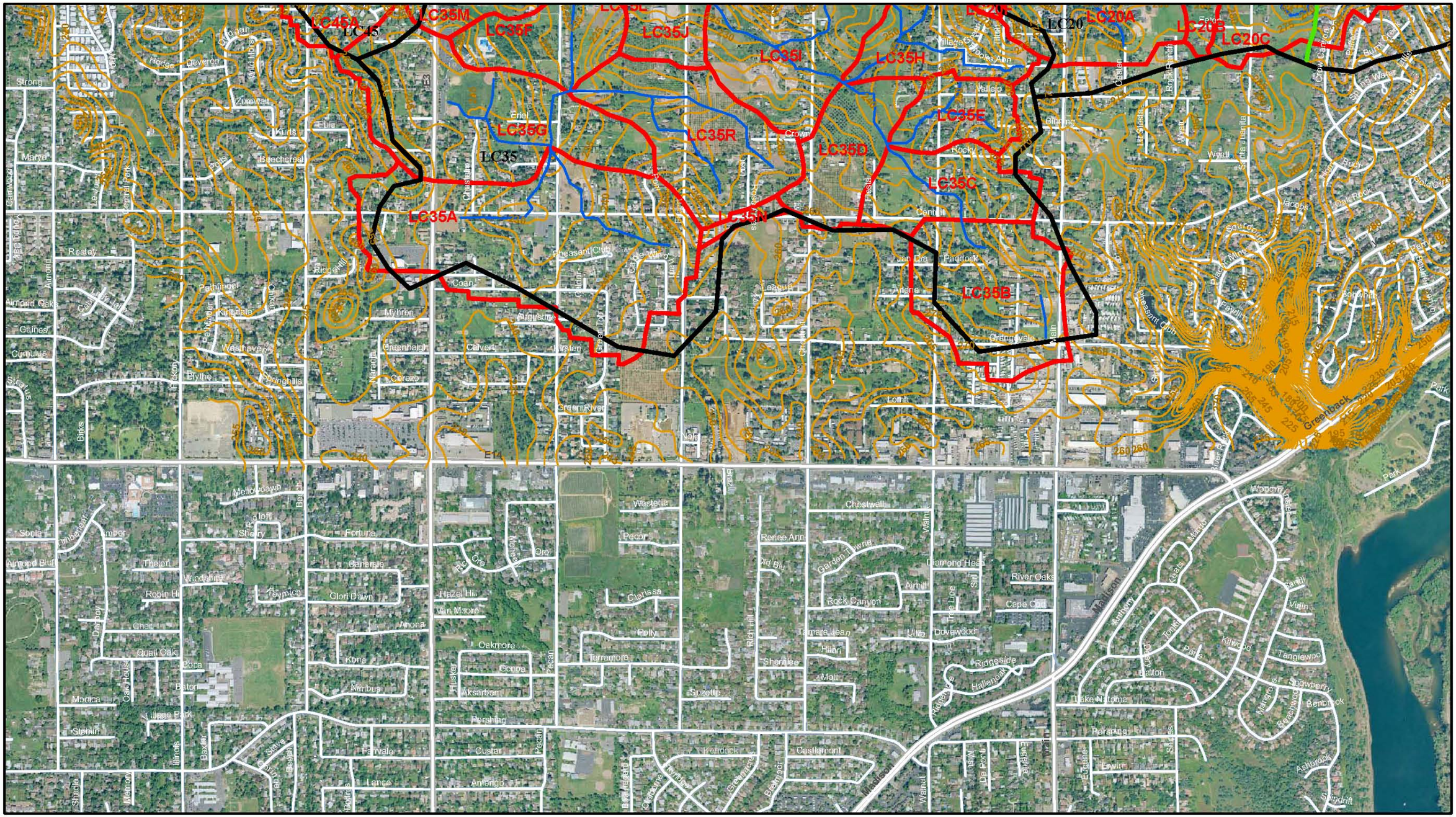
RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.31

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
- 1992 Plan Watersheds
- Update Plan Watersheds
- Project Contour Elevations
- Existing Ponds
- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

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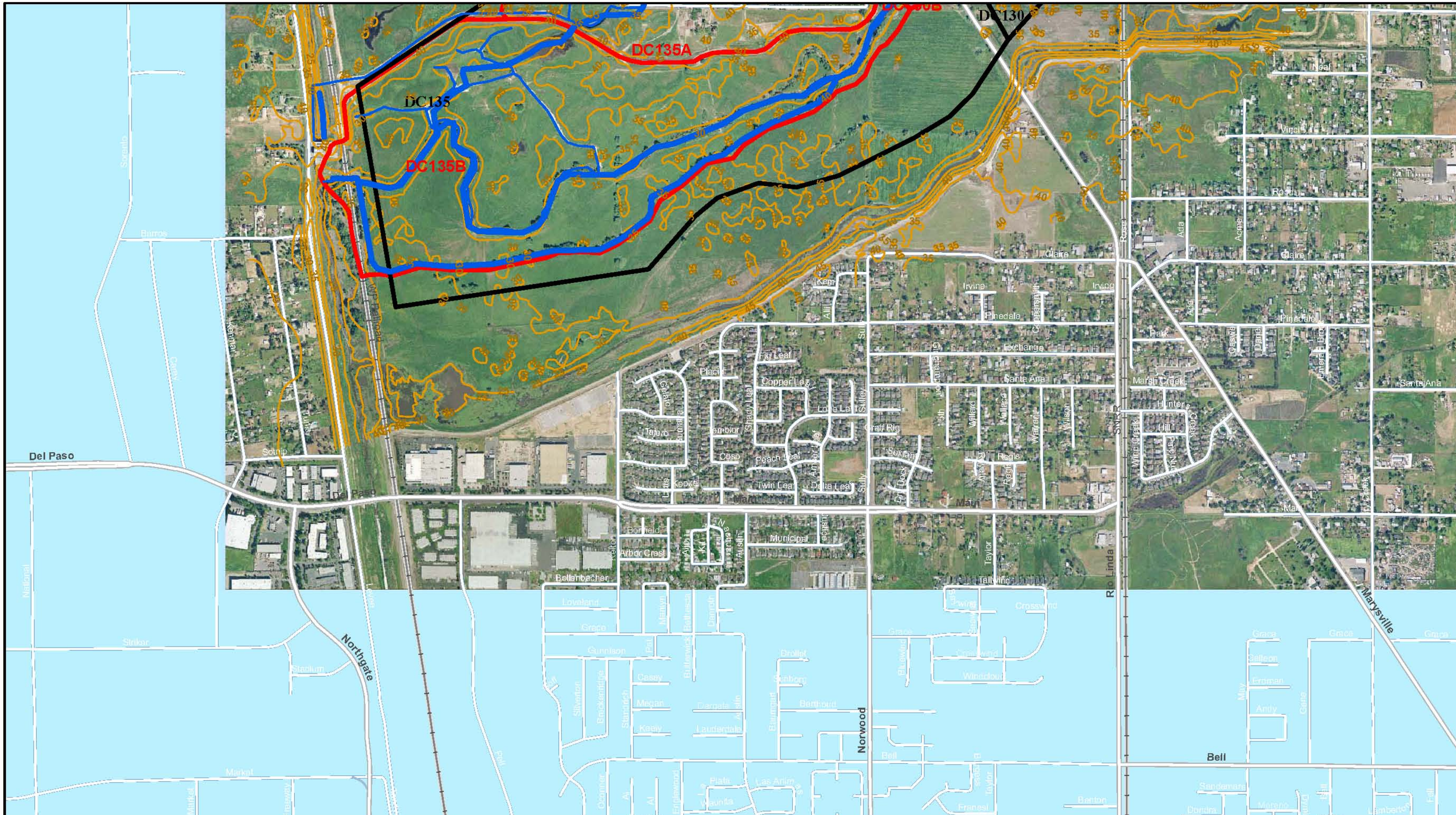
CIVIL ENGINEERING SOLUTIONS, INC.

0 250 500 Feet

PLATE B.32

WATERSHED MAPPING



Legend

- Points of Interest
- Local Detention
- Stream Gage
- Rain Gage
- Water Delivery Canals
- Storm Drain Pipes
- Hydraulic Routing Model X-sections
- Swales
- Streams
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- County Boundary

UPDATE TO THE DRY CREEK WATERSHED FLOOD CONTROL PLAN

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0 250 500 Feet

PLATE B.33

Appendix C - Hydrologic Model Calibration

C.1 Introduction

Record event precipitation was applied in the models for the various precipitation gages as shown in Plate C.1. Nine (9) stream gage locations, also shown in Plate C.1 were used in the calibration analysis which included the hydraulic routing analysis which provide stage data for gages without rating curves. Plate C.2 through Plate C.10 report the comparison of the stream gage measured values to the event predicted values for these gages respectively: 1603, 1605, 1607, 1609, 1611, 1619, 1623, 1626, and 1630. The following items are compared for all gage locations:

HMS Predict: The raw hydrology analysis predicted flow rates. These flow rates are fed into the hydraulic routing analysis which produces results for a more detailed attenuation analysis.

Gage Measured: The gage reported stage values were converted to a hydrograph using the best fit rating curve values.

HEC-RAS: The results of the calibrated hydraulic routing analysis for the predicted storm response.

C.2 January 1995 Event

For the January 1995 event, calibration analysis was performed using the Plan's 1992 baseline analysis. The January 1995 event (which is the largest event of record for the Dry Creek watershed) had sufficient gage records that a calibration analysis was performed. Twelve (12) rain gages within the watershed reported valid and continuous results for this storm event and were used in the calibration analysis. Graphs of the gage recorded precipitation are shown in Plate C.11. Plate C.11 graphs the SWMM precipitation rating curves for the elevation of each gage against the peak precipitation recorded for each time interval. These graphs are used to determine the precipitation event rating for each gage. For the January 1995 event, the precipitation ratings vary from a 50-year event to more than a 500-year event.

The stream gage locations within the Dry Creek watershed are shown on Plate C.13. Plate C.14 compares the results of the Hydraulic Routing (HEC-RAS) analysis rating curve for each gage location to a best fit curve. The best fit curve was used to convert the reported stage values to flow rates for comparison to the predicted flow rates of the calibrated analysis. In some cases, the gages also reported a previously converted flow rate, and in those cases the internal gage rating curve used to convert stage to flow rate is also presented.

Plate C.15 presents the comparison of the calibrated analysis to the record analysis for this event through the peak flow period of the event. In some cases, where an internal gage rating curve was available, the "Gage Measured" curve is directly reporting the

gage values. In these cases, a “Gage Adjusted” curve is added to the graphs to depict the values that would result if the best fit curve were used to report the flow rates. In most cases this curve would better represent the peak flow rates as the best fit curve was developed based on the hydraulics demonstrated in the Hydraulic Routing analysis.

The results of the analysis demonstrate the Plan Update models adequately predict the peak flood timing, scale, volume and response for this event.

C.3 December 1995 Event

For the December 1995 event, the calibration analysis was performed using the Plan Update’s 1992 baseline analysis hydrology and hydraulic routing models.

The December 1995 event demonstrates the calibration of the Plan Update analysis for a smaller flood event. Eleven (11) rain gages within the watershed reported valid and continuous results for this storm event and were used in the calibration analysis. Gage 1608 had corrupted data and was not used.

Graphs of the gage recorded precipitation are shown in Plate C.16. Plate C.17 graphs the SWMM precipitation rating curves for the elevation of each gage against the peak precipitation recorded for each time interval. These graphs are used to determine the precipitation event rating for each gage. For the December 1995 event, the precipitation ratings vary from a 2-year event to a 5-year event.

The stream gage locations within the Dry Creek watershed are shown on Plate C.13. Plate C.18 presents the comparison of the calibrated analysis to the record analysis for this event through the peak flow period of the event. In some cases, where an internal gage rating curve was available, the “Gage Measured” curve is directly reporting the gage values. In these cases, a “Gage Adjusted” curve is added to the graphs to depict the values that would result if the best fit curve were used to report the flow rates. In most cases this curve would better represent the peak flow rates as the best fit curve was developed based on the hydraulics demonstrated in the Hydraulic Routing analysis. Plate C.19 presents the entire flood event hydrographs.

The results of the analysis demonstrate the Plan Update models adequately predict the peak flood timing, scale, volume and response for this event.

C.4 January 1997 Event

For the January 1997 event, the calibration analysis was performed using the Plan’s 1992 baseline analysis hydrology and hydraulic routing models.

The January 1997 event demonstrates the calibration of the Plan Update analysis for a smaller flood event. Eleven (11) rain gages within the watershed reported valid and continuous results for this storm event and were used in the calibration analysis. Gage 1608 had corrupted data and was not used.

Graphs of the gage recorded precipitation are shown in Plate C.20. Plate C.21 graphs the SWMM precipitation rating curves for the elevation of each gage against the peak precipitation recorded for each time interval. These graphs are used to determine the precipitation event rating for each gage. For the January 1997 event, the precipitation ratings vary from a 5-year event to a 50-year event.

The stream gage locations within the Dry Creek watershed are shown on Plate C.13. Plate C.22 presents the comparison of the calibrated analysis to the record analysis for this event through the peak flow period of the event. In some cases, where an internal gage rating curve was available, the "Gage Measured" curve is directly reporting the gage values. In these cases, a "Gage Adjusted" curve is added to the graphs to depict the values that would result if the best fit curve were used to report the flow rates. In most cases this curve would better represent the peak flow rates as the best fit curve was developed based on the hydraulics demonstrated in the Hydraulic Routing analysis. Plate C.23 presents the entire flood event hydrographs.

The results of the analysis demonstrate the Plan Update models adequately predict the peak flood timing, scale, volume and response for this event.

C.5 December 2005 Event

For the December 2005, the calibration analysis was performed using the Plan Update's 2007 analysis hydrology and hydraulic routing models.

The December 2005 is remembered as the "New Years Eve" event because the storm came early in the morning on New Years Eve. The event demonstrates the calibration of the Plan Update analysis for moderate flood event. Eleven rain gages within the watershed reported valid and continuous results for this storm event and were used in the calibration analysis.

Graphs of the gage recorded precipitation are shown in Plate C.24. Plate C.25 graphs the SWMM precipitation rating curves for the elevation of each gage against the peak precipitation recorded for each time interval. These graphs are used to determine the precipitation event rating for each gage. For the December 2005 event, the precipitation ratings vary from a 2-year event to a 50-year event.

The stream gage locations within the Dry Creek watershed are shown on Plate C.13. Plate C.26 presents the comparison of the calibrated analysis to the record analysis for this event through the peak flow period of the event. In some cases, where an internal gage rating curve was available, the "Gage Measured" curve is directly reporting the gage values. In these cases, a "Gage Adjusted" curve is added to the graphs to depict the values that would result if the best fit curve were used to report the flow rates. In most cases this curve would better represent the peak flow rates as the best fit curve was developed based on the hydraulics demonstrated in the Hydraulic Routing analysis. Plate C.27 presents the entire flood event hydrographs.

The results of the analysis demonstrate the Plan Update models adequately predict the peak flood timing, scale, volume and response for this event.

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Plate C.4 - Gage 1607 Cirby/Loretto – All Calibration Hydrographs and Rating Curves
Plate C.5 - Gage 1609 Miners @ Moss Ln – All Calibration Hydrographs and Rating Curves
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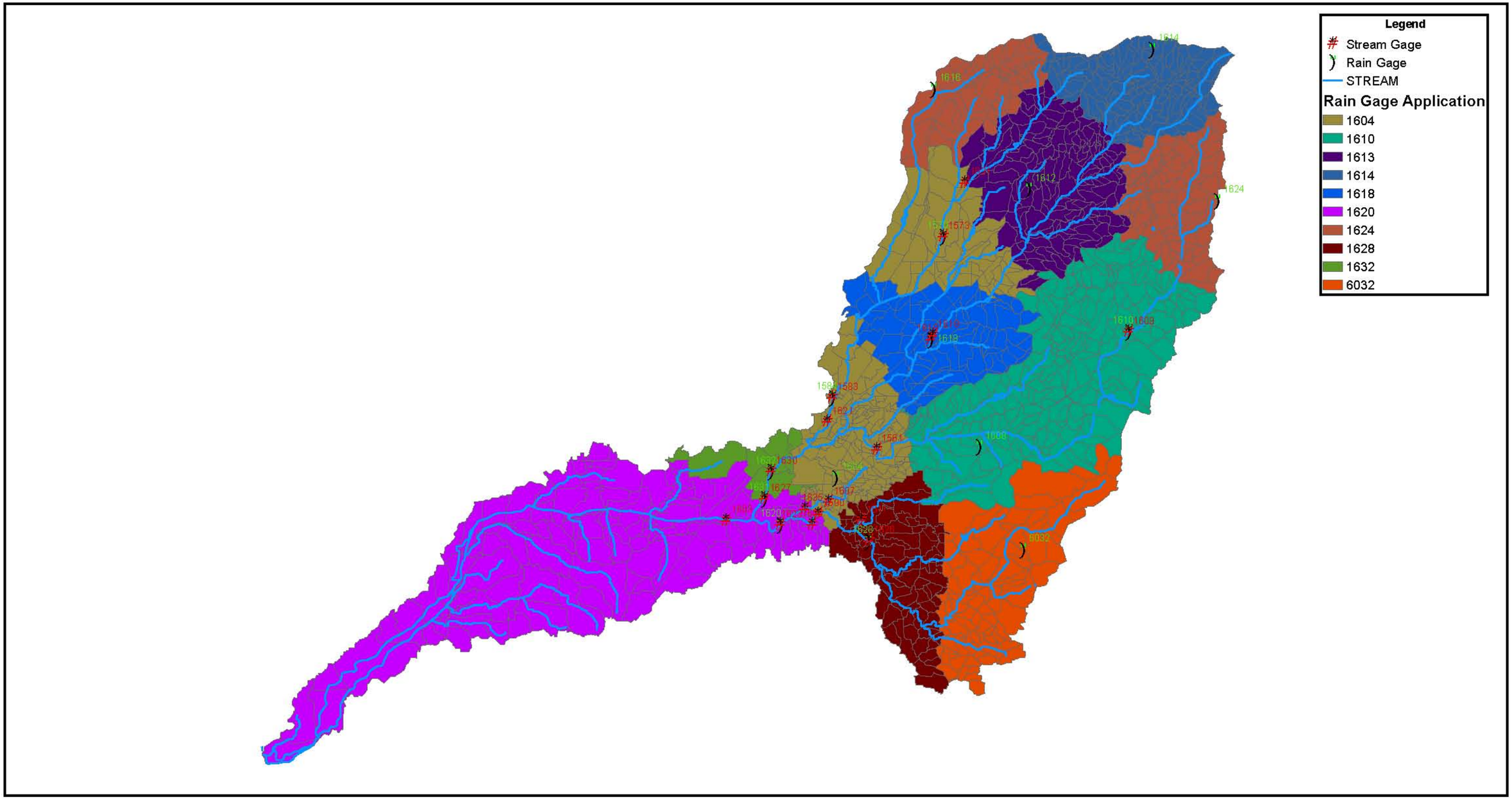
Plate C.26 - December 2005 Gage / Model Developed Rating Curves
Plate C.27 - December 2005 Event Hydrographs

RAIN GAGE APPLICATION TO WATERSHED FOR CALIBRATION ANALYSIS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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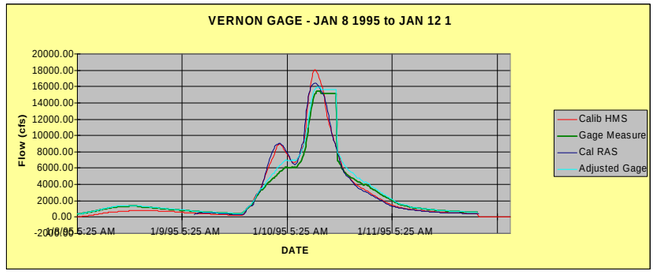
0 1 2 4 Miles

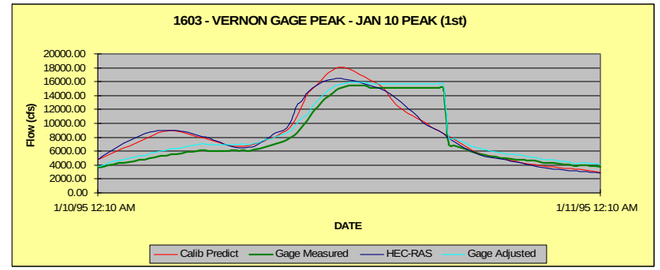
1 inch = 2 miles

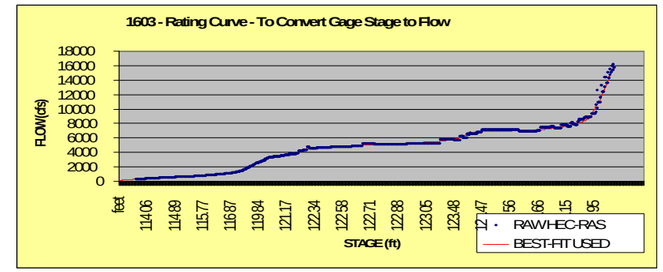
PLATE C.1

GAGE 1603 VERNON - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

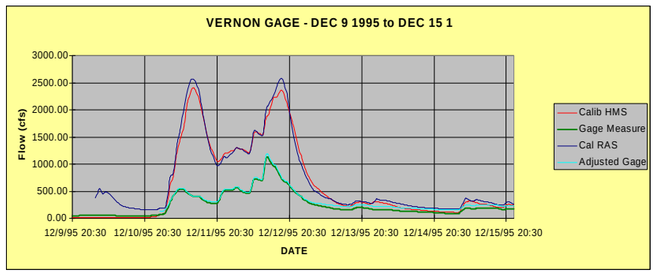
JAN. 1995 EVENT

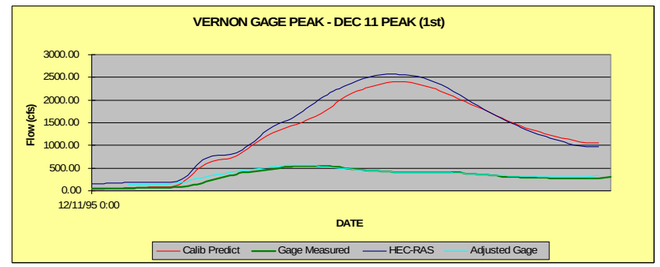




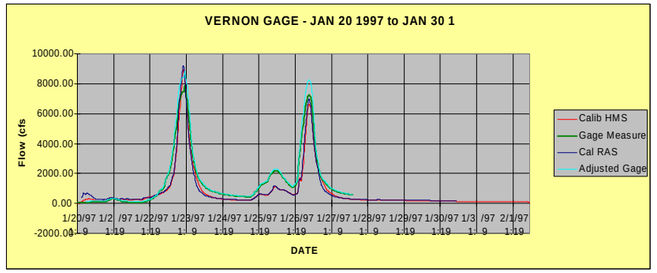


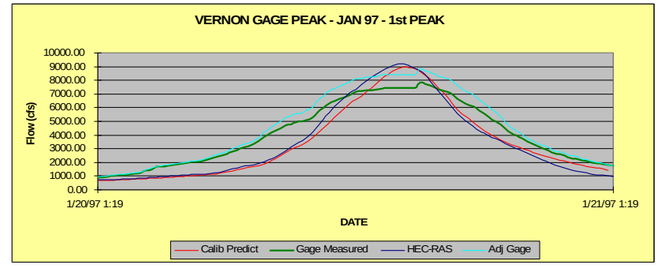
DEC. 1995 EVENT

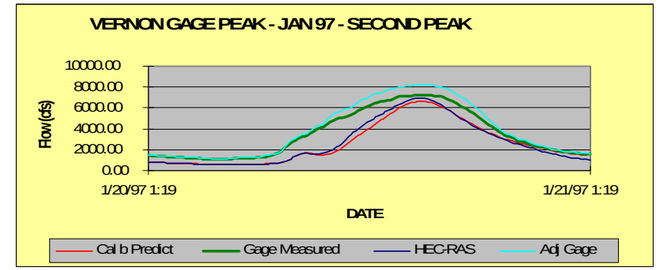




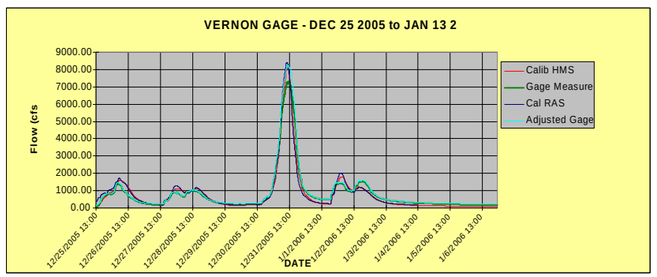
JAN. 1997 EVENT

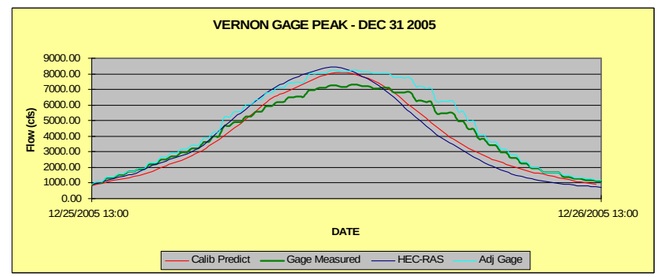


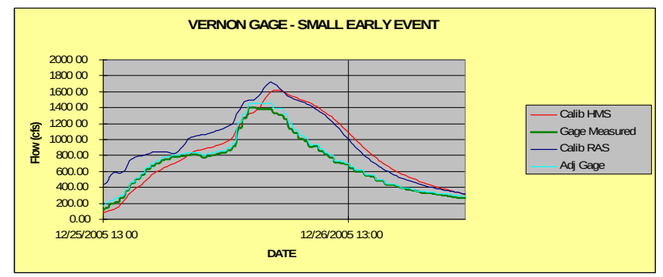




DEC. 2005 EVENT







PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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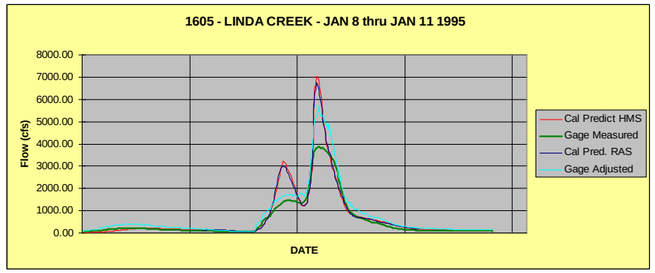
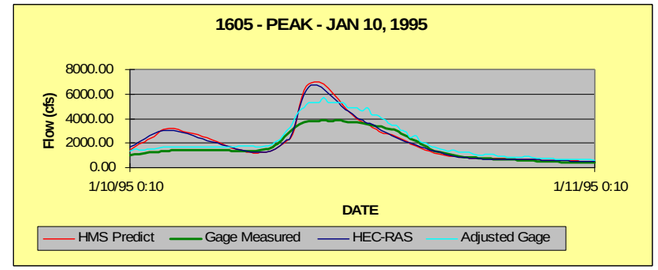
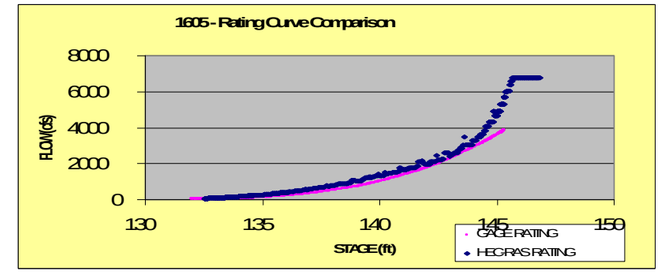
PLATE C.2

GAGE 1605 LINDA - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

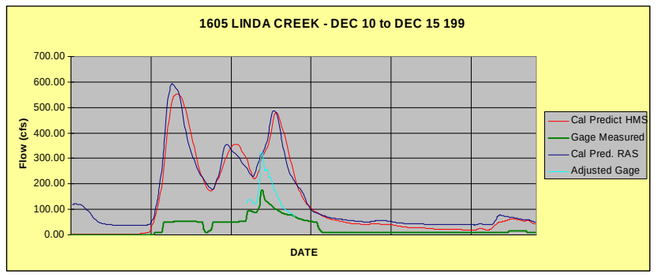
JAN. 1995 EVENT

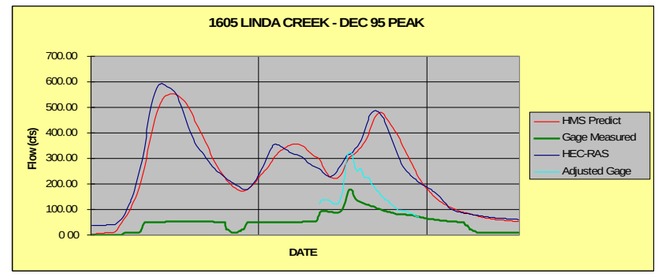




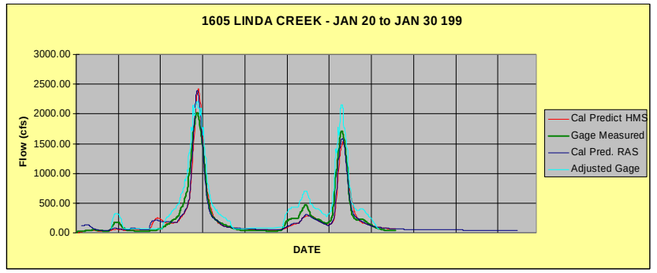


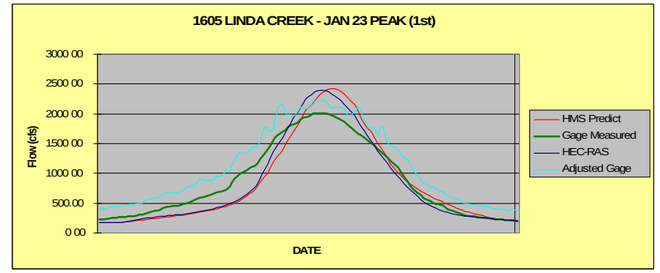
DEC. 1995 EVENT

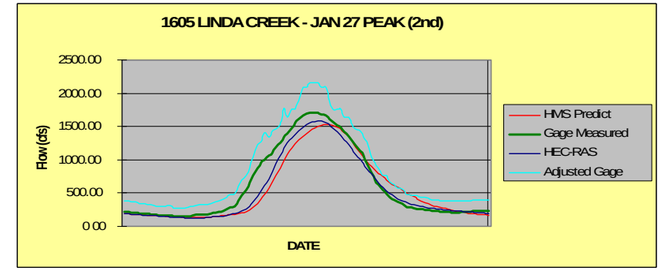




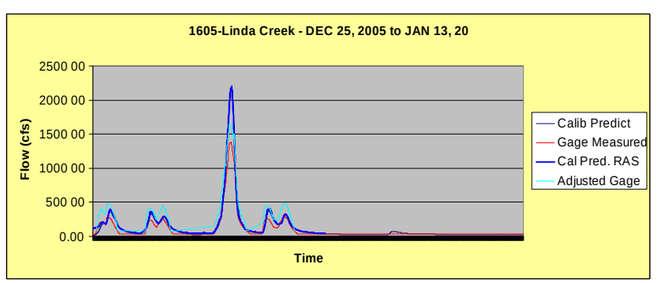
JAN. 1997 EVENT







DEC. 2005 EVENT



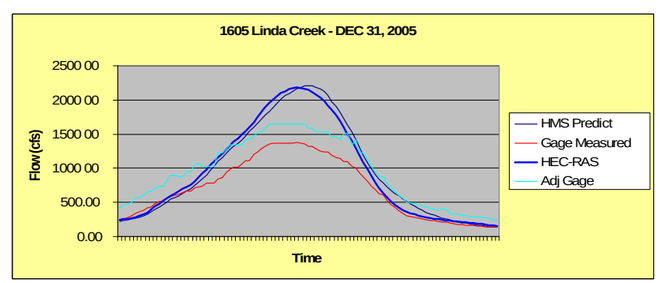


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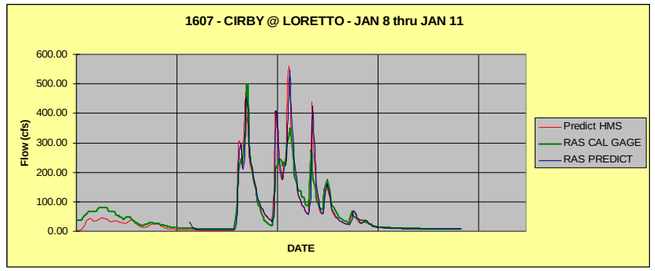
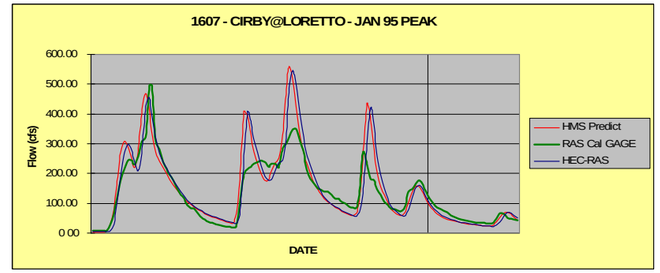
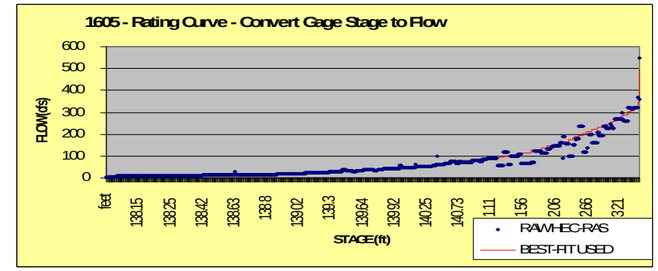
PLATE C.3

GAGE 1607 CIRBY/LORETTO - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

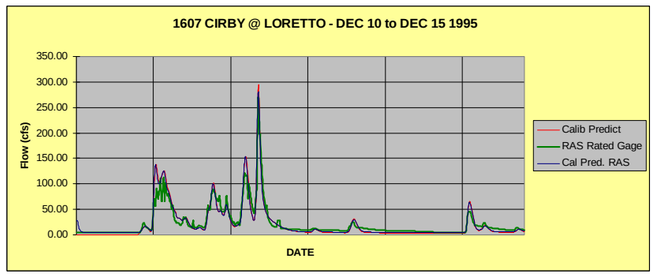
JAN. 1995 EVENT

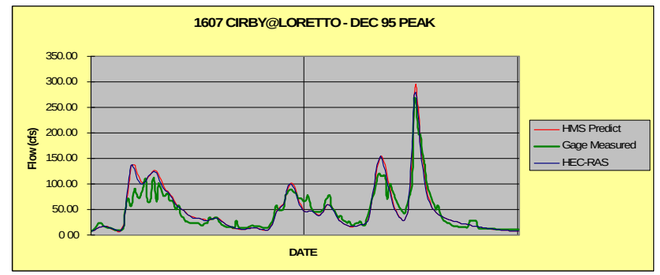




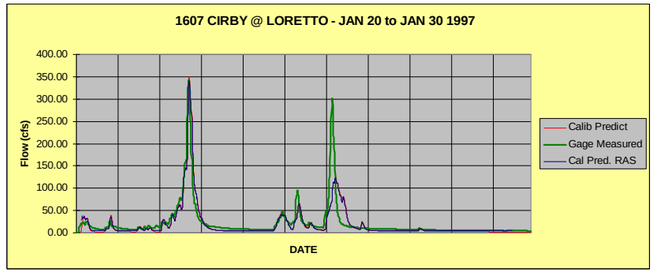


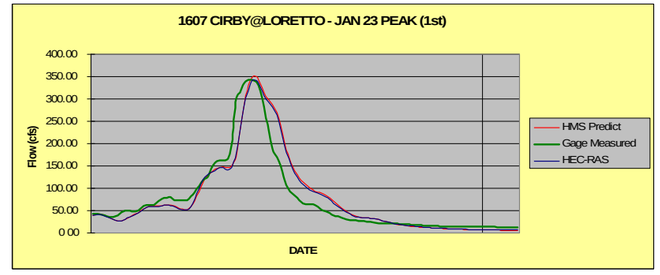
DEC. 1995 EVENT

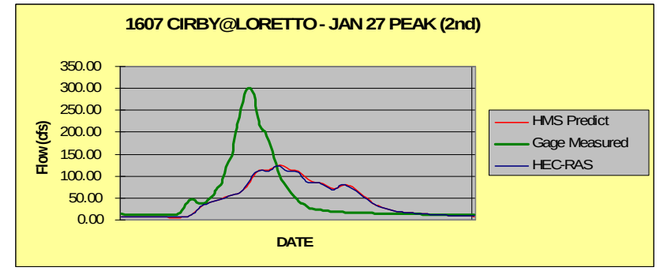




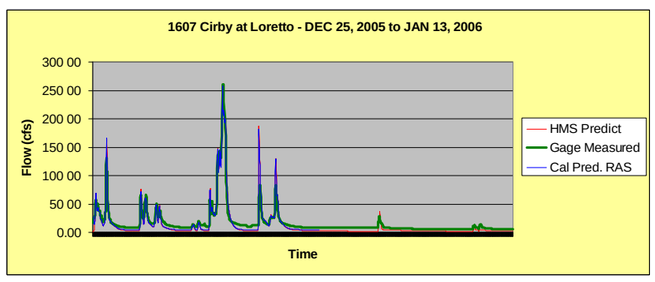
JAN. 1997 EVENT

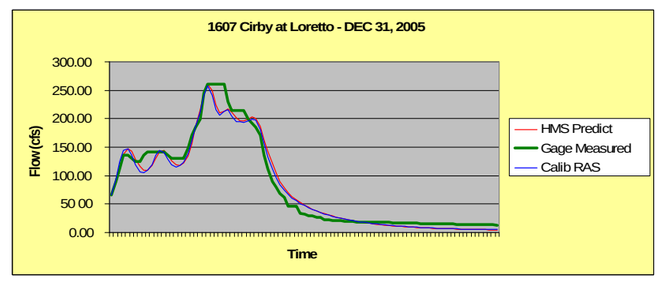






DEC. 2005 EVENT





PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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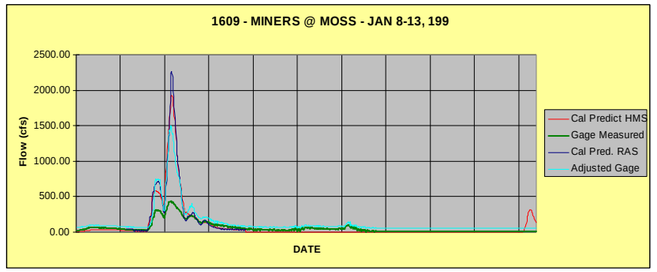
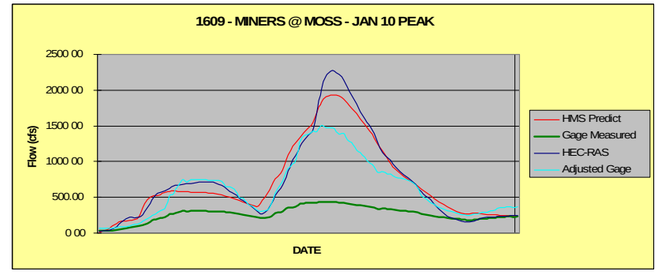
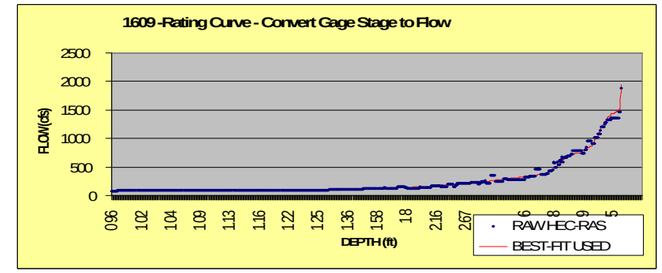
PLATE C.4

GAGE 1609 MINERS @ MOSS LN - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

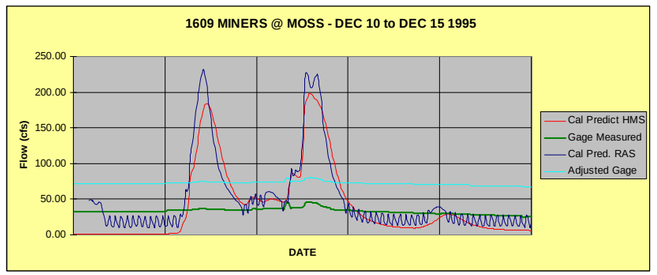
JAN. 1995 EVENT

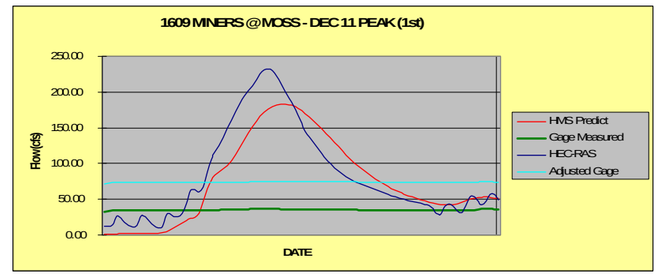




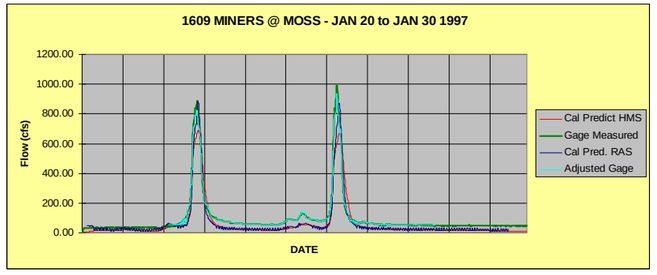


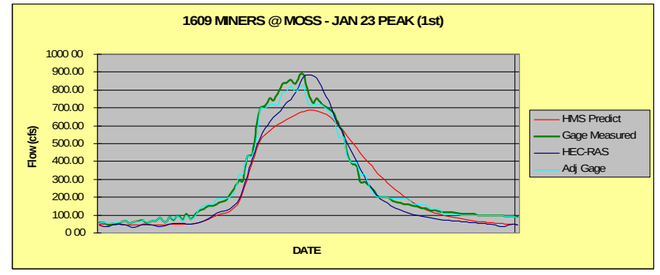
DEC. 1995 EVENT

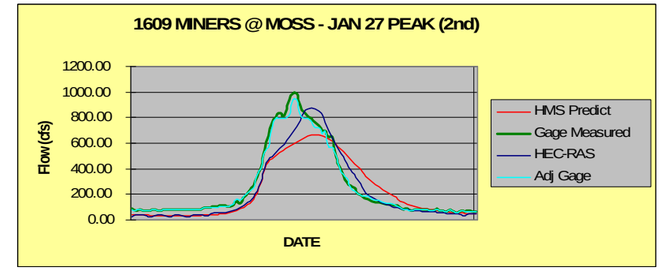




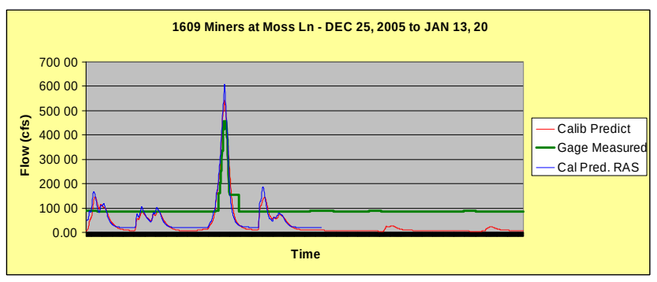
JAN. 1997 EVENT

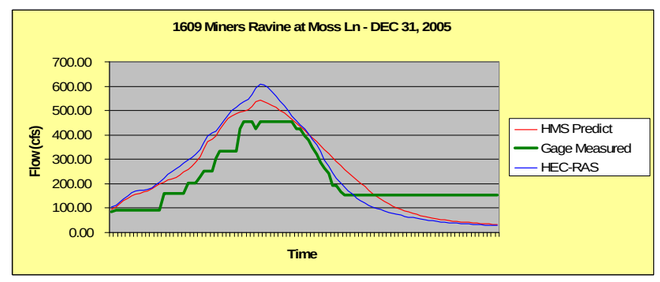






DEC. 2005 EVENT





PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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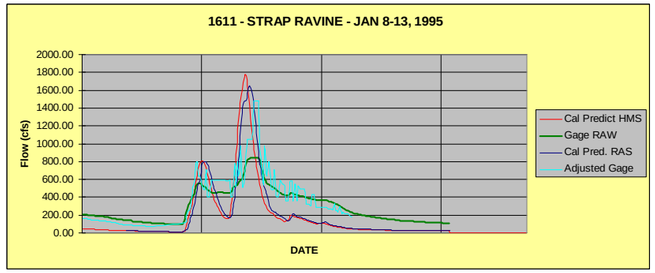
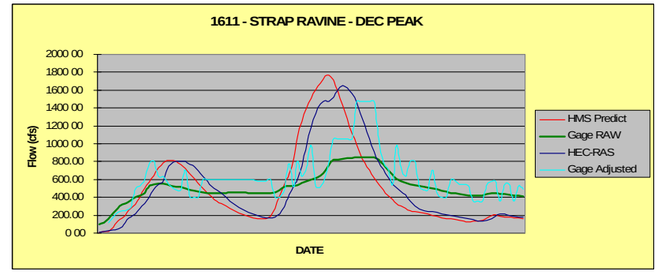
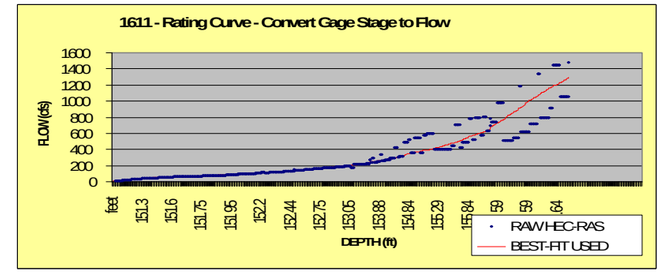
PLATE C.5

GAGE 1611 STRAP RAVINE - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

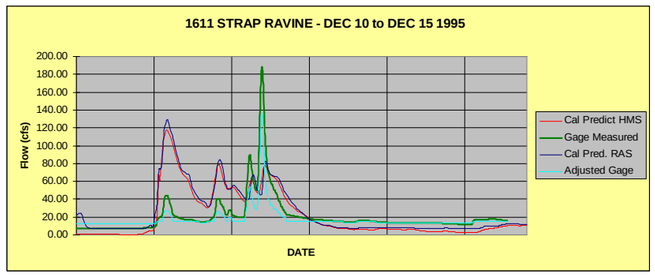
JAN. 1995 EVENT

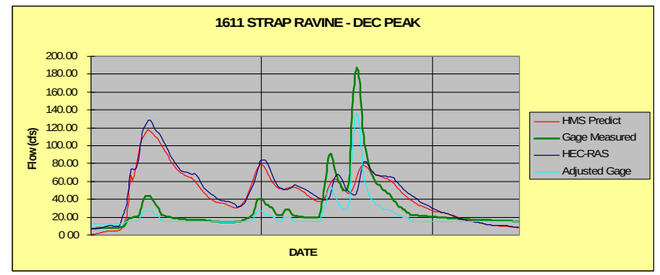




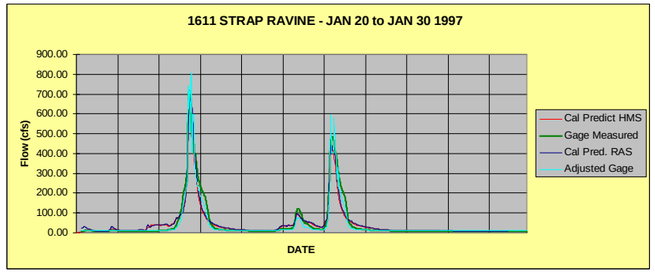


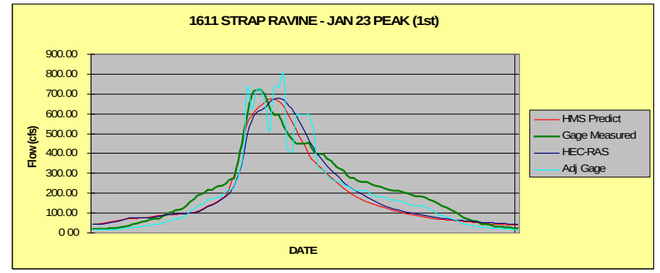
DEC. 1995 EVENT

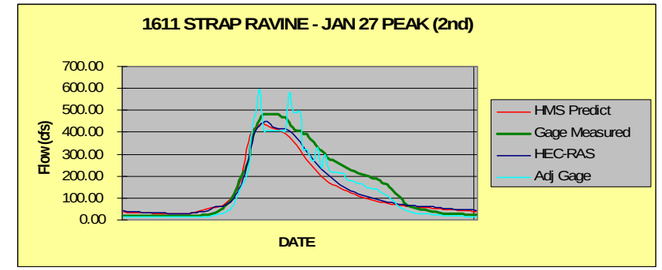




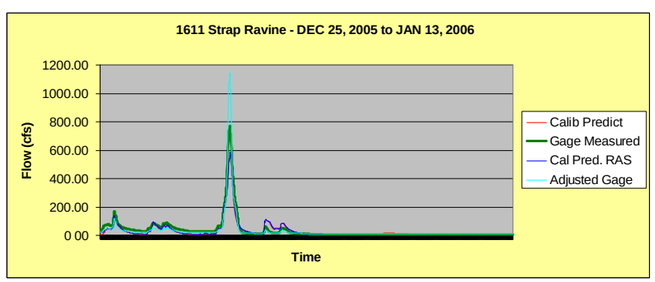
JAN. 1997 EVENT

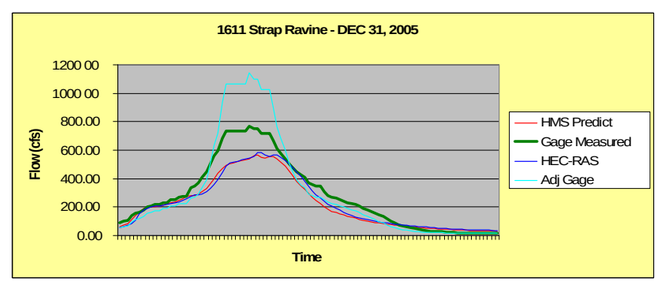






DEC. 2005 EVENT





PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

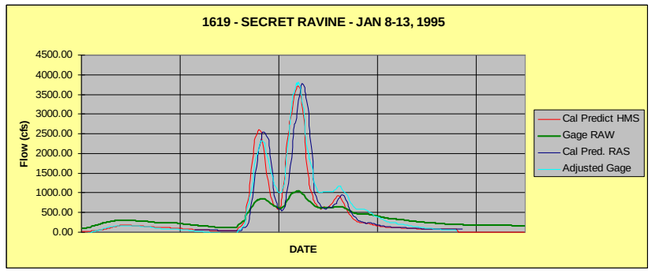
RBF CONSULTING

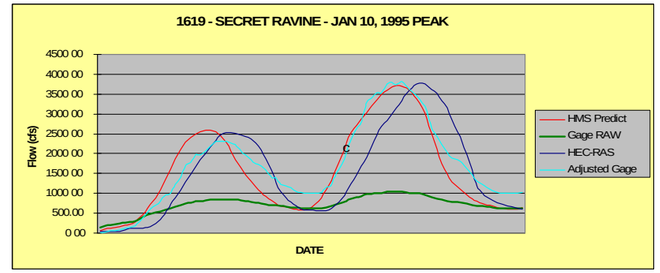
CIVIL ENGINEERING SOLUTIONS, INC.

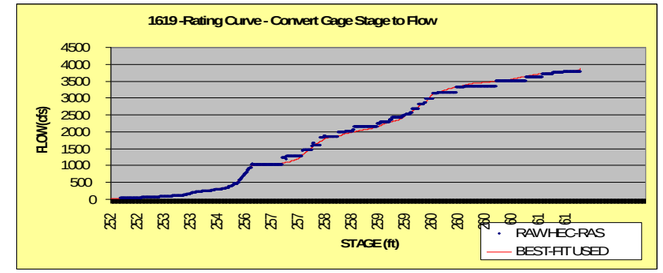
PLATE C.6

GAGE 1619 SECRET RAVINE - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

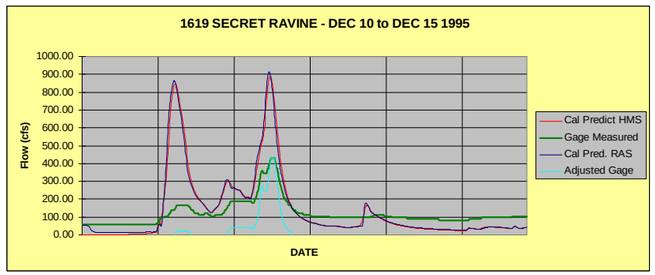
JAN. 1995 EVENT

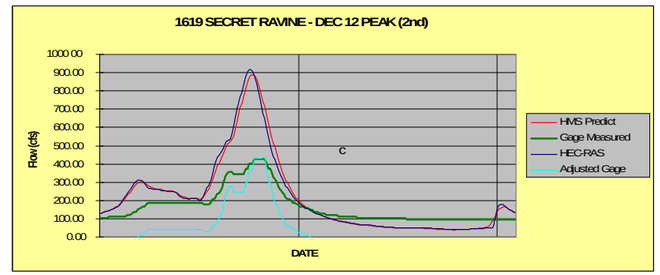




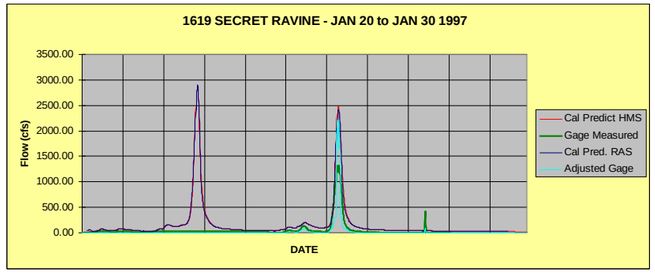


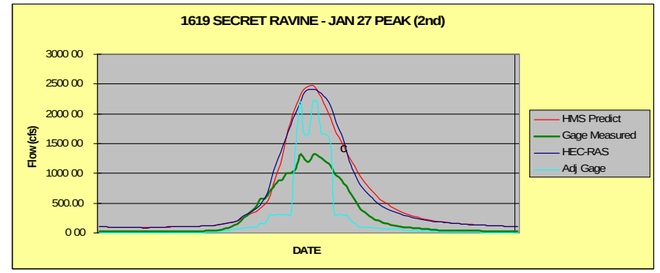
DEC. 1995 EVENT

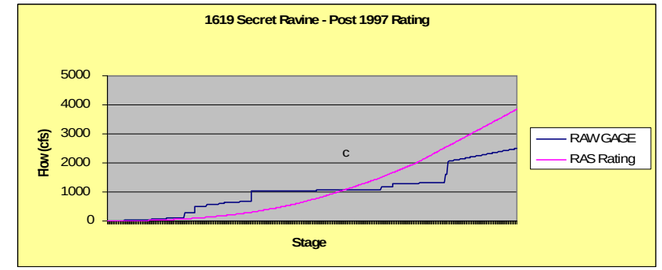




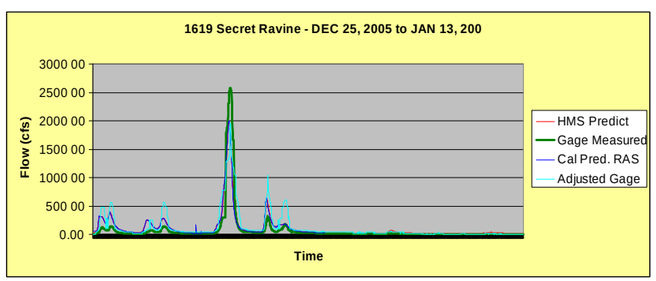
JAN. 1997 EVENT

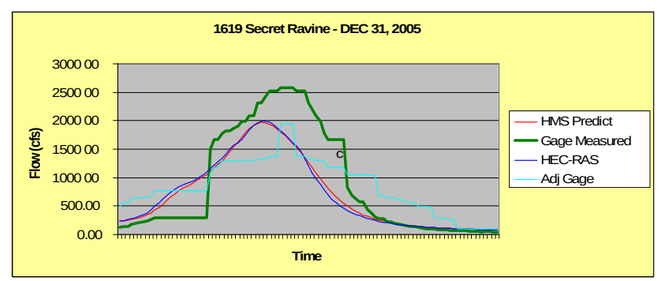






DEC. 2005 EVENT





PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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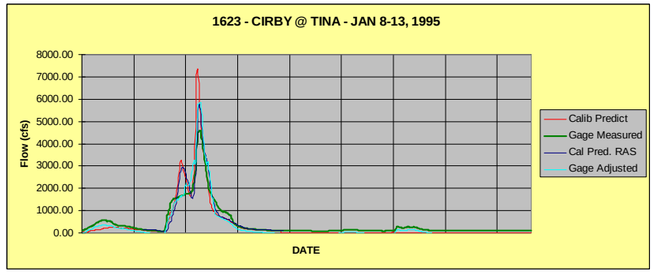
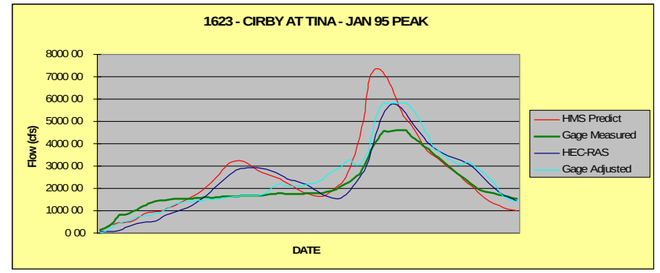
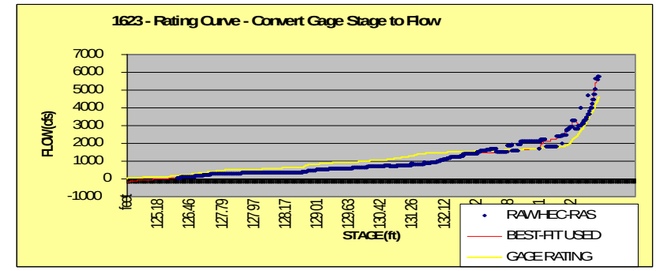
PLATE C.7

GAGE 1623 CIRBY @ TINA WAY - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

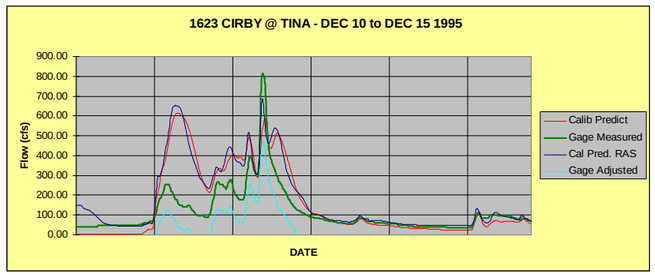
JAN. 1995 EVENT

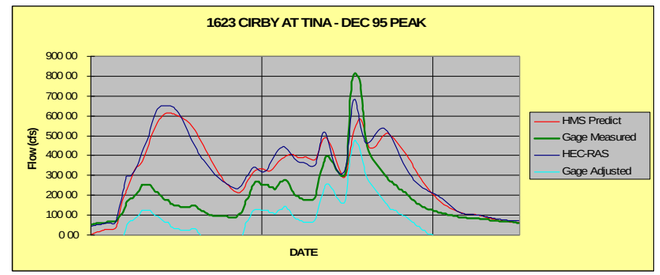




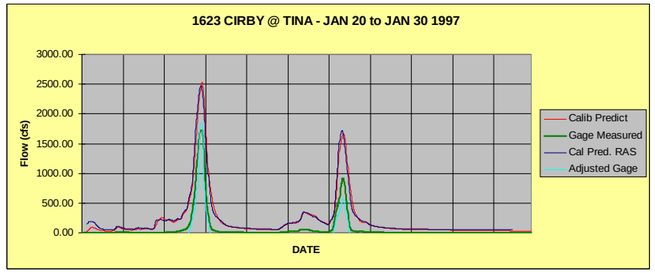


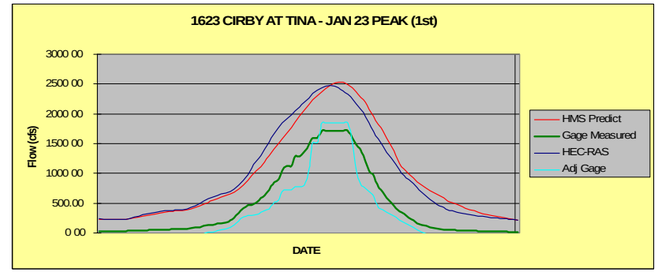
DEC. 1995 EVENT

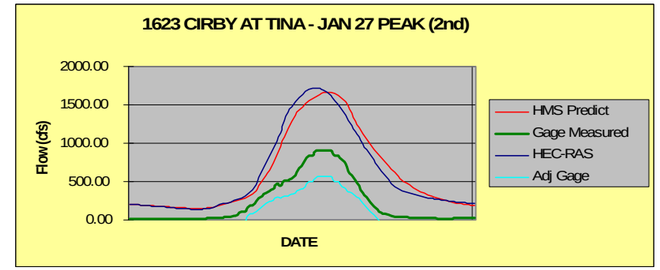




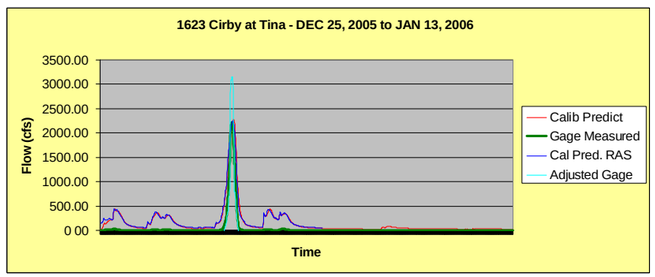
JAN. 1997 EVENT

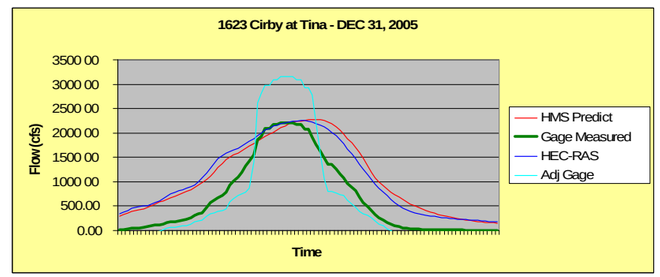






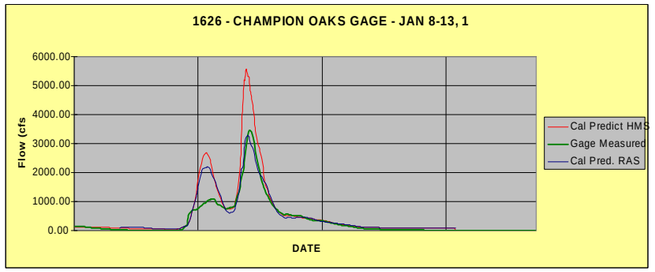
DEC. 2005 EVENT

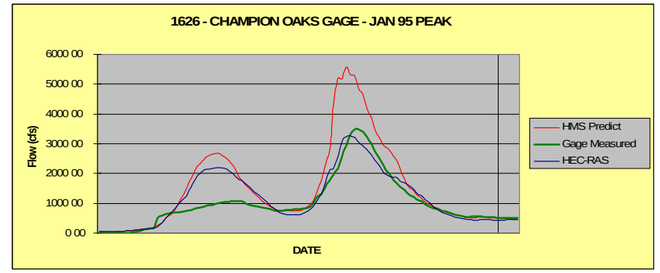


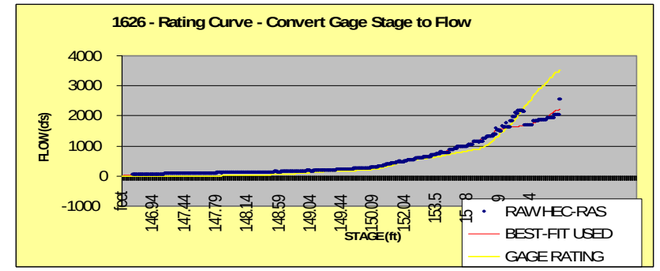


GAGE 1626 CIRBY @ CHAMPION - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

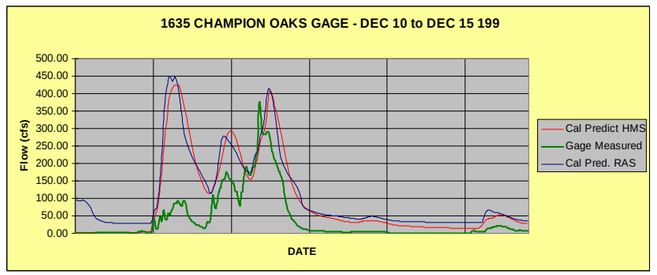
JAN. 1995 EVENT

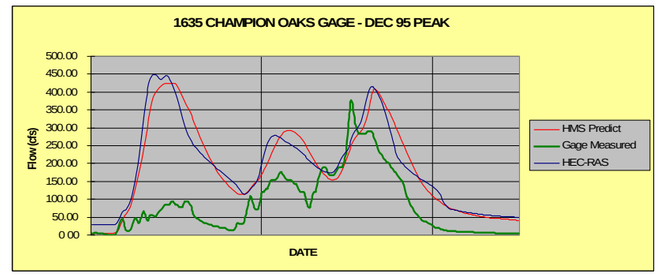




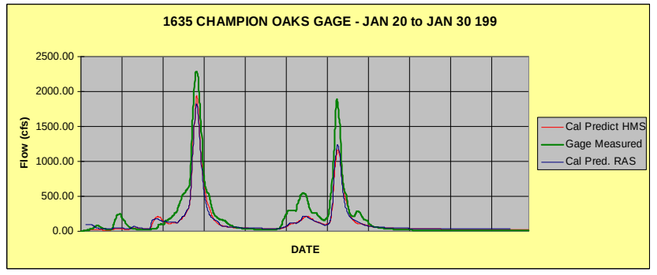


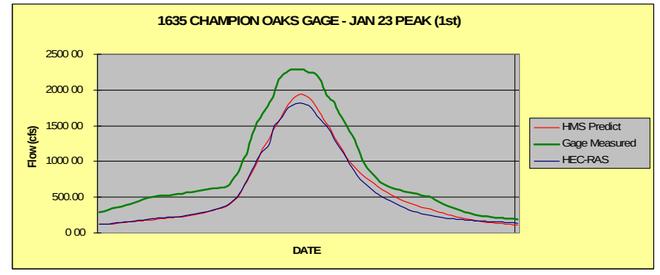
DEC. 1995 EVENT

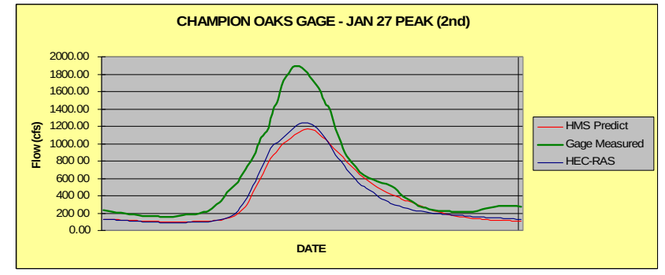




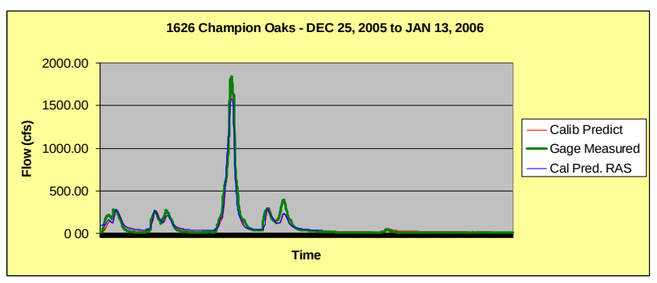
JAN. 1997 EVENT

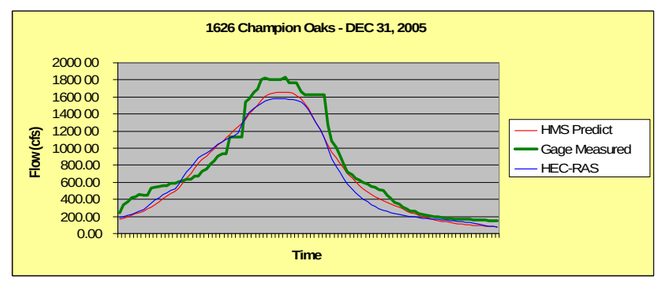






DEC. 2005 EVENT





PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

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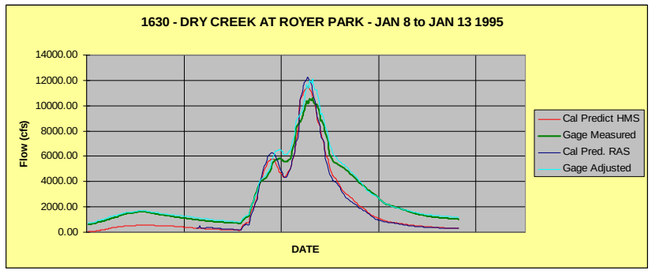
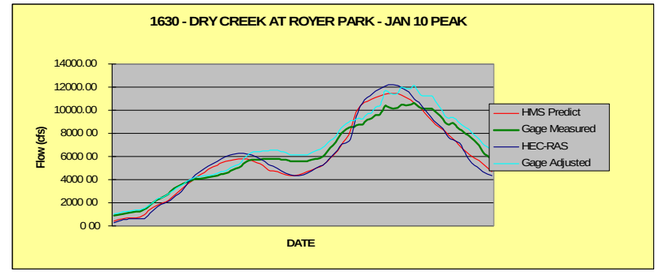
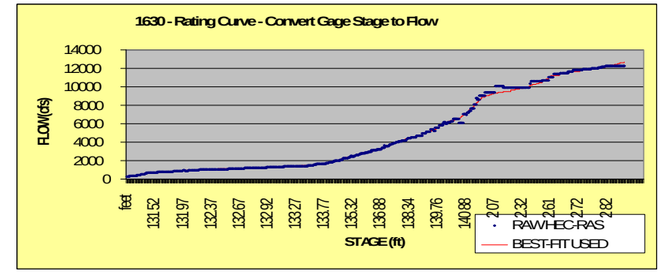
PLATE C.9

GAGE 1630 DC @ ROYER - ALL CALIBRATION HYDROGRAPHS AND RATING CURVES

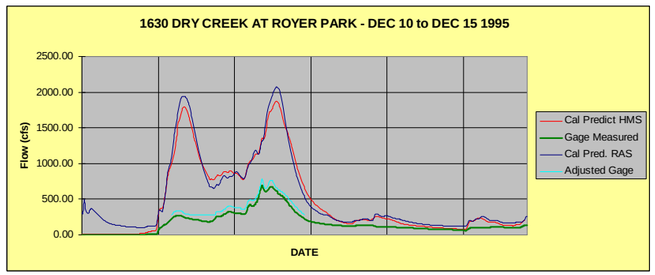
JAN. 1995 EVENT

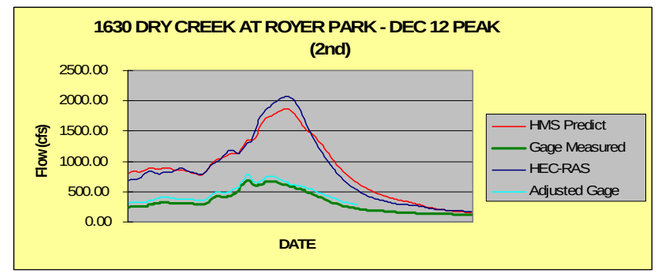




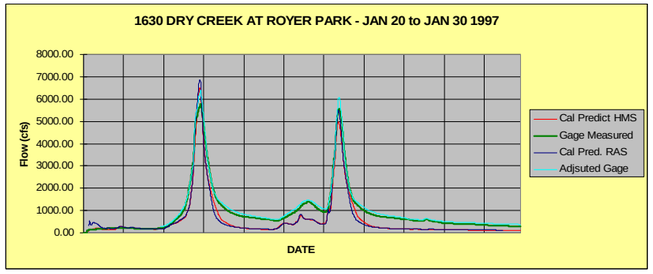


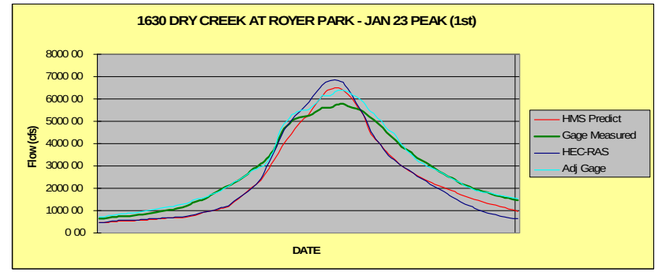
DEC. 1995 EVENT

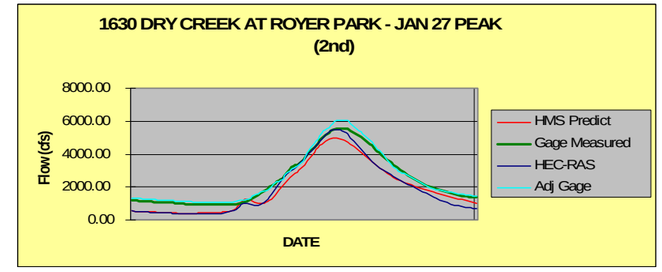




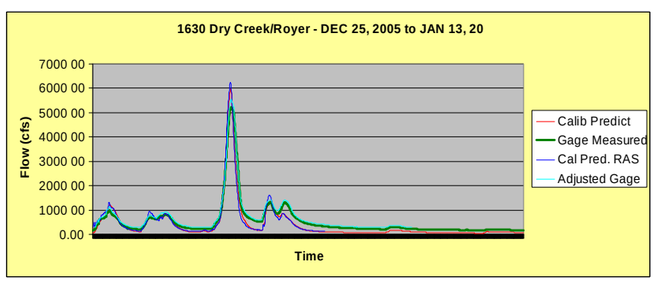
JAN. 1997 EVENT

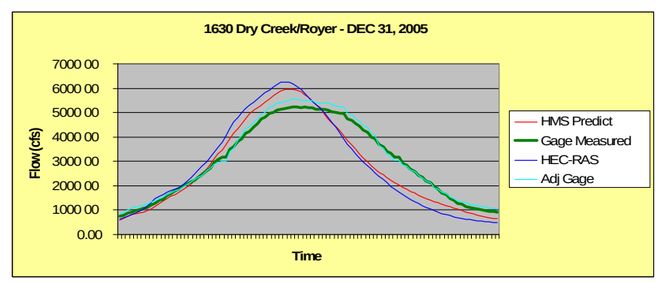




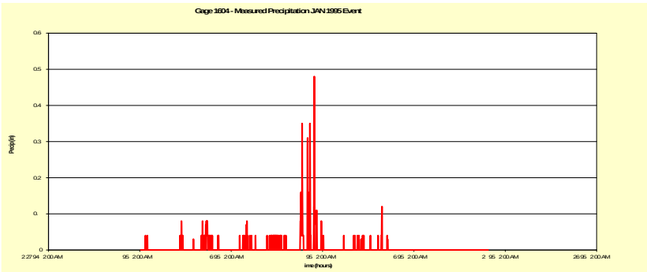


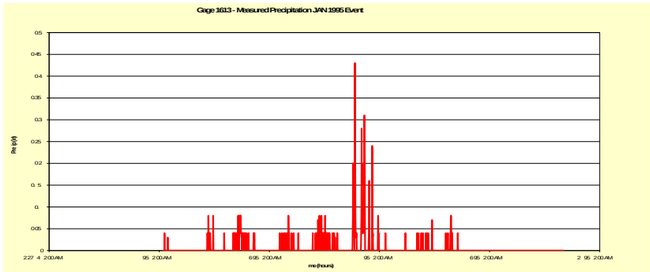
DEC. 2005 EVENT

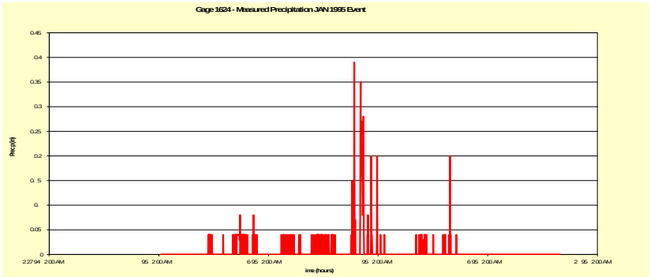


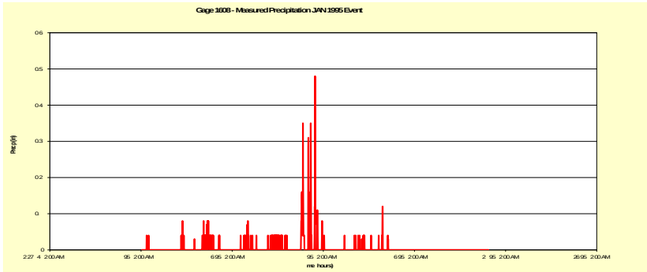


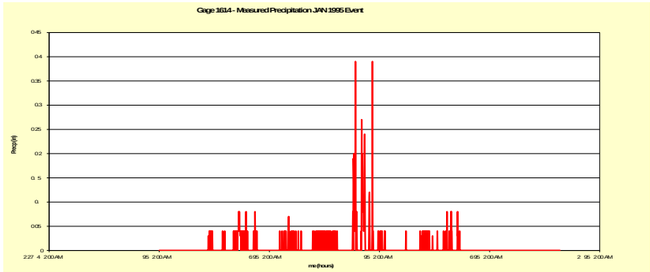
JANUARY 1995 EVENT RAINFALL BY GAGE

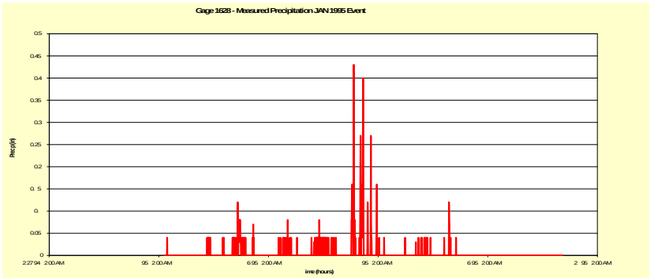


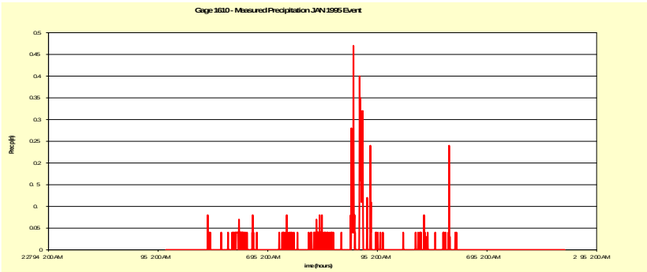


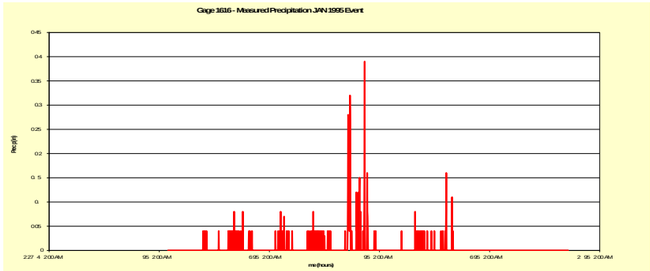


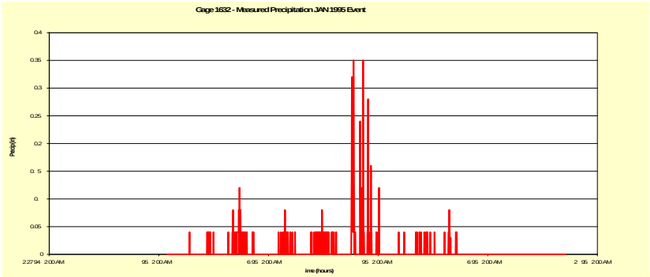


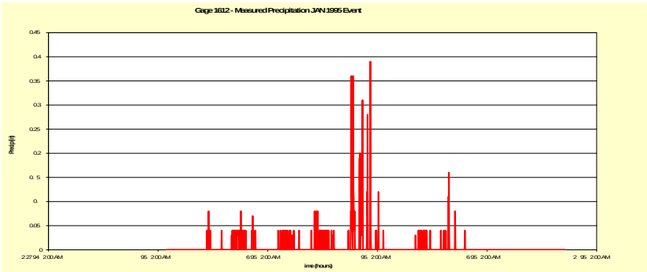


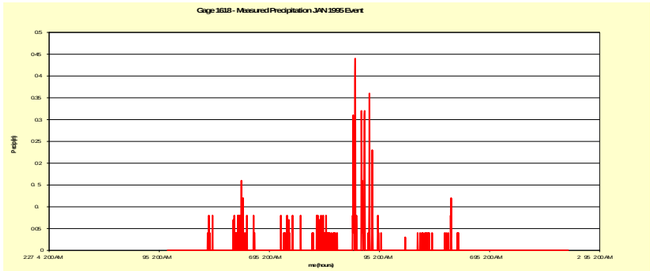


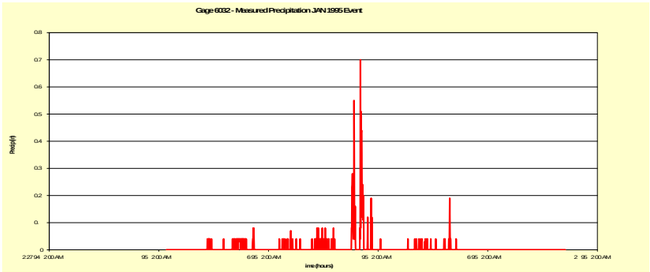












January 1995 Event

Varies between 50-yr and 500-yr precip.

50-year at gage:	1608
> 500-year at gage:	6032

Most Gages reported 200-year recurrance for 6-hour & 24-hour event.

24-hour precip varied between:	3.9	7.56
12-hour precip varied between	2.72	6.22
6-hour precip varied between	1.74	4.25

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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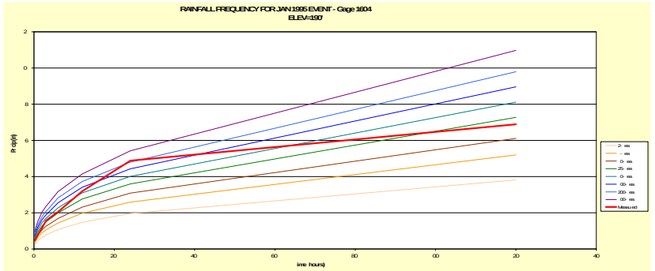
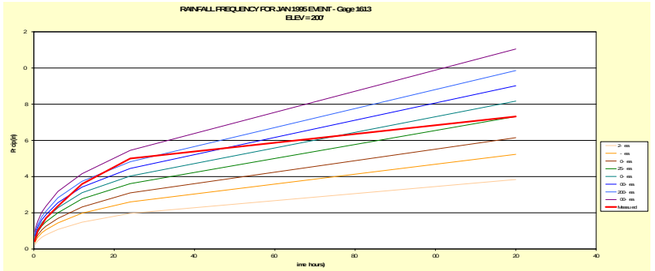
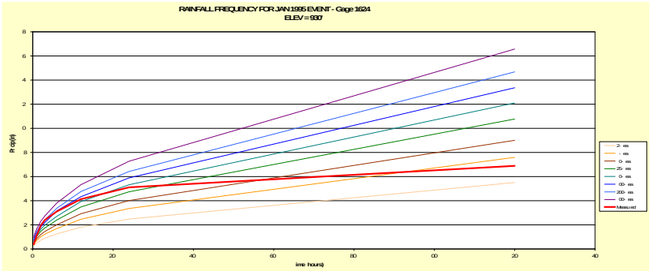
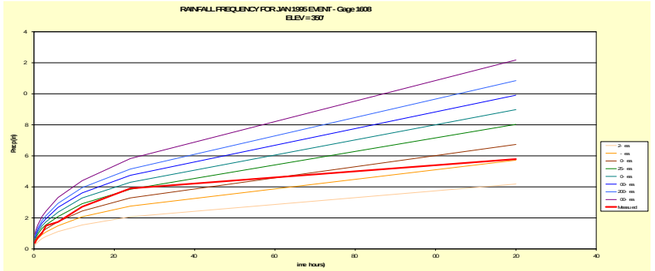
PLATE C.11

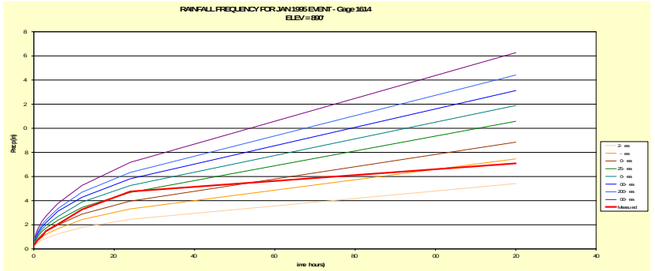
JANUARY 1995 EVENT RAINFALL STORM EVENT RATING BY GAGE

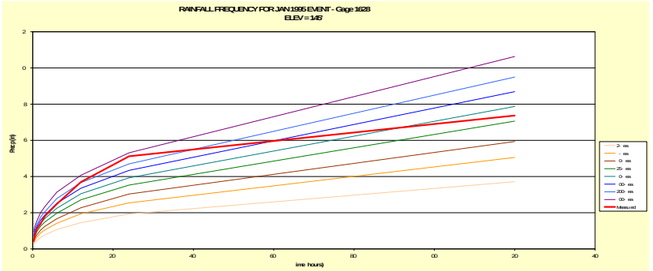


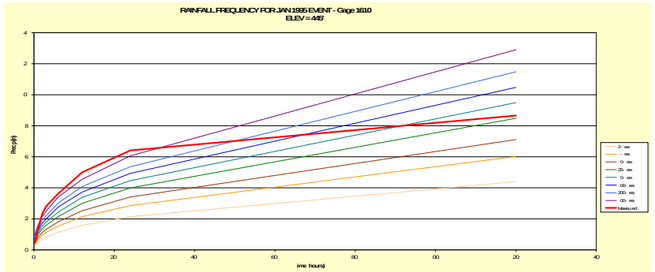


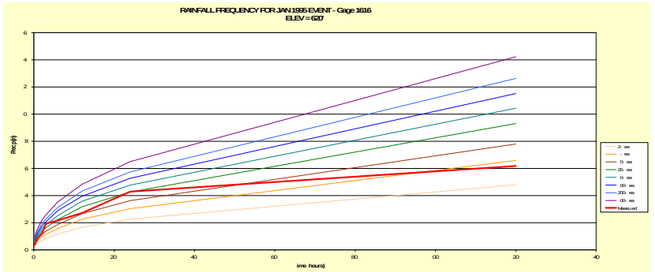


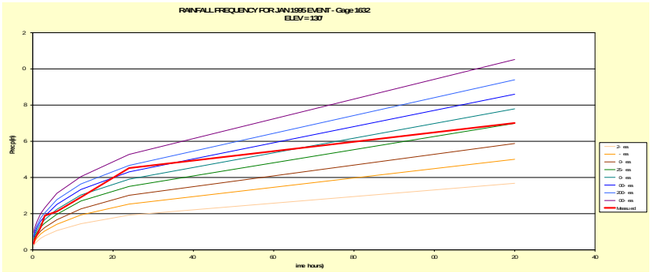


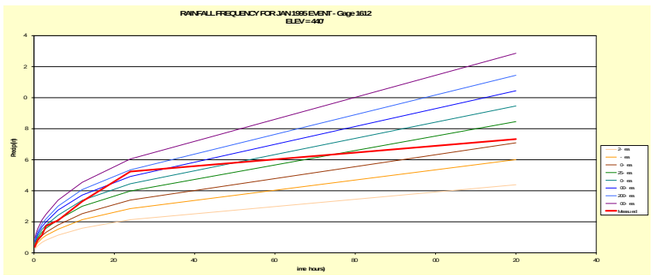


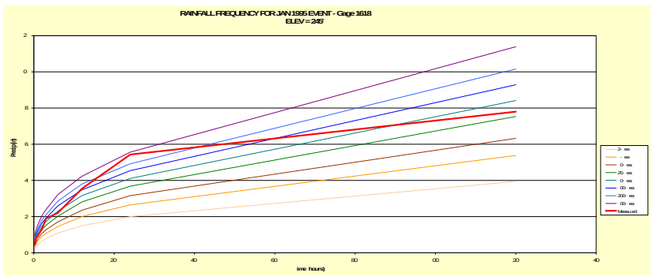


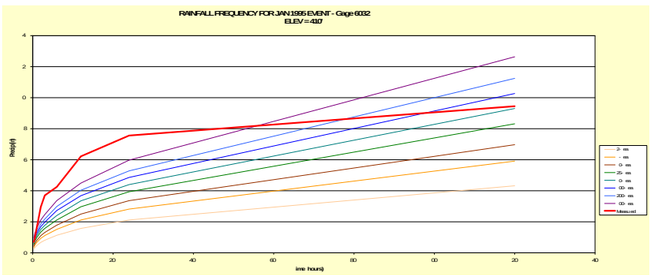












January 1995 Event

Varies between 50-yr and 500-yr precip.

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PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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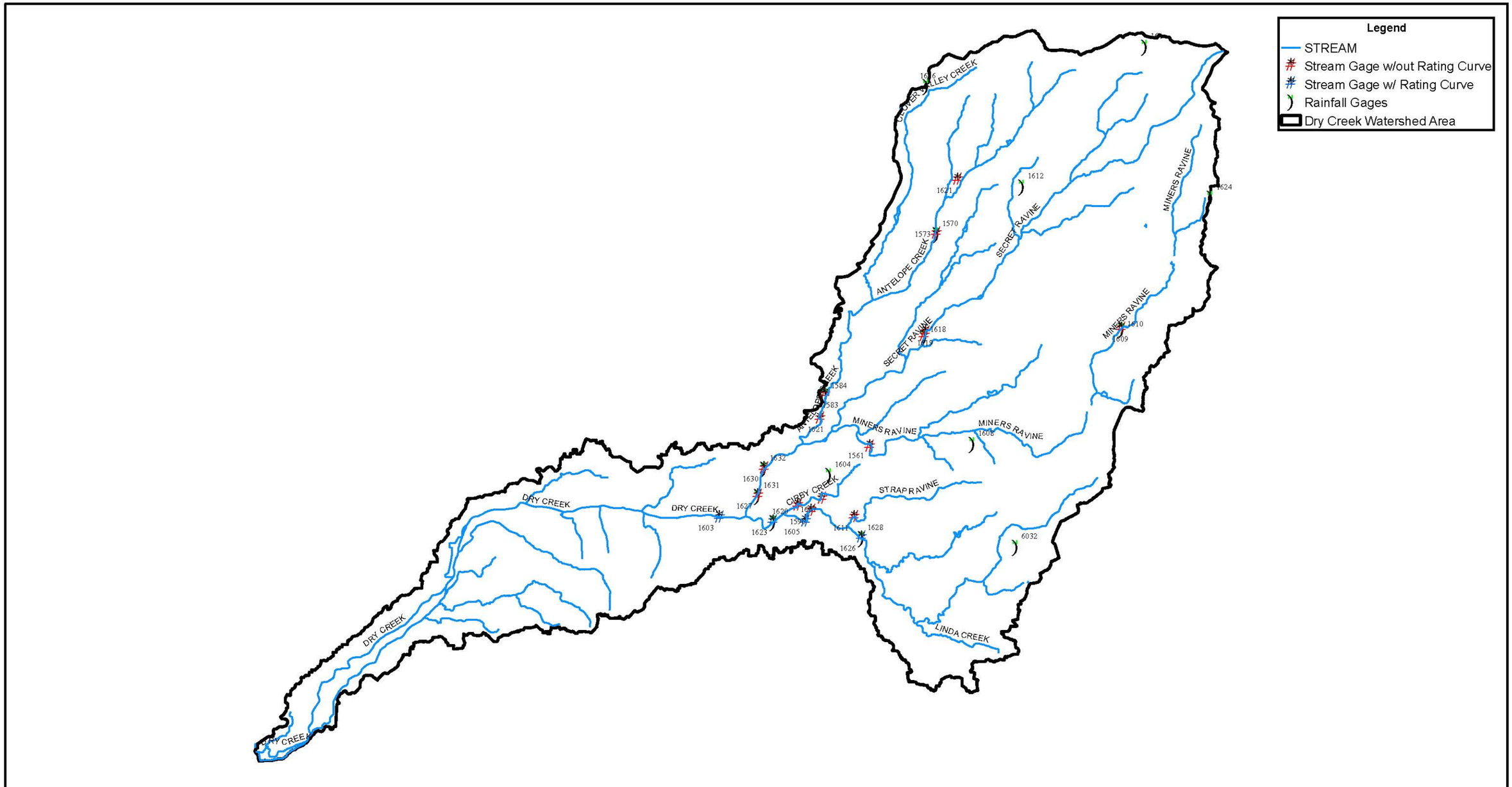
PLATE C.12

DRY CREEK WATERSHED STREAM AND RAINFALL GAGES



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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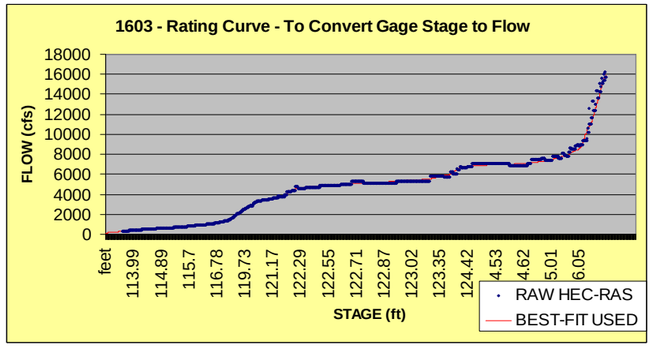
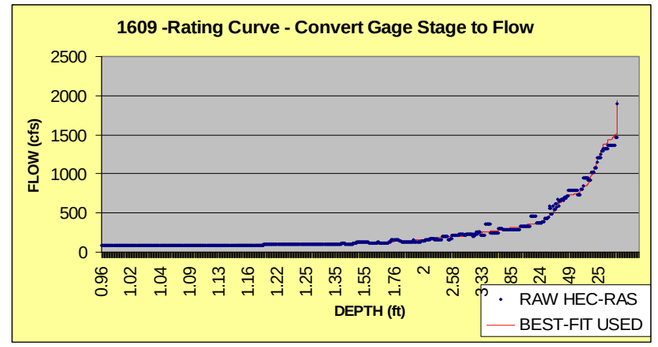
0 1 2 4 Miles

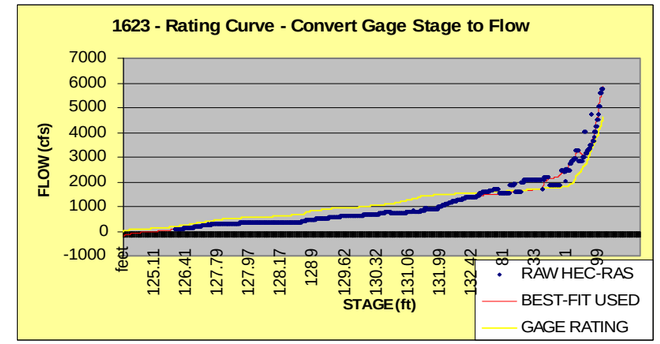
1 inch = 2 miles

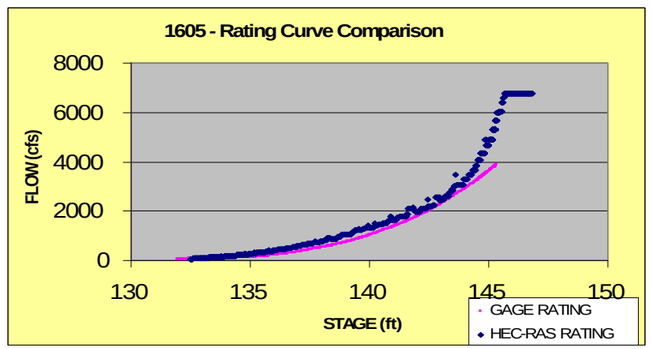
PLATE C.13

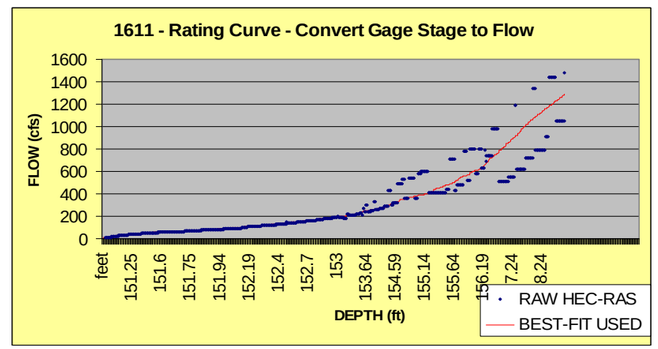
JANUARY 1995 GAGE / MODEL DEVELOPED RATING CURVES

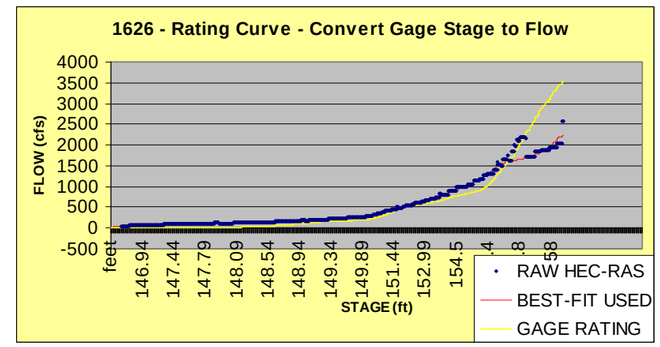


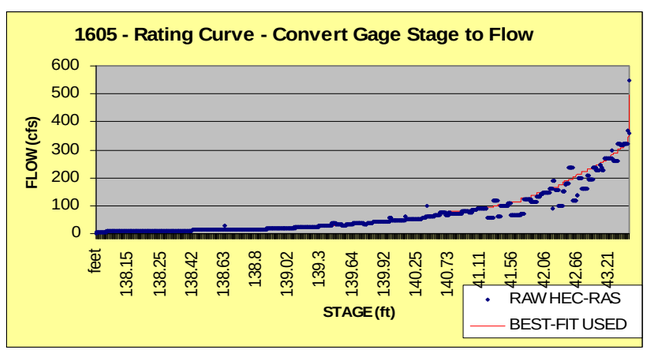


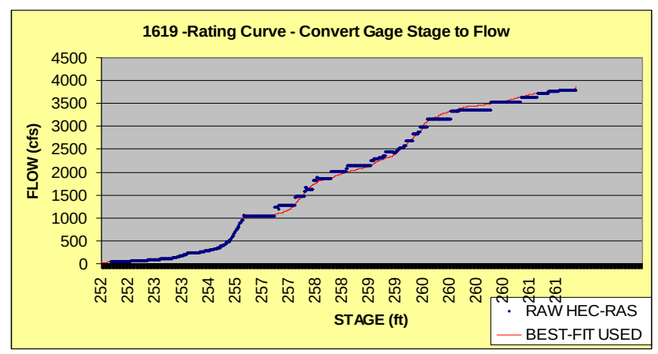


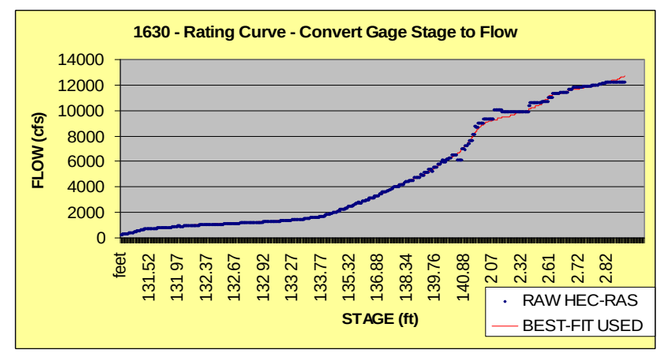












PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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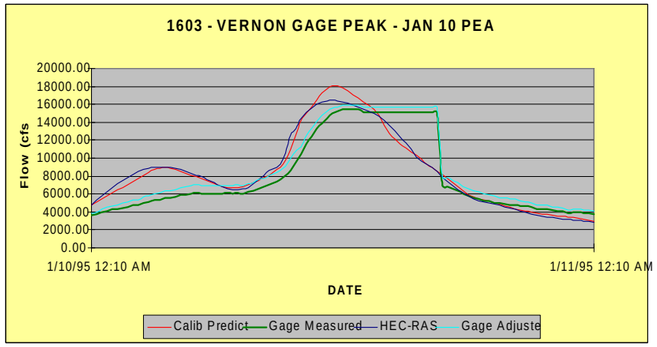
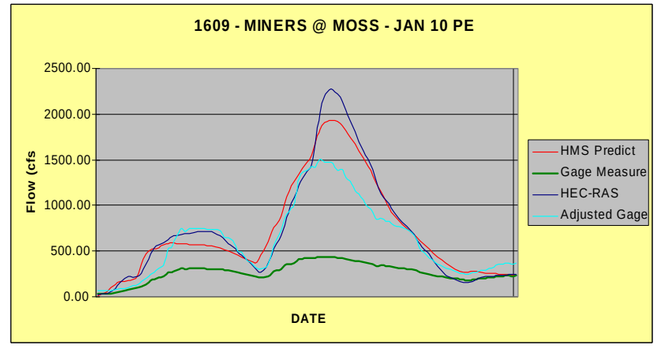
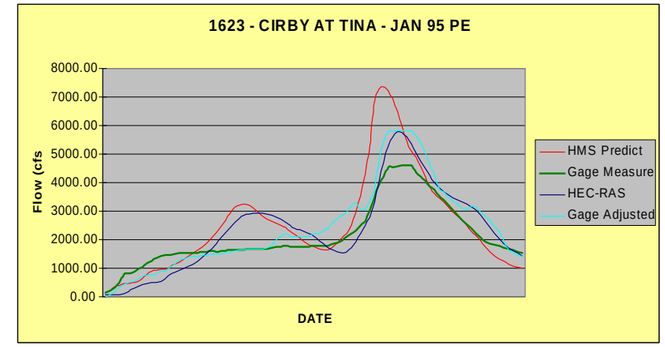
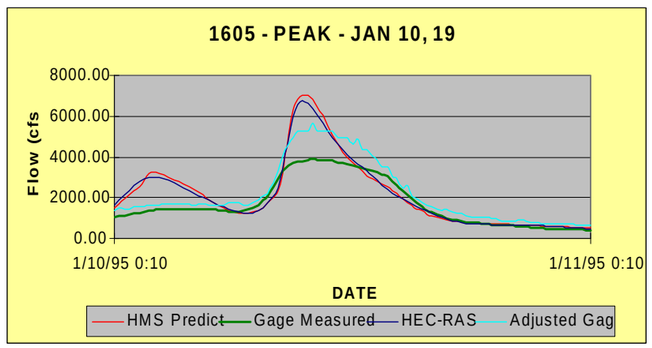
PLATE C.14

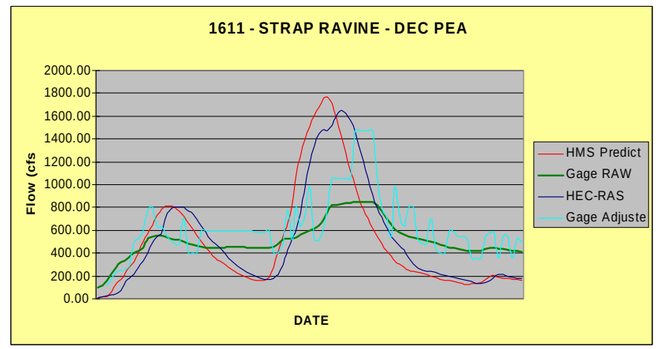
JANUARY 1995 PEAK EVENT HYDROGRAPH - GAGE VS CALIBRATED MODEL

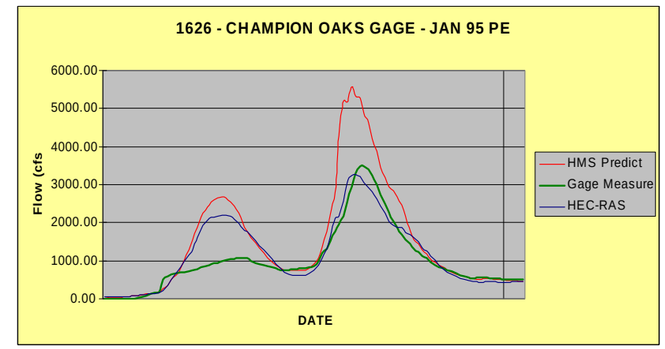


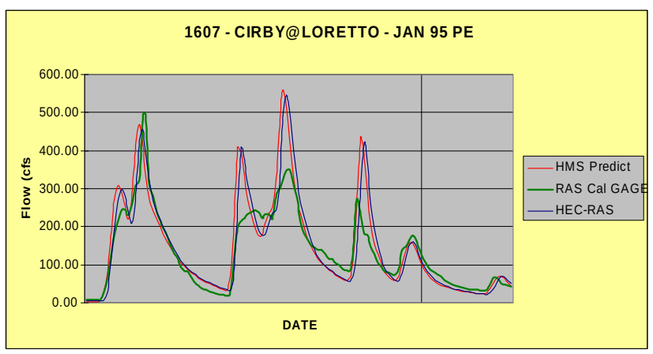


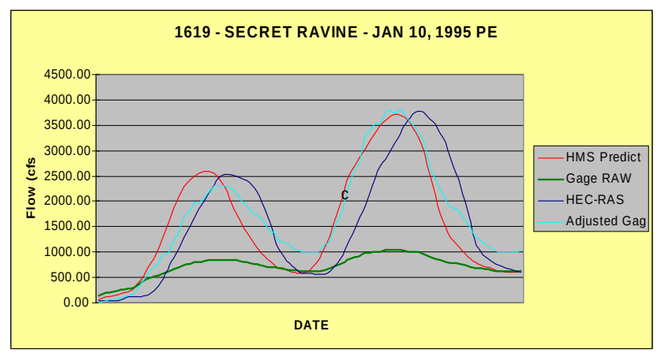


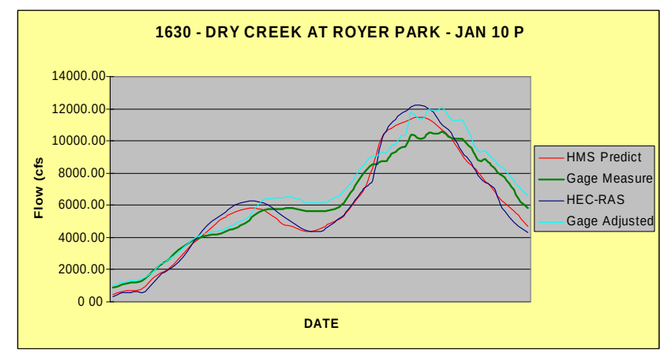












PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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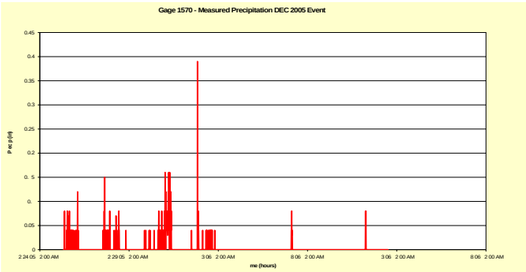
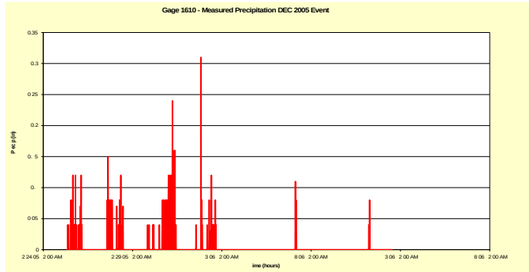
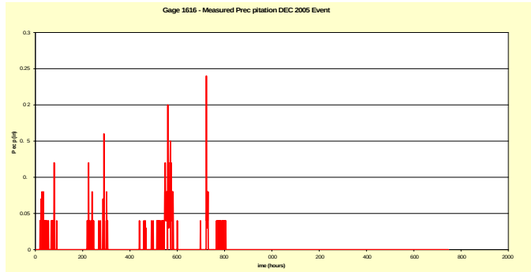
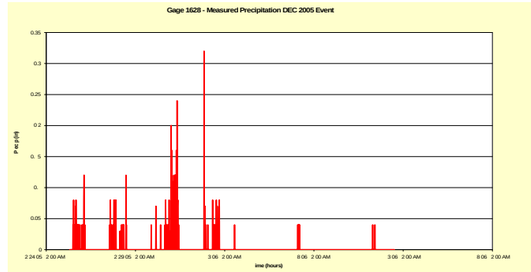
PLATE C.15

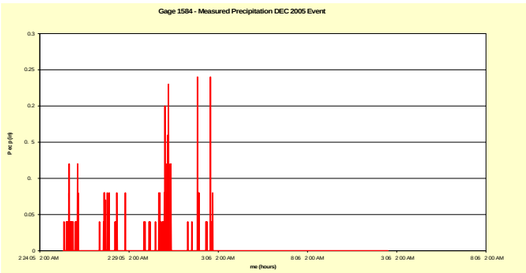
DECEMBER 1995 EVENT RAINFALL BY GAGE

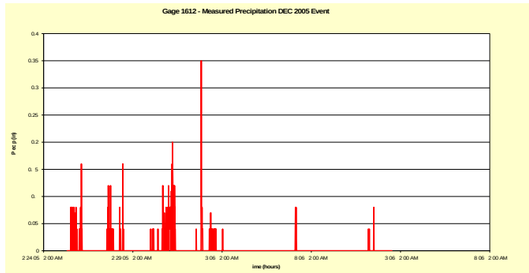


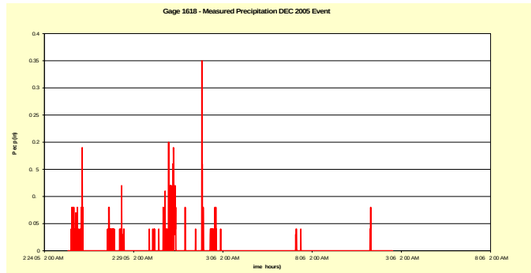


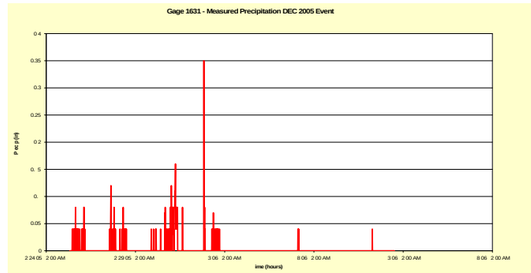


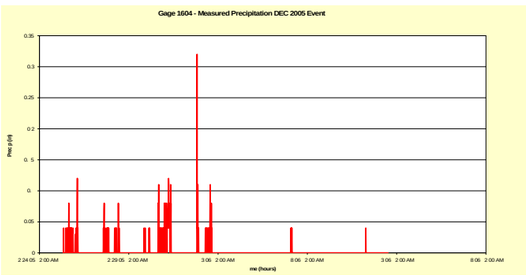


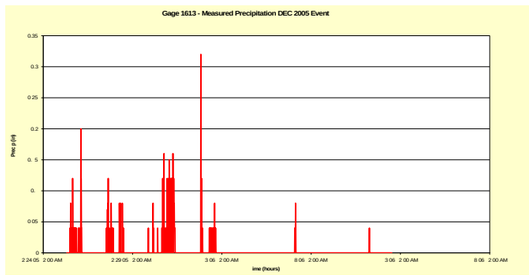


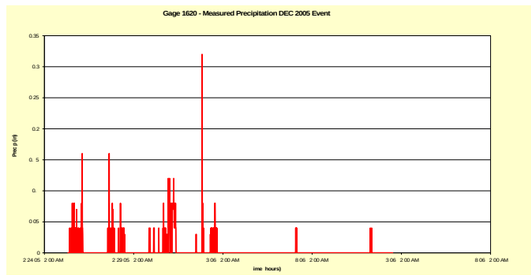


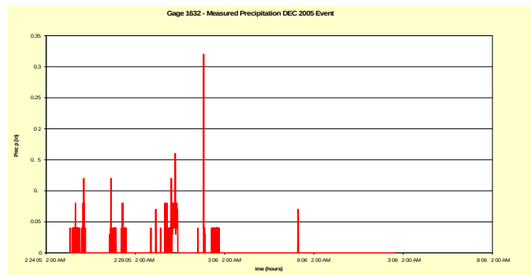


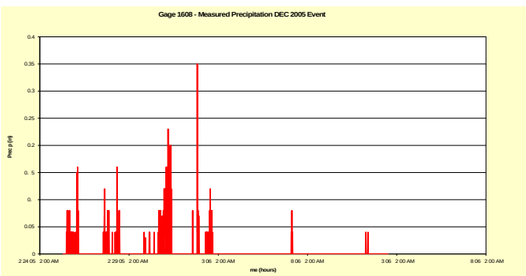


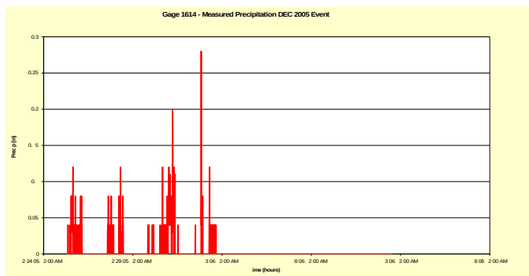


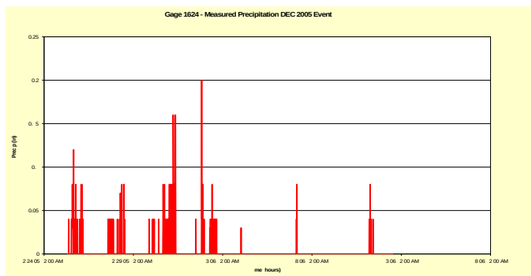


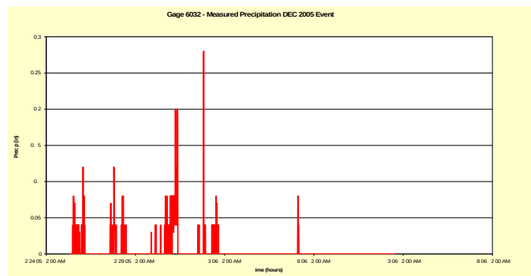












December 31, 2005 event

		Most Gages reported 10-year recurrance for 12 hour event.		
Varies between 2-yr and 50-yr precip.		24-hour precip varied between:	2.55	3.82
2-year at gage:	1624	12-hour precip varied between	2.12	3.3
50-year at gage:	6032	6-hour precip varied between	1.26	2.16

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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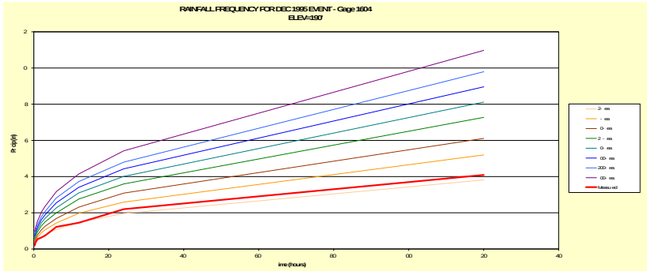
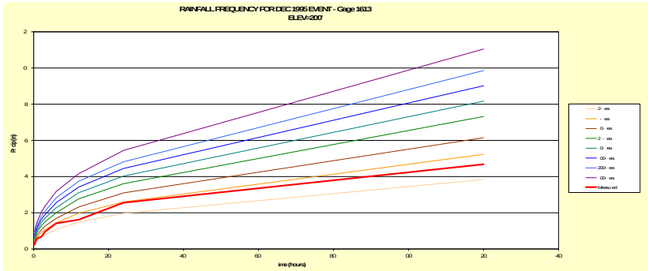
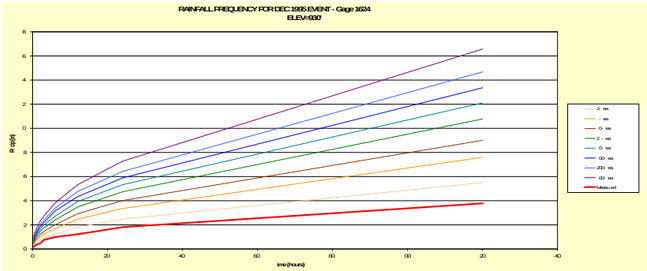
CIVIL ENGINEERING SOLUTIONS, INC.

PLATE C.16

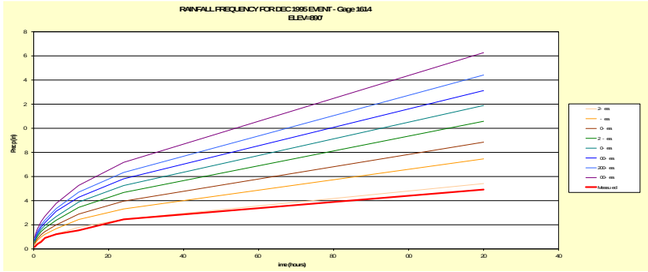
DECEMBER 1995 RAINFALL STORM EVENT RATING CURVE BY GAGE

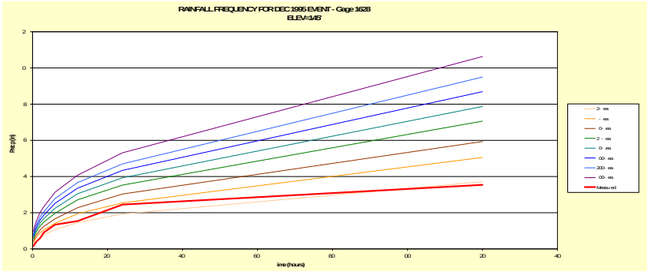


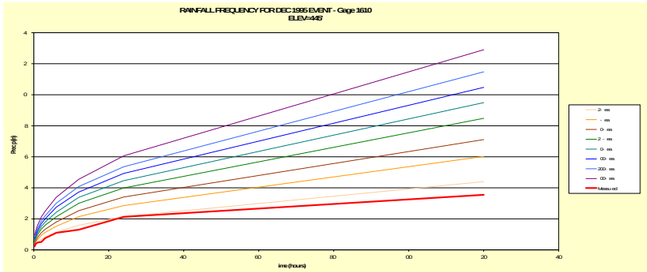


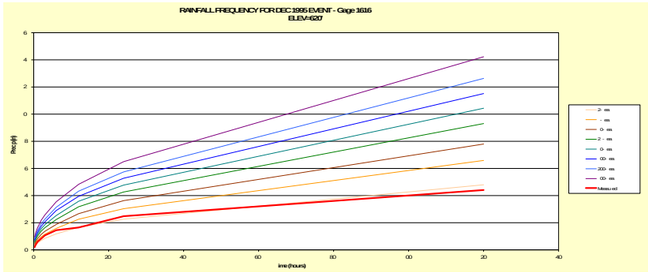


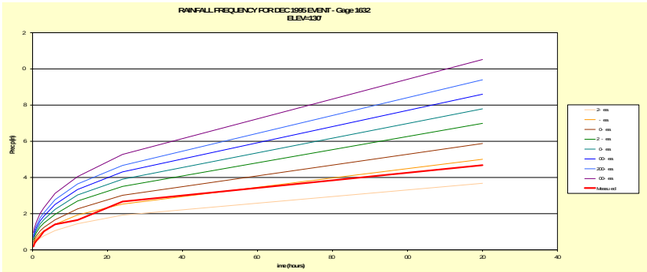
GAGE 1608
BAD DATA

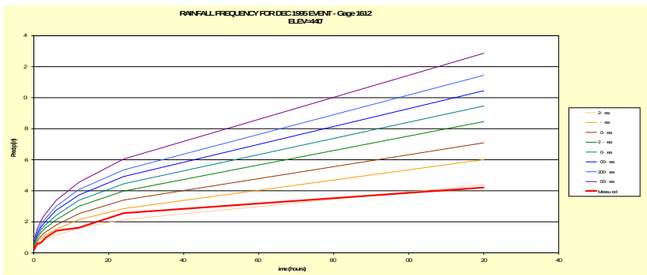


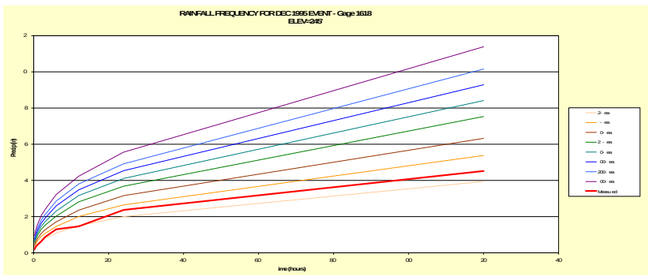


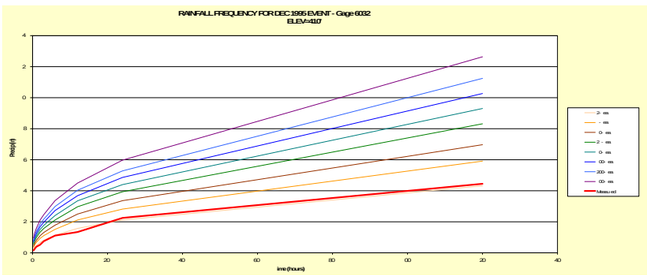












December 1995 event

Varies between 2-yr and 5-yr precip.

2-year at gage:	1614
5-year at gage:	1632

Most Gages reported 2-year recurrance for 24 hour event.

24-hour precip varied between:	1.81	2.67
12-hour precip varied between	1.22	1.65
6-hour precip varied between	0.99	1.45

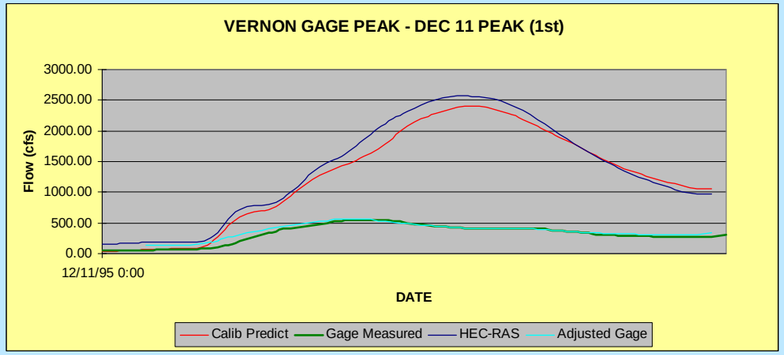
PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

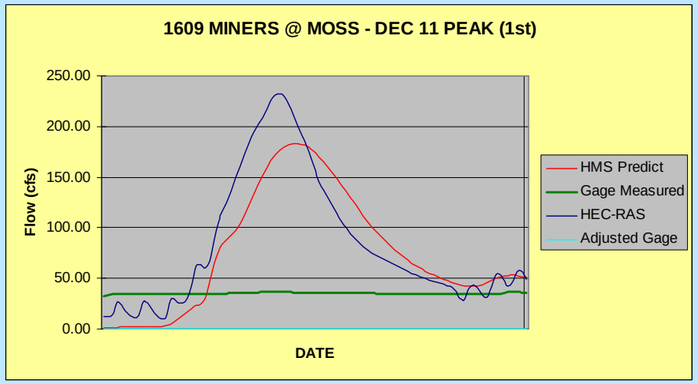
RBF CONSULTING

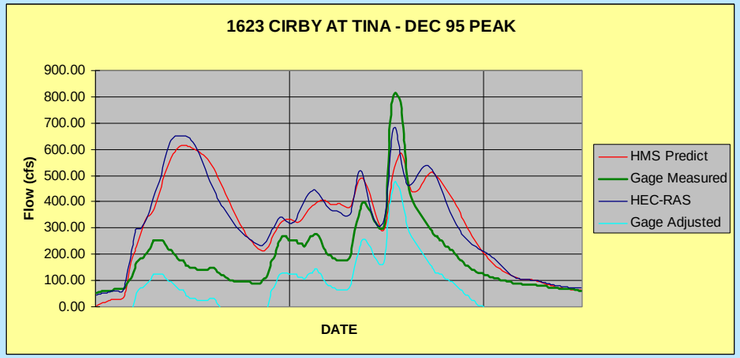
CIVIL ENGINEERING SOLUTIONS, INC.

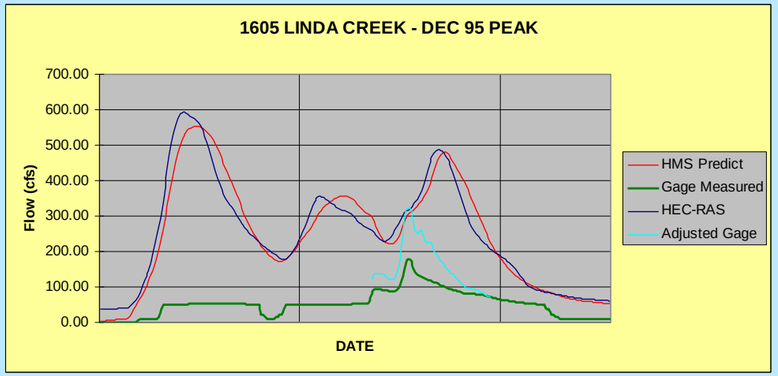
PLATE C.17

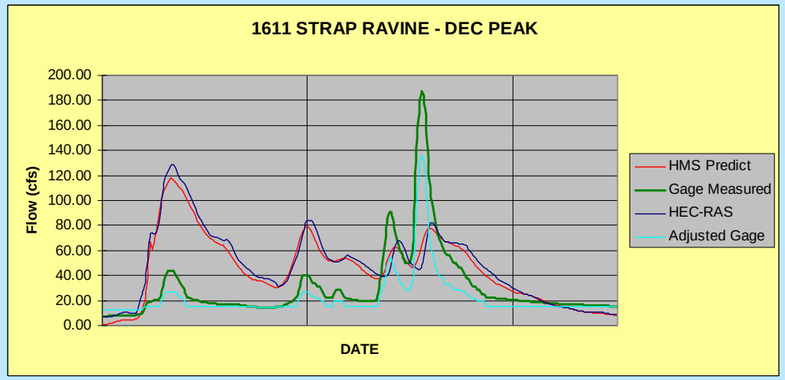
DEC. 1995 -PEAK EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

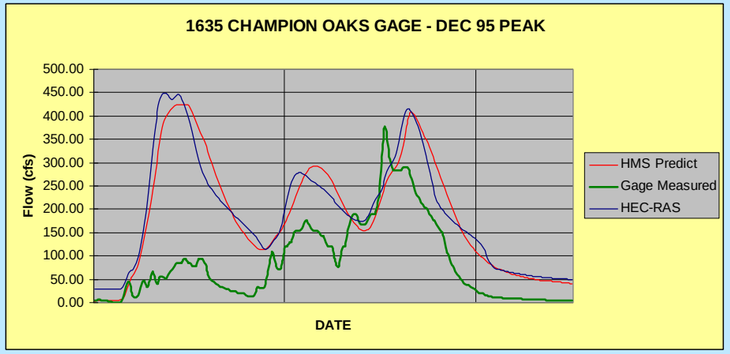


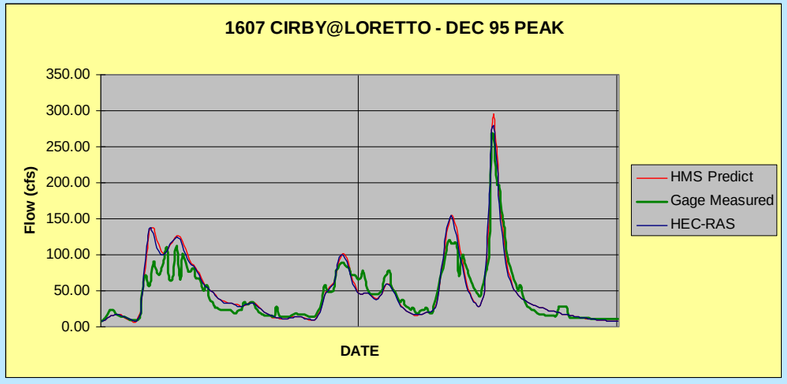


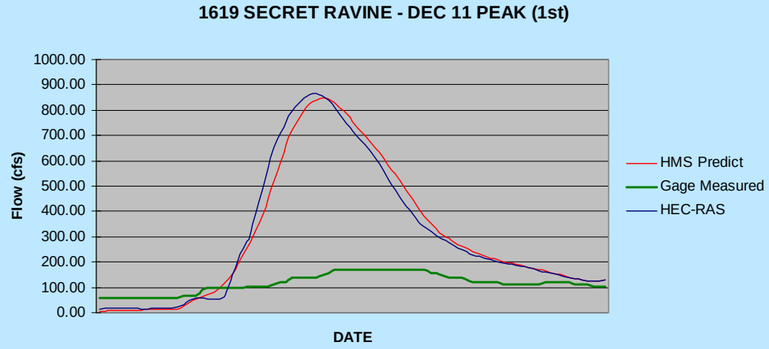


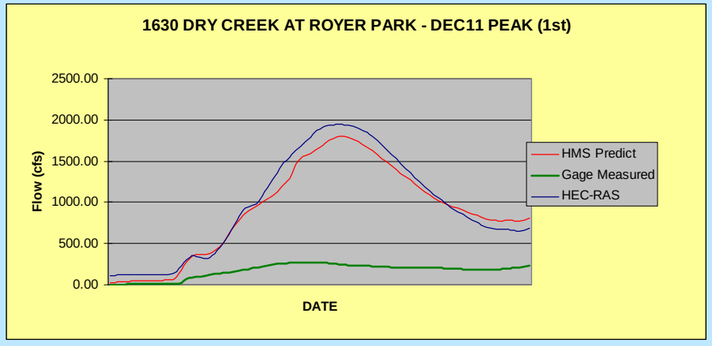












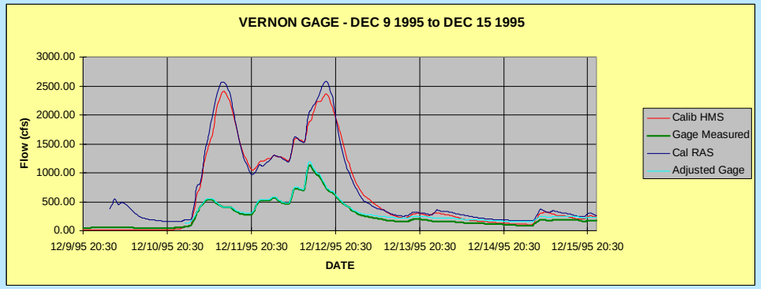
UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

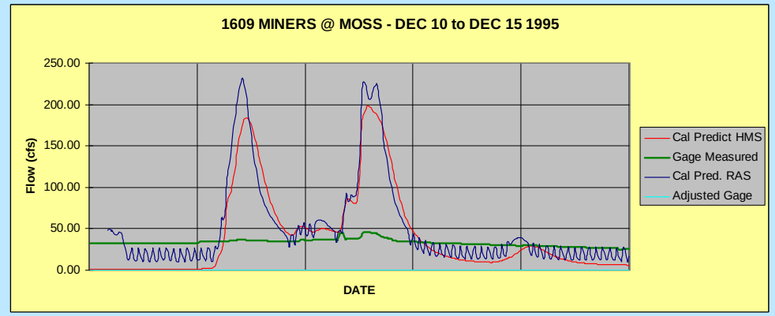
RBF CONSULTING

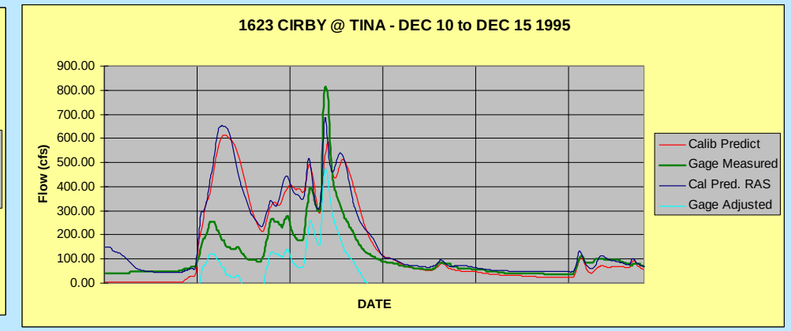
CIVIL ENGINEERING SOLUTIONS, INC.

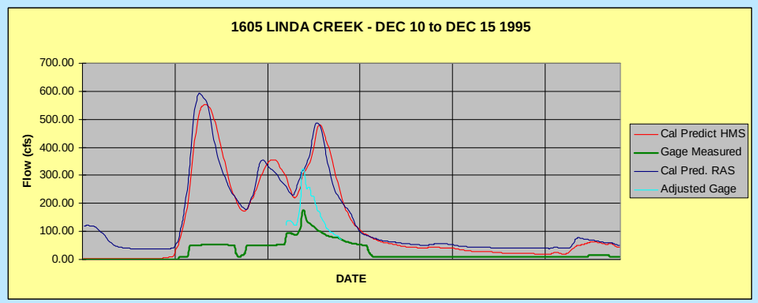
PLATE C-18

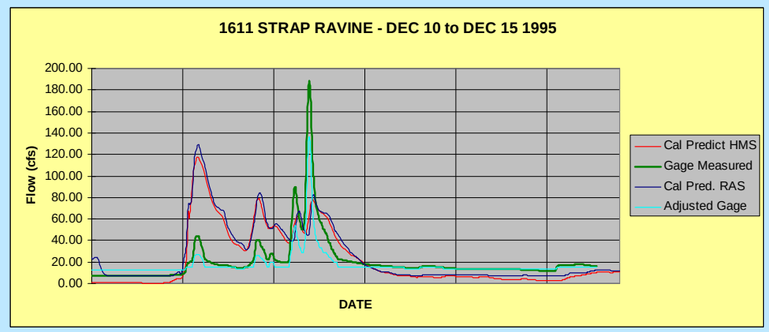
DEC. 1995 - WHOLE EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

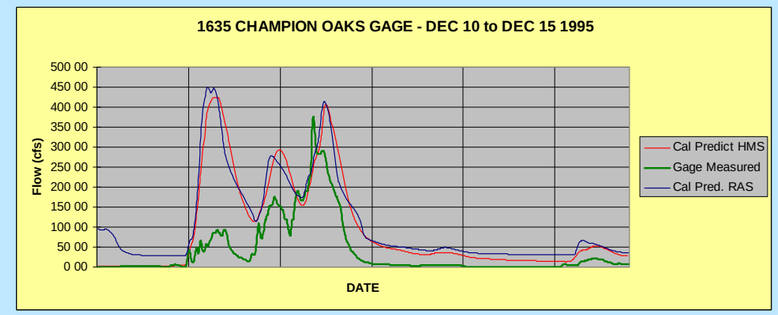


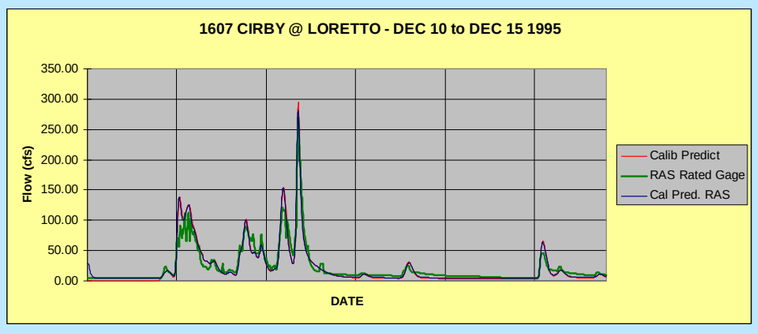


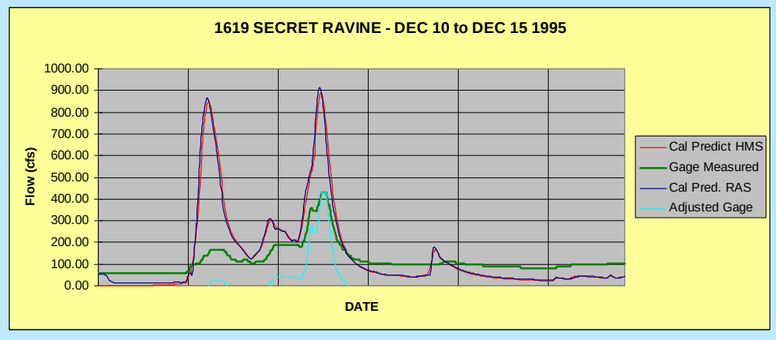


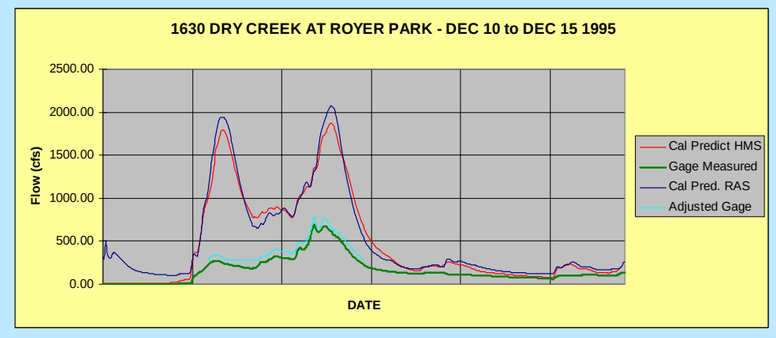












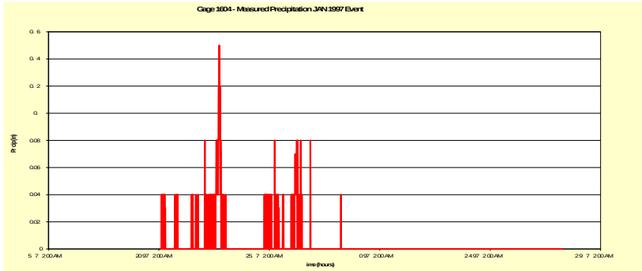
UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

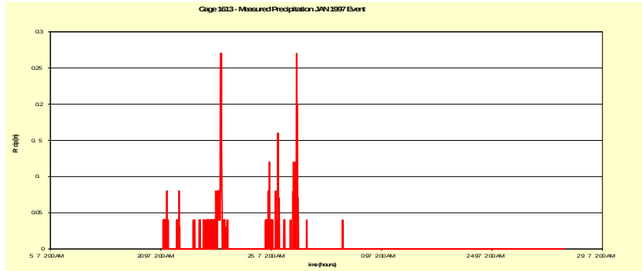
RBF CONSULTING

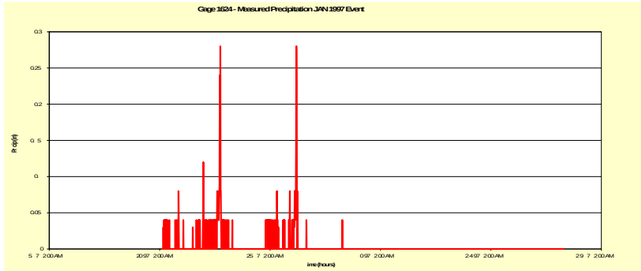
CIVIL ENGINEERING SOLUTIONS, INC.

PLATE C-19

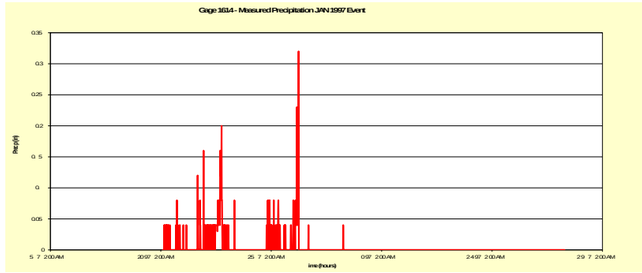
JANUARY 1997 EVENT RAINFALL BY GAGE

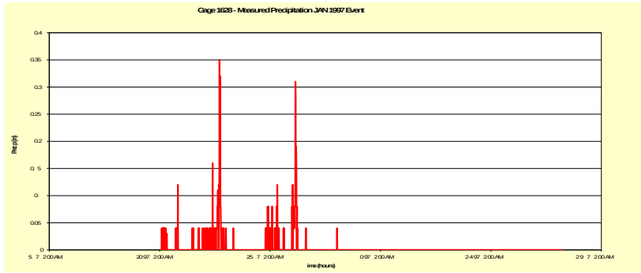


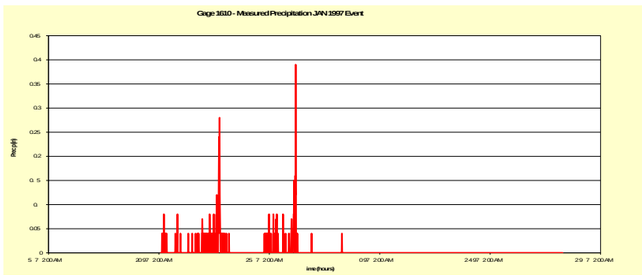


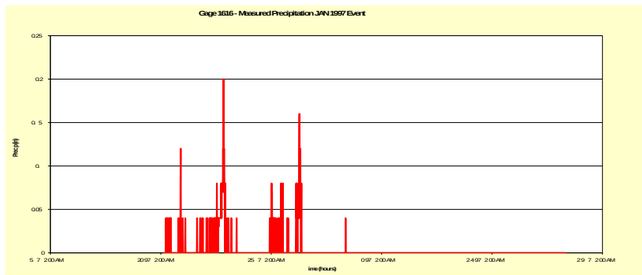


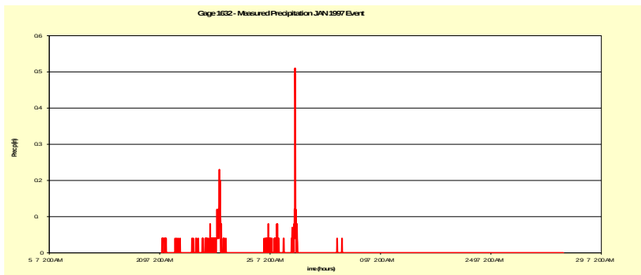
GAGE 1608
BAD DATA

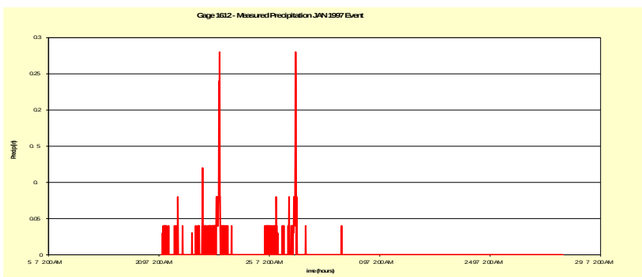


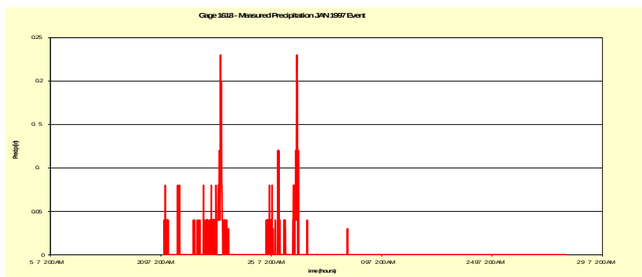


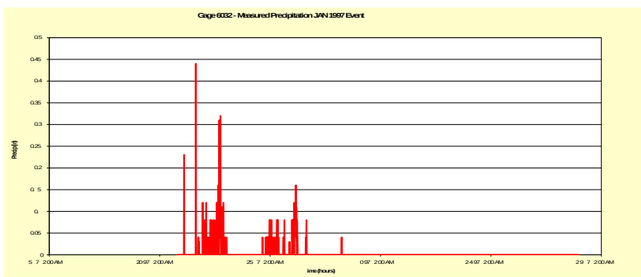












January 1997 event

Varies between 5-yr and 50-yr precip.

5-year at gage:	1624
50-year at gage:	1613

Most Gages reported 10-year recurrance for 24 hour event.

24-hour precip varied between:	2.95	3.55
12-hour precip varied between	2.37	2.99
6-hour precip varied between	1.81	2.29

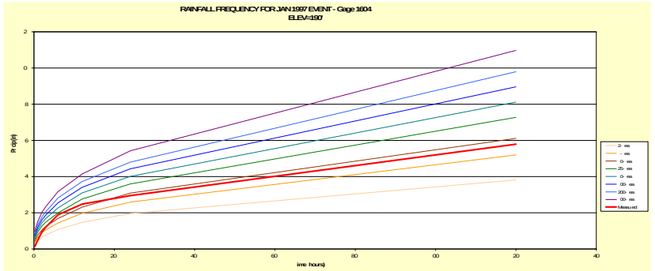
PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

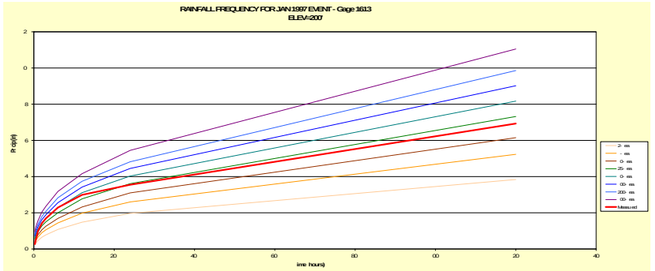
RBF CONSULTING

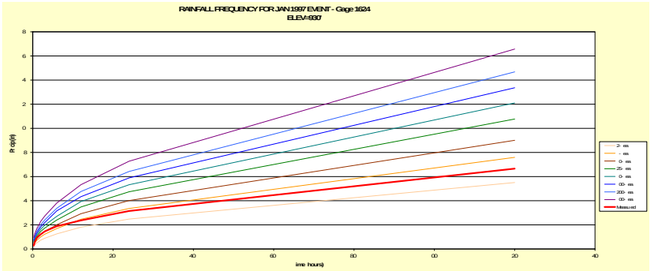
CIVIL ENGINEERING SOLUTIONS, INC.

PLATE C.20

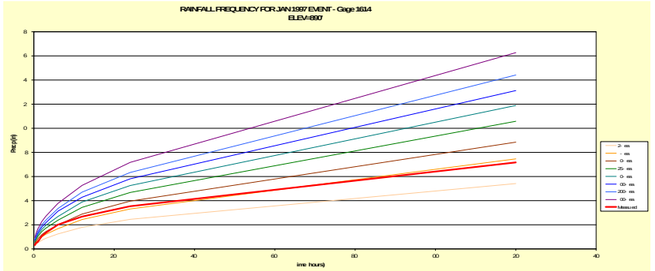
JANUARY 1997 STORM EVENT RATING BY GAGE

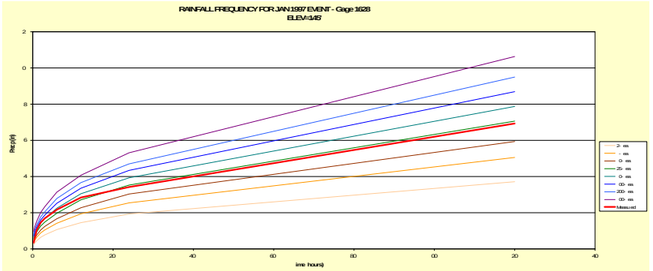


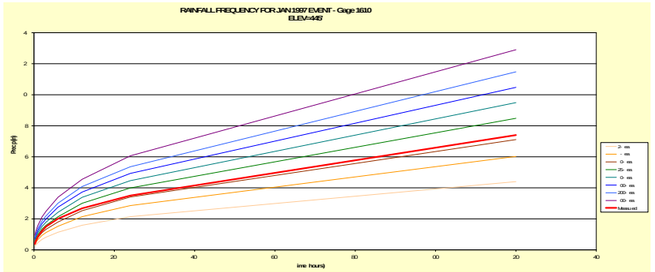


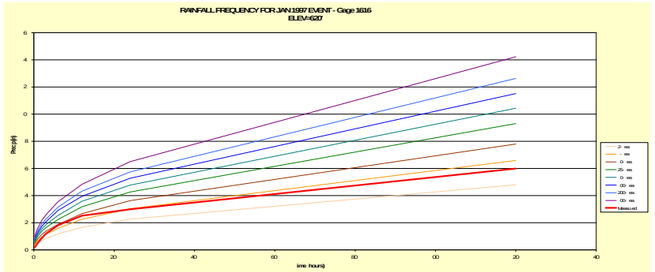


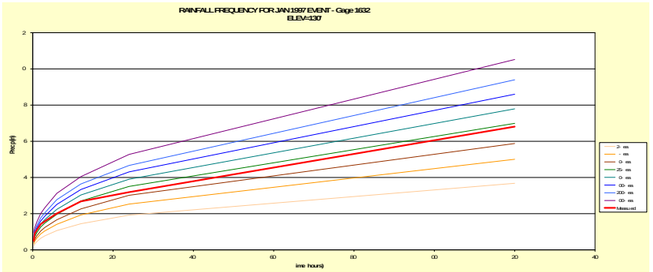
GAGE 1608
BAD DATA

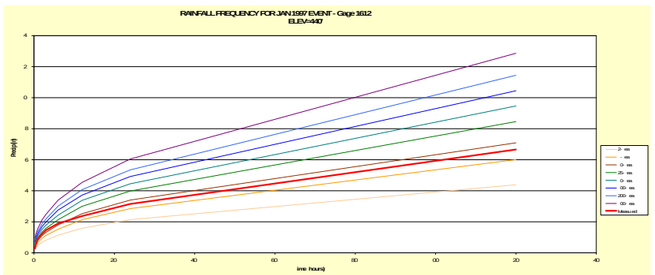


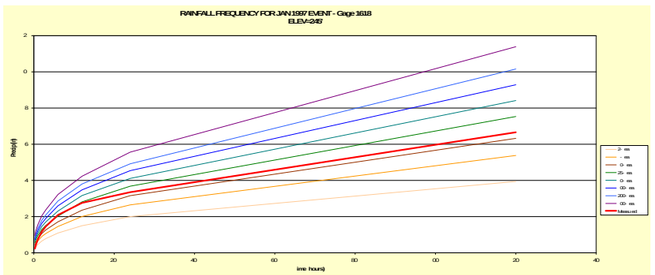


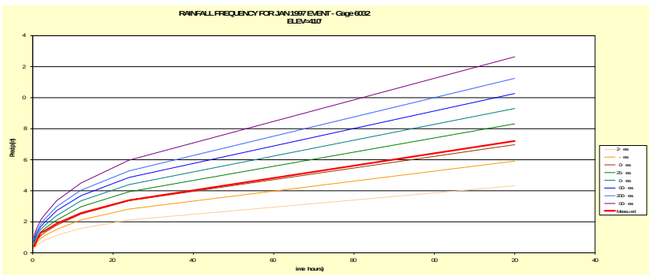












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Varies between 5-yr and 50-yr precip.

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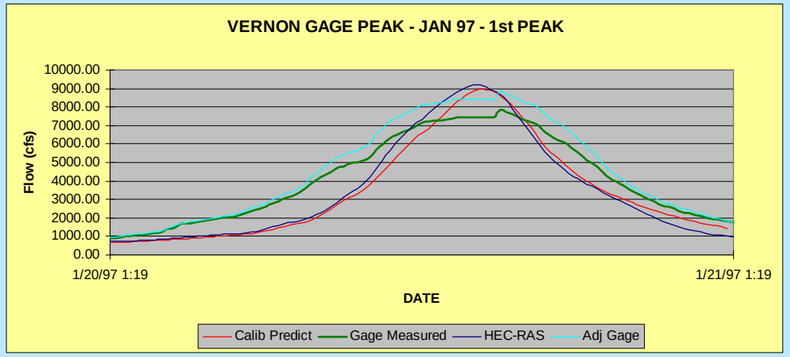
PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

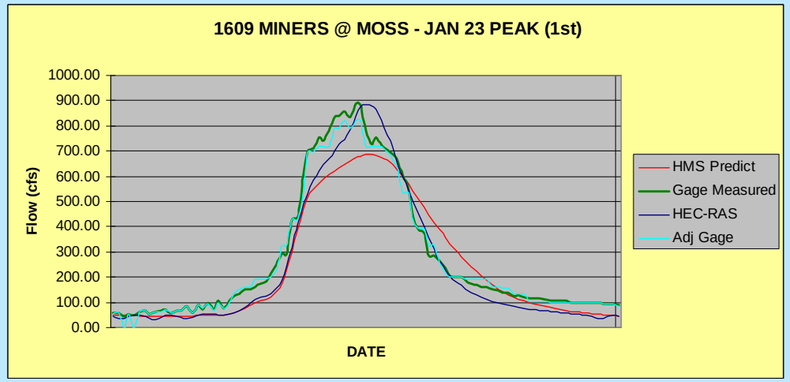
RBF CONSULTING

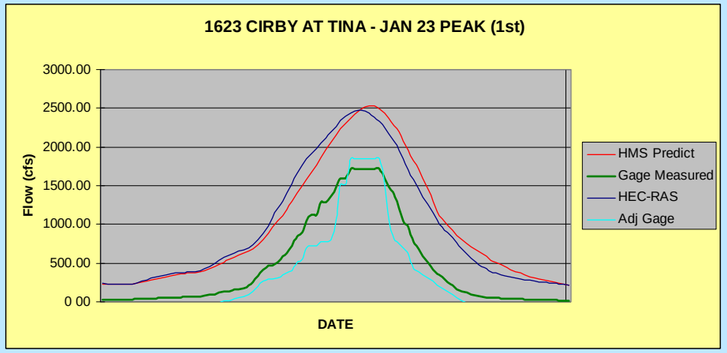
CIVIL ENGINEERING SOLUTIONS, INC.

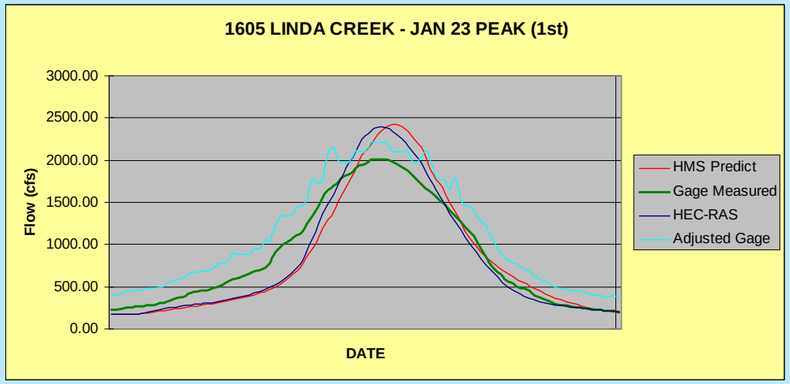
PLATE C.21

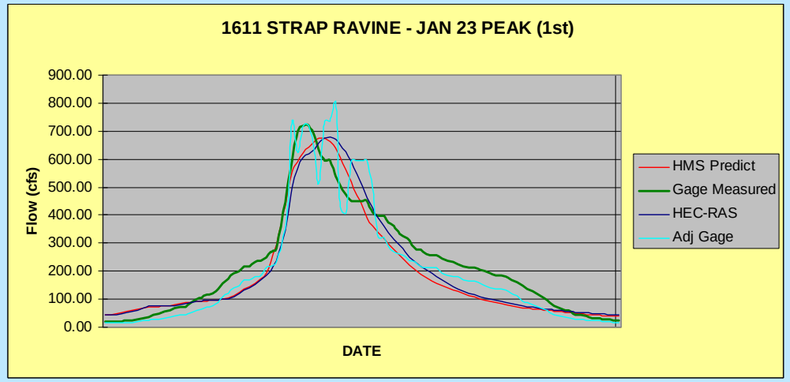
JAN. 1997 -PEAK EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

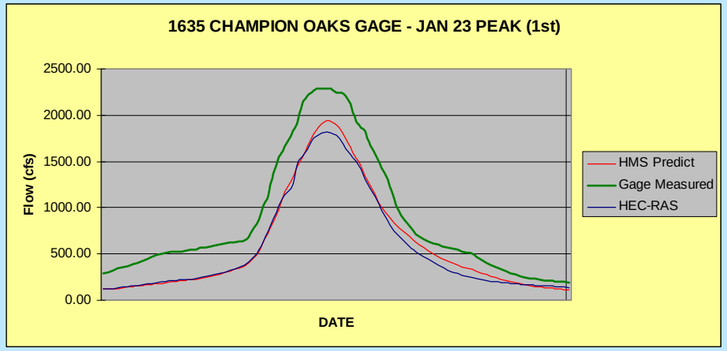


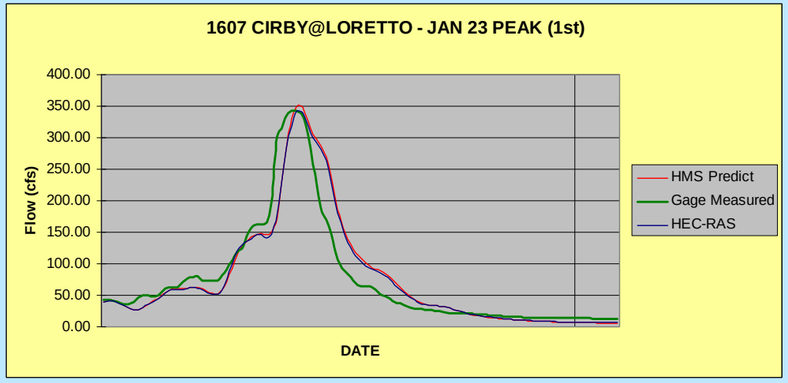


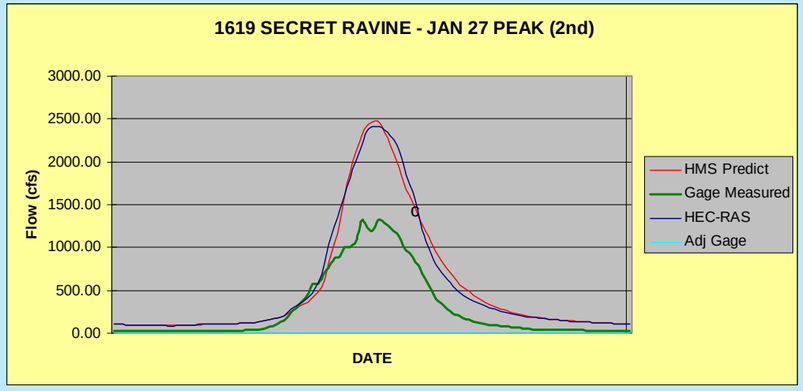


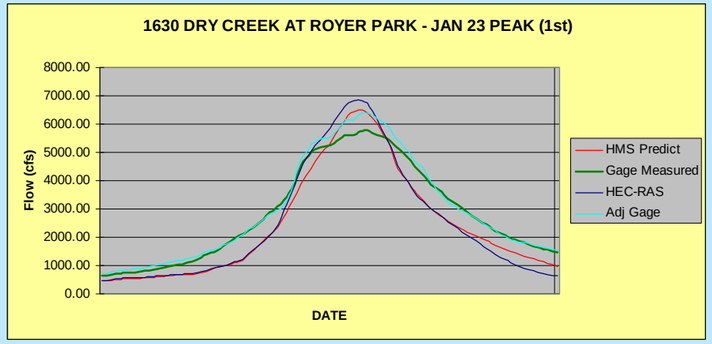












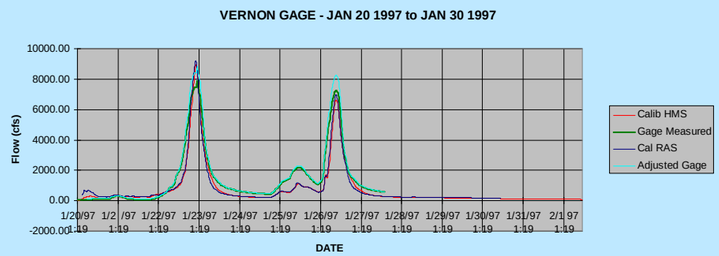
UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

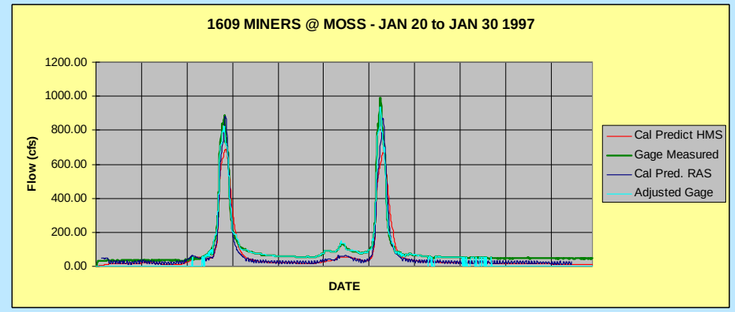
RBF CONSULTING

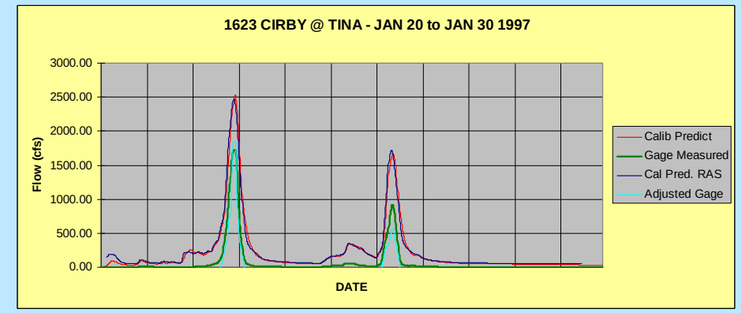
CIVIL ENGINEERING SOLUTIONS, INC.

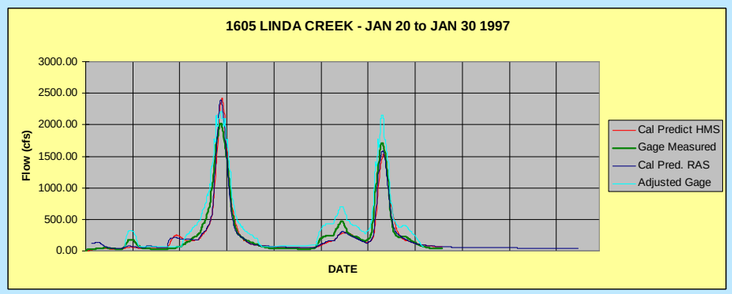
PLATE C-22

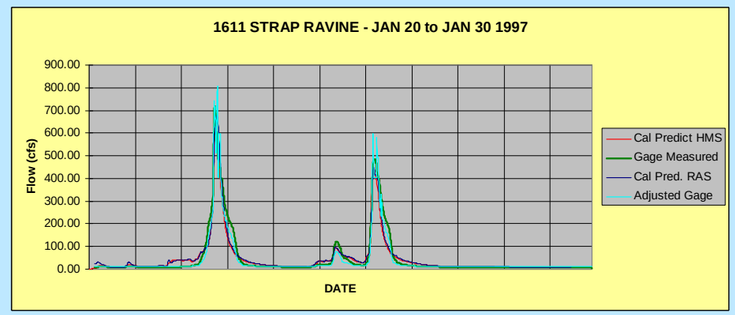
JAN. 1997 - WHOLE EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

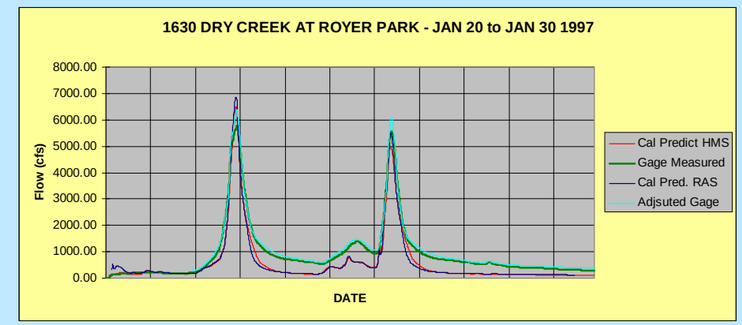


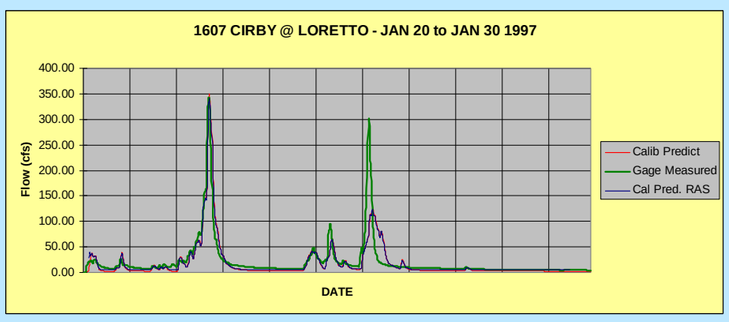


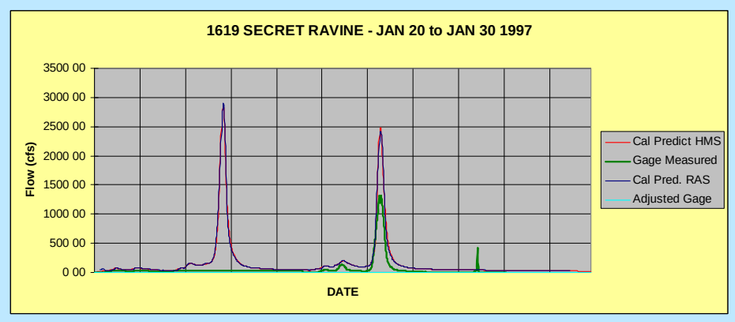


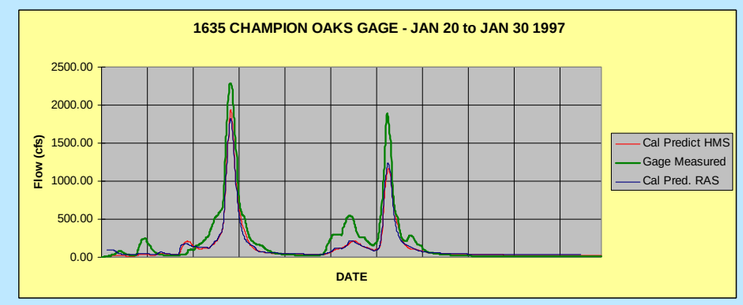












UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

PLATE C-23

JANUARY 1997 EVENT RAINFALL BY GAGE

December 31, 2005 event

Varies between 2-yr and 50-yr precip.

2-year at gage:	1624
50-year at gage:	6032

Most Gages reported 10-year recurrance for 12 hour event.

24-hour precip varied between:	2.55	3.82
12-hour precip varied between	2.12	3.3
6-hour precip varied between	1.26	2.16

UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

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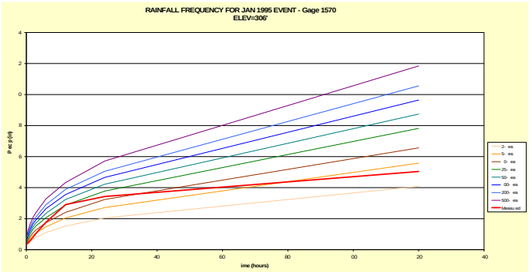
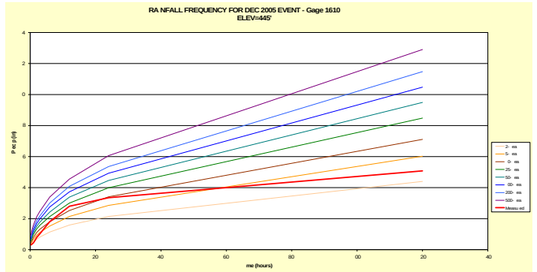
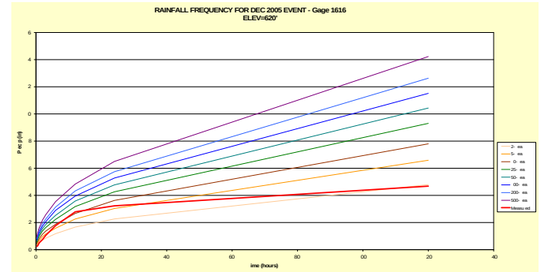
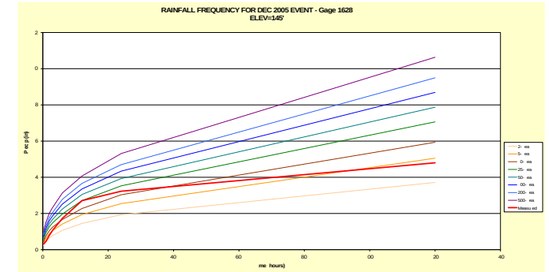
PLATE C-24

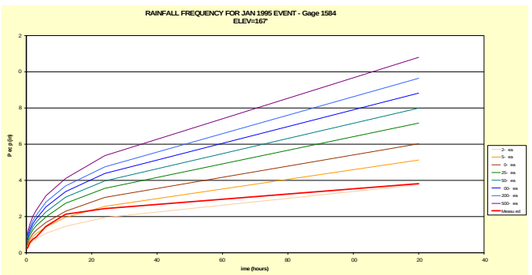
DECEMBER 2005 STORM EVENT RATING BY GAGE

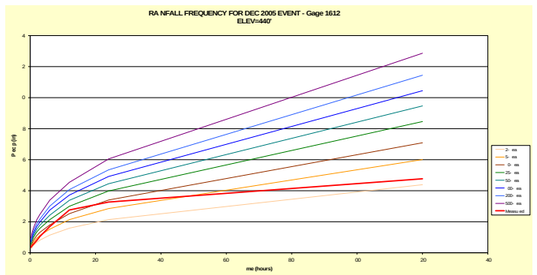


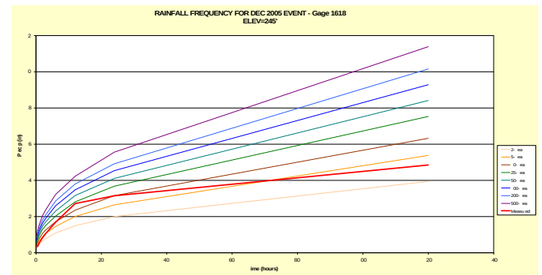


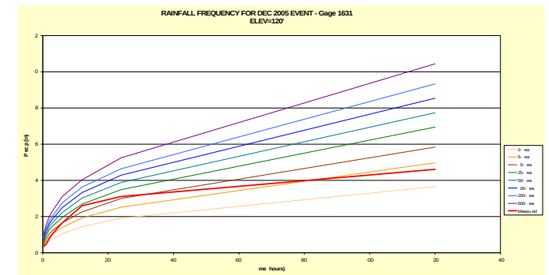


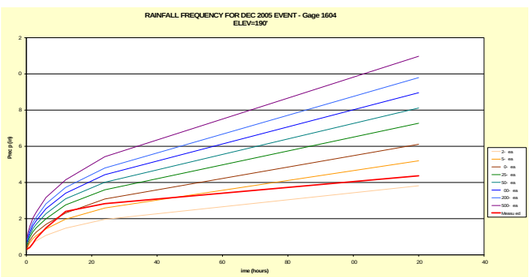


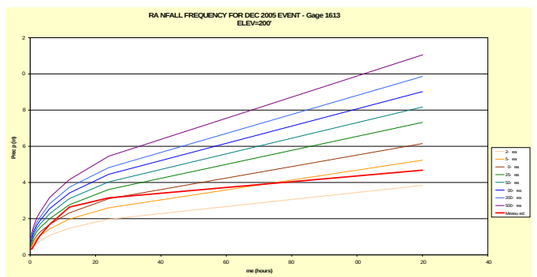


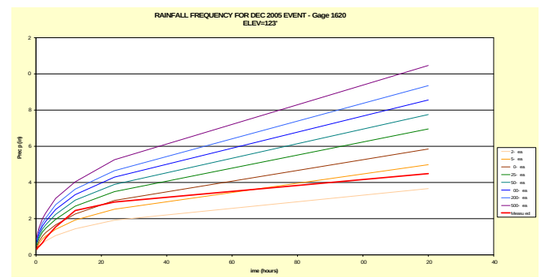


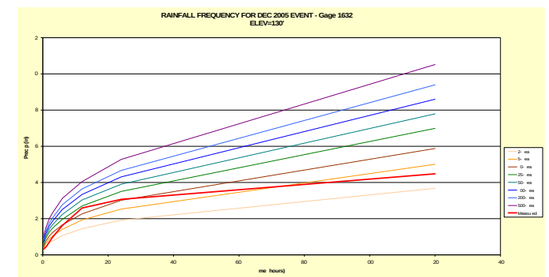


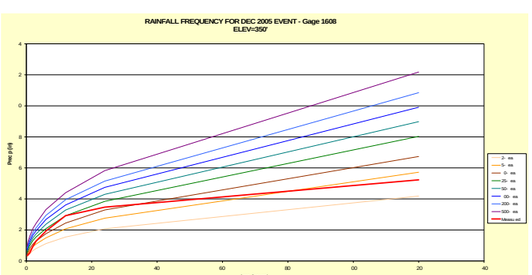


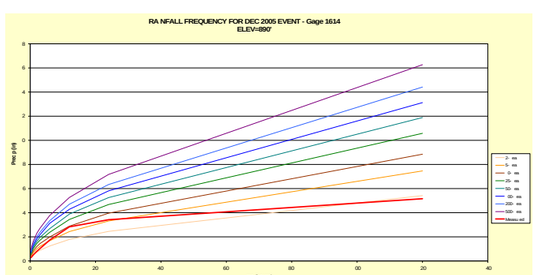


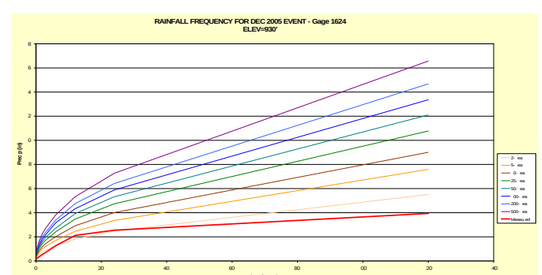


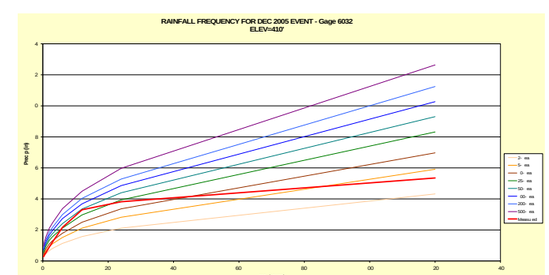












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PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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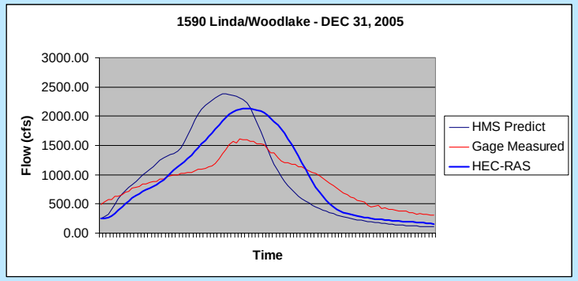
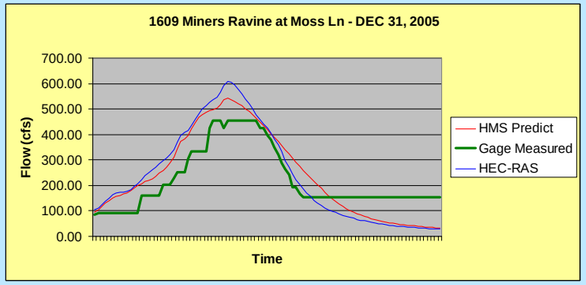
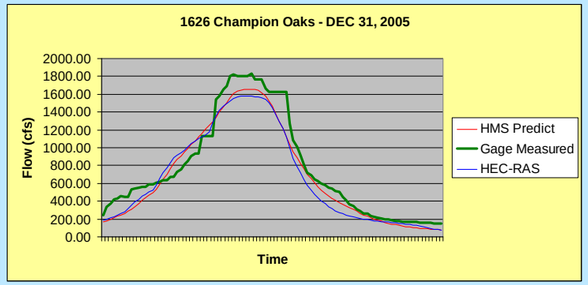
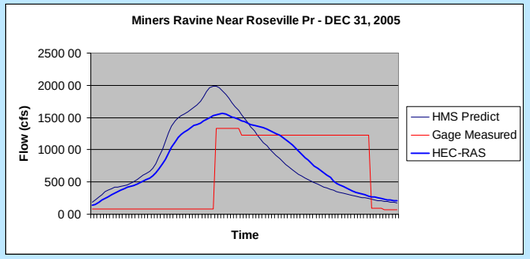
PLATE C.25

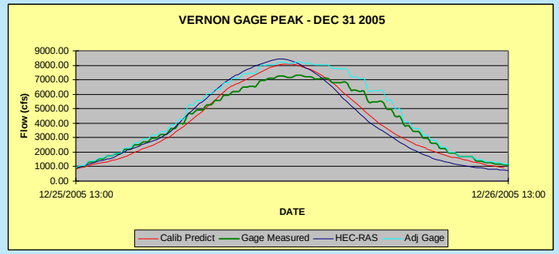
DEC. 2005 -PEAK EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

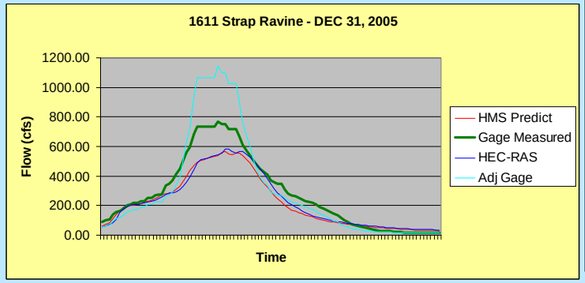


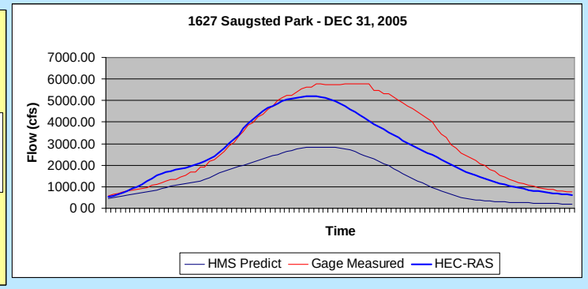


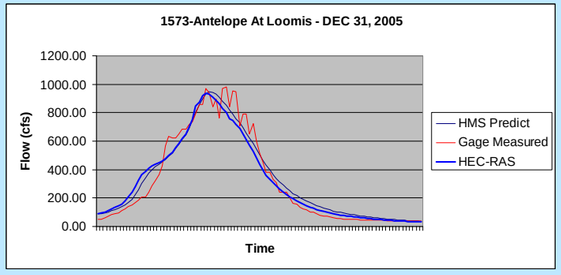


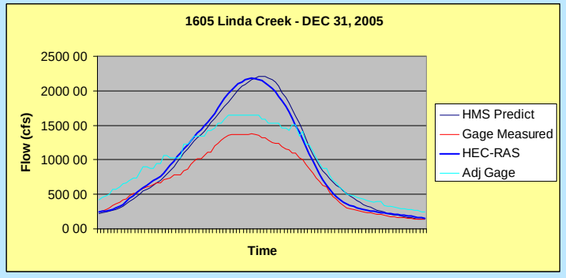


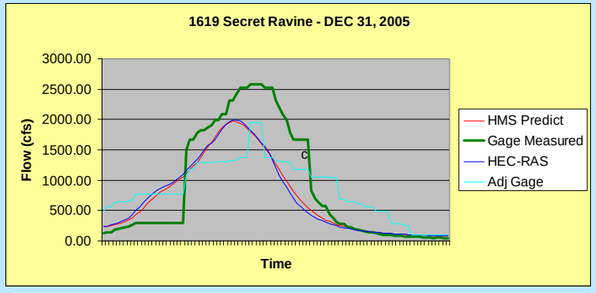


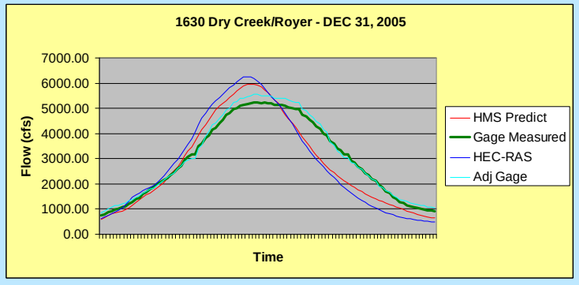


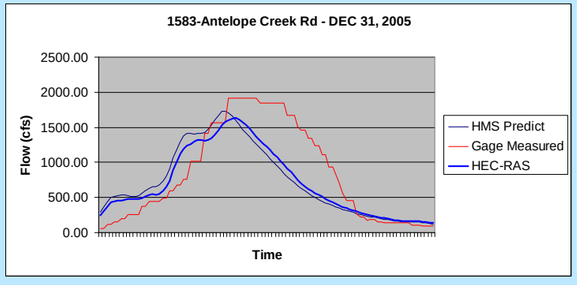


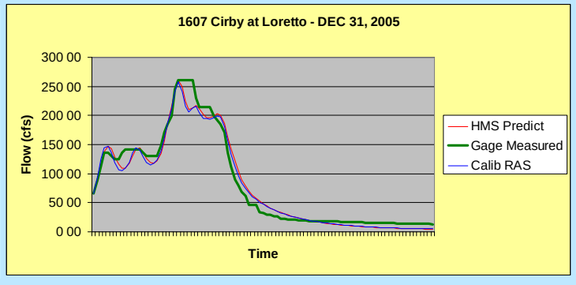


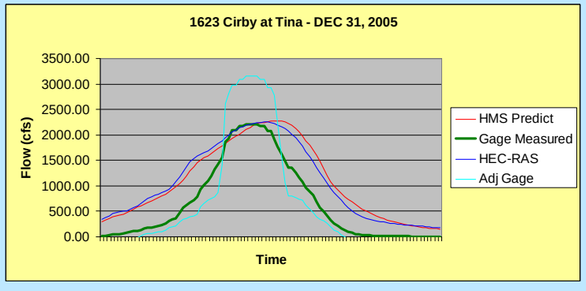


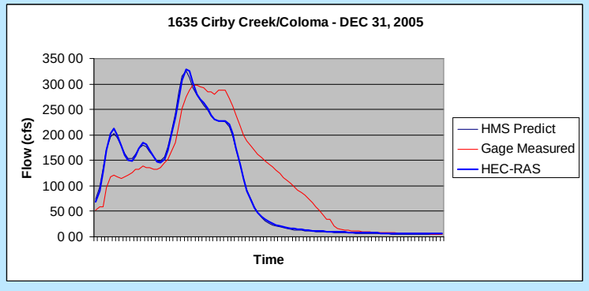












UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

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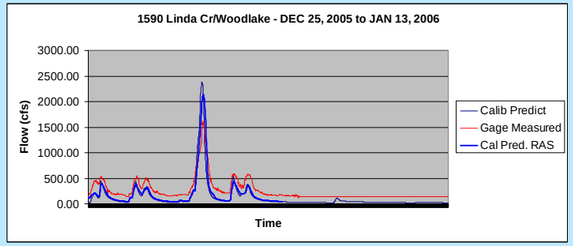
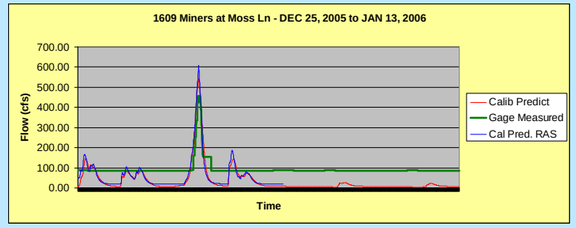
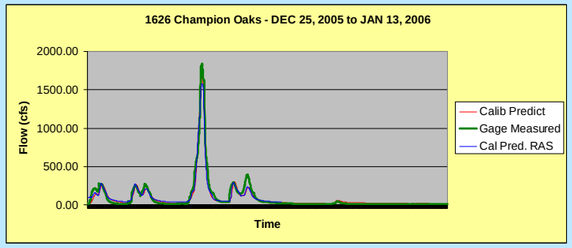
CIVIL ENGINEERING SOLUTIONS, INC.

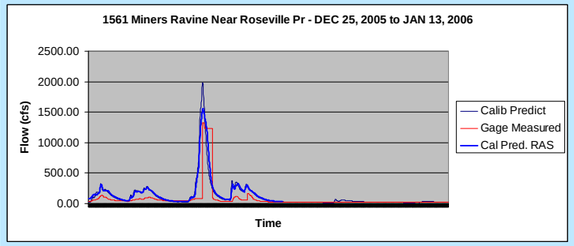
PLATE C-26

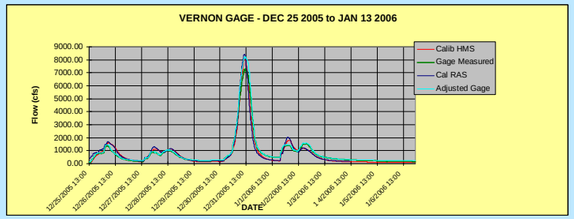
DEC. 2005 - WHOLE EVENT HYDROGRAPH - GAGE VS. CALIBRATED MODEL

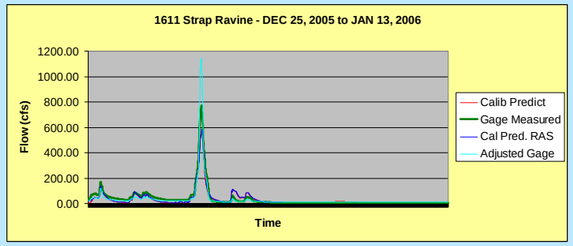


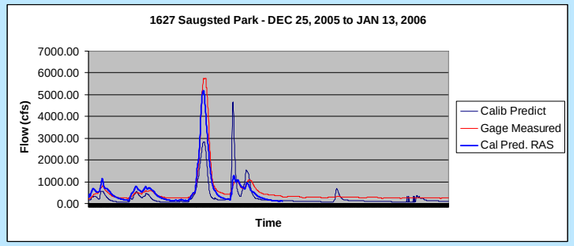


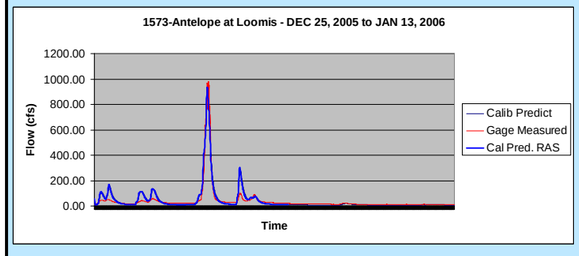


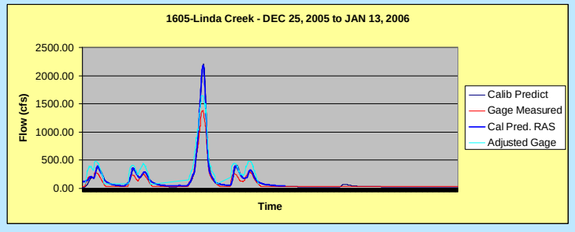


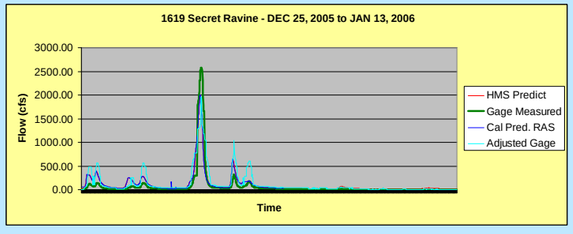


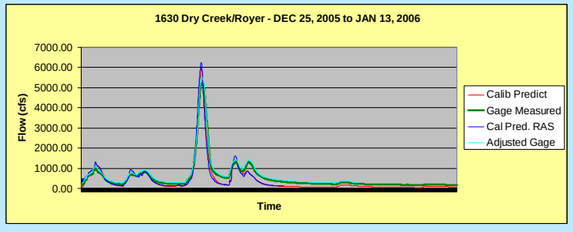


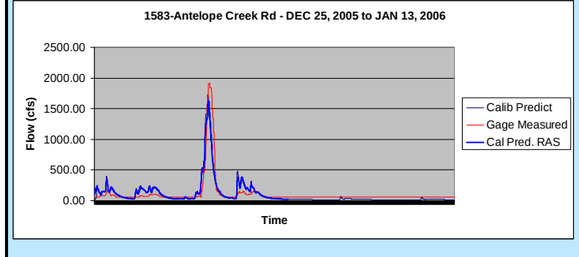


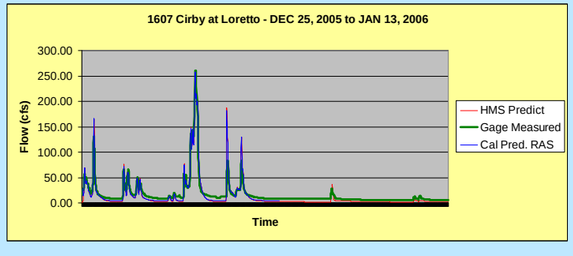


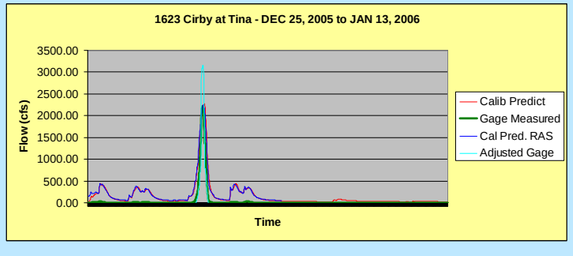


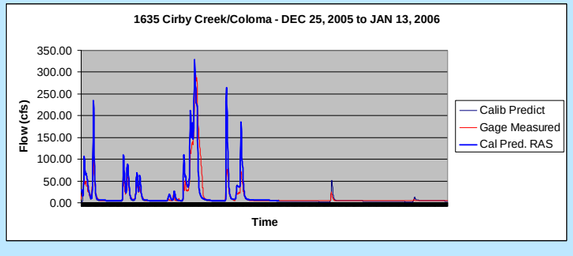












UPDATE TO THE 1992 DRY CREEK WATERSHED FLOOD CONTROL PLAN

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

PLATE C-27

Appendix D - Completed Local Structural Flood Control Projects

Table D.1 Completed Local Structural Flood Control Projects

Year Completed	Project Location	Project Type	Brief Project Description
1986	City of Roseville: Rocky Ridge Drive on Linda Creek	Culvert Enlargement	Quadrupled size of culvert at Rocky Ridge Drive on Linda Creek to handle 100-year storm
1986	City of Roseville: Champion Oaks Drive at Linda Creek	Culvert Addition	Culvert added at Champion Oaks Drive at Linda Creek and improved channel upstream to increase channel capacity
1986	Union Pacific Railroad Tracks on Dry Creek	Culvert Improvement	Improved culvert at Southern (now Union) Pacific tracks on Dry Creek
1990	City of Roseville: Diamond Oaks Road	Culvert Enlargement	Enlarged culvert under Diamond Oaks Road thereby protecting 10 homes that flooded in 1986.
1992	City of Roseville: Cirby Creek	Channel Modifications	The City of Roseville lowered the Cirby Creek channel bed up to two feet near Eich Intermediate School and installed geoweb walls on the edge of the channel to Sierra Gardens Drive.
1992	City of Roseville: Cirby Creek between Eich School and Sierra Gardens Drive	Bridge Replacement	Replaced Loretto Bridge over Cirby Creek and widened channel between Eich School and Sierra Gardens Drive. This project brought all nearby homes out of the floodplain.
1993	City of Roseville: Southern Pacific Railroad Bridge	Culvert Replacement	The Southern Pacific Railroad replaced four, 18'x13' elliptical culverts with a concrete bridge on four rows of 15" to 16" piles. The two piers adjacent to Subway Road were lowered to match the existing road grade thereby removing over 150 homes from the floodplain.
1993	City of Roseville: Diamond Oaks	Culvert Replacement	The culvert at Diamond Oaks Road was replaced. This project brought all nearby homes out of the floodplain.
1996	City of Roseville: 1-80 / Cirby Creek	Channel Modifications	The City of Roseville regraded portions of the Cirby Creek channel, just upstream of I-80, and added a floodwall along the north side of the channel. The levees were also regraded and a walkway was installed on the top of portions of the levee. This project brought the entire Tina/Elisa neighborhood of 40 homes out of the floodplain.
1998	City of Roseville: Cirby and Linda Creek to Tiffany Circle	Bypass Pipes / Bike Path / Floodwall	Two parallel 9-foot diameter cast-in-place bypass pipes on Linda Creek, just upstream of the confluence with Cirby Creek, were installed by the City of Roseville. The bypass pipes are 856 feet long and collect water from Linda Creek, bypassing a large bend in the stream, and discharge into Linda Creek, just upstream of the confluence with Cirby Creek. A bike path and floodwall were constructed upstream of the bypass to Tiffany Circle.

Year Completed	Project Location	Project Type	Brief Project Description
1998	City of Roseville: Rocky Ridge Drive to Old Auburn Road	Bypass Channel / Levee / Floodwall	The City of Roseville constructed a 115-foot long, 25-foot wide bypass channel on Linda Creek, upstream of Rocky Ridge Drive. The bypass channel parallels Linda Creek and is separated by about 100 feet. A levee and a floodwall were also installed along portions of the stream below Old Auburn Road.
2004	City of Roseville: Along Riverside, downstream of Darling Way	Bypass Channel	Stream corridor enhancement project with negligible flood control benefit
2005	Sacramento County: Hayer Dam	Dam Removal	Removal of agricultural dam in the lower portion of the Dry Creek watershed to enhance fish passage
2006	City of Roseville: Atkinson Street Bridge	Bridge Replacement	Caltrans and the City of Roseville replaced the two-lane, five-span Atkinson Street Bridge with a five lane, four-span bridge. Floodplain Encroachment analysis performed for the bridge showed a net decrease in water surface elevation upstream of the bridge do to the low chord at a higher elevation and the piers aligned to the direction of flow instead of the previous configuration with the piers skewed to the direction of flow.
Source: City of Roseville, 2010.			

Appendix E - Summary of Bridges and Culverts

Table E.1 Bridge and Culvert Overtopping Based on Hydraulic Model

Crossing Number in 1992 Report	River	Type	Name	Max Flow Overtopping the Structure (cfs)	Max Flow Total (cfs)	Flow Overtopping / Flow Total (%)	Centering	Recommended for Replacement
190	Miners Ravine	Culvert	Shadow Oaks Lane	2537	2560	99.1%	MR15J@30	No
91	Linda Creek	Culvert	Shadow Brook Place	685	692	99.0%	LC5A@0	No
120	Linda Creek	Culvert	Walnut Avenue	362	371	97.5%	LC40L@30	No
	Miners Ravine	Bridge	Ox Bow Lane	1185	1232	96.2%	MR15J@30	No
263	Sucker Ravine	Culvert	Pacific Street	350	365	95.9%	SE40N@0	No
76	Linda Creek	Culvert	Champion Oaks Drive	2084	2187	95.3%	LC40L@30	Yes
	Linda Creek	Culvert	Muir Way	264	296	89.4%	MR15J@30	No
213	Miners Ravine	Bridge	Penryn Rock Springs Rd.	468	524	89.3%	MR15J@30	No
92	Linda Creek	Culvert	Troy Purdy Lane	538	604	89.1%	LC5A@0	No
11	Dry Creek	Bridge	Watt Avenue	11535	13129	87.9%	LC5A@0	Yes
	Miners Ravine	Bridge	Willow Valley Place	1728	1989	86.9%	MR15J@30	No
	Miners Ravine	Bridge	Whiskey Bar Road	1172	1353	86.6%	MR15J@30	Yes
	Miners Ravine	Bridge	Buckboard Lane	1154	1363	84.7%	MR15J@30	No
203	Miners Ravine	Bridge	Auburn Folsom Road	2151	2541	84.7%	MR15J@30	Yes
	Miners Ravine	Culvert	Lomida Lane	1377	1647	83.6%	MR15J@30	No
212	Miners Ravine	Bridge	King Road	477	613	77.9%	MR15J@30	Yes
90	Linda Creek	Culvert	Barton Road	611	786	77.7%	LC5A@0	Yes
93	Linda Creek	Culvert	Country Court	375	494	75.9%	LC5A@0	No
14	Dry Creek	Bridge	Walerga Road	9874	13165	75.0%	SE40N@0	Scheduled for

Crossing Number in 1992 Report	River	Type	Name	Max Flow Overtopping the Structure (cfs)	Max Flow Total (cfs)	Flow Overtopping / Flow Total (%)	Centering	Recommended for Replacement
								Replacement
119	Linda Creek	Culvert	Chestnut Avenue	332	449	73.9%	LC40L@30	No
266	Sucker Ravine	Culvert	Saunders Avenue	426	592	72.0%	SE40M@30	No
208	Miners Ravine	Culvert	Auburn Folsom Road	881	1294	68.1%	MR15J@30	Yes
211	Miners Ravine	Bridge	Auburn Folsom Road	766	1154	66.4%	MR15J@30	No
124	Antelope Creek	Bridge	Atlantic Street	2628	4022	65.3%	AC5I@60	No
	Miners Ravine	Bridge	South of Willow Valley	1258	1984	63.4%	SE40M@30	No
194	Miners Ravine	Bridge	Itchy Acres Road	1572	2530	62.2%	LC5A@0	Yes
265	Sucker Ravine	Culvert	Sierra College Blvd.	264	427	61.9%	SE40M@30	No
58	Cirby Creek	Culvert	Rocky Ridge Drive	318	521	61.1%	CC5G@90	No
196	Miners Ravine	Bridge	Miners Ravine Road	1437	2410	59.6%	SE40M@30	No
52	Cirby Creek	Culvert	Oak Ridge Drive	524	895	58.5%	CC5G@90	Yes
117	Linda Creek	Culvert	Oak Avenue	491	934	52.5%	LC40L@30	No
255	Sucker Ravine	Culvert	Lakeside Drive	380	727	52.2%	SE40N@0	No
209	Miners Ravine	Culvert	Placer Canyon Parkway	856	1670	51.3%	MR15J@30	No
141	Antelope Creek	Bridge	King Road	279	558	50.0%	SE40N@0	No
191	Miners Ravine	Bridge	Barton Road	1114	2255	49.4%	SE40N@0	Replaced
118	Linda Creek	Mult Open	Filbert Avenue	241	501	48.0%	LC40L@30	No

Crossing Number in 1992 Report	River	Type	Name	Max Flow Overtopping the Structure (cfs)	Max Flow Total (cfs)	Flow Overtopping / Flow Total (%)	Centering	Recommended for Replacement
207	Miners Ravine	Bridge	Dick Cook Road	838	1777	47.2%	AC5I@60	Replaced
73	Linda Creek	Bridge	Rocky Ridge Drive	388	948	40.9%	LC40L@30	Yes
258	Sucker Ravine	Culvert	Super Span	282	697	40.4%	SE40M@30	No
236	Secret Ravine	Bridge	Horseshoe Bar Road	1866	4669	40.0%	SE40M@30	Yes
256	Sucker Ravine	Culvert	Rocklin Road	278	720	38.6%	SE40N@0	Yes
232	Secret Ravine	Culvert	Sierra College Blvd.	1882	4987	37.7%	SE40M@30	No
	Miners Ravine	Bridge	Hardy Lane	894	2470	36.2%	MR15J@30	No
205	Miners Ravine	Bridge	Moss Lane	710	2048	34.7%	MR15J@30	No
56	Cirby Creek	Culvert	Sierra Gardens Drive	310	897	34.5%	CC5G@90	Yes
139	Antelope Creek	Culvert	Delmar Avenue	103	317	32.6%	AC5I@60	No
158	Clover Valley	Culvert	Midas Avenue	351	1092	32.2%	AC5I@60	Yes
197	Miners Ravine	Culvert	Leibinger Lane	814	2534	32.1%	MR15J@30	Yes
83	Linda Creek	Culvert	Hazel Avenue	778	2427	32.1%	LC40L@30	Yes
50	Cirby Creek	Culvert	Sunrise Blvd.	277	904	30.6%	CC5G@90	Yes
163	Clover Valley	Culvert	Rawhide Road	308	1035	29.8%	AC5I@60	Yes
22	Dry Creek	Bridge	Riverside Avenue	2645	8908	29.7%	SE40N@0	Yes
199	Miners Ravine	Bridge	Auburn Folsom Road	727	2560	28.4%	MR15J@30	Yes
235	Secret Ravine	Bridge	Brace Road	1314	4702	27.9%	LC5A@0	Yes

Crossing Number in 1992 Report	River	Type	Name	Max Flow Overtopping the Structure (cfs)	Max Flow Total (cfs)	Flow Overtopping / Flow Total (%)	Centering	Recommended for Replacement
21	Dry Creek	Bridge	Vernon Street	3532	12901	27.4%	SE40N@0	No
86	Linda Creek	Culvert	Cherry Avenue	356	1404	25.4%	LC40L@30	No
51	Cirby Creek	Bridge	Coloma Way	179	816	21.9%	LC40L@30	Yes
188	Miners Ravine	Bridge	Cavitt & Stallman Road	288	1440	20.0%	MR15J@30	No
54	Cirby Creek	Culvert	Loretto Drive	199	1126	17.7%	CC5G@90	No
94	Linda Creek	Culvert	Auburn Folsom Road	33	210	15.8%	LC5A@0	No
260	Sucker Ravine	Culvert	Dominguez Road	100	638	15.7%	SE40M@30	No
156	Clover Valley	Culvert	Argonaut Avenue	103	781	13.2%	AC5I@60	No
134	Antelope Creek	Culvert	Midas Avenue	151	1369	11.0%	AC5I@60	No
28	Dry Creek	Bridge	Folsom Road	1174	11098	10.6%	SE40N@0	Yes
25	Dry Creek	Bridge	Douglas Blvd.	823	9752	8.4%	AC5I@60	No
136	Antelope Creek	Bridge	Yankee Hill Road	65	1646	4.0%	AC5I@60	No
16	Dry Creek	Bridge	Cook Riolo Road	50	13341	0.4%	SE40N@0	Replaced
Recommended for replacement in 1992 study							Total Recommended for Replacement =	23

Table E.2 1992 Plan Recommended Bridge and Culvert Replacements Not Included in Update Models

Stream	Crossing Name
Dry Creek County Line Tributary	Watt Avenue
Dry Creek DC65 Tributary	Walerga Road
Linda Creek Treelake Tributary	Sierra College Boulevard
Antelope Creek Clark Tunnel Road Tributary	Colwell Road
Antelope Creek Clark Tunnel Road Tributary	Clark Tunnel
Clover Valley Creek	English Colony Road
Antelope Creek	Citrus Colony Road
Antelope Creek	English Colony Road
Antelope Creek Humphrey Tributary	Colwell road
Miners Ravine Cavitt Stallman Tributary	Barton Road
Miners Ravine Lake	Auburn-Folsom Road
Secret Ravine	Brennans Road
Secret Ravine	Rock Springs Road
Secret Ravine	Newcastle Road
Secret Ravine	Powerhouse Road
Secret Ravine	King Road
Secret Ravine West Fork Penryn Tributary	Gilardi Road

Appendix F - Hydrology Model Developments

F.1 Comparison of Original 1992 Model to 1992 Model Adapted to SWMM

The HEC-1 input file labeled “HNBDVRNN.HC1” is the 1992 HEC-1 input file for the 1992 Plan, for the 100-year event, peak storm centering at the Vernon Street crossing, and the Future Fully Developed, Unmitigated conditions. The peak precipitation input for this model was HEC-1 gage value 12 which was included at watersheds SE51 and SE55. All precipitation gages referenced in this HEC-1 file produced precipitation for a 6-hour rainfall event, and the model was run for a 24-hour timespan.

The base file was adapted to Kinematic Wave methodology and made ready for precipitation to be input in the file: “DC1992UN.INP”. “PDP.EXE” (Version 2.0) was used to insert 6-hour, 100-year precipitation tables into the “DC1992UN.DAT” file for a storm centering locations of SE51 and SE55, and storm angles of 0, 30, 60, and 90 degrees. An “ELTROID.DAT” file was created based on the watershed centroids obtained from the AUTOCAD drawings from the 1992 Plan.

The results indicate that the SWMM Kinematic Wave equivalent analysis generates higher flow rates. This is largely the result of the application of an alternate storm centering methodology (per SWMM 1994).

The centering analysis on the Kinematic Wave converted HEC-1 analysis found that a storm centering at SE51, with a storm angle of 60 degrees would generate the highest flows. The SWMM also requires that precipitation be applied differently for different elevations. The adapted model used a SWMM specified total 6-hour storm event precipitation for a 100-year event storm centered at SE55, at an angle of 0 degrees and with elevation factored (peak for Vernon Street Crossing).

Since the storm centering for the 1992 Plan was based on calibration to actual events, the results of this section indicate that a simple conversion and adaptation of the model to the SWMM requirements will not result in properly calibrated results. Additional modifications to the analysis would be necessary to get calibrated results with an HEC-1 model modified to meet the requirements of the SWMM.

F.2 Response Time Factors

Overland flow response time factors were determined using relationships based solely on watershed imperviousness. These relationships are illustrated

Chart F.1 Overland Slope and Length Based on Imperviousness for Calibrated Response Times

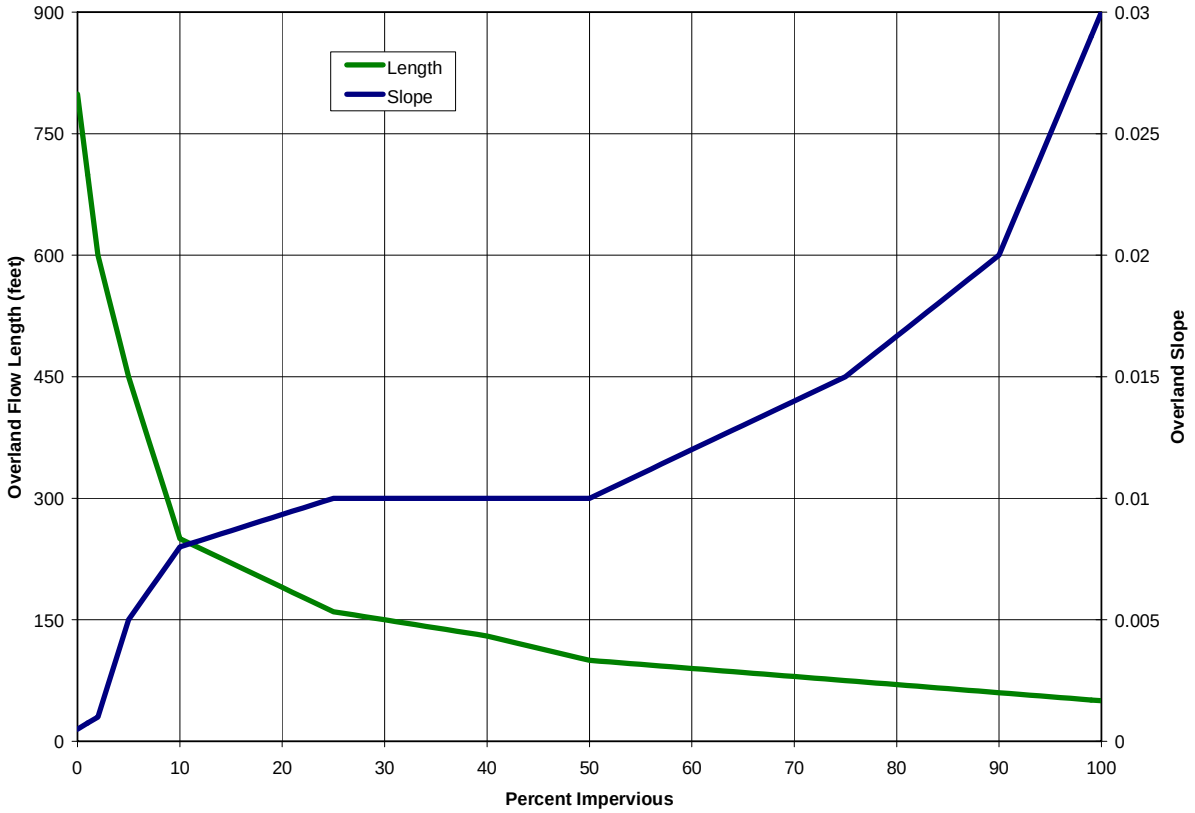


Table F.1 Overland Slope and Length Based on Imperviousness for Calibrated Response Times

Imperviousness (percent)	Length (feet)	Slope (feet/foot)
0	799	0.0005
2	600	0.001
5	450	0.005
10	250	0.008
25	160	0.01
40	130	0.01
50	100	0.01
75	75	0.015
90	60	0.02
100	50	0.03

Table F.2 Master Land Use Imperviousness and Infiltration Factors

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
SCGPLU	A	Agriculture	2	0.31	0.16	0.09	0.07	AG
SCGPLU	CNCO	Community/Neighborhood Commercial & Offices	80	0.48	0.25	0.16	0.12	COMM
SCGPLU	HCW	Heavy Commercial or Warehouse	85	0.48	0.25	0.16	0.12	IND
SCGPLU	HDR	High Density Residential 30+ du/na	80	0.48	0.25	0.16	0.12	HDR
SCGPLU	I	Industrial	80	0.31	0.16	0.09	0.07	IND
SCGPLU	I-EI	Industrial-Employee Intensive	80	0.31	0.16	0.09	0.07	IND
SCGPLU	LDR	Low Density Residential 4-15 du/na	50	0.48	0.25	0.16	0.12	LDR
SCGPLU	MDR	Medium Density Residential 16-29 du/na	65	0.48	0.25	0.16	0.12	MDR
SCGPLU	MU	Mixed-Use	70	0.48	0.25	0.16	0.12	MU
SCGPLU	OS	Parks-Recreation-Open Space	2	0.31	0.16	0.09	0.07	OS
SCGPLU	PO	Public Offices	80	0.48	0.25	0.16	0.12	BP
SCGPLU	PQPM	Public/Quasi-Public-Miscellaneous	50	0.48	0.25	0.16	0.12	PQP
SCGPLU	PROS	Parks-Recreation-Open Space	5	0.31	0.16	0.09	0.07	REC
SCGPLU	RCO	Regional Commercial & Offices	80	0.48	0.25	0.16	0.12	COMM
SCGPLU	RE	Rural Estates	15	0.31	0.16	0.09	0.07	RE
SCGPLU	RMU	Residential Mixed Use	70	0.48	0.25	0.16	0.12	MU
SCGPLU	RMX	Residential Mixed Use	70	0.48	0.25	0.16	0.12	MU
SCGPLU	S	Schools	50	0.48	0.25	0.16	0.12	PQP
SCGPLU	SPD	Special Planning District	15	0.31	0.16	0.09	0.07	RR
SCGPLU	TU	Transportation/Utilities	90	0.31	0.16	0.09	0.07	COMM
SCGPLU	W	Water	80	0.31	0.16	0.09	0.07	PQP
SAGPLU	AG_CROP		2	0.31	0.16	0.09	0.07	AG
SAGPLU	AG_CROP/RCA		2	0.31	0.16	0.09	0.07	AG
SAGPLU	AG_REC_RES		5	0.31	0.16	0.09	0.07	RR
SAGPLU	AG-RES		5	0.31	0.16	0.09	0.07	RR
SAGPLU	COMM/OFF		80	0.48	0.25	0.16	0.12	BP
SAGPLU	CORE_AREA		80	0.48	0.25	0.16	0.12	CITY
SAGPLU	EXT_IND		85	0.31	0.16	0.09	0.07	IND
SAGPLU	EXT_IND/SM		85	0.31	0.16	0.09	0.07	IND
SAGPLU	GA_20		5	0.31	0.16	0.09	0.07	RR
SAGPLU	GA_20/RCA		5	0.31	0.16	0.09	0.07	RR
SAGPLU	GA_20/SM		5	0.31	0.16	0.09	0.07	RR
SAGPLU	GA_80		2	0.31	0.16	0.09	0.07	AG

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
SAGPLU	GA_80/RCA		2	0.31	0.16	0.09	0.07	AG
SAGPLU	GA_80/SM		2	0.31	0.16	0.09	0.07	AG
SAGPLU	HDR		75	0.48	0.25	0.16	0.12	HDR
SAGPLU	INT_IND		80	0.31	0.16	0.09	0.07	IND
SAGPLU	INT_IND/SM		80	0.31	0.16	0.09	0.07	IND
SAGPLU	LDR		40	0.48	0.25	0.16	0.12	LDR
SAGPLU	MDR		50	0.48	0.25	0.16	0.12	MDR
SAGPLU	NAT_PRES		2	0.31	0.16	0.09	0.07	OS
SAGPLU	NTOD		2	0.31	0.16	0.09	0.07	OS
SAGPLU	PQP		50	0.48	0.25	0.16	0.12	PQP
SAGPLU	PQP/RCA		50	0.48	0.25	0.16	0.12	PQP
SAGPLU	REC		5	0.48	0.25	0.16	0.12	REC
SAGPLU	REC/RCA		5	0.48	0.25	0.16	0.12	REC
SAGPLU	UDA		5	0.48	0.25	0.16	0.12	RES
SAGPLU	URB_RES		5	0.48	0.25	0.16	0.12	RES
SAGPLU	URB_RES/SM		5	0.48	0.25	0.16	0.12	RES
SAGPLU	UTOD		5	0.31	0.16	0.09	0.07	RES
PCGPLU	AG10-80	AGAgricultural 10 - 80 Ac. Min.Agricultural 10 - 80 Ac. Min.	2	0.31	0.16	0.09	0.07	AG
PCGPLU	COMMERCIAL	COMMCommercialCommercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	HDR10-15	HDRHigh Density Residential 10 - 15 DU/Ac.High Density Residential 10 - 15 DU/Ac.	75	0.48	0.25	0.16	0.12	HDR
PCGPLU	IN	INDIndustrialIndustrial	80	0.31	0.16	0.09	0.07	IND
PCGPLU	LDR.4-.9	LDRLow Density Residential 0.4 - 0.9 Ac. Min.Low Density Residential .4 - .9 Ac. Min.	35	0.48	0.25	0.16	0.12	LDR
PCGPLU	LMDR2-5	LMDRLow Medium Density Residential 2 - 5 DU/Ac.Low Medium Density Residential 2-5 DU/Ac	40	0.48	0.25	0.16	0.12	MDR
PCGPLU	MDR5-10	MDRMedium Density Residential 5 - 10 DU./Ac.Medium Density Residential 5-10 DU/Ac	50	0.48	0.25	0.16	0.12	MDR
PCGPLU	MU	MUMixed UseMixed Use	75	0.48	0.25	0.16	0.12	MU
PCGPLU	O	Open SpaceOpen Space	2	0.31	0.16	0.09	0.07	OS

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
PCGPLU	O/BP	O/BPOpen Space / Business ParkOpen Space / Business Park	2	0.31	0.16	0.09	0.07	BP
PCGPLU	PO	POProfessional OfficeProfessional Office	80	0.48	0.25	0.16	0.12	BP
PCGPLU	RD	RDRiparian DrainageRiparian Drainage	2	0.31	0.16	0.09	0.07	OS
PCGPLU	RE4.6-10	RERural Estate 4.6 - 10 Ac. Min.Rural Estate 4.6 - 10 Ac. Min.	5	0.31	0.16	0.09	0.07	RE
PCGPLU	RLDR.9-2.3	RLDRRural Low Density Residential 0.9 - 2.3 Ac. Min.Rural Low Dens Res .9-2.3 Ac Min	15	0.31	0.16	0.09	0.07	RR
PCGPLU	RR2.3-4.6	RRRural Residential 2.3 - 4.6 Ac. Min.Rural Residential 2.3 - 4.6 Ac. Min.	15	0.31	0.16	0.09	0.07	RR
PCGPLU	200	See Alpine Meadows CP Documen*See Alpine Meadows CP DocumentationSee Alpine Meadows CP Documentation	2	0.31	0.16	0.09	0.07	REC
PCGPLU	AUBURN	AUBURNCity of AuburnJURISDICTION = AUBURN	50	0.31	0.16	0.09	0.07	CITY
PCGPLU	COLFAX	COLFAXCity of ColfaxJURISDICTION = COLFAX	50	0.31	0.16	0.09	0.07	CITY
PCGPLU	LINCOLN	LINCOLNCity of LincolnJURISDICTION = LINCOLN	50	0.31	0.16	0.09	0.07	CITY
PCGPLU	CEMETERY	CEMETERYCemeteryCemetery	15	0.48	0.25	0.16	0.12	CEM
PCGPLU	HDR6.1-20	HDRHigh Density Residential 6.1 - 20 DU./Ac.High Density Resid. 6.1 - 20 DU./Ac.	75	0.48	0.25	0.16	0.12	HDR
PCGPLU	LDR1-3.4	LDRLow Density Residential 1 - 3.4 DU./Ac.Low Density Residential 1 - 3.4 DU./Ac.	40	0.48	0.25	0.16	0.12	LDR
PCGPLU	MDR3.5-6	MDRMedium Density Residential 3.5 - 6 DU./Ac.Medium Density Residential 3.5-6 DU/Ac	50	0.48	0.25	0.16	0.12	MDR
PCGPLU	OR	OROffice RetailOffice Retail	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	PARK	PARKParkPark	5	0.48	0.25	0.16	0.12	REC
PCGPLU	RANCHETTE	Ranchette 2.5 - 20 Ac. Min.Ranchette 2.5 - 20 Ac. Min.	5	0.31	0.16	0.09	0.07	RR
PCGPLU	RE1.1-4.5	RERural Estate 1.1 - 4.5 Ac. Min.Rural Estate 1.1 - 4.5 Ac. Min.	15	0.31	0.16	0.09	0.07	RE
PCGPLU	SSC	SSCSpecial Study CorridorSpecial Study Corridor	2	0.31	0.16	0.09	0.07	RES
PCGPLU	VC	VCVisitor CommercialVisitor Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	W	Water InfluenceWater Influence	80	0.31	0.16	0.09	0.07	PQP

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
PCGPLU	ROCKLIN	ROCKLINCity of RocklinJURISDICTION = ROCKLIN	50	0.31	0.16	0.09	0.07	CITY
PCGPLU	ROSEVILLE	ROSEVILLECity of RosevilleJURISDICTION = ROSEVILLE	50	0.31	0.16	0.09	0.07	CITY
PCGPLU	AGRES4.6	AG-DRAgriculture-Residential Development Reserve 4.6 - 20 Ac. Min.Ag-Resid Development Rsrve 4.6-20 Ac Min	5	0.31	0.16	0.09	0.07	RR
PCGPLU	COMMERCIAL	COMMCommercialCommercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	GREENOS	Greenbelt & Open SpaceGreenbelt & Open Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	HDR4-10	HDRHigh Density Residential 4 - 10 DU/Ac.High Density Residential 4 - 10 DU/Ac.	70	0.48	0.25	0.16	0.12	HDR
PCGPLU	IN	INIndustrialIndustrial	80	0.31	0.16	0.09	0.07	IND
PCGPLU	IN-DR	IN-DRIndustrial Development ReserveIndustrial Development Reserve	80	0.31	0.16	0.09	0.07	IND
PCGPLU	LDR1-2	LDRLow Density Residential 1 - 2 DU./Ac.Low Density Residential 1 - 2 DU./Ac.	35	0.48	0.25	0.16	0.12	LDR
PCGPLU	PO	PROFProfessional OfficeProfessional Office	80	0.48	0.25	0.16	0.12	BP
PCGPLU	RLDR1-2.3	RLDRRural Low Density Residential 1 - 2.3 Ac. Min.Rural Low Dens Res 1-2.3 Ac Min	15	0.48	0.25	0.16	0.12	RE
PCGPLU	RR2.3-10	RR-DRRural Residential 2.3 - 10 Ac. Min.Rural Residential 2.3 - 10 Ac. Min.	15	0.48	0.25	0.16	0.12	RR
PCGPLU	COMMERCIAL	COMMCommercialCommercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	FOR20-160	FORESTRYForestry 20 - 160 Ac. Min.Forestry 20 - 160 Ac. Min.	2	0.31	0.16	0.09	0.07	OS
PCGPLU	FR4.6-20	FRForest Residential 4.6 - 20 Ac. Min.Forest Residential 4.6 - 20 Ac. Min.	5	0.31	0.16	0.09	0.07	RR
PCGPLU	IN	INIndustrialIndustrial	80	0.31	0.16	0.09	0.07	IND
PCGPLU	LDR2-4	LDRLow Density Residential 2 - 4 DU./Ac.Low Density Residential 2 - 4 DU./Ac.	40	0.48	0.25	0.16	0.12	LDR
PCGPLU	MDR4-10	MDRMedium Density Residential 4 - 10 DU./Ac.Medium Density Residential 4-10 DU/Ac	50	0.48	0.25	0.16	0.12	MDR
PCGPLU	PF	PFPublic FacilityPublic Facility	50	0.48	0.25	0.16	0.12	PQP

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
PCGPLU	RE2.3-4.6	RERural Estate 2.3 - 4.6 Ac. Min.Rural Estate 2.3 - 4.6 Ac. Min.	15	0.31	0.16	0.09	0.07	RE
PCGPLU	RR1-2.3	RRRural Residential 1 - 2.3 Ac. Min.Rural Residential 1 - 2.3 Ac. Min.	15	0.31	0.16	0.09	0.07	RR
PCGPLU	WPRI4.6-20	W/PRIWater Influence/Private Ownership 4.6 - 20 Ac. Min.Water Infl./Private Ownrshp 4.6-20 Ac Mi	5	0.31	0.16	0.09	0.07	PQP
PCGPLU	COMMERCIAL	COMMCommercialCommercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	HDR4-10	HDRHigh Density Residential 4 - 10 DU/Ac.High Density Residential 4 - 10 DU/Ac.	70	0.48	0.25	0.16	0.12	HDR
PCGPLU	LDR.4-.9	LDRLow Density Residential 0.4 - 0.9 Ac. Min.Low Density Residential .4 - .9 Ac. Min.	35	0.48	0.25	0.16	0.12	LDR
PCGPLU	MDR2-4	MDRMedium Density Residential 2 - 4 DU/Ac.Medium Density Residential 2 - 4 DU/Ac.	40	0.48	0.25	0.16	0.12	MDR
PCGPLU	O	Open SpaceOpen Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	PO	PROFProfessional OfficeProfessional Office	80	0.48	0.25	0.16	0.12	BP
PCGPLU	RE_4.6-20	RERural Estate 4.6 - 20 Ac. Min.Rural Estate 4.6 - 20 Ac. Min.	5	0.31	0.16	0.09	0.07	RE
PCGPLU	RLDR.9-2.3	RLDRRural Low Density Residential 0.9 - 2.3 Ac. Min.Rural Low Dens Res .9-2.3 Ac. Min.	15	0.31	0.16	0.09	0.07	LDR
PCGPLU	RLDR-DL.67	RLDRRural Low Density Residential 0.9 - 2.3 Ac. Min. Density Limit 0.67Rural Low Dens Res .9-2.3 Ac Min DL .67	15	0.31	0.16	0.09	0.07	LDR
PCGPLU	RLDR-DL.83	RLDRRural Low Density Residential 0.9 - 2.3 Ac. Min. Density Limit 0.83Rural Low Dens Res .9-2.3 Ac Min DL .83	15	0.31	0.16	0.09	0.07	LDR
PCGPLU	RR2.3-4.6	RRRural Residential 2.3 - 4.6 Ac. Min.Rural Residential 2.3 - 4.6 Ac. Min.	15	0.31	0.16	0.09	0.07	RR
PCGPLU	COMMERCIAL	COMMCommercialCommercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	HDR4-10	HDRHigh Density Residential 4 - 10 DU/Ac.High Density Residential 4 - 10 DU/Ac.	65	0.48	0.25	0.16	0.12	HDR
PCGPLU	IN	INIndustrialIndustrial	80	0.31	0.16	0.09	0.07	IND

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
PCGPLU	LDR.4-2.3	LDRLow Density Residential 0.4 - 2.3 Ac. Min.Low Density Resid. 0.4 - 2.3 Ac. Min.	15	0.48	0.25	0.16	0.12	LDR
PCGPLU	MDR2-4	MDRMedium Density Residential 2 - 4 DU/Ac.Medium Density Residential 2 - 4 DU/Ac.	40	0.48	0.25	0.16	0.12	MDR
PCGPLU	O	Open SpaceOpen Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	PP	PENRYN PARKWAYPenryn ParkwayPenryn Parkway	2	0.31	0.16	0.09	0.07	ROAD
PCGPLU	RD	RDRiparian DrainageRiparian Drainage	2	0.31	0.16	0.09	0.07	OS
PCGPLU	RE4.6-20	RERural Estate 4.6 - 20 Ac. Min.Rural Estate 4.6 - 20 Ac. Min.	5	0.31	0.16	0.09	0.07	RE
PCGPLU	RR2.3-4.6	RRRural Residential 2.3 - 4.6 Ac. Min.Rural Residential 2.3 - 4.6 Ac. Min.	15	0.31	0.16	0.09	0.07	RR
PCGPLU	FOR40-640	FORForest 40 - 640 Ac. Min.Forest 40 - 640 Ac. Min.	2	0.31	0.16	0.09	0.07	OS
PCGPLU	FR2.5-10	FRForest Residential 2.5 - 10 Ac. Min.Forest Residential 2.5 - 10 Ac. Min.	5	0.31	0.16	0.09	0.07	RR
PCGPLU	GC	GCGeneral CommercialGeneral Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	HDR10-15	HDRHigh Density Residential 10 - 15 DU/Ac.High Density Residential 10 - 15 DU/Ac.	70	0.48	0.25	0.16	0.12	HDR
PCGPLU	LDR1-5	LDRLow Density Residential 1 - 5 DU./Ac.Low Density Residential 1 - 5 DU./Ac.	40	0.48	0.25	0.16	0.12	LDR
PCGPLU	MDR5-10	MDRMedium Density Residential 5 - 10 DU./Ac.Medium Density Residential 5-10 DU/Ac	50	0.48	0.25	0.16	0.12	MDR
PCGPLU	O	Open SpaceOpen Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	P/QP	P/QPPublic/Quasi-PublicPublic/Quasi-Public	50	0.48	0.25	0.16	0.12	PQP
PCGPLU	PF	PFPublic Facility (TPZ Until 2013)Public Facility (TPZ Until 2013)	50	0.48	0.25	0.16	0.12	PQP
PCGPLU	PO	PROFProfessional OfficeProfessional Office	80	0.48	0.25	0.16	0.12	BP
PCGPLU	RR.4-1	RRRural Residential 0.4 - 1 DU/Ac.Rural Residential 0.4 - 1 DU/Ac.	30	0.48	0.25	0.16	0.12	RR
PCGPLU	TC	TCTourist/Resort CommercialTourist/Resort Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	W	Water InfluenceWater Influence	2	0.31	0.16	0.09	0.07	OS

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
PCGPLU	AG10	AGAgriculture 10 Ac. Min.Agriculture 10 Ac. Min.	5	0.31	0.16	0.09	0.07	RR
PCGPLU	AG10/SP	AG/SPAgriculture 10 Ac. Min./Specific PlanAgriculture 10 Ac. Min./Specific Plan	5	0.31	0.16	0.09	0.07	RR
PCGPLU	FORREC-MR	FOR/REC - MRForestry/Recreation - Mineral ReserveForestry/Recreation - Mineral Reserve	2	0.31	0.16	0.09	0.07	REC
PCGPLU	GC	GCGeneral CommercialGeneral Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	IN	INDIndustrialIndustrial	80	0.31	0.16	0.09	0.07	IND
PCGPLU	LDR40000-1	LDRLow Density Residential 40,000 sq. ft. - 1 Ac. Min.Low Density Resid 40,000 sq. ft-1 Ac Min	30	0.31	0.16	0.09	0.07	LDR
PCGPLU	LDR40000PO	LDR/POLow Density Residential 40,000 sq. ft. - 1 Ac. Min. & Professional OfficeLow Dens Resid 40000 sf-1 Ac Min/Profess	30	0.31	0.16	0.09	0.07	LDR
PCGPLU	MDR2-4	MDRMedium Density Residential 2 - 4 DU/Ac.Medium Density Residential 2 - 4 DU/Ac.	40	0.31	0.16	0.09	0.07	MDR
PCGPLU	O	Open SpaceOpen Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	PF	PFPublic FacilityPublic Facility	50	0.48	0.25	0.16	0.12	PQP
PCGPLU	PO	POProfessional OfficeProfessional Office	80	0.48	0.25	0.16	0.12	BP
PCGPLU	RD	RDRiparian DrainageRiparian Drainage	2	0.31	0.16	0.09	0.07	OS
PCGPLU	RE2.3-10	RERural Estate 2.3 - 10 Ac. Min.Rural Estate 2.3 - 10 Ac. Min.	15	0.31	0.16	0.09	0.07	RE
PCGPLU	RESREC	RECResorts and RecreationResorts and Recreation	15	0.31	0.16	0.09	0.07	REC
PCGPLU	RR1-2.3	RRRural Residential 1 - 2.3 Ac. Min.Rural Residential 1 - 2.3 Ac. Min.	25	0.31	0.16	0.09	0.07	RR
PCGPLU	TC	TCTourist/Resort CommercialTourist/Resort Commercial	80	0.31	0.16	0.09	0.07	COMM
PCGPLU	W	Water InfluenceWater Influence	2	0.31	0.16	0.09	0.07	OS
PCGPLU	201	See North Tahoe CP Documentat*See North Tahoe CP DocumentationSee North Tahoe CP Documentation	2	0.31	0.16	0.09	0.07	CITY
PCGPLU	AG10-20	AGAgricultural 10 - 20 Ac. Min.Agricultural 10 - 20 Ac. Min.	5	0.31	0.16	0.09	0.07	AG

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
PCGPLU	COMMERCIAL	COMMCommercialCommercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	IN	INIndustrialIndustrial	80	0.31	0.16	0.09	0.07	IND
PCGPLU	RE4.6-10	RERural Estate 4.6 - 10 Ac. Min.Rural Estate 4.6 - 10 Ac. Min.	5	0.31	0.16	0.09	0.07	RE
PCGPLU	RR2.3-4.6	RRRural Residential 2.3 - 4.6 Ac. Min.Rural Residential 2.3 - 4.6 Ac. Min.	5	0.31	0.16	0.09	0.07	RR
PCGPLU	AG/TMBR10	AG/TAgriculture/Timberland - 10 Ac. Min.Agriculture/Timberland - 10 Ac. Min.	2	0.31	0.16	0.09	0.07	AG
PCGPLU	AG/TMBR20	AG/TAgriculture/Timberland - 20 Ac. Min.Agriculture/Timberland - 20 Ac. Min.	2	0.31	0.16	0.09	0.07	AG
PCGPLU	AG/TMBR40	AG/TAgriculture/Timberland - 40 Ac. Min.Agriculture/Timberland - 40 Ac. Min.	2	0.31	0.16	0.09	0.07	AG
PCGPLU	AG/TMBR80	AG/TAgriculture/Timberland - 80 Ac. Min.Agriculture/Timberland - 80 Ac. Min.	2	0.31	0.16	0.09	0.07	AG
PCGPLU	BP/IN	BP/INBusiness Park/Industrial 10,000 Sq. Ft. - 5 Ac. Min.Business Park/Indust. 10000 sf-5 Ac Min	80	0.48	0.25	0.16	0.12	BP
PCGPLU	GC	GCGeneral CommercialGeneral Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	HDR10-21	HDRHigh Density Residential 3,500 - 10,000 Sq. Ft. (10-21 DU)High Dens Resid 3500-10000 sf 10-21 DU	70	0.48	0.25	0.16	0.12	HDR
PCGPLU	LDR10-1	LDRLow Density Residential 10,000 Sq. Ft. - 1 Ac. Min. (1-5 DU)Low Dens Resid 10000 sf-1 Ac Min 1-5 DU	40	0.48	0.25	0.16	0.12	LDR
PCGPLU	MDR35-10	MDRMedium Density Residential 3,500 - 10,000 Sq. Ft.Medium Density Residential 3500-10000 sf	50	0.48	0.25	0.16	0.12	MDR
PCGPLU	O	Open SpaceOpen Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	PF	PFPublic FacilityPublic Facility	50	0.48	0.25	0.16	0.12	PQP
PCGPLU	RESREC160	RECResorts and Recreation 1 - 160 Ac. Min.Resorts and Recreation 1 - 160 Ac. Min.	5	0.31	0.16	0.09	0.07	REC
PCGPLU	RR1-10	RRRural Residential 1 - 10 Ac. Min.Rural Residential 1 - 10 Ac. Min.	15	0.31	0.16	0.09	0.07	RR
PCGPLU	TC60-200	TCTourist/Resort Commercial 6,000 - 20,000 Sq. Ft.Tourist/Resort Commercial 6000-20000 sf	80	0.48	0.25	0.16	0.12	COMM

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
PCGPLU	W	Water InfluenceWater Influence	2	0.31	0.16	0.09	0.07	OS
PCGPLU	GC	GCGeneral CommercialGeneral Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	HDR4-10	HDRHigh Density Residential 4 - 10 DU/Ac.High Density Residential 4 - 10 DU/Ac.	70	0.48	0.25	0.16	0.12	HDR
PCGPLU	IN	INIndustrialIndustrial	80	0.31	0.16	0.09	0.07	IND
PCGPLU	LDR.4-2.3	LDRLow Density Residential 0.4 - 2.3 Ac. Min.Low Density Resid. 0.4 - 2.3 Ac. Min.	25	0.48	0.25	0.16	0.12	LDR
PCGPLU	MDR2-4	MDRMedium Density Residential 2 - 4 DU/Ac.Medium Density Residential 2 - 4 DU/Ac.	40	0.48	0.25	0.16	0.12	MDR
PCGPLU	RE5-20	RERural Estate 5 - 20 Ac. Min.Rural Estate 5 - 20 Ac. Min.	5	0.31	0.16	0.09	0.07	RE
PCGPLU	RR2.3-5	RRRural Residential 2.3 - 5 Ac. Min.Rural Residential 2.3 - 5 Ac. Min.	15	0.31	0.16	0.09	0.07	RR
PCGPLU	AG20	AGAgricultural 20 Ac. Min.Agricultural 20 Ac. Min.	5	0.31	0.16	0.09	0.07	AG
PCGPLU	AG80	AGAgricultural 80 Ac. Min.Agricultural 80 Ac. Min.	2	0.31	0.16	0.09	0.07	AG
PCGPLU	BUSPARK	BPBusiness ParkBusiness Park	80	0.48	0.25	0.16	0.12	BP
PCGPLU	COMMERCIAL	COMMCommercialCommercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	IN	INIndustrialIndustrial	80	0.31	0.16	0.09	0.07	IND
PCGPLU	O	Open SpaceOpen Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	PF	PFPublic FacilityPublic Facility	50	0.48	0.25	0.16	0.12	PQP
PCGPLU	PUBFAC/AG	PF/AGPublic Facility/Agricultural 80 Ac. Min.Public Facility/Agricultural 80 Ac. Min.	2	0.31	0.16	0.09	0.07	PQP
PCGPLU	AC	ACAlpine CommercialAlpine Commercial	70	0.48	0.25	0.16	0.12	COMM
PCGPLU	CP	CPConservation PreserveConservation Preserve	2	0.31	0.16	0.09	0.07	OS
PCGPLU	EC	ECEntrance CommercialEntrance Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	FOR/REC	FOR/RECForest RecreationForest Recreation	2	0.31	0.16	0.09	0.07	REC
PCGPLU	HC	HCHeavy CommercialHeavy Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	HDR10	HDRHigh Density Residential - Density Factor 10High Density Resid. - Density Factor 10	65	0.48	0.25	0.16	0.12	HDR

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
PCGPLU	HDR20	HDRHigh Density Residential - Density Factor 20High Density Resid. - Density Factor 20	75	0.48	0.25	0.16	0.12	HDR
PCGPLU	HDR25	HDRHigh Density Residential - Density Factor 25High Density Resid. - Density Factor 25	80	0.48	0.25	0.16	0.12	HDR
PCGPLU	LDR4	LDRLow Density Residential - Density Factor 4Low Density Residential-Density Factor 4	40	0.48	0.25	0.16	0.12	LDR
PCGPLU	LDR-DF10	LDRLow Density Residential - Density Factor 10Low Density Resid-Density Factor 10	50	0.48	0.25	0.16	0.12	LDR
PCGPLU	VC	VCVillage CommercialVillage Commercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	001A	See Tahoe City Area GP Docume*See Tahoe City Area GP DocumentationSee Tahoe City Area GP Documentation	2	0.31	0.16	0.09	0.07	CITY
PCGPLU	W	Water InfluenceWater Influence	2	0.31	0.16	0.09	0.07	OS
PCGPLU	LOOMIS	LOOMISTown of LoomisJURISDICTION = LOOMIS	2	0.31	0.16	0.09	0.07	CITY
PCGPLU	AG4.6-20	AGAgricultural 4.6 - 20 Ac. Min.Agricultural 4.6 - 20 Ac. Min.	5	0.31	0.16	0.09	0.07	AG
PCGPLU	COMMERCIAL	COMMCommercialCommercial	80	0.48	0.25	0.16	0.12	COMM
PCGPLU	HS	HSHighway ServiceHighway Service	90	0.48	0.25	0.16	0.12	COMM
PCGPLU	LDR2-4	LDRLow Density Residential 2 - 4 DU./Ac.Low Density Residential 2 - 4 DU./Ac.	40	0.48	0.25	0.16	0.12	LDR
PCGPLU	RE2.3-4.6	RERural Estate 2.3 - 4.6 Ac. Min.Rural Estate 2.3 - 4.6 Ac. Min.	15	0.31	0.16	0.09	0.07	RE
PCGPLU	RLDR.4-2.3	RLDRRural Low Density Residential 0.4 - 2.3 Ac. Min.Rural Low Dens Res .4-2.3 Ac Min	25	0.48	0.25	0.16	0.12	RE
PCGPLU	W	Water InfluenceWater Influence	2	0.31	0.16	0.09	0.07	OS
PCGPLU	WPRI4.6-20	PRIWater Influence/Private Ownership 4.6 - 20 Ac. Min.Water Infl./Private Ownrshp 4.6-20 Ac Mi	5	0.31	0.16	0.09	0.07	OS
PCGPLU	203	See West Shore GP Documentati*See West Shore GP DocumentationSee West Shore GP Documentation	2	0.31	0.16	0.09	0.07	OS
RVLU	BP	BP	75	0.48	0.25	0.16	0.12	BP
RVLU	BP/CC	BPCC	75	0.48	0.25	0.16	0.12	COMM
RVLU	BP/LI	BPLI	75	0.31	0.16	0.09	0.07	IND

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
RVLU	CBD	CBD	75	0.48	0.25	0.16	0.12	COMM
RVLU	CBD/FP	CBDFP	75	0.48	0.25	0.16	0.12	COMM
RVLU	CC	CC	75	0.48	0.25	0.16	0.12	COMM
RVLU	CC/BP	CCBP	75	0.48	0.25	0.16	0.12	BP
RVLU	CC/FP	CCFP	75	0.48	0.25	0.16	0.12	COMM
RVLU	CC/RC	CCRC	75	0.48	0.25	0.16	0.12	COMM
RVLU	CC/VC-2.8	CCVC	75	0.48	0.25	0.16	0.12	COMM
RVLU	CC-3.8	CC	75	0.48	0.25	0.16	0.12	COMM
RVLU	HDR 19.4	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR/VC-16.5	HDRVC	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR/VC-19.3	HDRVC	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-12.2	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-13.0	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-13.1	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-13.4	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-13.6	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-13.7	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-13.9	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-14	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-14.0	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-14.8	HDR	60	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-15	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-15.0	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-15.1	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-15.8	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-16	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-16.5	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-17.5	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-17.7	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-18.1	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-18.2	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-18.6	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-18.8	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-19	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-19.0	HDR	65	0.48	0.25	0.16	0.12	HDR

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
RVLU	HDR-19.1	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-19.2	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-19.4	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-19.7	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-20	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-20.0	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-20.1	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-20.4	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-21.1	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-21.5	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-22.0	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-22.3	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-22.5	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-22.9	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-25.0	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-25.3	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-25.6	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-26	HDR	65	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-29.2	HDR	70	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-31.3	HDR	70	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-34	HDR	70	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-41	HDR	70	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-48	HDR	70	0.48	0.25	0.16	0.12	HDR
RVLU	HDR-54.3,CC	HDR	70	0.48	0.25	0.16	0.12	HDR
RVLU	IND	IND	75	0.31	0.16	0.09	0.07	IND
RVLU	IND/FP	INDFP	75	0.31	0.16	0.09	0.07	IND
RVLU	LDR	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR 4.0	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR/NC	LDRNC	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-0.0	LDR	30	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-0.3	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-0.5	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-1	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-1.1	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-1.4	LDR	35	0.48	0.25	0.16	0.12	LDR

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
RVLU	LDR-1.5	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-1.8	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.1	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.2	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.3	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.4	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.5	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.6	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.7	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.75	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.8	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-2.9	LDR	35	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.0	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.1	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.1/FP	LDRFP	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.2	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.3	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.4	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.5	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.6	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.7	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.71	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.75	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.8	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-3.9	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.0	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.1	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.2	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.3	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.4	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.5	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.6	LDR	40	0.48	0.25	0.16	0.12	LDR

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
RVLU	LDR-4.7	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.8	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4.9	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-4/FP	LDRFP	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.0	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.1	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.2	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.3	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.4	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.5	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.6	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.7	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-5.9	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-6	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-6.0	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-6.2	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-6.4	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-6.5	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-6.7	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-6.9	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LDR-7.4	LDR	40	0.48	0.25	0.16	0.12	LDR
RVLU	LI	LI	75	0.31	0.16	0.09	0.07	IND
RVLU	LI/FP	LIFP	75	0.31	0.16	0.09	0.07	IND
RVLU	MDR 9.5	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR/VC-8.2	MDRVC	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR/VC-8.3	MDRVC	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR/VC-9.1	MDRVC	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-10	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-10.0	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-10.1	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-10.2	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-10.5	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-10.7	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-11	MDR	55	0.48	0.25	0.16	0.12	MDR

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
RVLU	MDR-11.5	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-11.6	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-11.8	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-12	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-12.75	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-12.9	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-13.1	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-13.2	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-13.4	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-13.5	MDR	55	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-15.0	MDR	60	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-6.2	MDR	45	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-6.4	MDR	45	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-7	MDR	45	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-7.1	MDR	45	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-7.3	MDR	45	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-7.5	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-7.6	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-7.8	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-7.9	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-8	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-8.0	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-8.25	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-8.64	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-8.9	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-9	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-9.23	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	MDR-9.8	MDR	50	0.48	0.25	0.16	0.12	MDR
RVLU	NC	NC	75	0.48	0.25	0.16	0.12	COMM
RVLU	OS	OS	2	0.31	0.16	0.09	0.07	OS
RVLU	OS/FP	OSFP	2	0.31	0.16	0.09	0.07	OS
RVLU	OS/FW	OS	2	0.31	0.16	0.09	0.07	OS
RVLU	OS/PR/FP	OSPR	2	0.31	0.16	0.09	0.07	OS
RVLU	P/QP	P/QP	50	0.48	0.25	0.16	0.12	PQP
RVLU	P/QP/FP	P/QPFP	50	0.48	0.25	0.16	0.12	PQP

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
RVLU	P/QP/VC	P/QPVC	50	0.48	0.25	0.16	0.12	PQP
RVLU	PR	PR	5	0.48	0.25	0.16	0.12	REC
RVLU	PR/FP	PRFP	5	0.48	0.25	0.16	0.12	REC
RVLU	PR/VC	PRVC	5	0.48	0.25	0.16	0.12	REC
RVLU	RC	RC	75	0.48	0.25	0.16	0.12	COMM
RVLU	ROAD	RW	80	0.48	0.25	0.16	0.12	ROAD
RVLU	TS	TS	75	0.48	0.25	0.16	0.12	COMM
RKLU	BP	BP - Professional Office	80	0.48	0.25	0.16	0.12	BP
RKLU	BP/COMM	BP/COMM - Business Professional/Commercial	80	0.48	0.25	0.16	0.12	COMM
RKLU	BP/COMM/LI	BP/COMM/LI - Business Professional/Commercial/Light Industrial	80	0.48	0.25	0.16	0.12	COMM
RKLU	HDR	HDR - High Density Residential	60	0.48	0.25	0.16	0.12	HDR
RKLU	HI	HI - Heavy Industrial	85	0.31	0.16	0.09	0.07	IND
RKLU	LDR	LDR - Low Density Residential	40	0.48	0.25	0.16	0.12	LDR
RKLU	LI	LI - Light Industrial	80	0.31	0.16	0.09	0.07	IND
RKLU	MDR	MDR - Medium Density Residetial	50	0.48	0.25	0.16	0.12	MDR
RKLU	MHDR	MHDR - Medium-High Density Residential	60	0.48	0.25	0.16	0.12	HDR
RKLU	PQP	PQP - Public-Quasi Public	50	0.48	0.25	0.16	0.12	PQP
RKLU	RC	RC - Retail Commercial	80	0.48	0.25	0.16	0.12	COMM
RKLU	R-C	R-C - Recreation/Conservation	5	0.31	0.16	0.09	0.07	REC
RKLU	ROAD	RW - Streets/Roads	90	0.48	0.25	0.16	0.12	ROAD
RKLU	RR	RR - Rural Residential	15	0.31	0.16	0.09	0.07	RR
RKLU	SC	SC - Service Commercial	80	0.48	0.25	0.16	0.12	COMM
LOLU	RU-ES-2_3	BP-Industrial Business ParkBP	80	0.48	0.25	0.16	0.12	IND
LOLU	GC-OFFICE	CG-General CommercialGC	80	0.48	0.25	0.16	0.12	BP
LOLU	GENCOMM	CG-General CommercialGC	80	0.48	0.25	0.16	0.12	COMM
LOLU	IND-PARK	CG-General CommercialGC	80	0.48	0.25	0.16	0.12	IND
LOLU	PL-DEVELOP	CG-General CommercialGC	80	0.48	0.25	0.16	0.12	COMM
LOLU	P-QP	CG-General CommercialGC	80	0.48	0.25	0.16	0.12	PQP
LOLU	RMD-2_6	CG-General CommercialGC	80	0.48	0.25	0.16	0.12	COMM
LOLU	RU-ES-2_3	CG-General CommercialGC	80	0.48	0.25	0.16	0.12	COMM
LOLU	SHPPCEN	CG-General CommercialGC	80	0.48	0.25	0.16	0.12	COMM
LOLU	IND-PARK	ILT-Limited Industrial	85	0.31	0.16	0.09	0.07	IND
LOLU	IND-PARK	IL-Light IndustrialIL	80	0.31	0.16	0.09	0.07	IND
LOLU	GC-NHC	CO-Office CommercialO/P	80	0.48	0.25	0.16	0.12	BP

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
LOLU	GC-OFFICE	CO-Office CommercialO/P	80	0.48	0.25	0.16	0.12	BP
LOLU	GENCOMM	CO-Office CommercialO/P	80	0.48	0.25	0.16	0.12	COMM
LOLU	RU-ES-2_3	CO-Office CommercialO/P	80	0.48	0.25	0.16	0.12	RE
LOLU	P-QP	PI-Public/Institutional	50	0.48	0.25	0.16	0.12	PQP
LOLU	RLD-1	PI-Public/Institutional	50	0.48	0.25	0.16	0.12	PQP
LOLU	RU-AG-4_6	PI-Public/Institutional	50	0.48	0.25	0.16	0.12	AG
LOLU	RU-ES-2_3	PI-Public/Institutional	50	0.48	0.25	0.16	0.12	RE
LOLU	RU-AG-4_6	RA-Residential AgriculturalRA	5	0.31	0.16	0.09	0.07	AG
LOLU	GENCOMM	RE-Residential EstateRE	80	0.48	0.25	0.16	0.12	COMM
LOLU	RRE-22_43	RE-Residential EstateRE	15	0.48	0.25	0.16	0.12	RE
LOLU	RU-AG-4_6	RE-Residential EstateRE	5	0.31	0.16	0.09	0.07	RR
LOLU	RU-ES-2_3	RE-Residential EstateRE	15	0.48	0.25	0.16	0.12	RE
LOLU	RHD-10_15	RH-High Density ResidentialRH	60	0.48	0.25	0.16	0.12	HDR
LOLU	RLD-ONE-HALF	RS-10-Single Family ResidentialRL	30	0.48	0.25	0.16	0.12	RE
LOLU	RLD-1	RS-20-Single Family ResidentialRL	35	0.48	0.25	0.16	0.12	LDR
LOLU	RMD-2_6	RS-10-Single Family ResidentialRM	55	0.48	0.25	0.16	0.12	MDR
LOLU	RMD-4	RS-10-Single Family ResidentialRM	40	0.48	0.25	0.16	0.12	MDR
LOLU	RMD-2_6	RS-5-Single Family ResidentialRM	55	0.48	0.25	0.16	0.12	MDR
LOLU	RMD-2_6	RS-7-Single Family ResidentialRM	55	0.48	0.25	0.16	0.12	MDR
LOLU	GC-MH-6_10	CC-Central CommercialRMH	80	0.48	0.25	0.16	0.12	COMM
LOLU	GC-MH-6_10	RM-3.5-Medium Density ResidentialRMH	50	0.48	0.25	0.16	0.12	MDR
LOLU	GC-MH-6_10	RM-5-Medium Density ResidentialRMH	55	0.48	0.25	0.16	0.12	MDR
LOLU	RMD-2_6	RM-5-Medium Density ResidentialRMH	50	0.48	0.25	0.16	0.12	MDR
LOLU	GC-DCORE	RS-5-Single Family ResidentialRMH	50	0.48	0.25	0.16	0.12	LDR
LOLU	GC-MH-6_10	RS-5-Single Family ResidentialRMH	55	0.48	0.25	0.16	0.12	MDR
LOLU	P-QP	RS-5-Single Family ResidentialRMH	50	0.48	0.25	0.16	0.12	PQP
LOLU	RMD-2_6	RM-3.5-Medium Density ResidentialRR	55	0.48	0.25	0.16	0.12	MDR
LOLU	RLD-1	RR-Rural ResidentialRR	15	0.31	0.16	0.09	0.07	LDR
LOLU	RU-ES-2_3	RR-Rural ResidentialRR	15	0.31	0.16	0.09	0.07	RE
LOLU	RMD-2_6	RS-10-Single Family ResidentialRR	55	0.48	0.25	0.16	0.12	MDR
LOLU	R-MD-6	RS-10-Single Family ResidentialRR	50	0.48	0.25	0.16	0.12	MDR
LOLU	RU-ES-2_3	RS-10-Single Family ResidentialRR	40	0.48	0.25	0.16	0.12	RE
LOLU	GC-MH-6_10	RS-5-Single Family ResidentialRR	55	0.48	0.25	0.16	0.12	MDR
LOLU	R-MD-6	RS-5-Single Family ResidentialRR	50	0.48	0.25	0.16	0.12	MDR
LOLU	RMD-2_6	RS-7-Single Family ResidentialRR	55	0.48	0.25	0.16	0.12	MDR

SOURCE LAYER	LOCAL CODE	DESCRIPTION	Imperviousness %	INFILTRATION FACTOR FOR HYD. SOIL TYPE (in/hr)				Minimized Codes
				A	B	C	D	
LOLU	GC-DCORE	CC-Central CommercialTC	80	0.48	0.25	0.16	0.12	COMM
LOLU	GC-MH-6_10	CC-Central CommercialTC	80	0.48	0.25	0.16	0.12	MDR
LOLU	P-QP	CC-Central CommercialTC	80	0.48	0.25	0.16	0.12	PQP
LOLU	GC-MH-6_10	RS-5-Single Family ResidentialTC	50	0.48	0.25	0.16	0.12	COMM
LOLU	RRE-22_43	CT-Tourist/Destination CommercialTD	2	0.31	0.16	0.09	0.07	COMM
LOLU	RU-AG-4_6	CT-Tourist/Destination CommercialTD	2	0.31	0.16	0.09	0.07	AG
LOLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
RKLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
0	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
RVLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
SAGPLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
SCGPLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
RKLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
PCGPLU	OS	Open Space	2	0.31	0.16	0.09	0.07	OS
0	OS	Open Space	2	0.31	0.16	0.09	0.07	OS

Appendix G - Peak Flow Comparison Tables

G.1 Flow Comparison Model Descriptions

The following legend applies to all of the Master Flow Summary tables.

DRY CREEK MASTER WATERSHED PLAN UPDATE		From 2009 HEC-1 Analysis Results
		From 2009 HEC-RAS Analysis Results (Best Calibration)
2009		From 1992 Montgomery Study
		From 2009 - Measured Event Calibration (HEC-RAS results only) See Header for Event Occurrence
CIVIL ENGINEERING SOLUTIONS, RBF	#N/A	Data was not previously provided or Data point unknown in new study
	#REF	Spreadsheet is unable to resolve the data point value

Column Details

The following phrases describe different models and are found in the column headers.

1989 Mont
From the 1992 Montgomery Study. This model used 1989 conditions.

1992 Corrected
The 1992 Corrected Original Baseline scenario uses Plan Update model methodology to provide a consistent basis for evaluating what has occurred since the preparation of the 1992 Plan. It uses 1992 hydrology and 1992 hydraulic conditions. This is Scenario 1 in the Model Scenario Matrix (Table 6).

2007-Current
The 2007 Current (Plan Update Baseline) scenario uses 2007 hydrology and 2007 hydraulics to provide a baseline for evaluating projects implemented after initiation of this Plan Update. This is Scenario 5 in the Model Scenario Matrix (Table 6).

Future Montgomery
1989 conditions model incorporating future expected land use. From the 1992 Montgomery Study.

Future Unmitigated
Update Future Fully Developed Unmitigated (UFFDU) model. The Future Unmitigated (Update from new baseline) scenario uses build-out hydrology without LID features, and 2007 hydraulic conditions to provide a basis for evaluating potential impacts if build-out were to occur without any new mitigation measures. This is Scenario 7 in the Model Scenario Matrix (Table 6).

GP-LID/PROJ
The Build-out with LID and Projects scenario uses build-out hydrology with LID and hydraulic conditions that reflect current conditions plus the five potential projects identified in this Plan Update. This is Scenario 9 in the Model Scenario Matrix (Table 6).

Table G.1 500-YEAR EVENT

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	500-year 1989 JMM	500-year 1992 Corrected	500-year 2007-Current	500-year Future JMM	500-year Future Unmitigated	500-year Build-out w/LID & Projects
DRY CREEK													
1	VC135B	SE40N_0	8900	Dry Creek	Below Cirby	NONE	Rio Linda Blvd(North and South)	21352	20103	20312	23398	20857	20549
2	Y130B2	SE40N_0	15000	Dry Creek	Below Cirby	NONE	Elkhorn Blvd. (North and South)	21349	20163	20369	23395	20915	20607
3	YC125B	SE40N_0	16600	Dry Creek	Below Cirby	NONE	Curved Bridge Road (North)	21334	20329	20535	23380	21089	20779
4	YC125A	SE40N_0	17400	Dry Creek	Below Cirby	NONE	Dry Creek Road (North and South)	21332	20289	20506	23377	21058	20748
5	YDC115	SE40N_0	24400	Dry Creek	Below Cirby	NONE	Q Street (North and South)	21397	20405	20617	23444	21172	20859
6	YDC90	SE40N_0	34900	Dry Creek	Below Cirby	NONE	Sierra Creek Confluence	21333	20353	20565	23378	21140	20836
7	YDC85	SE40N_0	35200	Dry Creek	Below Cirby	NONE	28th Street (South)	21157	20429	20635	23151	21212	20906
8	YDC85	SE40N_0	35400	Dry Creek	Below Cirby	NONE	Elverta Road	21127	20429	20635	23113	21212	20906
9	YDC71B	SE40N_0	36900	Dry Creek	Below Cirby	38733	Confluence with County Line Trib	21145	18692	19239	23131	19740	18281
11	YDC75C	SE40N_0	41400	Dry Creek	Below Cirby	41634	Watt Avenue	21068	18670	19220	23035	19732	18267
13	YC65I2	SE40N_0	47700	Dry Creek	Below Cirby	47754	Confluence with DC65 Trib	21100	18597	19158	23076	19686	18227
14	YDC60A	SE40N_0	50300	Dry Creek	Below Cirby	50025	Walerga Road	21021	18616	19194	22980	19725	18256
1015	YDC50A	SE40N_0	0	Dry Creek	Below Cirby	55005	Morgan Creek Ped Crossing	#N/A	18625	19216	#N/A	19780	18297
16	YDC35C	SE40N_0	58800	Dry Creek	Below Cirby	58560	Cook Riolo Road	20982	18693	19348	22914	19913	18436
17	YDC25A	CC5G_90	67000	Dry Creek	Below Cirby	67583.80	S.P. Railroad Bridge	20738	18712	19672	22577	20265	18655
18	YDC10D	SE40N_0	67400	Dry Creek	Below Cirby	67641.80	Atkinson Blvd.	20738	18712	19672	22577	20265	18654
20	YDC20A	SE40N_0	68900	Dry Creek	Below Cirby	69138.40	S.P. Railroad Culverts (now bridge)	20732	18697	19655	22562	20251	18649
21	YDC10D	SE40N_0	69900	Dry Creek	Below Cirby	70071.60	Vernon Street	20656	18772	19660	22449	20255	18648
22	YDC10B	SE40N_0	72600	Dry Creek	Below Cirby	72702.60	Riverside Avenue	21221	11487	10286	23099	10465	10027
23	YDCCC	SE40N_0	73000	Dry Creek	Below Cirby	72982	Cirby Creek Confluence	21221	11522	10318	23099	10512	10078
24	YDC5A	SE40M_30	73800	Dry Creek	Above Cirby	73943.30	Darling Way	15823	16301	16108	17127	16607	15165
25	YDC5C	SE40M_30	77000	Dry Creek	Above Cirby	77218.89	Douglas Blvd.	15821	16444	16204	17120	16659	15197
26	UDC5B	SE40M_30	77500	Dry Creek	Above Cirby	77606.49	Royer Park Footbridge	15691	16506	16255	16864	16716	15271
27	YDC5B	SE40M_30	79100	Dry Creek	Above Cirby	79166.05	Lincoln Street	15690	16601	16322	16860	16814	15266
28	YDC4C	SE40M_30	79400	Dry Creek	Above Cirby	79816.70	Folsom Road	15675	16597	16328	16876	16815	15287
30	YACMR	SE40M_30	84100	Dry Creek	Above Cirby	84214.40	Antelope Creek/ Miners Ravine Confluence	15918	16822	16680	17148	17004	15501
DRY CREEK - ELVERTA TRIB													
31	UDC90	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	454	471	471	605	533	530
DRY CREEK - SIERRA CREEK													
32	YC100B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	2066	2135	2204	2552	2645	2622
33	YC100A	CC5G_90	1400	0	0	NONE	28th Street	2018	2290	2363	2497	2737	2718
34	YC100A	CC5G_90	3700	0	0	NONE	Scotland Drive	1907	2290	2363	2370	2737	2718
35	VC96B2	CC5G_90	5400	0	0	NONE	Delaney Drive	1855	2100	2174	2340	2511	2491
36	YDC96A	CC5G_90	6800	0	0	NONE	Watt Avenue	1802	1801	1863	2287	2212	2181
37	VDC96C	CC5G_90	10300	0	0	NONE	Navaho Way	1079	1233	1294	1346	1592	1559
38	YDC96C	CC5G_90	11400	0	0	NONE	Elverta Road	924	1252	1323	1145	1602	1571
39	DC95A	CC5G_90	13500	0	0	NONE	Walerga Road	769	165	165	943	275	268

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	500-year 1989 JMM	500-year 1992 Corrected	500-year 2007-Current	500-year Future JMM	500-year Future Unmitigated	500-year Build-out w/LID & Projects
DRY CREEK/County Line Trib. (Note: Riolo Vineyards project determined this tributary does not drain as previously modeled - corrected in 2009 study)													
40	YDC75B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	898	1288	1321	1249	1585	1585
41	N/A	#N/A	3200	0	0	NONE	Watt Avenue	829	#N/A	#N/A	1196	#N/A	#N/A
42	VDC68B	CC5G_90	8200	0	0	NONE	PFE Road	645	1269	1299	993	1458	1447
Dry Creek DC-65 Tributary													
43	YDC65I	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	659	836	970	707	1047	1047
44	YDC65K	CC5G_90	3000	0	0	NONE	Walerga Road	527	770	914	566	967	967
Cirby Creek													
45	YCC45G	LC40L_30	0	Cirby Creek	below Linda	0	Dry Creek Confluence	4392	3900	4788	4887	5015	4814
46	YCC45A	LC40L_30	3000	Cirby Creek	below Linda	2969.699	Interstate 80	4371	4330	4887	4866	5131	4938
48	UCC45E	LC40L_30	4600	Cirby Creek	below Linda	4580.699	Wanda Lee Court Footbridge	4384	4528	4873	4886	5137	4923
49	YCC45E	LC40L_30	6100	Cirby Creek	Above Linda	6009.699	Linda Creek Confluence	6542	4705	4917	7178	5158	4974
50	YCC40A	CC5G_90	7400	Cirby Creek	Above Linda	7262.099	Sunrise Blvd.	1159	1166	1311	1444	1355	1279
51	YCC40C	CC5G_90	8100	Cirby Creek	Above Linda	8038.899	Coloma Way - Gage 1635	1176	968	1240	1440	1147	1149
52	YC40G2	CC5G_90	9100	Cirby Creek	Above Linda	9004.399	Oak Ridge Drive	1173	895	1188	1432	1124	1125
53	UCC35D	CC5G_90	10000	Cirby Creek	Above Linda	9873.999	Sierra Gardens Footbridge	1165	985	1315	1425	1239	1239
54	YCC15B	CC5G_90	11800	Cirby Creek	Above Linda	11679.19	Loretto Drive	1133	1081	1499	1431	1376	1371
55	YCC252	CC5G_90	12000	Cirby Creek	Above Linda	12228.79	Sierra Gardens Trib. Confluence	1175	802	1206	1440	1115	1117
56	YCC15C	CC5G_90	12500	Cirby Creek	Above Linda	12377.29	Sierra Gardens Drive	929	799	1202	1247	1117	1105
57	YCC10E	CC5G_90	13900	Cirby Creek	Above Linda	13765.49	Huntington Drive	895	465	471	1271	475	488
58	UCC10H	CC5G_90	14500	Cirby Creek	Above Linda	14420.19	Rocky Ridge Drive	559	476	697	742	711	716
60	YCC5B	CC5G_90	16400	Cirby Creek	Above Linda	15748.19	Winchester Way	482	358	539	670	546	549
61	YCC5D	CC5G_90	17200	Cirby Creek	Above Linda	16312.19	Eureka Road	485	250	423	745	430	432
62	YCC1A	CC5G_90	19700	Cirby Creek	Above Linda	17753.79	Douglas Blvd.	280	185	360	568	368	367
Cirby Creek/Sierra Gardens Trib.													
63	VCC25	CC5G_90	0	0	0	NONE	Cirby Creek Confluence	208	340	353	240	354	354
65	YCC20G	CC5G_90	1000	0	0	NONE	Douglas Blvd.	150	226	244	150	246	246
66	YCC20K	CC5G_90	1400	0	0	NONE	Sierra Gardens Ret. Basin	143	299	429	143	458	450
Linda Creek													
67	ULC95C	LC40L_30	0	Linda Creek	Below Strap	0.	Cirby Creek Confluence	5990	2894	2939	6592	2968	2944
68	ULC95D	LC40L_30	1000	Linda Creek	Below Strap	565.1000	Sunrise Avenue	5987	2943	2975	6587	3012	2987
70	YLC90A	LC40L_30	2600	Linda Creek	Below Strap	2125.000	Oak Ridge Drive	6185	5009	5009	6760	5287	5084
72	ULC90B	LC40L_30	4300	Linda Creek	Below Strap	3843.300	Sierra Gardens Footbridge	6160	5007	5209	6731	5503	5293
73	YLC85C	LC40L_30	8400	Linda Creek	Below Strap	8257.900	Rocky Ridge Dirve	6030	5425	5640	6574	5989	5800
74	ULC85B	LC40L_30	10000	Linda Creek	Below Strap	9810.000	Strap Ravine Confluence	6024	5402	5626	6531	5979	5791
76	ULC80I	LC40L_30	11500	Linda Creek	Below S Branch	136	Champion Oaks Drive/Samoa Way (Gage 1626/1628)	4619	2623	2690	4985	2830	2675
78	ULC80A	LC40L_30	14300	Linda Creek	Below S Branch	157	Auburn Road	4562	3952	4163	4931	4413	4175
79	UC45J3	LC40L_30	15700	Linda Creek	Below S Branch	176	Old Auburn Road/City Limits	4652	3193	3420	5039	3667	3397
1079	ULC45J	LC40L_30	0	Linda Creek	Below S Branch	181	Ped Bridge over Creek in Park	#N/A	3064	3295	#N/A	3546	3271

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	500-year 1989 JMM	500-year 1992 Corrected	500-year 2007-Current	500-year Future JMM	500-year Future Unmitigated	500-year Build-out w/LID & Projects
Treelake Tributary Confluence													
80	ULC45J	LC40L_30	15900	Linda Creek	Below S Branch	181	Treelake Tributary Confluence	4652	3064	3295	5039	3546	3271
82	UC45J2	LC40L_30	19800	Linda Creek	Below S Branch	188	Indian Creek Drive	3474	3043	3295	3832	3570	3281
1082	ULC45D	LC40L_30	0	Linda Creek	Below S Branch	207	Private Bridge Near Hazel	#N/A	2782	3520	#N/A	3507	3266
83	ULC45D	LC40L_30	25300	Linda Creek	Below S Branch	211	Hazel Avenue	3213	2789	3213	3519	3506	3261
84	UC35Q3	LC40L_30	25500	Linda Creek	Below S Branch	212	Orangevale Tributary Confluence	3213	2789	3213	3519	3505	3262
1084	ULC40A	LC40L_30	0	Linda Creek	Above S Branch	3.075	BDG 17 2-24" CMPS	#N/A	1991	2016	#N/A	2232	1992
85	UC15N2	LC40L_30	31300	Linda Creek	Above S Branch	4.239	Granite Road Bridge	1738	1776	1657	1886	1909	1625
86	ULC15N	LC40L_30	32600	Linda Creek	Above S Branch	4.407	Cherry Avenue	1703	1762	1642	1841	1896	1606
1086	ULC15J	LC5A_0	0	Linda Creek	Above S Branch	5.22	Private Driveway Concrete Box Type	#N/A	1304	1198	#N/A	1351	859
1087	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.264	Driveway Bridge	#N/A	1306	1203	#N/A	1353	863
1088	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.526	Granite Glen Court (Private)	#N/A	1324	1217	#N/A	1360	853
88	YLC15J	LC5A_0	38600	Linda Creek	Above S Branch	5.715	Wedgewood Drive	1186	1331	1217	1357	1376	963
1089	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.039	Golf Cart Bridge #5	#N/A	1279	1132	#N/A	1329	875
1090	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.12	Golf Cart Bridge #4	#N/A	1271	1159	#N/A	1330	874
1091	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.197	Golf Cart Bridge #3	#N/A	1305	1128	#N/A	1343	876
1092	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.241	Golf Cart Bridge #2	#N/A	1337	1128	#N/A	1341	876
1093	ULC5F2	LC5A_0	0	Linda Creek	Above S Branch	6.515	Golf Cart Bridge #1	#N/A	1063	1078	#N/A	1128	845
89	ULC5F2	LC5A_0	42300	Linda Creek	Above S Branch	6.53	East Roaseville Parkway	1066	1063	1078	1293	1128	845
90	ULC5F	LC5A_0	43100	Linda Creek	Above S Branch	6.759	Barton Road	1006	1024	1037	1227	1089	876
91	YLC5E	LC5A_0	44600	Linda Creek	Above S Branch	7.140	Shadow Brook Place	848	881	888	1036	943	618
92	ULC5B	LC5A_0	46500	Linda Creek	Above S Branch	7.479	Troy Purdy Lane	620	739	758	834	814	516
1094	ULC5C	LC5A_0	0	Linda Creek	Above S Branch	7.609	Muir Way	#N/A	600	629	#N/A	687	449
93	YLC5C	LC5A_0	48100	Linda Creek	Above S Branch	7.77	Country Court (Private)	510	633	629	722	682	452
1095	ULC1A	LC5A_0	0	Linda Creek	Above S Branch	7.839	Country Court	#N/A	1273	1503	#N/A	1624	1643
94	YLC1A	LC5A_0	48700	Linda Creek	Above S Branch	8.011	Auburn Folsom Road	455	649	650	666	696	451
Linda Creek/Strap Ravine													
95	USR25C	CC5G_90	0	Strap Ravine	Reach 1	0.	Linda Creek Confluence	1339	1267	1477	1494	1619	1635
1095	YSR25A	CC5G_90	300	Strap Ravine	Reach 1	276	Foot Bridge in Park	#N/A	1273	1503	#N/A	1624	1643
96	UR20A4	CC5G_90	1500	Strap Ravine	Reach 1	1136.900	McClaren Drive (Gage 1611)	1335	1319	1543	1490	1633	1653
97	UXR20A	CC5G_90	5900	Strap Ravine	Reach 1	5539.100	Johnson Ranch Drive	1303	1308	1642	1469	1703	1674
98	USR152	CC5G_90	6800	Strap Ravine	Reach 1	6380.600	Eureka Road	1299	1308	1643	1468	1705	1674
99	USR82	CC5G_90	8600	Strap Ravine	Reach 1	8201.500	East Roseville Parkway	1278	1140	1363	1627	1469	1514
100	USR5C2	LC5A_0	11800	Strap Ravine	Reach 1	11366.10	Sierra College Blvd.	1165	820	1051	1478	1212	1217
101	USR1A	LC5A_0	23000	0	0	NONE	Barton Road	851	828	1472	1312	1340	1340
Linda Creek/Treelake Tributary													
102	ULC60B	LC40L_30	0	0	0	NONE	Linda Creek Confluence	1177	867	999	1308	1106	1079
103	YLC60B	LC40L_30	3200	0	0	NONE	Petite Way (approximated)	1092	894	1036	1206	1150	1119
104	YLC60A	LC40L_30	5700	0	0	NONE	Old Auburn Road	1075	801	968	1314	1076	1051
105	YC55H3	LC40L_30	6000	0	0	NONE	Sierra College Blvd.	1064	867	1055	1315	1188	1155
106	YLC55F	LC40L_30	9600	0	0	NONE	Swan Lake Drive	766	742	995	919	1146	1112
107	UC55L2	LC40L_30	9600	0	0	NONE	Swan Lake	766	695	963	919	1110	1083
108	UPC55L	LC40L_30	10800	0	0	NONE	Waterbury Way	652	713	982	766	1140	1108

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	500-year 1989 JMM	500-year 1992 Corrected	500-year 2007-Current	500-year Future JMM	500-year Future Unmitigated	500-year Build-out w/LID & Projects
109	YLC55L	LC40L_30	10800	0	0	NONE	Waterbury Lake	652	757	1063	766	1238	1204
110	ULC50E	LC40L_30	11400	0	0	NONE	East Roaseville Parkway	566	611	820	654	961	915
111	YLC50E	LC40L_30	11400	0	0	NONE	East Roseville Parkway Pond	566	647	869	654	1021	952
112	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane	566	565	702	654	825	772
113	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane Pond	566	565	702	654	825	772
Linda Creek/Hazel Avenue Tributary (Sac County)													
114	YC35Q2	LC40L_30	0	0	0	NONE	Linda Creek Confluence	920	881	1113	1146	1178	1171
115	UC35Q2	LC40L_30	400	0	0	NONE	Oak Avenue	920	881	1113	1146	1178	1171
Linda Creek/Orangevale Tributary (Sac County)													
116	YC35Q2	LC40L_30	0	Linda Creek	South Branch	.001	Linda Creek Confluence	1696	911	1249	1815	1330	1311
1116	YLC35Q	LC40L_30	0	Linda Creek	South Branch	0.125	Private Bridge (Metal and Concrete)	#N/A	976	1296	#N/A	1414	1417
117	ULC35Q	LC40L_30	900	Linda Creek	South Branch	0.196	Oak Avenue	865	972	1296	924	1411	1409
1117	ULC30E	LC40L_30	0	Linda Creek	South Branch	1.022	Private Bridge in Park Area	#N/A	459	671	#N/A	720	731
118	ULC30E	LC40L_30	3300	Linda Creek	South Branch	1.035	Filbert Avenue	813	459	671	868	721	731
1118	ULC30B	LC40L_30	0	Linda Creek	South Branch	1.244	Private Bridge Near Chestnut	#N/A	427	624	#N/A	685	677
119	UC30C2	LC40L_30	4300	Linda Creek	South Branch	1.346	Chestnut Avenue	896	409	595	973	684	685
120	ULC30A	LC40L_30	5500	Linda Creek	South Branch	1.649	Walnut Avenue (North)	383	315	431	386	476	489
120	UC20E3	LC40L_30	5500	Linda Creek	South Branch	1.772	Walnut Avenue (South)	383	315	431	386	476	489
121	VLC25C	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (North)	287	61	88	290	96	96
1121	VLC20E	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (South)	#N/A	259	355	#N/A	385	383
Antelope Creek													
122	UDC4D	AC5I_60	0	Antelope Ck	AntelopeBlwClove	0.	Miners Ravine/Dry Creek	4490	5118	5335	5027	5444	4136
123	UC45B2	AC5I_60	1400	Antelope Ck	AntelopeBlwClove	1394.899	Harding Blvd.	4487	5149	5776	5025	5488	4091
124	UAC45B	AC5I_60	2300	Antelope Ck	AntelopeBlwClove	2349.499	Atlantic Street	4485	5149	5273	5024	5490	4091
1124	UAC45B	AC5I_60	0	Antelope Ck	AntelopeBlwClove	2455.599	Bridge #3	#N/A	5133	5263	#N/A	5483	4087
125	UAC45L	AC5I_60	5000	Antelope Ck	AntelopeBlwClove	5017.599	County Dump Road	4472	5221	5311	5015	5611	5305
126	UC41E4	AC5I_60	9600	Antelope Ck	AntelopeBlwClove	10909.49	Highway 65 - non ras (Gage 1583)	4484	5227	5494	5037	5648	5597
127	UC41E3	AC5I_60	10300	Antelope Ck	AntelopeBlwClove	11383.53	Springview Drive	4363	5198	5286	4911	5625	5574
128	YC41E2	AC5I_60	10800	Antelope Ck	AntelopeBlwClove	11418.53	Rocklin City Tributary Confluence	4342	5189	5304	4883	5615	5563
130	UC40K2	AC5I_60	15800	Antelope Ck	AntelopeBlwClove	16930.03	Sunset Blvd.	4508	5042	5175	5070	5498	5459
133	UV10B2	AC5I_60	22800	Antelope Ck	AntelopeBlwClove	24722.3	Clover Valley Creek Confluence	4653	5360	5431	5234	5795	5751
134	UC35G3	AC5I_60	23600	Antelope Ck	Reach 1	25350.71	Midas Avenue	3360	4265	4265	3847	4280	4280
135	UAC35C	AC5I_60	25700	Antelope Ck	Reach 1	27696.03	Southern Pacific Railroad (UPRR) - non ras	3317	4227	4247	3799	4314	4300
136	VAC35I	AC5I_60	26500	Antelope Ck	Reach 1	28434.67	Yankee Hill Road	3303	4459	4238	3783	4412	4488
137	YAC30C	AC5I_60	27600	Antelope Ck	Reach 1	34226	Atkinson Dairy Dam	3260	4103	4112	3735	4215	4208
138	YAC30B	AC5I_60	28900	Antelope Ck	Reach 1	34691	Unnamed Road - no ras - no find aerial	3218	4019	4023	3688	4145	4144
139	YAC30B	AC5I_60	31800	Antelope Ck	Reach 1	35656	Delmar Avenue - no ras	3173	4028	4028	3652	4155	4150
140	YAC30B	AC5I_60	34300	Antelope Ck	Reach 1	36964	Sierra College Blvd. (Gage 1573)	3073	4030	4029	3544	4157	4153
141	U30AC4	AC5I_60	37000	Antelope Ck	Reach 1	39726	King Road	2989	4189	4224	3446	4367	4372
Antelope Creek / Clark Tunnel Road Tributary													
142	U30AC2	AC5I_60	0	Antelope Ck	Reach 1	40906	Antelope Creek Confluence	2975	4115	4151	3431	4297	4284

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143	UC25BC	AC5I_60	100	0	0	NONE	Barker Road	1780	1340	1340	2202	1382	1379
144	VAC20C	AC5I_60	1300	0	0	NONE	Humphrey Road	1649	886	886	2114	928	933
145	YC16EB	AC5I_60	1700	0	0	NONE	Humphrey Tributary Confluence	1619	727	727	2073	772	775
148	UC15CB	AC5I_60	7000	0	0	NONE	Colwell Road	1141	440	440	1578	464	464
149	YC15BC	AC5I_60	10000	0	0	NONE	English Colony Way	1024	368	368	1492	373	373
150	AC15AD	AC5I_60	12800	0	0	NONE	Clark Tunnel Road	395	273	273	658	275	275
Antelope Creek/Rocklin City Tributary													
151	VAC41E	CC5G_90	0	0	0	NONE	Antelope Creek Confluence	246	1144	1144	312	1258	1257
152	VAC41F	SE40M_30	2700	0	0	NONE	Taylor Road	185	449	449	234	555	539
153	VAC41F	SE40M_30	2800	0	0	NONE	Taylor Road	154	449	449	195	555	539
154	UAC41A	SE40M_30	4500	0	0	NONE	Sunset Blvd.	92	249	249	117	349	340
Antelope Creek/Clover Valley Creek													
155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	.1	Antelope Creek Confluence	1266	1339	1403	1379	1525	1491
1155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	155	Golf Course Ped Bridge	#N/A	1335	1399	#N/A	1533	1495
156	UCV10B	AC5I_60	400	Clover Valley	Clover Valley1	445	Argonaut Avenue	1261	1334	1397	1373	1656	1500
157	YCV10B	AC5I_60	2200	Clover Valley	Clover Valley1	2785	Footbridge and Weir	1237	1456	1403	1342	1654	1500
158	UXV10A	AC5I_60	4300	Clover Valley	Clover Valley1	4090	Midas Avenue	1227	1322	1377	1330	1619	1468
159	YCV10A	AC5I_60	4700	Clover Valley	Clover Valley1	4430	Abandoned Stone Bridge	1224	1322	1377	1325	1619	1469
160	YCV10A	AC5I_60	5600	Clover Valley	Clover Valley1	5400	Unnamed Bridge	1207	1255	1313	1303	1554	1409
1160	UV6CB2	AC5I_60	0	Clover Valley	Clover Valley1	6365	Gazebo Crossing	#N/A	1255	1314	#N/A	1553	1412
161	UCV6CB	AC5I_60	6500	Clover Valley	Clover Valley1	6505	Clover Valley Detention Pond	1199	1255	1314	1292	1553	1411
162	YV6CB2	AC5I_60	7700	Clover Valley	Clover Valley1	7815	Creekwood Drive	1182	1257	1315	1270	1557	1413
163	UCV6BC	AC5I_60	12000	Clover Valley	Clover Valley1	12015	Rawhide Road	1073	1156	1148	1172	1364	1330
164	UCV6BC	AC5I_60	12500	Clover Valley	Clover Valley1	12550	Rowhide Road Det. Pond	1058	1157	1148	1158	1370	1337
165	UCV5C	AC5I_60	25600	Clover Valley	Clover Valley1	NONE	Unnamed Road	696	955	955	827	1305	1215
166	UCV1T	AC5I_60	28000	Clover Valley	Clover Valley1	NONE	Sierra College Blvd.	578	601	601	694	682	686
167	VCV1T	AC5I_60	28500	Clover Valley	Clover Valley1	NONE	English Colony Way	578	580	580	694	1102	1035
Antelope Creek Continued (West Branch)													
169	UC25BC	AC5I_60	38700	0	0	NONE	Clark Tunnel Road Tributary Confluence	1195	1340	1340	1229	1382	1379
170	U25AD2	AC5I_60	40600	0	0	NONE	Barker Road	1059	1246	1246	1118	1288	1278
171	Y25AD2	AC5I_60	42500	0	0	NONE	Citrus Colony Road	1001	1283	1283	1084	1326	1320
172	YAC16A	AC5I_60	47900	0	0	NONE	English Colony Road	492	539	539	625	568	568
Antelope Creek/Humphrey Tributary													
173	UPAC5K	AC5I_60	0	0	0	NONE	Clark Tunnel Road Tributary Confluence	487	451	451	604	454	454
174	VAC5J2	AC5I_60	1700	0	0	NONE	Sandy Road	341	478	478	423	484	484
175	VAC5O	AC5I_60	3300	0	0	NONE	Mardell Lane	292	77	77	362	77	77
176	UPAC5G	AC5I_60	3700	0	0	NONE	Colwell Road	243	334	334	302	339	339
177	YAC5E	AC5I_60	6300	0	0	NONE	English Colony Way	146	289	289	181	294	294
Miners Ravine													
178	UMR40E	SE40M_30	0	Miners Ravine	Below Secret	10.	Antelope Creek/Dry Creek	11991	11709	12576	12943	11847	11451

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179	UMR40E	SE40M_30	200	Miners Ravine	Below Secret	94.	Harding Blvd.	11989	11709	12576	12937	11847	11451
180	YMR40E	SE40M_30	1500	Miners Ravine	Below Secret	659.8999	Interstate 80 - no ras	11980	11701	12568	12914	11836	11453
181	YMR40B	SE40M_30	2800	Miners Ravine	Below Secret	1422.400	Eureka Way	11979	11701	12572	12900	11823	11459
182	YSEMR	SE40M_30	3800	Miners Ravine	Below Secret	3734.100	Secret Ravine Confluence	11950	11707	12592	12864	11844	11470
183	YMR37D	MR15J_30	5300	Miners Ravine	BET SECRET-FALSE	5674.100	Sunrise Avenue - no ras	9468	4109	3850	10338	4033	3938
184	UR37D4	MR15J_30	7000	Miners Ravine	BET SECRET-FALSE	7319.900	Boardman Tributary	2453	4107	3851	2808	4031	3937
185	UR36N2	MR15J_30	9000	Miners Ravine	Above False	9828.100	East Roseville Parkway	5991	3995	3771	6887	3953	3860
186	UMR31Q	MR15J_30	18200	Miners Ravine	Above False	18310.19	Sierra College Blvd.	5894	4058	3999	6883	3916	3694
187	YR31Q2	MR15J_30	18300	Miners Ravine	Above False	18610	Cavitt Stallman Tributary - no ras	5894	4046	4037	6883	4272	4066
188	UMR31G	MR15J_30	18600	Miners Ravine	Above False	18685	Cavitt (&) Stallman Road	5093	3703	3662	5980	3855	3738
190	UR31P2	MR15J_30	23400	Miners Ravine	Above False	23390	Shadow Oaks Lane	4940	3640	3637	5787	3796	3794
1190	YMR31D	MR15J_30	0	Miners Ravine	Above False	27990.	Hardy Lane	#N/A	3602	3602	#N/A	3759	3765
191	UMR31D	MR15J_30	28900	Miners Ravine	Above False	28826	Barton Road	4762	3681	3597	5565	3753	3761
192	UMR30R	MR15J_30	31300	Miners Ravine	Above False	31379	TallPine Lane	4661	3587	3586	5448	3735	3747
193	UMR30Q	MR15J_30	33000	Miners Ravine	Above False	32984	Carolinda Drive	4560	3585	3972	5332	3732	3746
194	UMR30P	MR15J_30	34800	Miners Ravine	Above False	34813	Itchy Acres Road	4474	3576	3541	5238	3686	3736
196	UR30H2	MR15J_30	35500	Miners Ravine	Above False	35489	Miners Ravine Road	4426	3578	3543	5184	3687	3738
197	UR30H3	MR15J_30	36800	Miners Ravine	Above False	36790	Leibinger Lane	4378	3551	3533	5129	3674	3727
199	UR29B2	MR15J_30	39700	Miners Ravine	Above False	39765	Auburn Folsom Road	4266	3569	3539	4976	3669	3751
200	UXR29H	MR15J_30	41700	Miners Ravine	Above False	40276	Oak Lane	4148	3539	3551	4846	3685	515
201	UR29I2	MR15J_30	43000	Miners Ravine	Above False	44240	Old Bridge	4067	3616	3637	4782	3713	3715
202	YMR29I	MR15J_30	43200	Miners Ravine	Above False	44240	Cottonwood Lake	4042	3616	3637	4758	3713	3715
203	UMR21C	MR15J_30	44400	Miners Ravine	Above False	44368	Auburn Folsom Road	4087	3528	3637	4772	3713	3665
1203	YMR21C	MR15J_30	0	Miners Ravine	Above False	44523	Driveway opposite Twin Rocks Road	#N/A	3465	3562	#N/A	3633	3596
204	YMR21D	MR15J_30	45600	Miners Ravine	Above False	45593	Confluence with Lake Tributary (MR15)	3891	3510	3565	4551	3631	3625
1204	UXR20R	MR15J_30	0	Miners Ravine	Above False	52637	Bridge 15	#N/A	2844	2872	#N/A	2909	2918
1205	UXR20Q	MR15J_30	0	Miners Ravine	Above False	53992	Bridge 16	#N/A	2797	2819	#N/A	2858	2867
205	UR20P2	MR15J_30	56000	Miners Ravine	Above False	55052	Moss Lane	3713	2867	2870	4364	2890	2905
1206	YR20K2	MR15J_30	0	Miners Ravine	Above False	57194	Bridge 18 So of Willow Valley Place	#N/A	2771	2742	#N/A	2787	2795
1207	YR20K2	MR15J_30	0	Miners Ravine	Above False	57599	Willow Valley Place	#N/A	2775	2745	#N/A	2789	2797
1208	UR20C2	MR15J_30	0	Miners Ravine	Above False	57984	Bridge 20 North of Willow Valley Place	#N/A	2728	2690	#N/A	2762	2766
207	UR15K2	MR15J_30	59900	Miners Ravine	Above False	59894	Dick Cook Road	2419	2566	2520	2950	2592	2585
208	UXR15V	MR15J_30	61500	Miners Ravine	Above False	61470	Auburn Folsom Road	2277	2342	2250	2773	2346	2480
209	UR15W2	MR15J_30	62400	Miners Ravine	Above False	62487	Placer Canyon Parkway	2135	2293	2269	2596	2363	2348
1209	Y15AE2	MR15J_30	0	Miners Ravine	Above False	64347	Lominda Lane	#N/A	2179	2191	#N/A	2332	2263
210	UXR15Q	MR15J_30	67600	Miners Ravine	Above False	67574	Horseshoe Bar Road	1749	2112	2123	2129	2299	2210
1210	UMR10M	MR15J_30	0	Miners Ravine	Above False	70394	Bridge 26	#N/A	2070	2085	#N/A	2267	2155
1211	UMR10M	MR15J_30	0	Miners Ravine	Above False	70984	Bridge 27	#N/A	2079	2086	#N/A	2262	2168
1212	UMR10I	MR15J_30	0	Miners Ravine	Above False	73328	Whiskey Bar Road	#N/A	1788	1794	#N/A	1963	1862
1213	UXR10E	MR15J_30	0	Miners Ravine	Above False	75238	Bridge 30	#N/A	1734	1740	#N/A	1905	1820
1214	UMMR5S	MR15J_30	0	Miners Ravine	Above False	75448	Bridge 31	#N/A	1563	1568	#N/A	1734	1659
1215	YMR10E	MR15J_30	0	Miners Ravine	Above False	76148	Bridge 32	#N/A	1575	1580	#N/A	1740	1666
211	YMR10E	MR15J_30	71700	Miners Ravine	Above False	76613	Auburn Folsom Road	1362	1574	1579	1715	1739	1663

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212	UPMR5R	MR15J_30	73300	Miners Ravine	Above False	78358	King Road	1265	789	790	1611	861	867
213	YMR5W	MR15J_30	79400	Miners Ravine	Above False	79398	Penryn Rock Springs Road	365	730	731	488	794	796
214	YMR5P	MR15J_30	80200	Miners Ravine	Above False	80243	Newcastle Road	219	581	581	293	635	638
Miners Ravine/Boardman Tributary													
215	UR37D3	CC5G_90	0	0	0	NONE	Miners Ravine Confluence	557	702	1326	695	1388	1389
216	UR35R6	CC5G_90	800	0	0	NONE	East Roseville Parkway	529	690	1312	660	1372	1372
Miners Ravine/Cavitt & Stallman Tributary													
217	UMR25L	SE40N_0	0	0	0	NONE	Miners Ravine Confluence	885	1010	1002	989	1090	1104
218	YR25M2	SE40N_0	2400	0	0	NONE	Hidden Valley Place	843	1037	1029	943	1126	1142
219	YMR25N	SE40N_0	3100	0	0	NONE	Baywood Road	801	1022	1014	896	1111	1130
220	YR25P2	SE40N_0	3700	0	0	NONE	S. Bar B Lane	759	1004	996	850	1092	1111
221	YMR25D	SE40N_0	4500	0	0	NONE	Kokuia Lane	717	854	854	804	982	984
222	YMR25I	SE40N_0	5100	0	0	NONE	Crestview Lane	675	930	930	758	1029	1038
223	YMR24E	SE40N_0	9300	0	0	NONE	Barton Road	671	764	764	872	870	869
Miners Ravine/Lake Tributary (MR21)													
224	UMR21H	MR15J_30	0	0	0	NONE	Miners Ravine Confluence	410	288	288	523	459	446
225	UMR21H	MR15J_30	200	0	0	NONE	Auburn Folsom Road	462	288	288	589	459	446
226	YMR21H	MR15J_30	300	0	0	NONE	South Lake Circle	462	336	336	589	524	503
Secret Ravine													
227	YSE85Q	SE40M_30	0	Secret Ravine	Below Sucker	1	Miners Ravine Confluence	6524	8371	9551	6695	8765	8460
228	YE85Y2	SE40M_30	1400	Secret Ravine	Below Sucker	798.3000	East Roseville Parkway	6521	8371	9546	6693	8758	8463
229	YE76A2	SE40M_30	13500	Secret Ravine	Below Sucker	14280.	Sucker Ravine Confluence	6288	8320	9578	6462	8793	8512
230	Y56AB3	SE40M_30	16200	Secret Ravine	Reach 1	17396	Aguiar Road Tributary Confluence	5600	7285	7316	6122	7689	7485
231	USE52D	SE40M_30	17600	Secret Ravine	Reach 1	18595.9	Rocklin Road - China Gardens	5158	7287	7317	5736	7699	7486
232	YSE51K	SE40M_30	23300	Secret Ravine	Reach 1	24526	Sierra College Blvd.	5143	7803	7861	5747	8209	8017
233	UE50Q2	SE40M_30	28800	Secret Ravine	Reach 1	30371	Private Road - Diaz	4832	7180	7305	5542	7887	7677
234	UE50P2	SE40M_30	29200	Secret Ravine	Reach 1	30801	Private Road	4813	7185	7324	5523	7885	7685
235	YE50F2	SE40M_30	30800	Secret Ravine	Reach 1	32256	Brace Road	4681	7146	7283	5385	7837	7645
236	YE50A2	SE40M_30	32600	Secret Ravine	Reach 1	34081	Horseshoe Bar Road	4593	7048	7188	5303	7727	7529
237	YE50A2	SE40M_30	33400	Secret Ravine	Reach 1	34081	Loomis Tributary Confluence	4577	7048	7188	5289	7727	7529
238	YE35B2	SE40M_30	33500	Secret Ravine	Reach 1	34866	King Road Tributary Confluence	4294	6888	7052	5041	7612	7436
239	USE35A	SE40M_30	38600	Secret Ravine	Reach 1	38066	King Road-no ras	3418	5711	5757	4019	6283	6213
241	YE35B2	SE40M_30	40000	Secret Ravine	Reach 1	40346	Penryn Road	3353	5566	5616	3961	6145	6081
242	YSE30E	SE40M_30	40500	Secret Ravine	Reach 1	NONE	Harris/Boulder Creek Road.	3334	5202	5253	3944	5832	5760
243	VSE26I	SE40M_30	40700	Secret Ravine	Reach 1	NONE	Penryn Tributary Confluence	3332	4981	5036	3955	5628	5534
244	VSE26H	SE40M_30	43300	Secret Ravine	Reach 1	NONE	Boulder Creek Road	2780	1831	1831	3285	2016	2014
245	VE26N2	SE40M_30	48500	Secret Ravine	Reach 1	NONE	Brennans Road	1570	1744	1744	1840	1936	1938
246	VE26N2	SE40M_30	48900	Secret Ravine	Reach 1	NONE	Rock Springs Road	1530	1744	1744	1799	1936	1938
247	USE26E	SE40M_30	50400	Secret Ravine	Reach 1	NONE	Meadow Lane	1410	1464	1464	1676	1636	1632
248	UE26BB	SE40M_30	51300	Secret Ravine	Reach 1	NONE	Los Puentes Road	1425	1410	1410	1834	1577	1573
249	VE25IA	SE40M_30	55300	Secret Ravine	Reach 1	NONE	Newcastle Road	1240	1464	1464	1689	1647	1643

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250	UE25AB	SE40M_30	57700	Secret Ravine	Reach 1	NONE	Powerhouse Road	868	1334	1334	1182	1509	1508
Secret Ravine/Sucker Ravine													
251	UXE70I	SE40N_0	0	Sucker Ravine	Reach 1	0	Secret Ravine Confluence	1582	707	2097	1798	932	911
252	USE76A	SE40N_0	1000	Sucker Ravine	Reach 1	840	China Garden Road	1575	693	2012	1790	967	933
253	YSE76B	SE40N_0	1200	Sucker Ravine	Reach 1	1305	Interstate 80	1572	694	2009	1787	968	934
254	YSE76B	SE40N_0	2200	Sucker Ravine	Reach 1	1860	Oakridge Street	1571	762	2009	1786	988	959
255	YSE76B	SE40N_0	2600	Sucker Ravine	Reach 1	2750	Lakeside Drive	1589	788	2009	1823	1004	976
256	USE70I	SE40N_0	3950	Sucker Ravine	Reach 1	4110	Rocklin Road	1596	779	2015	1848	1013	978
257	USE70H	SE40N_0	4300	Sucker Ravine	Reach 1	4580	Quary Lake	1582	701	2010	1835	985	953
258	YSE70H	SE40N_0	4700	Sucker Ravine	Reach 1	4840	Super Span	1568	701	2010	1821	985	953
259	USE70F	SE40N_0	7450	Sucker Ravine	Reach 1	7605	Sierra Meadows Drive	1527	653	2003	1781	983	953
1259	YSE70B	SE40N_0	0	Sucker Ravine	Reach 1	9955	Culvert 1	#N/A	574	2002	#N/A	920	897
1260	YSE70D	SE40N_0	0	Sucker Ravine	Reach 1	10565	Driveway Below Dominguez Road	#N/A	580	2003	#N/A	926	906
260	YSE70C	SE40N_0	10800	Sucker Ravine	Reach 1	10935	Dominguez Road	1408	598	2005	1791	1011	993
261	UE60E2	SE40N_0	11000	Sucker Ravine	Reach 1	10935	Loomis Tributary Confluence	1431	598	2005	1793	1011	993
263	YSE66J	SE40N_0	13400	Sucker Ravine	Reach 1	14525	Pacific Street	803	428	9365	689	630	614
1263	USE66J	SE40N_0	0	Sucker Ravine	Reach 1	14756	Railroad	#N/A	429	3082	#N/A	630	630
1264	USE66D	SE40N_0	0	Sucker Ravine	Reach 1	16706	Culvert 5	#N/A	463	2035	#N/A	817	808
264	USE66D	SE40N_0	14800	Sucker Ravine	Reach 1	16846	Bankhead Road	734	463	1518	634	817	807
265	YSE66C	SE40N_0	15200	Sucker Ravine	Reach 1	17266	Sierra College Blvd.	711	446	1713	615	806	797
266	USE66A	SE40N_0	19000	Sucker Ravine	Reach 1	20671	Saunders Avenue	695	740	2116	876	835	836
267	SE65	SE40N_0	20200	Sucker Ravine	Reach 1	22546	King Road	709	585	888	901	585	585
Secret Ravine/Sucker Ravine/Loomis Tributary													
268	VSE60E	SE40N_0	0	0	0	NONE	Sucker Ravine Confluence	497	608	603	941	863	872
270	VE60D2	SE40N_0	4400	0	0	NONE	Sierra College Blvd.	273	517	511	518	672	657
Secret Ravine/Aguilar Road Tributary													
271	Y56AB2	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	929	916	849	1287	1064	1246
272	Y56AB2	SE40N_0	700	0	0	NONE	Aguilar Road	891	916	849	1223	1064	1246
273	YSE56B	SE40N_0	2400	0	0	NONE	Foothill Road	815	741	837	1095	1026	1076
274	Y55MA2	SE40N_0	4100	0	0	NONE	El Don Road	758	515	559	999	658	645
275	UE56DB	SE40N_0	4100	0	0	NONE	El Don Detention Pond	738	512	519	970	601	613
276	VSE55L	SE40N_0	6100	0	0	NONE	Sierra College Blvd.	624	414	417	768	503	511
Secret Ravine / Loomis Tributary													
277	YSE40J	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	673	578	706	996	817	806
278	YSE40J	SE40N_0	1200	0	0	NONE	Interstate 80	622	578	706	921	817	806
279	VSE40I	SE40N_0	2800	0	0	NONE	Laird Street	586	507	625	866	658	660
280	VSE40F	SE40N_0	3600	0	0	NONE	King Road	549	375	476	812	477	477
Secret Ravine/King Road Tributary													
281	USE45W	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	1838	1839	1840	1994	2019	2000
282	YSE45Q	SE40M_30	3900	0	0	NONE	Rancho Verde Road	1707	895	895	1855	1026	1025

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	500-year 1989 JMM	500-year 1992 Corrected	500-year 2007-Current	500-year Future JMM	500-year Future Unmitigated	500-year Build-out w/LID & Projects
283	YSE45A	MR15J_30	5400	0	0	NONE	Val Verde Road	558	745	745	659	907	896
284	USE44B	MR15J_30	6300	0	0	NONE	King Road	502	654	654	593	814	800
Secret Ravine/Penryn Tributary													
285	YE15L2	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	1329	3242	3288	1830	3723	3638
286	USE7H2	SE40M_30	4700	0	0	NONE	Rock Springs Road	1413	2701	2762	2026	3164	3076
287	YSE5F2	SE40M_30	5600	0	0	NONE	East/West Forks Confluence	1240	2464	2528	1890	2934	2831
Secret Ravine/ E. Fork Penryn Tributary													
288	VSE5F2	SE40M_30	0	0	0	NONE	West Fork Confluence	338	899	937	459	1093	1030
289	YSE5F	SE40M_30	900	0	0	NONE	Fairview Lane	303	902	940	411	1097	1031
290	YE20BS	SE40M_30	3700	0	0	NONE	Gilardi Road	125	709	749	169	907	848
Secret Ravine/W. Fork Penryn Tributary													
291	YSE7D	SE40M_30	0	0	0	NONE	East Fork Confluence	823	1712	1736	1299	2040	1999
292	YSE10A	SE40M_30	200	0	0	NONE	Interstate 80	819	1695	1720	1292	2023	1982
293	YE10BB	SE40M_30	1400	0	0	NONE	Girardi Road	773	1638	1669	1317	1984	1938

Table G.2 200-YEAR EVENT

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	200-year 1989 JMM	200-year 1992 Corrected	January 1995	200-year 2007-Current	200-year Future JMM	200-year Future Unmitigated	200-year Build-out w/LID & Projects
DRY CREEK														
1	VC135B	SE40N_0	8900	Dry Creek	Below Cirby	NONE	Rio Linda Blvd(North and South)	17480	14641	18907	14995	19209	15610	15331
2	Y130B2	SE40N_0	15000	Dry Creek	Below Cirby	NONE	Elkhorn Blvd. (North and South)	17479	14690	18962	15046	19205	15662	15384
3	YC125B	SE40N_0	16600	Dry Creek	Below Cirby	NONE	Curved Bridge Road (North)	17467	14820	19054	15185	19193	15808	15524
4	YC125A	SE40N_0	17400	Dry Creek	Below Cirby	NONE	Dry Creek Road (North and South)	17465	14786	18970	15160	19190	15780	15497
5	YDC115	SE40N_0	24400	Dry Creek	Below Cirby	NONE	Q Street (North and South)	17526	14875	19005	15257	19245	15880	15595
6	YDC90	SE40N_0	34900	Dry Creek	Below Cirby	NONE	Sierra Creek Confluence	17473	14805	18551	15193	19184	15837	15555
7	YDC85	SE40N_0	35200	Dry Creek	Below Cirby	NONE	28th Street (South)	17320	14846	18564	15250	18984	15897	15616
8	YDC85	SE40N_0	35400	Dry Creek	Below Cirby	NONE	Elverta Road	17294	14846	18564	15250	18951	15897	15616
9	YDC71B	SE40N_0	36900	Dry Creek	Below Cirby	38733	Confluence with County Line Trib	17313	14710	17139	14941	18964	15452	14672
11	YDC75C	SE40N_0	41400	Dry Creek	Below Cirby	41634	Watt Avenue	17255	14691	17104	14921	18875	15443	14665
13	YC65I2	SE40N_0	47700	Dry Creek	Below Cirby	47754	Confluence with DC65 Trib	17282	14605	16697	14831	18903	15375	14610
14	YDC60A	SE40N_0	50300	Dry Creek	Below Cirby	50025	Walerga Road	17215	14605	16698	14849	18821	15396	14621
1015	YDC50A	SE40N_0	0	Dry Creek	Below Cirby	55005	Morgan Creek Ped Crossing	#N/A	14581	16494	14843	#N/A	15413	14605
16	YDC35C	SE40N_0	58800	Dry Creek	Below Cirby	58560	Cook Riolo Road	17185	14596	16432	14885	18753	15525	14638
17	YDC25A	CC5G_90	67000	Dry Creek	Below Cirby	67583.80	S.P. Railroad Bridge	16974	12310	16378	12216	18449	12658	11746
18	YDC10D	SE40N_0	67400	Dry Creek	Below Cirby	67641.80	Atkinson Blvd.	16974	14766	16378	15293	18449	15825	14984
20	YDC20A	SE40N_0	68900	Dry Creek	Below Cirby	69138.40	S.P. Railroad Culverts (now bridge)	16969	14754	16379	15283	18433	15824	14975
21	YDC10D	SE40N_0	69900	Dry Creek	Below Cirby	70071.60	Vernon Street	16903	14781	16438	15286	18335	15865	14982
22	YDC10B	SE40N_0	72600	Dry Creek	Below Cirby	72702.60	Riverside Avenue	17227	8945	15638	9170	18823	9242	9157
23	YDCCC	SE40N_0	73000	Dry Creek	Below Cirby	72982	Cirby Creek Confluence	17227	8993	15647	9191	18823	9260	9175
24	YDC5A	SE40M_30	73800	Dry Creek	Above Cirby	73943.30	Darling Way	12878	12622	12226	12437	13965	12994	12294
25	YDC5C	SE40M_30	77000	Dry Creek	Above Cirby	77218.89	Douglas Blvd.	12875	12660	12269	12448	13956	13125	12317
26	UDC5B	SE40M_30	77500	Dry Creek	Above Cirby	77606.49	Royer Park Footbridge	12875	12660	12268	12447	13890	13109	12317
27	YDC5B	SE40M_30	79100	Dry Creek	Above Cirby	79166.05	Lincoln Street	12873	12638	12260	12430	13886	13093	12297
28	YDC4C	SE40M_30	79400	Dry Creek	Above Cirby	79816.70	Folsom Road	12869	12641	12257	12432	13891	13095	12297
30	YACMR	SE40M_30	84100	Dry Creek	Above Cirby	84214.40	Antelope Creek/ Miners Ravine Confluence	12972	12763	12339	12554	13996	13296	12468
DRY CREEK - ELVERTA TRIB														
31	UDC90	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	395	229	275	229	530	255	254
DRY CREEK - SIERRA CREEK														
32	YC100B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	1801	1025	1162	1051	2245	1219	1203
33	YC100A	CC5G_90	1400	0	0	NONE	28th Street	1759	1048	1216	1079	2197	1246	1225
34	YC100A	CC5G_90	3700	0	0	NONE	Scotland Drive	1663	1048	1216	1079	2085	1246	1225
35	VC96B2	CC5G_90	5400	0	0	NONE	Delaney Drive	1620	947	1101	978	2057	1130	1110
36	YDC96A	CC5G_90	6800	0	0	NONE	Watt Avenue	1574	811	960	836	2010	986	967
37	VDC96C	CC5G_90	10300	0	0	NONE	Navaho Way	945	575	671	600	1181	733	714
38	YDC96C	CC5G_90	11400	0	0	NONE	Elverta Road	811	577	697	603	1004	736	717
39	DC95A	CC5G_90	13500	0	0	NONE	Walerga Road	676	88	98	88	826	133	129

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	200-year 1989 JMM	200-year 1992 Corrected	January 1995	200-year 2007-Current	200-year Future JMM	200-year Future Unmitigated	200-year Build-out w/LID & Projects
DRY CREEK/County Line Trib. (Note: Riolo Vineyards project determined this tributary does not drain as previously modeled - corrected in 2009 study)														
40	YDC75B	CC5G_90	0	0		NONE	Confluence with Dry Creek	775	677	732	688	1105	797	793
41	N/A	#N/A	3200	0	0	NONE	Watt Avenue	722	#N/A	#N/A	#N/A	1069	#N/A	#N/A
42	VDC68B	CC5G_90	8200	0	0	NONE	PFE Road	551	600	641	619	868	684	679
Dry Creek DC-65 Tributary														
43	YDC65I	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	565	499	455	577	608	608	614
44	YDC65K	CC5G_90	3000	0	0	NONE	Walerga Road	451	459	419	543	487	567	569
Cirby Creek														
45	YCC45G	LC40L_30	0	Cirby Creek	below Linda	0	Dry Creek Confluence	4248	3547	5573	3690	4739	3921	3724
46	YCC45A	LC40L_30	3000	Cirby Creek	below Linda	2969.699	Interstate 80	4228	3586	5763	3758	4718	3958	3786
48	UCC45E	LC40L_30	4600	Cirby Creek	below Linda	4580.699	Wanda Lee Court Footbridge	4240	3585	5768	3753	4739	3941	3777
49	YCC45E	LC40L_30	6100	Cirby Creek	Above Linda	6009.699	Linda Creek Confluence	5230	3593	2661	3766	5793	3951	3785
50	YCC40A	CC5G_90	7400	Cirby Creek	Above Linda	7262.099	Sunrise Blvd.	961	764	1575	1009	1257	1023	1022
51	YCC40C	CC5G_90	8100	Cirby Creek	Above Linda	8038.899	Coloma Way - Gage 1635	996	830	548	1023	1263	1028	1030
52	YC40G2	CC5G_90	9100	Cirby Creek	Above Linda	9004.399	Oak Ridge Drive	1007	774	531	976	1273	989	988
53	UCC35D	CC5G_90	10000	Cirby Creek	Above Linda	9873.999	Sierra Gardens Footbridge	1000	847	546	1083	1267	1095	1094
54	YCC15B	CC5G_90	11800	Cirby Creek	Above Linda	11679.19	Loretto Drive	981	905	547	1223	1271	1223	1222
55	YCC252	CC5G_90	12000	Cirby Creek	Above Linda	12228.79	Sierra Gardens Trib. Confluence	1009	670	389	967	1275	974	973
56	YCC15C	CC5G_90	12500	Cirby Creek	Above Linda	12377.29	Sierra Gardens Drive	803	673	389	968	1097	972	972
57	YCC10E	CC5G_90	13900	Cirby Creek	Above Linda	13765.49	Huntington Drive	768	453	352	463	1116	467	467
58	UCC10H	CC5G_90	14500	Cirby Creek	Above Linda	14420.19	Rocky Ridge Drive	478	391	217	570	646	592	591
60	YCC5B	CC5G_90	16400	Cirby Creek	Above Linda	15748.19	Winchester Way	414	289	155	447	581	454	456
61	YCC5D	CC5G_90	17200	Cirby Creek	Above Linda	16312.19	Eureka Road	416	201	117	349	643	355	356
62	YCC1A	CC5G_90	19700	Cirby Creek	Above Linda	17753.79	Douglas Blvd.	245	149	92	297	496	302	302
Cirby Creek/Sierra Gardens Trib.														
63	VCC25	CC5G_90	0	0	0	NONE	Cirby Creek Confluence	172	293	159	308	203	310	309
65	YCC20G	CC5G_90	1000	0	0	NONE	Douglas Blvd.	148	198	126	217	150	218	217
66	YCC20K	CC5G_90	1400	0	0	NONE	Sierra Gardens Ret. Basin	141	243	116	362	143	379	372
Linda Creek														
67	ULC95C	LC40L_30	0	Linda Creek	Below Strap	0.	Cirby Creek Confluence	4900	2787	3218	2817	5443	2837	2818
68	ULC95D	LC40L_30	1000	Linda Creek	Below Strap	565.1000	Sunrise Avenue	4898	2794	3290	2824	5439	2850	2826
70	YLC90A	LC40L_30	2600	Linda Creek	Below Strap	2125.000	Oak Ridge Drive	5000	3797	6753	3799	5575	3976	3808
72	ULC90B	LC40L_30	4300	Linda Creek	Below Strap	3843.300	Sierra Gardens Footbridge	4986	3813	6728	3997	5556	4193	4004
73	YLC85C	LC40L_30	8400	Linda Creek	Below Strap	8257.900	Rocky Ridge Dirve	5020	4102	7238	4508	5521	4835	4633
74	ULC85B	LC40L_30	10000	Linda Creek	Below Strap	9810.000	Strap Ravine Confluence	4983	4156	7215	4488	5455	4813	4603
76	ULC80I	LC40L_30	11500	Linda Creek	Below S Branch	136	Champion Oaks Drive/Samoa Way (Gage 1626/1628)	3905	2260	3280	2294	4244	2403	2292
78	ULC80A	LC40L_30	14300	Linda Creek	Below S Branch	157	Auburn Road	3904	3192	5296	3456	4239	3648	3477
79	UC45J3	LC40L_30	15700	Linda Creek	Below S Branch	176	Old Auburn Road/City Limits	3914	2562	4346	2847	4250	3026	2855
1079	ULC45J	LC40L_30	0	Linda Creek	Below S Branch	181	Ped Bridge over Creek in Park	#N/A	2447	4184	2741	#N/A	2921	2750

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	200-year 1989 JMM	200-year 1992 Corrected	January 1995	200-year 2007-Current	200-year Future JMM	200-year Future Unmitigated	200-year Build-out w/LID & Projects
Treelake Tributary Confluence														
80	ULC45J	LC40L_30	15900	Linda Creek	Below S Branch	181	Treelake Tributary Confluence	3914	2447	4184	2741	4250	2921	2750
82	UC45J2	LC40L_30	19800	Linda Creek	Below S Branch	188	Indian Creek Drive	2942	2420	4148	2728	3261	2913	2743
1082	ULC45D	LC40L_30	0	Linda Creek	Below S Branch	207	Private Bridge Near Hazel	#N/A	2185	3839	2560	#N/A	2810	2629
83	ULC45D	LC40L_30	25300	Linda Creek	Below S Branch	211	Hazel Avenue	2677	2185	3839	2571	2950	2829	2644
84	UC35Q3	LC40L_30	25500	Linda Creek	Below S Branch	212	Orangevale Tributary Confluence	2677	2185	3839	2571	2950	2830	2643
1084	ULC40A	LC40L_30	0	Linda Creek	Above S Branch	3.075	BDG 17 2-24" CMPS	#N/A	1497	2743	1676	#N/A	1880	1690
85	UC15N2	LC40L_30	31300	Linda Creek	Above S Branch	4.239	Granite Road Bridge	1475	1259	2312	1402	1613	1604	1404
86	ULC15N	LC40L_30	32600	Linda Creek	Above S Branch	4.407	Cherry Avenue	1448	1223	2253	1362	1576	1581	1361
1086	ULC15J	LC5A_0	0	Linda Creek	Above S Branch	5.22	Private Driveway Concrete Box Type	#N/A	848	1468	994	#N/A	948	703
1087	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.264	Driveway Bridge	#N/A	850	1467	993	#N/A	974	703
1088	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.526	Granite Glen Court (Private)	#N/A	855	1472	1011	#N/A	963	706
88	YLC15J	LC5A_0	38600	Linda Creek	Above S Branch	5.715	Wedgewood Drive	1025	947	1479	1000	1181	975	738
1089	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.039	Golf Cart Bridge #5	#N/A	870	1323	950	#N/A	913	728
1090	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.12	Golf Cart Bridge #4	#N/A	869	1323	952	#N/A	912	729
1091	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.197	Golf Cart Bridge #3	#N/A	870	1323	935	#N/A	912	731
1092	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.241	Golf Cart Bridge #2	#N/A	870	1322	935	#N/A	912	731
1093	ULC5F2	LC5A_0	0	Linda Creek	Above S Branch	6.515	Golf Cart Bridge #1	#N/A	852	1117	868	#N/A	918	737
89	ULC5F2	LC5A_0	42300	Linda Creek	Above S Branch	6.53	East Roaseville Parkway	927	852	1117	867	1132	914	736
90	ULC5F	LC5A_0	43100	Linda Creek	Above S Branch	6.759	Barton Road	874	853	1042	871	1074	903	722
91	YLC5E	LC5A_0	44600	Linda Creek	Above S Branch	7.140	Shadow Brook Place	737	746	799	767	907	789	506
92	ULC5B	LC5A_0	46500	Linda Creek	Above S Branch	7.479	Troy Purdy Lane	541	643	613	654	729	678	398
1094	ULC5C	LC5A_0	0	Linda Creek	Above S Branch	7.609	Muir Way	#N/A	528	432	538	#N/A	561	347
93	YLC5C	LC5A_0	48100	Linda Creek	Above S Branch	7.77	Country Court (Private)	445	524	439	535	631	555	351
1095	ULC1A	LC5A_0	0	Linda Creek	Above S Branch	7.839	Country Court	#N/A	1051	1654	1319	#N/A	1381	1377
94	YLC1A	LC5A_0	48700	Linda Creek	Above S Branch	8.011	Auburn Folsom Road	398	537	446	548	582	572	353
Linda Creek/Strap Ravine														
95	USR25C	CC5G_90	0	Strap Ravine	Reach 1	0.	Linda Creek Confluence	1110	1039	1653	1277	1254	1366	1365
1095	YSR25A	CC5G_90	300	Strap Ravine	Reach 1	276	Foot Bridge in Park	#N/A	1051	1654	1319	#N/A	1381	1377
96	UR20A4	CC5G_90	1500	Strap Ravine	Reach 1	1136.900	McClaren Drive (Gage 1611)	1111	1070	1649	1344	1255	1415	1395
97	UXR20A	CC5G_90	5900	Strap Ravine	Reach 1	5539.100	Johnson Ranch Drive	1094	1019	1722	1388	1244	1381	1359
98	USR152	CC5G_90	6800	Strap Ravine	Reach 1	6380.600	Eureka Road	1092	1019	1717	1384	1244	1382	1359
99	USR82	CC5G_90	8600	Strap Ravine	Reach 1	8201.500	East Roseville Parkway	1077	879	1437	1045	1321	1136	1212
100	USR5C2	LC5A_0	11800	Strap Ravine	Reach 1	11366.10	Sierra College Blvd.	997	625	1068	826	1280	895	958
101	USR1A	LC5A_0	23000	0	0	NONE	Barton Road	744	641	605	1209	1154	1099	1087
Linda Creek/Treelake Tributary														
102	ULC60B	LC40L_30	0	0	0	NONE	Linda Creek Confluence	999	663	1009	788	1119	875	851
103	YLC60B	LC40L_30	3200	0	0	NONE	Petite Way (approximated)	931	681	1021	821	1034	914	888
104	YLC60A	LC40L_30	5700	0	0	NONE	Old Auburn Road	928	612	944	767	1135	858	836
105	YC55H3	LC40L_30	6000	0	0	NONE	Sierra College Blvd.	920	671	961	849	1137	954	929
106	YLC55F	LC40L_30	9600	0	0	NONE	Swan Lake Drive	665	587	889	800	800	921	896
107	UC55L2	LC40L_30	9600	0	0	NONE	Swan Lake	665	549	856	771	800	892	869

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108	UPC55L	LC40L_30	10800	0	0	NONE	Waterbury Way	568	566	859	794	670	914	887
109	YLC55L	LC40L_30	10800	0	0	NONE	Waterbury Lake	568	616	866	856	670	980	947
110	ULC50E	LC40L_30	11400	0	0	NONE	East Roaseville Parkway	492	496	653	637	572	779	729
111	YLC50E	LC40L_30	11400	0	0	NONE	East Roseville Parkway Pond	492	523	655	699	572	831	768
112	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane	492	457	544	554	572	673	639
113	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane Pond	492	457	544	554	572	673	639
Linda Creek/Hazel Avenue Tributary (Sac County)														
114	YC35Q2	LC40L_30	0	0	0	NONE	Linda Creek Confluence	806	701	3689	908	1002	967	962
115	UC35Q2	LC40L_30	400	0	0	NONE	Oak Avenue	806	701	1083	908	1002	967	962
Linda Creek/Orangevale Tributary (Sac County)														
116	YC35Q2	LC40L_30	0	Linda Creek	South Branch	.001	Linda Creek Confluence	1481	712	1089	981	1587	1070	1053
1116	YLC35Q	LC40L_30	0	Linda Creek	South Branch	0.125	Private Bridge (Metal and Concrete)	#N/A	775	1105	1023	#N/A	1100	1130
117	ULC35Q	LC40L_30	900	Linda Creek	South Branch	0.196	Oak Avenue	756	764	1108	1024	809	1099	1100
1117	ULC30E	LC40L_30	0	Linda Creek	South Branch	1.022	Private Bridge in Park Area	#N/A	365	630	543	#N/A	598	607
118	ULC30E	LC40L_30	3300	Linda Creek	South Branch	1.035	Filbert Avenue	711	365	631	543	760	599	607
1118	ULC30B	LC40L_30	0	Linda Creek	South Branch	1.244	Private Bridge Near Chestnut	#N/A	339	570	501	#N/A	550	557
119	UC30C2	LC40L_30	4300	Linda Creek	South Branch	1.346	Chestnut Avenue	784	323	530	485	853	540	547
120	ULC30A	LC40L_30	5500	Linda Creek	South Branch	1.649	Walnut Avenue (North)	337	256	295	355	338	393	407
120	UC20E3	LC40L_30	5500	Linda Creek	South Branch	1.772	Walnut Avenue (South)	337	256	295	355	338	393	407
121	VLC25C	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (North)	252	51	88	72	254	78	78
1121	VLC20E	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (South)	#N/A	212	229	294	#N/A	322	320
Antelope Creek														
122	UDC4D	AC5I_60	0	Antelope Ck	AntelopeBlwClove	0.	Miners Ravine/Dry Creek	3726	4234	3172	4364	4195	4562	4035
123	UC45B2	AC5I_60	1400	Antelope Ck	AntelopeBlwClove	1394.899	Harding Blvd.	3724	4246	3206	4378	4193	4575	4030
124	UAC45B	AC5I_60	2300	Antelope Ck	AntelopeBlwClove	2349.499	Atlantic Street	3722	4253	3185	4384	4192	4593	4030
1124	UAC45B	AC5I_60	0	Antelope Ck	AntelopeBlwClove	2455.599	Bridge #3	#N/A	4242	3176	4376	#N/A	4592	4025
125	UAC45L	AC5I_60	5000	Antelope Ck	AntelopeBlwClove	5017.599	County Dump Road	3712	4327	3480	4449	4184	4683	4394
126	UC41E4	AC5I_60	9600	Antelope Ck	AntelopeBlwClove	10909.49	Highway 65 - non ras (Gage 1583)	3729	4342	3137	4450	4207	4698	4657
127	UC41E3	AC5I_60	10300	Antelope Ck	AntelopeBlwClove	11383.53	Springview Drive	3722	4319	3128	4430	4209	4677	4638
128	YC41E2	AC5I_60	10800	Antelope Ck	AntelopeBlwClove	11418.53	Rocklin City Tributary Confluence	3704	4313	3128	4423	4186	4669	4631
130	UC40K2	AC5I_60	15800	Antelope Ck	AntelopeBlwClove	16930.03	Sunset Blvd.	3750	4211	3109	4311	4232	4566	4530
133	UV10B2	AC5I_60	22800	Antelope Ck	AntelopeBlwClove	24722.3	Clover Valley Creek Confluence	3849	4261	3079	4367	4348	4801	4762
134	UC35G3	AC5I_60	23600	Antelope Ck	Reach 1	25350.71	Midas Avenue	2804	3380	2077	3432	3229	3505	3498
135	UAC35C	AC5I_60	25700	Antelope Ck	Reach 1	27696.03	Southern Pacific Railroad (UPRR) - non ras	2773	3350	2062	3424	3196	3531	3519
136	VAC35I	AC5I_60	26500	Antelope Ck	Reach 1	28434.67	Yankee Hill Road	2763	3341	2062	3415	3185	3518	3513
137	YAC30C	AC5I_60	27600	Antelope Ck	Reach 1	34226	Atkinson Dairy Dam	2732	3224	1994	3318	3152	3469	3466
138	YAC30B	AC5I_60	28900	Antelope Ck	Reach 1	34691	Unnamed Road - no ras - no find aerial	2702	3160	1960	3259	3119	3416	3410
139	YAC30B	AC5I_60	31800	Antelope Ck	Reach 1	35656	Delmar Avenue - no ras	2670	3162	1962	3275	3088	3433	3436
140	YAC30B	AC5I_60	34300	Antelope Ck	Reach 1	36964	Sierra College Blvd. (Gage 1573)	2591	3163	1958	3273	3002	3444	3444
141	U30AC4	AC5I_60	37000	Antelope Ck	Reach 1	39726	King Road	2529	3432	1933	3464	2927	3596	3594

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Antelope Creek / Clark Tunnel Road Tributary														
142	U30AC2	AC5I_60	0	Antelope Ck	Reach 1	40906	Antelope Creek Confluence	2520	3371	1896	3405	2926	3537	3521
143	UC25BC	AC5I_60	100	0	0	NONE	Barker Road	1504	1086	685	1086	1879	1125	1122
144	VAC20C	AC5I_60	1300	0	0	NONE	Humphrey Road	1382	722	520	722	1802	763	762
145	YC16EB	AC5I_60	1700	0	0	NONE	Humphrey Tributary Confluence	1358	595	425	595	1769	634	636
148	UC15CB	AC5I_60	7000	0	0	NONE	Colwell Road	963	357	200	357	1360	379	379
149	YC15BC	AC5I_60	10000	0	0	NONE	English Colony Way	881	296	138	296	1308	301	301
150	AC15AD	AC5I_60	12800	0	0	NONE	Clark Tunnel Road	342	219	97	219	581	223	223
Antelope Creek/Rocklin City Tributary														
151	VAC41E	CC5G_90	0	0	0	NONE	Antelope Creek Confluence	216	713	399	713	275	778	771
152	VAC41F	SE40M_30	2700	0	0	NONE	Taylor Road	162	269	202	269	206	335	327
153	VAC41F	SE40M_30	2800	0	0	NONE	Taylor Road	135	269	202	269	172	335	327
154	UAC41A	SE40M_30	4500	0	0	NONE	Sunset Blvd.	81	152	119	152	103	205	201
Antelope Creek/Clover Valley Creek														
155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	.1	Antelope Creek Confluence	1045	1151	1000	1194	1139	1293	1260
1155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	155	Golf Course Ped Bridge	#N/A	1142	1000	1190	#N/A	1300	1265
156	UCV10B	AC5I_60	400	Clover Valley	Clover Valley1	445	Argonaut Avenue	1042	1137	1000	1185	1134	1405	1268
157	YCV10B	AC5I_60	2200	Clover Valley	Clover Valley1	2785	Footbridge and Weir	1024	1147	998	1190	1111	1410	1279
158	UXV10A	AC5I_60	4300	Clover Valley	Clover Valley1	4090	Midas Avenue	1016	1120	982	1166	1102	1381	1252
159	YCV10A	AC5I_60	4700	Clover Valley	Clover Valley1	4430	Abandoned Stone Bridge	1015	1120	982	1166	1100	1382	1261
160	YCV10A	AC5I_60	5600	Clover Valley	Clover Valley1	5400	Unnamed Bridge	1003	1071	949	1118	1084	1327	1213
1160	UV6CB2	AC5I_60	0	Clover Valley	Clover Valley1	6365	Gazebo Crossing	#N/A	1073	949	1118	#N/A	1329	1212
161	UCV6CB	AC5I_60	6500	Clover Valley	Clover Valley1	6505	Clover Valley Detention Pond	997	1073	950	1118	1076	1328	1213
162	YV6CB2	AC5I_60	7700	Clover Valley	Clover Valley1	7815	Creekwood Drive	985	1074	951	1118	1060	1330	1217
163	UCV6BC	AC5I_60	12000	Clover Valley	Clover Valley1	12015	Rawhide Road	895	999	899	991	981	1171	1146
164	UCV6BC	AC5I_60	12500	Clover Valley	Clover Valley1	12550	Rowhide Road Det. Pond	883	1000	904	994	970	1173	1148
165	UCV5C	AC5I_60	25600	Clover Valley	Clover Valley1	NONE	Unnamed Road	578	849	826	849	691	1098	1037
166	UCV1T	AC5I_60	28000	Clover Valley	Clover Valley1	NONE	Sierra College Blvd.	494	554	484	554	600	629	629
167	VCV1T	AC5I_60	28500	Clover Valley	Clover Valley1	NONE	English Colony Way	494	474	352	474	600	989	900
Antelope Creek Continued (West Branch)														
169	UC25BC	AC5I_60	38700	0	0	NONE	Clark Tunnel Road Tributary Confluence	1016	1086	1894	1086	1048	1125	1122
170	U25AD2	AC5I_60	40600	0	0	NONE	Barker Road	903	1011	1293	1011	957	1049	1041
171	Y25AD2	AC5I_60	42500	0	0	NONE	Citrus Colony Road	856	1045	671	1045	931	1083	1078
172	YAC16A	AC5I_60	47900	0	0	NONE	English Colony Road	432	437	239	437	549	465	465
Antelope Creek/Humphrey Tributary														
173	UPAC5K	AC5I_60	0	0	0	NONE	Clark Tunnel Road Tributary Confluence	421	367	1250	367	527	368	368
174	VAC5J2	AC5I_60	1700	0	0	NONE	Sandy Road	295	389	231	389	369	392	392
175	VAC5O	AC5I_60	3300	0	0	NONE	Mardell Lane	252	62	1035	62	316	62	62

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176	UPAC5G	AC5I_60	3700	0	0	NONE	Colwell Road	210	274	118	274	264	278	278
177	YAC5E	AC5I_60	6300	0	0	NONE	English Colony Way	126	236	107	236	158	242	242
Miners Ravine														
178	UMR40E	SE40M_30	0	Miners Ravine	Below Secret	10.	Antelope Creek/Dry Creek	9752	8900	9167	8792	10505	9129	8721
179	UMR40E	SE40M_30	200	Miners Ravine	Below Secret	94.	Harding Blvd.	9750	8900	9167	8792	10500	9129	8721
180	YMR40E	SE40M_30	1500	Miners Ravine	Below Secret	659.8999	Interstate 80 - no ras	9743	8923	9184	8807	10483	9192	8781
181	YMR40B	SE40M_30	2800	Miners Ravine	Below Secret	1422.400	Eureka Way	9745	8917	9186	8807	10475	9208	8786
182	YSEMR	SE40M_30	3800	Miners Ravine	Below Secret	3734.100	Secret Ravine Confluence	9717	8927	9180	8813	10423	9226	8804
183	YMR37D	MR15J_30	5300	Miners Ravine	BET SECRET-FALSE	5674.100	Sunrise Avenue - no ras	7676	3180	4638	2946	8342	3042	2975
184	UR37D4	MR15J_30	7000	Miners Ravine	BET SECRET-FALSE	7319.900	Boardman Tributary	1989	3178	4635	2944	2271	3040	2974
185	UR36N2	MR15J_30	9000	Miners Ravine	Above False	9828.100	East Roseville Parkway	4854	3093	4499	2870	5581	2968	2905
186	UMR31Q	MR15J_30	18200	Miners Ravine	Above False	18310.19	Sierra College Blvd.	4789	3107	4448	2881	5577	2905	2865
187	YR31Q2	MR15J_30	18300	Miners Ravine	Above False	18610	Cavitt Stallman Tributary - no ras	4789	3129	4433	3160	5577	3297	3207
188	UMR31G	MR15J_30	18600	Miners Ravine	Above False	18685	Cavitt (&) Stallman Road	4093	2875	3782	2894	4815	3041	2966
190	UR31P2	MR15J_30	23400	Miners Ravine	Above False	23390	Shadow Oaks Lane	3985	2867	3689	2901	4684	3069	3015
1190	YMR31D	MR15J_30	0	Miners Ravine	Above False	27990.	Hardy Lane	#N/A	2840	3640	2876	#N/A	3041	2994
191	UMR31D	MR15J_30	28900	Miners Ravine	Above False	28826	Barton Road	3865	2848	3640	2882	4542	3043	3000
192	UMR30R	MR15J_30	31300	Miners Ravine	Above False	31379	TallPine Lane	3786	2839	3624	2871	4452	3030	2989
193	UMR30Q	MR15J_30	33000	Miners Ravine	Above False	32984	Carolinda Drive	3708	2841	3728	2872	4362	3029	2990
194	UMR30P	MR15J_30	34800	Miners Ravine	Above False	34813	Itchy Acres Road	3643	2836	3548	2843	4291	2997	2980
196	UR30H2	MR15J_30	35500	Miners Ravine	Above False	35489	Miners Ravine Road	3607	2839	3552	2845	4249	2998	2982
197	UR30H3	MR15J_30	36800	Miners Ravine	Above False	36790	Leibinger Lane	3570	2818	3520	2836	4207	2988	2973
199	UR29B2	MR15J_30	39700	Miners Ravine	Above False	39765	Auburn Folsom Road	3456	3022	3487	2834	4059	3331	3081
200	UXR29H	MR15J_30	41700	Miners Ravine	Above False	40276	Oak Lane	3369	2827	3493	2837	3960	3030	3011
201	UR29I2	MR15J_30	43000	Miners Ravine	Above False	44240	Old Bridge	3323	2920	3424	2930	3933	3014	3023
202	YMR29I	MR15J_30	43200	Miners Ravine	Above False	44240	Cottonwood Lake	3307	2920	3424	2930	3918	3014	3023
203	UMR21C	MR15J_30	44400	Miners Ravine	Above False	44368	Auburn Folsom Road	3335	2833	3424	2932	3925	3014	2953
1203	YMR21C	MR15J_30	0	Miners Ravine	Above False	44523	Driveway opposite Twin Rocks Road	#N/A	2781	3319	2873	#N/A	2952	2892
204	YMR21D	MR15J_30	45600	Miners Ravine	Above False	45593	Confluence with Lake Tributary (MR15)	3177	2786	3323	2879	3746	2951	2892
1204	UXR20R	MR15J_30	0	Miners Ravine	Above False	52637	Bridge 15	#N/A	2277	2468	2334	#N/A	2377	2337
1205	UXR20Q	MR15J_30	0	Miners Ravine	Above False	53992	Bridge 16	#N/A	2238	2376	2293	#N/A	2337	2299
205	UR20P2	MR15J_30	56000	Miners Ravine	Above False	55052	Moss Lane	3041	2271	2361	2336	3610	2351	2318
1206	YR20K2	MR15J_30	0	Miners Ravine	Above False	57194	Bridge 18 So of Willow Valley Place	#N/A	2180	2102	2226	#N/A	2256	2229
1207	YR20K2	MR15J_30	0	Miners Ravine	Above False	57599	Willow Valley Place	#N/A	2183	2108	2231	#N/A	2259	2233
1208	UR20C2	MR15J_30	0	Miners Ravine	Above False	57984	Bridge 20 North of Willow Valley Place	#N/A	2147	2050	2195	#N/A	2242	2215
207	UR15K2	MR15J_30	59900	Miners Ravine	Above False	59894	Dick Cook Road	2078	2037	1929	2069	2587	2108	2096
208	UXR15V	MR15J_30	61500	Miners Ravine	Above False	61470	Auburn Folsom Road	1961	1814	1998	1830	2439	1892	1875
209	UR15W2	MR15J_30	62400	Miners Ravine	Above False	62487	Placer Canyon Parkway	1844	1852	1448	1848	2291	1921	1892
1209	Y15AE2	MR15J_30	0	Miners Ravine	Above False	64347	Lominda Lane	#N/A	1792	1346	1789	#N/A	1893	1865
210	UXR15Q	MR15J_30	67600	Miners Ravine	Above False	67574	Horseshoe Bar Road	1506	1723	1163	1710	1868	1870	1804

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1210	UMR10M	MR15J_30	0	Miners Ravine	Above False	70394	Bridge 26	#N/A	1715	1150	1859	#N/A	1911	1796
1211	UMR10M	MR15J_30	0	Miners Ravine	Above False	70984	Bridge 27	#N/A	1722	1113	1745	#N/A	1893	1802
1212	UMR10I	MR15J_30	0	Miners Ravine	Above False	73328	Whiskey Bar Road	#N/A	1477	934	1484	#N/A	1633	1546
1213	UXR10E	MR15J_30	0	Miners Ravine	Above False	75238	Bridge 30	#N/A	1470	904	1472	#N/A	1588	1526
1214	UMMR5S	MR15J_30	0	Miners Ravine	Above False	75448	Bridge 31	#N/A	1318	825	1320	#N/A	1429	1375
1215	YMR10E	MR15J_30	0	Miners Ravine	Above False	76148	Bridge 32	#N/A	1324	828	1327	#N/A	1444	1374
211	YMR10E	MR15J_30	71700	Miners Ravine	Above False	76613	Auburn Folsom Road	1171	1326	830	1327	1493	1435	1384
212	UPMR5R	MR15J_30	73300	Miners Ravine	Above False	78358	King Road	1094	678	538	679	1407	702	694
213	YMR5W	MR15J_30	79400	Miners Ravine	Above False	79398	Penryn Rock Springs Road	317	585	470	584	428	629	630
214	YMR5P	MR15J_30	80200	Miners Ravine	Above False	80243	Newcastle Road	190	459	350	459	257	497	499
Miners Ravine/Boardman Tributary														
215	UR37D3	CC5G_90	0	0	0	NONE	Miners Ravine Confluence	480	520	4175	956	606	1003	1002
216	UR35R6	CC5G_90	800	0	0	NONE	East Roseville Parkway	456	509	353	939	576	983	982
Miners Ravine/Cavitt & Stallman Tributary														
217	UMR25L	SE40N_0	0	0	0	NONE	Miners Ravine Confluence	728	755	3757	751	826	811	820
218	YR25M2	SE40N_0	2400	0	0	NONE	Hidden Valley Place	693	776	1115	771	787	839	850
219	YMR25N	SE40N_0	3100	0	0	NONE	Baywood Road	658	762	1072	758	748	828	839
220	YR25P2	SE40N_0	3700	0	0	NONE	S. Bar B Lane	623	748	1034	744	709	812	825
221	YMR25D	SE40N_0	4500	0	0	NONE	Kokuia Lane	588	635	768	635	669	729	728
222	YMR25I	SE40N_0	5100	0	0	NONE	Crestview Lane	554	691	913	691	630	765	772
223	YMR24E	SE40N_0	9300	0	0	NONE	Barton Road	577	576	678	576	760	660	662
Miners Ravine/Lake Tributary (MR21)														
224	UMR21H	MR15J_30	0	0	0	NONE	Miners Ravine Confluence	358	227	2843	227	459	356	341
225	UMR21H	MR15J_30	200	0	0	NONE	Auburn Folsom Road	403	227	202	227	516	356	341
226	YMR21H	MR15J_30	300	0	0	NONE	South Lake Circle	403	267	209	267	516	425	406
Secret Ravine														
227	YSE85Q	SE40M_30	0	Secret Ravine	Below Sucker	1	Miners Ravine Confluence	5267	6588	4573	6617	5419	6991	6612
228	YE85Y2	SE40M_30	1400	Secret Ravine	Below Sucker	798.3000	East Roseville Parkway	5266	6581	4565	6619	5417	6986	6608
229	YE76A2	SE40M_30	13500	Secret Ravine	Below Sucker	14280.	Sucker Ravine Confluence	5134	6617	4490	6667	5305	7097	6754
230	Y56AB3	SE40M_30	16200	Secret Ravine	Reach 1	17396	Aguiar Road Tributary Confluence	4577	5809	3789	5790	5000	6170	5952
231	USE52D	SE40M_30	17600	Secret Ravine	Reach 1	18595.9	Rocklin Road - China Gardens	4195	5817	3787	5807	4701	6181	5972
232	YSE51K	SE40M_30	23300	Secret Ravine	Reach 1	24526	Sierra College Blvd.	4188	5886	3804	5851	4703	6323	6251
233	UE50Q2	SE40M_30	28800	Secret Ravine	Reach 1	30371	Private Road - Diaz	3942	5450	3373	5403	4555	6004	6000
234	UE50P2	SE40M_30	29200	Secret Ravine	Reach 1	30801	Private Road	3926	5453	3381	5999	4541	6005	6002
235	YE50F2	SE40M_30	30800	Secret Ravine	Reach 1	32256	Brace Road	3822	5464	3320	5466	4448	6119	6019
236	YE50A2	SE40M_30	32600	Secret Ravine	Reach 1	34081	Horseshoe Bar Road	3780	5360	3234	5404	4429	6061	5922
237	YE50A2	SE40M_30	33400	Secret Ravine	Reach 1	34081	Loomis Tributary Confluence	3768	5360	3234	5404	4418	6061	5922
238	YE35B2	SE40M_30	33500	Secret Ravine	Reach 1	34866	King Road Tributary Confluence	3516	5266	3159	5298	4199	5957	5856
239	USE35A	SE40M_30	38600	Secret Ravine	Reach 1	38066	King Road-no ras	2846	4486	2291	4530	3402	4970	4910
241	YE35B2	SE40M_30	40000	Secret Ravine	Reach 1	40346	Penryn Road	2804	4425	2214	4412	3364	4853	4796
242	YSE30E	SE40M_30	40500	Secret Ravine	Reach 1	NONE	Harris/Boulder Creek Road.	2792	4032	1960	4070	3353	4537	4475

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243	VSE26I	SE40M_30	40700	Secret Ravine	Reach 1	NONE	Penryn Tributary Confluence	2800	3844	1851	3883	3359	4341	4273
244	VSE26H	SE40M_30	43300	Secret Ravine	Reach 1	NONE	Boulder Creek Road	2338	1317	663	1318	2791	1451	1448
245	VE26N2	SE40M_30	48500	Secret Ravine	Reach 1	NONE	Brennans Road	1341	1242	634	1242	1586	1383	1383
246	VE26N2	SE40M_30	48900	Secret Ravine	Reach 1	NONE	Rock Springs Road	1308	1242	634	1242	1551	1383	1383
247	USE26E	SE40M_30	50400	Secret Ravine	Reach 1	NONE	Meadow Lane	1206	1030	483	1030	1448	1151	1148
248	UE26BB	SE40M_30	51300	Secret Ravine	Reach 1	NONE	Los Puentes Road	1227	983	462	983	1596	1104	1101
249	VE25IA	SE40M_30	55300	Secret Ravine	Reach 1	NONE	Newcastle Road	1071	1001	466	1002	1477	1129	1127
250	UE25AB	SE40M_30	57700	Secret Ravine	Reach 1	NONE	Powerhouse Road	750	896	415	897	1034	1015	1014
Secret Ravine/Sucker Ravine														
251	UXE70I	SE40N_0	0	Sucker Ravine	Reach 1	0	Secret Ravine Confluence	1345	548	558	587	1545	766	738
252	USE76A	SE40N_0	1000	Sucker Ravine	Reach 1	840	China Garden Road	1340	581	564	597	1539	790	754
253	YSE76B	SE40N_0	1200	Sucker Ravine	Reach 1	1305	Interstate 80	1338	581	564	598	1537	791	755
254	YSE76B	SE40N_0	2200	Sucker Ravine	Reach 1	1860	Oakridge Street	1337	594	576	613	1536	818	785
255	YSE76B	SE40N_0	2600	Sucker Ravine	Reach 1	2750	Lakeside Drive	1356	597	577	616	1572	830	799
256	USE70I	SE40N_0	3950	Sucker Ravine	Reach 1	4110	Rocklin Road	1365	586	610	617	1598	826	795
257	USE70H	SE40N_0	4300	Sucker Ravine	Reach 1	4580	Quary Lake	1354	563	566	584	1587	802	771
258	YSE70H	SE40N_0	4700	Sucker Ravine	Reach 1	4840	Super Span	1343	563	566	584	1577	802	771
259	USE70F	SE40N_0	7450	Sucker Ravine	Reach 1	7605	Sierra Meadows Drive	1310	543	478	567	1545	787	756
1259	YSE70B	SE40N_0	0	Sucker Ravine	Reach 1	9955	Culvert 1	#N/A	470	404	499	#N/A	741	699
1260	YSE70D	SE40N_0	0	Sucker Ravine	Reach 1	10565	Driveway Below Dominguez Road	#N/A	471	407	500	#N/A	748	715
260	YSE70C	SE40N_0	10800	Sucker Ravine	Reach 1	10935	Dominguez Road	1223	473	404	503	1560	810	771
261	UE60E2	SE40N_0	11000	Sucker Ravine	Reach 1	10935	Loomis Tributary Confluence	1244	473	404	503	1562	810	771
263	YSE66J	SE40N_0	13400	Sucker Ravine	Reach 1	14525	Pacific Street	697	279	172	409	594	506	480
1263	USE66J	SE40N_0	0	Sucker Ravine	Reach 1	14756	Railroad	#N/A	280	171	412	#N/A	508	482
1264	USE66D	SE40N_0	0	Sucker Ravine	Reach 1	16706	Culvert 5	#N/A	344	211	546	#N/A	568	564
264	USE66D	SE40N_0	14800	Sucker Ravine	Reach 1	16846	Bankhead Road	638	344	211	546	548	568	564
265	YSE66C	SE40N_0	15200	Sucker Ravine	Reach 1	17266	Sierra College Blvd.	619	331	204	537	533	555	552
266	USE66A	SE40N_0	19000	Sucker Ravine	Reach 1	20671	Saunders Avenue	606	603	272	900	754	695	695
267	SE65	SE40N_0	20200	Sucker Ravine	Reach 1	22546	King Road	618	481	244	746	776	481	481
Secret Ravine/Sucker Ravine/Loomis Tributary														
268	VSE60E	SE40N_0	0	0	0	NONE	Sucker Ravine Confluence	434	496	242	486	827	716	722
270	VE60D2	SE40N_0	4400	0	0	NONE	Sierra College Blvd.	238	425	196	419	456	550	545
Secret Ravine/Aguilar Road Tributary														
271	Y56AB2	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	733	652	4003	629	994	789	922
272	Y56AB2	SE40N_0	700	0	0	NONE	Aguilar Road	706	652	607	629	950	789	922
273	YSE56B	SE40N_0	2400	0	0	NONE	Foothill Road	654	536	593	618	863	775	806
274	Y55MA2	SE40N_0	4100	0	0	NONE	El Don Road	614	395	414	420	798	501	495
275	UE56DB	SE40N_0	4100	0	0	NONE	El Don Detention Pond	605	393	410	394	786	463	473
276	VSE55L	SE40N_0	6100	0	0	NONE	Sierra College Blvd.	537	320	322	320	668	390	395
Secret Ravine / Loomis Tributary														
277	YSE40J	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	565	490	3247	603	842	676	660

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	200-year 1989 JMM	200-year 1992 Corrected	January 1995	200-year 2007-Current	200-year Future JMM	200-year Future Unmitigated	200-year Build-out w/LID & Projects
278	YSE40J	SE40N_0	1200	0	0	NONE	Interstate 80	522	490	246	603	778	676	660
279	VSE40I	SE40N_0	2800	0	0	NONE	Laird Street	492	431	207	534	732	554	554
280	VSE40F	SE40N_0	3600	0	0	NONE	King Road	461	319	158	398	686	398	398
Secret Ravine/King Road Tributary														
281	USE45W	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	1584	1428	3247	1428	1727	1566	1553
282	YSE45Q	SE40M_30	3900	0	0	NONE	Rancho Verde Road	1471	697	422	697	1607	794	792
283	YSE45A	MR15J_30	5400	0	0	NONE	Val Verde Road	483	578	321	578	576	693	684
284	USE44B	MR15J_30	6300	0	0	NONE	King Road	435	510	277	510	518	633	621
Secret Ravine/Penryn Tributary														
285	YE15L2	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	1151	2579	1205	2615	1603	2979	2911
286	USE7H2	SE40M_30	4700	0	0	NONE	Rock Springs Road	1203	2131	956	2171	1757	2491	2428
287	YSE5F2	SE40M_30	5600	0	0	NONE	East/West Forks Confluence	1046	1929	868	1971	1637	2295	2222
Secret Ravine/ E. Fork Penryn Tributary														
288	VSE5F2	SE40M_30	0	0	0	NONE	West Fork Confluence	293	678	324	705	403	812	769
289	YSE5F	SE40M_30	900	0	0	NONE	Fairview Lane	263	680	326	707	361	814	770
290	YE20BS	SE40M_30	3700	0	0	NONE	Gilardi Road	108	520	244	549	148	653	614
Secret Ravine/W. Fork Penryn Tributary														
291	YSE7D	SE40M_30	0	0	0	NONE	East Fork Confluence	700	1359	554	1380	1137	1625	1591
292	YSE10A	SE40M_30	200	0	0	NONE	Interstate 80	697	1345	548	1366	1131	1611	1578
293	YE10BB	SE40M_30	1400	0	0	NONE	Girardi Road	662	1292	538	1316	1159	1570	1537

Table G.3 100-YEAR EVENT

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	100-year 1989 JMM	100-year 1992 Corrected	100-year 2007-Current	100-year Future JMM	100-year Future Unmitigated	100-year Build-out w/LID & Projects
DRY CREEK													
1	VC135B	SE40N_0	8900	Dry Creek	Below Cirby	NONE	Rio Linda Blvd(North and South)	14182	11852	12200	15642	12854	12596
2	Y130B2	SE40N_0	15000	Dry Creek	Below Cirby	NONE	Elkhorn Blvd. (North and South)	14183	11887	12241	15637	12898	12640
3	YC125B	SE40N_0	16600	Dry Creek	Below Cirby	NONE	Curved Bridge Road (North)	14173	11988	12352	15626	13018	12757
4	YC125A	SE40N_0	17400	Dry Creek	Below Cirby	NONE	Dry Creek Road (North and South)	14171	11960	12330	15623	12994	12734
5	YDC115	SE40N_0	24400	Dry Creek	Below Cirby	NONE	Q Street (North and South)	14228	12032	12411	15668	13080	12820
6	YDC90	SE40N_0	34900	Dry Creek	Below Cirby	NONE	Sierra Creek Confluence	14184	11975	12357	15612	13030	12778
7	YDC85	SE40N_0	35200	Dry Creek	Below Cirby	NONE	28th Street (South)	14051	12018	12403	15435	13074	12823
8	YDC85	SE40N_0	35400	Dry Creek	Below Cirby	NONE	Elverta Road	14028	12018	12403	15406	13074	12823
9	YDC71B	SE40N_0	36900	Dry Creek	Below Cirby	38733	Confluence with County Line Trib	14048	12571	12616	15414	13079	12237
11	YDC75C	SE40N_0	41400	Dry Creek	Below Cirby	41634	Watt Avenue	14007	12569	12606	15531	13077	12232
13	YC65I2	SE40N_0	47700	Dry Creek	Below Cirby	47754	Confluence with DC65 Trib	14029	12523	12549	15348	13030	12184
14	YDC60A	SE40N_0	50300	Dry Creek	Below Cirby	50025	Walerga Road	13973	12549	12575	15278	13059	12199
1015	YDC50A	SE40N_0	0	Dry Creek	Below Cirby	55005	Morgan Creek Ped Crossing	#N/A	12568	12606	#N/A	13078	12214
16	YDC35C	SE40N_0	58800	Dry Creek	Below Cirby	58560	Cook Riolo Road	13950	12615	12669	15208	13124	12253
17	YDC25A	CC5G_90	67000	Dry Creek	Below Cirby	67583.80	S.P. Railroad Bridge	13767	10099	9952	14932	10497	9829
18	YDC10D	SE40N_0	67400	Dry Creek	Below Cirby	67641.80	Atkinson Blvd.	13767	12625	12915	14932	13509	12277
20	YDC20A	SE40N_0	68900	Dry Creek	Below Cirby	69138.40	S.P. Railroad Culverts (now bridge)	13764	12614	12919	14916	13506	12270
21	YDC10D	SE40N_0	69900	Dry Creek	Below Cirby	70071.60	Vernon Street	13706	12635	12970	14830	13535	12276
22	YDC10B	SE40N_0	72600	Dry Creek	Below Cirby	72702.60	Riverside Avenue	13825	8562	8727	15181	8812	8633
23	YDCCC	SE40N_0	73000	Dry Creek	Below Cirby	72982	Cirby Creek Confluence	13825	8582	8753	15181	8811	8648
24	YDC5A	SE40M_30	73800	Dry Creek	Above Cirby	73943.30	Darling Way	10370	10634	10348	11272	10870	10045
25	YDC5C	SE40M_30	77000	Dry Creek	Above Cirby	77218.89	Douglas Blvd.	10365	10666	10363	11262	10879	10058
26	UDC5B	SE40M_30	77500	Dry Creek	Above Cirby	77606.49	Royer Park Footbridge	10476	10663	10362	11358	10880	10058
27	YDC5B	SE40M_30	79100	Dry Creek	Above Cirby	79166.05	Lincoln Street	10474	10638	10385	11354	10862	10088
28	YDC4C	SE40M_30	79400	Dry Creek	Above Cirby	79816.70	Folsom Road	10479	10638	10395	11349	10863	10097
30	YACMR	SE40M_30	84100	Dry Creek	Above Cirby	84214.40	Antelope Creek/ Miners Ravine Confluence	10462	10694	10458	11312	10935	10165
DRY CREEK - ELVERTA TRIB													
31	UDC90	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	344	180	180	467	200	199
DRY CREEK - SIERRA CREEK													
32	YC100B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	1575	802	823	1984	956	941
33	YC100A	CC5G_90	1400	0	0	NONE	28th Street	1539	816	839	1942	971	953
34	YC100A	CC5G_90	3700	0	0	NONE	Scotland Drive	1456	816	839	1843	971	953
35	VC96B2	CC5G_90	5400	0	0	NONE	Delaney Drive	1419	737	760	1816	880	862
36	YDC96A	CC5G_90	6800	0	0	NONE	Watt Avenue	1350	630	649	1774	765	750
37	VDC96C	CC5G_90	10300	0	0	NONE	Navaho Way	831	448	468	1041	570	555
38	YDC96C	CC5G_90	11400	0	0	NONE	Elverta Road	714	449	470	884	574	557
39	DC95A	CC5G_90	13500	0	0	NONE	Walerga Road	596	69	69	727	103	100

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	100-year 1989 JMM	100-year 1992 Corrected	100-year 2007-Current	100-year Future JMM	100-year Future Unmitigated	100-year Build-out w/LID & Projects
DRY CREEK/County Line Trib. (Note: Riolo Vineyards project determined this tributary does not drain as previously modeled - corrected in 2009 study)													
40	YDC75B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	671	532	544	982	630	625
41	N/A	#N/A	3200	0	0	NONE	Watt Avenue	630471	#N/A	#N/A	960	#N/A	#N/A
42	VDC68B	CC5G_90	8200	0	0	NONE	PFE Road	0	469	483	762	532	527
Dry Creek DC-65 Tributary													
43	YDC65I	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	484	393	448	524	474	483
44	YDC65K	CC5G_90	3000	0	0	NONE	Walerga Road	387	362	426	419	446	447
Cirby Creek													
45	YCC45G	LC40L_30	0	Cirby Creek	below Linda	0	Dry Creek Confluence	4126	3024	3225	4613	3303	3256
46	YCC45A	LC40L_30	3000	Cirby Creek	below Linda	2969.699	Interstate 80	4106	3067	3283	4592	3359	3295
48	UCC45E	LC40L_30	4600	Cirby Creek	below Linda	4580.699	Wanda Lee Court Footbridge	4118	3084	3269	4614	3367	3281
49	YCC45E	LC40L_30	6100	Cirby Creek	Above Linda	6009.699	Linda Creek Confluence	4113	3096	3258	4614	3376	3274
50	YCC40A	CC5G_90	7400	Cirby Creek	Above Linda	7262.099	Sunrise Blvd.	793	677	885	1098	901	898
51	YCC40C	CC5G_90	8100	Cirby Creek	Above Linda	8038.899	Coloma Way - Gage 1635	842	758	932	1113	943	941
52	YC40G2	CC5G_90	9100	Cirby Creek	Above Linda	9004.399	Oak Ridge Drive	866	705	882	1138	893	892
53	UCC35D	CC5G_90	10000	Cirby Creek	Above Linda	9873.999	Sierra Gardens Footbridge	860	759	973	1132	988	986
54	YCC15B	CC5G_90	11800	Cirby Creek	Above Linda	11679.19	Loretto Drive	851	792	1108	1135	1121	1120
55	YCC252	CC5G_90	12000	Cirby Creek	Above Linda	12228.79	Sierra Gardens Trib. Confluence	867	569	878	1135	891	890
56	YCC15C	CC5G_90	12500	Cirby Creek	Above Linda	12377.29	Sierra Gardens Drive	696	568	880	969	894	894
57	YCC10E	CC5G_90	13900	Cirby Creek	Above Linda	13765.49	Huntington Drive	659	457	476	984	478	479
58	UCC10H	CC5G_90	14500	Cirby Creek	Above Linda	14420.19	Rocky Ridge Drive	409	334	503	565	519	520
60	YCC5B	CC5G_90	16400	Cirby Creek	Above Linda	15748.19	Winchester Way	356	251	395	505	400	401
61	YCC5D	CC5G_90	17200	Cirby Creek	Above Linda	16312.19	Eureka Road	357	171	308	557	312	313
62	YCC1A	CC5G_90	19700	Cirby Creek	Above Linda	17753.79	Douglas Blvd.	215	126	259	435	269	269
Cirby Creek/Sierra Gardens Trib.													
63	VCC25	CC5G_90	0	0	0	NONE	Cirby Creek Confluence	141	264	277	172	280	279
65	YCC20G	CC5G_90	1000	0	0	NONE	Douglas Blvd.	147	182	200	150	204	203
66	YCC20K	CC5G_90	1400	0	0	NONE	Sierra Gardens Ret. Basin	140	212	318	143	337	333
Linda Creek													
67	ULC95C	LC40L_30	0	Linda Creek	Below Strap	0.	Cirby Creek Confluence	3972	2682	2728	4464	2755	2731
68	ULC95D	LC40L_30	1000	Linda Creek	Below Strap	565.1000	Sunrise Avenue	3970	2684	2730	4461	2759	2733
70	YLC90A	LC40L_30	2600	Linda Creek	Below Strap	2125.000	Oak Ridge Drive	3991	3124	3188	4565	3358	3203
72	ULC90B	LC40L_30	4300	Linda Creek	Below Strap	3843.300	Sierra Gardens Footbridge	3985	3156	3389	4555	3572	3406
73	YLC85C	LC40L_30	8400	Linda Creek	Below Strap	8257.900	Rocky Ridge Dirve	4159	3509	3744	4624	3959	3772
74	ULC85B	LC40L_30	10000	Linda Creek	Below Strap	9810.000	Strap Ravine Confluence	4097	3520	3786	4538	4009	3823
76	ULC80I	LC40L_30	11500	Linda Creek	Below S Branch	136	Champion Oaks Drive/Samoa Way (Gage 1626/1628)	3297	2158	2229	3612	2245	2191
78	ULC80A	LC40L_30	14300	Linda Creek	Below S Branch	157	Auburn Road	3343	2657	2954	3649	3155	2962
79	UC45J3	LC40L_30	15700	Linda Creek	Below S Branch	176	Old Auburn Road/City Limits	3285	2142	2435	3577	2610	2476
1079	ULC45J	LC40L_30	0	Linda Creek	Below S Branch	181	Ped Bridge over Creek in Park	#N/A	2054	2348	#N/A	2518	2390

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	100-year 1989 JMM	100-year 1992 Corrected	100-year 2007-Current	100-year Future JMM	100-year Future Unmitigated	100-year Build-out w/LID & Projects
Treelake Tributary Confluence													
80	ULC45J	LC40L_30	15900	Linda Creek	Below S Branch	181	Treelake Tributary Confluence	3285	2054	2348	3577	2518	2390
82	UC45J2	LC40L_30	19800	Linda Creek	Below S Branch	188	Indian Creek Drive	2489	2044	2330	2774	2503	2377
1082	ULC45D	LC40L_30	0	Linda Creek	Below S Branch	207	Private Bridge Near Hazel	#N/A	1841	2150	#N/A	2379	2238
83	ULC45D	LC40L_30	25300	Linda Creek	Below S Branch	211	Hazel Avenue	2220	1845	2150	2465	2384	2249
84	UC35Q3	LC40L_30	25500	Linda Creek	Below S Branch	212	Orangevale Tributary Confluence	2220	1845	2150	2465	2384	2249
1084	ULC40A	LC40L_30	0	Linda Creek	Above S Branch	3.075	BDG 17 2-24" CMPS	#N/A	1299	1437	#N/A	1631	1482
85	UC15N2	LC40L_30	31300	Linda Creek	Above S Branch	4.239	Granite Road Bridge	1251	1082	1226	1380	1418	1253
86	ULC15N	LC40L_30	32600	Linda Creek	Above S Branch	4.407	Cherry Avenue	1230	1060	1193	1351	1389	1216
1086	ULC15J	LC5A_0	0	Linda Creek	Above S Branch	5.22	Private Driveway Concrete Box Type	#N/A	780	834	#N/A	827	580
1087	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.264	Driveway Bridge	#N/A	780	834	#N/A	824	580
1088	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.526	Granite Glen Court (Private)	#N/A	782	840	#N/A	826	580
88	YLC15J	LC5A_0	38600	Linda Creek	Above S Branch	5.715	Wedgewood Drive	887	812	878	1031	849	582
1089	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.039	Golf Cart Bridge #5	#N/A	740	808	#N/A	790	618
1090	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.12	Golf Cart Bridge #4	#N/A	741	809	#N/A	791	622
1091	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.197	Golf Cart Bridge #3	#N/A	742	810	#N/A	791	624
1092	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.241	Golf Cart Bridge #2	#N/A	742	810	#N/A	791	624
1093	ULC5F2	LC5A_0	0	Linda Creek	Above S Branch	6.515	Golf Cart Bridge #1	#N/A	743	752	#N/A	773	627
89	ULC5F2	LC5A_0	42300	Linda Creek	Above S Branch	6.53	East Roaseville Parkway	809	743	752	995	772	626
90	ULC5F	LC5A_0	43100	Linda Creek	Above S Branch	6.759	Barton Road	762	721	733	943	777	613
91	YLC5E	LC5A_0	44600	Linda Creek	Above S Branch	7.140	Shadow Brook Place	642	632	646	797	681	439
92	ULC5B	LC5A_0	46500	Linda Creek	Above S Branch	7.479	Troy Purdy Lane	473	545	559	640	595	331
1094	ULC5C	LC5A_0	0	Linda Creek	Above S Branch	7.609	Muir Way	#N/A	441	458	#N/A	508	289
93	YLC5C	LC5A_0	48100	Linda Creek	Above S Branch	7.77	Country Court (Private)	390	442	451	553	488	291
1095	ULC1A	LC5A_0	0	Linda Creek	Above S Branch	7.839	Country Court	#N/A	893	1186	#N/A	1227	1213
94	YLC1A	LC5A_0	48700	Linda Creek	Above S Branch	8.011	Auburn Folsom Road	349	453	466	510	499	294
Linda Creek/Strap Ravine													
95	USR25C	CC5G_90	0	Strap Ravine	Reach 1	0.	Linda Creek Confluence	915	861	1158	1050	1191	1172
1095	YSR25A	CC5G_90	300	Strap Ravine	Reach 1	276	Foot Bridge in Park	#N/A	893	1186	#N/A	1227	1213
96	UR20A4	CC5G_90	1500	Strap Ravine	Reach 1	1136.900	McClaren Drive (Gage 1611)	920	919	1191	1054	1250	1227
97	UXR20A	CC5G_90	5900	Strap Ravine	Reach 1	5539.100	Johnson Ranch Drive	916	851	1199	1053	1213	1197
98	USR152	CC5G_90	6800	Strap Ravine	Reach 1	6380.600	Eureka Road	915	852	1205	1053	1214	1197
99	USR82	CC5G_90	8600	Strap Ravine	Reach 1	8201.500	East Roseville Parkway	905	727	852	1060	937	996
100	USR5C2	LC5A_0	11800	Strap Ravine	Reach 1	11366.10	Sierra College Blvd.	854	512	684	1112	751	808
101	USR1A	LC5A_0	23000	0	0	NONE	Barton Road	652	556	1061	1020	916	989
Linda Creek/Treelake Tributary													
102	ULC60B	LC40L_30	0	0	0	NONE	Linda Creek Confluence	847	540	636	958	718	698
103	YLC60B	LC40L_30	3200	0	0	NONE	Petite Way (approximated)	793	558	662	888	751	729
104	YLC60A	LC40L_30	5700	0	0	NONE	Old Auburn Road	802	501	620	982	706	686
105	YC55H3	LC40L_30	6000	0	0	NONE	Sierra College Blvd.	797	546	695	985	797	775
106	YLC55F	LC40L_30	9600	0	0	NONE	Swan Lake Drive	579	478	673	699	772	756
107	UC55L2	LC40L_30	9600	0	0	NONE	Swan Lake	579	446	650	699	746	732

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108	UPC55L	LC40L_30	10800	0	0	NONE	Waterbury Way	496	466	676	589	773	755
109	YLC55L	LC40L_30	10800	0	0	NONE	Waterbury Lake	496	518	724	589	823	804
110	ULC50E	LC40L_30	11400	0	0	NONE	East Roaseville Parkway	429	415	544	503	638	609
111	YLC50E	LC40L_30	11400	0	0	NONE	East Roseville Parkway Pond	429	437	604	503	701	656
112	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane	429	381	471	503	557	530
113	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane Pond	429	381	471	503	557	530
Linda Creek/Hazel Avenue Tributary (Sac County)													
114	YC35Q2	LC40L_30	0	0	0	NONE	Linda Creek Confluence	708	583	760	879	817	811
115	UC35Q2	LC40L_30	400	0	0	NONE	Oak Avenue	708	583	760	879	817	811
Linda Creek/Orangevale Tributary (Sac County)													
116	YC35Q2	LC40L_30	0	Linda Creek	South Branch	.001	Linda Creek Confluence	1298	554	818	1393	887	862
1116	YLC35Q	LC40L_30	0	Linda Creek	South Branch	0.125	Private Bridge (Metal and Concrete)	#N/A	609	821	#N/A	937	974
117	ULC35Q	LC40L_30	900	Linda Creek	South Branch	0.196	Oak Avenue	664	612	849	711	933	927
1117	ULC30E	LC40L_30	0	Linda Creek	South Branch	1.022	Private Bridge in Park Area	#N/A	297	459	#N/A	511	511
118	ULC30E	LC40L_30	3300	Linda Creek	South Branch	1.035	Filbert Avenue	624	297	459	668	511	512
1118	ULC30B	LC40L_30	0	Linda Creek	South Branch	1.244	Private Bridge Near Chestnut	#N/A	280	428	#N/A	468	469
119	UC30C2	LC40L_30	4300	Linda Creek	South Branch	1.346	Chestnut Avenue	689	266	412	750	449	451
120	ULC30A	LC40L_30	5500	Linda Creek	South Branch	1.649	Walnut Avenue (North)	297	221	308	298	346	354
120	UC20E3	LC40L_30	5500	Linda Creek	South Branch	1.772	Walnut Avenue (South)	297	221	308	298	346	354
121	VLC25C	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (North)	223	44	62	224	68	68
1121	VLC20E	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (South)	#N/A	183	254	#N/A	281	279
Antelope Creek													
122	UDC4D	AC5I_60	0	Antelope Ck	AntelopeBlwClove	0.	Miners Ravine/Dry Creek	3075	3605	3586	3486	3918	3557
123	UC45B2	AC5I_60	1400	Antelope Ck	AntelopeBlwClove	1394.899	Harding Blvd.	3074	3613	3632	3485	3925	3605
124	UAC45B	AC5I_60	2300	Antelope Ck	AntelopeBlwClove	2349.499	Atlantic Street	3072	3612	3595	3483	3973	3560
1124	UAC45B	AC5I_60	0	Antelope Ck	AntelopeBlwClove	2455.599	Bridge #3	#N/A	3603	3588	#N/A	3974	3555
125	UAC45L	AC5I_60	5000	Antelope Ck	AntelopeBlwClove	5017.599	County Dump Road	3065	3638	3625	3477	4057	3795
126	UC41E4	AC5I_60	9600	Antelope Ck	AntelopeBlwClove	10909.49	Highway 65 - non ras (Gage 1583)	3086	3630	3616	3500	4095	4035
127	UC41E3	AC5I_60	10300	Antelope Ck	AntelopeBlwClove	11383.53	Springview Drive	3176	3611	3600	3612	4079	4019
128	YC41E2	AC5I_60	10800	Antelope Ck	AntelopeBlwClove	11418.53	Rocklin City Tributary Confluence	3161	3607	3594	3592	4073	4014
130	UC40K2	AC5I_60	15800	Antelope Ck	AntelopeBlwClove	16930.03	Sunset Blvd.	3104	3572	3558	3519	4022	3987
133	UV10B2	AC5I_60	22800	Antelope Ck	AntelopeBlwClove	24722.3	Clover Valley Creek Confluence	3165	3587	3573	3593	4162	4125
134	UC35G3	AC5I_60	23600	Antelope Ck	Reach 1	25350.71	Midas Avenue	2330	2982	2989	2703	3026	3017
135	UAC35C	AC5I_60	25700	Antelope Ck	Reach 1	27696.03	Southern Pacific Railroad (UPRR) - non ras	2310	2978	2988	2683	3033	3026
136	VAC35I	AC5I_60	26500	Antelope Ck	Reach 1	28434.67	Yankee Hill Road	2303	2968	2979	2676	3026	3016
137	YAC30C	AC5I_60	27600	Antelope Ck	Reach 1	34226	Atkinson Dairy Dam	2283	2870	2886	2655	2959	2954
138	YAC30B	AC5I_60	28900	Antelope Ck	Reach 1	34691	Unnamed Road - no ras - no find aerial	2262	2813	2830	2634	2911	2907
139	YAC30B	AC5I_60	31800	Antelope Ck	Reach 1	35656	Delmar Avenue - no ras	2242	2817	2831	2607	2914	2910
140	YAC30B	AC5I_60	34300	Antelope Ck	Reach 1	36964	Sierra College Blvd. (Gage 1573)	2180	2819	2834	2541	2914	2912
141	U30AC4	AC5I_60	37000	Antelope Ck	Reach 1	39726	King Road	2137	2912	2931	2485	3055	3045
Antelope Creek / Clark Tunnel Road Tributary													

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142	U30AC2	AC5I_60	0	Antelope Ck	Reach 1	40906	Antelope Creek Confluence	2132	2860	2882	2496	3007	2987
143	UC25BC	AC5I_60	100	0	0	NONE	Barker Road	1268	915	915	1603	947	944
144	VAC20C	AC5I_60	1300	0	0	NONE	Humphrey Road	1155	617	617	1537	654	656
145	YC16EB	AC5I_60	1700	0	0	NONE	Humphrey Tributary Confluence	1136	507	507	1510	546	546
148	UC15CB	AC5I_60	7000	0	0	NONE	Colwell Road	811	308	308	1174	328	328
149	YC15BC	AC5I_60	10000	0	0	NONE	English Colony Way	759	259	259	1152	262	262
150	AC15AD	AC5I_60	12800	0	0	NONE	Clark Tunnel Road	297	187	187	515	189	189
Antelope Creek/Rocklin City Tributary													
151	VAC41E	CC5G_90	0	0	0	NONE	Antelope Creek Confluence	190	548	548	243	605	597
152	VAC41F	SE40M_30	2700	0	0	NONE	Taylor Road	142	212	212	182	262	258
153	VAC41F	SE40M_30	2800	0	0	NONE	Taylor Road	119	212	212	152	262	258
154	UAC41A	SE40M_30	4500	0	0	NONE	Sunset Blvd.	71	117	117	91	161	157
Antelope Creek/Clover Valley Creek													
155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	.1	Antelope Creek Confluence	857	987	958	934	1135	1103
1155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	155	Golf Course Ped Bridge	#N/A	981	953	#N/A	1138	1103
156	UCV10B	AC5I_60	400	Clover Valley	Clover Valley1	445	Argonaut Avenue	855	977	950	931	1141	1102
157	YCV10B	AC5I_60	2200	Clover Valley	Clover Valley1	2785	Footbridge and Weir	842	989	965	915	1153	1107
158	UXV10A	AC5I_60	4300	Clover Valley	Clover Valley1	4090	Midas Avenue	837	973	948	908	1127	1085
159	YCV10A	AC5I_60	4700	Clover Valley	Clover Valley1	4430	Abandoned Stone Bridge	837	973	949	908	1127	1086
160	YCV10A	AC5I_60	5600	Clover Valley	Clover Valley1	5400	Unnamed Bridge	829	932	911	898	1083	1048
1160	UV6CB2	AC5I_60	0	Clover Valley	Clover Valley1	6365	Gazebo Crossing	#N/A	932	911	#N/A	1085	1051
161	UCV6CB	AC5I_60	6500	Clover Valley	Clover Valley1	6505	Clover Valley Detention Pond	825	932	911	892	1085	1051
162	YV6CB2	AC5I_60	7700	Clover Valley	Clover Valley1	7815	Creekwood Drive	817	933	912	882	1087	1052
163	UCV6BC	AC5I_60	12000	Clover Valley	Clover Valley1	12015	Rawhide Road	744	869	864	819	1030	1001
164	UCV6BC	AC5I_60	12500	Clover Valley	Clover Valley1	12550	Rowhide Road Det. Pond	734	873	868	810	1032	1006
165	UCV5C	AC5I_60	25600	Clover Valley	Clover Valley1	NONE	Unnamed Road	478	758	758	576	950	904
166	UCV1T	AC5I_60	28000	Clover Valley	Clover Valley1	NONE	Sierra College Blvd.	422	502	502	519	599	599
167	VCV1T	AC5I_60	28500	Clover Valley	Clover Valley1	NONE	English Colony Way	422	399	399	519	848	765
Antelope Creek Continued (West Branch)													
169	UC25BC	AC5I_60	38700	0	0	NONE	Clark Tunnel Road Tributary Confluence	864	915	915	893	947	944
170	U25AD2	AC5I_60	40600	0	0	NONE	Barker Road	770	855	855	819	888	881
171	Y25AD2	AC5I_60	42500	0	0	NONE	Citrus Colony Road	732	881	881	800	918	913
172	YAC16A	AC5I_60	47900	0	0	NONE	English Colony Road	380	373	373	484	398	398
Antelope Creek/Humphrey Tributary													
173	UPAC5K	AC5I_60	0	0	0	NONE	Clark Tunnel Road Tributary Confluence	364	311	311	462	313	313
174	VAC5J2	AC5I_60	1700	0	0	NONE	Sandy Road	255	328	328	323	330	330
175	VAC5O	AC5I_60	3300	0	0	NONE	Mardell Lane	218	53	53	277	53	53
176	UPAC5G	AC5I_60	3700	0	0	NONE	Colwell Road	182	235	235	231	238	238
177	YAC5E	AC5I_60	6300	0	0	NONE	English Colony Way	109	202	202	138	206	206
Miners Ravine													

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178	UMR40E	SE40M_30	0	Miners Ravine	Below Secret	10.	Antelope Creek/Dry Creek	7844	7427	7203	8428	7322	7203
179	UMR40E	SE40M_30	200	Miners Ravine	Below Secret	94.	Harding Blvd.	7843	7427	7203	8424	7322	7203
180	YMR40E	SE40M_30	1500	Miners Ravine	Below Secret	659.8999	Interstate 80 - no ras	7837	7426	7208	8412	7319	7208
181	YMR40B	SE40M_30	2800	Miners Ravine	Below Secret	1422.400	Eureka Way	7842	7416	7198	8409	7311	7200
182	YSEMR	SE40M_30	3800	Miners Ravine	Below Secret	3734.100	Secret Ravine Confluence	7815	7407	7193	8344	7303	7195
183	YMR37D	MR15J_30	5300	Miners Ravine	BET SECRET-FALSE	5674.100	Sunrise Avenue - no ras	6149	2576	2423	6642	2593	2577
184	UR37D4	MR15J_30	7000	Miners Ravine	BET SECRET-FALSE	7319.900	Boardman Tributary	1594	2575	2422	1814	2592	2577
185	UR36N2	MR15J_30	9000	Miners Ravine	Above False	9828.100	East Roseville Parkway	3885	2506	2373	4468	2533	2520
186	UMR31Q	MR15J_30	18200	Miners Ravine	Above False	18310.19	Sierra College Blvd.	3847	2522	2327	4465	2482	2473
187	YR31Q2	MR15J_30	18300	Miners Ravine	Above False	18610	Cavitt Stallman Tributary - no ras	3847	2527	2486	4465	2780	2885
188	UMR31G	MR15J_30	18600	Miners Ravine	Above False	18685	Cavitt (&) Stallman Road	3241	2332	2299	3823	2539	2635
190	UR31P2	MR15J_30	23400	Miners Ravine	Above False	23390	Shadow Oaks Lane	3171	2298	2281	3745	2441	2431
1190	YMR31D	MR15J_30	0	Miners Ravine	Above False	27990.	Hardy Lane	#N/A	2277	2264	#N/A	2422	2416
191	UMR31D	MR15J_30	28900	Miners Ravine	Above False	28826	Barton Road	3101	2277	2265	3671	2422	2416
192	UMR30R	MR15J_30	31300	Miners Ravine	Above False	31379	TallPine Lane	3041	2270	2262	3603	2414	2408
193	UMR30Q	MR15J_30	33000	Miners Ravine	Above False	32984	Carolinda Drive	2982	2270	2262	3535	2413	2407
194	UMR30P	MR15J_30	34800	Miners Ravine	Above False	34813	Itchy Acres Road	2936	2280	2279	3484	2427	2413
196	UR30H2	MR15J_30	35500	Miners Ravine	Above False	35489	Miners Ravine Road	2909	2283	2284	3453	2433	2417
197	UR30H3	MR15J_30	36800	Miners Ravine	Above False	36790	Leibinger Lane	2881	2268	2275	3421	2456	2452
199	UR29B2	MR15J_30	39700	Miners Ravine	Above False	39765	Auburn Folsom Road	2766	2298	2313	3278	2460	2457
200	UXR29H	MR15J_30	41700	Miners Ravine	Above False	40276	Oak Lane	2706	2337	2327	3206	2538	2469
201	UR29I2	MR15J_30	43000	Miners Ravine	Above False	44240	Old Bridge	2689	2402	2366	3210	2562	2562
202	YMR29I	MR15J_30	43200	Miners Ravine	Above False	44240	Cottonwood Lake	2680	2402	2366	3202	2562	2562
203	UMR21C	MR15J_30	44400	Miners Ravine	Above False	44368	Auburn Folsom Road	2694	2358	2378	3204	2489	2480
1203	YMR21C	MR15J_30	0	Miners Ravine	Above False	44523	Driveway opposite Twin Rocks Road	#N/A	2313	2335	#N/A	2440	2434
204	YMR21D	MR15J_30	45600	Miners Ravine	Above False	45593	Confluence with Lake Tributary (MR15)	2568	2315	2335	3061	2444	2442
1204	UXR20R	MR15J_30	0	Miners Ravine	Above False	52637	Bridge 15	#N/A	1884	1899	#N/A	1990	1985
1205	UXR20Q	MR15J_30	0	Miners Ravine	Above False	53992	Bridge 16	#N/A	1857	1869	#N/A	1960	1958
205	UR20P2	MR15J_30	56000	Miners Ravine	Above False	55052	Moss Lane	2468	1899	1910	2967	1984	1978
1206	YR20K2	MR15J_30	0	Miners Ravine	Above False	57194	Bridge 18 So of Willow Valley Place	#N/A	1840	1848	#N/A	1921	1912
1207	YR20K2	MR15J_30	0	Miners Ravine	Above False	57599	Willow Valley Place	#N/A	1839	1850	#N/A	1923	1914
1208	UR20C2	MR15J_30	0	Miners Ravine	Above False	57984	Bridge 20 North of Willow Valley Place	#N/A	1808	1814	#N/A	1904	1895
207	UR15K2	MR15J_30	59900	Miners Ravine	Above False	59894	Dick Cook Road	1787	1714	1727	2277	1791	1780
208	UXR15V	MR15J_30	61500	Miners Ravine	Above False	61470	Auburn Folsom Road	1691	1514	1545	2154	1607	1585
209	UR15W2	MR15J_30	62400	Miners Ravine	Above False	62487	Placer Canyon Parkway	1596	1564	1574	2031	1659	1631
1209	Y15AE2	MR15J_30	0	Miners Ravine	Above False	64347	Lominda Lane	#N/A	1525	1531	#N/A	1638	1605
210	UXR15Q	MR15J_30	67600	Miners Ravine	Above False	67574	Horseshoe Bar Road	1299	1458	1463	1645	1593	1539
1210	UMR10M	MR15J_30	0	Miners Ravine	Above False	70394	Bridge 26	#N/A	1442	1449	#N/A	1586	1509
1211	UMR10M	MR15J_30	0	Miners Ravine	Above False	70984	Bridge 27	#N/A	1451	1453	#N/A	1597	1503
1212	UMR10I	MR15J_30	0	Miners Ravine	Above False	73328	Whiskey Bar Road	#N/A	1252	1253	#N/A	1369	1313
1213	UXR10E	MR15J_30	0	Miners Ravine	Above False	75238	Bridge 30	#N/A	1218	1218	#N/A	1360	1280
1214	UMMR5S	MR15J_30	0	Miners Ravine	Above False	75448	Bridge 31	#N/A	1091	1093	#N/A	1223	1159
1215	YMR10E	MR15J_30	0	Miners Ravine	Above False	76148	Bridge 32	#N/A	1100	1102	#N/A	1219	1170

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211	YMR10E	MR15J_30	71700	Miners Ravine	Above False	76613	Auburn Folsom Road	1008	1108	1111	1304	1230	1171
212	UPMR5R	MR15J_30	73300	Miners Ravine	Above False	78358	King Road	949	568	571	1234	611	606
213	YMR5W	MR15J_30	79400	Miners Ravine	Above False	79398	Penryn Rock Springs Road	277	482	482	376	535	535
214	YMR5P	MR15J_30	80200	Miners Ravine	Above False	80243	Newcastle Road	166	389	389	226	423	424
Miners Ravine/Boardman Tributary													
215	UR37D3	CC5G_90	0	0	0	NONE	Miners Ravine Confluence	414	421	771	530	810	809
216	UR35R6	CC5G_90	800	0	0	NONE	East Roseville Parkway	393	412	758	504	798	796
Miners Ravine/Cavitt & Stallman Tributary -													
217	UMR25L	SE40N_0	0	0	0	NONE	Miners Ravine Confluence	595	595	592	688	645	653
218	YR25M2	SE40N_0	2400	0	0	NONE	Hidden Valley Place	566	612	608	655	668	678
219	YMR25N	SE40N_0	3100	0	0	NONE	Baywood Road	537	604	601	621	659	670
220	YR25P2	SE40N_0	3700	0	0	NONE	S. Bar B Lane	508	592	588	588	648	657
221	YMR25D	SE40N_0	4500	0	0	NONE	Kokuia Lane	479	507	506	554	589	589
222	YMR25I	SE40N_0	5100	0	0	NONE	Crestview Lane	451	551	551	521	611	617
223	YMR24E	SE40N_0	9300	0	0	NONE	Barton Road	496	460	460	665	531	533
Miners Ravine/Lake Tributary (MR21) -													
224	UMR21H	MR15J_30	0	0	0	NONE	Miners Ravine Confluence	314	180	180	404	289	280
225	UMR21H	MR15J_30	200	0	0	NONE	Auburn Folsom Road	353	180	180	454	289	280
226	YMR21H	MR15J_30	300	0	0	NONE	South Lake Circle	353	214	214	454	346	330
Secret Ravine													
227	YSE85Q	SE40M_30	0	Secret Ravine	Below Sucker	1	Miners Ravine Confluence	4197	5447	5431	4332	5497	5401
228	YE85Y2	SE40M_30	1400	Secret Ravine	Below Sucker	798.3000	East Roseville Parkway	4196	5442	5427	4331	5493	5398
229	YE76A2	SE40M_30	13500	Secret Ravine	Below Sucker	14280.	Sucker Ravine Confluence	4151	5338	5345	4320	5441	5350
230	Y56AB3	SE40M_30	16200	Secret Ravine	Reach 1	17396	Aguiar Road Tributary Confluence	3706	4728	4640	4045	4719	4682
231	USE52D	SE40M_30	17600	Secret Ravine	Reach 1	18595.9	Rocklin Road - China Gardens	3374	4679	4641	3820	4697	4682
232	YSE51K	SE40M_30	23300	Secret Ravine	Reach 1	24526	Sierra College Blvd.	3375	4681	4687	3814	5011	4916
233	UE50Q2	SE40M_30	28800	Secret Ravine	Reach 1	30371	Private Road - Diaz	3183	4285	4328	3714	4873	4822
234	UE50P2	SE40M_30	29200	Secret Ravine	Reach 1	30801	Private Road	3171	4288	4328	3705	4876	4829
235	YE50F2	SE40M_30	30800	Secret Ravine	Reach 1	32256	Brace Road	3090	4219	4285	3649	4856	4803
236	YE50A2	SE40M_30	32600	Secret Ravine	Reach 1	34081	Horseshoe Bar Road	3088	4153	4218	3648	4779	4735
237	YE50A2	SE40M_30	33400	Secret Ravine	Reach 1	34081	Loomis Tributary Confluence	3078	4153	4218	3676	4779	4735
238	YE35B2	SE40M_30	33500	Secret Ravine	Reach 1	34866	King Road Tributary Confluence	2853	4330	4366	3481	4729	4690
239	USE35A	SE40M_30	38600	Secret Ravine	Reach 1	38066	King Road-no ras	2358	3691	3724	2877	4149	4096
241	YE35B2	SE40M_30	40000	Secret Ravine	Reach 1	40346	Penryn Road	2337	3587	3624	2856	4173	4053
242	YSE30E	SE40M_30	40500	Secret Ravine	Reach 1	NONE	Harris/Boulder Creek Road.	2331	3359	3387	2850	3781	3733
243	VSE26I	SE40M_30	40700	Secret Ravine	Reach 1	NONE	Penryn Tributary Confluence	2346	3196	3225	2852	3619	3561
244	VSE26H	SE40M_30	43300	Secret Ravine	Reach 1	NONE	Boulder Creek Road	1961	1089	1089	2371	1199	1198
245	VE26N2	SE40M_30	48500	Secret Ravine	Reach 1	NONE	Brennans Road	1146	1026	1026	1369	1140	1140
246	VE26N2	SE40M_30	48900	Secret Ravine	Reach 1	NONE	Rock Springs Road	1118	1026	1026	1340	1140	1140
247	USE26E	SE40M_30	50400	Secret Ravine	Reach 1	NONE	Meadow Lane	1032	848	848	1254	947	945
248	UE26BB	SE40M_30	51300	Secret Ravine	Reach 1	NONE	Los Puentes Road	1058	809	809	1394	905	903

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	100-year 1989 JMM	100-year 1992 Corrected	100-year 2007-Current	100-year Future JMM	100-year Future Unmitigated	100-year Build-out w/LID & Projects
249	VE25IA	SE40M_30	55300	Secret Ravine	Reach 1	NONE	Newcastle Road	927	824	824	1297	927	924
250	UE25AB	SE40M_30	57700	Secret Ravine	Reach 1	NONE	Powerhouse Road	649	731	731	908	829	828
Secret Ravine/Sucker Ravine													
251	UXE70I	SE40N_0	0	Sucker Ravine	Reach 1	0	Secret Ravine Confluence	1144	490	505	1330	668	654
252	USE76A	SE40N_0	1000	Sucker Ravine	Reach 1	840	China Garden Road	1140	514	527	1326	685	666
253	YSE76B	SE40N_0	1200	Sucker Ravine	Reach 1	1305	Interstate 80	1138	514	527	1324	685	666
254	YSE76B	SE40N_0	2200	Sucker Ravine	Reach 1	1860	Oakridge Street	1138	523	535	1324	718	693
255	YSE76B	SE40N_0	2600	Sucker Ravine	Reach 1	2750	Lakeside Drive	1157	525	537	1358	725	722
256	USE70I	SE40N_0	3950	Sucker Ravine	Reach 1	4110	Rocklin Road	1169	515	526	1385	719	697
257	USE70H	SE40N_0	4300	Sucker Ravine	Reach 1	4580	Quary Lake	1160	494	505	1377	697	676
258	YSE70H	SE40N_0	4700	Sucker Ravine	Reach 1	4840	Super Span	1151	494	505	1369	697	676
259	USE70F	SE40N_0	7450	Sucker Ravine	Reach 1	7605	Sierra Meadows Drive	1125	487	493	1344	677	658
1259	YSE70B	SE40N_0	0	Sucker Ravine	Reach 1	9955	Culvert 1	#N/A	428	464	#N/A	617	592
1260	YSE70D	SE40N_0	0	Sucker Ravine	Reach 1	10565	Driveway Below Dominguez Road	#N/A	425	432	#N/A	623	591
260	YSE70C	SE40N_0	10800	Sucker Ravine	Reach 1	10935	Dominguez Road	1065	425	433	1363	633	648
261	UE60E2	SE40N_0	11000	Sucker Ravine	Reach 1	10935	Loomis Tributary Confluence	1085	425	433	1366	633	648
263	YSE66J	SE40N_0	13400	Sucker Ravine	Reach 1	14525	Pacific Street	607	175	262	514	367	355
1263	USE66J	SE40N_0	0	Sucker Ravine	Reach 1	14756	Railroad	#N/A	175	264	#N/A	370	361
1264	USE66D	SE40N_0	0	Sucker Ravine	Reach 1	16706	Culvert 5	#N/A	240	380	#N/A	438	433
264	USE66D	SE40N_0	14800	Sucker Ravine	Reach 1	16846	Bankhead Road	556	240	380	476	438	433
265	YSE66C	SE40N_0	15200	Sucker Ravine	Reach 1	17266	Sierra College Blvd.	540	230	371	463	428	423
266	USE66A	SE40N_0	19000	Sucker Ravine	Reach 1	20671	Saunders Avenue	531	509	786	651	590	592
267	SE65	SE40N_0	20200	Sucker Ravine	Reach 1	22546	King Road	541	416	648	669	416	416
Secret Ravine/Sucker Ravine/Loomis Tributary													
268	VSE60E	SE40N_0	0	0	0	NONE	Sucker Ravine Confluence	380	432	418	730	631	629
270	VE60D2	SE40N_0	4400	0	0	NONE	Sierra College Blvd.	209	376	362	402	483	474
Secret Ravine/Aguilar Road Tributary													
271	Y56AB2	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	566	506	511	744	639	745
272	Y56AB2	SE40N_0	700	0	0	NONE	Aguilar Road	549	506	511	718	639	745
273	YSE56B	SE40N_0	2400	0	0	NONE	Foothill Road	516	428	502	666	625	648
274	Y55MA2	SE40N_0	4100	0	0	NONE	El Don Road	491	320	329	627	397	389
275	UE56DB	SE40N_0	4100	0	0	NONE	El Don Detention Pond	491	319	319	630	368	378
276	VSE55L	SE40N_0	6100	0	0	NONE	Sierra College Blvd.	462	261	260	583	307	312
Secret Ravine / Loomis Tributary													
277	YSE40J	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	473	422	520	710	584	575
278	YSE40J	SE40N_0	1200	0	0	NONE	Interstate 80	437	422	520	656	584	575
279	VSE40I	SE40N_0	2800	0	0	NONE	Laird Street	411	373	460	618	483	484
280	VSE40F	SE40N_0	3600	0	0	NONE	King Road	386	279	351	579	350	350
Secret Ravine/King Road Tributary													
281	USE45W	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	1367	1182	1183	1500	1305	1295

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	100-year 1989 JMM	100-year 1992 Corrected	100-year 2007-Current	100-year Future JMM	100-year Future Unmitigated	100-year Build-out w/LID & Projects
282	YSE45Q	SE40M_30	3900	0	0	NONE	Rancho Verde Road	1270	578	578	1395	665	664
283	YSE45A	MR15J_30	5400	0	0	NONE	Val Verde Road	419	474	474	505	572	564
284	USE44B	MR15J_30	6300	0	0	NONE	King Road	377	422	422	455	519	512
Secret Ravine/Penryn Tributary													
285	YE15L2	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	999	2140	2168	1410	2475	2417
286	USE7H2	SE40M_30	4700	0	0	NONE	Rock Springs Road	1024	1761	1794	1528	2065	2010
287	YSE5F2	SE40M_30	5600	0	0	NONE	East/West Forks Confluence	881	1589	1625	1421	1902	1842
Secret Ravine/ E. Fork Penryn Tributary													
288	VSE5F2	SE40M_30	0	0	0	NONE	West Fork Confluence	255	554	576	356	671	636
289	YSE5F	SE40M_30	900	0	0	NONE	Fairview Lane	228	556	577	319	671	636
290	YE20BS	SE40M_30	3700	0	0	NONE	Gilardi Road	94	417	438	131	533	503
Secret Ravine/W. Fork Penryn Tributary													
291	YSE7D	SE40M_30	0	0	0	NONE	East Fork Confluence	595	1119	1132	999	1341	1309
292	YSE10A	SE40M_30	200	0	0	NONE	Interstate 80	593	1107	1119	994	1329	1297
293	YE10BB	SE40M_30	1400	0	0	NONE	Girardi Road	567	1055	1069	1024	1290	1255

Table G.4 50-YEAR EVENT

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:		50-year 1992 Corrected	50-year 2007-Current		50-year Future Unmitigated	50-year Build-out w/LID & Projects
DRY CREEK													
1	VC135B	SE40N_0	8900	Dry Creek	Below Cirby	NONE	Rio Linda Blvd(North and South)		9393	9659		10241	10026
2	Y130B2	SE40N_0	15000	Dry Creek	Below Cirby	NONE	Elkhorn Blvd. (North and South)		9414	9682		10264	10049
3	YC125B	SE40N_0	16600	Dry Creek	Below Cirby	NONE	Curved Bridge Road (North)		9468	9736		10323	10106
4	YC125A	SE40N_0	17400	Dry Creek	Below Cirby	NONE	Dry Creek Road (North and South)		9446	9719		10305	10089
5	YDC115	SE40N_0	24400	Dry Creek	Below Cirby	NONE	Q Street (North and South)		9481	9755		10341	10127
6	YDC90	SE40N_0	34900	Dry Creek	Below Cirby	NONE	Sierra Creek Confluence		9415	9687		10282	10071
7	YDC85	SE40N_0	35200	Dry Creek	Below Cirby	NONE	28th Street (South)		9429	9700		10296	10087
8	YDC85	SE40N_0	35400	Dry Creek	Below Cirby	NONE	Elverta Road		9429	9700		10296	10087
9	YDC71B	SE40N_0	36900	Dry Creek	Below Cirby	38733	Confluence with County Line Trib		9755	9928		10672	9840
11	YDC75C	SE40N_0	41400	Dry Creek	Below Cirby	41634	Watt Avenue		9841	10008		10696	9882
13	YC65I2	SE40N_0	47700	Dry Creek	Below Cirby	47754	Confluence with DC65 Trib		10001	10166		10766	9970
14	YDC60A	SE40N_0	50300	Dry Creek	Below Cirby	50025	Walerga Road		10047	10218		10792	9998
1015	YDC50A	SE40N_0	0	Dry Creek	Below Cirby	55005	Morgan Creek Ped Crossing		10065	10249		10802	10005
16	YDC35C	SE40N_0	58800	Dry Creek	Below Cirby	58560	Cook Riolo Road		10098	10283		10826	10028
17	YDC25A	CC5G_90	67000	Dry Creek	Below Cirby	67583.80	S.P. Railroad Bridge		8161	7996		8522	8095
18	YDC10D	SE40N_0	67400	Dry Creek	Below Cirby	67641.80	Atkinson Blvd.		10127	10353		10885	9991
20	YDC20A	SE40N_0	68900	Dry Creek	Below Cirby	69138.40	S.P. Railroad Culverts (now bridge)		10121	10347		10877	9981
21	YDC10D	SE40N_0	69900	Dry Creek	Below Cirby	70071.60	Vernon Street		10132	10354		10876	9978
22	YDC10B	SE40N_0	72600	Dry Creek	Below Cirby	72702.60	Riverside Avenue		8340	8471		8572	8339
23	YDCCC	SE40N_0	73000	Dry Creek	Below Cirby	72982	Cirby Creek Confluence		8393	8487		8587	8348
24	YDC5A	SE40M_30	73800	Dry Creek	Above Cirby	73943.30	Darling Way		8743	8592		9020	8187
25	YDC5C	SE40M_30	77000	Dry Creek	Above Cirby	77218.89	Douglas Blvd.		8762	8605		9011	8188
26	UDC5B	SE40M_30	77500	Dry Creek	Above Cirby	77606.49	Royer Park Footbridge		8763	8606		9100	8188
27	YDC5B	SE40M_30	79100	Dry Creek	Above Cirby	79166.05	Lincoln Street		8761	8601		9009	8176
28	YDC4C	SE40M_30	79400	Dry Creek	Above Cirby	79816.70	Folsom Road		8763	8605		9010	8178
30	YACMR	SE40M_30	84100	Dry Creek	Above Cirby	84214.40	Antelope Creek/ Miners Ravine Confluence		8818	8656		9116	8200
DRY CREEK - ELVERTA TRIB													
31	UDC90	CC5G_90	0	0	0	NONE	Confluence with Dry Creek		135	135		150	149
DRY CREEK - SIERRA CREEK													
32	YC100B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek		593	607		703	692
33	YC100A	CC5G_90	1400	0	0	NONE	28th Street		596	612		706	694
34	YC100A	CC5G_90	3700	0	0	NONE	Scotland Drive		596	612		706	694
35	VC96B2	CC5G_90	5400	0	0	NONE	Delaney Drive		536	551		635	624
36	YDC96A	CC5G_90	6800	0	0	NONE	Watt Avenue		456	470		550	540
37	VDC96C	CC5G_90	10300	0	0	NONE	Navaho Way		326	340		410	401
38	YDC96C	CC5G_90	11400	0	0	NONE	Elverta Road		327	341		412	402
39	DC95A	CC5G_90	13500	0	0	NONE	Walerga Road		52	52		75	72

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DRY CREEK/County Line Trib. (Note: Riolo Vineyards project determined this tributary does not drain as previously modeled - corrected in 2009 study)													
40	YDC75B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek		388	396		458	455
41	N/A	#N/A	3200	0	0	NONE	Watt Avenue		#N/A	#N/A		#N/A	#N/A
42	VDC68B	CC5G_90	8200	0	0	NONE	PFE Road		334	343		378	377
Dry Creek DC-65 Tributary													
43	YDC65I	CC5G_90	0	0	0	NONE	Confluence with Dry Creek		290	299		316	356
44	YDC65K	CC5G_90	3000	0	0	NONE	Walerga Road		266	315		329	329
Cirby Creek													
45	YCC45G	LC40L_30	0	Cirby Creek	below Linda	0	Dry Creek Confluence		2562	2681		2802	2720
46	YCC45A	LC40L_30	3000	Cirby Creek	below Linda	2969.699	Interstate 80		2571	2760		2869	2794
48	UCC45E	LC40L_30	4600	Cirby Creek	below Linda	4580.699	Wanda Lee Court Footbridge		2565	2746		2863	2779
49	YCC45E	LC40L_30	6100	Cirby Creek	Above Linda	6009.699	Linda Creek Confluence		2559	2734		2862	2767
50	YCC40A	CC5G_90	7400	Cirby Creek	Above Linda	7262.099	Sunrise Blvd.		612	742		751	751
51	YCC40C	CC5G_90	8100	Cirby Creek	Above Linda	8038.899	Coloma Way - Gage 1635		687	826		836	836
52	YC40G2	CC5G_90	9100	Cirby Creek	Above Linda	9004.399	Oak Ridge Drive		640	786		796	796
53	UCC35D	CC5G_90	10000	Cirby Creek	Above Linda	9873.999	Sierra Gardens Footbridge		668	862		873	873
54	YCC15B	CC5G_90	11800	Cirby Creek	Above Linda	11679.19	Loretto Drive		709	971		986	986
55	YCC252	CC5G_90	12000	Cirby Creek	Above Linda	12228.79	Sierra Gardens Trib. Confluence		494	758		773	773
56	YCC15C	CC5G_90	12500	Cirby Creek	Above Linda	12377.29	Sierra Gardens Drive		497	757		773	773
57	YCC10E	CC5G_90	13900	Cirby Creek	Above Linda	13765.49	Huntington Drive		438	450		454	453
58	UCC10H	CC5G_90	14500	Cirby Creek	Above Linda	14420.19	Rocky Ridge Drive		281	433		446	446
60	YCC5B	CC5G_90	16400	Cirby Creek	Above Linda	15748.19	Winchester Way		215	337		341	342
61	YCC5D	CC5G_90	17200	Cirby Creek	Above Linda	16312.19	Eureka Road		147	260		263	264
62	YCC1A	CC5G_90	19700	Cirby Creek	Above Linda	17753.79	Douglas Blvd.		107	222		229	229
Cirby Creek/Sierra Gardens Trib.													
63	VCC25	CC5G_90	0	0	0	NONE	Cirby Creek Confluence		232	245		248	247
65	YCC20G	CC5G_90	1000	0	0	NONE	Douglas Blvd.		163	179		183	182
66	YCC20K	CC5G_90	1400	0	0	NONE	Sierra Gardens Ret. Basin		181	270		281	286
Linda Creek													
67	ULC95C	LC40L_30	0	Linda Creek	Below Strap	0.	Cirby Creek Confluence		2418	2546		2610	2563
68	ULC95D	LC40L_30	1000	Linda Creek	Below Strap	565.1000	Sunrise Avenue		2419	2546		2611	2563
70	YLC90A	LC40L_30	2600	Linda Creek	Below Strap	2125.000	Oak Ridge Drive		2423	2459		2639	2499
72	ULC90B	LC40L_30	4300	Linda Creek	Below Strap	3843.300	Sierra Gardens Footbridge		2462	2679		2865	2719
73	YLC85C	LC40L_30	8400	Linda Creek	Below Strap	8257.900	Rocky Ridge Dirve		2849	3131		3340	3157
74	ULC85B	LC40L_30	10000	Linda Creek	Below Strap	9810.000	Strap Ravine Confluence		2845	3125		3341	3152
76	ULC80I	LC40L_30	11500	Linda Creek	Below S Branch	136	Champion Oaks Drive/Samoa Way (Gage 1626/1628)		1925	2046		2111	1995
78	ULC80A	LC40L_30	14300	Linda Creek	Below S Branch	157	Auburn Road		2172	2404		2562	2340
79	UC45J3	LC40L_30	15700	Linda Creek	Below S Branch	176	Old Auburn Road/City Limits		1754	1975		2117	2024
1079	ULC45J	LC40L_30	0	Linda Creek	Below S Branch	181	Ped Bridge over Creek in Park		1677	1902		2047	1951

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Treelake Tributary Confluence													
80	ULC45J	LC40L_30	15900	Linda Creek	Below S Branch	181	Treelake Tributary Confluence		1677	1902		2047	1951
82	UC45J2	LC40L_30	19800	Linda Creek	Below S Branch	188	Indian Creek Drive		1660	1902		2057	1964
1082	ULC45D	LC40L_30	0	Linda Creek	Below S Branch	207	Private Bridge Near Hazel		1486	1727		1895	1814
83	ULC45D	LC40L_30	25300	Linda Creek	Below S Branch	211	Hazel Avenue		1488	1728		1897	1816
84	UC35Q3	LC40L_30	25500	Linda Creek	Below S Branch	212	Orangevale Tributary Confluence		1488	1729		1897	1816
1084	ULC40A	LC40L_30	0	Linda Creek	Above S Branch	3.075	BDG 17 2-24" CMPS		1060	1203		1377	1273
85	UC15N2	LC40L_30	31300	Linda Creek	Above S Branch	4.239	Granite Road Bridge		886	1022		1224	1056
86	ULC15N	LC40L_30	32600	Linda Creek	Above S Branch	4.407	Cherry Avenue		859	1001		1202	1033
1086	ULC15J	LC5A_0	0	Linda Creek	Above S Branch	5.22	Private Driveway Concrete Box Type		641	696		688	519
1087	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.264	Driveway Bridge		641	696		688	519
1088	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.526	Granite Glen Court (Private)		643	699		689	519
88	YLC15J	LC5A_0	38600	Linda Creek	Above S Branch	5.715	Wedgewood Drive		662	722		707	522
1089	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.039	Golf Cart Bridge #5		602	665		655	513
1090	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.12	Golf Cart Bridge #4		602	664		661	512
1091	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.197	Golf Cart Bridge #3		603	665		656	514
1092	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.241	Golf Cart Bridge #2		603	665		656	514
1093	ULC5F2	LC5A_0	0	Linda Creek	Above S Branch	6.515	Golf Cart Bridge #1		616	625		650	536
89	ULC5F2	LC5A_0	42300	Linda Creek	Above S Branch	6.53	East Roaseville Parkway		616	625		649	536
90	ULC5F	LC5A_0	43100	Linda Creek	Above S Branch	6.759	Barton Road		583	597		629	506
91	YLC5E	LC5A_0	44600	Linda Creek	Above S Branch	7.140	Shadow Brook Place		492	515		546	368
92	ULC5B	LC5A_0	46500	Linda Creek	Above S Branch	7.479	Troy Purdy Lane		418	436		465	267
1094	ULC5C	LC5A_0	0	Linda Creek	Above S Branch	7.609	Muir Way		341	380		383	207
93	YLC5C	LC5A_0	48100	Linda Creek	Above S Branch	7.77	Country Court (Private)		347	363		387	207
1095	ULC1A	LC5A_0	0	Linda Creek	Above S Branch	7.839	Country Court		738	1015		1066	1046
94	YLC1A	LC5A_0	48700	Linda Creek	Above S Branch	8.011	Auburn Folsom Road		351	367		398	208
Linda Creek/Strap Ravine													
95	USR25C	CC5G_90	0	Strap Ravine	Reach 1	0.	Linda Creek Confluence		728	993		1039	1025
1095	YSR25A	CC5G_90	300	Strap Ravine	Reach 1	276	Foot Bridge in Park		738	1015		1066	1046
96	UR20A4	CC5G_90	1500	Strap Ravine	Reach 1	1136.900	McClaren Drive (Gage 1611)		745	1017		1069	1049
97	UXR20A	CC5G_90	5900	Strap Ravine	Reach 1	5539.100	Johnson Ranch Drive		682	1001		1036	1009
98	USR152	CC5G_90	6800	Strap Ravine	Reach 1	6380.600	Eureka Road		683	1009		1037	1010
99	USR82	CC5G_90	8600	Strap Ravine	Reach 1	8201.500	East Roseville Parkway		580	678		747	784
100	USR5C2	LC5A_0	11800	Strap Ravine	Reach 1	11366.10	Sierra College Blvd.		406	536		593	646
101	USR1A	LC5A_0	23000	0	0	NONE	Barton Road		465	860		767	819
Linda Creek/Treelake Tributary													
102	ULC60B	LC40L_30	0	0	0	NONE	Linda Creek Confluence		423	499		560	544
103	YLC60B	LC40L_30	3200	0	0	NONE	Petite Way (approximated)		436	521		587	570
104	YLC60A	LC40L_30	5700	0	0	NONE	Old Auburn Road		392	487		552	536
105	YC55H3	LC40L_30	6000	0	0	NONE	Sierra College Blvd.		423	550		630	612
106	YLC55F	LC40L_30	9600	0	0	NONE	Swan Lake Drive		359	539		624	608
107	UC55L2	LC40L_30	9600	0	0	NONE	Swan Lake		333	519		603	588
108	UPC55L	LC40L_30	10800	0	0	NONE	Waterbury Way		360	543		627	609

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109	YLC55L	LC40L_30	10800	0	0	NONE	Waterbury Lake		412	604		685	667
110	ULC50E	LC40L_30	11400	0	0	NONE	East Roaseville Parkway		327	442		520	495
111	YLC50E	LC40L_30	11400	0	0	NONE	East Roseville Parkway Pond		344	490		567	531
112	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane		301	384		451	428
113	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane Pond		301	384		451	428
Linda Creek/Hazel Avenue Tributary (Sac County)													
114	YC35Q2	LC40L_30	0	0	0	NONE	Linda Creek Confluence		469	615		660	656
115	UC35Q2	LC40L_30	400	0	0	NONE	Oak Avenue		469	615		660	656
Linda Creek/Orangevale Tributary (Sac County)													
116	YC35Q2	LC40L_30	0	Linda Creek	South Branch	.001	Linda Creek Confluence		444	625		695	680
1116	YLC35Q	LC40L_30	0	Linda Creek	South Branch	0.125	Private Bridge (Metal and Concrete)		448	665		721	710
117	ULC35Q	LC40L_30	900	Linda Creek	South Branch	0.196	Oak Avenue		449	666		728	716
1117	ULC30E	LC40L_30	0	Linda Creek	South Branch	1.022	Private Bridge in Park Area		230	372		412	415
118	ULC30E	LC40L_30	3300	Linda Creek	South Branch	1.035	Filbert Avenue		230	372		413	414
1118	ULC30B	LC40L_30	0	Linda Creek	South Branch	1.244	Private Bridge Near Chestnut		219	346		382	385
119	UC30C2	LC40L_30	4300	Linda Creek	South Branch	1.346	Chestnut Avenue		207	329		364	368
120	ULC30A	LC40L_30	5500	Linda Creek	South Branch	1.649	Walnut Avenue (North)		180	255		284	289
120	UC20E3	LC40L_30	5500	Linda Creek	South Branch	1.772	Walnut Avenue (South)		180	255		284	289
121	VLC25C	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (North)		37	52		57	57
1121	VLC20E	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (South)		148	210		228	227
Antelope Creek													
122	UDC4D	AC5I_60	0	Antelope Ck	AntelopeBlwClove	0.	Miners Ravine/Dry Creek		2948	3002		3345	2819
123	UC45B2	AC5I_60	1400	Antelope Ck	AntelopeBlwClove	1394.899	Harding Blvd.		2950	3003		3351	2816
124	UAC45B	AC5I_60	2300	Antelope Ck	AntelopeBlwClove	2349.499	Atlantic Street		2981	3021		3362	2823
1124	UAC45B	AC5I_60	0	Antelope Ck	AntelopeBlwClove	2455.599	Bridge #3		2975	3017		3359	2820
125	UAC45L	AC5I_60	5000	Antelope Ck	AntelopeBlwClove	5017.599	County Dump Road		3017	3062		3414	3087
126	UC41E4	AC5I_60	9600	Antelope Ck	AntelopeBlwClove	10909.49	Highway 65 - non ras (Gage 1583)		3015	3062		3418	3371
127	UC41E3	AC5I_60	10300	Antelope Ck	AntelopeBlwClove	11383.53	Springview Drive		2998	3047		3404	3358
128	YC41E2	AC5I_60	10800	Antelope Ck	AntelopeBlwClove	11418.53	Rocklin City Tributary Confluence		2993	3042		3400	3353
130	UC40K2	AC5I_60	15800	Antelope Ck	AntelopeBlwClove	16930.03	Sunset Blvd.		2937	2975		3384	3335
133	UV10B2	AC5I_60	22800	Antelope Ck	AntelopeBlwClove	24722.3	Clover Valley Creek Confluence		2973	3004		3504	3444
134	UC35G3	AC5I_60	23600	Antelope Ck	Reach 1	25350.71	Midas Avenue		2471	2484		2549	2539
135	UAC35C	AC5I_60	25700	Antelope Ck	Reach 1	27696.03	Southern Pacific Railroad (UPRR) - non ras		2518	2547		2601	2594
136	VAC35I	AC5I_60	26500	Antelope Ck	Reach 1	28434.67	Yankee Hill Road		2513	2543		2594	2586
137	YAC30C	AC5I_60	27600	Antelope Ck	Reach 1	34226	Atkinson Dairy Dam		2436	2470		2541	2535
138	YAC30B	AC5I_60	28900	Antelope Ck	Reach 1	34691	Unnamed Road - no ras - no find aerial		2390	2423		2498	2495
139	YAC30B	AC5I_60	31800	Antelope Ck	Reach 1	35656	Delmar Avenue - no ras		2396	2428		2503	2498
140	YAC30B	AC5I_60	34300	Antelope Ck	Reach 1	36964	Sierra College Blvd. (Gage 1573)		2399	2430		2504	2500
141	U30AC4	AC5I_60	37000	Antelope Ck	Reach 1	39726	King Road		2413	2430		2531	2525
Antelope Creek / Clark Tunnel Road Tributary													
142	U30AC2	AC5I_60	0	Antelope Ck	Reach 1	40906	Antelope Creek Confluence		2364	2383		2482	2470

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143	UC25BC	AC5I_60	100	0	0	NONE	Barker Road		748	748		777	775
144	VAC20C	AC5I_60	1300	0	0	NONE	Humphrey Road		504	504		540	539
145	YC16EB	AC5I_60	1700	0	0	NONE	Humphrey Tributary Confluence		415	415		450	451
148	UC15CB	AC5I_60	7000	0	0	NONE	Colwell Road		253	253		272	272
149	YC15BC	AC5I_60	10000	0	0	NONE	English Colony Way		220	220		223	223
150	AC15AD	AC5I_60	12800	0	0	NONE	Clark Tunnel Road		161	161		163	163
Antelope Creek/Rocklin City Tributary													
151	VAC41E	CC5G_90	0	0	0	NONE	Antelope Creek Confluence		408	408		444	443
152	VAC41F	SE40M_30	2700	0	0	NONE	Taylor Road		157	157		189	186
153	VAC41F	SE40M_30	2800	0	0	NONE	Taylor Road		157	157		189	186
154	UAC41A	SE40M_30	4500	0	0	NONE	Sunset Blvd.		84	84		114	111
Antelope Creek/Clover Valley Creek													
155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	.1	Antelope Creek Confluence		801	835		970	943
1155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	155	Golf Course Ped Bridge		797	832		968	939
156	UCV10B	AC5I_60	400	Clover Valley	Clover Valley1	445	Argonaut Avenue		794	830		1025	936
157	YCV10B	AC5I_60	2200	Clover Valley	Clover Valley1	2785	Footbridge and Weir		803	838		1031	954
158	UXV10A	AC5I_60	4300	Clover Valley	Clover Valley1	4090	Midas Avenue		790	825		1012	936
159	YCV10A	AC5I_60	4700	Clover Valley	Clover Valley1	4430	Abandoned Stone Bridge		790	826		1012	936
160	YCV10A	AC5I_60	5600	Clover Valley	Clover Valley1	5400	Unnamed Bridge		759	795		979	904
1160	UV6CB2	AC5I_60	0	Clover Valley	Clover Valley1	6365	Gazebo Crossing		761	796		983	904
161	UCV6CB	AC5I_60	6500	Clover Valley	Clover Valley1	6505	Clover Valley Detention Pond		761	796		983	905
162	YV6CB2	AC5I_60	7700	Clover Valley	Clover Valley1	7815	Creekwood Drive		765	796		984	905
163	UCV6BC	AC5I_60	12000	Clover Valley	Clover Valley1	12015	Rawhide Road		714	710		891	864
164	UCV6BC	AC5I_60	12500	Clover Valley	Clover Valley1	12550	Rowhide Road Det. Pond		720	715		894	871
165	UCV5C	AC5I_60	25600	Clover Valley	Clover Valley1	NONE	Unnamed Road		629	629		801	781
166	UCV1T	AC5I_60	28000	Clover Valley	Clover Valley1	NONE	Sierra College Blvd.		423	423		571	570
167	VCV1T	AC5I_60	28500	Clover Valley	Clover Valley1	NONE	English Colony Way		324	324		683	623
Antelope Creek Continued (West Branch)													
169	UC25BC	AC5I_60	38700	0	0	NONE	Clark Tunnel Road Tributary Confluence		748	748		777	775
170	U25AD2	AC5I_60	40600	0	0	NONE	Barker Road		699	699		728	722
171	Y25AD2	AC5I_60	42500	0	0	NONE	Citrus Colony Road		720	720		751	747
172	YAC16A	AC5I_60	47900	0	0	NONE	English Colony Road		308	308		332	332
Antelope Creek/Humphrey Tributary													
173	UPAC5K	AC5I_60	0	0	0	NONE	Clark Tunnel Road Tributary Confluence		255	255		256	256
174	VAC5J2	AC5I_60	1700	0	0	NONE	Sandy Road		267	267		270	270
175	VAC5O	AC5I_60	3300	0	0	NONE	Mardell Lane		44	44		44	44
176	UPAC5G	AC5I_60	3700	0	0	NONE	Colwell Road		195	195		199	199
177	YAC5E	AC5I_60	6300	0	0	NONE	English Colony Way		170	170		174	174
Miners Ravine													
178	UMR40E	SE40M_30	0	Miners Ravine	Below Secret	10.	Antelope Creek/Dry Creek		6194	6009		6402	5922

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179	UMR40E	SE40M_30	200	Miners Ravine	Below Secret	94.	Harding Blvd.		6194	6009		6402	5922
180	YMR40E	SE40M_30	1500	Miners Ravine	Below Secret	659.8999	Interstate 80 - no ras		6198	6012		6407	5928
181	YMR40B	SE40M_30	2800	Miners Ravine	Below Secret	1422.400	Eureka Way		6188	6004		6400	5920
182	YSEMR	SE40M_30	3800	Miners Ravine	Below Secret	3734.100	Secret Ravine Confluence		6184	6000		6405	5917
183	YMR37D	MR15J_30	5300	Miners Ravine	BET SECRET-FALSE	5674.100	Sunrise Avenue - no ras		2031	1963		2131	2039
184	UR37D4	MR15J_30	7000	Miners Ravine	BET SECRET-FALSE	7319.900	Boardman Tributary		2030	1962		2130	2039
185	UR36N2	MR15J_30	9000	Miners Ravine	Above False	9828.100	East Roseville Parkway		1973	1919		2079	1994
186	UMR31Q	MR15J_30	18200	Miners Ravine	Above False	18310.19	Sierra College Blvd.		1979	1876		2038	1954
187	YR31Q2	MR15J_30	18300	Miners Ravine	Above False	18610	Cavitt Stallman Tributary - no ras		1977	2056		2167	2140
188	UMR31G	MR15J_30	18600	Miners Ravine	Above False	18685	Cavitt (&) Stallman Road		1814	1892		1991	1988
190	UR31P2	MR15J_30	23400	Miners Ravine	Above False	23390	Shadow Oaks Lane		1775	1812		1966	1914
1190	YMR31D	MR15J_30	0	Miners Ravine	Above False	27990.	Hardy Lane		1758	1797		1950	1901
191	UMR31D	MR15J_30	28900	Miners Ravine	Above False	28826	Barton Road		1756	1795		1948	1900
192	UMR30R	MR15J_30	31300	Miners Ravine	Above False	31379	TallPine Lane		1749	1788		1947	1894
193	UMR30Q	MR15J_30	33000	Miners Ravine	Above False	32984	Carolinda Drive		1751	1789		1947	1894
194	UMR30P	MR15J_30	34800	Miners Ravine	Above False	34813	Itchy Acres Road		1733	1773		1933	1889
196	UR30H2	MR15J_30	35500	Miners Ravine	Above False	35489	Miners Ravine Road		1734	1773		1933	1890
197	UR30H3	MR15J_30	36800	Miners Ravine	Above False	36790	Leibinger Lane		1724	1775		1934	1891
199	UR29B2	MR15J_30	39700	Miners Ravine	Above False	39765	Auburn Folsom Road		1769	1826		1972	1936
200	UXR29H	MR15J_30	41700	Miners Ravine	Above False	40276	Oak Lane		1815	1829		1975	1974
201	UR29I2	MR15J_30	43000	Miners Ravine	Above False	44240	Old Bridge		1836	1853		1999	2001
202	YMR29I	MR15J_30	43200	Miners Ravine	Above False	44240	Cottonwood Lake		1836	1853		1999	2001
203	UMR21C	MR15J_30	44400	Miners Ravine	Above False	44368	Auburn Folsom Road		1813	1855		2000	1965
1203	YMR21C	MR15J_30	0	Miners Ravine	Above False	44523	Driveway opposite Twin Rocks Road		1783	1824		1965	1931
204	YMR21D	MR15J_30	45600	Miners Ravine	Above False	45593	Confluence with Lake Tributary (MR15)		1780	1832		1971	1931
1204	UXR20R	MR15J_30	0	Miners Ravine	Above False	52637	Bridge 15		1463	1495		1617	1587
1205	UXR20Q	MR15J_30	0	Miners Ravine	Above False	53992	Bridge 16		1445	1474		1596	1567
205	UR20P2	MR15J_30	56000	Miners Ravine	Above False	55052	Moss Lane		1461	1485		1624	1578
1206	YR20K2	MR15J_30	0	Miners Ravine	Above False	57194	Bridge 18 So of Willow Valley Place		1426	1442		1612	1531
1207	YR20K2	MR15J_30	0	Miners Ravine	Above False	57599	Willow Valley Place		1427	1441		1628	1549
1208	UR20C2	MR15J_30	0	Miners Ravine	Above False	57984	Bridge 20 North of Willow Valley Place		1401	1416		1624	1537
207	UR15K2	MR15J_30	59900	Miners Ravine	Above False	59894	Dick Cook Road		1324	1338		1589	1456
208	UXR15V	MR15J_30	61500	Miners Ravine	Above False	61470	Auburn Folsom Road		1171	1188		1560	1299
209	UR15W2	MR15J_30	62400	Miners Ravine	Above False	62487	Placer Canyon Parkway		1248	1247		1352	1324
1209	Y15AE2	MR15J_30	0	Miners Ravine	Above False	64347	Lominda Lane		1220	1218		1335	1305
210	UXR15Q	MR15J_30	67600	Miners Ravine	Above False	67574	Horseshoe Bar Road		1165	1163		1286	1242
1210	UMR10M	MR15J_30	0	Miners Ravine	Above False	70394	Bridge 26		1131	1121		1257	1219
1211	UMR10M	MR15J_30	0	Miners Ravine	Above False	70984	Bridge 27		1139	1168		1302	1236
1212	UMR10I	MR15J_30	0	Miners Ravine	Above False	73328	Whiskey Bar Road		972	998		1107	1062
1213	UXR10E	MR15J_30	0	Miners Ravine	Above False	75238	Bridge 30		984	987		1082	1039
1214	UMMR5S	MR15J_30	0	Miners Ravine	Above False	75448	Bridge 31		880	881		977	935
1215	YMR10E	MR15J_30	0	Miners Ravine	Above False	76148	Bridge 32		881	883		980	935
211	YMR10E	MR15J_30	71700	Miners Ravine	Above False	76613	Auburn Folsom Road		882	882		980	940

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212	UPMR5R	MR15J_30	73300	Miners Ravine	Above False	78358	King Road		465	467		502	494
213	YMR5W	MR15J_30	79400	Miners Ravine	Above False	79398	Penryn Rock Springs Road		407	405		439	439
214	YMR5P	MR15J_30	80200	Miners Ravine	Above False	80243	Newcastle Road		316	316		346	347
Miners Ravine/Boardman Tributary													
215	UR37D3	CC5G_90	0	0	0	NONE	Miners Ravine Confluence		319	594		624	622
216	UR35R6	CC5G_90	800	0	0	NONE	East Roseville Parkway		312	582		611	609
Miners Ravine/Cavitt & Stallman Tributary													
217	UMR25L	SE40N_0	0	0	0	NONE	Miners Ravine Confluence		444	441		485	491
218	YR25M2	SE40N_0	2400	0	0	NONE	Hidden Valley Place		455	453		502	508
219	YMR25N	SE40N_0	3100	0	0	NONE	Baywood Road		448	446		496	503
220	YR25P2	SE40N_0	3700	0	0	NONE	S. Bar B Lane		439	436		486	493
221	YMR25D	SE40N_0	4500	0	0	NONE	Kokuia Lane		375	375		445	446
222	YMR25I	SE40N_0	5100	0	0	NONE	Crestview Lane		407	407		460	464
223	YMR24E	SE40N_0	9300	0	0	NONE	Barton Road		341	341		401	404
Miners Ravine/Lake Tributary (MR21)													
224	UMR21H	MR15J_30	0	0	0	NONE	Miners Ravine Confluence		133	133		227	218
225	UMR21H	MR15J_30	200	0	0	NONE	Auburn Folsom Road		133	133		227	218
226	YMR21H	MR15J_30	300	0	0	NONE	South Lake Circle		168	168		268	257
Secret Ravine													
227	YSE85Q	SE40M_30	0	Secret Ravine	Below Sucker	1	Miners Ravine Confluence		4676	4649		5006	4531
228	YE85Y2	SE40M_30	1400	Secret Ravine	Below Sucker	798.3000	East Roseville Parkway		4676	4648		5010	4530
229	YE76A2	SE40M_30	13500	Secret Ravine	Below Sucker	14280.	Sucker Ravine Confluence		4613	4596		5035	4508
230	Y56AB3	SE40M_30	16200	Secret Ravine	Reach 1	17396	Aguiar Road Tributary Confluence		4047	4010		4407	3986
231	USE52D	SE40M_30	17600	Secret Ravine	Reach 1	18595.9	Rocklin Road - China Gardens		4051	4012		4415	3990
232	YSE51K	SE40M_30	23300	Secret Ravine	Reach 1	24526	Sierra College Blvd.		4122	4095		4465	4035
233	UE50Q2	SE40M_30	28800	Secret Ravine	Reach 1	30371	Private Road - Diaz		3840	3897		4257	4023
234	UE50P2	SE40M_30	29200	Secret Ravine	Reach 1	30801	Private Road		3849	3909		4258	4023
235	YE50F2	SE40M_30	30800	Secret Ravine	Reach 1	32256	Brace Road		3770	3857		4202	3976
236	YE50A2	SE40M_30	32600	Secret Ravine	Reach 1	34081	Horseshoe Bar Road		3805	3805		4143	3900
237	YE50A2	SE40M_30	33400	Secret Ravine	Reach 1	34081	Loomis Tributary Confluence		3805	3805		4143	3900
238	YE35B2	SE40M_30	33500	Secret Ravine	Reach 1	34866	King Road Tributary Confluence		3695	3735		4081	3997
239	USE35A	SE40M_30	38600	Secret Ravine	Reach 1	38066	King Road-no ras		2993	3026		3310	3269
241	YE35B2	SE40M_30	40000	Secret Ravine	Reach 1	40346	Penryn Road		2921	2952		3230	3195
242	YSE30E	SE40M_30	40500	Secret Ravine	Reach 1	NONE	Harris/Boulder Creek Road.		2695	2718		3028	2992
243	VSE26I	SE40M_30	40700	Secret Ravine	Reach 1	NONE	Penryn Tributary Confluence		2558	2582		2892	2850
244	VSE26H	SE40M_30	43300	Secret Ravine	Reach 1	NONE	Boulder Creek Road		855	855		945	943
245	VE26N2	SE40M_30	48500	Secret Ravine	Reach 1	NONE	Brennans Road		802	802		896	895
246	VE26N2	SE40M_30	48900	Secret Ravine	Reach 1	NONE	Rock Springs Road		802	802		896	895
247	USE26E	SE40M_30	50400	Secret Ravine	Reach 1	NONE	Meadow Lane		660	660		742	740
248	UE26BB	SE40M_30	51300	Secret Ravine	Reach 1	NONE	Los Puentes Road		628	628		709	706
249	VE25IA	SE40M_30	55300	Secret Ravine	Reach 1	NONE	Newcastle Road		636	636		723	720

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250	UE25AB	SE40M_30	57700	Secret Ravine	Reach 1	NONE	Powerhouse Road		562	562		642	641
Secret Ravine/Sucker Ravine													
251	UXE70I	SE40N_0	0	Sucker Ravine	Reach 1	0	Secret Ravine Confluence		428	439		581	571
252	USE76A	SE40N_0	1000	Sucker Ravine	Reach 1	840	China Garden Road		441	451		595	578
253	YSE76B	SE40N_0	1200	Sucker Ravine	Reach 1	1305	Interstate 80		441	451		595	578
254	YSE76B	SE40N_0	2200	Sucker Ravine	Reach 1	1860	Oakridge Street		445	455		616	601
255	YSE76B	SE40N_0	2600	Sucker Ravine	Reach 1	2750	Lakeside Drive		445	455		621	605
256	USE70I	SE40N_0	3950	Sucker Ravine	Reach 1	4110	Rocklin Road		438	449		616	600
257	USE70H	SE40N_0	4300	Sucker Ravine	Reach 1	4580	Quary Lake		421	431		597	582
258	YSE70H	SE40N_0	4700	Sucker Ravine	Reach 1	4840	Super Span		421	431		597	582
259	USE70F	SE40N_0	7450	Sucker Ravine	Reach 1	7605	Sierra Meadows Drive		420	427		588	574
1259	YSE70B	SE40N_0	0	Sucker Ravine	Reach 1	9955	Culvert 1		367	375		525	513
1260	YSE70D	SE40N_0	0	Sucker Ravine	Reach 1	10565	Driveway Below Dominguez Road		370	377		526	514
260	YSE70C	SE40N_0	10800	Sucker Ravine	Reach 1	10935	Dominguez Road		371	377		530	518
261	UE60E2	SE40N_0	11000	Sucker Ravine	Reach 1	10935	Loomis Tributary Confluence		371	377		530	518
263	YSE66J	SE40N_0	13400	Sucker Ravine	Reach 1	14525	Pacific Street		145	164		201	186
1263	USE66J	SE40N_0	0	Sucker Ravine	Reach 1	14756	Railroad		145	164		202	187
1264	USE66D	SE40N_0	0	Sucker Ravine	Reach 1	16706	Culvert 5		156	247		337	321
264	USE66D	SE40N_0	14800	Sucker Ravine	Reach 1	16846	Bankhead Road		156	247		337	317
265	YSE66C	SE40N_0	15200	Sucker Ravine	Reach 1	17266	Sierra College Blvd.		149	239		333	318
266	USE66A	SE40N_0	19000	Sucker Ravine	Reach 1	20671	Saunders Avenue		430	649		491	490
267	SE65	SE40N_0	20200	Sucker Ravine	Reach 1	22546	King Road		358	535		358	358
Secret Ravine/Sucker Ravine/Loomis Tributary													
268	VSE60E	SE40N_0	0	0	0	NONE	Sucker Ravine Confluence		358	347		518	515
270	VE60D2	SE40N_0	4400	0	0	NONE	Sierra College Blvd.		313	307		405	397
Secret Ravine/Aguilar Road Tributary													
271	Y56AB2	SE40N_0	0	0	0	NONE	Secret Ravine Confluence		383	396		497	570
272	Y56AB2	SE40N_0	700	0	0	NONE	Aguilar Road		383	396		497	570
273	YSE56B	SE40N_0	2400	0	0	NONE	Foothill Road		326	384		481	501
274	Y55MA2	SE40N_0	4100	0	0	NONE	El Don Road		244	255		305	298
275	UE56DB	SE40N_0	4100	0	0	NONE	El Don Detention Pond		243	244		287	294
276	VSE55L	SE40N_0	6100	0	0	NONE	Sierra College Blvd.		199	199		239	243
Secret Ravine / Loomis Tributary													
277	YSE40J	SE40N_0	0	0	0	NONE	Secret Ravine Confluence		366	449		501	503
278	YSE40J	SE40N_0	1200	0	0	NONE	Interstate 80		366	449		501	503
279	VSE40I	SE40N_0	2800	0	0	NONE	Laird Street		325	399		422	423
280	VSE40F	SE40N_0	3600	0	0	NONE	King Road		241	305		307	307
Secret Ravine/King Road Tributary													
281	USE45W	SE40M_30	0	0	0	NONE	Secret Ravine Confluence		926	926		1031	1021
282	YSE45Q	SE40M_30	3900	0	0	NONE	Rancho Verde Road		456	456		529	528

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:		50-year 1992 Corrected	50-year 2007-Current		50-year Future Unmitigated	50-year Build-out w/LID & Projects
283	YSE45A	MR15J_30	5400	0	0	NONE	Val Verde Road		370	370		451	446
284	USE44B	MR15J_30	6300	0	0	NONE	King Road		330	330		414	407
Secret Ravine/Penryn Tributary													
285	YE15L2	SE40M_30	0	0	0	NONE	Secret Ravine Confluence		1734	1754		1986	1945
286	USE7H2	SE40M_30	4700	0	0	NONE	Rock Springs Road		1412	1439		1645	1605
287	YSE5F2	SE40M_30	5600	0	0	NONE	East/West Forks Confluence		1265	1295		1508	1463
Secret Ravine/ E. Fork Penryn Tributary													
288	VSE5F2	SE40M_30	0	0	0	NONE	West Fork Confluence		444	459		525	501
289	YSE5F	SE40M_30	900	0	0	NONE	Fairview Lane		444	460		525	502
290	YE20BS	SE40M_30	3700	0	0	NONE	Gilardi Road		331	346		403	386
Secret Ravine/W. Fork Penryn Tributary													
291	YSE7D	SE40M_30	0	0	0	NONE	East Fork Confluence		897	905		1063	1038
292	YSE10A	SE40M_30	200	0	0	NONE	Interstate 80		886	894		1052	1028
293	YE10BB	SE40M_30	1400	0	0	NONE	Girardi Road		842	852		1011	988

Table G.5 25-YEAR EVENT

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	25-year 1989 JMM	25-year 1992 Corrected	25-year 2007-Current	25-year Future JMM	25-year Future Unmitigated	25-year Build-out w/LID & Projects
DRY CREEK													
1	VC135B	SE40N_0	8900	Dry Creek	Below Cirby	NONE	Rio Linda Blvd(North and South)	9382	7067	7313	10376	7900	7700
2	Y130B2	SE40N_0	15000	Dry Creek	Below Cirby	NONE	Elkhorn Blvd. (North and South)	9386	7096	7327	10374	7918	7718
3	YC125B	SE40N_0	16600	Dry Creek	Below Cirby	NONE	Curved Bridge Road (North)	9380	7126	7360	10367	7964	7762
4	YC125A	SE40N_0	17400	Dry Creek	Below Cirby	NONE	Dry Creek Road (North and South)	9378	7108	7346	10365	7948	7747
5	YDC115	SE40N_0	24400	Dry Creek	Below Cirby	NONE	Q Street (North and South)	9423	7128	7370	10409	7978	7776
6	YDC90	SE40N_0	34900	Dry Creek	Below Cirby	NONE	Sierra Creek Confluence	9398	7068	7310	10379	7924	7726
7	YDC85	SE40N_0	35200	Dry Creek	Below Cirby	NONE	28th Street (South)	9305	7073	7318	10254	7936	7739
8	YDC85	SE40N_0	35400	Dry Creek	Below Cirby	NONE	Elverta Road	9288	7073	7318	10233	7936	7739
9	YDC71B	SE40N_0	36900	Dry Creek	Below Cirby	38733	Confluence with County Line Trib	9308	7231	7463	10233	8090	7651
11	YDC75C	SE40N_0	41400	Dry Creek	Below Cirby	41634	Watt Avenue	9300	7329	7577	10209	8219	7742
13	YC65I2	SE40N_0	47700	Dry Creek	Below Cirby	47754	Confluence with DC65 Trib	9313	7524	7710	10225	8340	7806
14	YDC60A	SE40N_0	50300	Dry Creek	Below Cirby	50025	Walerga Road	9273	7569	7745	10175	8381	7827
1015	YDC50A	SE40N_0	0	Dry Creek	Below Cirby	55005	Morgan Creek Ped Crossing	#N/A	7631	7801	#N/A	8425	7852
16	YDC35C	SE40N_0	58800	Dry Creek	Below Cirby	58560	Cook Riolo Road	9261	7664	7830	10139	8433	7875
17	YDC25A	CC5G_90	67000	Dry Creek	Below Cirby	67583.80	S.P. Railroad Bridge	9125	6253	6225	9940	6781	6528
18	YDC10D	SE40N_0	67400	Dry Creek	Below Cirby	67641.80	Atkinson Blvd.	9125	7747	7867	9940	8492	7845
20	YDC20A	SE40N_0	68900	Dry Creek	Below Cirby	69138.40	S.P. Railroad Culverts (now bridge)	9127	7743	7860	9935	8488	7837
21	YDC10D	SE40N_0	69900	Dry Creek	Below Cirby	70071.60	Vernon Street	9084	7747	7857	9871	8489	7833
22	YDC10B	SE40N_0	72600	Dry Creek	Below Cirby	72702.60	Riverside Avenue	9147	7653	7766	9925	8073	7725
23	YDCCC	SE40N_0	73000	Dry Creek	Below Cirby	72982	Cirby Creek Confluence	9147	7663	7772	9925	8094	7729
24	YDC5A	SE40M_30	73800	Dry Creek	Above Cirby	73943.30	Darling Way	6943	6533	6484	7551	7119	6411
25	YDC5C	SE40M_30	77000	Dry Creek	Above Cirby	77218.89	Douglas Blvd.	6941	6569	6502	7544	7140	6404
26	UDC5B	SE40M_30	77500	Dry Creek	Above Cirby	77606.49	Royer Park Footbridge	6938	6570	6524	7538	7143	6405
27	YDC5B	SE40M_30	79100	Dry Creek	Above Cirby	79166.05	Lincoln Street	6937	6625	6580	7536	7136	6428
28	YDC4C	SE40M_30	79400	Dry Creek	Above Cirby	79816.70	Folsom Road	6948	6633	6587	7525	7138	6434
30	YACMR	SE40M_30	84100	Dry Creek	Above Cirby	84214.40	Antelope Creek/ Miners Ravine Confluence	6938	6673	6625	7501	7162	6438
DRY CREEK - ELVERTA TRIB													
31	UDC90	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	251	102	102	344	115	114
DRY CREEK - SIERRA CREEK													
32	YC100B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	1121	444	455	1421	529	520
33	YC100A	CC5G_90	1400	0	0	NONE	28th Street	1095	445	456	1390	528	519
34	YC100A	CC5G_90	3700	0	0	NONE	Scotland Drive	1033	445	456	1318	528	519
35	VC96B2	CC5G_90	5400	0	0	NONE	Delaney Drive	1006	398	408	1299	472	463
36	YDC96A	CC5G_90	6800	0	0	NONE	Watt Avenue	977	337	347	1269	407	398
37	VDC96C	CC5G_90	10300	0	0	NONE	Navaho Way	568	241	251	718	305	296
38	YDC96C	CC5G_90	11400	0	0	NONE	Elverta Road	481	242	251	600	305	297
39	DC95A	CC5G_90	13500	0	0	NONE	Walerga Road	438	39	39	537	55	53

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	25-year 1989 JMM	25-year 1992 Corrected	25-year 2007-Current	25-year Future JMM	25-year Future Unmitigated	25-year Build-out w/LID & Projects
DRY CREEK/County Line Trib. (Note: Riolo Vineyards project determined this tributary does not drain as previously modeled - corrected in 2009 study)													
40	YDC75B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	346	287	292	558	339	335
41	N/A	#N/A	3200	0	0	NONE	Watt Avenue	346	#N/A	#N/A	558	#N/A	#N/A
42	VDC68B	CC5G_90	8200	0	0	NONE	PFE Road	346	244	250	558	276	274
Dry Creek DC-65 Tributary													
43	YDC65I	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	352	208	213	380	228	265
44	YDC65K	CC5G_90	3000	0	0	NONE	Walerga Road	382	192	233	304	244	244
Cirby Creek													
45	YCC45G	LC40L_30	0	Cirby Creek	below Linda	0	Dry Creek Confluence	2617	2021	2167	2853	2269	2208
46	YCC45A	LC40L_30	3000	Cirby Creek	below Linda	2969.699	Interstate 80	2602	2080	2233	2838	2341	2272
48	UCC45E	LC40L_30	4600	Cirby Creek	below Linda	4580.699	Wanda Lee Court Footbridge	2595	2068	2221	2834	2329	2260
49	YCC45E	LC40L_30	6100	Cirby Creek	Above Linda	6009.699	Linda Creek Confluence	2581	2058	2210	2822	2318	2248
50	YCC40A	CC5G_90	7400	Cirby Creek	Above Linda	7262.099	Sunrise Blvd.	625	563	646	774	654	653
51	YCC40C	CC5G_90	8100	Cirby Creek	Above Linda	8038.899	Coloma Way - Gage 1635	640	620	736	819	744	746
52	YC40G2	CC5G_90	9100	Cirby Creek	Above Linda	9004.399	Oak Ridge Drive	629	579	701	824	712	710
53	UCC35D	CC5G_90	10000	Cirby Creek	Above Linda	9873.999	Sierra Gardens Footbridge	625	590	752	821	763	761
54	YCC15B	CC5G_90	11800	Cirby Creek	Above Linda	11679.19	Loretto Drive	627	635	802	838	813	810
55	YCC252	CC5G_90	12000	Cirby Creek	Above Linda	12228.79	Sierra Gardens Trib. Confluence	646	441	616	854	623	621
56	YCC15C	CC5G_90	12500	Cirby Creek	Above Linda	12377.29	Sierra Gardens Drive	298	442	618	636	626	623
57	YCC10E	CC5G_90	13900	Cirby Creek	Above Linda	13765.49	Huntington Drive	485	391	461	730	463	463
58	UCC10H	CC5G_90	14500	Cirby Creek	Above Linda	14420.19	Rocky Ridge Drive	301	232	364	416	377	376
60	YCC5B	CC5G_90	16400	Cirby Creek	Above Linda	15748.19	Winchester Way	262	179	282	370	287	286
61	YCC5D	CC5G_90	17200	Cirby Creek	Above Linda	16312.19	Eureka Road	261	122	217	407	221	221
62	YCC1A	CC5G_90	19700	Cirby Creek	Above Linda	17753.79	Douglas Blvd.	158	88	186	325	194	194
Cirby Creek/Sierra Gardens Trib.													
63	VCC25	CC5G_90	0	0	0	NONE	Cirby Creek Confluence	109	205	217	132	220	219
65	YCC20G	CC5G_90	1000	0	0	NONE	Douglas Blvd.	129	146	161	146	164	164
66	YCC20K	CC5G_90	1400	0	0	NONE	Sierra Gardens Ret. Basin	123	152	230	139	247	243
Linda Creek													
67	ULC95C	LC40L_30	0	Linda Creek	Below Strap	0.	Cirby Creek Confluence	2538	1936	2099	2751	2204	2135
68	ULC95D	LC40L_30	1000	Linda Creek	Below Strap	565.1000	Sunrise Avenue	2537	1936	2099	2749	2204	2134
70	YLC90A	LC40L_30	2600	Linda Creek	Below Strap	2125.000	Oak Ridge Drive	3116	1934	1929	3266	2038	1961
72	ULC90B	LC40L_30	4300	Linda Creek	Below Strap	3843.300	Sierra Gardens Footbridge	3094	1944	2120	3244	2237	2161
73	YLC85C	LC40L_30	8400	Linda Creek	Below Strap	8257.900	Rocky Ridge Dirve	3045	2153	2309	3194	2550	2404
74	ULC85B	LC40L_30	10000	Linda Creek	Below Strap	9810.000	Strap Ravine Confluence	3004	2186	2395	3153	2623	2487
76	ULC80I	LC40L_30	11500	Linda Creek	Below S Branch	136	Champion Oaks Drive/Samoa Way (Gage 1626/1628)	2338	1630	1734	2476	1839	1749
78	ULC80A	LC40L_30	14300	Linda Creek	Below S Branch	157	Auburn Road	2199	1714	1899	2335	2068	1935
79	UC45J3	LC40L_30	15700	Linda Creek	Below S Branch	176	Old Auburn Road/City Limits	2239	1409	1558	2381	1709	1645
1079	ULC45J	LC40L_30	0	Linda Creek	Below S Branch	181	Ped Bridge over Creek in Park	#N/A	1346	1494	#N/A	1648	1584

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Treelake Tributary Confluence													
80	ULC45J	LC40L_30	15900	Linda Creek	Below S Branch	181	Treelake Tributary Confluence	2239	1346	1494	2381	1648	1584
82	UC45J2	LC40L_30	19800	Linda Creek	Below S Branch	188	Indian Creek Drive	1716	1330	1481	1839	1639	1578
1082	ULC45D	LC40L_30	0	Linda Creek	Below S Branch	207	Private Bridge Near Hazel	#N/A	1182	1327	#N/A	1488	1438
83	ULC45D	LC40L_30	25300	Linda Creek	Below S Branch	211	Hazel Avenue	1505	1184	1328	1696	1492	1443
84	UC35Q3	LC40L_30	25500	Linda Creek	Below S Branch	212	Orangevale Tributary Confluence	1505	1184	1329	1696	1492	1443
1084	ULC40A	LC40L_30	0	Linda Creek	Above S Branch	3.075	BDG 17 2-24" CMPS	#N/A	827	970	#N/A	1116	1047
85	UC15N2	LC40L_30	31300	Linda Creek	Above S Branch	4.239	Granite Road Bridge	775	690	847	852	998	894
86	ULC15N	LC40L_30	32600	Linda Creek	Above S Branch	4.407	Cherry Avenue	870	669	825	949	985	868
1086	ULC15J	LC5A_0	0	Linda Creek	Above S Branch	5.22	Private Driveway Concrete Box Type	#N/A	512	558	#N/A	560	448
1087	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.264	Driveway Bridge	#N/A	512	558	#N/A	560	448
1088	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.526	Granite Glen Court (Private)	#N/A	512	559	#N/A	560	448
88	YLC15J	LC5A_0	38600	Linda Creek	Above S Branch	5.715	Wedgewood Drive	637	520	571	738	570	451
1089	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.039	Golf Cart Bridge #5	#N/A	475	522	#N/A	524	414
1090	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.12	Golf Cart Bridge #4	#N/A	475	521	#N/A	523	414
1091	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.197	Golf Cart Bridge #3	#N/A	474	523	#N/A	524	414
1092	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.241	Golf Cart Bridge #2	#N/A	475	523	#N/A	524	414
1093	ULC5F2	LC5A_0	0	Linda Creek	Above S Branch	6.515	Golf Cart Bridge #1	#N/A	488	494	#N/A	527	423
89	ULC5F2	LC5A_0	42300	Linda Creek	Above S Branch	6.53	East Roaseville Parkway	480	488	494	539	526	423
90	ULC5F	LC5A_0	43100	Linda Creek	Above S Branch	6.759	Barton Road	470	464	468	529	500	399
91	YLC5E	LC5A_0	44600	Linda Creek	Above S Branch	7.140	Shadow Brook Place	410	376	392	463	426	304
92	ULC5B	LC5A_0	46500	Linda Creek	Above S Branch	7.479	Troy Purdy Lane	298	316	334	341	363	213
1094	ULC5C	LC5A_0	0	Linda Creek	Above S Branch	7.609	Muir Way	#N/A	258	265	#N/A	295	171
93	YLC5C	LC5A_0	48100	Linda Creek	Above S Branch	7.77	Country Court (Private)	244	258	277	281	294	173
1095	ULC1A	LC5A_0	0	Linda Creek	Above S Branch	7.839	Country Court	#N/A	566	842	#N/A	892	874
94	YLC1A	LC5A_0	48700	Linda Creek	Above S Branch	8.011	Auburn Folsom Road	255	274	280	377	300	175
Linda Creek/Strap Ravine													
95	USR25C	CC5G_90	0	Strap Ravine	Reach 1	0.	Linda Creek Confluence	674	555	836	766	878	861
1095	YSR25A	CC5G_90	300	Strap Ravine	Reach 1	276	Foot Bridge in Park	#N/A	566	842	#N/A	892	874
96	UR20A4	CC5G_90	1500	Strap Ravine	Reach 1	1136.900	McClaren Drive (Gage 1611)	674	566	841	767	890	873
97	UXR20A	CC5G_90	5900	Strap Ravine	Reach 1	5539.100	Johnson Ranch Drive	671	516	815	770	854	837
98	USR152	CC5G_90	6800	Strap Ravine	Reach 1	6380.600	Eureka Road	629	517	822	721	855	833
99	USR82	CC5G_90	8600	Strap Ravine	Reach 1	8201.500	East Roseville Parkway	664	436	546	781	573	609
100	USR5C2	LC5A_0	11800	Strap Ravine	Reach 1	11366.10	Sierra College Blvd.	586	305	415	758	456	497
101	USR1A	LC5A_0	23000	0	0	NONE	Barton Road	476	378	660	751	599	640
Linda Creek/Treelake Tributary													
102	ULC60B	LC40L_30	0	0	0	NONE	Linda Creek Confluence	691	310	366	766	415	404
103	YLC60B	LC40L_30	3200	0	0	NONE	Petite Way (approximated)	625	321	381	696	434	422
104	YLC60A	LC40L_30	5700	0	0	NONE	Old Auburn Road	538	289	357	602	408	397
105	YC55H3	LC40L_30	6000	0	0	NONE	Sierra College Blvd.	521	313	401	584	468	455
106	YLC55F	LC40L_30	9600	0	0	NONE	Swan Lake Drive	376	265	392	427	472	461
107	UC55L2	LC40L_30	9600	0	0	NONE	Swan Lake	376	246	377	427	457	446

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108	UPC55L	LC40L_30	10800	0	0	NONE	Waterbury Way	317	261	415	362	485	473
109	YLC55L	LC40L_30	10800	0	0	NONE	Waterbury Lake	317	311	482	362	549	531
110	ULC50E	LC40L_30	11400	0	0	NONE	East Roaseville Parkway	314	244	345	368	404	387
111	YLC50E	LC40L_30	11400	0	0	NONE	East Roseville Parkway Pond	314	266	383	368	442	419
112	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane	314	234	300	368	348	332
113	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane Pond	314	234	300	368	348	332
Linda Creek/Hazel Avenue Tributary (Sac County)													
114	YC35Q2	LC40L_30	0	0	0	NONE	Linda Creek Confluence	519	355	475	646	511	508
115	UC35Q2	LC40L_30	400	0	0	NONE	Oak Avenue	519	355	475	646	511	508
Linda Creek/Orangevale Tributary (Sac County)													
116	YC35Q2	LC40L_30	0	Linda Creek	South Branch	.001	Linda Creek Confluence	655	370	459	727	513	515
1116	YLC35Q	LC40L_30	0	Linda Creek	South Branch	0.125	Private Bridge (Metal and Concrete)	#N/A	366	455	#N/A	509	507
117	ULC35Q	LC40L_30	900	Linda Creek	South Branch	0.196	Oak Avenue	376	366	455	427	510	508
1117	ULC30E	LC40L_30	0	Linda Creek	South Branch	1.022	Private Bridge in Park Area	#N/A	177	275	#N/A	311	311
118	ULC30E	LC40L_30	3300	Linda Creek	South Branch	1.035	Filbert Avenue	358	177	275	406	311	311
1118	ULC30B	LC40L_30	0	Linda Creek	South Branch	1.244	Private Bridge Near Chestnut	#N/A	162	265	#N/A	296	298
119	UC30C2	LC40L_30	4300	Linda Creek	South Branch	1.346	Chestnut Avenue	336	152	250	383	280	281
120	ULC30A	LC40L_30	5500	Linda Creek	South Branch	1.649	Walnut Avenue (North)	219	139	199	220	225	230
120	UC20E3	LC40L_30	5500	Linda Creek	South Branch	1.772	Walnut Avenue (South)	219	139	199	220	225	230
121	VLC25C	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (North)	164	30	43	165	47	47
1121	VLC20E	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (South)	#N/A	114	163	#N/A	179	179
Antelope Creek													
122	UDC4D	AC5I_60	0	Antelope Ck	AntelopeBlwClove	0.	Miners Ravine/Dry Creek	1979	2358	2366	2244	2730	2248
123	UC45B2	AC5I_60	1400	Antelope Ck	AntelopeBlwClove	1394.899	Harding Blvd.	1978	2360	2366	2243	2734	2243
124	UAC45B	AC5I_60	2300	Antelope Ck	AntelopeBlwClove	2349.499	Atlantic Street	1977	2365	2369	2242	2742	2247
1124	UAC45B	AC5I_60	0	Antelope Ck	AntelopeBlwClove	2455.599	Bridge #3	#N/A	2359	2365	#N/A	2739	2244
125	UAC45L	AC5I_60	5000	Antelope Ck	AntelopeBlwClove	5017.599	County Dump Road	1973	2387	2416	2236	2778	2394
126	UC41E4	AC5I_60	9600	Antelope Ck	AntelopeBlwClove	10909.49	Highway 65 - non ras (Gage 1583)	1982	2416	2444	2243	2788	2735
127	UC41E3	AC5I_60	10300	Antelope Ck	AntelopeBlwClove	11383.53	Springview Drive	2526	2403	2431	2653	2776	2723
128	YC41E2	AC5I_60	10800	Antelope Ck	AntelopeBlwClove	11418.53	Rocklin City Tributary Confluence	2483	2399	2426	2618	2771	2718
130	UC40K2	AC5I_60	15800	Antelope Ck	AntelopeBlwClove	16930.03	Sunset Blvd.	2425	2344	2368	2570	2743	2688
133	UV10B2	AC5I_60	22800	Antelope Ck	AntelopeBlwClove	24722.3	Clover Valley Creek Confluence	2135	2323	2349	2401	2786	2720
134	UC35G3	AC5I_60	23600	Antelope Ck	Reach 1	25350.71	Midas Avenue	1544	1917	1913	1779	1992	1980
135	UAC35C	AC5I_60	25700	Antelope Ck	Reach 1	27696.03	Southern Pacific Railroad (UPRR) - non ras	1528	2005	1995	1763	2044	2022
136	VAC35I	AC5I_60	26500	Antelope Ck	Reach 1	28434.67	Yankee Hill Road	1523	2002	1988	1757	2043	2021
137	YAC30C	AC5I_60	27600	Antelope Ck	Reach 1	34226	Atkinson Dairy Dam	1507	1940	1946	1741	2050	2042
138	YAC30B	AC5I_60	28900	Antelope Ck	Reach 1	34691	Unnamed Road - no ras - no find aerial	1492	1907	1917	1725	2015	2011
139	YAC30B	AC5I_60	31800	Antelope Ck	Reach 1	35656	Delmar Avenue - no ras	1505	1912	1922	1761	2021	2016
140	YAC30B	AC5I_60	34300	Antelope Ck	Reach 1	36964	Sierra College Blvd. (Gage 1573)	1477	1915	1923	1728	2024	2018
141	U30AC4	AC5I_60	37000	Antelope Ck	Reach 1	39726	King Road	1465	1910	1926	1715	2011	2010
Antelope Creek / Clark Tunnel Road Tributary													

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142	U30AC2	AC5I_60	0	Antelope Ck	Reach 1	40906	Antelope Creek Confluence	1506	1873	1890	1763	1973	1965
143	UC25BC	AC5I_60	100	0	0	NONE	Barker Road	883	579	579	1115	604	602
144	VAC20C	AC5I_60	1300	0	0	NONE	Humphrey Road	934	396	396	1218	425	427
145	YC16EB	AC5I_60	1700	0	0	NONE	Humphrey Tributary Confluence	913	325	325	1197	356	356
148	UC15CB	AC5I_60	7000	0	0	NONE	Colwell Road	599	196	196	870	212	212
149	YC15BC	AC5I_60	10000	0	0	NONE	English Colony Way	520	174	174	770	176	176
150	AC15AD	AC5I_60	12800	0	0	NONE	Clark Tunnel Road	218	129	129	382	130	130
Antelope Creek/Rocklin City Tributary													
151	VAC41E	CC5G_90	0	0	0	NONE	Antelope Creek Confluence	140	299	299	180	329	324
152	VAC41F	SE40M_30	2700	0	0	NONE	Taylor Road	105	117	117	135	140	138
153	VAC41F	SE40M_30	2800	0	0	NONE	Taylor Road	88	117	117	113	140	138
154	UAC41A	SE40M_30	4500	0	0	NONE	Sunset Blvd.	52	62	62	67	81	80
Antelope Creek/Clover Valley Creek													
155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	.1	Antelope Creek Confluence	592	599	627	640	812	785
1155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	155	Golf Course Ped Bridge	#N/A	596	625	#N/A	809	781
156	UCV10B	AC5I_60	400	Clover Valley	Clover Valley1	445	Argonaut Avenue	590	595	624	638	906	778
157	YCV10B	AC5I_60	2200	Clover Valley	Clover Valley1	2785	Footbridge and Weir	582	598	628	627	865	792
158	UXV10A	AC5I_60	4300	Clover Valley	Clover Valley1	4090	Midas Avenue	578	589	626	623	849	779
159	YCV10A	AC5I_60	4700	Clover Valley	Clover Valley1	4430	Abandoned Stone Bridge	578	590	626	623	849	778
160	YCV10A	AC5I_60	5600	Clover Valley	Clover Valley1	5400	Unnamed Bridge	572	591	618	616	823	756
1160	UV6CB2	AC5I_60	0	Clover Valley	Clover Valley1	6365	Gazebo Crossing	#N/A	596	620	#N/A	824	758
161	UCV6CB	AC5I_60	6500	Clover Valley	Clover Valley1	6505	Clover Valley Detention Pond	570	596	620	612	824	758
162	YV6CB2	AC5I_60	7700	Clover Valley	Clover Valley1	7815	Creekwood Drive	564	597	620	605	824	763
163	UCV6BC	AC5I_60	12000	Clover Valley	Clover Valley1	12015	Rawhide Road	516	555	552	566	753	733
164	UCV6BC	AC5I_60	12500	Clover Valley	Clover Valley1	12550	Rowhide Road Det. Pond	509	556	553	560	764	742
165	UCV5C	AC5I_60	25600	Clover Valley	Clover Valley1	NONE	Unnamed Road	322	493	493	386	692	678
166	UCV1T	AC5I_60	28000	Clover Valley	Clover Valley1	NONE	Sierra College Blvd.	307	329	329	378	526	520
167	VCV1T	AC5I_60	28500	Clover Valley	Clover Valley1	NONE	English Colony Way	307	252	252	378	544	496
Antelope Creek Continued (West Branch) -													
169	UC25BC	AC5I_60	38700	0	0	NONE	Clark Tunnel Road Tributary Confluence	624	579	579	648	604	602
170	U25AD2	AC5I_60	40600	0	0	NONE	Barker Road	556	544	544	592	569	565
171	Y25AD2	AC5I_60	42500	0	0	NONE	Citrus Colony Road	506	564	564	755	592	587
172	YAC16A	AC5I_60	47900	0	0	NONE	English Colony Road	279	239	239	358	258	258
Antelope Creek/Humphrey Tributary -													
173	UPAC5K	AC5I_60	0	0	0	NONE	Clark Tunnel Road Tributary Confluence	264	196	196	337	197	197
174	VAC5J2	AC5I_60	1700	0	0	NONE	Sandy Road	185	206	206	236	209	209
175	VAC5O	AC5I_60	3300	0	0	NONE	Mardell Lane	158	35	35	202	35	35
176	UPAC5G	AC5I_60	3700	0	0	NONE	Colwell Road	132	159	159	168	162	162
177	YAC5E	AC5I_60	6300	0	0	NONE	English Colony Way	79	141	141	101	145	145
Miners Ravine													

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178	UMR40E	SE40M_30	0	Miners Ravine	Below Secret	10.	Antelope Creek/Dry Creek	5282	4710	4635	5644	5010	4594
179	UMR40E	SE40M_30	200	Miners Ravine	Below Secret	94.	Harding Blvd.	5281	4710	4635	5642	5010	4594
180	YMR40E	SE40M_30	1500	Miners Ravine	Below Secret	659.8999	Interstate 80 - no ras	5278	4716	4639	5634	5017	4597
181	YMR40B	SE40M_30	2800	Miners Ravine	Below Secret	1422.400	Eureka Way	5291	4707	4630	5641	5009	4588
182	YSEMR	SE40M_30	3800	Miners Ravine	Below Secret	3734.100	Secret Ravine Confluence	4343	4703	4626	4755	5005	4583
183	YMR37D	MR15J_30	5300	Miners Ravine	BET SECRET-FALSE	5674.100	Sunrise Avenue - no ras	3753	1616	1532	4170	1593	1557
184	UR37D4	MR15J_30	7000	Miners Ravine	BET SECRET-FALSE	7319.900	Boardman Tributary	1130	1615	1531	1266	1592	1556
185	UR36N2	MR15J_30	9000	Miners Ravine	Above False	9828.100	East Roseville Parkway	2630	1563	1492	3028	1538	1507
186	UMR31Q	MR15J_30	18200	Miners Ravine	Above False	18310.19	Sierra College Blvd.	2577	1548	1453	2973	1497	1467
187	YR31Q2	MR15J_30	18300	Miners Ravine	Above False	18610	Cavitt Stallman Tributary - no ras	2577	1544	1561	2973	1615	1576
188	UMR31G	MR15J_30	18600	Miners Ravine	Above False	18685	Cavitt (&) Stallman Road	2276	1410	1419	2681	1494	1426
190	UR31P2	MR15J_30	23400	Miners Ravine	Above False	23390	Shadow Oaks Lane	2215	1376	1390	2619	1511	1433
1190	YMR31D	MR15J_30	0	Miners Ravine	Above False	27990.	Hardy Lane	#N/A	1362	1378	#N/A	1502	1425
191	UMR31D	MR15J_30	28900	Miners Ravine	Above False	28826	Barton Road	2147	1361	1377	2557	1510	1424
192	UMR30R	MR15J_30	31300	Miners Ravine	Above False	31379	TallPine Lane	2105	1354	1370	2510	1580	1420
193	UMR30Q	MR15J_30	33000	Miners Ravine	Above False	32984	Carolinda Drive	2063	1354	1378	2462	1470	1422
194	UMR30P	MR15J_30	34800	Miners Ravine	Above False	34813	Itchy Acres Road	2029	1339	1365	2426	1457	1409
196	UR30H2	MR15J_30	35500	Miners Ravine	Above False	35489	Miners Ravine Road	2009	1340	1365	2404	1458	1410
197	UR30H3	MR15J_30	36800	Miners Ravine	Above False	36790	Leibinger Lane	1989	1334	1368	2383	1455	1406
199	UR29B2	MR15J_30	39700	Miners Ravine	Above False	39765	Auburn Folsom Road	2000	1332	1375	2366	1466	1408
200	UXR29H	MR15J_30	41700	Miners Ravine	Above False	40276	Oak Lane	1947	1363	1376	2310	1467	1463
201	UR29I2	MR15J_30	43000	Miners Ravine	Above False	44240	Old Bridge	1893	1348	1363	2252	1449	1445
202	YMR29I	MR15J_30	43200	Miners Ravine	Above False	44240	Cottonwood Lake	1880	1348	1363	2238	1449	1445
203	UMR21C	MR15J_30	44400	Miners Ravine	Above False	44368	Auburn Folsom Road	1866	1306	1363	2223	1449	1404
1203	YMR21C	MR15J_30	0	Miners Ravine	Above False	44523	Driveway opposite Twin Rocks Road	#N/A	1286	1340	#N/A	1426	1382
204	YMR21D	MR15J_30	45600	Miners Ravine	Above False	45593	Confluence with Lake Tributary (MR15)	1789	1294	1341	2141	1427	1383
1204	UXR20R	MR15J_30	0	Miners Ravine	Above False	52637	Bridge 15	#N/A	1070	1101	#N/A	1184	1146
1205	UXR20Q	MR15J_30	0	Miners Ravine	Above False	53992	Bridge 16	#N/A	1058	1089	#N/A	1176	1135
205	UR20P2	MR15J_30	56000	Miners Ravine	Above False	55052	Moss Lane	1710	1086	1115	2055	1195	1165
1206	YR20K2	MR15J_30	0	Miners Ravine	Above False	57194	Bridge 18 So of Willow Valley Place	#N/A	1045	1068	#N/A	1175	1150
1207	YR20K2	MR15J_30	0	Miners Ravine	Above False	57599	Willow Valley Place	#N/A	1056	1094	#N/A	1176	1152
1208	UR20C2	MR15J_30	0	Miners Ravine	Above False	57984	Bridge 20 North of Willow Valley Place	#N/A	1037	1075	#N/A	1170	1148
207	UR15K2	MR15J_30	59900	Miners Ravine	Above False	59894	Dick Cook Road	1227	988	1012	1525	1097	1081
208	UXR15V	MR15J_30	61500	Miners Ravine	Above False	61470	Auburn Folsom Road	1181	871	897	1473	987	966
209	UR15W2	MR15J_30	62400	Miners Ravine	Above False	62487	Placer Canyon Parkway	1133	923	938	1419	1011	996
1209	Y15AE2	MR15J_30	0	Miners Ravine	Above False	64347	Lominda Lane	#N/A	922	935	#N/A	1026	1017
210	UXR15Q	MR15J_30	67600	Miners Ravine	Above False	67574	Horseshoe Bar Road	890	862	872	1142	973	963
1210	UMR10M	MR15J_30	0	Miners Ravine	Above False	70394	Bridge 26	#N/A	831	843	#N/A	961	957
1211	UMR10M	MR15J_30	0	Miners Ravine	Above False	70984	Bridge 27	#N/A	839	850	#N/A	988	941
1212	UMR10I	MR15J_30	0	Miners Ravine	Above False	73328	Whiskey Bar Road	#N/A	705	706	#N/A	852	814
1213	UXR10E	MR15J_30	0	Miners Ravine	Above False	75238	Bridge 30	#N/A	764	765	#N/A	854	818
1214	UMMR5S	MR15J_30	0	Miners Ravine	Above False	75448	Bridge 31	#N/A	675	675	#N/A	760	728
1215	YMR10E	MR15J_30	0	Miners Ravine	Above False	76148	Bridge 32	#N/A	679	678	#N/A	758	731

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211	YMR10E	MR15J_30	71700	Miners Ravine	Above False	76613	Auburn Folsom Road	730	681	681	955	763	732
212	UPMR5R	MR15J_30	73300	Miners Ravine	Above False	78358	King Road	694	358	355	910	391	387
213	YMR5W	MR15J_30	79400	Miners Ravine	Above False	79398	Penryn Rock Springs Road	199	318	318	275	349	349
214	YMR5P	MR15J_30	80200	Miners Ravine	Above False	80243	Newcastle Road	119	249	249	165	275	276
Miners Ravine/Boardman Tributary													
215	UR37D3	CC5G_90	0	0	0	NONE	Miners Ravine Confluence	302	234	449	387	471	470
216	UR35R6	CC5G_90	800	0	0	NONE	East Roseville Parkway	287	228	439	368	460	459
Miners Ravine/Cavitt & Stallman Tributary													
217	UMR25L	SE40N_0	0	0	0	NONE	Miners Ravine Confluence	539	300	298	648	336	339
218	YR25M2	SE40N_0	2400	0	0	NONE	Hidden Valley Place	508	306	304	610	346	351
219	YMR25N	SE40N_0	3100	0	0	NONE	Baywood Road	477	300	298	573	341	346
220	YR25P2	SE40N_0	3700	0	0	NONE	S. Bar B Lane	446	294	291	535	334	339
221	YMR25D	SE40N_0	4500	0	0	NONE	Kokuia Lane	415	250	250	497	310	311
222	YMR25I	SE40N_0	5100	0	0	NONE	Crestview Lane	384	270	270	460	315	318
223	YMR24E	SE40N_0	9300	0	0	NONE	Barton Road	360	232	232	486	282	283
Miners Ravine/Lake Tributary (MR21)													
224	UMR21H	MR15J_30	0	0	0	NONE	Miners Ravine Confluence	230	90	90	298	169	161
225	UMR21H	MR15J_30	200	0	0	NONE	Auburn Folsom Road	258	90	90	335	169	161
226	YMR21H	MR15J_30	300	0	0	NONE	South Lake Circle	258	126	126	335	207	197
Secret Ravine													
227	YSE85Q	SE40M_30	0	Secret Ravine	Below Sucker	1	Miners Ravine Confluence	2865	3660	3623	2954	3940	3511
228	YE85Y2	SE40M_30	1400	Secret Ravine	Below Sucker	798.3000	East Roseville Parkway	2864	3661	3623	2953	3940	3511
229	YE76A2	SE40M_30	13500	Secret Ravine	Below Sucker	14280.	Sucker Ravine Confluence	2774	3604	3566	2991	3918	3474
230	Y56AB3	SE40M_30	16200	Secret Ravine	Reach 1	17396	Aguiar Road Tributary Confluence	2495	3171	3120	2729	3415	3069
231	USE52D	SE40M_30	17600	Secret Ravine	Reach 1	18595.9	Rocklin Road - China Gardens	2304	3174	3121	2611	3415	3070
232	YSE51K	SE40M_30	23300	Secret Ravine	Reach 1	24526	Sierra College Blvd.	2263	3190	3111	2577	3486	3090
233	UE50Q2	SE40M_30	28800	Secret Ravine	Reach 1	30371	Private Road - Diaz	2115	3032	2898	2452	3336	3295
234	UE50P2	SE40M_30	29200	Secret Ravine	Reach 1	30801	Private Road	2106	3034	2898	2445	3334	3291
235	YE50F2	SE40M_30	30800	Secret Ravine	Reach 1	32256	Brace Road	2031	2985	2852	2381	3288	3245
236	YE50A2	SE40M_30	32600	Secret Ravine	Reach 1	34081	Horseshoe Bar Road	1974	2923	2794	2332	3226	3176
237	YE50A2	SE40M_30	33400	Secret Ravine	Reach 1	34081	Loomis Tributary Confluence	1967	2923	2794	2326	3226	3176
238	YE35B2	SE40M_30	33500	Secret Ravine	Reach 1	34866	King Road Tributary Confluence	1853	2860	2868	2226	3181	3165
239	USE35A	SE40M_30	38600	Secret Ravine	Reach 1	38066	King Road-no ras	1580	2317	2341	1965	2630	2590
241	YE35B2	SE40M_30	40000	Secret Ravine	Reach 1	40346	Penryn Road	1564	2267	2293	1957	2575	2538
242	YSE30E	SE40M_30	40500	Secret Ravine	Reach 1	NONE	Harris/Boulder Creek Road.	1559	2096	2116	1955	2385	2351
243	VSE26I	SE40M_30	40700	Secret Ravine	Reach 1	NONE	Penryn Tributary Confluence	1368	1986	2007	1784	2274	2236
244	VSE26H	SE40M_30	43300	Secret Ravine	Reach 1	NONE	Boulder Creek Road	1196	657	657	1617	728	726
245	VE26N2	SE40M_30	48500	Secret Ravine	Reach 1	NONE	Brennans Road	731	616	616	1128	690	688
246	VE26N2	SE40M_30	48900	Secret Ravine	Reach 1	NONE	Rock Springs Road	718	616	616	1113	690	688
247	USE26E	SE40M_30	50400	Secret Ravine	Reach 1	NONE	Meadow Lane	672	504	504	1061	568	567
248	UE26BB	SE40M_30	51300	Secret Ravine	Reach 1	NONE	Los Puentes Road	643	479	479	1027	543	541

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249	VE25IA	SE40M_30	55300	Secret Ravine	Reach 1	NONE	Newcastle Road	666	484	484	943	552	550
250	UE25AB	SE40M_30	57700	Secret Ravine	Reach 1	NONE	Powerhouse Road	466	423	423	660	489	487
Secret Ravine/Sucker Ravine													
251	UXE70I	SE40N_0	0	Sucker Ravine	Reach 1	0	Secret Ravine Confluence	753	369	379	115	512	482
252	USE76A	SE40N_0	1000	Sucker Ravine	Reach 1	840	China Garden Road	748	376	385	1147	518	487
253	YSE76B	SE40N_0	1200	Sucker Ravine	Reach 1	1305	Interstate 80	747	376	385	1145	518	487
254	YSE76B	SE40N_0	2200	Sucker Ravine	Reach 1	1860	Oakridge Street	745	379	387	1143	529	495
255	YSE76B	SE40N_0	2600	Sucker Ravine	Reach 1	2750	Lakeside Drive	735	379	387	1132	531	496
256	USE70I	SE40N_0	3950	Sucker Ravine	Reach 1	4110	Rocklin Road	716	372	381	1111	557	494
257	USE70H	SE40N_0	4300	Sucker Ravine	Reach 1	4580	Quary Lake	711	358	366	1105	508	479
258	YSE70H	SE40N_0	4700	Sucker Ravine	Reach 1	4840	Super Span	704	358	366	1097	508	479
259	USE70F	SE40N_0	7450	Sucker Ravine	Reach 1	7605	Sierra Meadows Drive	686	349	357	1077	501	486
1259	YSE70B	SE40N_0	0	Sucker Ravine	Reach 1	9955	Culvert 1	#N/A	329	313	#N/A	445	436
1260	YSE70D	SE40N_0	0	Sucker Ravine	Reach 1	10565	Driveway Below Dominguez Road	#N/A	310	318	#N/A	449	436
260	YSE70C	SE40N_0	10800	Sucker Ravine	Reach 1	10935	Dominguez Road	597	313	319	973	450	437
261	UE60E2	SE40N_0	11000	Sucker Ravine	Reach 1	10935	Loomis Tributary Confluence	589	313	319	963	450	437
263	YSE66J	SE40N_0	13400	Sucker Ravine	Reach 1	14525	Pacific Street	553	130	140	919	147	142
1263	USE66J	SE40N_0	0	Sucker Ravine	Reach 1	14756	Railroad	#N/A	130	140	#N/A	147	142
1264	USE66D	SE40N_0	0	Sucker Ravine	Reach 1	16706	Culvert 5	#N/A	140	160	#N/A	186	172
264	USE66D	SE40N_0	14800	Sucker Ravine	Reach 1	16846	Bankhead Road	523	140	160	883	186	172
265	YSE66C	SE40N_0	15200	Sucker Ravine	Reach 1	17266	Sierra College Blvd.	513	134	155	870	181	166
266	USE66A	SE40N_0	19000	Sucker Ravine	Reach 1	20671	Saunders Avenue	211	350	489	455	394	394
267	SE65	SE40N_0	20200	Sucker Ravine	Reach 1	22546	King Road	211	283	405	455	283	283
Secret Ravine/Sucker Ravine/Loomis Tributary													
268	VSE60E	SE40N_0	0	0	0	NONE	Sucker Ravine Confluence	278	285	280	542	428	422
270	VE60D2	SE40N_0	4400	0	0	NONE	Sierra College Blvd.	153	254	251	298	331	319
Secret Ravine/Aguilar Road Tributary													
271	Y56AB2	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	543	280	293	907	373	420
272	Y56AB2	SE40N_0	700	0	0	NONE	Aguilar Road	529	280	293	890	373	420
273	YSE56B	SE40N_0	2400	0	0	NONE	Foothill Road	499	242	282	852	356	371
274	Y55MA2	SE40N_0	4100	0	0	NONE	El Don Road	476	172	185	824	220	217
275	UE56DB	SE40N_0	4100	0	0	NONE	El Don Detention Pond	461	172	174	805	209	212
276	VSE55L	SE40N_0	6100	0	0	NONE	Sierra College Blvd.	334	141	141	423	174	174
Secret Ravine / Loomis Tributary													
277	YSE40J	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	373	295	373	689	418	419
278	YSE40J	SE40N_0	1200	0	0	NONE	Interstate 80	354	295	373	663	418	419
279	VSE40I	SE40N_0	2800	0	0	NONE	Laird Street	339	263	331	643	350	350
280	VSE40F	SE40N_0	3600	0	0	NONE	King Road	326	200	257	625	257	257
Secret Ravine/King Road Tributary													
281	USE45W	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	782	692	693	1184	779	775

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	25-year 1989 JMM	25-year 1992 Corrected	25-year 2007-Current	25-year Future JMM	25-year Future Unmitigated	25-year Build-out w/LID & Projects
282	YSE45Q	SE40M_30	3900	0	0	NONE	Rancho Verde Road	743	342	342	1142	404	402
283	YSE45A	MR15J_30	5400	0	0	NONE	Val Verde Road	303	276	276	368	345	340
284	USE44B	MR15J_30	6300	0	0	NONE	King Road	273	248	248	331	319	313
Secret Ravine/Penryn Tributary -													
285	YE15L2	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	580	1359	1377	952	1575	1540
286	USE7H2	SE40M_30	4700	0	0	NONE	Rock Springs Road	729	1100	1122	1116	1295	1261
287	YSE5F2	SE40M_30	5600	0	0	NONE	East/West Forks Confluence	647	982	1005	1042	1179	1141
Secret Ravine/ E. Fork Penryn Tributary													
288	VSE5F2	SE40M_30	0	0	0	NONE	West Fork Confluence	185	343	357	262	413	395
289	YSE5F	SE40M_30	900	0	0	NONE	Fairview Lane	166	344	357	235	414	395
290	YE20BS	SE40M_30	3700	0	0	NONE	Gilardi Road	68	255	268	97	316	303
Secret Ravine/W. Fork Penryn Tributary													
291	YSE7D	SE40M_30	0	0	0	NONE	East Fork Confluence	440	706	712	738	833	815
292	YSE10A	SE40M_30	200	0	0	NONE	Interstate 80	438	698	704	735	825	807
293	YE10BB	SE40M_30	1400	0	0	NONE	Girardi Road	416	660	666	757	791	772

Table G.6 10-YEAR EVENT

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	10-year 1989 JMM	10-year 1992 Corrected	January 1995	10-year 2007-Current	10-year Future JMM	10-year Future Unmitigated	10-year Build-out w/LID & Projects
DRY CREEK														
1	VC135B	SE40N_0	8900	Dry Creek	Below Cirby	NONE	Rio Linda Blvd(North and South)	6085	4223	8157	4555	6915	5162	4985
2	Y130B2	SE40N_0	15000	Dry Creek	Below Cirby	NONE	Elkhorn Blvd. (North and South)	6126	4288	8166	4598	6920	5182	5011
3	YC125B	SE40N_0	16600	Dry Creek	Below Cirby	NONE	Curved Bridge Road (North)	6131	4450	8174	4677	6916	5201	5035
4	YC125A	SE40N_0	17400	Dry Creek	Below Cirby	NONE	Dry Creek Road (North and South)	6130	4436	8146	4665	6914	5188	5023
5	YDC115	SE40N_0	24400	Dry Creek	Below Cirby	NONE	Q Street (North and South)	6157	4464	8152	4673	6944	5199	5033
6	YDC90	SE40N_0	34900	Dry Creek	Below Cirby	NONE	Sierra Creek Confluence	6132	4407	8124	4611	6921	5140	4977
7	YDC85	SE40N_0	35200	Dry Creek	Below Cirby	NONE	28th Street (South)	6060	4404	8132	4609	6826	5138	4976
8	YDC85	SE40N_0	35400	Dry Creek	Below Cirby	NONE	Elverta Road	6048	4404	8132	4609	6810	5138	4976
9	YDC71B	SE40N_0	36900	Dry Creek	Below Cirby	38733	Confluence with County Line Trib	6055	4610	8441	4784	6817	5268	5138
11	YDC75C	SE40N_0	41400	Dry Creek	Below Cirby	41634	Watt Avenue	6038	4607	8470	4779	6786	5272	5147
13	YC65I2	SE40N_0	47700	Dry Creek	Below Cirby	47754	Confluence with DC65 Trib	6040	4588	8430	4754	6790	5295	5151
14	YDC60A	SE40N_0	50300	Dry Creek	Below Cirby	50025	Walerga Road	6011	4618	8428	4791	6753	5364	5212
1015	YDC50A	SE40N_0	0	Dry Creek	Below Cirby	55005	Morgan Creek Ped Crossing	#N/A	4675	8422	4843	#N/A	5440	5273
16	YDC35C	SE40N_0	58800	Dry Creek	Below Cirby	58560	Cook Riolo Road	5996	4696	8429	4861	6723	5465	5294
17	YDC25A	CC5G_90	67000	Dry Creek	Below Cirby	67583.80	S.P. Railroad Bridge	5883	4022	8392	4083	6569	4641	4524
18	YDC10D	SE40N_0	67400	Dry Creek	Below Cirby	67641.80	Atkinson Blvd.	5883	4665	8392	4815	6569	5452	5274
20	YDC20A	SE40N_0	68900	Dry Creek	Below Cirby	69138.40	S.P. Railroad Culverts (now bridge)	5894	4659	8391	4808	6569	5446	5270
21	YDC10D	SE40N_0	69900	Dry Creek	Below Cirby	70071.60	Vernon Street	5860	4658	8388	4806	6818	5444	5267
22	YDC10B	SE40N_0	72600	Dry Creek	Below Cirby	72702.60	Riverside Avenue	5868	4694	8223	4828	6536	5473	5285
23	YDCCC	SE40N_0	73000	Dry Creek	Below Cirby	72982	Cirby Creek Confluence	5868	4695	8226	4829	6536	5475	5286
24	YDC5A	SE40M_30	73800	Dry Creek	Above Cirby	73943.30	Darling Way	4361	3974	6195	3986	4849	4611	4401
25	YDC5C	SE40M_30	77000	Dry Creek	Above Cirby	77218.89	Douglas Blvd.	4359	3980	6205	3990	4844	4614	4397
26	UDC5B	SE40M_30	77500	Dry Creek	Above Cirby	77606.49	Royer Park Footbridge	4357	3980	6207	3990	4840	4614	4397
27	YDC5B	SE40M_30	79100	Dry Creek	Above Cirby	79166.05	Lincoln Street	4356	3968	6226	3978	4839	4602	4387
28	YDC4C	SE40M_30	79400	Dry Creek	Above Cirby	79816.70	Folsom Road	429	3970	6227	3980	4926	4604	4388
30	YACMR	SE40M_30	84100	Dry Creek	Above Cirby	84214.40	Antelope Creek/ Miners Ravine Confluence	4425	3965	6219	3974	4913	4602	4380
DRY CREEK - ELVERTA TRIB														
31	UDC90	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	187	72	129	72	263	82	81
DRY CREEK - SIERRA CREEK														
32	YC100B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	833	301	536	308	1067	361	354
33	YC100A	CC5G_90	1400	0	0	NONE	28th Street	813	300	529	308	1043	358	351
34	YC100A	CC5G_90	3700	0	0	NONE	Scotland Drive	767	300	529	308	988	358	351
35	VC96B2	CC5G_90	5400	0	0	NONE	Delaney Drive	747	267	474	274	974	316	309
36	YDC96A	CC5G_90	6800	0	0	NONE	Watt Avenue	726	224	404	230	951	269	263
37	VDC96C	CC5G_90	10300	0	0	NONE	Navaho Way	452	158	287	164	575	198	192
38	YDC96C	CC5G_90	11400	0	0	NONE	Elverta Road	393	158	290	164	495	198	192
39	DC95A	CC5G_90	13500	0	0	NONE	Walerga Road	334	24	44	24	414	34	32

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	10-year 1989 JMM	10-year 1992 Corrected	January 1995	10-year 2007-Current	10-year Future JMM	10-year Future Unmitigated	10-year Build-out w/LID & Projects
DRY CREEK/County Line Trib. (Note: Riolo Vineyards project determined this tributary does not drain as previously modeled - corrected in 2009 study)														
40	YDC75B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	247	179	326	182	421	209	205
41	N/A	#N/A	3200	0	0	NONE	Watt Avenue	247	#N/A	#N/A	#N/A	421	#N/A	#N/A
42	VDC68B	CC5G_90	8200	0	0	NONE	PFE Road	247	154	274	158	421	172	170
Dry Creek DC-65 Tributary														
43	YDC65I	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	253	109	206	112	277	121	150
44	YDC65K	CC5G_90	3000	0	0	NONE	Walerga Road	202	100	188	131	222	138	138
Cirby Creek														
45	YCC45G	LC40L_30	0	Cirby Creek	below Linda	0	Dry Creek Confluence	1930	1362	2308	1551	2148	1660	1632
46	YCC45A	LC40L_30	3000	Cirby Creek	below Linda	2969.699	Interstate 80	1920	1391	2260	1590	2138	1708	1684
48	UCC45E	LC40L_30	4600	Cirby Creek	below Linda	4580.699	Wanda Lee Court Footbridge	1922	1382	2252	1581	2143	1698	1674
49	YCC45E	LC40L_30	6100	Cirby Creek	Above Linda	6009.699	Linda Creek Confluence	1957	1373	311	1572	2174	1690	1666
50	YCC40A	CC5G_90	7400	Cirby Creek	Above Linda	7262.099	Sunrise Blvd.	454	483	314	559	603	562	562
51	YCC40C	CC5G_90	8100	Cirby Creek	Above Linda	8038.899	Coloma Way - Gage 1635	456	492	293	611	604	615	614
52	YC40G2	CC5G_90	9100	Cirby Creek	Above Linda	9004.399	Oak Ridge Drive	466	465	274	584	616	589	588
53	UCC35D	CC5G_90	10000	Cirby Creek	Above Linda	9873.999	Sierra Gardens Footbridge	463	474	271	596	613	602	600
54	YCC15B	CC5G_90	11800	Cirby Creek	Above Linda	11679.19	Loretto Drive	479	502	258	637	658	640	639
55	YCC252	CC5G_90	12000	Cirby Creek	Above Linda	12228.79	Sierra Gardens Trib. Confluence	463	344	167	472	669	473	473
56	YCC15C	CC5G_90	12500	Cirby Creek	Above Linda	12377.29	Sierra Gardens Drive	231	344	167	473	499	474	473
57	YCC10E	CC5G_90	13900	Cirby Creek	Above Linda	13765.49	Huntington Drive	346	305	151	441	566	441	441
58	UCC10H	CC5G_90	14500	Cirby Creek	Above Linda	14420.19	Rocky Ridge Drive	212	176	92	268	319	277	277
60	YCC5B	CC5G_90	16400	Cirby Creek	Above Linda	15748.19	Winchester Way	186	133	67	211	284	214	214
61	YCC5D	CC5G_90	17200	Cirby Creek	Above Linda	16312.19	Eureka Road	189	90	52	163	317	166	167
62	YCC1A	CC5G_90	19700	Cirby Creek	Above Linda	17753.79	Douglas Blvd.	117	65	41	140	254	146	146
Cirby Creek/Sierra Gardens Trib.														
63	VCC25	CC5G_90	0	0	0	NONE	Cirby Creek Confluence	95	168	92	176	107	178	177
65	YCC20G	CC5G_90	1000	0	0	NONE	Douglas Blvd.	108	124	79	134	131	136	135
66	YCC20K	CC5G_90	1400	0	0	NONE	Sierra Gardens Ret. Basin	103	113	52	167	124	179	175
Linda Creek														
67	ULC95C	LC40L_30	0	Linda Creek	Below Strap	0.	Cirby Creek Confluence	1816	1281	2180	1486	2022	1602	1579
68	ULC95D	LC40L_30	1000	Linda Creek	Below Strap	565.1000	Sunrise Avenue	1815	1281	2180	1486	2021	1602	1579
70	YLC90A	LC40L_30	2600	Linda Creek	Below Strap	2125.000	Oak Ridge Drive	2051	1276	2179	1315	2325	1431	1408
72	ULC90B	LC40L_30	4300	Linda Creek	Below Strap	3843.300	Sierra Gardens Footbridge	2037	1275	2183	1487	2309	1606	1586
73	YLC85C	LC40L_30	8400	Linda Creek	Below Strap	8257.900	Rocky Ridge Dirve	2007	1322	2254	1563	2275	1724	1723
74	ULC85B	LC40L_30	10000	Linda Creek	Below Strap	9810.000	Strap Ravine Confluence	1982	1348	2245	1642	2246	1808	1777
76	ULC80I	LC40L_30	11500	Linda Creek	Below S Branch	136	Champion Oaks Drive/Samoa Way (Gage 1626/1628)	1566	1074	1581	1331	1775	1444	1413
78	ULC80A	LC40L_30	14300	Linda Creek	Below S Branch	157	Auburn Road	1479	1077	1573	1343	1677	1480	1443
79	UC45J3	LC40L_30	15700	Linda Creek	Below S Branch	176	Old Auburn Road/City Limits	1579	982	1241	1146	1741	1256	1222
1079	ULC45J	LC40L_30	0	Linda Creek	Below S Branch	181	Ped Bridge over Creek in Park	#N/A	938	1193	1099	#N/A	1211	1178

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Treelake Tributary Confluence														
80	ULC45J	LC40L_30	15900	Linda Creek	Below S Branch	181	Treelake Tributary Confluence	1579	938	1193	1099	1741	1211	1178
82	UC45J2	LC40L_30	19800	Linda Creek	Below S Branch	188	Indian Creek Drive	1172	926	1181	1089	1329	1203	1170
1082	ULC45D	LC40L_30	0	Linda Creek	Below S Branch	207	Private Bridge Near Hazel	#N/A	817	1082	964	#N/A	1085	1059
83	ULC45D	LC40L_30	25300	Linda Creek	Below S Branch	211	Hazel Avenue	1034	818	1084	965	1201	1090	1064
84	UC35Q3	LC40L_30	25500	Linda Creek	Below S Branch	212	Orangevale Tributary Confluence	1034	818	1084	965	1201	1090	1064
1084	ULC40A	LC40L_30	0	Linda Creek	Above S Branch	3.075	BDG 17 2-24" CMPS	#N/A	543	763	652	#N/A	778	747
85	UC15N2	LC40L_30	31300	Linda Creek	Above S Branch	4.239	Granite Road Bridge	644	447	671	622	730	747	671
86	ULC15N	LC40L_30	32600	Linda Creek	Above S Branch	4.407	Cherry Avenue	623	433	638	610	691	737	650
1086	ULC15J	LC5A_0	0	Linda Creek	Above S Branch	5.22	Private Driveway Concrete Box Type	#N/A	348	407	377	#N/A	394	334
1087	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.264	Driveway Bridge	#N/A	349	406	377	#N/A	394	334
1088	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.526	Granite Glen Court (Private)	#N/A	349	403	378	#N/A	394	334
88	YLC15J	LC5A_0	38600	Linda Creek	Above S Branch	5.715	Wedgewood Drive	464	350	407	381	545	397	336
1089	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.039	Golf Cart Bridge #5	#N/A	319	361	346	#N/A	362	295
1090	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.12	Golf Cart Bridge #4	#N/A	319	362	346	#N/A	362	295
1091	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.197	Golf Cart Bridge #3	#N/A	319	363	346	#N/A	362	296
1092	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.241	Golf Cart Bridge #2	#N/A	319	363	346	#N/A	362	296
1093	ULC5F2	LC5A_0	0	Linda Creek	Above S Branch	6.515	Golf Cart Bridge #1	#N/A	344	324	347	#N/A	360	281
89	ULC5F2	LC5A_0	42300	Linda Creek	Above S Branch	6.53	East Roaseville Parkway	355	344	324	347	402	360	281
90	ULC5F	LC5A_0	43100	Linda Creek	Above S Branch	6.759	Barton Road	348	321	301	323	395	336	265
91	YLC5E	LC5A_0	44600	Linda Creek	Above S Branch	7.140	Shadow Brook Place	306	274	201	276	347	282	224
92	ULC5B	LC5A_0	46500	Linda Creek	Above S Branch	7.479	Troy Purdy Lane	227	190	156	197	257	215	162
1094	ULC5C	LC5A_0	0	Linda Creek	Above S Branch	7.609	Muir Way	#N/A	153	124	158	#N/A	179	95
93	YLC5C	LC5A_0	48100	Linda Creek	Above S Branch	7.77	Country Court (Private)	188	155	124	159	213	180	95
1095	ULC1A	LC5A_0	0	Linda Creek	Above S Branch	7.839	Country Court	#N/A	352	587	600	#N/A	650	632
94	YLC1A	LC5A_0	48700	Linda Creek	Above S Branch	8.011	Auburn Folsom Road	193	162	135	168	291	181	100
Linda Creek/Strap Ravine														
95	USR25C	CC5G_90	0	Strap Ravine	Reach 1	0.	Linda Creek Confluence	488	349	586	592	572	643	636
1095	YSR25A	CC5G_90	300	Strap Ravine	Reach 1	276	Foot Bridge in Park	#N/A	352	587	600	#N/A	650	632
96	UR20A4	CC5G_90	1500	Strap Ravine	Reach 1	1136.900	McClaren Drive (Gage 1611)	489	350	583	601	575	651	631
97	UXR20A	CC5G_90	5900	Strap Ravine	Reach 1	5539.100	Johnson Ranch Drive	487	314	571	575	577	629	624
98	USR152	CC5G_90	6800	Strap Ravine	Reach 1	6380.600	Eureka Road	485	314	541	580	577	629	607
99	USR82	CC5G_90	8600	Strap Ravine	Reach 1	8201.500	East Roseville Parkway	483	258	456	369	587	412	390
100	USR5C2	LC5A_0	11800	Strap Ravine	Reach 1	11366.10	Sierra College Blvd.	426	175	306	260	567	295	324
101	USR1A	LC5A_0	23000	0	0	NONE	Barton Road	356	251	207	388	578	370	439
Linda Creek/Treelake Tributary														
102	ULC60B	LC40L_30	0	0	0	NONE	Linda Creek Confluence	499	170	333	205	566	235	229
103	YLC60B	LC40L_30	3200	0	0	NONE	Petite Way (approximated)	455	178	333	213	515	246	239
104	YLC60A	LC40L_30	5700	0	0	NONE	Old Auburn Road	395	160	303	199	448	230	224
105	YC55H3	LC40L_30	6000	0	0	NONE	Sierra College Blvd.	384	176	301	225	435	264	258
106	YLC55F	LC40L_30	9600	0	0	NONE	Swan Lake Drive	282	150	248	222	320	263	259
107	UC55L2	LC40L_30	9600	0	0	NONE	Swan Lake	282	139	234	212	320	253	249

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	10-year 1989 JMM	10-year 1992 Corrected	January 1995	10-year 2007-Current	10-year Future JMM	10-year Future Unmitigated	10-year Build-out w/LID & Projects
108	UPC55L	LC40L_30	10800	0	0	NONE	Waterbury Way	241	150	239	236	273	284	280
109	YLC55L	LC40L_30	10800	0	0	NONE	Waterbury Lake	241	189	242	280	273	338	332
110	ULC50E	LC40L_30	11400	0	0	NONE	East Roaseville Parkway	231	147	181	204	276	249	240
111	YLC50E	LC40L_30	11400	0	0	NONE	East Roseville Parkway Pond	231	168	196	237	276	278	263
112	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane	231	149	157	187	276	220	211
113	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane Pond	231	149	157	187	276	220	211
Linda Creek/Hazel Avenue Tributary (Sac County)														
114	YC35Q2	LC40L_30	0	0	0	NONE	Linda Creek Confluence	391	220	1069	306	494	331	330
115	UC35Q2	LC40L_30	400	0	0	NONE	Oak Avenue	391	220	331	306	494	331	330
Linda Creek/Orangevale Tributary (Sac County)														
116	YC35Q2	LC40L_30	0	Linda Creek	South Branch	.001	Linda Creek Confluence	475	270	333	350	538	375	372
1116	YLC35Q	LC40L_30	0	Linda Creek	South Branch	0.125	Private Bridge (Metal and Concrete)	#N/A	286	328	347	#N/A	361	360
117	ULC35Q	LC40L_30	900	Linda Creek	South Branch	0.196	Oak Avenue	282	286	329	347	320	361	360
1117	ULC30E	LC40L_30	0	Linda Creek	South Branch	1.022	Private Bridge in Park Area	#N/A	131	163	186	#N/A	198	198
118	ULC30E	LC40L_30	3300	Linda Creek	South Branch	1.035	Filbert Avenue	269	131	163	186	305	198	198
1118	ULC30B	LC40L_30	0	Linda Creek	South Branch	1.244	Private Bridge Near Chestnut	#N/A	120	147	167	#N/A	188	188
119	UC30C2	LC40L_30	4300	Linda Creek	South Branch	1.346	Chestnut Avenue	254	114	138	156	288	175	175
120	ULC30A	LC40L_30	5500	Linda Creek	South Branch	1.649	Walnut Avenue (North)	167	89	97	134	167	151	154
120	UC20E3	LC40L_30	5500	Linda Creek	South Branch	1.772	Walnut Avenue (South)	167	89	97	134	167	151	154
121	VLC25C	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (North)	125	21	27	31	125	34	34
1121	VLC20E	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (South)	#N/A	73	79	107	#N/A	119	119
Antelope Creek														
122	UDC4D	AC5I_60	0	Antelope Ck	AntelopeBlwClove	0.	Miners Ravine/Dry Creek	1242	1600	1782	1604	1426	1914	1719
123	UC45B2	AC5I_60	1400	Antelope Ck	AntelopeBlwClove	1394.899	Harding Blvd.	1241	1600	1780	1602	1425	1915	1715
124	UAC45B	AC5I_60	2300	Antelope Ck	AntelopeBlwClove	2349.499	Atlantic Street	1241	1602	1781	1604	1425	1918	1717
1124	UAC45B	AC5I_60	0	Antelope Ck	AntelopeBlwClove	2455.599	Bridge #3	#N/A	1598	1775	1602	#N/A	1916	1714
125	UAC45L	AC5I_60	5000	Antelope Ck	AntelopeBlwClove	5017.599	County Dump Road	1238	1629	1784	1659	1421	1937	1761
126	UC41E4	AC5I_60	9600	Antelope Ck	AntelopeBlwClove	10909.49	Highway 65 - non ras (Gage 1583)	1243	1637	1767	1667	1425	1950	1921
127	UC41E3	AC5I_60	10300	Antelope Ck	AntelopeBlwClove	11383.53	Springview Drive	1620	1628	1755	1659	1721	1941	1913
128	YC41E2	AC5I_60	10800	Antelope Ck	AntelopeBlwClove	11418.53	Rocklin City Tributary Confluence	1594	1624	1754	1655	1701	1938	1909
130	UC40K2	AC5I_60	15800	Antelope Ck	AntelopeBlwClove	16930.03	Sunset Blvd.	1559	1580	1697	1612	1673	1896	1869
133	UV10B2	AC5I_60	22800	Antelope Ck	AntelopeBlwClove	24722.3	Clover Valley Creek Confluence	1400	1537	1610	1572	1587	1862	1834
134	UC35G3	AC5I_60	23600	Antelope Ck	Reach 1	25350.71	Midas Avenue	1018	1255	1111	1261	1186	1328	1305
135	UAC35C	AC5I_60	25700	Antelope Ck	Reach 1	27696.03	Southern Pacific Railroad (UPRR) - non ras	1008	1298	1086	1303	1175	1372	1365
136	VAC35I	AC5I_60	26500	Antelope Ck	Reach 1	28434.67	Yankee Hill Road	1004	1293	1079	1298	1171	1367	1359
137	YAC30C	AC5I_60	27600	Antelope Ck	Reach 1	34226	Atkinson Dairy Dam	993	1263	1012	1268	1160	1337	1333
138	YAC30B	AC5I_60	28900	Antelope Ck	Reach 1	34691	Unnamed Road - no ras - no find aerial	983	1249	985	1253	1148	1317	1314
139	YAC30B	AC5I_60	31800	Antelope Ck	Reach 1	35656	Delmar Avenue - no ras	1018	1250	984	1254	1196	1319	1316
140	YAC30B	AC5I_60	34300	Antelope Ck	Reach 1	36964	Sierra College Blvd. (Gage 1573)	986	1251	987	1255	1165	1320	1317
141	U30AC4	AC5I_60	37000	Antelope Ck	Reach 1	39726	King Road	962	1243	958	1244	1137	1308	1306

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Antelope Creek / Clark Tunnel Road Tributary														
142	U30AC2	AC5I_60	0	Antelope Ck	Reach 1	40906	Antelope Creek Confluence	1004	1224	929	1238	1200	1293	1287
143	UC25BC	AC5I_60	100	0	0	NONE	Barker Road	567	384	283	384	745	403	401
144	VAC20C	AC5I_60	1300	0	0	NONE	Humphrey Road	638	261	157	261	864	281	283
145	YC16EB	AC5I_60	1700	0	0	NONE	Humphrey Tributary Confluence	625	214	130	214	851	234	236
148	UC15CB	AC5I_60	7000	0	0	NONE	Colwell Road	423	132	76	132	643	141	141
149	YC15BC	AC5I_60	10000	0	0	NONE	English Colony Way	369	114	56	114	576	116	116
150	AC15AD	AC5I_60	12800	0	0	NONE	Clark Tunnel Road	158	87	41	87	293	87	87
Antelope Creek/Rocklin City Tributary														
151	VAC41E	CC5G_90	0	0	0	NONE	Antelope Creek Confluence	108	165	201	165	140	183	180
152	VAC41F	SE40M_30	2700	0	0	NONE	Taylor Road	81	67	93	67	105	79	78
153	VAC41F	SE40M_30	2800	0	0	NONE	Taylor Road	67	67	93	67	87	79	78
154	UAC41A	SE40M_30	4500	0	0	NONE	Sunset Blvd.	40	35	52	35	52	45	44
Antelope Creek/Clover Valley Creek														
155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	.1	Antelope Creek Confluence	398	399	493	413	432	550	534
1155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	155	Golf Course Ped Bridge	#N/A	397	493	411	#N/A	549	533
156	UCV10B	AC5I_60	400	Clover Valley	Clover Valley1	445	Argonaut Avenue	397	396	493	411	431	577	532
157	YCV10B	AC5I_60	2200	Clover Valley	Clover Valley1	2785	Footbridge and Weir	391	396	494	411	423	580	533
158	UXV10A	AC5I_60	4300	Clover Valley	Clover Valley1	4090	Midas Avenue	388	389	478	404	420	570	524
159	YCV10A	AC5I_60	4700	Clover Valley	Clover Valley1	4430	Abandoned Stone Bridge	389	390	479	404	420	571	525
160	YCV10A	AC5I_60	5600	Clover Valley	Clover Valley1	5400	Unnamed Bridge	385	373	435	388	415	582	526
1160	UV6CB2	AC5I_60	0	Clover Valley	Clover Valley1	6365	Gazebo Crossing	#N/A	374	436	390	#N/A	592	540
161	UCV6CB	AC5I_60	6500	Clover Valley	Clover Valley1	6505	Clover Valley Detention Pond	384	374	436	390	412	592	540
162	YV6CB2	AC5I_60	7700	Clover Valley	Clover Valley1	7815	Creekwood Drive	380	375	437	390	407	592	542
163	UCV6BC	AC5I_60	12000	Clover Valley	Clover Valley1	12015	Rawhide Road	346	348	387	348	380	537	516
164	UCV6BC	AC5I_60	12500	Clover Valley	Clover Valley1	12550	Rowhide Road Det. Pond	342	349	387	348	377	538	518
165	UCV5C	AC5I_60	25600	Clover Valley	Clover Valley1	NONE	Unnamed Road	243	314	311	314	298	508	488
166	UCV1T	AC5I_60	28000	Clover Valley	Clover Valley1	NONE	Sierra College Blvd.	218	207	191	207	273	396	384
167	VCV1T	AC5I_60	28500	Clover Valley	Clover Valley1	NONE	English Colony Way	218	158	138	158	273	350	321
Antelope Creek Continued (West Branch)														
169	UC25BC	AC5I_60	38700	0	0	NONE	Clark Tunnel Road Tributary Confluence	437	384	938	384	455	403	401
170	U25AD2	AC5I_60	40600	0	0	NONE	Barker Road	390	360	656	360	419	380	377
171	Y25AD2	AC5I_60	42500	0	0	NONE	Citrus Colony Road	360	371	261	371	566	392	390
172	YAC16A	AC5I_60	47900	0	0	NONE	English Colony Road	210	161	90	161	274	174	174
Antelope Creek/Humphrey Tributary														
173	UPAC5K	AC5I_60	0	0	0	NONE	Clark Tunnel Road Tributary Confluence	194	131	630	131	251	133	133
174	VAC5J2	AC5I_60	1700	0	0	NONE	Sandy Road	135	135	115	135	176	137	137
175	VAC5O	AC5I_60	3300	0	0	NONE	Mardell Lane	116	24	530	24	151	24	24

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176	UPAC5G	AC5I_60	3700	0	0	NONE	Colwell Road	97	114	60	114	126	117	117
177	YAC5E	AC5I_60	6300	0	0	NONE	English Colony Way	58	102	43	102	75	105	105
Miners Ravine														
178	UMR40E	SE40M_30	0	Miners Ravine	Below Secret	10.	Antelope Creek/Dry Creek	3384	2833	4437	2845	3697	3203	3057
179	UMR40E	SE40M_30	200	Miners Ravine	Below Secret	94.	Harding Blvd.	3383	2833	4437	2845	3696	3203	3057
180	YMR40E	SE40M_30	1500	Miners Ravine	Below Secret	659.8999	Interstate 80 - no ras	3381	2835	4436	2848	3691	3215	3058
181	YMR40B	SE40M_30	2800	Miners Ravine	Below Secret	1422.400	Eureka Way	3384	2828	4435	2840	3689	3197	3051
182	YSEMR	SE40M_30	3800	Miners Ravine	Below Secret	3734.100	Secret Ravine Confluence	2625	2822	4431	2835	2813	3192	3047
183	YMR37D	MR15J_30	5300	Miners Ravine	BET SECRET-FALSE	5674.100	Sunrise Avenue - no ras	2307	1092	1838	1106	2497	1177	1130
184	UR37D4	MR15J_30	7000	Miners Ravine	BET SECRET-FALSE	7319.900	Boardman Tributary	672	1091	1834	1106	775	1176	1130
185	UR36N2	MR15J_30	9000	Miners Ravine	Above False	9828.100	East Roseville Parkway	1685	1056	1718	1076	1867	1145	1100
186	UMR31Q	MR15J_30	18200	Miners Ravine	Above False	18310.19	Sierra College Blvd.	1656	1034	1658	1060	1837	1127	1084
187	YR31Q2	MR15J_30	18300	Miners Ravine	Above False	18610	Cavitt Stallman Tributary - no ras	1656	1031	1648	1058	1837	1125	1082
188	UMR31G	MR15J_30	18600	Miners Ravine	Above False	18685	Cavitt (&) Stallman Road	1520	939	1279	964	1698	1026	989
190	UR31P2	MR15J_30	23400	Miners Ravine	Above False	23390	Shadow Oaks Lane	1478	915	1217	942	1654	1050	977
1190	YMR31D	MR15J_30	0	Miners Ravine	Above False	27990.	Hardy Lane	#N/A	905	1185	934	#N/A	1002	970
191	UMR31D	MR15J_30	28900	Miners Ravine	Above False	28826	Barton Road	1485	903	1183	932	1770	1001	969
192	UMR30R	MR15J_30	31300	Miners Ravine	Above False	31379	TallPine Lane	1457	899	1171	929	1740	995	965
193	UMR30Q	MR15J_30	33000	Miners Ravine	Above False	32984	Carolinda Drive	1429	900	1171	930	1710	995	965
194	UMR30P	MR15J_30	34800	Miners Ravine	Above False	34813	Itchy Acres Road	1409	888	1135	919	1694	984	954
196	UR30H2	MR15J_30	35500	Miners Ravine	Above False	35489	Miners Ravine Road	1397	888	1135	920	1682	984	954
197	UR30H3	MR15J_30	36800	Miners Ravine	Above False	36790	Leibinger Lane	1384	884	1112	916	1669	979	950
199	UR29B2	MR15J_30	39700	Miners Ravine	Above False	39765	Auburn Folsom Road	1323	875	1071	909	1493	969	940
200	UXR29H	MR15J_30	41700	Miners Ravine	Above False	40276	Oak Lane	1292	901	1072	909	1461	969	968
201	UR29I2	MR15J_30	43000	Miners Ravine	Above False	44240	Old Bridge	1260	891	991	898	1428	946	945
202	YMR29I	MR15J_30	43200	Miners Ravine	Above False	44240	Cottonwood Lake	1253	891	991	898	1420	946	945
203	UMR21C	MR15J_30	44400	Miners Ravine	Above False	44368	Auburn Folsom Road	1244	861	993	898	1411	946	916
1203	YMR21C	MR15J_30	0	Miners Ravine	Above False	44523	Driveway opposite Twin Rocks Road	#N/A	846	948	881	#N/A	927	900
204	YMR21D	MR15J_30	45600	Miners Ravine	Above False	45593	Confluence with Lake Tributary (MR15)	1199	855	948	884	1364	927	907
1204	UXR20R	MR15J_30	0	Miners Ravine	Above False	52637	Bridge 15	#N/A	694	633	718	#N/A	762	744
1205	UXR20Q	MR15J_30	0	Miners Ravine	Above False	53992	Bridge 16	#N/A	686	602	708	#N/A	755	737
205	UR20P2	MR15J_30	56000	Miners Ravine	Above False	55052	Moss Lane	1152	687	608	709	1314	757	740
1206	YR20K2	MR15J_30	0	Miners Ravine	Above False	57194	Bridge 18 So of Willow Valley Place	#N/A	650	521	669	#N/A	732	717
1207	YR20K2	MR15J_30	0	Miners Ravine	Above False	57599	Willow Valley Place	#N/A	650	522	670	#N/A	732	719
1208	UR20C2	MR15J_30	0	Miners Ravine	Above False	57984	Bridge 20 North of Willow Valley Place	#N/A	638	502	659	#N/A	728	716
207	UR15K2	MR15J_30	59900	Miners Ravine	Above False	59894	Dick Cook Road	860	592	431	609	1002	683	674
208	UXR15V	MR15J_30	61500	Miners Ravine	Above False	61470	Auburn Folsom Road	831	513	335	529	971	611	599
209	UR15W2	MR15J_30	62400	Miners Ravine	Above False	62487	Placer Canyon Parkway	801	589	338	606	939	663	649
1209	Y15AE2	MR15J_30	0	Miners Ravine	Above False	64347	Lominda Lane	#N/A	576	310	597	#N/A	664	652
210	UXR15Q	MR15J_30	67600	Miners Ravine	Above False	67574	Horseshoe Bar Road	647	575	273	581	771	655	628

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1210	UMR10M	MR15J_30	0	Miners Ravine	Above False	70394	Bridge 26	#N/A	564	258	574	#N/A	646	620
1211	UMR10M	MR15J_30	0	Miners Ravine	Above False	70984	Bridge 27	#N/A	570	259	578	#N/A	653	624
1212	UMR10I	MR15J_30	0	Miners Ravine	Above False	73328	Whiskey Bar Road	#N/A	488	227	491	#N/A	548	530
1213	UXR10E	MR15J_30	0	Miners Ravine	Above False	75238	Bridge 30	#N/A	474	220	477	#N/A	533	513
1214	UMMR5S	MR15J_30	0	Miners Ravine	Above False	75448	Bridge 31	#N/A	415	200	416	#N/A	468	455
1215	YMR10E	MR15J_30	0	Miners Ravine	Above False	76148	Bridge 32	#N/A	415	199	417	#N/A	469	455
211	YMR10E	MR15J_30	71700	Miners Ravine	Above False	76613	Auburn Folsom Road	543	415	199	418	656	470	456
212	UPMR5R	MR15J_30	73300	Miners Ravine	Above False	78358	King Road	510	223	136	225	683	246	248
213	YMR5W	MR15J_30	79400	Miners Ravine	Above False	79398	Penryn Rock Springs Road	147	200	122	200	208	222	222
214	YMR5P	MR15J_30	80200	Miners Ravine	Above False	80243	Newcastle Road	88	155	97	155	125	174	174
Miners Ravine/Boardman Tributary														
215	UR37D3	CC5G_90	0	0	0	NONE	Miners Ravine Confluence	217	134	1644	262	288	276	275
216	UR35R6	CC5G_90	800	0	0	NONE	East Roseville Parkway	206	130	173	255	274	268	267
Miners Ravine/Cavitt & Stallman Tributary														
217	UMR25L	SE40N_0	0	0	0	NONE	Miners Ravine Confluence	355	151	1446	151	425	170	172
218	YR25M2	SE40N_0	2400	0	0	NONE	Hidden Valley Place	335	156	375	155	402	176	178
219	YMR25N	SE40N_0	3100	0	0	NONE	Baywood Road	316	152	359	151	379	172	174
220	YR25P2	SE40N_0	3700	0	0	NONE	S. Bar B Lane	296	149	345	147	355	168	171
221	YMR25D	SE40N_0	4500	0	0	NONE	Kokuia Lane	277	125	241	125	332	152	152
222	YMR25I	SE40N_0	5100	0	0	NONE	Crestview Lane	257	135	300	135	309	157	158
223	YMR24E	SE40N_0	9300	0	0	NONE	Barton Road	260	121	204	121	360	146	146
Miners Ravine/Lake Tributary (MR21) -														
224	UMR21H	MR15J_30	0	0	0	NONE	Miners Ravine Confluence	170	51	893	51	226	88	84
225	UMR21H	MR15J_30	200	0	0	NONE	Auburn Folsom Road	192	51	55	51	254	88	84
226	YMR21H	MR15J_30	300	0	0	NONE	South Lake Circle	192	73	60	73	254	120	114
Secret Ravine														
227	YSE85Q	SE40M_30	0	Secret Ravine	Below Sucker	1	Miners Ravine Confluence	1890	2260	2591	2291	1967	2573	2439
228	YE85Y2	SE40M_30	1400	Secret Ravine	Below Sucker	798.3000	East Roseville Parkway	1889	2259	2587	2290	1967	2572	2438
229	YE76A2	SE40M_30	13500	Secret Ravine	Below Sucker	14280.	Sucker Ravine Confluence	1864	2208	2511	2244	1977	2541	2407
230	Y56AB3	SE40M_30	16200	Secret Ravine	Reach 1	17396	Aguiar Road Tributary Confluence	1659	1919	1983	1933	1762	2198	2093
231	USE52D	SE40M_30	17600	Secret Ravine	Reach 1	18595.9	Rocklin Road - China Gardens	1552	1920	1982	1933	1750	2199	2094
232	YSE51K	SE40M_30	23300	Secret Ravine	Reach 1	24526	Sierra College Blvd.	1525	1905	1946	1918	1729	2192	2085
233	UE50Q2	SE40M_30	28800	Secret Ravine	Reach 1	30371	Private Road - Diaz	1427	1797	1688	1808	1654	2076	2072
234	UE50P2	SE40M_30	29200	Secret Ravine	Reach 1	30801	Private Road	1421	1799	1688	1811	1649	2076	2049
235	YE50F2	SE40M_30	30800	Secret Ravine	Reach 1	32256	Brace Road	1371	1771	1650	1782	1611	2047	2017
236	YE50A2	SE40M_30	32600	Secret Ravine	Reach 1	34081	Horseshoe Bar Road	1333	1732	1606	1743	1581	2003	1971
237	YE50A2	SE40M_30	33400	Secret Ravine	Reach 1	34081	Loomis Tributary Confluence	1329	1732	1606	1743	1578	2003	1971
238	YE35B2	SE40M_30	33500	Secret Ravine	Reach 1	34866	King Road Tributary Confluence	1252	1685	1544	1704	1516	1969	1938
239	USE35A	SE40M_30	38600	Secret Ravine	Reach 1	38066	King Road-no ras	1071	1369	1180	1383	1370	1606	1573
241	YE35B2	SE40M_30	40000	Secret Ravine	Reach 1	40346	Penryn Road	1063	1331	1140	1346	1369	1570	1538
242	YSE30E	SE40M_30	40500	Secret Ravine	Reach 1	NONE	Harris/Boulder Creek Road.	1060	1237	1040	1251	1368	1464	1436

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243	VSE26I	SE40M_30	40700	Secret Ravine	Reach 1	NONE	Penryn Tributary Confluence	929	1174	987	1187	1243	1398	1365
244	VSE26H	SE40M_30	43300	Secret Ravine	Reach 1	NONE	Boulder Creek Road	814	394	324	394	1138	445	442
245	VE26N2	SE40M_30	48500	Secret Ravine	Reach 1	NONE	Brennans Road	501	369	307	369	824	418	417
246	VE26N2	SE40M_30	48900	Secret Ravine	Reach 1	NONE	Rock Springs Road	492	369	307	369	813	418	417
247	USE26E	SE40M_30	50400	Secret Ravine	Reach 1	NONE	Meadow Lane	461	301	265	302	779	344	342
248	UE26BB	SE40M_30	51300	Secret Ravine	Reach 1	NONE	Los Puentes Road	442	284	257	284	757	326	324
249	VE25IA	SE40M_30	55300	Secret Ravine	Reach 1	NONE	Newcastle Road	487	283	262	283	709	325	324
250	UE25AB	SE40M_30	57700	Secret Ravine	Reach 1	NONE	Powerhouse Road	341	241	242	241	496	281	280
Secret Ravine/Sucker Ravine														
251	UXE70I	SE40N_0	0	Sucker Ravine	Reach 1	0	Secret Ravine Confluence	516	293	356	302	840	392	376
252	USE76A	SE40N_0	1000	Sucker Ravine	Reach 1	840	China Garden Road	513	296	358	305	836	396	380
253	YSE76B	SE40N_0	1200	Sucker Ravine	Reach 1	1305	Interstate 80	512	296	358	305	835	396	380
254	YSE76B	SE40N_0	2200	Sucker Ravine	Reach 1	1860	Oakridge Street	510	299	359	308	834	398	383
255	YSE76B	SE40N_0	2600	Sucker Ravine	Reach 1	2750	Lakeside Drive	504	300	359	308	826	399	383
256	USE70I	SE40N_0	3950	Sucker Ravine	Reach 1	4110	Rocklin Road	491	295	349	304	812	394	378
257	USE70H	SE40N_0	4300	Sucker Ravine	Reach 1	4580	Quary Lake	487	283	330	291	808	382	366
258	YSE70H	SE40N_0	4700	Sucker Ravine	Reach 1	4840	Super Span	483	283	330	291	803	382	366
259	USE70F	SE40N_0	7450	Sucker Ravine	Reach 1	7605	Sierra Meadows Drive	471	272	305	278	790	385	366
1259	YSE70B	SE40N_0	0	Sucker Ravine	Reach 1	9955	Culvert 1	#N/A	234	249	240	#N/A	343	328
1260	YSE70D	SE40N_0	0	Sucker Ravine	Reach 1	10565	Driveway Below Dominguez Road	#N/A	235	249	241	#N/A	347	331
260	YSE70C	SE40N_0	10800	Sucker Ravine	Reach 1	10935	Dominguez Road	410	242	251	248	721	348	333
261	UE60E2	SE40N_0	11000	Sucker Ravine	Reach 1	10935	Loomis Tributary Confluence	405	242	251	248	715	348	333
263	YSE66J	SE40N_0	13400	Sucker Ravine	Reach 1	14525	Pacific Street	380	109	134	119	685	125	121
1263	USE66J	SE40N_0	0	Sucker Ravine	Reach 1	14756	Railroad	#N/A	109	135	119	#N/A	125	122
1264	USE66D	SE40N_0	0	Sucker Ravine	Reach 1	16706	Culvert 5	#N/A	119	117	132	#N/A	136	135
264	USE66D	SE40N_0	14800	Sucker Ravine	Reach 1	16846	Bankhead Road	360	119	117	132	661	136	135
265	YSE66C	SE40N_0	15200	Sucker Ravine	Reach 1	17266	Sierra College Blvd.	353	116	111	128	652	132	131
266	USE66A	SE40N_0	19000	Sucker Ravine	Reach 1	20671	Saunders Avenue	148	218	131	327	364	274	257
267	SE65	SE40N_0	20200	Sucker Ravine	Reach 1	22546	King Road	148	193	108	283	364	193	193
Secret Ravine/Sucker Ravine/Loomis Tributary														
268	VSE60E	SE40N_0	0	0	0	NONE	Sucker Ravine Confluence	210	198	132	196	422	298	292
270	VE60D2	SE40N_0	4400	0	0	NONE	Sierra College Blvd.	116	178	105	179	232	234	226
Secret Ravine/Aguilar Road Tributary														
271	Y56AB2	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	374	156	2156	169	677	214	236
272	Y56AB2	SE40N_0	700	0	0	NONE	Aguilar Road	364	156	261	169	666	214	236
273	YSE56B	SE40N_0	2400	0	0	NONE	Foothill Road	344	140	242	164	640	206	211
274	Y55MA2	SE40N_0	4100	0	0	NONE	El Don Road	328	94	162	105	621	126	123
275	UE56DB	SE40N_0	4100	0	0	NONE	El Don Detention Pond	318	94	161	99	608	119	120
276	VSE55L	SE40N_0	6100	0	0	NONE	Sierra College Blvd.	242	76	123	76	316	98	97
Secret Ravine / Loomis Tributary														
277	YSE40J	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	258	217	1599	273	529	317	312

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	10-year 1989 JMM	10-year 1992 Corrected	January 1995	10-year 2007-Current	10-year Future JMM	10-year Future Unmitigated	10-year Build-out w/LID & Projects
278	YSE40J	SE40N_0	1200	0	0	NONE	Interstate 80	245	217	113	273	511	317	312
279	VSE40I	SE40N_0	2800	0	0	NONE	Laird Street	235	196	96	246	497	262	263
280	VSE40F	SE40N_0	3600	0	0	NONE	King Road	226	147	71	191	485	191	191
Secret Ravine/King Road Tributary														
281	USE45W	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	535	395	1599	395	860	451	447
282	YSE45Q	SE40M_30	3900	0	0	NONE	Rancho Verde Road	509	196	153	196	832	236	234
283	YSE45A	MR15J_30	5400	0	0	NONE	Val Verde Road	221	153	113	153	274	199	195
284	USE44B	MR15J_30	6300	0	0	NONE	King Road	199	139	92	139	247	185	181
Secret Ravine/Penryn Tributary														
285	YE15L2	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	399	862	685	876	707	1013	992
286	USE7H2	SE40M_30	4700	0	0	NONE	Rock Springs Road	495	689	558	703	809	819	798
287	YSE5F2	SE40M_30	5600	0	0	NONE	East/West Forks Confluence	453	610	513	624	771	741	718
Secret Ravine/ E. Fork Penryn Tributary														
288	VSE5F2	SE40M_30	0	0	0	NONE	West Fork Confluence	135	202	179	212	198	254	243
289	YSE5F	SE40M_30	900	0	0	NONE	Fairview Lane	121	202	179	212	177	254	243
290	YE20BS	SE40M_30	3700	0	0	NONE	Gilardi Road	50	152	137	161	73	192	185
Secret Ravine/W. Fork Penryn Tributary														
291	YSE7D	SE40M_30	0	0	0	NONE	East Fork Confluence	315	444	342	450	560	534	520
292	YSE10A	SE40M_30	200	0	0	NONE	Interstate 80	314	438	338	444	557	528	515
293	YE10BB	SE40M_30	1400	0	0	NONE	Girardi Road	295	409	328	415	571	502	489

Table G.7 2-YEAR EVENT

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	2-year 1989 JMM	2-year 1992 Corrected	Dec 2005 (<10 yr) (>2 yr)	2-year 2007-Current	2-year Future JMM	2-year Future Unmitigated	2-year Build-out w/LID & Projects
DRY CREEK														
1	VC135B	SE40N_0	8900	Dry Creek	Below Cirby	NONE	Rio Linda Blvd(North and South)	2715	1250	2660	1509	3000	1756	1661
2	Y130B2	SE40N_0	15000	Dry Creek	Below Cirby	NONE	Elkhorn Blvd. (North and South)	2758	1258	2665	1519	3040	1770	1675
3	YC125B	SE40N_0	16600	Dry Creek	Below Cirby	NONE	Curved Bridge Road (North)	2765	1288	2641	1548	3046	1812	1715
4	YC125A	SE40N_0	17400	Dry Creek	Below Cirby	NONE	Dry Creek Road (North and South)	2764	1277	2571	1539	3046	1803	1706
5	YDC115	SE40N_0	24400	Dry Creek	Below Cirby	NONE	Q Street (North and South)	2909	1296	2539	1551	3131	1821	1723
6	YDC90	SE40N_0	34900	Dry Creek	Below Cirby	NONE	Sierra Creek Confluence	2901	1266	2499	1513	3171	1788	1692
7	YDC85	SE40N_0	35200	Dry Creek	Below Cirby	NONE	28th Street (South)	2770	1271	2498	1512	3066	1789	1693
8	YDC85	SE40N_0	35400	Dry Creek	Below Cirby	NONE	Elverta Road	2748	1271	2498	1512	3043	1789	1693
9	YDC71B	SE40N_0	36900	Dry Creek	Below Cirby	38733	Confluence with County Line Trib	2761	1466	2701	1644	3060	1946	1842
11	YDC75C	SE40N_0	41400	Dry Creek	Below Cirby	41634	Watt Avenue	2828	1466	2694	1638	3039	1941	1836
13	YC65I2	SE40N_0	47700	Dry Creek	Below Cirby	47754	Confluence with DC65 Trib	2853	1438	2659	1598	3037	1895	1798
14	YDC60A	SE40N_0	50300	Dry Creek	Below Cirby	50025	Walerga Road	2829	1437	2657	1595	2975	1891	1795
1015	YDC50A	SE40N_0	0	Dry Creek	Below Cirby	55005	Morgan Creek Ped Crossing	#N/A	1430	2651	1587	#N/A	1884	1785
16	YDC35C	SE40N_0	58800	Dry Creek	Below Cirby	58560	Cook Riolo Road	3000	1427	2654	1584	3104	1879	1781
17	YDC25A	CC5G_90	67000	Dry Creek	Below Cirby	67583.80	S.P. Railroad Bridge	3135	1334	2574	1434	3185	1715	1628
18	YDC10D	SE40N_0	67400	Dry Creek	Below Cirby	67641.80	Atkinson Blvd.	3135	1350	2574	1485	3185	1764	1674
20	YDC20A	SE40N_0	68900	Dry Creek	Below Cirby	69138.40	S.P. Railroad Culverts (now bridge)	3459	1346	2572	1480	3503	1758	1669
21	YDC10D	SE40N_0	69900	Dry Creek	Below Cirby	70071.60	Vernon Street	3439	1343	2571	1476	3467	1754	1664
22	YDC10B	SE40N_0	72600	Dry Creek	Below Cirby	72702.60	Riverside Avenue	3980	1336	2576	1466	3980	1743	1653
23	YDCCC	SE40N_0	73000	Dry Creek	Below Cirby	72982	Cirby Creek Confluence	3980	1336	2576	1466	3980	1743	1653
24	YDC5A	SE40M_30	73800	Dry Creek	Above Cirby	73943.30	Darling Way	2760	1008	2064	1066	2761	1322	1250
25	YDC5C	SE40M_30	77000	Dry Creek	Above Cirby	77218.89	Douglas Blvd.	2599	1000	2066	1056	2601	1312	1240
26	UDC5B	SE40M_30	77500	Dry Creek	Above Cirby	77606.49	Royer Park Footbridge	2502	1000	2065	1056	2504	1312	1240
27	YDC5B	SE40M_30	79100	Dry Creek	Above Cirby	79166.05	Lincoln Street	2454	994	2065	1051	2456	1306	1235
28	YDC4C	SE40M_30	79400	Dry Creek	Above Cirby	79816.70	Folsom Road	2438	994	2065	1051	2440	1306	1235
30	YACMR	SE40M_30	84100	Dry Creek	Above Cirby	84214.40	Antelope Creek/ Miners Ravine Confluence	1378	980	2060	1035	1675	1290	1220
DRY CREEK - ELVERTA TRIB														
31	UDC90	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	72	38	88	38	113	45	44
DRY CREEK - SIERRA CREEK														
32	YC100B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	208	165	382	170	273	205	197
33	YC100A	CC5G_90	1400	0	0	NONE	28th Street	159	166	388	171	212	204	197
34	YC100A	CC5G_90	3700	0	0	NONE	Scotland Drive	161	166	388	171	228	204	197
35	VC96B2	CC5G_90	5400	0	0	NONE	Delaney Drive	163	149	352	154	230	184	177
36	YDC96A	CC5G_90	6800	0	0	NONE	Watt Avenue	172	125	310	130	229	158	151
37	VDC96C	CC5G_90	10300	0	0	NONE	Navaho Way	111	87	217	92	141	116	110
38	YDC96C	CC5G_90	11400	0	0	NONE	Elverta Road	98	87	223	92	122	117	110

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39	DC95A	CC5G_90	13500	0	0	NONE	Walerga Road	141	11	31	11	180	20	17
DRY CREEK/County Line Trib. (Note: Riolo Vineyards project determined this tributary does not drain as previously modeled - corrected in 2009 study)														
40	YDC75B	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	90	93	215	96	150	115	111
41	N/A	#N/A	3200	0	0	NONE	Watt Avenue	68	#N/A	#N/A	#N/A	127	#N/A	#N/A
42	VDC68B	CC5G_90	8200	0	0	NONE	PFE Road	79	82	185	85	174	95	93
Dry Creek DC-65 Tributary														
43	YDC65I	CC5G_90	0	0	0	NONE	Confluence with Dry Creek	84	39	128	32	97	36	57
44	YDC65K	CC5G_90	3000	0	0	NONE	Walerga Road	67	36	118	50	78	53	53
Cirby Creek														
45	YCC45G	LC40L_30	0	Cirby Creek	below Linda	0	Dry Creek Confluence	1362	374	668	498	1367	560	544
46	YCC45A	LC40L_30	3000	Cirby Creek	below Linda	2969.699	Interstate 80	1350	382	672	498	1355	567	550
48	UCC45E	LC40L_30	4600	Cirby Creek	below Linda	4580.699	Wanda Lee Court Footbridge	1388	377	673	493	1390	564	546
49	YCC45E	LC40L_30	6100	Cirby Creek	Above Linda	6009.699	Linda Creek Confluence	1405	371	324	486	1406	558	540
50	YCC40A	CC5G_90	7400	Cirby Creek	Above Linda	7262.099	Sunrise Blvd.	325	230	325	312	325	317	316
51	YCC40C	CC5G_90	8100	Cirby Creek	Above Linda	8038.899	Coloma Way - Gage 1635	281	219	314	304	281	309	308
52	YC40G2	CC5G_90	9100	Cirby Creek	Above Linda	9004.399	Oak Ridge Drive	270	207	291	293	270	299	298
53	UCC35D	CC5G_90	10000	Cirby Creek	Above Linda	9873.999	Sierra Gardens Footbridge	270	209	299	297	270	303	302
54	YCC15B	CC5G_90	11800	Cirby Creek	Above Linda	11679.19	Loretto Drive	291	201	280	296	291	302	301
55	YCC252	CC5G_90	12000	Cirby Creek	Above Linda	12228.79	Sierra Gardens Trib. Confluence	134	143	182	221	228	225	224
56	YCC15C	CC5G_90	12500	Cirby Creek	Above Linda	12377.29	Sierra Gardens Drive	56	145	185	222	121	226	226
57	YCC10E	CC5G_90	13900	Cirby Creek	Above Linda	13765.49	Huntington Drive	75	132	166	210	165	214	213
58	UCC10H	CC5G_90	14500	Cirby Creek	Above Linda	14420.19	Rocky Ridge Drive	46	79	91	122	93	126	126
60	YCC5B	CC5G_90	16400	Cirby Creek	Above Linda	15748.19	Winchester Way	40	63	72	100	84	102	102
61	YCC5D	CC5G_90	17200	Cirby Creek	Above Linda	16312.19	Eureka Road	40	42	51	76	84	77	77
62	YCC1A	CC5G_90	19700	Cirby Creek	Above Linda	17753.79	Douglas Blvd.	41	29	37	62	119	63	63
Cirby Creek/Sierra Gardens Trib.														
63	VCC25	CC5G_90	0	0	0	NONE	Cirby Creek Confluence	90	67	104	81	125	84	83
65	YCC20G	CC5G_90	1000	0	0	NONE	Douglas Blvd.	62	55	89	70	90	73	72
66	YCC20K	CC5G_90	1400	0	0	NONE	Sierra Gardens Ret. Basin	59	37	61	54	86	57	56
Linda Creek														
67	ULC95C	LC40L_30	0	Linda Creek	Below Strap	0.	Cirby Creek Confluence	1133	322	597	431	1136	503	486
68	ULC95D	LC40L_30	1000	Linda Creek	Below Strap	565.1000	Sunrise Avenue	1132	322	597	431	1134	502	485
70	YLC90A	LC40L_30	2600	Linda Creek	Below Strap	2125.000	Oak Ridge Drive	1198	319	593	312	1199	373	358
72	ULC90B	LC40L_30	4300	Linda Creek	Below Strap	3843.300	Sierra Gardens Footbridge	1198	316	588	425	1198	498	481
73	YLC85C	LC40L_30	8400	Linda Creek	Below Strap	8257.900	Rocky Ridge Dirve	1354	311	580	419	1355	495	477
74	ULC85B	LC40L_30	10000	Linda Creek	Below Strap	9810.000	Strap Ravine Confluence	1214	309	575	418	1214	497	477
76	ULC80I	LC40L_30	11500	Linda Creek	Below S Branch	136	Champion Oaks Drive/Samoa Way (Gage 1626/1628)	361	236	449	327	437	386	369
78	ULC80A	LC40L_30	14300	Linda Creek	Below S Branch	157	Auburn Road	357	216	412	312	429	372	354
79	UC45J3	LC40L_30	15700	Linda Creek	Below S Branch	176	Old Auburn Road/City Limits	356	207	376	292	427	351	333

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1079	ULC45J	LC40L_30	0	Linda Creek	Below S Branch	181	Ped Bridge over Creek in Park	#N/A	205	353	286	#N/A	343	324
Treelake Tributary Confluence														
80	ULC45J	LC40L_30	15900	Linda Creek	Below S Branch	181	Treelake Tributary Confluence	356	205	353	286	427	343	324
82	UC45J2	LC40L_30	19800	Linda Creek	Below S Branch	188	Indian Creek Drive	274	199	347	283	321	339	321
1082	ULC45D	LC40L_30	0	Linda Creek	Below S Branch	207	Private Bridge Near Hazel	#N/A	170	333	247	#N/A	301	284
83	ULC45D	LC40L_30	25300	Linda Creek	Below S Branch	211	Hazel Avenue	241	170	334	248	284	301	284
84	UC35Q3	LC40L_30	25500	Linda Creek	Below S Branch	212	Orangevale Tributary Confluence	241	170	334	248	284	301	284
1084	ULC40A	LC40L_30	0	Linda Creek	Above S Branch	3.075	BDG 17 2-24" CMPS	#N/A	100	245	153	#N/A	191	180
85	UC15N2	LC40L_30	31300	Linda Creek	Above S Branch	4.239	Granite Road Bridge	119	125	205	181	145	222	200
86	ULC15N	LC40L_30	32600	Linda Creek	Above S Branch	4.407	Cherry Avenue	134	124	199	179	163	221	198
1086	ULC15J	LC5A_0	0	Linda Creek	Above S Branch	5.22	Private Driveway Concrete Box Type	#N/A	118	124	124	#N/A	141	134
1087	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.264	Driveway Bridge	#N/A	118	124	124	#N/A	141	134
1088	YLC15J	LC5A_0	0	Linda Creek	Above S Branch	5.526	Granite Glen Court (Private)	#N/A	118	124	124	#N/A	141	134
88	YLC15J	LC5A_0	38600	Linda Creek	Above S Branch	5.715	Wedgewood Drive	111	118	124	124	134	141	134
1089	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.039	Golf Cart Bridge #5	#N/A	108	112	112	#N/A	126	121
1090	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.12	Golf Cart Bridge #4	#N/A	108	112	112	#N/A	126	119
1091	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.197	Golf Cart Bridge #3	#N/A	108	112	112	#N/A	126	119
1092	ULC102	LC5A_0	0	Linda Creek	Above S Branch	6.241	Golf Cart Bridge #2	#N/A	108	112	112	#N/A	126	119
1093	ULC5F2	LC5A_0	0	Linda Creek	Above S Branch	6.515	Golf Cart Bridge #1	#N/A	118	105	119	#N/A	122	115
89	ULC5F2	LC5A_0	42300	Linda Creek	Above S Branch	6.53	East Roaseville Parkway	102	118	105	119	126	122	115
90	ULC5F	LC5A_0	43100	Linda Creek	Above S Branch	6.759	Barton Road	101	109	100	111	125	113	108
91	YLC5E	LC5A_0	44600	Linda Creek	Above S Branch	7.140	Shadow Brook Place	86	87	89	90	106	91	82
92	ULC5B	LC5A_0	46500	Linda Creek	Above S Branch	7.479	Troy Purdy Lane	63	54	71	56	84	61	52
1094	ULC5C	LC5A_0	0	Linda Creek	Above S Branch	7.609	Muir Way	#N/A	51	53	51	#N/A	51	52
93	YLC5C	LC5A_0	48100	Linda Creek	Above S Branch	7.77	Country Court (Private)	52	37	53	37	73	37	52
1095	ULC1A	LC5A_0	0	Linda Creek	Above S Branch	7.839	Country Court	#N/A	121	130	206	#N/A	222	216
94	YLC1A	LC5A_0	48700	Linda Creek	Above S Branch	8.011	Auburn Folsom Road	79	31	53	32	125	36	30
Linda Creek/Strap Ravine														
95	USR25C	CC5G_90	0	Strap Ravine	Reach 1	0.	Linda Creek Confluence	133	120	129	205	194	221	215
1095	YSR25A	CC5G_90	300	Strap Ravine	Reach 1	276	Foot Bridge in Park	#N/A	121	130	206	#N/A	222	216
96	UR20A4	CC5G_90	1500	Strap Ravine	Reach 1	1136.900	McClaren Drive (Gage 1611)	132	121	129	204	193	221	215
97	UXR20A	CC5G_90	5900	Strap Ravine	Reach 1	5539.100	Johnson Ranch Drive	128	114	106	187	186	202	196
98	USR152	CC5G_90	6800	Strap Ravine	Reach 1	6380.600	Eureka Road	127	118	107	193	185	203	196
99	USR82	CC5G_90	8600	Strap Ravine	Reach 1	8201.500	East Roseville Parkway	125	61	76	110	195	119	112
100	USR5C2	LC5A_0	11800	Strap Ravine	Reach 1	11366.10	Sierra College Blvd.	116	43	43	57	158	59	63
101	USR1A	LC5A_0	23000	0	0	NONE	Barton Road	135	54	78	68	240	68	87
Linda Creek/Treelake Tributary														
102	ULC60B	LC40L_30	0	0	0	NONE	Linda Creek Confluence	356	14	78	23	427	25	24
103	YLC60B	LC40L_30	3200	0	0	NONE	Petite Way (approximated)	242	20	80	37	293	43	43
104	YLC60A	LC40L_30	5700	0	0	NONE	Old Auburn Road	108	17	78	26	140	28	27
105	YC55H3	LC40L_30	6000	0	0	NONE	Sierra College Blvd.	80	18	84	30	108	33	33

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106	YLC55F	LC40L_30	9600	0	0	NONE	Swan Lake Drive	65	15	84	22	77	24	23
107	UC55L2	LC40L_30	9600	0	0	NONE	Swan Lake	65	14	81	20	77	22	22
108	UPC55L	LC40L_30	10800	0	0	NONE	Waterbury Way	54	14	86	20	65	22	22
109	YLC55L	LC40L_30	10800	0	0	NONE	Waterbury Lake	54	31	91	64	65	75	75
110	ULC50E	LC40L_30	11400	0	0	NONE	East Roaseville Parkway	80	26	69	44	104	52	51
111	YLC50E	LC40L_30	11400	0	0	NONE	East Roseville Parkway Pond	80	33	74	48	104	56	54
112	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane	80	29	60	36	104	42	41
113	ULC50F	LC40L_30	11700	0	0	NONE	Treelake office Lane Pond	80	29	60	36	104	42	41
Linda Creek/Hazel Avenue Tributary (Sac County)														
114	YC35Q2	LC40L_30	0	0	0	NONE	Linda Creek Confluence	150	73	327	102	200	110	109
115	UC35Q2	LC40L_30	400	0	0	NONE	Oak Avenue	150	73	112	102	200	110	109
Linda Creek/Orangevale Tributary (Sac County)														
116	YC35Q2	LC40L_30	0	Linda Creek	South Branch	.001	Linda Creek Confluence	241	78	124	111	284	121	120
1116	YLC35Q	LC40L_30	0	Linda Creek	South Branch	0.125	Private Bridge (Metal and Concrete)	#N/A	78	125	112	#N/A	122	121
117	ULC35Q	LC40L_30	900	Linda Creek	South Branch	0.196	Oak Avenue	99	78	125	112	110	122	121
1117	ULC30E	LC40L_30	0	Linda Creek	South Branch	1.022	Private Bridge in Park Area	#N/A	36	53	54	#N/A	58	58
118	ULC30E	LC40L_30	3300	Linda Creek	South Branch	1.035	Filbert Avenue	90	36	53	54	100	58	58
1118	ULC30B	LC40L_30	0	Linda Creek	South Branch	1.244	Private Bridge Near Chestnut	#N/A	34	48	50	#N/A	54	53
119	UC30C2	LC40L_30	4300	Linda Creek	South Branch	1.346	Chestnut Avenue	92	32	45	48	101	51	50
120	ULC30A	LC40L_30	5500	Linda Creek	South Branch	1.649	Walnut Avenue (North)	66	17	30	25	67	28	28
120	UC20E3	LC40L_30	5500	Linda Creek	South Branch	1.772	Walnut Avenue (South)	66	17	30	25	67	28	28
121	VLC25C	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (North)	50	6	10	10	50	11	11
1121	VLC20E	LC40L_30	6700	Linda Creek	South Branch	NONE	Main Avenue (South)	#N/A	15	30	23	#N/A	26	25
Antelope Creek														
122	UDC4D	AC5I_60	0	Antelope Ck	AntelopeBlwClove	0.	Miners Ravine/Dry Creek	320	417	766	435	399	565	541
123	UC45B2	AC5I_60	1400	Antelope Ck	AntelopeBlwClove	1394.899	Harding Blvd.	320	417	765	434	399	564	539
124	UAC45B	AC5I_60	2300	Antelope Ck	AntelopeBlwClove	2349.499	Atlantic Street	320	417	765	434	399	564	540
1124	UAC45B	AC5I_60	0	Antelope Ck	AntelopeBlwClove	2455.599	Bridge #3	#N/A	415	763	433	#N/A	563	539
125	UAC45L	AC5I_60	5000	Antelope Ck	AntelopeBlwClove	5017.599	County Dump Road	319	419	765	436	397	570	546
126	UC41E4	AC5I_60	9600	Antelope Ck	AntelopeBlwClove	10909.49	Highway 65 - non ras (Gage 1583)	320	415	788	433	399	571	541
127	UC41E3	AC5I_60	10300	Antelope Ck	AntelopeBlwClove	11383.53	Springview Drive	320	411	784	428	399	567	537
128	YC41E2	AC5I_60	10800	Antelope Ck	AntelopeBlwClove	11418.53	Rocklin City Tributary Confluence	317	409	784	426	395	565	535
130	UC40K2	AC5I_60	15800	Antelope Ck	AntelopeBlwClove	16930.03	Sunset Blvd.	316	385	768	402	394	541	513
133	UV10B2	AC5I_60	22800	Antelope Ck	AntelopeBlwClove	24722.3	Clover Valley Creek Confluence	309	360	743	377	385	517	489
134	UC35G3	AC5I_60	23600	Antelope Ck	Reach 1	25350.71	Midas Avenue	225	328	605	336	293	364	359
135	UAC35C	AC5I_60	25700	Antelope Ck	Reach 1	27696.03	Southern Pacific Railroad (UPRR) - non ras	222	321	596	328	291	356	352
136	VAC35I	AC5I_60	26500	Antelope Ck	Reach 1	28434.67	Yankee Hill Road	220	318	594	326	290	353	349
137	YAC30C	AC5I_60	27600	Antelope Ck	Reach 1	34226	Atkinson Dairy Dam	217	312	576	319	287	340	337
138	YAC30B	AC5I_60	28900	Antelope Ck	Reach 1	34691	Unnamed Road - no ras - no find aerial	214	310	571	317	284	337	334
139	YAC30B	AC5I_60	31800	Antelope Ck	Reach 1	35656	Delmar Avenue - no ras	215	311	572	317	285	338	335

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140	YAC30B	AC5I_60	34300	Antelope Ck	Reach 1	36964	Sierra College Blvd. (Gage 1573)	210	311	574	317	279	338	335
141	U30AC4	AC5I_60	37000	Antelope Ck	Reach 1	39726	King Road	207	309	567	315	275	335	332
Antelope Creek / Clark Tunnel Road Tributary														
142	U30AC2	AC5I_60	0	Antelope Ck	Reach 1	40906	Antelope Creek Confluence	205	304	558	310	273	330	327
143	UC25BC	AC5I_60	100	0	0	NONE	Barker Road	118	79	174	79	180	86	85
144	VAC20C	AC5I_60	1300	0	0	NONE	Humphrey Road	112	57	128	57	178	63	63
145	YC16EB	AC5I_60	1700	0	0	NONE	Humphrey Tributary Confluence	111	47	105	47	174	54	54
148	UC15CB	AC5I_60	7000	0	0	NONE	Colwell Road	81	28	69	28	143	30	30
149	YC15BC	AC5I_60	10000	0	0	NONE	English Colony Way	76	24	70	24	133	24	24
150	AC15AD	AC5I_60	12800	0	0	NONE	Clark Tunnel Road	51	19	51	19	112	19	19
Antelope Creek/Rocklin City Tributary														
151	VAC41E	CC5G_90	0	0	0	NONE	Antelope Creek Confluence	49	74	199	74	64	83	81
152	VAC41F	SE40M_30	2700	0	0	NONE	Taylor Road	37	30	70	30	48	36	35
153	VAC41F	SE40M_30	2800	0	0	NONE	Taylor Road	31	30	70	30	40	36	35
154	UAC41A	SE40M_30	4500	0	0	NONE	Sunset Blvd.	18	16	37	16	24	21	19
Antelope Creek/Clover Valley Creek														
155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	.1	Antelope Creek Confluence	32	70	224	75	63	155	137
1155	UCV10B	AC5I_60	0	Clover Valley	Clover Valley1	155	Golf Course Ped Bridge	#N/A	70	223	74	#N/A	155	137
156	UCV10B	AC5I_60	400	Clover Valley	Clover Valley1	445	Argonaut Avenue	34	70	223	74	64	160	137
157	YCV10B	AC5I_60	2200	Clover Valley	Clover Valley1	2785	Footbridge and Weir	46	70	223	74	70	160	137
158	UXV10A	AC5I_60	4300	Clover Valley	Clover Valley1	4090	Midas Avenue	50	68	220	73	72	156	133
159	YCV10A	AC5I_60	4700	Clover Valley	Clover Valley1	4430	Abandoned Stone Bridge	55	68	220	73	75	156	133
160	YCV10A	AC5I_60	5600	Clover Valley	Clover Valley1	5400	Unnamed Bridge	64	63	213	67	80	149	127
1160	UV6CB2	AC5I_60	0	Clover Valley	Clover Valley1	6365	Gazebo Crossing	#N/A	63	213	67	#N/A	149	127
161	UCV6CB	AC5I_60	6500	Clover Valley	Clover Valley1	6505	Clover Valley Detention Pond	69	63	213	67	82	149	128
162	YV6CB2	AC5I_60	7700	Clover Valley	Clover Valley1	7815	Creekwood Drive	78	63	214	68	87	151	126
163	UCV6BC	AC5I_60	12000	Clover Valley	Clover Valley1	12015	Rawhide Road	71	58	203	58	81	134	118
164	UCV6BC	AC5I_60	12500	Clover Valley	Clover Valley1	12550	Rowhide Road Det. Pond	70	58	203	58	80	134	118
165	UCV5C	AC5I_60	25600	Clover Valley	Clover Valley1	NONE	Unnamed Road	48	54	197	54	58	133	115
166	UCV1T	AC5I_60	28000	Clover Valley	Clover Valley1	NONE	Sierra College Blvd.	66	36	126	36	87	100	90
167	VCV1T	AC5I_60	28500	Clover Valley	Clover Valley1	NONE	English Colony Way	66	27	92	27	87	79	71
Antelope Creek Continued (West Branch)														
169	UC25BC	AC5I_60	38700	0	0	NONE	Clark Tunnel Road Tributary Confluence	87	79	561	79	93	86	85
170	U25AD2	AC5I_60	40600	0	0	NONE	Barker Road	80	76	390	76	88	83	82
171	Y25AD2	AC5I_60	42500	0	0	NONE	Citrus Colony Road	78	78	170	78	88	86	86
172	YAC16A	AC5I_60	47900	0	0	NONE	English Colony Road	76	35	84	35	103	39	39
Antelope Creek/Humphrey Tributary														
173	UPAC5K	AC5I_60	0	0	0	NONE	Clark Tunnel Road Tributary Confluence	68	35	371	35	94	36	36

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174	VAC5J2	AC5I_60	1700	0	0	NONE	Sandy Road	47	37	68	37	65	37	37
175	VAC5O	AC5I_60	3300	0	0	NONE	Mardell Lane	41	8	308	8	56	8	8
176	UPAC5G	AC5I_60	3700	0	0	NONE	Colwell Road	34	39	48	39	47	40	40
177	YAC5E	AC5I_60	6300	0	0	NONE	English Colony Way	20	33	50	33	28	34	34
Miners Ravine														
178	UMR40E	SE40M_30	0	Miners Ravine	Below Secret	10.	Antelope Creek/Dry Creek	1261	737	1473	802	1346	960	910
179	UMR40E	SE40M_30	200	Miners Ravine	Below Secret	94.	Harding Blvd.	1261	737	1473	802	1345	960	910
180	YMR40E	SE40M_30	1500	Miners Ravine	Below Secret	659.8999	Interstate 80 - no ras	1261	735	1471	800	1342	959	908
181	YMR40B	SE40M_30	2800	Miners Ravine	Below Secret	1422.400	Eureka Way	1121	731	1470	796	1340	954	903
182	YSEMR	SE40M_30	3800	Miners Ravine	Below Secret	3734.100	Secret Ravine Confluence	1096	728	1469	792	1339	950	900
183	YMR37D	MR15J_30	5300	Miners Ravine	BET SECRET-FALSE	5674.100	Sunrise Avenue - no ras	965	294	427	306	1141	354	344
184	UR37D4	MR15J_30	7000	Miners Ravine	BET SECRET-FALSE	7319.900	Boardman Tributary	770	294	426	306	843	353	343
185	UR36N2	MR15J_30	9000	Miners Ravine	Above False	9828.100	East Roseville Parkway	763	275	395	288	833	334	325
186	UMR31Q	MR15J_30	18200	Miners Ravine	Above False	18310.19	Sierra College Blvd.	730	262	381	270	801	316	308
187	YR31Q2	MR15J_30	18300	Miners Ravine	Above False	18610	Cavitt Stallman Tributary - no ras	730	260	381	268	801	314	306
188	UMR31G	MR15J_30	18600	Miners Ravine	Above False	18685	Cavitt (&) Stallman Road	730	247	376	255	801	298	290
190	UR31P2	MR15J_30	23400	Miners Ravine	Above False	23390	Shadow Oaks Lane	723	237	375	245	347	288	283
1190	YMR31D	MR15J_30	0	Miners Ravine	Above False	27990.	Hardy Lane	#N/A	232	374	240	#N/A	283	278
191	UMR31D	MR15J_30	28900	Miners Ravine	Above False	28826	Barton Road	707	231	373	239	708	282	277
192	UMR30R	MR15J_30	31300	Miners Ravine	Above False	31379	TallPine Lane	706	228	373	236	707	279	274
193	UMR30Q	MR15J_30	33000	Miners Ravine	Above False	32984	Carolinda Drive	705	228	373	236	706	278	273
194	UMR30P	MR15J_30	34800	Miners Ravine	Above False	34813	Itchy Acres Road	641	224	373	231	643	273	268
196	UR30H2	MR15J_30	35500	Miners Ravine	Above False	35489	Miners Ravine Road	630	224	373	231	632	273	268
197	UR30H3	MR15J_30	36800	Miners Ravine	Above False	36790	Leibinger Lane	619	223	371	227	621	269	264
199	UR29B2	MR15J_30	39700	Miners Ravine	Above False	39765	Auburn Folsom Road	597	220	367	223	599	263	258
200	UXR29H	MR15J_30	41700	Miners Ravine	Above False	40276	Oak Lane	595	221	367	223	597	263	263
201	UR29I2	MR15J_30	43000	Miners Ravine	Above False	44240	Old Bridge	747	216	357	218	748	257	257
202	YMR29I	MR15J_30	43200	Miners Ravine	Above False	44240	Cottonwood Lake	765	216	357	218	766	257	257
203	UMR21C	MR15J_30	44400	Miners Ravine	Above False	44368	Auburn Folsom Road	784	214	357	218	785	257	252
1203	YMR21C	MR15J_30	0	Miners Ravine	Above False	44523	Driveway opposite Twin Rocks Road	#N/A	211	336	214	#N/A	253	248
204	YMR21D	MR15J_30	45600	Miners Ravine	Above False	45593	Confluence with Lake Tributary (MR15)	783	211	335	214	753	253	248
1204	UXR20R	MR15J_30	0	Miners Ravine	Above False	52637	Bridge 15	#N/A	187	244	191	#N/A	226	221
1205	UXR20Q	MR15J_30	0	Miners Ravine	Above False	53992	Bridge 16	#N/A	182	229	186	#N/A	220	216
205	UR20P2	MR15J_30	56000	Miners Ravine	Above False	55052	Moss Lane	538	182	233	186	429	221	218
1206	YR20K2	MR15J_30	0	Miners Ravine	Above False	57194	Bridge 18 So of Willow Valley Place	#N/A	166	218	169	#N/A	201	198
1207	YR20K2	MR15J_30	0	Miners Ravine	Above False	57599	Willow Valley Place	#N/A	166	218	169	#N/A	201	198
1208	UR20C2	MR15J_30	0	Miners Ravine	Above False	57984	Bridge 20 North of Willow Valley Place	#N/A	164	215	166	#N/A	198	195
207	UR15K2	MR15J_30	59900	Miners Ravine	Above False	59894	Dick Cook Road	543	143	195	145	544	174	171
208	UXR15V	MR15J_30	61500	Miners Ravine	Above False	61470	Auburn Folsom Road	542	117	173	119	543	144	140
209	UR15W2	MR15J_30	62400	Miners Ravine	Above False	62487	Placer Canyon Parkway	542	117	173	119	542	144	140

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1209	Y15AE2	MR15J_30	0	Miners Ravine	Above False	64347	Lominda Lane	#N/A	113	170	115	#N/A	139	135
210	UXR15Q	MR15J_30	67600	Miners Ravine	Above False	67574	Horseshoe Bar Road	582	107	164	109	582	128	123
1210	UMR10M	MR15J_30	0	Miners Ravine	Above False	70394	Bridge 26	#N/A	101	158	102	#N/A	122	117
1211	UMR10M	MR15J_30	0	Miners Ravine	Above False	70984	Bridge 27	#N/A	101	158	102	#N/A	122	117
1212	UMR10I	MR15J_30	0	Miners Ravine	Above False	73328	Whiskey Bar Road	#N/A	91	144	91	#N/A	108	105
1213	UXR10E	MR15J_30	0	Miners Ravine	Above False	75238	Bridge 30	#N/A	88	141	88	#N/A	105	102
1214	UMMR5S	MR15J_30	0	Miners Ravine	Above False	75448	Bridge 31	#N/A	82	131	82	#N/A	98	95
1215	YMR10E	MR15J_30	0	Miners Ravine	Above False	76148	Bridge 32	#N/A	82	130	82	#N/A	98	95
211	YMR10E	MR15J_30	71700	Miners Ravine	Above False	76613	Auburn Folsom Road	186	82	130	82	214	98	95
212	UPMR5R	MR15J_30	73300	Miners Ravine	Above False	78358	King Road	87	57	85	57	122	64	64
213	YMR5W	MR15J_30	79400	Miners Ravine	Above False	79398	Penryn Rock Springs Road	50	51	76	51	77	58	58
214	YMR5P	MR15J_30	80200	Miners Ravine	Above False	80243	Newcastle Road	53	42	61	42	46	48	48
Miners Ravine/Boardman Tributary														
215	UR37D3	CC5G_90	0	0	0	NONE	Miners Ravine Confluence	71	37	355	78	110	81	81
216	UR35R6	CC5G_90	800	0	0	NONE	East Roseville Parkway	67	36	108	76	105	79	79
Miners Ravine/Cavitt & Stallman Tributary														
217	UMR25L	SE40N_0	0	0	0	NONE	Miners Ravine Confluence	129	14	334	15	178	18	18
218	YR25M2	SE40N_0	2400	0	0	NONE	Hidden Valley Place	121	18	17	18	167	24	23
219	YMR25N	SE40N_0	3100	0	0	NONE	Baywood Road	113	17	17	17	155	21	21
220	YR25P2	SE40N_0	3700	0	0	NONE	S. Bar B Lane	106	17	17	16	144	19	19
221	YMR25D	SE40N_0	4500	0	0	NONE	Kokuia Lane	98	14	22	14	133	17	18
222	YMR25I	SE40N_0	5100	0	0	NONE	Crestview Lane	90	15	18	15	122	17	17
223	YMR24E	SE40N_0	9300	0	0	NONE	Barton Road	85	13	23	13	130	16	16
Miners Ravine/Lake Tributary (MR21)														
224	UMR21H	MR15J_30	0	0	0	NONE	Miners Ravine Confluence	61	3	304	3	86	6	5
225	UMR21H	MR15J_30	200	0	0	NONE	Auburn Folsom Road	68	3	34	3	96	6	5
226	YMR21H	MR15J_30	300	0	0	NONE	South Lake Circle	68	9	43	9	96	15	14
Secret Ravine														
227	YSE85Q	SE40M_30	0	Secret Ravine	Below Sucker	1	Miners Ravine Confluence	463	560	1153	591	595	728	690
228	YE85Y2	SE40M_30	1400	Secret Ravine	Below Sucker	798.3000	East Roseville Parkway	463	560	1151	590	595	727	689
229	YE76A2	SE40M_30	13500	Secret Ravine	Below Sucker	14280.	Sucker Ravine Confluence	457	539	1107	568	588	701	666
230	Y56AB3	SE40M_30	16200	Secret Ravine	Reach 1	17396	Aguiar Road Tributary Confluence	354	409	909	421	467	520	496
231	USE52D	SE40M_30	17600	Secret Ravine	Reach 1	18595.9	Rocklin Road - China Gardens	329	409	911	421	440	520	497
232	YSE51K	SE40M_30	23300	Secret Ravine	Reach 1	24526	Sierra College Blvd.	326	399	902	411	437	502	481
233	UE50Q2	SE40M_30	28800	Secret Ravine	Reach 1	30371	Private Road - Diaz	312	381	801	388	422	463	452
234	UE50P2	SE40M_30	29200	Secret Ravine	Reach 1	30801	Private Road	310	381	802	388	421	463	446
235	YE50F2	SE40M_30	30800	Secret Ravine	Reach 1	32256	Brace Road	304	377	784	383	412	457	440
236	YE50A2	SE40M_30	32600	Secret Ravine	Reach 1	34081	Horseshoe Bar Road	297	370	761	380	405	449	431
237	YE50A2	SE40M_30	33400	Secret Ravine	Reach 1	34081	Loomis Tributary Confluence	295	370	761	380	404	449	431
238	YE35B2	SE40M_30	33500	Secret Ravine	Reach 1	34866	King Road Tributary Confluence	248	349	743	356	378	428	411
239	USE35A	SE40M_30	38600	Secret Ravine	Reach 1	38066	King Road-no ras	209	283	551	291	322	341	329

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241	YE35B2	SE40M_30	40000	Secret Ravine	Reach 1	40346	Penryn Road	207	266	534	273	321	324	311
242	YSE30E	SE40M_30	40500	Secret Ravine	Reach 1	NONE	Harris/Boulder Creek Road.	206	229	472	231	320	288	272
243	VSE26I	SE40M_30	40700	Secret Ravine	Reach 1	NONE	Penryn Tributary Confluence	206	211	446	214	320	271	255
244	VSE26H	SE40M_30	43300	Secret Ravine	Reach 1	NONE	Boulder Creek Road	172	25	146	25	262	42	37
245	VE26N2	SE40M_30	48500	Secret Ravine	Reach 1	NONE	Brennans Road	98	24	140	24	142	41	35
246	VE26N2	SE40M_30	48900	Secret Ravine	Reach 1	NONE	Rock Springs Road	96	24	140	24	139	41	35
247	USE26E	SE40M_30	50400	Secret Ravine	Reach 1	NONE	Meadow Lane	88	92	150	92	129	109	108
248	UE26BB	SE40M_30	51300	Secret Ravine	Reach 1	NONE	Los Puentes Road	91	88	143	88	141	105	103
249	VE25IA	SE40M_30	55300	Secret Ravine	Reach 1	NONE	Newcastle Road	163	90	142	90	268	107	106
250	UE25AB	SE40M_30	57700	Secret Ravine	Reach 1	NONE	Powerhouse Road	114	81	126	81	188	98	97
Secret Ravine/Sucker Ravine														
251	UXE70I	SE40N_0	0	Sucker Ravine	Reach 1	0	Secret Ravine Confluence	457	120	201	125	588	186	162
252	USE76A	SE40N_0	1000	Sucker Ravine	Reach 1	840	China Garden Road	414	120	201	125	535	187	162
253	YSE76B	SE40N_0	1200	Sucker Ravine	Reach 1	1305	Interstate 80	40	120	201	125	517	187	162
254	YSE76B	SE40N_0	2200	Sucker Ravine	Reach 1	1860	Oakridge Street	395	120	204	125	510	187	163
255	YSE76B	SE40N_0	2600	Sucker Ravine	Reach 1	2750	Lakeside Drive	318	120	204	125	418	187	163
256	USE70I	SE40N_0	3950	Sucker Ravine	Reach 1	4110	Rocklin Road	179	118	196	122	247	184	161
257	USE70H	SE40N_0	4300	Sucker Ravine	Reach 1	4580	Quary Lake	177	111	182	115	244	176	154
258	YSE70H	SE40N_0	4700	Sucker Ravine	Reach 1	4840	Super Span	174	111	182	115	241	176	154
259	USE70F	SE40N_0	7450	Sucker Ravine	Reach 1	7605	Sierra Meadows Drive	167	102	176	107	232	167	147
1259	YSE70B	SE40N_0	0	Sucker Ravine	Reach 1	9955	Culvert 1	#N/A	83	166	89	#N/A	143	127
1260	YSE70D	SE40N_0	0	Sucker Ravine	Reach 1	10565	Driveway Below Dominguez Road	#N/A	118	168	112	#N/A	143	125
260	YSE70C	SE40N_0	10800	Sucker Ravine	Reach 1	10935	Dominguez Road	142	90	169	96	202	143	127
261	UE60E2	SE40N_0	11000	Sucker Ravine	Reach 1	10935	Loomis Tributary Confluence	140	90	169	96	200	143	127
263	YSE66J	SE40N_0	13400	Sucker Ravine	Reach 1	14525	Pacific Street	79	49	85	58	81	65	61
1263	USE66J	SE40N_0	0	Sucker Ravine	Reach 1	14756	Railroad	#N/A	54	96	65	#N/A	70	67
1264	USE66D	SE40N_0	0	Sucker Ravine	Reach 1	16706	Culvert 5	#N/A	54	107	66	#N/A	69	69
264	USE66D	SE40N_0	14800	Sucker Ravine	Reach 1	16846	Bankhead Road	74	54	107	65	74	69	66
265	YSE66C	SE40N_0	15200	Sucker Ravine	Reach 1	17266	Sierra College Blvd.	72	54	104	64	72	66	64
266	USE66A	SE40N_0	19000	Sucker Ravine	Reach 1	20671	Saunders Avenue	69	52	116	61	72	56	56
267	SE65	SE40N_0	20200	Sucker Ravine	Reach 1	22546	King Road	70	45	104	50	73	45	45
Secret Ravine/Sucker Ravine/Loomis Tributary														
268	VSE60E	SE40N_0	0	0	0	NONE	Sucker Ravine Confluence	88	57	110	59	202	92	80
270	VE60D2	SE40N_0	4400	0	0	NONE	Sierra College Blvd.	48	52	96	54	111	70	66
Secret Ravine/Aguilar Road Tributary														
271	Y56AB2	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	23	42	934	48	49	61	59
272	Y56AB2	SE40N_0	700	0	0	NONE	Aguilar Road	23	42	113	48	50	61	59
273	YSE56B	SE40N_0	2400	0	0	NONE	Foothill Road	23	37	113	44	53	54	51
274	Y55MA2	SE40N_0	4100	0	0	NONE	El Don Road	22	18	66	22	55	26	25
275	UE56DB	SE40N_0	4100	0	0	NONE	El Don Detention Pond	22	18	63	22	61	26	24
276	VSE55L	SE40N_0	6100	0	0	NONE	Sierra College Blvd.	79	9	43	11	121	13	12

1992 No. (1000+ are 2009 Assigned)	2009 Shed Label	2009 Storm Center	Distance From Mouth 1992	HEC-RAS Stream	HEC-RAS Segment	HEC-RAS Section ID	Location Description:	2-year 1989 JMM	2-year 1992 Corrected	Dec 2005 (<10 yr) (>2 yr)	2-year 2007-Current	2-year Future JMM	2-year Future Unmitigated	2-year Build-out w/LID & Projects
Secret Ravine / Loomis Tributary														
277	YSE40J	SE40N_0	0	0	0	NONE	Secret Ravine Confluence	64	68	762	86	99	104	100
278	YSE40J	SE40N_0	1200	0	0	NONE	Interstate 80	60	68	98	86	92	104	100
279	VSE40I	SE40N_0	2800	0	0	NONE	Laird Street	56	60	87	74	86	82	80
280	VSE40F	SE40N_0	3600	0	0	NONE	King Road	53	41	64	54	81	54	54
Secret Ravine/King Road Tributary														
281	USE45W	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	41	69	762	69	378	82	80
282	YSE45Q	SE40M_30	3900	0	0	NONE	Rancho Verde Road	41	35	89	35	345	44	43
283	YSE45A	MR15J_30	5400	0	0	NONE	Val Verde Road	73	31	69	31	99	40	38
284	USE44B	MR15J_30	6300	0	0	NONE	King Road	66	29	58	29	89	38	36
Secret Ravine/Penryn Tributary														
285	YE15L2	SE40M_30	0	0	0	NONE	Secret Ravine Confluence	87	194	375	196	140	248	232
286	USE7H2	SE40M_30	4700	0	0	NONE	Rock Springs Road	96	149	301	152	176	205	191
287	YSE5F2	SE40M_30	5600	0	0	NONE	East/West Forks Confluence	88	132	276	140	170	191	177
Secret Ravine/ E. Fork Penryn Tributary														
288	VSE5F2	SE40M_30	0	0	0	NONE	West Fork Confluence	46	51	101	55	75	74	69
289	YSE5F	SE40M_30	900	0	0	NONE	Fairview Lane	41	51	101	55	67	74	69
290	YE20BS	SE40M_30	3700	0	0	NONE	Gilardi Road	17	41	78	44	28	59	55
Secret Ravine/W. Fork Penryn Tributary														
291	YSE7D	SE40M_30	0	0	0	NONE	East Fork Confluence	58	97	190	97	119	125	119
292	YSE10A	SE40M_30	200	0	0	NONE	Interstate 80	58	95	187	95	118	123	117
293	YE10BB	SE40M_30	1400	0	0	NONE	Girardi Road	90	87	180	88	217	117	111

Appendix H - Evaluation of Potential Projects

H.1 Introduction

Ten potential projects were analyzed to determine potential for peak flow reduction at Vernon Street. The potential peak flow impact was determined using hydrology developed from the General Plan build-out land use with LID and with the 2010 hydraulic system geometry, including the Miners Ravine Off-Channel Detention Basin and adjustments to Sierra College Boulevard at Secret Ravine. The locations of the ten potential projects are shown on Plate H.1. Seven storm centerings that caused peak flows at key locations in the watershed were used to determine localized peak flow rates and the localized impact of the projects. Of the seven storm centerings that were analyzed, the SE40N@0 storm centering caused the highest peak flow rate at Vernon Street. Each of the potential projects listed below was modeled with the 100-year SE40N@0 storm centering to determine the impact on peak flow rates at Vernon Street. Additionally, each potential project was modeled with the 100-year storm centering from the set of seven that produced the highest local peak flow rate to determine the local impact of the project. Because only seven centerings were used in the analysis, the local centering is not necessarily the 100-year flow, which may be higher.

The projects increase flood storage volume through excavation, off-channel detention, or in-channel weirs that would increase water surface elevation.

Most of the potential projects are based on the use of an in-channel weir that will clear-span an opening across the low flow channel. The objective of this concept is to minimize the environmental impacts of a system that would allow unimpeded passage of frequent flows while detaining high flows. The proposed approach would not restrict fish passage and would minimize the need for grading and clearing of vegetation due to the small footprint of a weir compared to a dam. Table H.1 summarizes calculated peak flow reduction and is provided below.

Table H.1 Summary of peak flow reductions near the potential project location and at Vernon Street for SE40N@0 centering and the local centering causing the highest local peak flow

			Baseline SE40N@0 Centering		Local Centering		
	Stream	**Project Location**	**Local Peak Flow Reduction (cfs)**	**Peak Flow Reduction at Vernon (cfs)**	**Local Centering**	**Local Peak Flow Reduction (cfs)**	**Peak Flow Reduction at Vernon (cfs)**
1	Antelope Creek	Atlantic Street	446	825	AC5I60	323	490
2	Linda Creek	Auburn-Folsom Road	45	12	LC5A	66	25
3	Linda Creek	Wedgewood Drive	33	13	LC5A	67	44
4	Linda Creek	Old Auburn Road	68	28	LC40L	48	34
5	Linda Creek	West of Rocky Ridge Drive	27	9	LC40L	NA	NA
6	Miners Ravine	WWTP near Dick Cook Road	308	-6	MR15J	130	-6
7	Miners Ravine	East of Roseville Parkway	Project not feasible				
8	Secret Ravine	Sierra College Boulevard	68	175	SE40M	57	188
9	Strap Ravine	McLaren Drive at Maidu Park	156	-35	CC5G_90	148	-35
10	Secret Ravine	Vista Oaks	103	0	SE40M	288	62

H.2 Dick Cook Wastewater Treatment Plant Decommissioning

The wastewater treatment plant near Dick Cook Road on Miners Ravine is scheduled to be decommissioned. Significant flooding problems occur about five miles downstream in the Joe Rodgers area. A potential flood control project at the wastewater treatment plant site was analyzed to determine its effectiveness for reducing peak flow rates in the Joe Rodgers area and at Vernon Street.

Including the adjacent parcels, approximately 12 acres of surface area could be available for a flood control project. Conceptually, a potential project could include a berm adjacent to Miners Ravine on the north and west sides of the project site that would allow for increased water levels on the project site, as well as culverts or inlet boxes to control the flows entering the project site. The potential flood control project at the decommissioned wastewater plant site would allow low flows to pass through and detain peak flows. Plate H.2 shows a map of the potential project area.

For the SE40N@0 centering, the analyzed configuration would reduce peak flows at the

Joe Rodgers area by only 21 cubic feet per second (cfs), and would cause a net increase of six cfs at Vernon Street. Because the peak flow on Miners Ravine occurs after the peak flow at Vernon Street, the elimination of floodplain storage at the project site for the lower flows would cause an early increase in flow rates downstream. Adjacent to the project site, the potential project may increase the maximum water surface elevation which would cause increased flooding of the development on the right (west) bank. Table H.2 summarizes the FEMA FIS (2001), pre- and post-potential project conditions from the model used for project analysis.

Table H.2 Water Surface Elevations (feet) for Locations Impacted by Potential Project at the Wastewater Treatment Plant Site Near Dick Cook Road on Miners Ravine

		SE40N0			MR15J@30		
Location	FEMA (2001)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Downstream from Leibinger Lane	362.0	360.51	360.48	-0.03	360.97	360.87	-0.1
Adjacent to potential project	488.0	487.7	488.25	0.55	488.41	489.44	1.03

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference or other issues.

Chart H.1 and Chart H.2 show the flow hydrographs at Leibinger Lane in the Joe Rodgers area and at Vernon Street for the SE40N@0 storm centering.

Chart H.1 Flow Hydrograph at Leibinger Lane in the Joe Rodgers Area With and Without a Potential Project at the Wastewater Treatment Plant near Dick Cook Road

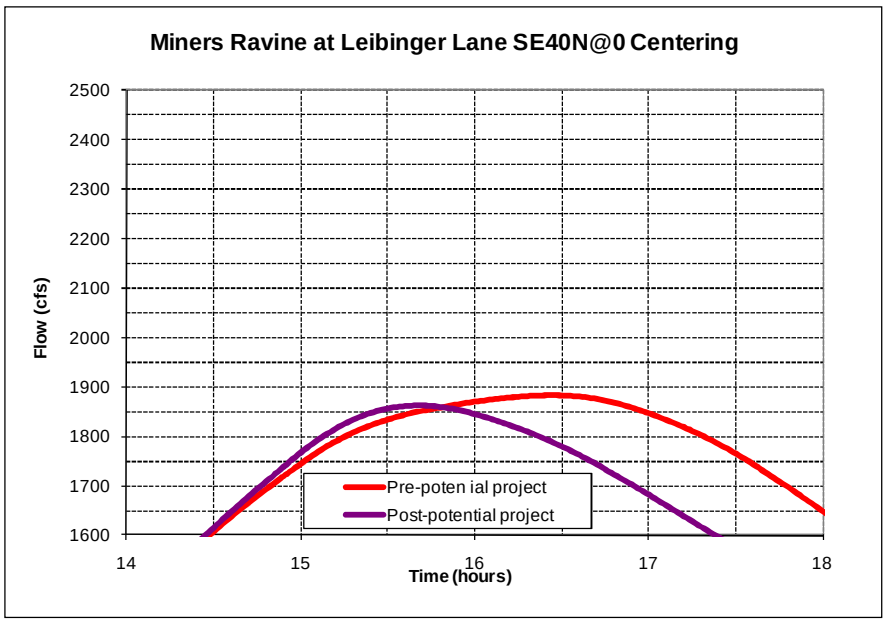
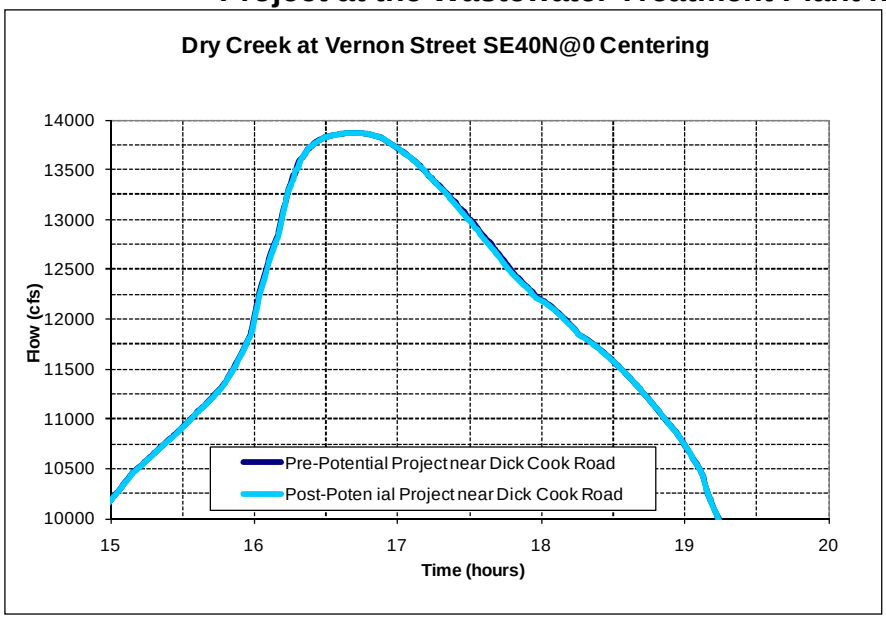


Chart H.2 Flow Hydrograph at Vernon Street With and Without a Potential Project at the Wastewater Treatment Plant near Dick Cook Road



Although the project site may provide a small flow and stage reduction in the Joe Rodgers area, the project is infeasible because of the net increase of peak flow rate at Vernon Street. The reduction in early floodplain storage causes acceleration in the peak flow rate for the project condition. The site is too small to effectively detain enough flow for a long enough duration to significantly reduce peak flow rates at both the Joe Rodgers area and at Vernon Street. No further action is recommended for this project site.

H.3 Auburn-Folsom Road on Linda Creek

Another potential project site is located on the upper portion of Linda Creek, upstream from Auburn-Folsom Road, adjacent to Cavitt Junior High School. The project site is approximately 6.5 acres and currently is undeveloped open space with some tree coverage. Plate H.3 shows the layout of the potential project site. The potential project site is within the preliminary FEMA floodplain. The project concept would add a berm on the right (west) bank of Linda Creek, creating an off-channel detention basin to divert and attenuate peak flows. Table H.3 summarizes the preliminary FEMA FIS, pre- and post-potential project conditions from the model used for project analysis. There is currently no effective FIS for the potential project area.

Table H.3 Water Surface Elevations (feet) for Locations Impacted by Potential Project at the Auburn-Folsom Road Site on Linda Creek

		SE40N0			LC5A0		
Location	FEMA (Nolte)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Downstream from Troy/ Purdy Lane	357.5	357.46	357.21	-0.25	357.69	357.62	-0.07

Flooding problems exist about one half mile downstream in the Troy/Purdy Lane area. The potential project could be designed to provide peak flow attenuation at Vernon as well as peak flow and water surface elevation reduction at the Troy/Purdy Lane area.

For the SE40N@0 centering, the potential project would reduce peak flows at Auburn-Folsom Road by approximately 26 cfs and at the Troy/Purdy Lane area by 45 cfs. This would result in a decrease of approximately two to four inches of peak water surface elevation. Additionally, the project would cause a 12 cfs reduction in peak flow rate at Vernon Street. Chart H.3, Chart H.4, Chart H.5, and Chart H.6 show flow hydrographs for the SE40N@0 Centering for Auburn-Folsom Road, Troy/Purdy Lane, and Vernon Street with and without the potential project.

Chart H.3 Flow Hydrograph at Auburn-Folsom With and Without Potential Project Above Auburn-Folsom Road

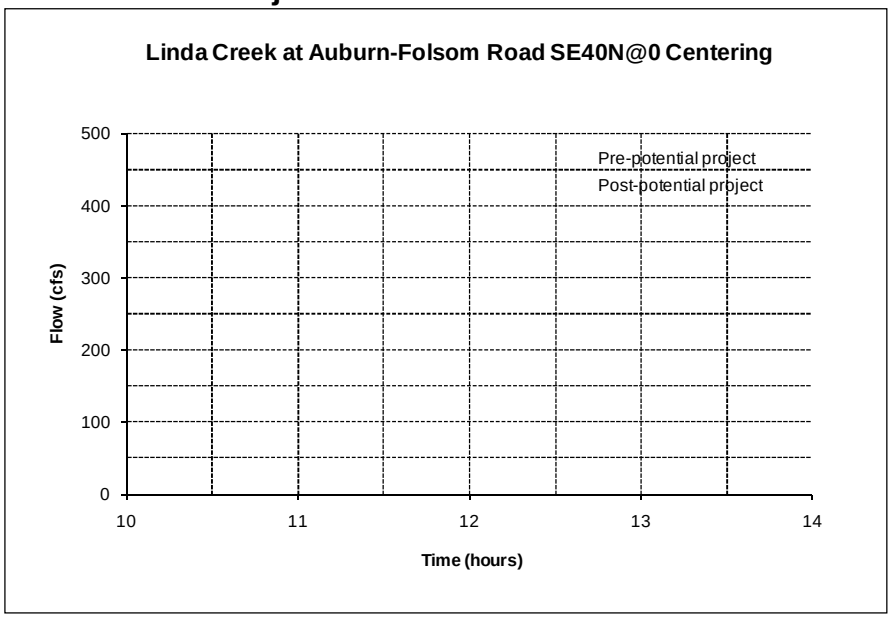


Chart H.4 Flow Hydrograph Just Downstream from Troy/Purdy With and Without Potential Project Upstream From Auburn-Folsom Road

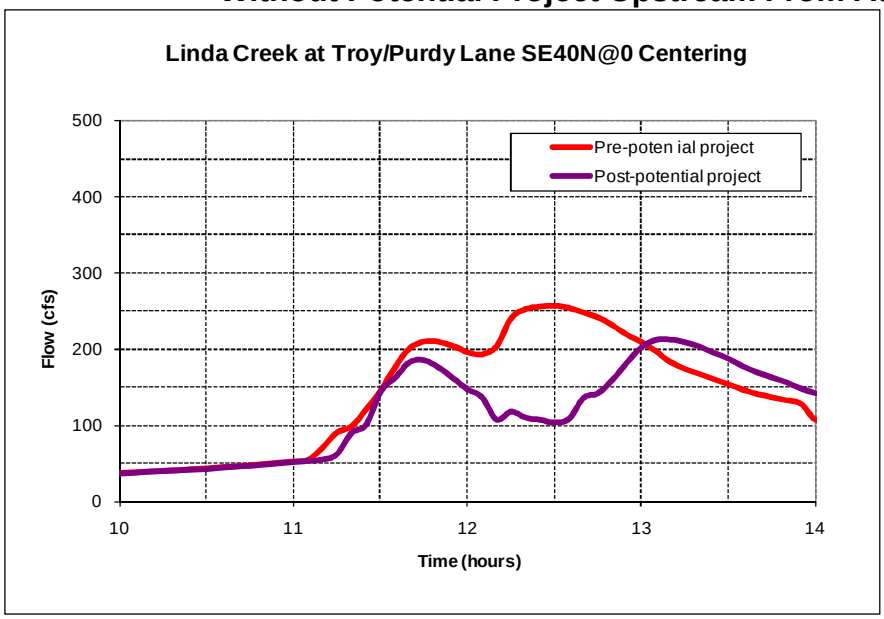
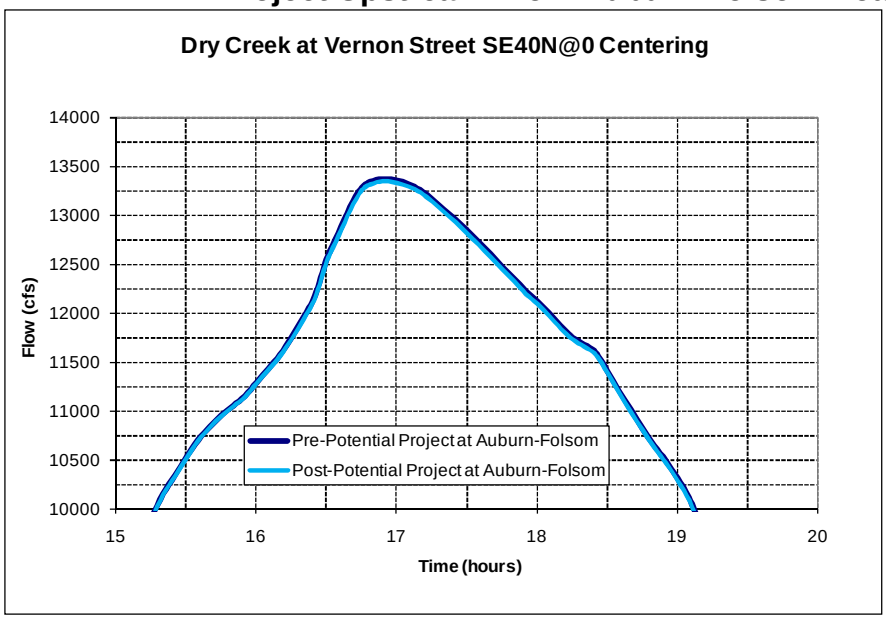


Chart H.5 Flow Hydrograph at Vernon Street With and Without Potential Project Upstream From Auburn-Folsom Road



For the LC5A@0 centering, the potential project would reduce peak flow rates at Auburn-Folsom Road by 40 cfs, the Troy/Purdy Lane area by 66 cfs, and the water surface elevation by 2-4 inches. Based on the LC5A@0 centering, the peak flow rate at Vernon Street would be reduced by 25 cfs. Chart H.6, Chart H.7, and Chart H.8 show flow hydrographs for the LC5A@0 centering at Auburn-Folsom Road, Troy/Purdy Lane and at Vernon Street.

The double peak in the flow hydrograph at Troy/Purdy Lane for the post-potential project scenario is due to a separate inflow hydrograph introducing flow into the system below the potential project site. The potential project delays the peak above Auburn-Folsom Road, as seen in Chart H.3 and Chart H.6. The inflow below Auburn-Folsom road produces a separate, earlier peak as shown in Chart H.4 and Chart H.8.

Chart H.6 Flow Hydrograph at Auburn-Folsom Road With and Without Potential Project Upstream From Auburn Folsom-Road

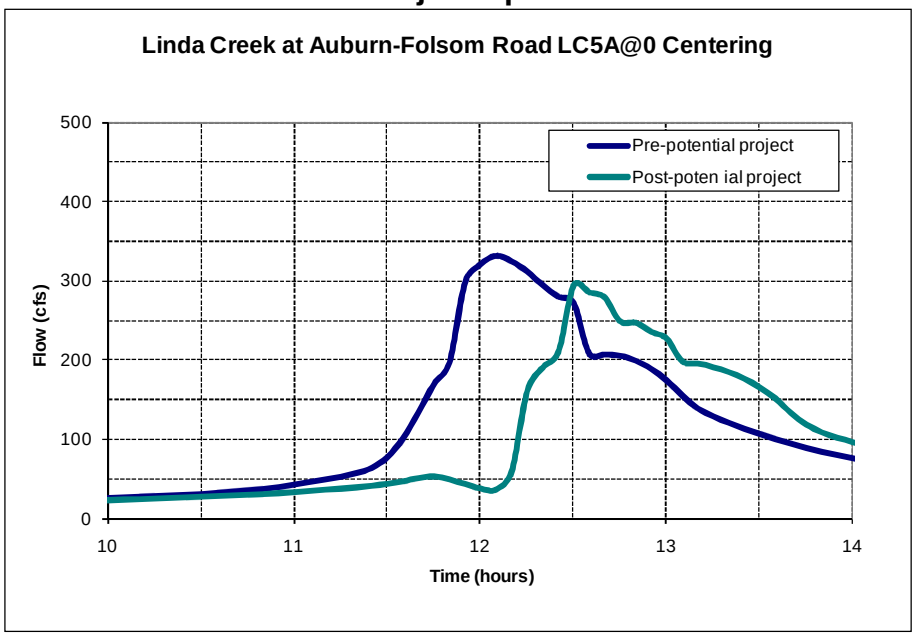


Chart H.7 Flow Hydrograph at Troy/Purdy Lane With and Without Potential Project Above Auburn-Folsom Road

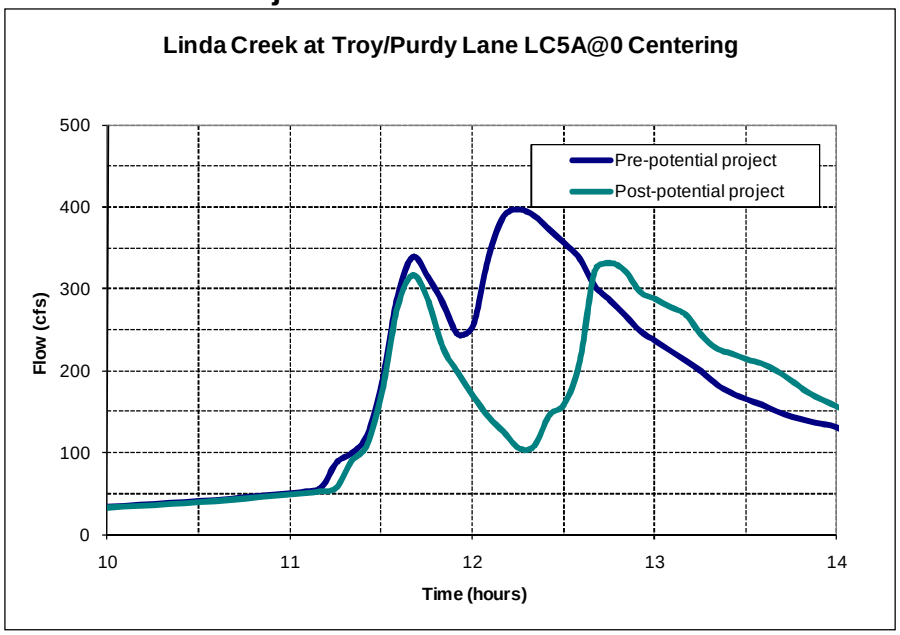
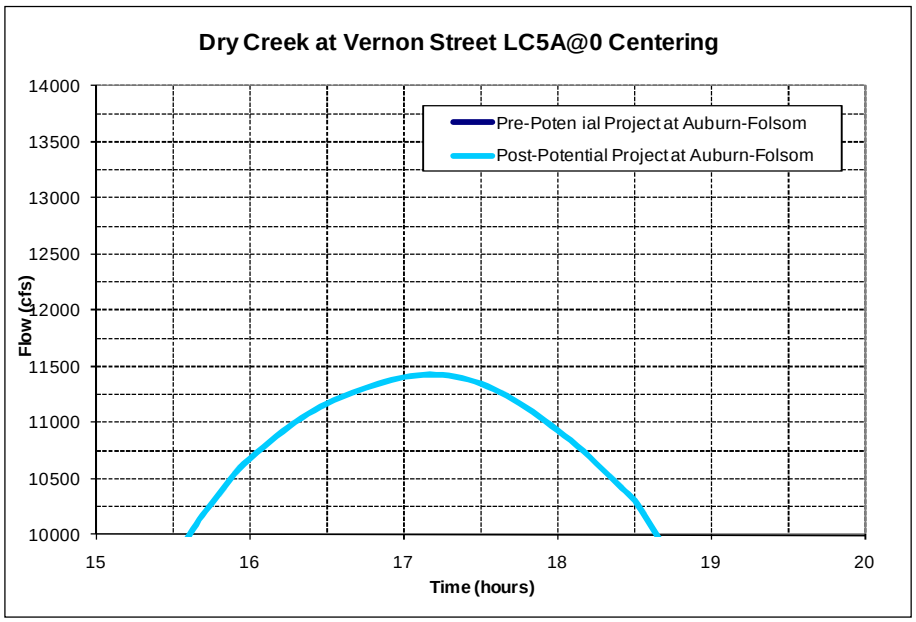


Chart H.8 Flow Hydrograph at Vernon Street With and Without Potential Above Auburn-Folsom Road



The project would require a berm of approximately 1,000 feet in length and 2-12 feet in height to create the off-channel detention basin. Additional storage volume may be created by excavating the potential project site; however, due to existing vegetation, excavation may be infeasible and was not considered for this analysis. The potential storage volume is approximately 20 acre-feet. Any project with less than 50 acre-feet of storage is not within the jurisdiction of the Division of Safety of Dams (DSOD). The area that would be inundated by the potential project is located in an existing floodplain.

The project analysis assumes that a one-foot diameter culvert would drain the detained volume. The detained volume would drain over a period of about 24 hours.

The potential project site above Auburn-Folsom Road on Linda Creek near Cavitt Junior High has potential to decrease peak flow rates and water surface elevations in the Troy/Purdy Lane area, where some flood prone properties are located, and to reduce peak flow rates at Vernon Street. The impact that this potential project may have on decreasing flow rates at Vernon Street may be limited in comparison with the magnitude of impact that other projects may have. However, due to few potential project sites in the Linda Creek watershed, this project may be considered as having the potential for local peak flow reduction.

H.4 Wedgewood Drive on Linda Creek

Just upstream from Wedgewood Drive on Linda Creek is a steep, narrow ravine between residential developments that could potentially be used as a flood detention project site. The surface area of the potential project site is approximately 2.5 acres that is covered by riparian vegetation and trees. The project concept would be to construct an in-channel weir, allowing low flow passage, but detaining the peak flows by

increasing the water surface elevation. Plate H.4 shows a map of the potential project area.

Based on the evaluated configuration and the SE40N@0 centering, the maximum water surface elevation would increase by 8 feet just upstream from Wedgewood Drive. This scenario would decrease peak flows by 33 cfs just downstream from Wedgewood Drive and decrease peak flows 13 cfs at Vernon Street. Table H.4 summarizes the FEMA FIS, pre- and post-potential project water surface elevations.

Table H.4 Water Surface Elevations (feet) for Locations Impacted by Potential Wedgewood Drive Project

		SE40N0			LC5A0		
Location	FEMA (Nolte)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Upstream from Wedgewood Drive	281.76	281.34	288.47	7.13	281.34	294.23	12.89
Downstream from Wedgewood Drive	279.61	277.97	277.82	-0.17	279.05	278.73	-0.32

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference or other issues.

Chart H.9 and Chart H.10 show the flow hydrographs for the SE40N@0 centering at Wedgewood Drive and Vernon Street with and without the potential project at Wedgewood Drive.

Chart H.9 Flow Hydrograph Just Downstream from Wedgewood Drive With and Without Potential Wedgewood Drive Project

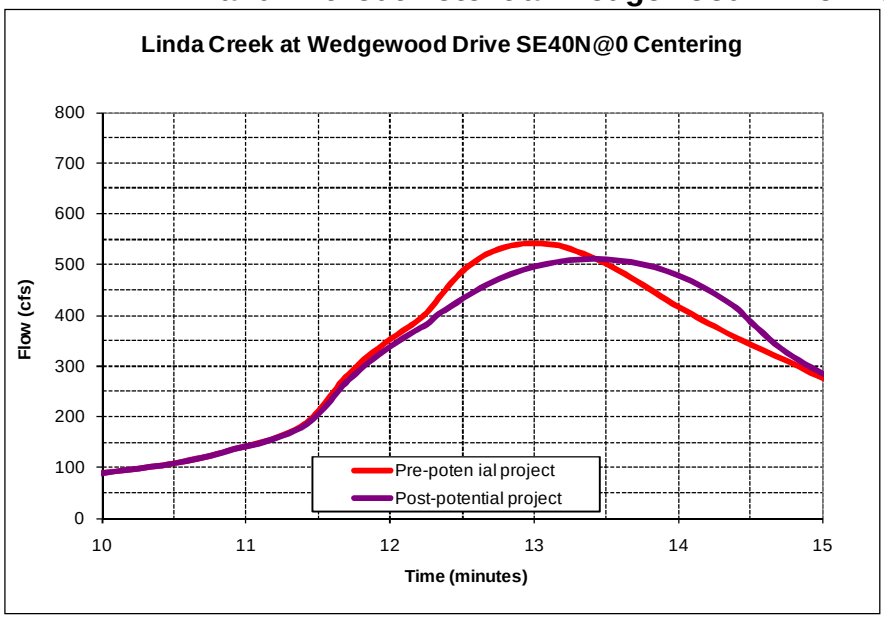
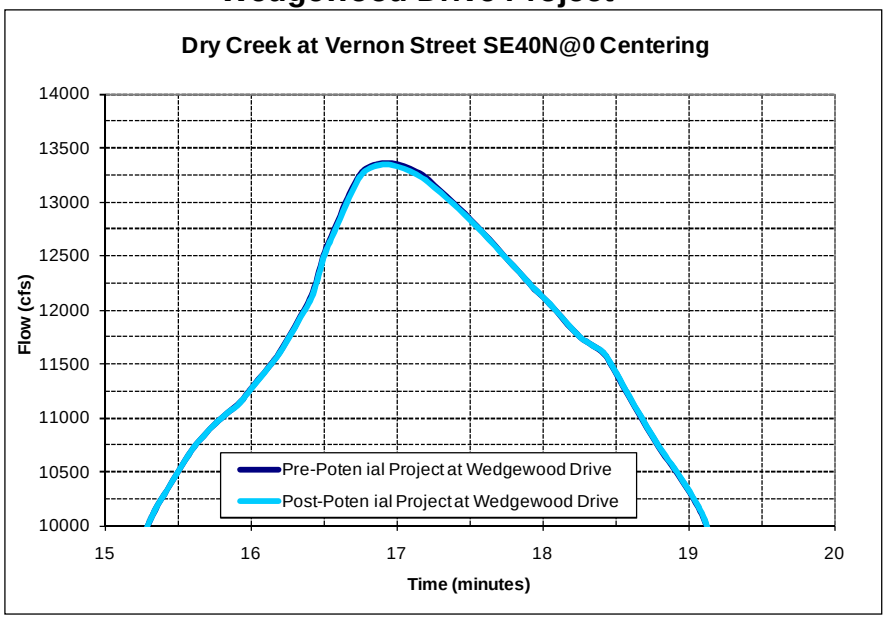


Chart H.10 Flow Hydrograph at Vernon Street With and Without Potential Wedgewood Drive Project



For the LC5A@0 centering, the project may cause the water surface elevation to increase by 13 feet just upstream from Wedgewood Drive. This scenario would reduce peak flows by 67 cfs just downstream from Wedgewood Drive and 44 cfs at Vernon Street. The 100-year water surface elevation may be able to increase by 20 feet at this location without impacting the adjacent properties. Chart H.11 and Chart H.12 show the flow hydrographs for the LC5A@0 centering at Wedgewood Drive and Vernon Street with and without the potential project.

Chart H.11 Flow Hydrograph Just Downstream from Wedgewood Drive With and Without Potential Project

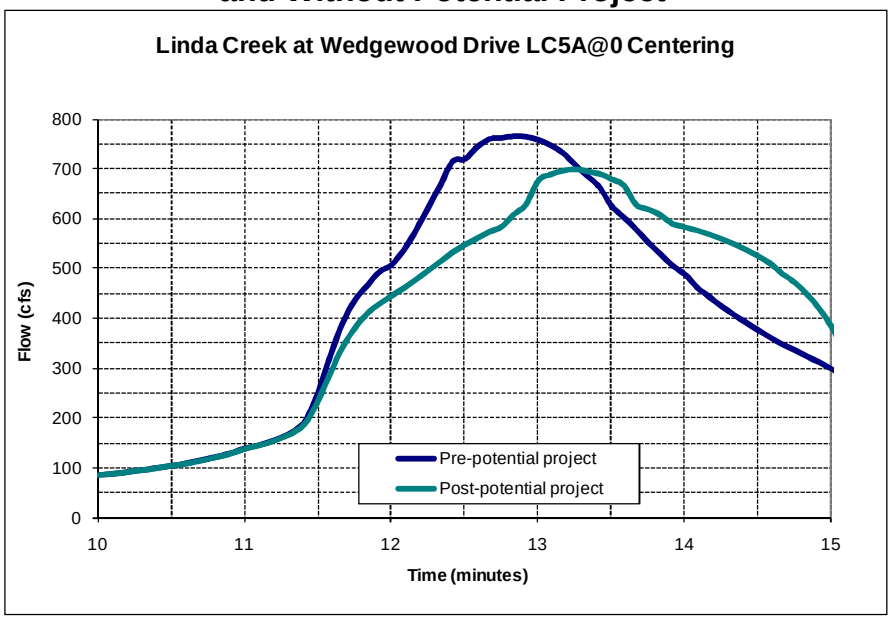
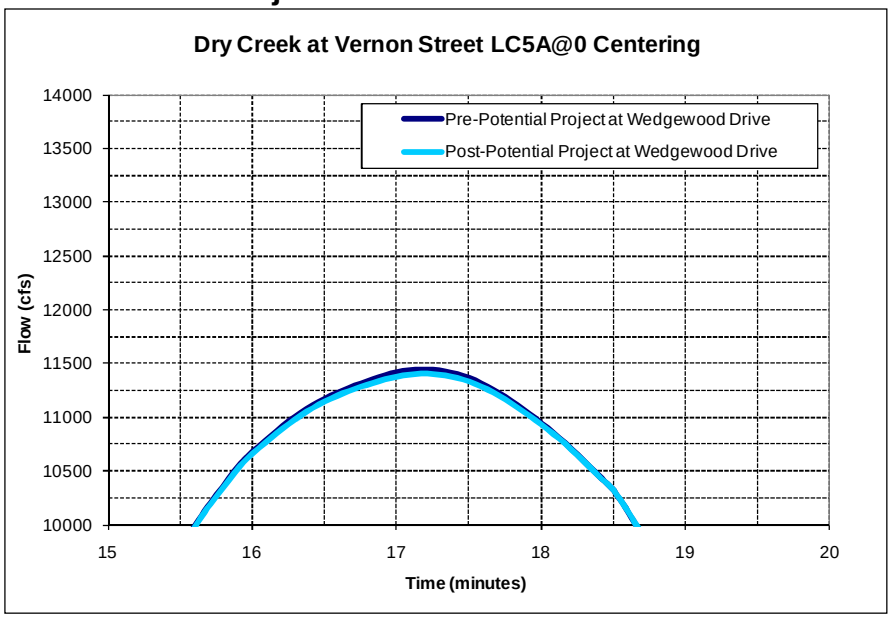


Chart H.12 Flow Hydrograph at Vernon Street With and Without Potential Project



The total weir length would be approximately 150 feet. The weir would vary in height from 0 to 16 feet and would require erosion control measures on the downstream side. The extent of the area impacted by the increased water surface extends 1,300 feet upstream from the potential weir, just downstream from the Granite Bay Golf Course. Most of the area impacted by the project site is currently floodplain.

The potential project just upstream from Wedgewood Drive on Linda Creek may provide peak flow reduction at Vernon Street. Other alternatives such as installing flow control gates on the potential weir may also be analyzed to reduce overall project costs. It is recommended that this potential project site be investigated further for a flood control project.

H.5 Atlantic Street on Antelope Creek

A potential project site is located adjacent to westbound Interstate-80, north of Atlantic Street on Antelope Creek. The potential flood detention project consists of constructing two weirs or embankments spanning the main channel that allow passage of low flows while detaining higher flows. This concept was evaluated with one weir or embankment about 200 feet upstream from the railroad bridge that runs adjacent to Atlantic Street (Phase 1) and a second weir or embankment that would replace the bicycle path bridge that is just downstream of Roseville Parkway (Phase 2). Though the project could involve either or both weirs/embankments, the analysis presented here represents the completion of both. Plate H.5 shows a map of the potential project location.

For the peak flow reduction anaylsis, Phase 1 structure was modeled as a 10-to 12-foot high embankment on the floodplain with a Conspan Arch culvert with a span of 32 feet

and a rise of 7.5 feet. The Phase 2 structure will replace the existing bike bridge, raising the bridge deck about 4 to 6 feet. An embankment or wall will tie in the crest of the new structure to existing ground to limit overtopping to the desired area. The model assumed that the two existing 6.5-foot diameter culverts will be replaced with a Conspan Arch with a span of 20 feet and a rise of 7 feet.

The total weir length would be approximately 120 feet for the downstream weir near Atlantic Street and 200 feet for the upstream weir at the bicycle bridge.

For the SE40N@0 centering, the combined effect of the weirs would reduce the calculated peak Antelope Creek flows just downstream from Atlantic Street by 446 cfs, and would reduce the peak Dry Creek flow at Vernon Street by 825 cfs. Table H.5 summarizes water surface elevations from FEMA FIS (2001), and pre- and post-potential project conditions from the model used for project analysis.

Table H.5 Water Surface Elevations (feet) for Locations Impacted by Potential Project at Atlantic Street

		SE40N0			AC5I60		
Location	FEMA (2001)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Upstream from weir near bicycle bridge	173.0	174.23	179.01	4.78	174.59	179.43	4.84
Upstream from weir near railroad bridge	165.2	165.69	169.83	4.14	166.22	170.71	4.49
Downstream from Atlantic Street	162.0	162.81	162.40	-0.41	163.39	162.85	-0.54

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference or other issues including peak flow rates that are considerably higher in the current model than the flow rates used in the FEMA FIS.

Chart H.13 and Chart H.14 show the flow hydrographs just downstream from Atlantic Street and at Vernon Street with and without the potential project.

Chart H.13 Flow Hydrograph Just Downstream from Atlantic Street With and Without Potential Project

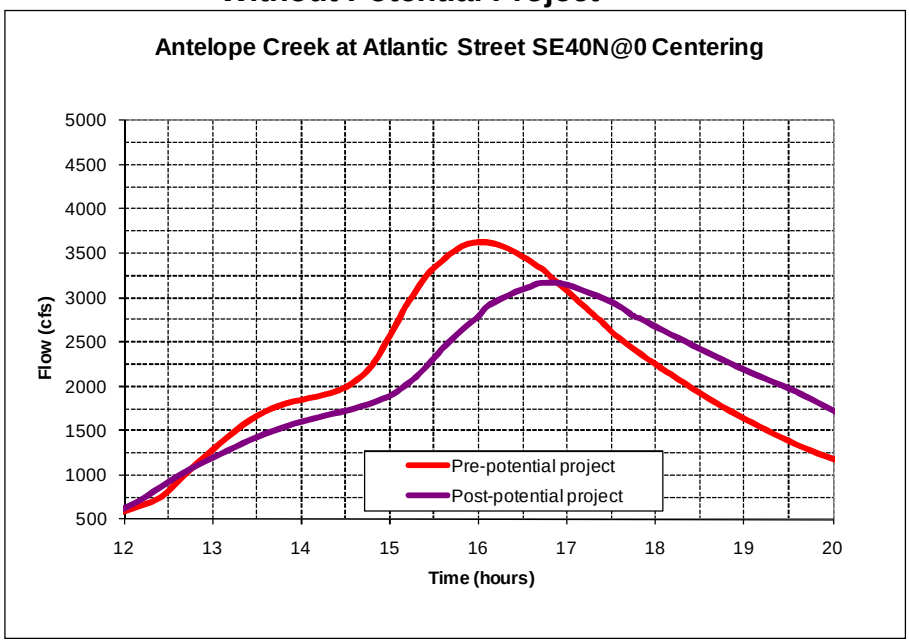
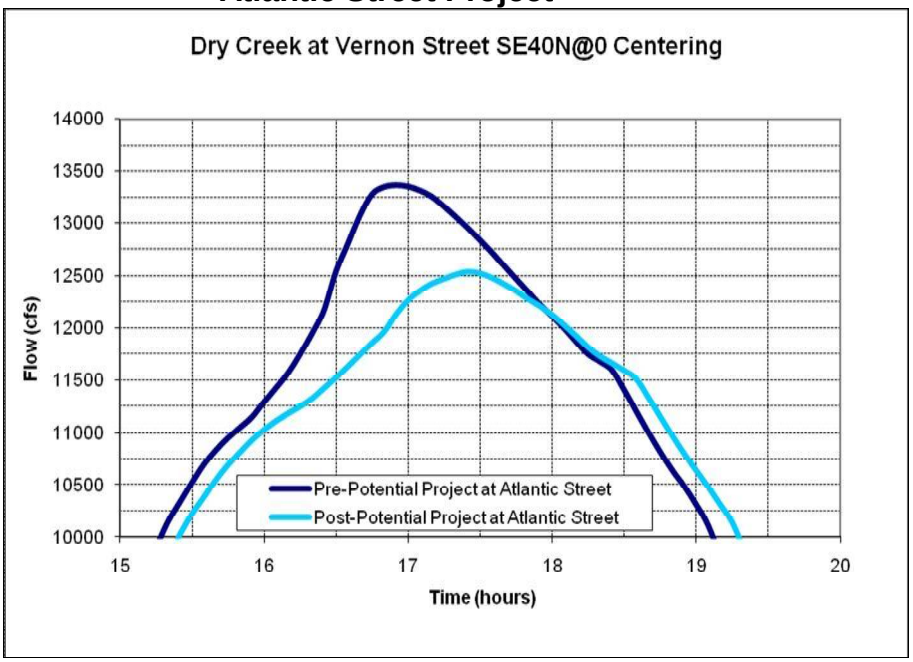


Chart H.14 Flow Hydrograph at Vernon Street With and Without Potential Atlantic Street Project



Based on the seven storm centering locations used in the analysis that cause the highest flows, the project could reduce the peak flow generated by the AC5I@60 by 323 cfs at Atlantic Street and 490 cfs at Vernon Street. Chart H.15 and Chart H.16 show the flow hydrographs just downstream from Atlantic Street and at Vernon Street with and without the potential project based on the AC5I@60 centering.

Chart H.15 Flow Hydrograph Just Downstream from Atlantic Street With and Without Potential Project

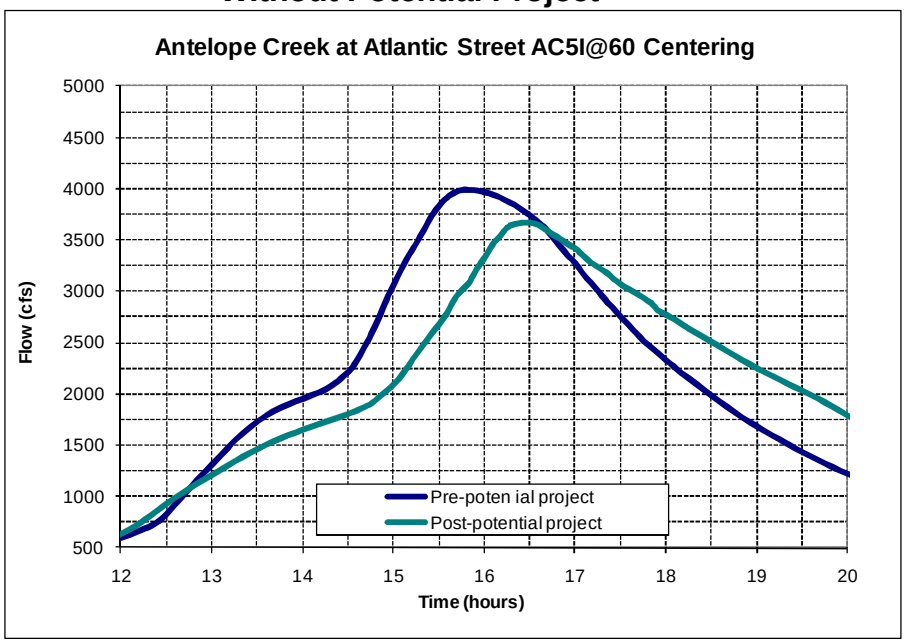
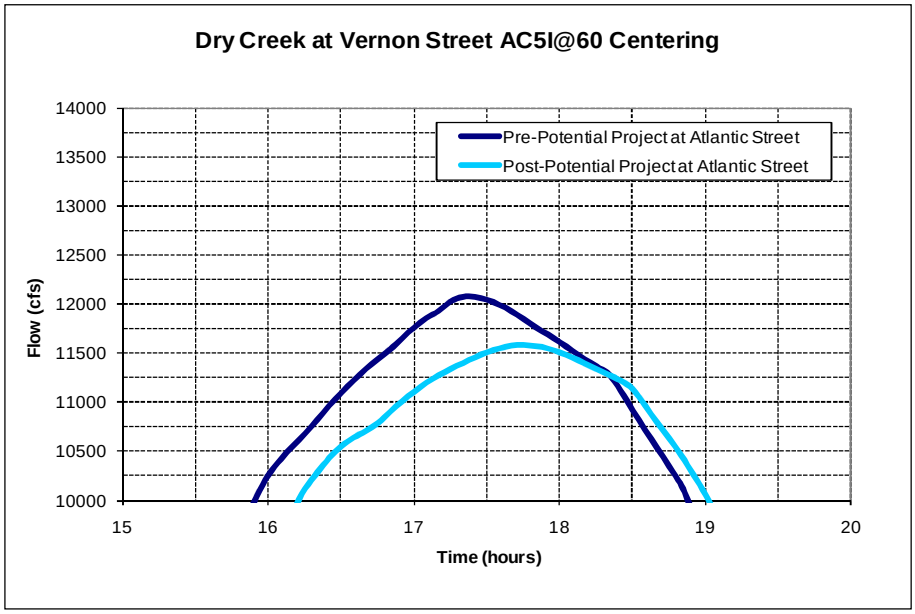


Chart H.16 Flow Hydrograph at Vernon Street With and Without Potential Atlantic Street Project



The project would require increasing the 100-year water surface elevation upstream from Atlantic Street and upstream from the bicycle path bridge to achieve the indicated benefit. It is estimated that this project would increase the 100-year floodplain area by 8.6 acres.

The majority of the project site is owned by the City of Roseville, including 5.3 of the 8.6

acres of additional area that would be included in the 100-year floodplain. A flood easement may be negotiated with the City of Roseville for areas impacted by the potential project. The extent of the area impacted by the increased water surface would extend from the weir at the bicycle bridge upstream about 5,000 feet to approximately the Highway 65 crossing over Antelope Creek.

Part of the project site is a capped landfill that has been capped. A potential project on this site, such as the weir, would require reviewing the environmental and geotechnical feasibility of construction within this area.

The potential project upstream from Atlantic Street on Antelope Creek demonstrates great potential for reducing peak flows at Vernon Street and meeting the District's peak flow mitigation goals. The District has already conducted a flood damage reduction analysis for this project to quantify the flood damage reduction benefits to be realized from this project. A detailed cost estimate is found in Section H.12.

H.6 Old Auburn Road on Linda Creek

Another potential project site just upstream (south) of Old Auburn Road on Linda Creek was previously studied by the City of Roseville for possible future development. Plate H.6 shows a map of the potential project. A portion of the site was found to be infeasible for development purposes due to the current extent of the floodplain. However, this portion of the site may be used for detention purposes by excavating additional storage volume on the left bank. This evaluation is based on excavating approximately 5,000 cubic yards of cut, and depositing it on the right bank, above the existing floodplain. This potential project would include a berm constructed along the left (west) bank to increase effective detention volume in the off-channel detention basin.

For the SE40N@0 centering, the peak flows would be reduced by 68 cfs just downstream from Old Auburn Road and 28 cfs at Vernon Street. The analysis indicates that the potential project may increase water surface elevation up to six inches just upstream from the project location. Table H.6 summarizes the FEMA FIS (2001), pre- and post-potential project conditions from the model used for project analysis.

Table H.6 Water Surface Elevations (feet) for Locations Impacted by Potential Project at Old Auburn Road

		SE40N0			LC40L@30		
Location	FEMA (Nolte)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Downstream from Old Auburn	169.0	162.98	162.88	-0.10	164.21	164.16	-0.05
Upstream from Potential Project Site	169.2	166.64	166.80	0.16	167.75	168.02	0.27

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference

or other issues. In this case, it is likely that the LC40L@30 centering does not produce the peak 100-year flow rate. Future analysis of this project site would need to consider the centering that causes the 100-year flow rate.

Chart H.17 and Chart H.18 show the flow hydrographs for the SE40N@0 centering at Old Auburn Road and Vernon Street with and without the potential project.

Chart H.17 Flow Hydrograph Just Downstream from Old Auburn Road With and Without Potential Project

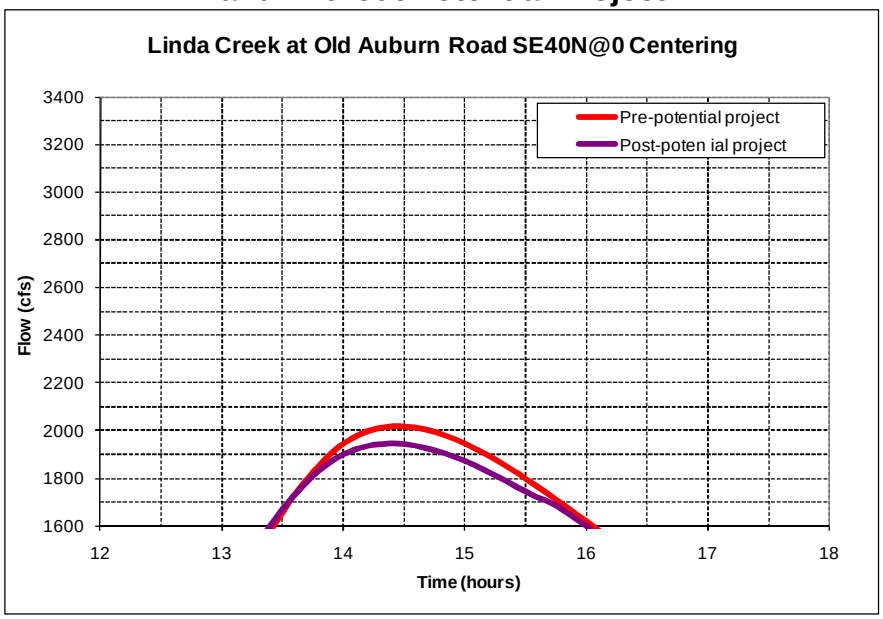
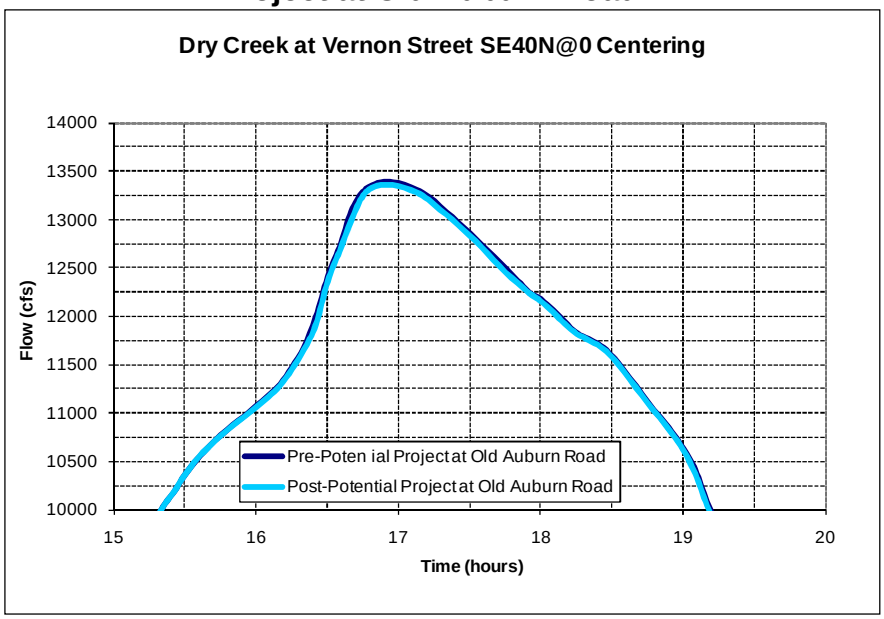


Chart H.18 Flow Hydrograph at Vernon Street With and Without Potential Project at Old Auburn Road



For the LC40L@30 centering, the peak flow reductions would be 48 cfs at Old Auburn Road and 34 cfs at Vernon Street. The analysis indicates the maximum water surface elevation increasing between eight and 10 inches, just upstream from the project site. Chart H.19 and Chart H.20 show the flow hydrographs for Linda Creek at Old Auburn Road and Dry Creek at Vernon Street for the LC40L@30 centering with and without the potential project at Old Auburn Road.

Chart H.19 Flow Hydrograph Just Downstream from Old Auburn Road With and Without Potential Project

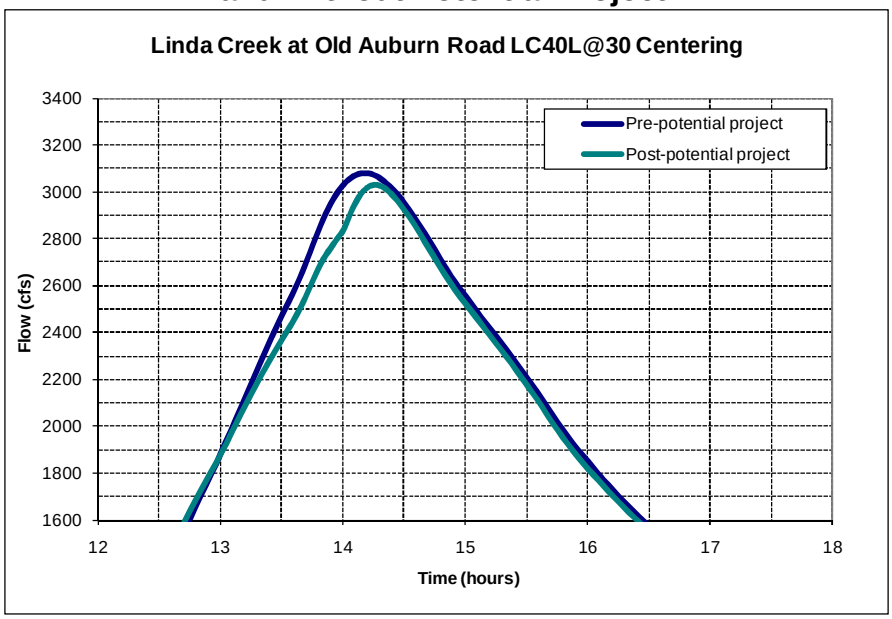
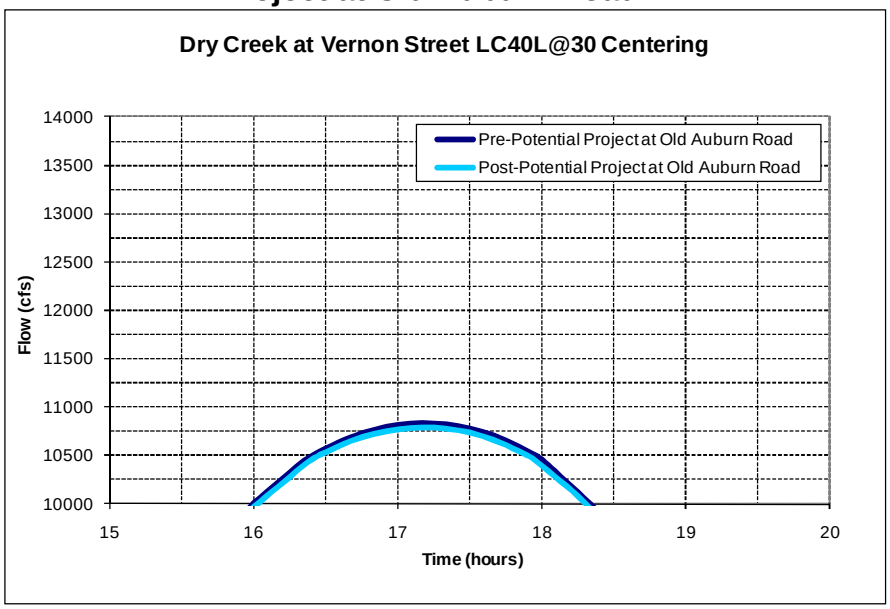


Chart H.20 Flow Hydrograph at Vernon Street With and Without Potential Project at Old Auburn Road



The project would require a berm approximately 1,000 feet in length that is

approximately four to eight feet high, depending on the natural ground. Additionally, an opening of approximately 30 feet at the upstream end of the detention basin would allow flow to enter, and a culvert with a flap gate at the downstream end of the detention basin would allow the flow to return to Linda Creek.

The potential project that was evaluated has a maximum volume of 15 acre-feet, which is less than the 50-acre-feet threshold cause it to be within DSOD jurisdiction.

More excavation may yield more peak flow reduction benefit. Also, the project may be designed to reduce potential upstream increases in water surface elevation with in-channel modifications or a different configuration of the project site.

Since the potential project site is owned by the City of Roseville, a flood easement may be negotiated for areas impacted by increased flood depths.

The Old Auburn Road on Linda Creek project site has some potential for decreasing peak flow rates at Vernon Street. It is recommended that the site be further analyzed.

H.7 West of Rocky Ridge on Linda Drive

A potential eight-acre project site is located near Sierra Gardens Drive, downstream (west) of Rocky Ridge Drive. This potential project site is already within the existing floodplain. Plate H.7 shows a map of the potential project. Existing storage volume may be added using a berm to create an off-channel detention basin, allowing higher water surface elevations within the detention basin, or by excavation. Because of the vegetative cover and the existing trees on-site, it may be difficult to create significant storage volume by excavation. The potential project only evaluated an off-channel detention basin configuration with berms.

Based on the SE40N@0 centering, peak flows immediately downstream from the project site would be decreased by 27 cfs and peak flows at Vernon Street would be decreased by nine cfs. Chart H.21 and Chart H.22 show the flow hydrographs for the SE40N@0 centering just downstream from the project site and at Vernon Street.

The site does not afford enough storage volume to effectively attenuate the large peak flows that occur lower in the watershed. This project is deemed in feasible due to potential environmental constraints and lack of peak flow reduction benefit. No further action is recommended on this project site.

Chart H.21 Flow Hydrograph Just Downstream From the Potential Project Site Near Rocky Ridge Road With and Without the Potential Project

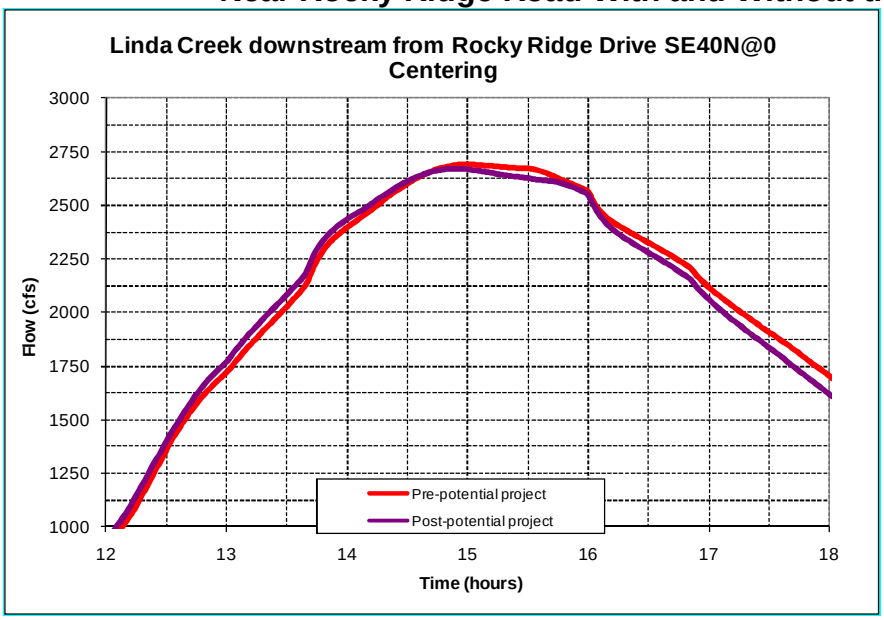
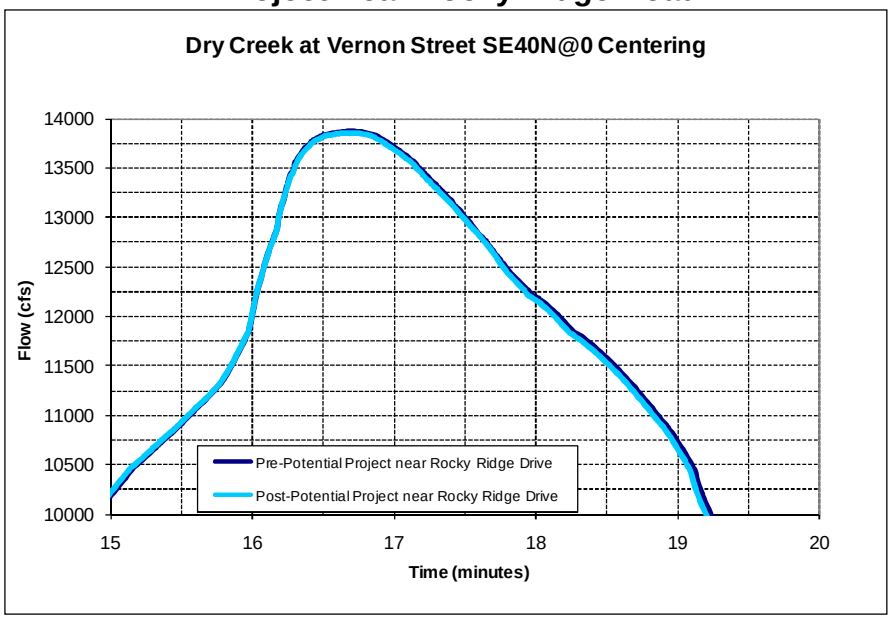


Chart H.22 Flow Hydrograph at Vernon Street With and Without Potential Project Near Rocky Ridge Road



H.8 East Roseville Parkway on Miners Ravine

A potential project site exists upstream (east) from Roseville Parkway on Miners Ravine, just downstream from the Miners Ravine Off-Channel Detention Basin. Plate H.8 shows the potential project area. The ground on the site is approximately 15 to 30 feet higher than the existing floodplain. In order for additional flood storage volume to

be added to the floodplain, at least 130,000 cubic yards of cut would have to be excavated and removed from the site before additional storage volume could be added. Due to the high costs of excavation and soil removal, this project site was deemed infeasible and not analyzed with the hydraulic model. No further action is recommended for this project site.

H.9 Sierra College Boulevard on Secret Ravine

Another potential project site is located upstream (east) from Sierra College Boulevard on Secret Ravine. Plate H.9 shows a map of the potential project location. This potential project involves construction of an in-channel weir just upstream from Sierra College Boulevard that would allow the low flows to pass, but detain the high flows. The potential project site is approximately 20 acres, of which approximately 15 acres are located within the existing floodplain. This project was evaluated for construction in 2007 using a Department of Water Resources (DWR) grant. It was determined that in order for the project to achieve the desired flood control benefit, it would require additional flood control easements and was not consistent with the terms of the available funding. Therefore, the project could not be constructed at that time. The previously proposed weir configuration was used for this analysis. Plate H.10 shows renderings of the potential weir that were created in 2007 for the feasibility study.

As noted in Section 3.9.4 modifications to raise the profile elevation of Sierra College Boulevard by about 1.6 feet were completed in 2010. Prior to construction, the peak flows overtopped Sierra College Boulevard. By increasing the top elevation, the maximum water surface elevation is increased and additional storage volume is created. Table 15 shows the impacts of the modifications to Sierra College Boulevard, including a 62 cfs peak flow reduction at Vernon Street. This potential flow reduction project evaluation was completed using a hydraulic model that included the modifications to Sierra College Boulevard.

The current study SE40N@0 centering includes much higher Secret Ravine flows than the flows considered in the 2007 project evaluation. Based on the 2007 project configuration for the SE40N@0 centering, the water surface elevation just upstream from the potential project weir would increase by 3 to 4 feet. The peak flow just downstream from Sierra College Boulevard would decrease by 68 cfs and the peak flow at Vernon Street would decrease by 175 cfs. Table H.7 summarizes the FEMA FIS (2001), pre- potential project condition, the increase in Sierra College Boulevard roadway overtopping elevation condition, and the post-potential project conditions from the model used for project analysis.

Table H.7 Water Surface Elevations (feet) Just Upstream From Potential Project Weir Near Sierra College Boulevard

		SE40N@0			SE40M@30		
Location	FEMA (2001)	No Project	With Project	Project Delta	No Project	With Project	Project Delta
Upstream from Potential Project Weir	299.4	300.92	304.28	3.36	301.50	304.68	3.18

Note: The FEMA water surface elevation is provided for reference and was not used in the analysis. It may be different from the current study model due to flow rate difference or other issues. The Secret Ravine centerings cause higher flow rates than those used in the FEMA FIS.

Chart H.23 and Chart H.24 show the flow hydrographs for the SE40N@0 centering for Sierra College Boulevard and Vernon Street with and without the potential project

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Chart H.23 Flow Hydrographs for Secret Ravine at Sierra College Boulevard With and Without the Potential Project – Vernon Peak Flow Centering

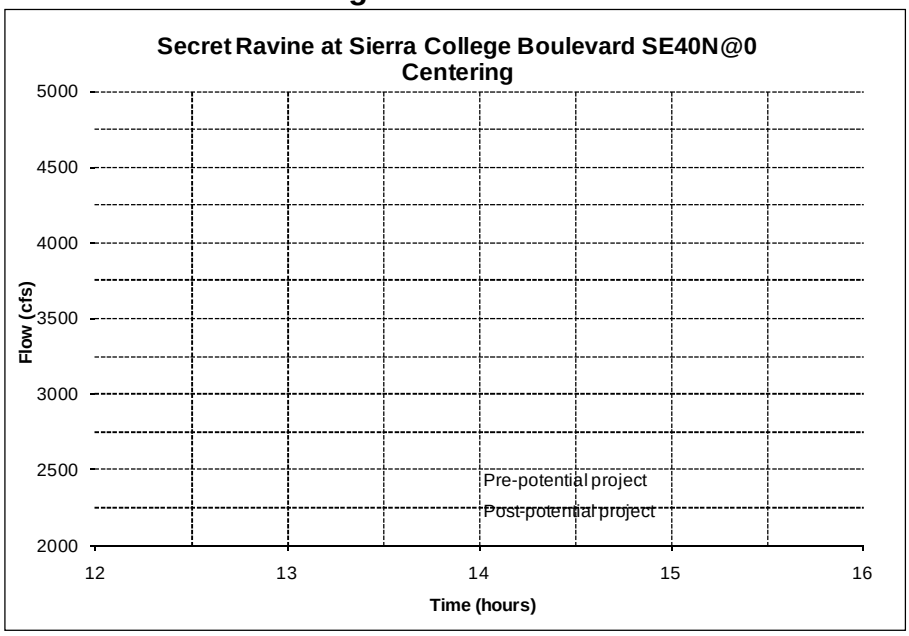
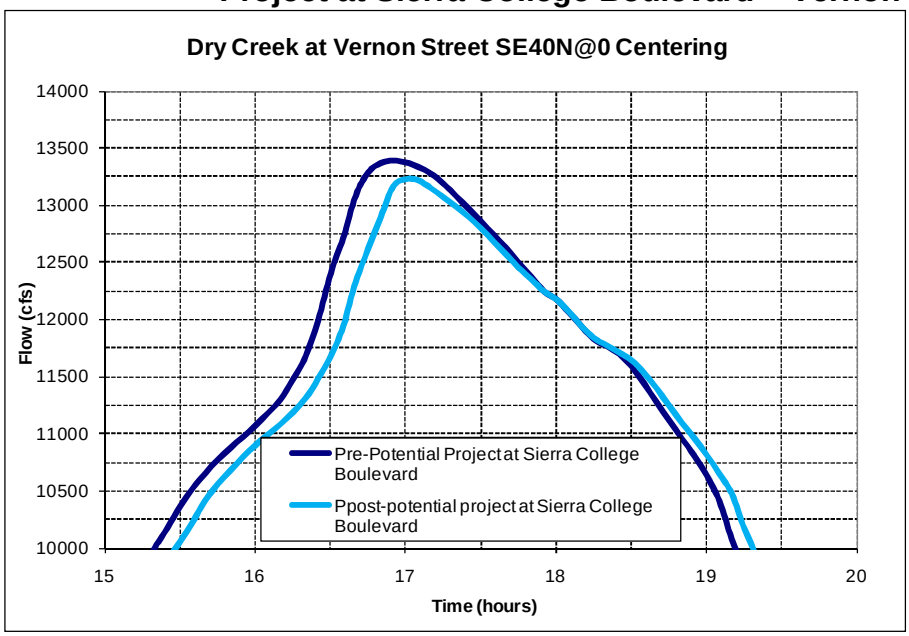


Chart H.24 Flow Hydrographs at Vernon Street With and Without Potential Project at Sierra College Boulevard – Vernon Peak Flow Centering



For the SE40M30 centering, the peak flow rates at Sierra College Boulevard and Vernon Street would be decreased by 57 cfs and 188 cfs, respectively, considering the new roadway elevation and the potential in-channel weir. Chart H.25 and Chart H.26 show the flow hydrographs for the SE40M@0 centering for Sierra College Boulevard and Vernon Street with and without the potential project.

Chart H.25 Flow Hydrographs for Secret Ravine at Sierra College Boulevard With and Without the Potential Project – Local Peak Flow Centering

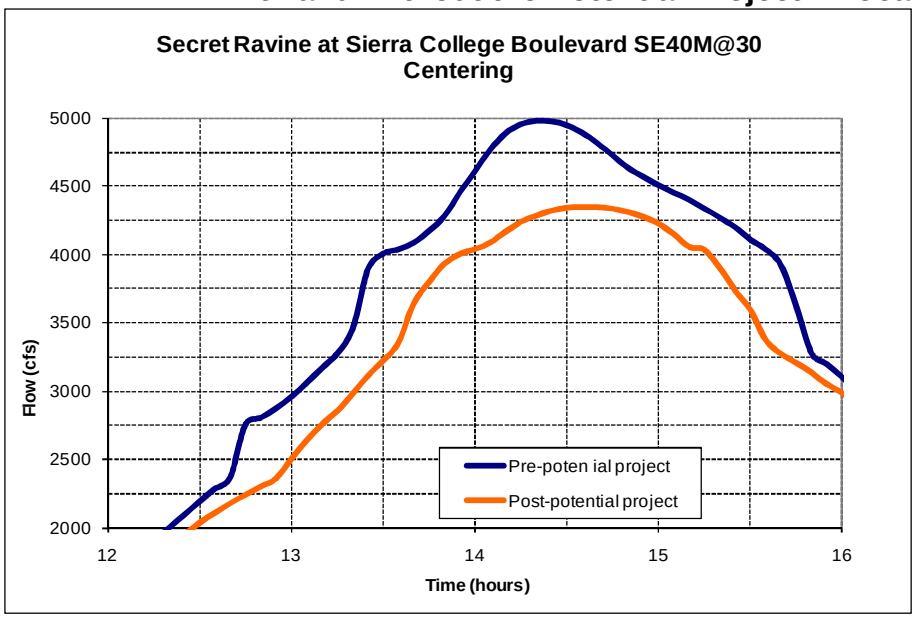
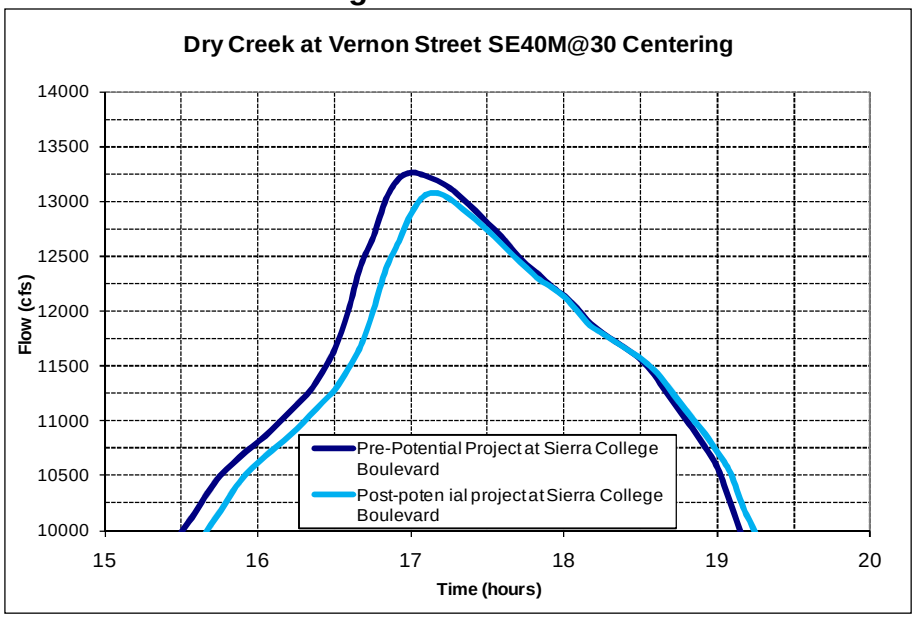


Chart H.26 Flow Hydrographs at Vernon Street before and after Sierra College Boulevard With and Without the Potential Project – Local Peak Flow Centering



The impact of the project extends about 3,000 feet upstream. The potential project weir would be approximately 450 feet wide and 0 to 15 feet tall, depending on the natural ground height. About five acres of developable land (outside of the existing floodplain) would need to be acquired for the potential project. The other 15 acres impacted by the project are in the existing floodplain and would also require a flood easement or fee title.

This project has the potential for reducing peak flow rates at Vernon Street. Further study is recommended for this project site.

H.10 McLaren Drive at Maidu Park on Strap Ravine

One potential project site is located in Maidu Park on Strap Ravine, just upstream (north) of McLaren Drive. The potential project would involve constructing an in-channel structure that allows low flow passage, but detains higher flows, increasing the upstream water surface elevation for the peak flows, and attenuating the peak flow from the project site. Plate H.11 shows a map of the potential project site.

Based on the SE40N@0 centering, the maximum water surface elevation in Maidu Park would increase by three feet. The peak flow just downstream from McLaren Drive would be reduced by 156 cfs. However, the peak flow at Vernon Street would increase by 35 cfs. Without the project, the peak flow on Strap Ravine occurs about one hour before the peak flow on Linda Creek, just upstream from the Strap-Linda confluence. Delaying the peak on Strap Ravine would cause the peak to align with the peak Linda Creek flow, producing a net increase in peak flow rate downstream from the confluence and at Vernon Street. Chart H.27 and Chart H.28 show the flow hydrographs for

SE40N@0 centering at McLaren Drive and Vernon Street.

Chart H.27 Flow Hydrograph at McLaren Drive With and Without a Potential Project Upstream from McLaren Drive

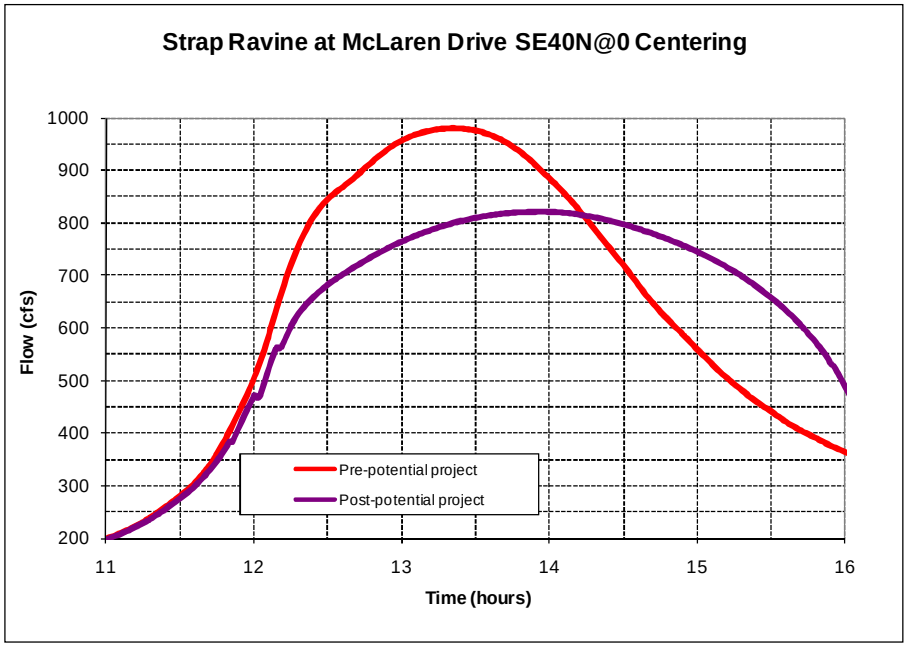
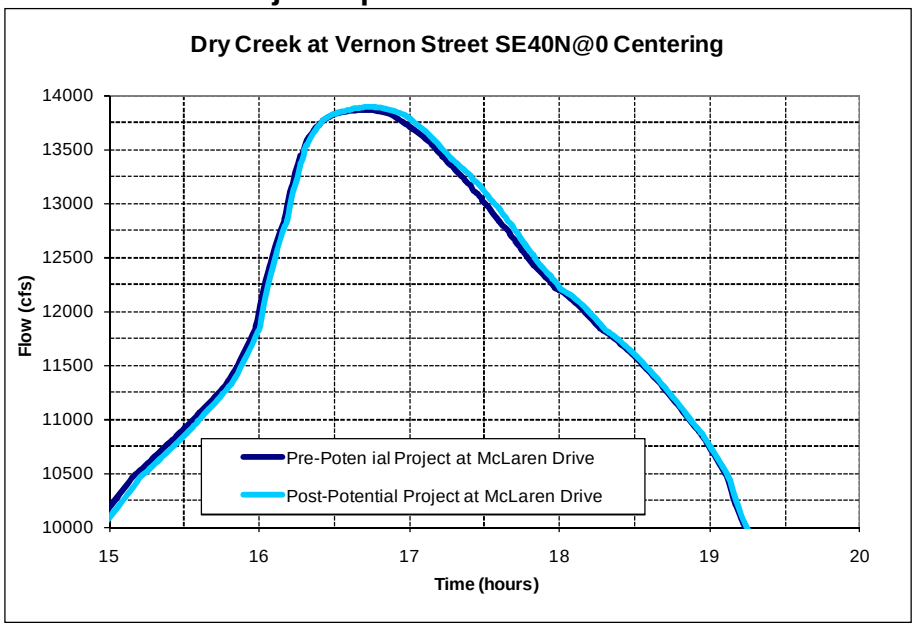


Chart H.28 Flow Hydrograph at Vernon Street With and Without a Potential Project Upstream from McLaren Drive



The project is deemed infeasible due to the net increase of peak flows at Vernon Street. No further action is recommended for this potential project site.

H.11 Vista Oaks Area on Secret Ravine

As part of the development plan for the Vista Oaks area, downstream (south) of China Garden on Secret Ravine, an opportunity exists for a potential flood control and creek restoration project as part of the development. The potential project implements an in-channel weir with low flow passage and detains high flows. Plate H.12 shows a map of the potential project area.

For the SE40N@0 centering, the evaluated potential project would decrease local peak flows by 103 cfs, but would not cause any net change at Vernon Street. Any decrease and delay in peak flow on the lower part of Secret Ravine is counteracted by the rising limb of the Miners Ravine hydrograph, causing no net impact at Vernon Street. Chart H.29 and Chart H.30 show the flow hydrographs for downstream from the potential Vista Oaks project site and Vernon Street with and without the potential project.

Chart H.29 Flow Hydrograph Just Downstream from Vista Oaks With and Without a Potential Project at Vista Oaks

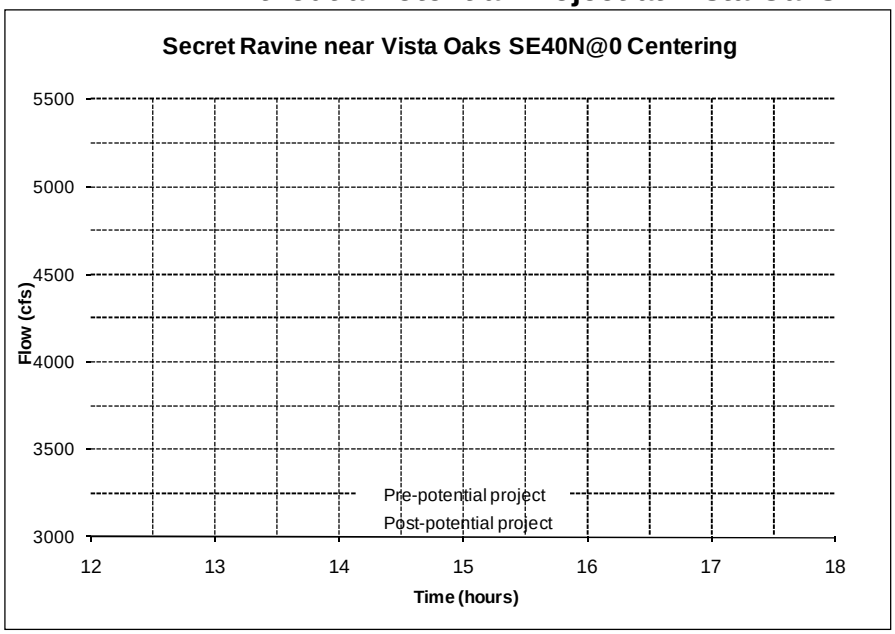
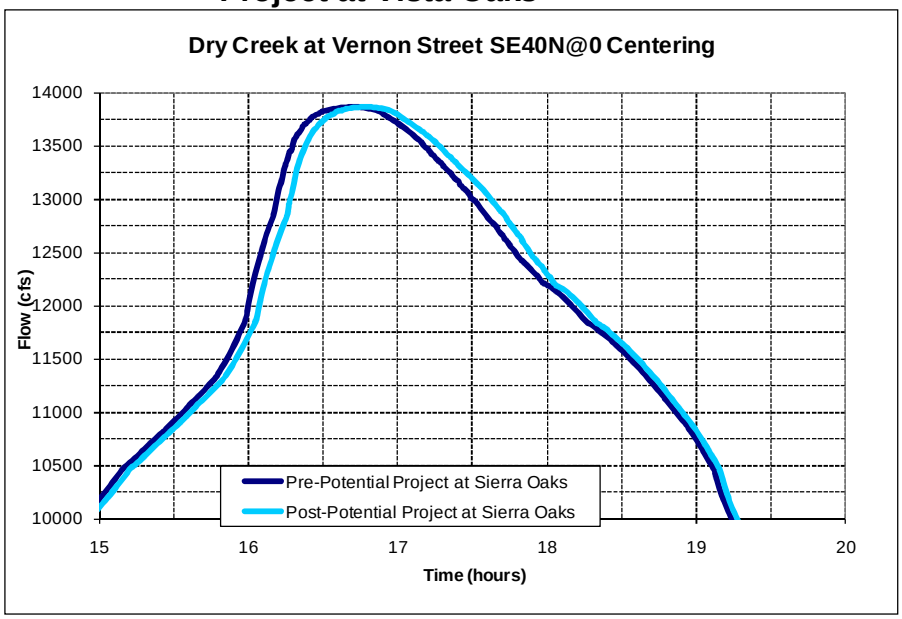


Chart H.30 Flow Hydrograph at Vernon Street with and without a Potential Project at Vista Oaks



A local stream restoration project may be feasible but would offer no additional regional flood control benefits beyond local peak flow reduction, based on the SE40N@0 centering. No further action is recommended for this potential project site.

H.12 Potential Project Cost Estimates

The cost estimates for the five recommended potential projects (Antelope Creek at Atlantic Street Phase 1 and Phase 2, Linda Creek near Auburn-Folsom Road, Linda Creek near Wedgewood Drive, Linda Creek at Old Auburn Road, and Secret Ravine at Sierra College Boulevard) are included in Tables H.8-H.12.

Table H.8 Cost Estimate for Project on Antelope Creek at Atlantic Street

Project:	**Antelope Creek at Atlantic Street Phase 1**			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Con-Span Arch Phase 1 (Span: 32', Rise 7.5', Length 42')	1	LS	$ 200,000	$ 200,000
Reinforced Concrete Footings	30	CY	$ 800	$ 24,000
Excavation (Includes Placement as Fill)	8,000	CY	$ 20	$ 160,000
Asphalt Paving (For Weir Crest)	5,000	SF	$ 10	$ 50,000
Heavy Duty Turf Reinforcement Mat	2,500	SY	$ 10	$ 25,000
Rip-rap Slope Protection	2,000	CY	$ 100	$ 200,000
ALERT stream level and precip gages	2	EA	$ 12,500	$ 25,000
Subtotal Phase 1 Base Construction				*$ 684,000*
Mobilization (10%)				$ 68,400

Project:	Antelope Creek at Atlantic Street Phase 1			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Restoration Component (20%)				$ 136,800
Geotechnical (15%)				$ 102,600
Construction Management (10%)				$ 68,400
Contingency (15%)				$ 102,600
Administration (10%)				$ 68,400
Engineering				
Hydraulic Design Calculations				$ 26,000
Structural Design				$ 40,000
Civil Plans and Specifications				$ 70,000
Land Acquisition	3	AC	$ 55,555	$ 166,665
Mitigation and Permitting				$ 170,000
Total Phase 1				***$ 1,664,000***

Project:	Antelope Creek at Atlantic Street Phase 2			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Con-Span Arch Phase 2 (Span: 20', Rise 7', Length 40')	1	LS	$ 150,000	$ 150,000
Reinforced Concrete Footings	25	CY	$ 800	$ 20,000
Excavation (Includes Placement as Fill)	3,000	CY	$ 20	$ 60,000
Bicycle Path Paving	4,000	SF	$ 10	$ 40,000
Heavy Duty Turf Reinforcement Mat	1,500	SY	$ 10	$ 15,000
Rip-rap Slope Protection	1,500	CY	$ 100	$ 150,000
Miscellaneous	1	LS	$ 100,000	$ 100,000
Subtotal Phase 2 Base Construction				*$ 535,000*
Mobilization (10%)				$ 53,500
Restoration Component (20%)				$ 107,000
Geotechnical (15%)				$ 80,250
Construction Management (10%)				$ 53,500
Contingency (15%)				$ 80,250
Administration (10%)				$ 53,500
Engineering				
Hydraulic Design Calculations				$ 26,000
Structural Design				$ 40,000
Civil Plans and Specifications				$ 70,000
Land Acquisition	7	AC	$ 55,555	$ 388,885
Mitigation and Permitting				$ 175,000
Total Phase 2				***$ 1,623,000***
Total Phase 1 and Phase 2				**$ 3,367,000**

Table H.9 Cost Estimate for Project on Linda Creek near Auburn-Folsom Road

Project :	Linda Creek near Auburn-Folsom Road			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Excavation	0	CY	$ 10	$ -
Hauling	0	CY	$ 15	$ -
Fill for Berms	2,700	CY	$ 10	$ 27,000
Grading for Berms	2,700	CY	$ 25	$ 67,500
Erosion Control for Berms	16,000	SY	$ 5	$ 80,000
Outlet	1	LS	$ 15,000	$ 15,000
Subtotal Base Construction				*$ 189,500*
Mobilization (10%)				$ 18,950
Restoration Component (20%)				$ 37,900
Geotechnical (15%)				$ 28,425
Construction Management (10%)				$ 18,950
Contingency (25%)				$ 47,375
Administration (10%)				$ 18,950
Engineering				
Hydraulic Design Calculations				$ 30,000
Structural Design				$ 4,000
Civil Plans and Specifications				$ 90,000
Land Acquisition	7	AC	$ 55,555	$ 388,885
Mitigation and Permitting				$ 135,000
Total				***$ 1,008,000***

Table H.10 Cost Estimate for Project on Linda Creek at Wedgewood Drive

Project :	Linda Creek at Wedgewood Drive			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Wall Excavation	480	CY	$ 90	$ 43,200
Hauling	480	CY	$ 15	$ 7,200
Grading	300	CY	$ 25	$ 7,500
Reinforced Concrete Weir	150	LF	$ 2,000	$ 300,000
Rip-rap	38	CY	$ 100	$ 3,750
Subtotal Base Construction				*$ 361,650*
Mobilization (10%)				$ 36,165
Restoration Component (20%)				$ 72,330
Geotechnical (15%)				$ 54,248
Construction Management (10%)				$ 36,165
Contingency (25%)				$ 90,413
Administration (10%)				$ 36,165
Engineering				
Hydraulic Design Calculations				$ 26,000
Structural Design				$ 35,000
Civil Plans and Specifications				$ 40,000
Land Acquisition	3	AC	$ 55,555	$ 166,665
Mitigation and Permitting				$ 64,000
Total				***$ 1,019,000***

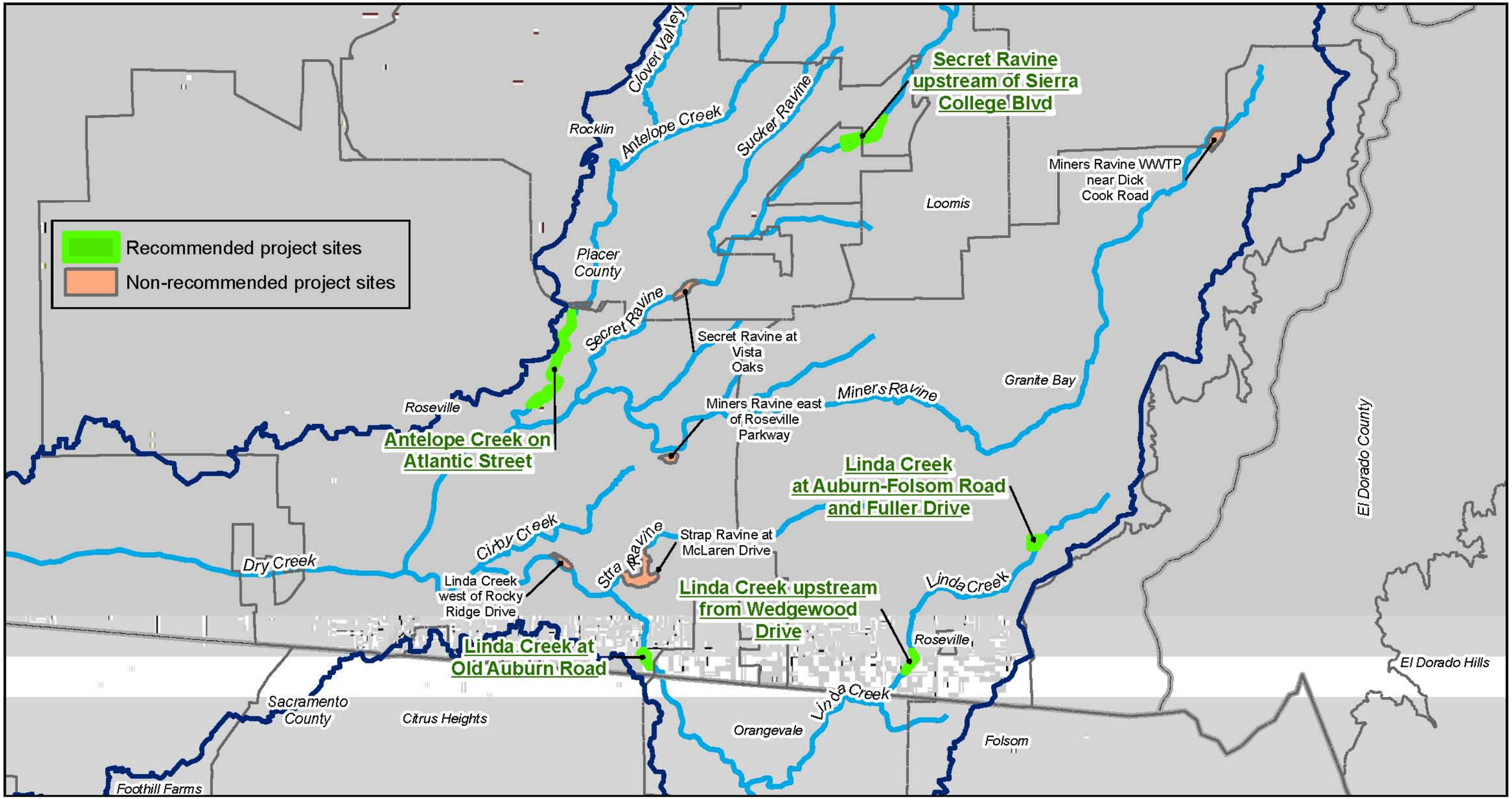
Table H.11 Cost Estimate for Project on Linda Creek at Old Auburn Road

Project :	Linda Creek at Old Auburn Road			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Excavation	1,900	CY	$ 10	$ 19,000
Hauling	600	CY	$ 15	$ 9,000
Grading for Berms	2,500	CY	$ 25	$ 62,500
Erosion Control for Berms	16,800	SY	$ 5	$ 84,000
Outlet	1	LS	$ 15,000	$ 15,000
Subtotal Base Construction				*$ 189,500*
Mobilization (10%)				$ 18,950
Restoration Component (20%)				$ 37,900
Geotechnical (15%)				$ 28,425
Construction Management (10%)				$ 18,950
Contingency (25%)				$ 47,375
Administration (10%)				$ 18,950
Engineering				
Hydraulic Design Calculations				$ 30,000
Structural Design				$ 4,000
Civil Plans and Specifications				$ 90,000
Land Acquisition	5	AC	$ 55,555	$ 277,775
Mitigation and Permitting				$ 170,000
Total				***$ 932,000***

Table H.12 Cost Estimate for Project on Secret Ravine at Sierra College Boulevard

Project :	Secret Ravine at Sierra College Boulevard			
Item	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Wall Excavation	800	CY	$ 90	$ 72,000
Hauling	800	CY	$ 15	$ 12,000
Grading	100	CY	$ 25	$ 2,500
Reinforced Concrete Weir	400	LF	$ 2,000	$ 800,000
Rip-rap	100	CY	$ 100	$ 10,000
Subtotal Base Construction				*$ 896,500*
Mobilization (10%)				$ 89,650
Restoration Component (20%)				$ 179,300
Geotechnical (15%)				$ 134,475
Construction Management (10%)				$ 89,650
Contingency (25%)				$ 224,125
Administration (10%)				$ 89,650
Engineering				
Hydraulic Design Calculations				$ 55,000
Structural Design				$ 55,000
Civil Plans and Specifications				$ 90,000
Land Acquisition	20	AC	$ 55,555	$ 1,111,100
Mitigation and Permitting				$ 220,000
Total				***$ 3,234,000***

DRY CREEK WATERSHED POTENTIAL REGIONAL DETENTION PROJECTS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

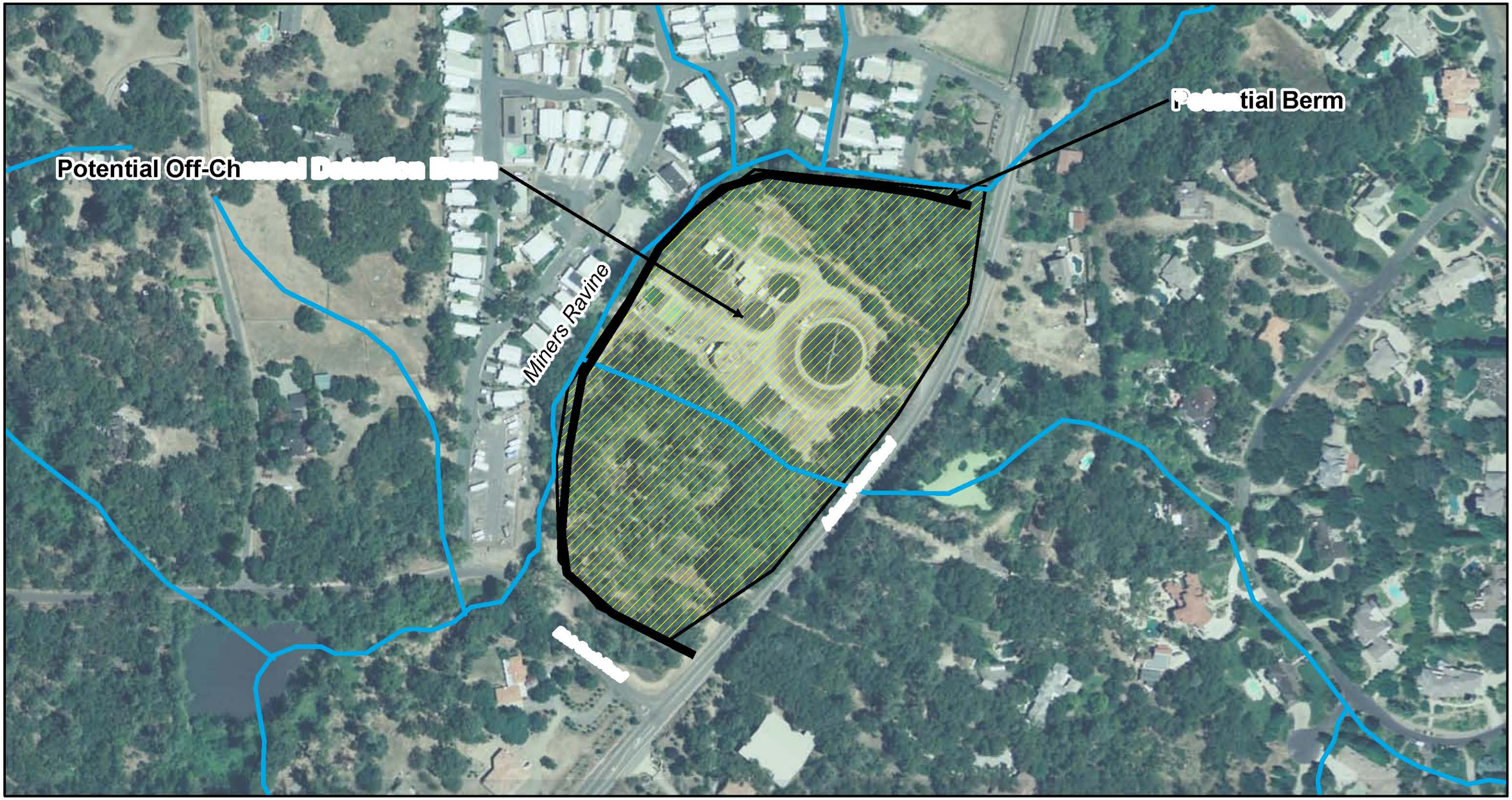
CIVIL ENGINEERING SOLUTIONS, INC.

0 0.5 1 Miles

1 inch = 1 mile

PLATE H1

MINERS RAVINE UPSTREAM FROM DICK COOK ROAD



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

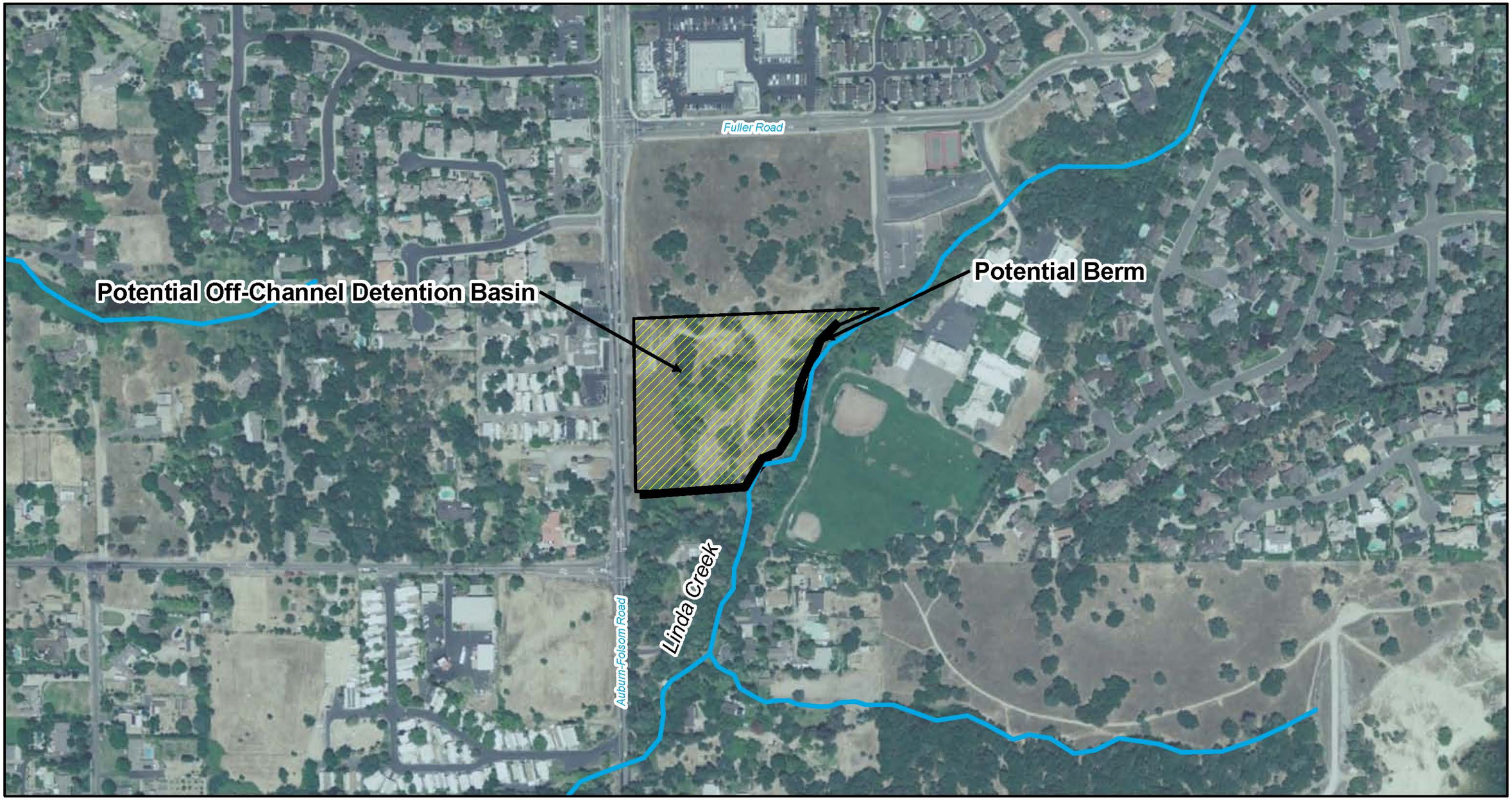
CIVIL ENGINEERING SOLUTIONS, INC.

0 50 100 200 Feet

1 inch = 200 feet

PLATE H2

LINDA CREEK UPSTREAM FROM AUBURN-FOLSOM ROAD



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

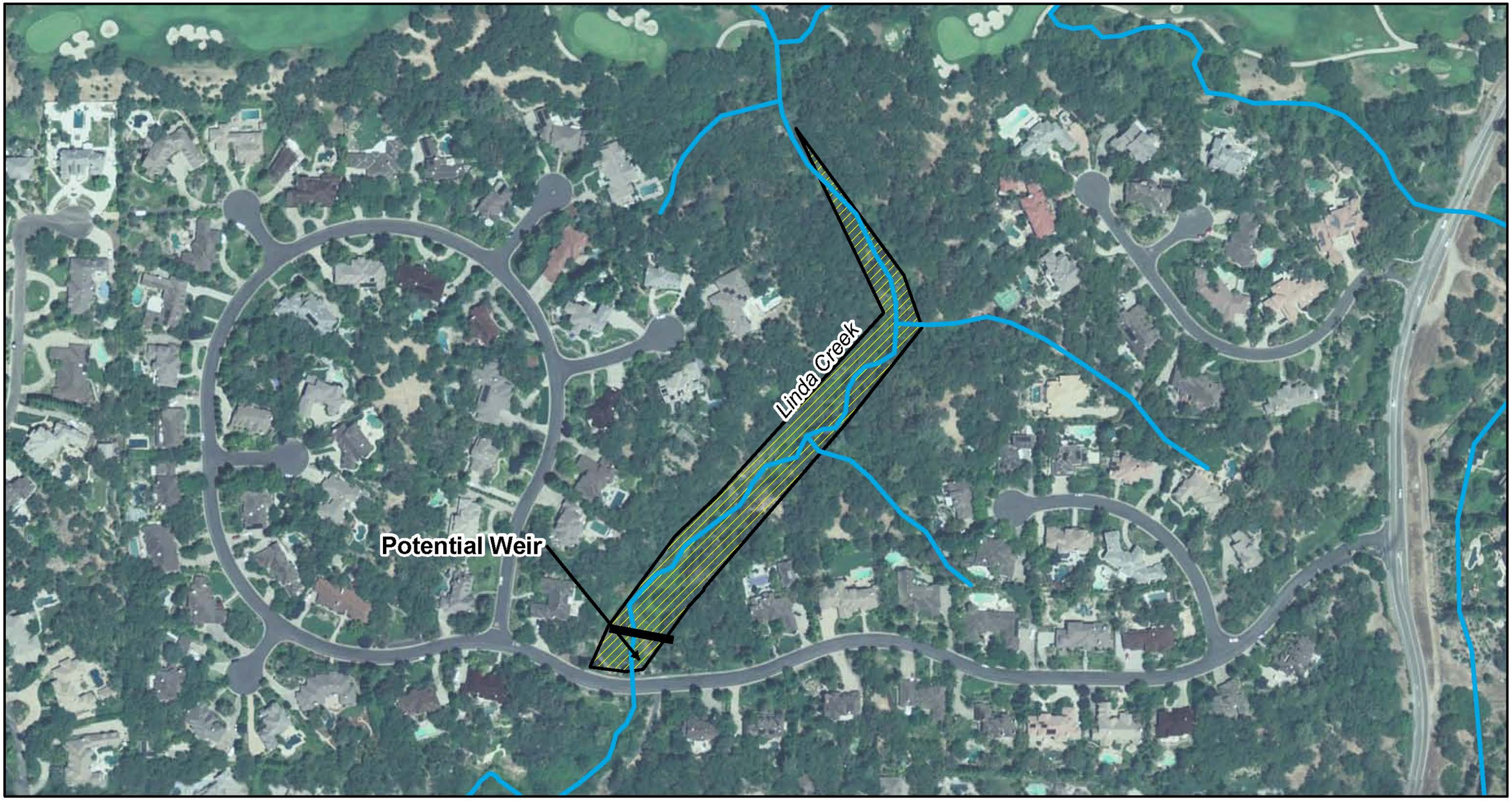
CIVIL ENGINEERING SOLUTIONS, INC.

0 100 200 300 Feet

1 inch = 300 feet

PLATE H3

LINDA CREEK UPSTREAM FROM WEDGEWOOD DRIVE



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

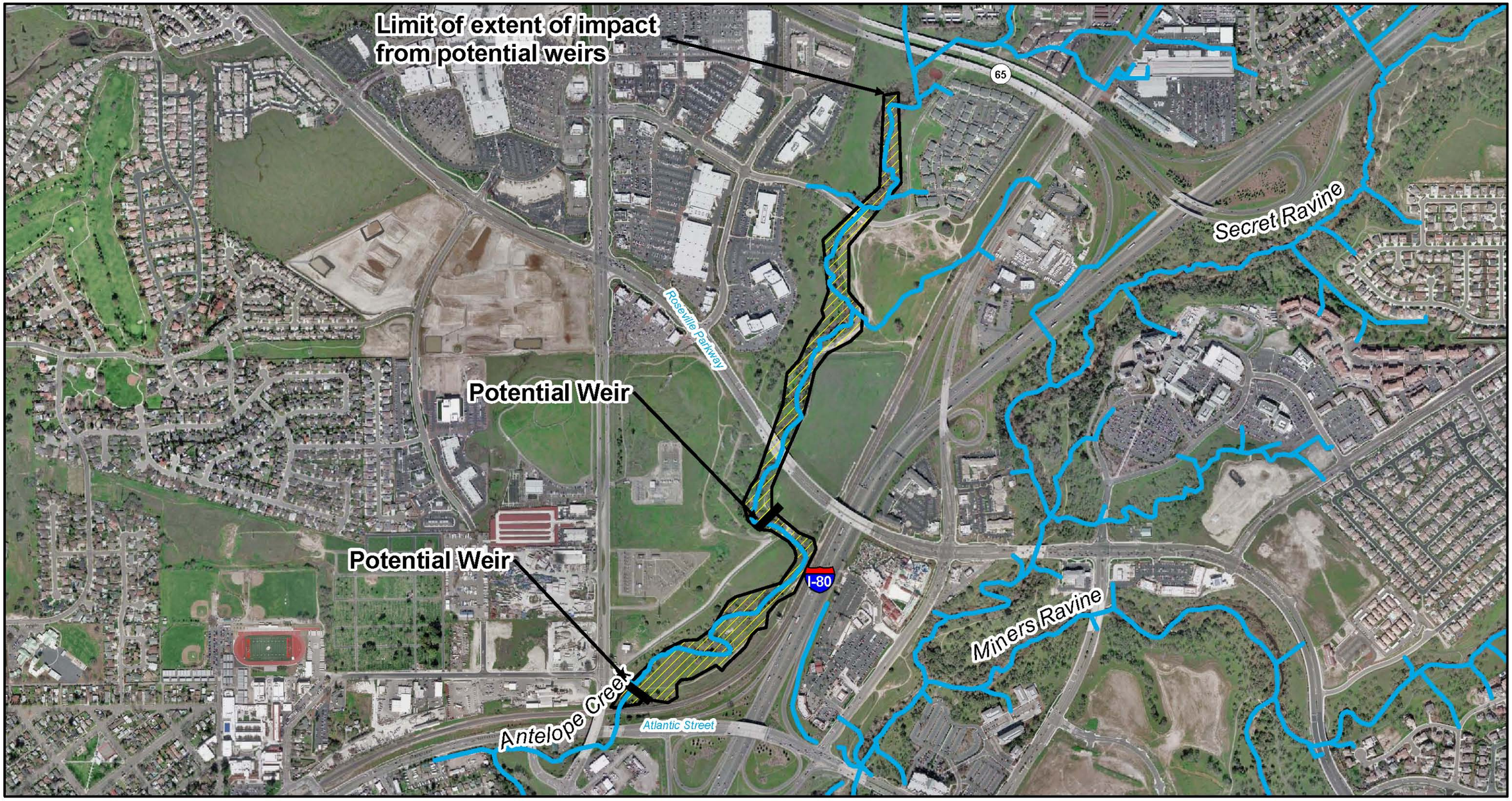
CIVIL ENGINEERING SOLUTIONS, INC.

0 100 200 Feet

1 inch = 200 feet

PLATE H4

ANTELOPE CREEK UPSTREAM FROM ATLANTIC STREET



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 400 800 1,200 Feet

1 inch = 800 feet

PLATE H5

LINDA CREEK UPSTREM FROM OLD AUBURN ROAD

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 150 300 Feet

1 inch = 150 feet

PLATE H6

LINDA CREEK NEAR ROCKY RIDGE DRIVE

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 150 300 Feet

1 inch = 300 feet

PLATE H7

MINERS RAVINE UPSTREAM FROM EAST ROSEVILLE PARKWAY

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

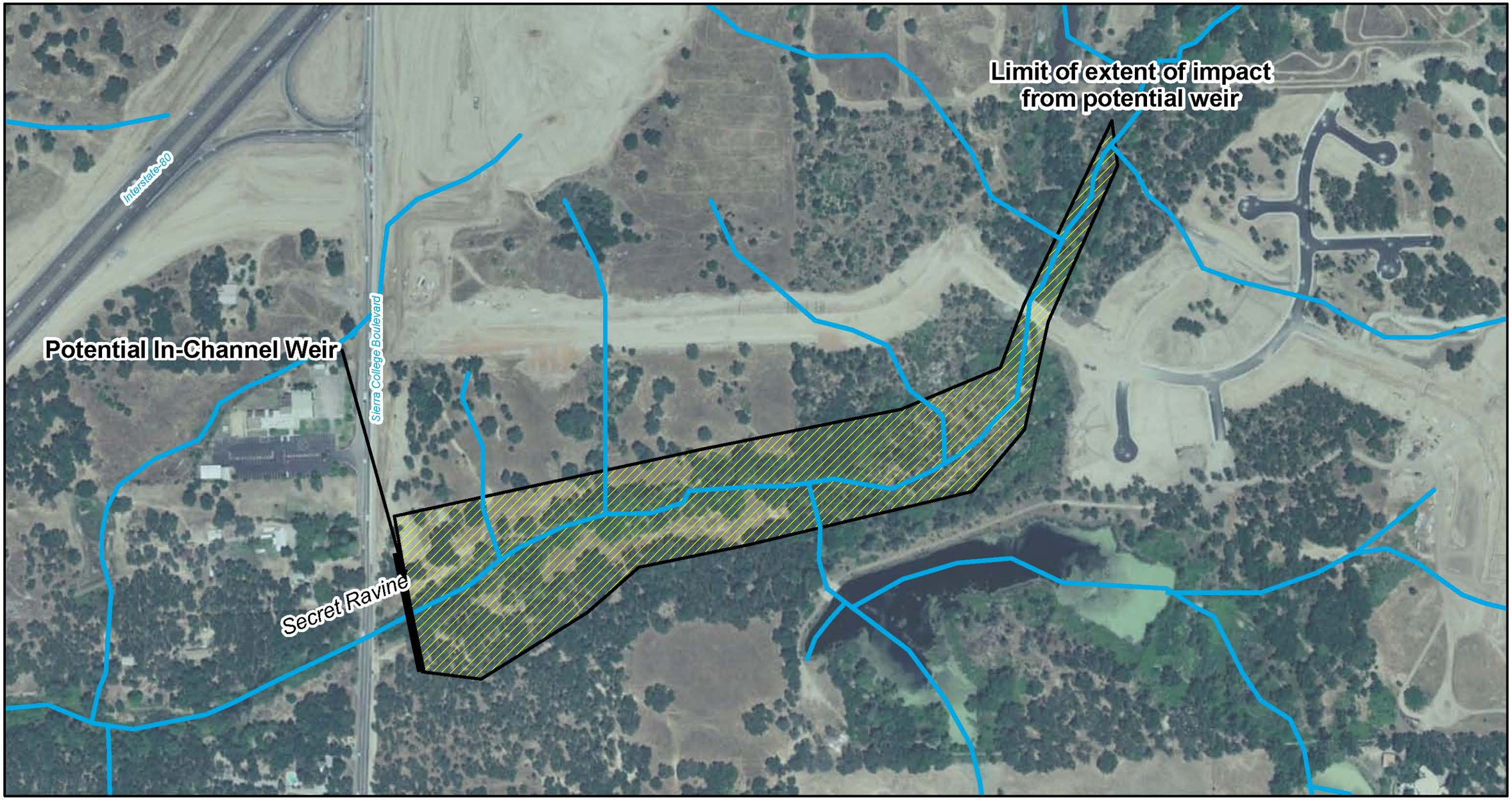
CIVIL ENGINEERING SOLUTIONS, INC.

0 150 300 Feet

1 inch = 300 feet

PLATE H8

SECRET RAVINE UPSTREAM FROM SIERRA COLLEGE BOULEVARD



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 300 600 Feet

1 inch = 300 feet

PLATE H9

RENDERINGS OF POTENTIAL WEIR AT SIERRA COLLEGE BOULEVARD ON SECRET RAVINE

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 100 200 Feet

1 inch = 200 feet

PLATE H10

STRAP RAVINE UPSTREAM FROM MCLAREN DRIVE AT MAIDU PARK

PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

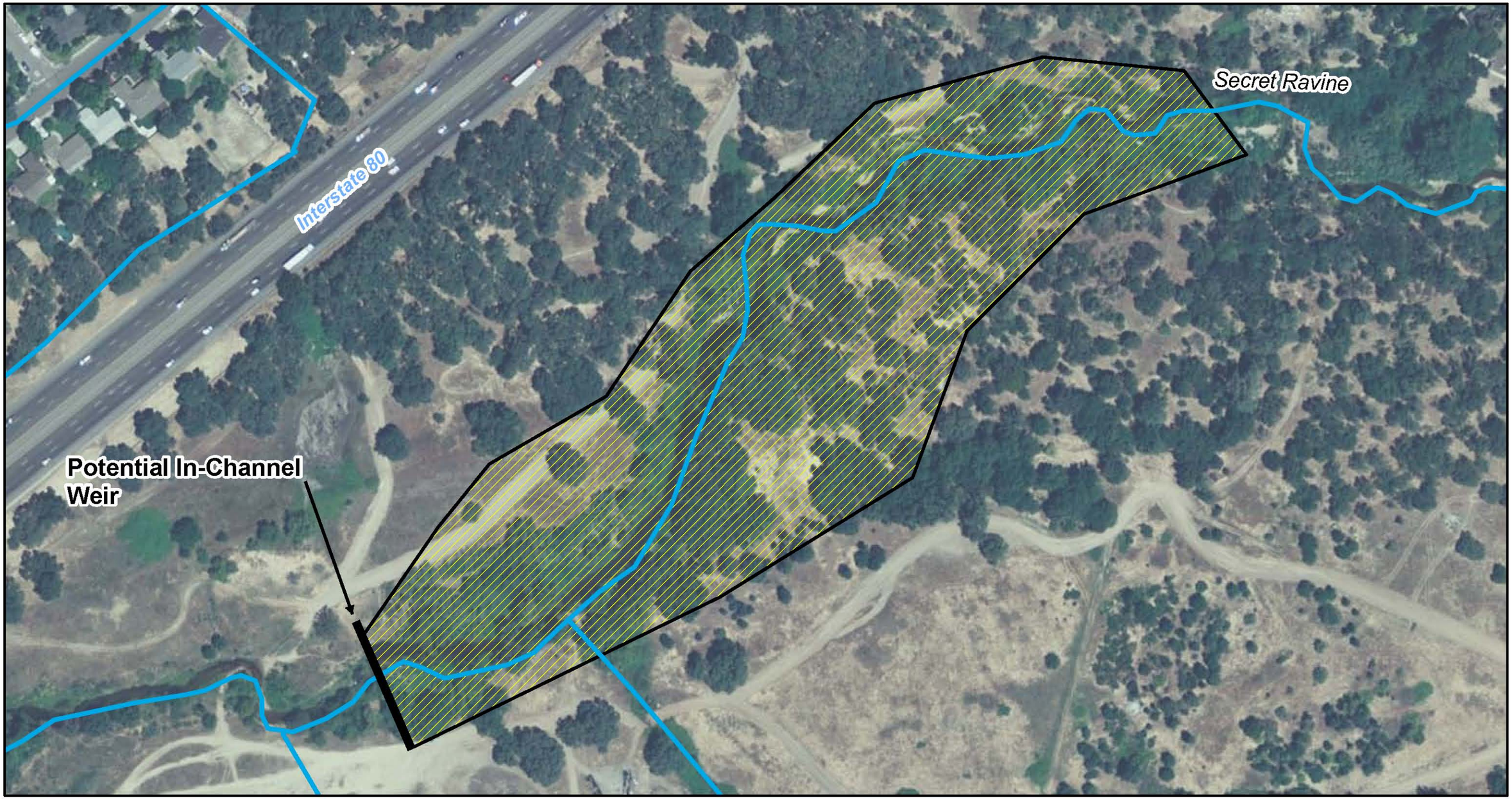
CIVIL ENGINEERING SOLUTIONS, INC.

0 400 800 Feet

1 inch = 400 feet

PLATE H11

SECRET RAVINE IN VISTA OAKS AREA



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RBF CONSULTING

CIVIL ENGINEERING SOLUTIONS, INC.

0 150 300 Feet

1 inch = 150 feet

PLATE H12

Appendix I - Existing Detention Basins

I.1 Introduction

Various local detention basins have been constructed to mitigate the increase of runoff flows due to development. A summary of the local detention basins constructed in the Dry Creek watershed is listed in Table I.1. Plate I1 shows the locations of the basins.

Table I.1 Local Detention Basins in the Dry Creek Watershed

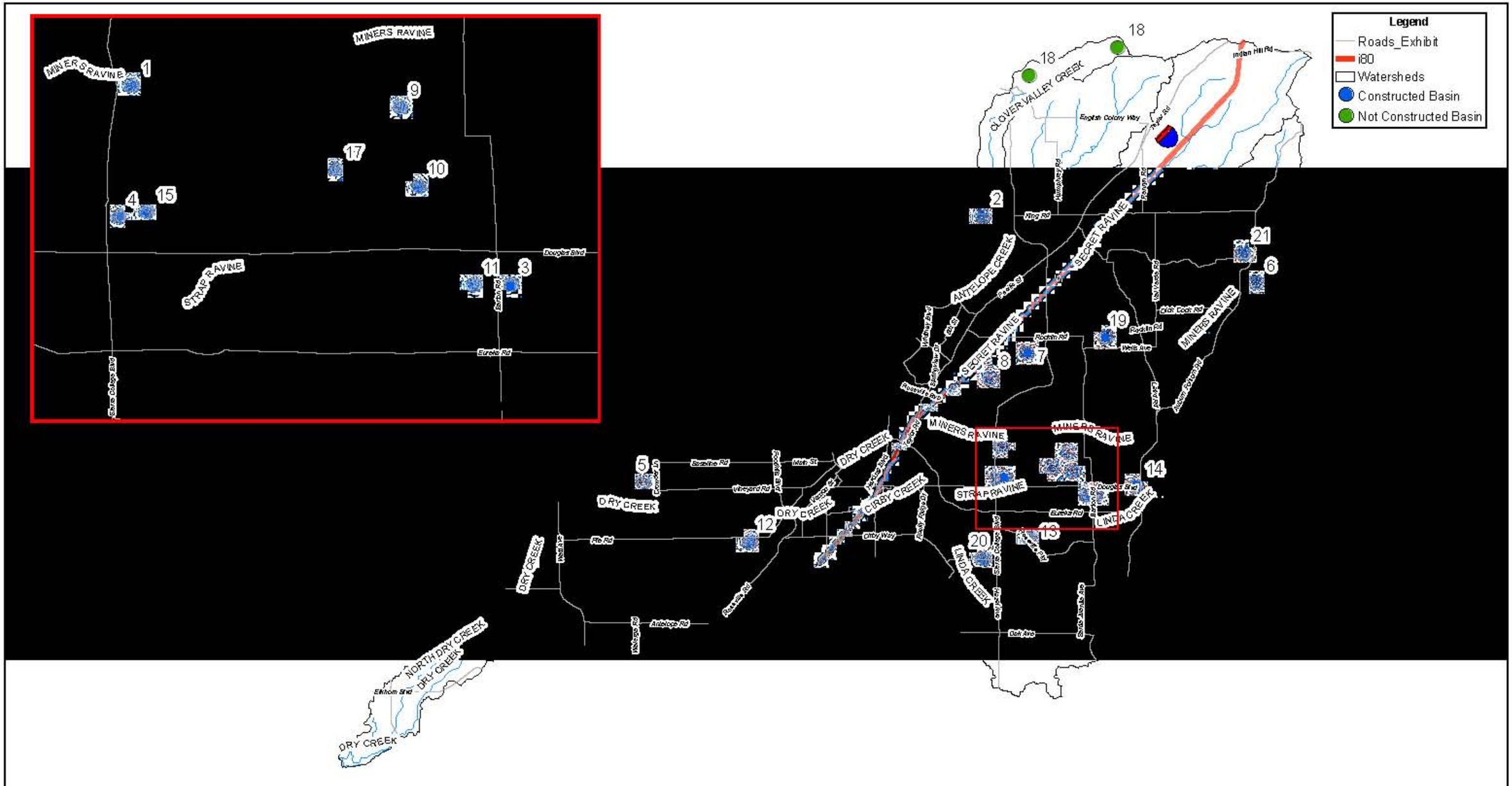
I.D.	PROJECT NAME	LOCATION	JURISDICTION	SUB-WATERSHED	100-YEAR STORAGE (ac-ft)	100-yr PEAK FLOW REDUCTION (cfs)[1]	COMMENTS
1A	Bayside Covenant Church	Sierra College Blvd	Placer	Strap Ravine	0.078	5	Peak flow reduction at project boundary
1B	Bayside Covenant Church	Olympus Drive	Placer	Miners Ravine	1.160	0	Peak flow reduction at SCB
2	Clover Valley Lakes	Private property	Rocklin	Clover Valley Creek	47.700	106	Peak flow reduction at project boundary
3	Alexandria Estates	Douglas Blvd/Barton Rd	Placer	Strap Ravine		12	Peak flow reduction at Douglas Blvd.
4	Granite Rose	APN 048-030-063	Placer	Strap Ravine	0.012	1	Peak flow reduction at project boundary
5	Woodcreek West	Baseline Road/Crowder	Roseville	Dry Creek	4.000	16	
6	Miners Creek	036-085-043	Placer	Miners Ravine	1.000	15	Peak flow reduction at project boundary

I.D.	PROJECT NAME	LOCATION	JURISDICTION	SUB-WATERSHED	100-YEAR STORAGE (ac-ft)	100-yr PEAK FLOW REDUCTION (cfs)[1]	COMMENTS
7	Sasaki Subdivision		Rocklin	Secret Ravine	1.780	34	Peak flow reduction at project boundary
8	Granite Lakes Estates		Rocklin	Secret Ravine	3.200	104	Peak flow reduction at Secret Ravine
9	Winterhawk Subdivision	046-131-001	Placer	Miners Ravine	3.700	94	Peak flow reduction at project boundary
10	Stonebrook Subdivision	048-301-045	Placer	Miners Ravine	0.200	18	Not found
11	Bella Terra Subdivision	Barton Rd	Placer	Strap Ravine	0.6	12	Peak flow reduction at project boundary
12	Folsom Ready Mix	Del Road	Placer	Dry Creek	0.206	8	Peak flow reduction at project boundary
13	East Parkway Bible Church	East Roseville Pkwy	Placer	Dry Creek	0.195	5	Peak flow reduction at project boundary
14	Granite Bay Kovar Karate	Douglas Blvd	Placer	Dry Creek	0.044	3	Peak flow reduction at project boundary
15	Seymour Ranch	Cavitt-Stallman Rd	Placer	Strap Ravine	0.534	12	Peak flow reduction at project boundary
16	(not used)						

I.D.	PROJECT NAME	LOCATION	JURISDICTION	SUB-WATERSHED	100-YEAR STORAGE (ac-ft)	100-yr PEAK FLOW REDUCTION (cfs)[1]	COMMENTS
17	Douglas Ranch	460-210-001	Placer	Strap Ravine	8.300	89	Peak flow reduction at project boundary
18	Bickford Ranch	Sierra College Blvd / Hwy 193	Placer	Clover Valley Creek	11.150	22 (planned)	Peak flow reduction at Caperton Res.
19	Loomis Hills Estates		Loomis	Secret Ravine		52	Peak flow reduction at project boundary
20	Woodbridge Estates	Martella Lane	Placer	Linda Creek	0.230	7	Peak flow reduction at project boundary
21	Maggi Country Estates	Auburn Folsom Road	Placer	Miners Ravine	2.000	36	Peak flow reduction at project boundary
	Total Peak Flow Reduction:[2]				86.089	651	

[1]Peak flow reduction values are based on reported values and have not been verified.
[2]The 1992 Plan included a flow reduction goal at build-out of 1,124cfs at project boundaries.

DRY CREEK WATERSHED LOCAL DETENTION BASINS



PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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0 1 2 4 Miles

1 inch = 2 miles

PLATE I1

Appendix J - Dry Creek Toolbox Users Guide & Tutorials

USERS GUIDE

DRY CREEK DESKTOP
"LIMITED USER LICENSE" FUNCTIONS

SOFTWARE PREPARED FOR:

PLACER COUNTY
FLOOD CONTROL AND WATER CONSERVATION DISTRICT

TO BE USED WITH:
THE UPDATE TO THE
DRY CREEK WATERSHED PLAN, 2011

SOFTWARE BY:

THOMAS S. PLUMMER P.E., CFM

CIVIL ENGINEERING SOLUTIONS, INC.

With Cooperation and Assistance from:

RBF CONSULTING

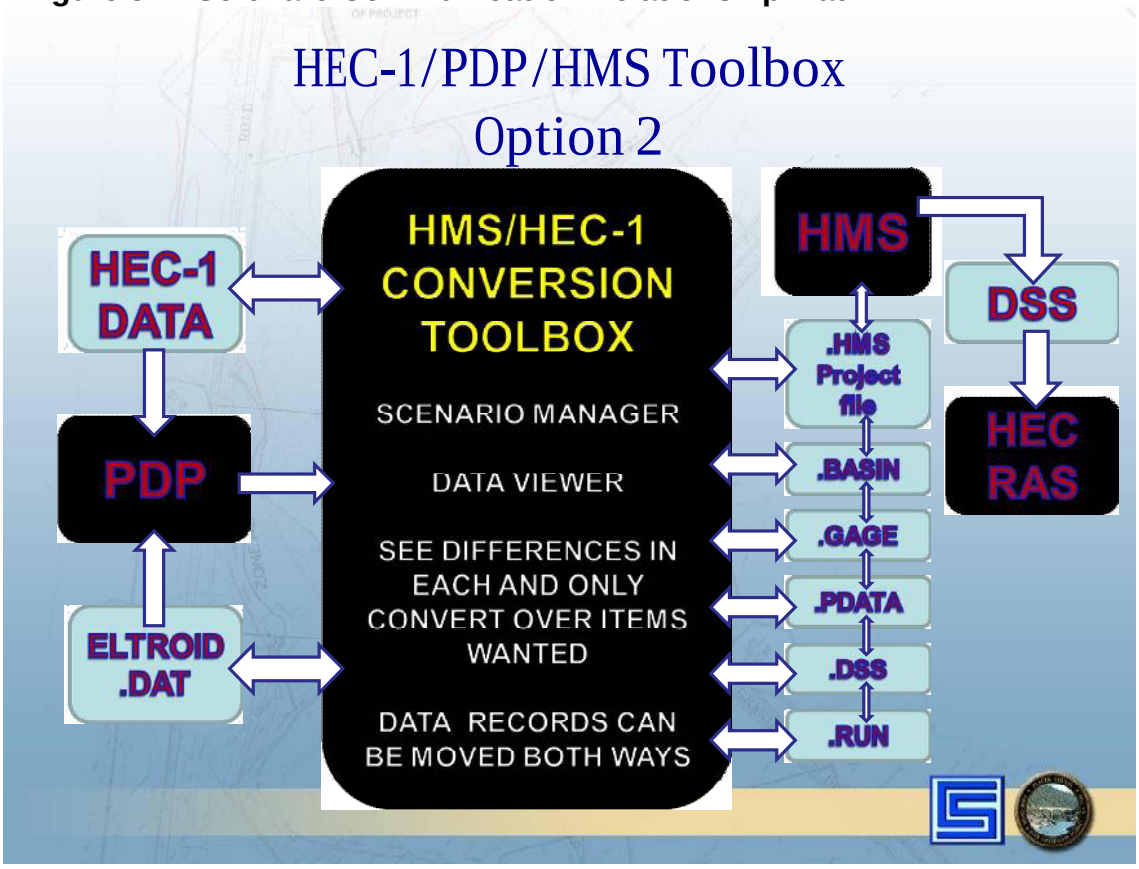
J.1 Overview

Prior to the 2011 Update to the Dry Creek Watershed Plan, many firms had been automating the integration of the District's PDP software with the HEC-1 hydrology software, through the use of spreadsheets and batch files. Some firms had even developed computer programs and spreadsheet tools to reduce the results of the HEC-1 analysis to simplified tables for scenario management. But it was not easy to utilize HEC-HMS (a graphical and more up-to-date hydrology processor). An import utility from HEC-1 was available within HEC-HMS. However, errors often occurred in the resulting files, and it would take considerable time to import each scenario.

With the initiation of the Dry Creek Plan Update in 2008, it became obvious that a central set of software tools would be necessary to assist with the data management for the proposed analysis containing more than 1250 watersheds and more than 3800 data points in the hydrology files alone. The update planned using the HEC-HMS software for hydrology calculations, in order to provide a graphical environment for future editing of the files as well as to make use of the geo-referencing and GIS capabilities, essentially to bring the analysis to the "state-of-the-art" levels. The planned integration of a hydraulic routing analysis via HEC-RAS further complicated the proposed data tracking efforts as more than 200 links between the base hydrology model and the hydraulic routing model were planned for each scenario. Ultimately, the modeling involved 9 scenarios, with 7 storm events being modeled in each scenario, and 7 storm centering conditions being modeled for each event. Then for each event and each scenario the results needed to be compared and the highest flow results presented for the tables included in the report.

During the proposal process the complexity of getting the various software programs to communicate and produce useable and coherent information was represented by the following software matrix (Figure J.1), which formed the outline for the toolset developed with the Dry Creek Toolbox (DCDESKTOP).

Figure J.1: Software Communication Relationship Matrix



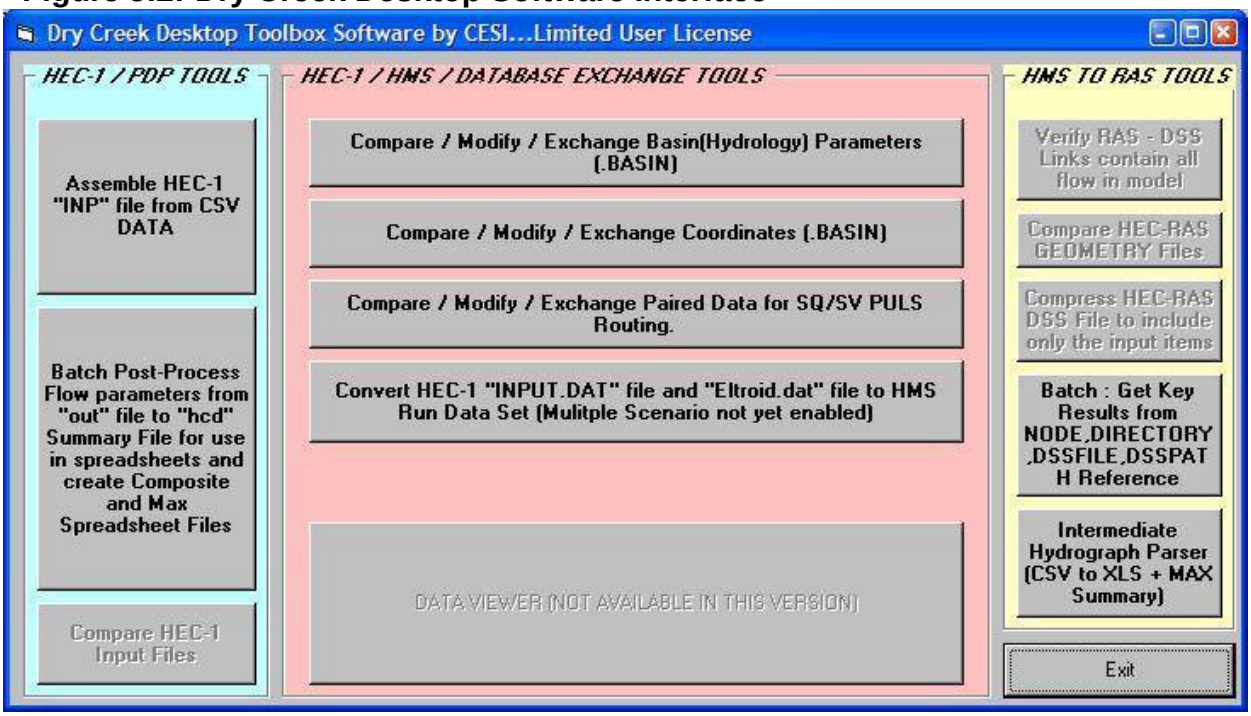
As we worked our way through the Dry Creek Plan Update, we found that several previously difficult tasks needed to be repeated many thousands of times, and therefore we programmed several tools to automate these processes. The 1st tools developed related to the need for the ability to convert source numerical data for the watersheds directly into HEC-1 input files and HEC-HMS data structures. Then tools were needed to update different aspects of HEC-HMS data sets from source data. Then tools were needed for post-processing the HEC-HMS and HEC-RAS results into spreadsheets, automatically retrieving certain data from certain locations.

The resulting software tools are shown in Figure J.2 for the Limited User License (FREEWARE) version of the software. This software can be downloaded from the project website at: www.pcdrycreek.org . There are 2 versions of the software. The FREEWARE version which provides end users the ability to create/modify project file sets, and the RESTRICTED license version, which is only provided to model reviewing agency staff, which provides some additional tools that are useful for checking submittal data. The FREEWARE version may be used by anyone that agrees to the license agreement posted on the website. The limitation of the FREEWARE version is that it is only intended for use on the DRY CREEK WATERSHED PLAN UPDATE files, and derivative works, and is not intended or licensed for use on other studies outside the Dry Creek Watershed of Placer County, CA.

Both CESI and PCFCWCD restrict the use of the RESTRICTED version to certain authorized users.

Both versions of the software are provided at no cost to the end users.

Figure J.2: Dry Creek Desktop Software Interface



Neither version includes the “DATA VIEWER”, which is restricted to CESI internal use only (at the time of the writing of this document it was not complete).

Additionally, some buttons within the software are not activated and may say “Not Available in this Version” or something similar… This means that we have not completed the programming for this button and have determined it was not necessary for the use of the Dry Creek Plan Update Modeling.

A similar version of the software for use in the Pleasant Grove Creek watershed is available thru the City of Roseville.

NOTE: The second version of the PDP software, PDP2.EXE is required to be properly installed in order for this software to work correctly.

J.2 Prerequisites

Pre-requisite Software for Dry Creek Plan Update and DCDESKTOP:

HEC-HMS version 3.3
HEC-RAS 4.1.0 or later
HEC-DSSVUE (Recommended and necessary for some functions)
PDP2
Microsoft Excel (optional for XLS file creation)

J.3 Installation

Please install all prerequisites correctly. When installing HEC-1 and PDP2, make sure they are installed into a directory on your "PATH" (see READ_ME_FIRST.txt README.txt in DCDesktop\PDP file folder). Please remove any previous versions of PDP from your system.

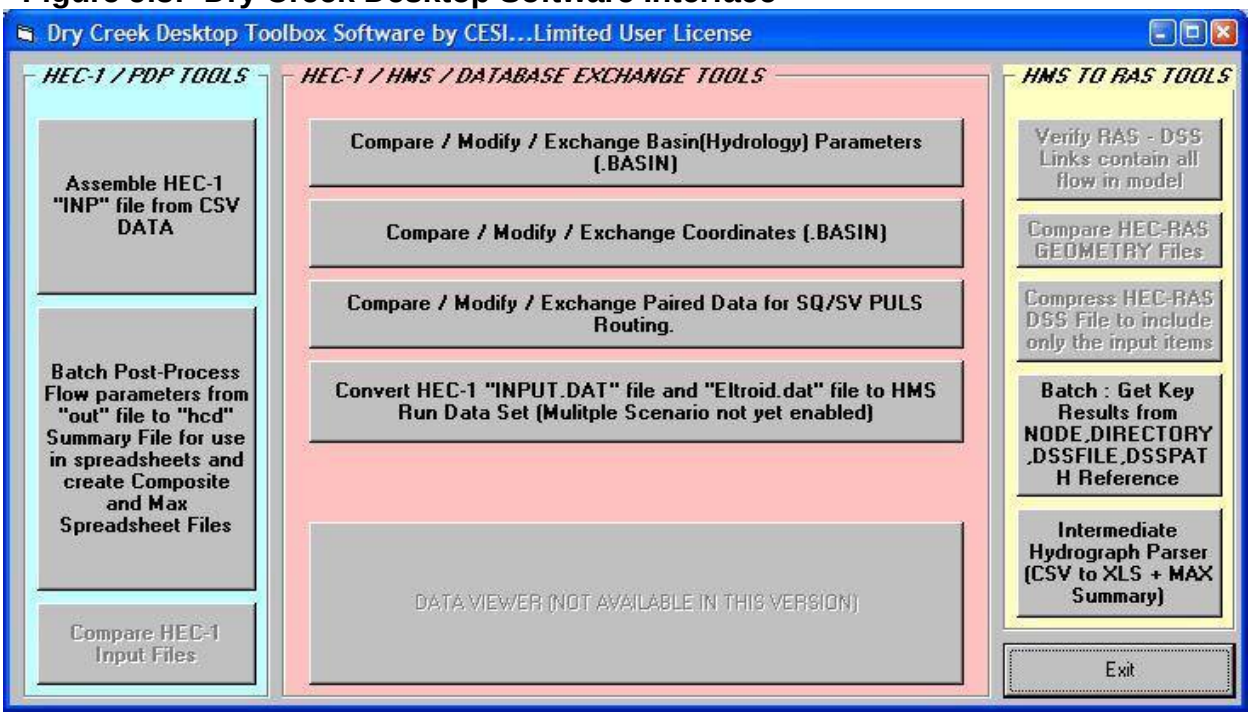
The DCDESKTOP software uses standard WINDOWS XP Professional Dynamic Link libraries (DLL). If the user will create DLL's with these tools then the program will require access to the third party HECLib.dll and hlib42.dll which need to be located in the system folder (c:\windows\system32\ ) in order to function completely. These DLL files are distributed by the US Army Corps of Engineers (USACE) and are included in the DCDesktop distribution zip file.

Step 1: Unzip the DCDESKTOP.ZIP file to a network or local hard drive location, that your user has permissions to access.

Step 2: Create a shortcut on your desktop to the DCDESKTOP.EXE program. Right mouse click any empty location on your desktop and hold the mouse over "New", then select "Shortcut". Then use the browse button to find the DCDESKTOP.EXE that you unzipped in the previous step. Then press "Next" and "Finish" and you should see a new icon on your desktop.

You should be done and ready to use the software at this point. Double click on the icon that you created and verify that the software starts up with the following screen:

Figure J.3: Dry Creek Desktop Software Interface



J.4 Before you Start!

You need to have a good understanding of how to use the HEC-1, HEC-HMS, and HEC-RAS software programs. You also need to have a good understanding of how to prepare base PDP input files and use the PDP2 software to create storm centered events for HEC-1 input. You also need to have a good understanding of the use of "ELTROID.DAT" files for the storing of coordinates of watersheds. In DCDESKTOP, the use of "ELTROID.DAT" is extended to also store coordinates for all hydrology nodes, which includes Connections, Routing Reaches, Watersheds, Storage Routing, etc… In order to keep the data geo-referenced in HEC-HMS all hydrology nodes will need a coordinate. For watersheds, the centroid location should be used.

The standard format for "ELTROID.DAT" is:

Junction Name, ZCOORD, XCOORD, YCOORD
Reach Name, ZCOORD, XCOORD, YCOORD
Watershed Name, ZCOORD, XCOORD, YCOORD
Etc...

ZCOORD is the vertical elevation in feet
XCOORD and YCOORD are the X and Y coordinates of the element in miles (feet/5280).

Yes, the comma separators are important.

To be consistent with HEC-1, the names are usually limited to 6 characters. For the Dry Creek watershed study, watershed names were not allowed to start with the following letters because they were used to symbolize other features: V, Y, U, Z. When one of these letters was used in the 1st character it means that the element is something other than a watershed as defined below:

V = Routing Feature
Y = Connection Node
U = PULS Routing Feature
Z = Reserved for DSS file interaction

Very large spreadsheets were assembled for the project, based on CESI's standard "Connect_Order" formatting. In which on the 1st sheet of the workbook, the connection order of all hydrology elements is defined in the left-most column. The user simply inputs the element name for each element in the order they would need to be processed by HEC-1, and the remainder of the sheet is automatically filled out. The remaining sheets of the workbooks that are distributed with the Plan Update Models, were generated from GIS files and other databases, such that they are looked up from the connect_order sheet for content. Users editing connect_order data should edit the content on the supporting sheets to match their desired values.

The 1st sheet of the "connect_order" workbook is "Saved As" a ".csv" (comma separated values) file from excel. This ".csv" file is read by DCDESKTOP in other operations.

J.5 DCDESKTOP Functions

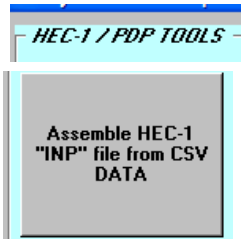
The program will perform the following functions for the Dry Creek Watershed Plan Update base files:

- Creates HEC-1 input setup files from a spreadsheet format
- Creates HEC-1 input files using Placer County Flood Control and Water Conservation District Stormwater Management Manual procedures and modified Placer County Design Precipitation Program (pdp).
- Converts HEC-1 files to HEC-HMS
- Sets up batch (.bat) files for simplifying the execution of certain project data.
- Performs batch processing operations
- Performs batch post-processing operations.

The main interface is divided into three task areas based on the third party software that the functions produced files will interact with:

- HEC-1 Tools (2)
- HEC-HMS Tools (4)
- HEC-RAS & Post-Processing Tools (2)

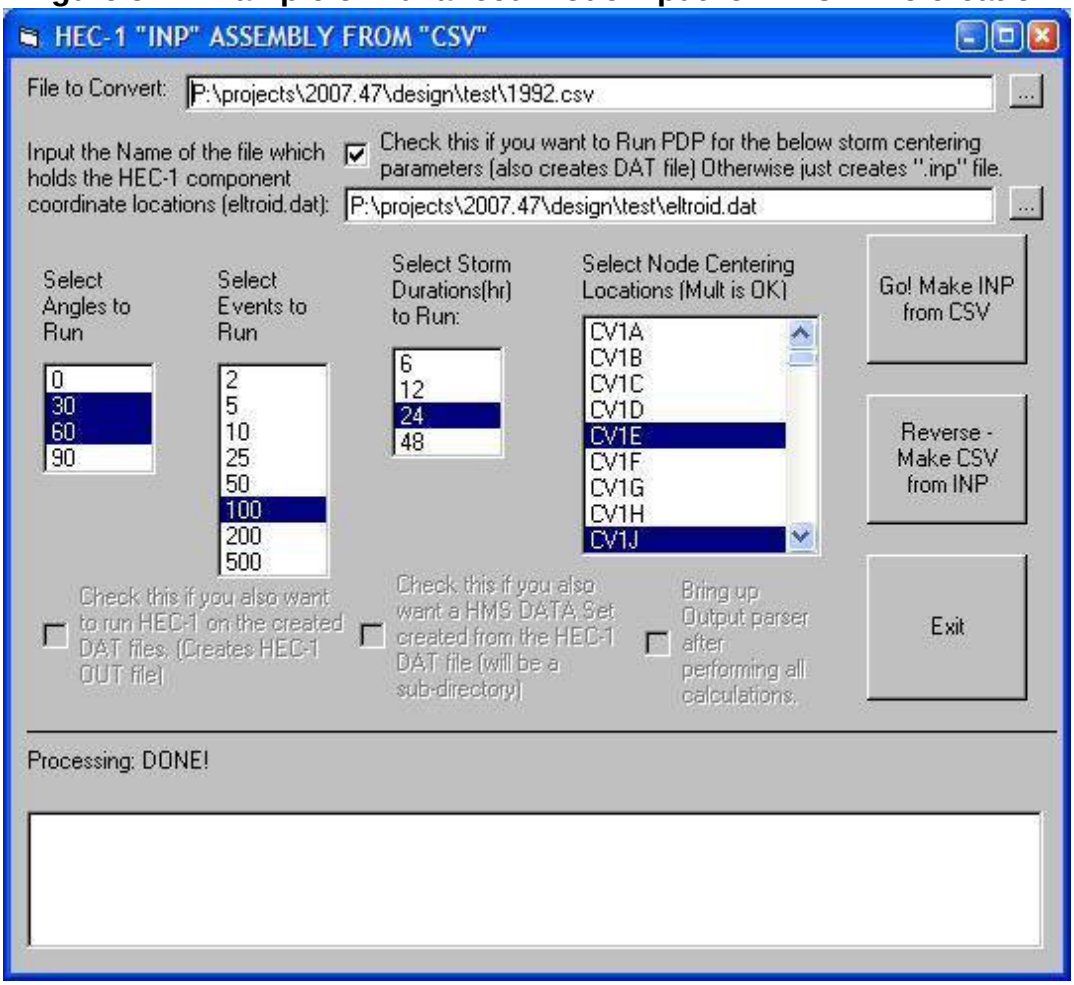
J.6 HEC-1 Tools (2)



The First HEC-1 based tool will assemble an HEC-1 base file model from the “Connect_Order” “.csv” spreadsheet for that scenario. It can create PDP input files in the default mode, by specifying the source CSV file and pressing the “Go! Make INP from CSV” button. In this default mode, a “.inp” file will be created with the same file name and in the same directory as the source CSV file.

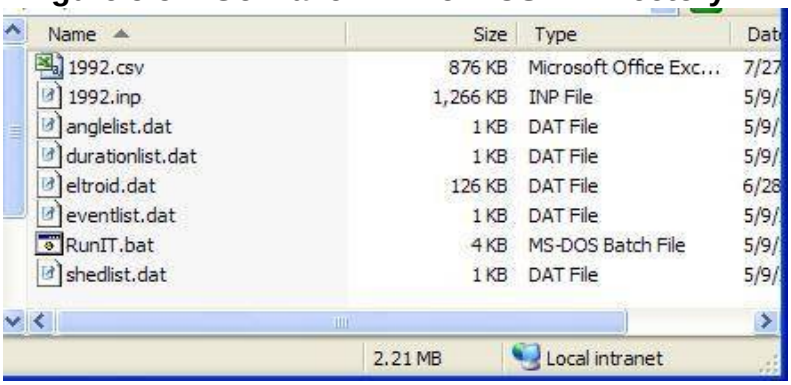
Alternatively, the user can “Check this if you want to Run PDP for the below storm centering parameters”. Under the advanced mode, INP and HEC-1 DAT files are created. The DAT file already contains the PDP storm centering precipitation and is ready to be processed through HEC-1. In the advanced mode, the “ELTROID.DAT” file must also be specified.

Figure J.4: Example of Advanced Mode Input for HEC-1 file creation Tool:



Selecting the “Go Make INP from CSV” in this case would create the file directory shown in Figure J.5.

Figure J.5: “Go Make INP from CSV” Directory

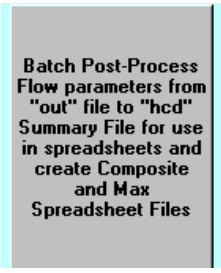


Name	Size	Type	Dat
1992.csv	876 KB	Microsoft Office Exc...	7/27
1992.inp	1,266 KB	INP File	5/9/
anglelist.dat	1 KB	DAT File	5/9/
durationlist.dat	1 KB	DAT File	5/9/
eltroid.dat	126 KB	DAT File	6/28
eventlist.dat	1 KB	DAT File	5/9/
RunIT.bat	4 KB	MS-DOS Batch File	5/9/
shedlist.dat	1 KB	DAT File	5/9/

2.21 MB Local intranet

Double clicking the “RunIT.bat” file would execute PDP2 & HEC-1 for the above selected storm angles, frequency, duration, and centerings. These files could then be used by one of the HEC-HMS tools to create HEC-HMS models for each of the scenarios that were created.

A reverse lookup button is also available. If an HEC-1 INP file is provided in the 1st text box, a connect_order formatted CSV file is created from the HEC-1 input file. This tool is useful, if all you have is a model and you don’t have the source “connect_order” spreadsheet. This tool can create a version of the connect_order spreadsheet that could then be edited for model changes, or used to create other model scenarios, using this tool, for event duration, frequency, storm angle, and centerings if you also had an “ELTROID.DAT” file for the model.



After executing the HEC-1 analysis, it is sometimes desirable to retrieve the peak flow results computed at each node in the system. This tool will allow the user to create CESI standard hydrology comparison data format (.hcd) files. These are simply a CSV format file with an HCD file extension. The 1st column is the node name, the second contains the peak flow, the third is the time of peak flow, and the 4th is the basin area at the node in square miles. The data looks like the example in Figure J.6.

Figure J.6: Example of HCD data format

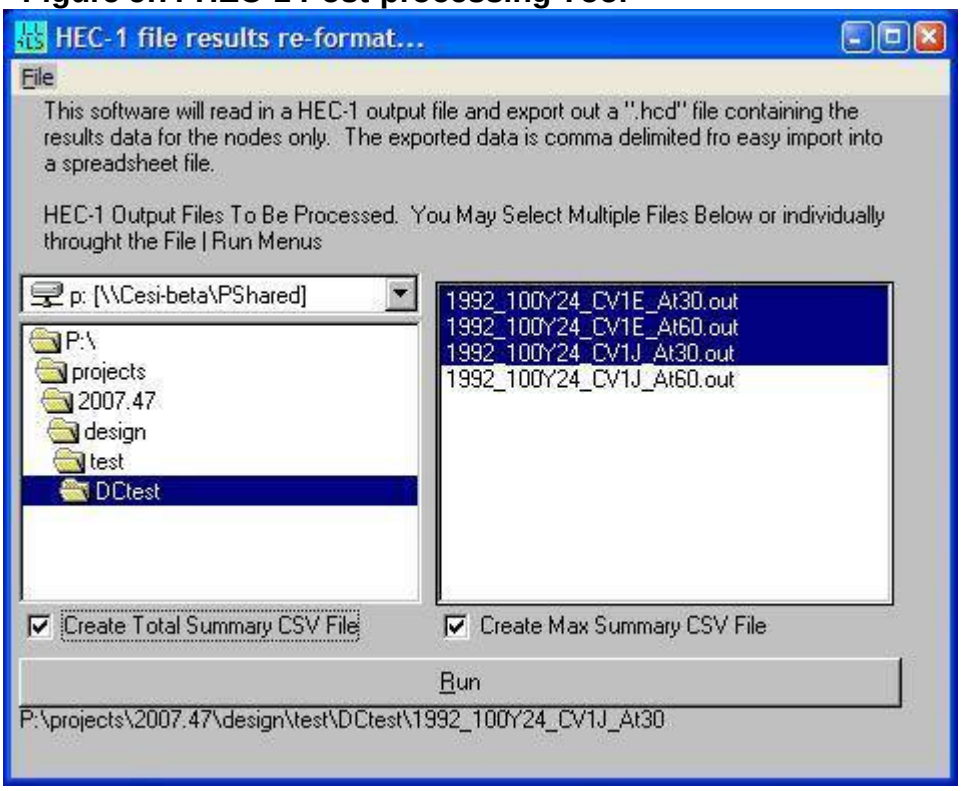
```
     CV1A, 23, 13.67, .06
     CV1B, 23, 13.33, .04
    YCV1B, 45, 13.5, .1
    VCV1C, 45, 13.5, .1
     CV1C, 17, 13.75, .05
    YCV1C, 62, 13.5, .15
   VCV1C2, 62, 13.58, .15
     CV1D, 12, 13.75, .03
    YCV1D, 73, 13.58, .18
    VCV1F, 73, 13.58, .18
     CV1E, 27, 12.92, .05
    YCV1E, 96, 13.42, .23
```

In addition to exporting the peak flow results of each HEC-1 ".out" file that is selected this tool can create some additional CSV files that can be very useful. The two check boxes at the bottom of the "HEC-1 Post-processing Tool" will create additional spreadsheets based on the data files selected.

The "Create Total Summary CSV File" will create a CSV spreadsheet file that contains the peak flow of each selected file in a separate column, so that they can be directly compared.

The "Create Max Summary CSV File" will create a CSV spreadsheet, that identifies the peak flow for each node in the files selected, comparing the values from each of the files, and reports in the adjacent column the source file that the peak occurred in.

Figure J.7: HEC-1 Post-processing Tool



J.7 HEC-HMS Tools (4)

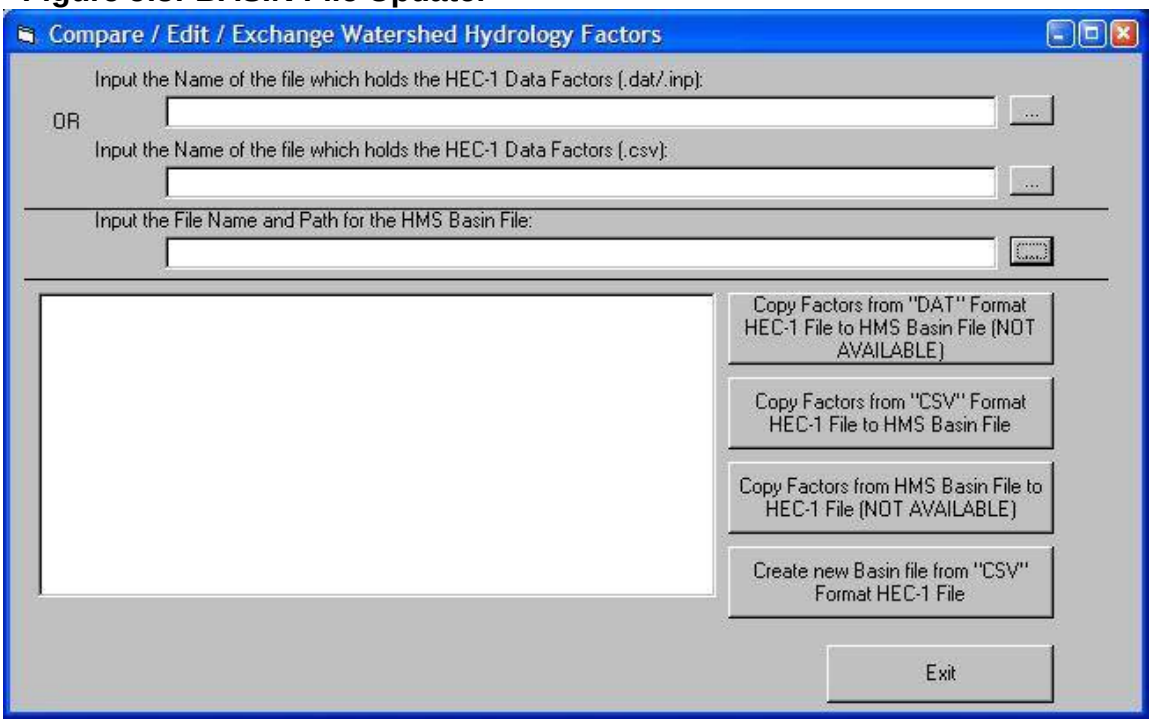
HEC-1 / HMS / DATABASE EXCHANGE TOOLS

The DCDESKTOP was programmed for compatibility with HEC-HMS version 3.3 file formats, and may not be compatible with subsequent versions. The following 4 tools were programmed to enable the user to communicate data from project standard formats such as the "connect_order", ELTROID, and HEC-1 input files (INP) directly into HEC-HMS data files and to create complete HEC-HMS data structures from source files.

Compare / Modify / Exchange Basin(Hydrology) Parameters (.BASIN)

This tool is used to update an existing HEC-HMS data set (BASIN file) for model updates in either a connect_order spreadsheet.

Figure J.8: BASIN File Updater



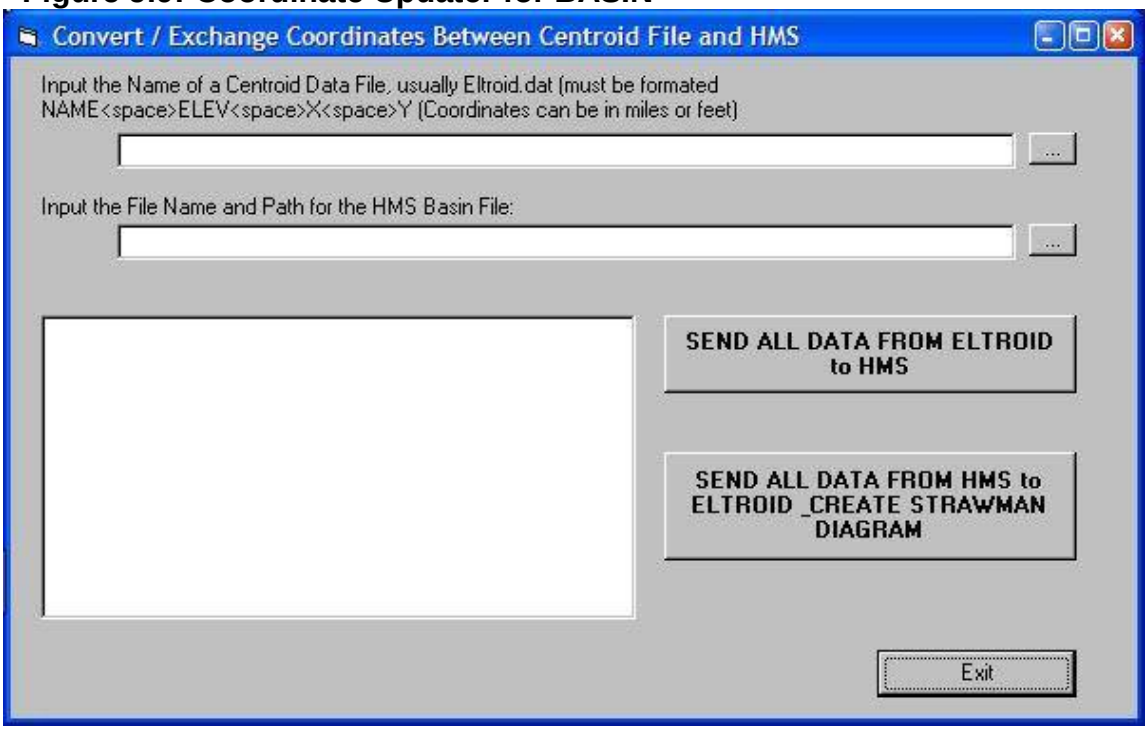
Only the second and fourth buttons are available for this tool, meaning the tool only works for converting the CSV spreadsheet format to the BASIN file.

This routine will usually not replace the original BASIN file, but rather creates a new one in the same directory with a slightly different name. The user would need to delete the old one and rename the new one for it to become the effective BASIN file for the model.

Compare / Modify / Exchange Coordinates (.BASIN)

This routine updates the coordinate values (feet) used in a HEC-HMS model (BASIN file), with the values contained in an ELTROID.DAT file.

Figure J.9: Coordinate Updater for BASIN



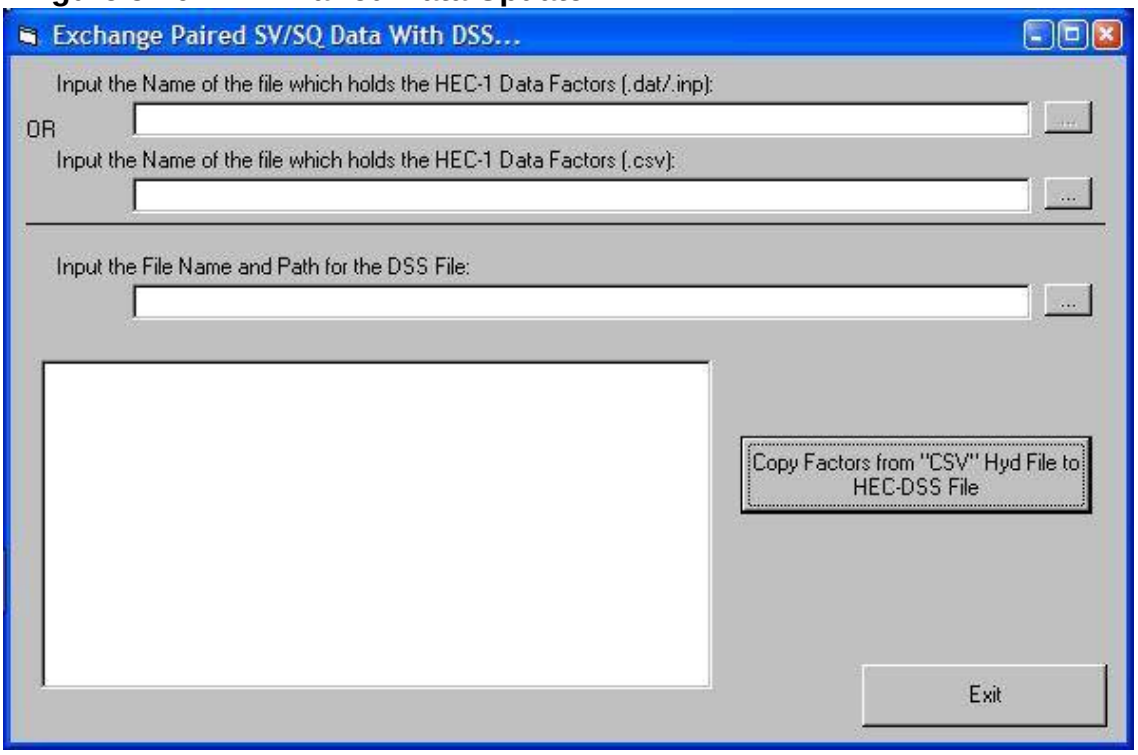
A second function allows the coordinates stored in a HEC-HMS data set to be exported to an ELTROID.DAT file, and creates a strawman (connected by straight lines) diagram of the HEC-HMS data set. This is useful for creating an ELTROID.DAT, and also for creating a drawing describing the connectivity of the analysis data.

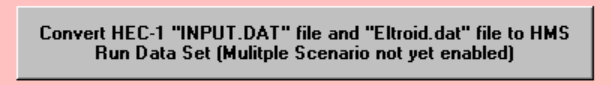
Compare / Modify / Exchange Paired Data for SQ/SV PULS Routing.

This tool is used to update “PAIRED” data for an HEC-HMS data set from the “connect_order” CSV format. PAIRED data is stored in the HEC-HMS data set in a DSS data table. DSS files cannot be directly viewed or edited without special tools such as “DSSVUE”.

The option to convert HEC-1 Input (INP) file format data is not available.

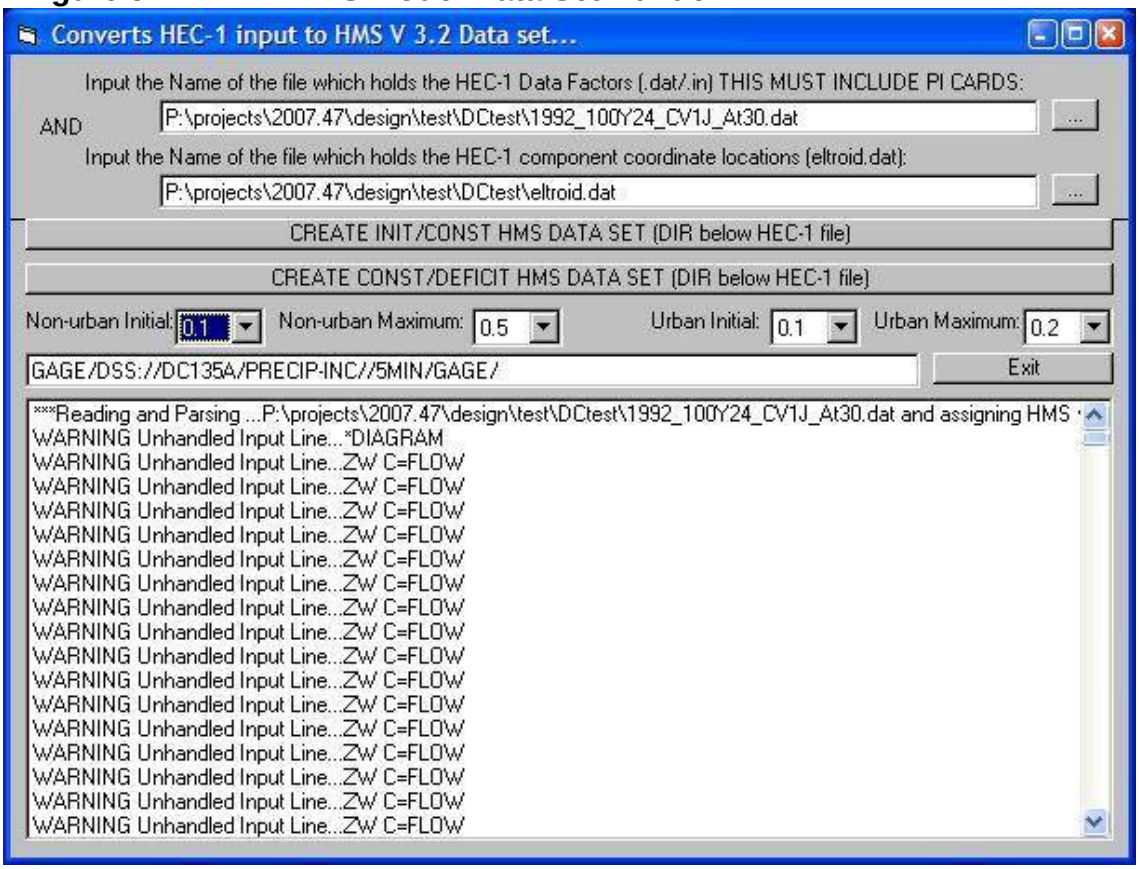
Figure J.10: Paired Data Updater





This tool creates an entire HEC-HMS data set from a HEC-1 Input (.DAT or INP) file. The HEC-1 input file must contain the precipitation data (PI CARDS) . This tool requires that the user specify the source HEC-1 Input file, and an ELTROID.DAT file containing coordinates for all nodes in the model. Two options are available for the assignment of loss factors: Initial and Constant (the 1st option) is the district standard specified in the Stormwater Management Manual, however, for Dry Creek it was found that Constant Loss with an Initial Deficit (2nd option), provided a better calibration in lower flows. The 2011 Update was computed using he Constant/Deficit settings. Selecting the appropriate action button will prepare the files with that type of loss rates. Default values for the loss coefficients are shown below the action buttons, which can be modified to suit each model.

Figure J.11: HMS Model Data Set Builder

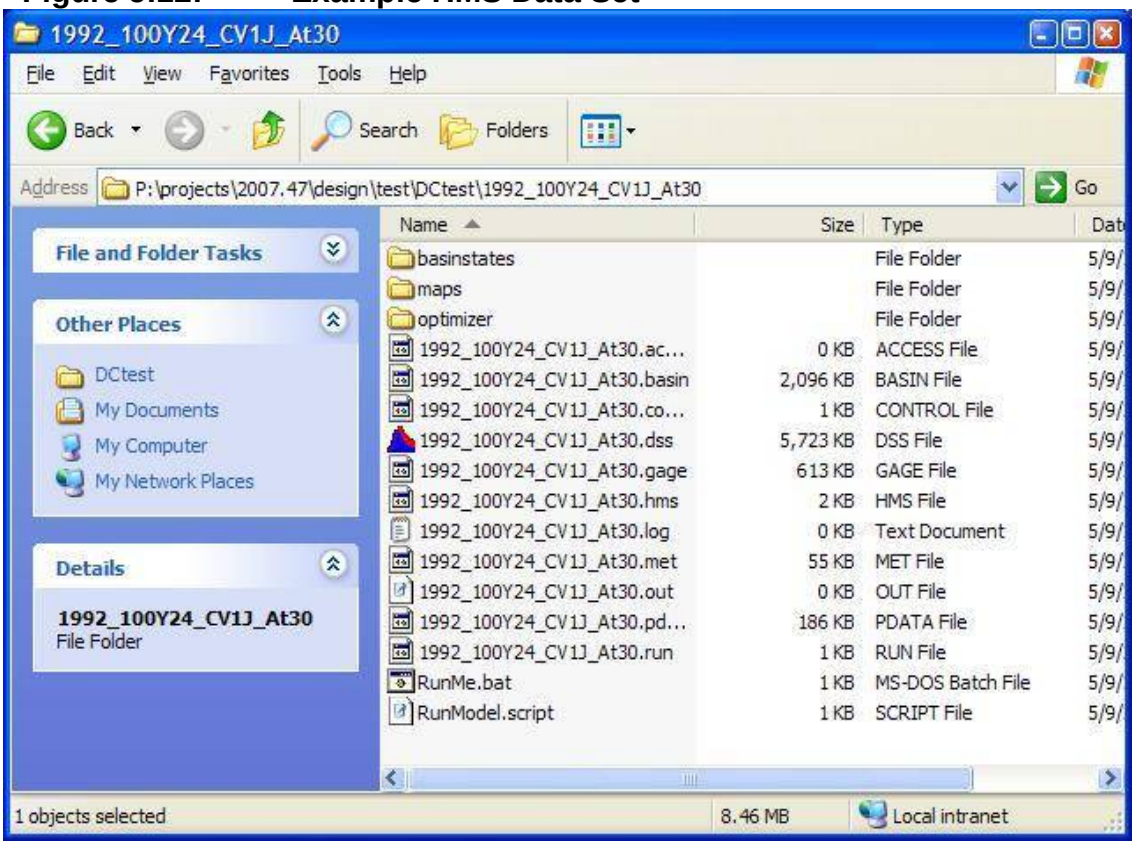


The HMS data set will be created in a directory with the same name as the source model DAT file. An Example HMS data set is shown in Figure J.12.

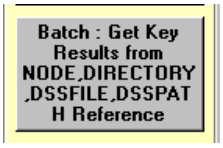
The “RunMe.bat” file provides the user a means to compute the HEC-HMS analysis without having to enter the HEC-HMS software. The batch file will externally execute HEC-HMS for the data set in that directory. This can save the user considerable time. However, after the batch file is finished running the user should check to make sure the created DSS file contains results data. There are cases where errors occur within HMS due to data issues (mostly relating to PAIRED data not covering the peak flows passing a certain element), which can cause HEC-HMS to abort when running in this manner, without generating an error message.

Be careful when setting up your model names as batch files can only handle ordinary characters (not spaces for example), and there is a limit of 255 characters that can be passed for the directory structure and file name combined.

Figure J.12: Example HMS Data Set



J.8 HEC-RAS and Post-Processing Tools (2)



This tool is used to create a set of script files that will retrieve the node results from a variety of analysis results DSS files. For example, the peak flow for some points may need to come from the HEC-RAS results DSS file for one storm centering, and others from another storm centering, and some may need to come from the results of an HEC-HMS analysis. The user needs to create a CSV file in advance that has 4 pieces of information specified for each element they desire to extract the data for: Point Number, Directory Name, DSS file name and directory, DSSPATH. Example of this input format is shown in Figure J.14.

Figure J.13: Example of PARSER DATA FILE Format

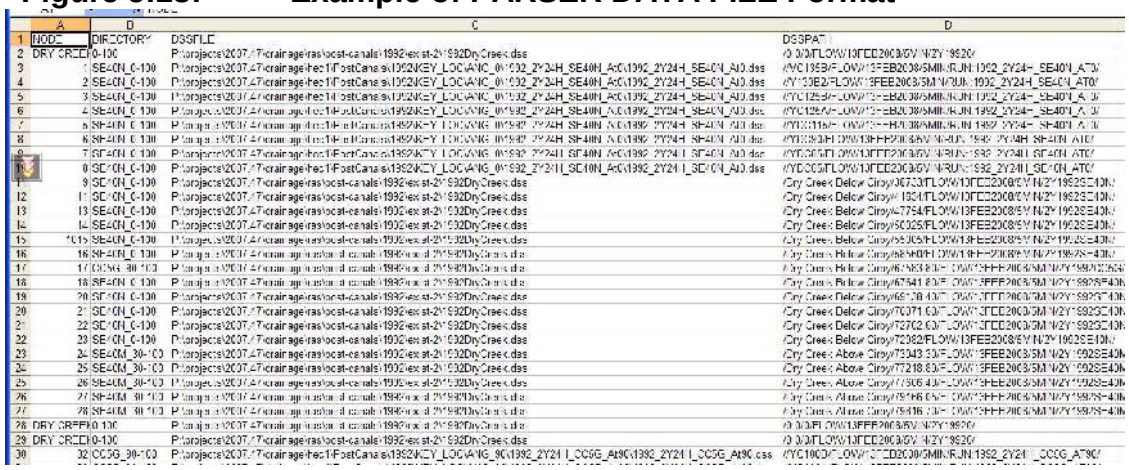
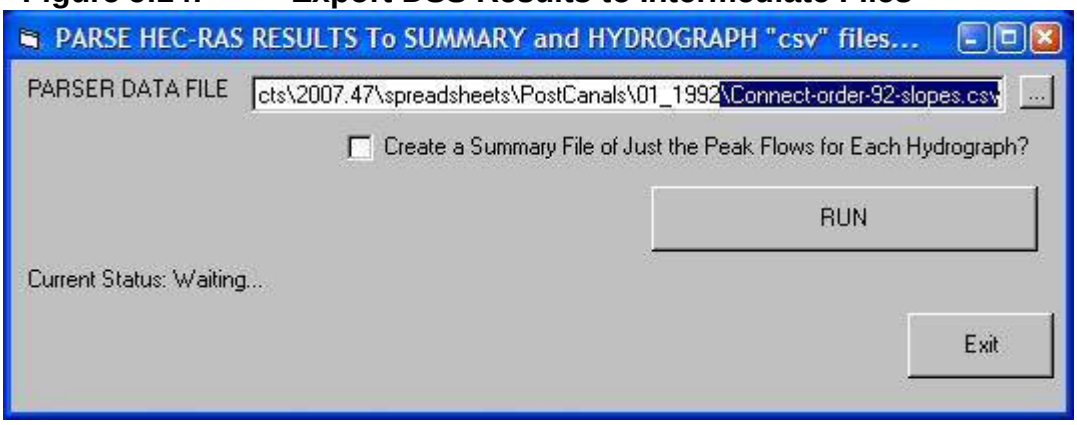
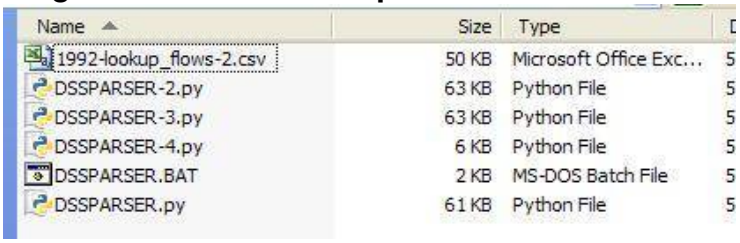


Figure J.14: Export DSS Results to Intermediate Files

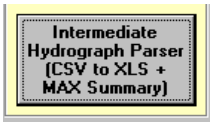


The option to create a summary file does not function in this version. The resulting files are created as shown in Figure J.15. Executing the "DSSPARSER.DAT" will retrieve the hydrograph for each point, saving it to a 3 column CSV file: [Increment, DATE, FLOW]. Each file will be named by the point number field. The resulting "intermediate hydrograph files" can be used to plot individual hydrographs from a variety of model scenarios and locations or to retain the data for other uses.

Figure J.15: Example of DSSPARSER files

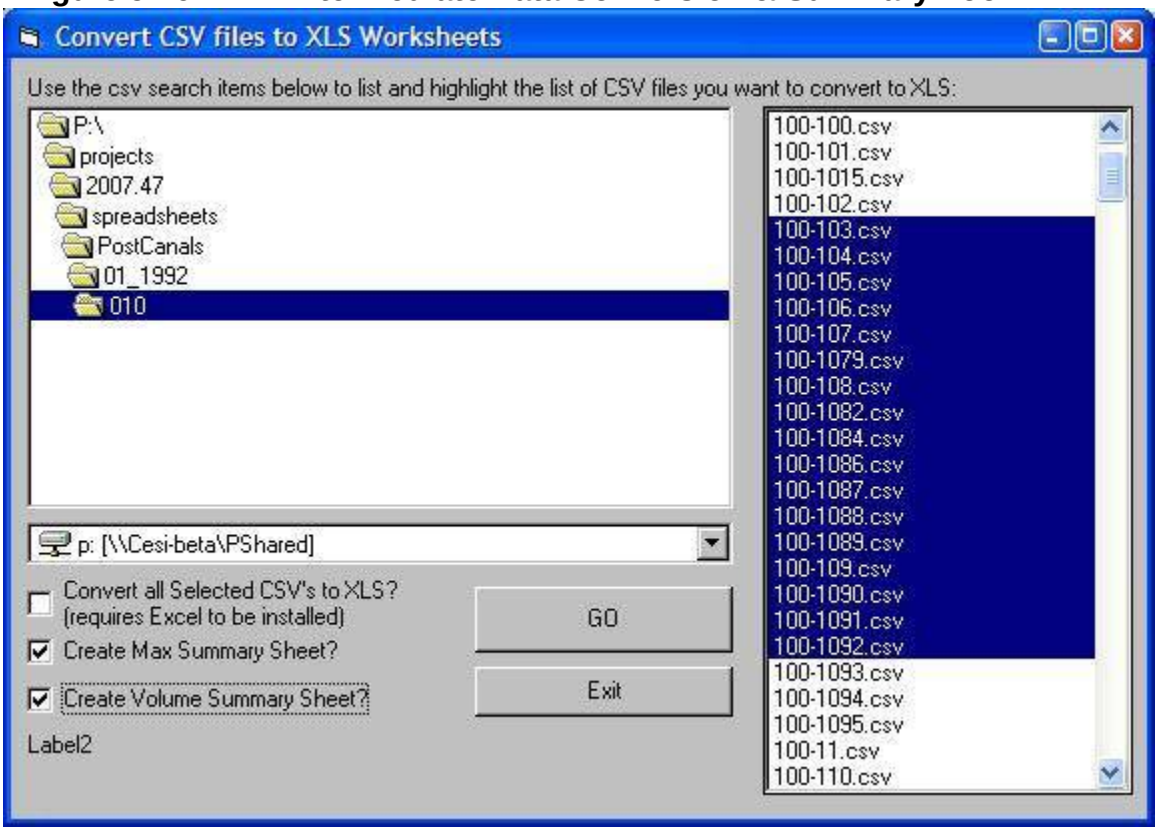


Name	Size	Type
1992-lookup_flows-2.csv	50 KB	Microsoft Office Exc...
DSSPARSER-2.py	63 KB	Python File
DSSPARSER-3.py	63 KB	Python File
DSSPARSER-4.py	6 KB	Python File
DSSPARSER.BAT	2 KB	MS-DOS Batch File
DSSPARSER.py	61 KB	Python File



This tool reads the intermediate hydrographs produced in the previous tool, and can convert or summarize them. Figure J.16 shows the conversion tool.

Figure J.16: Intermediate Data Conversion & Summary Tool



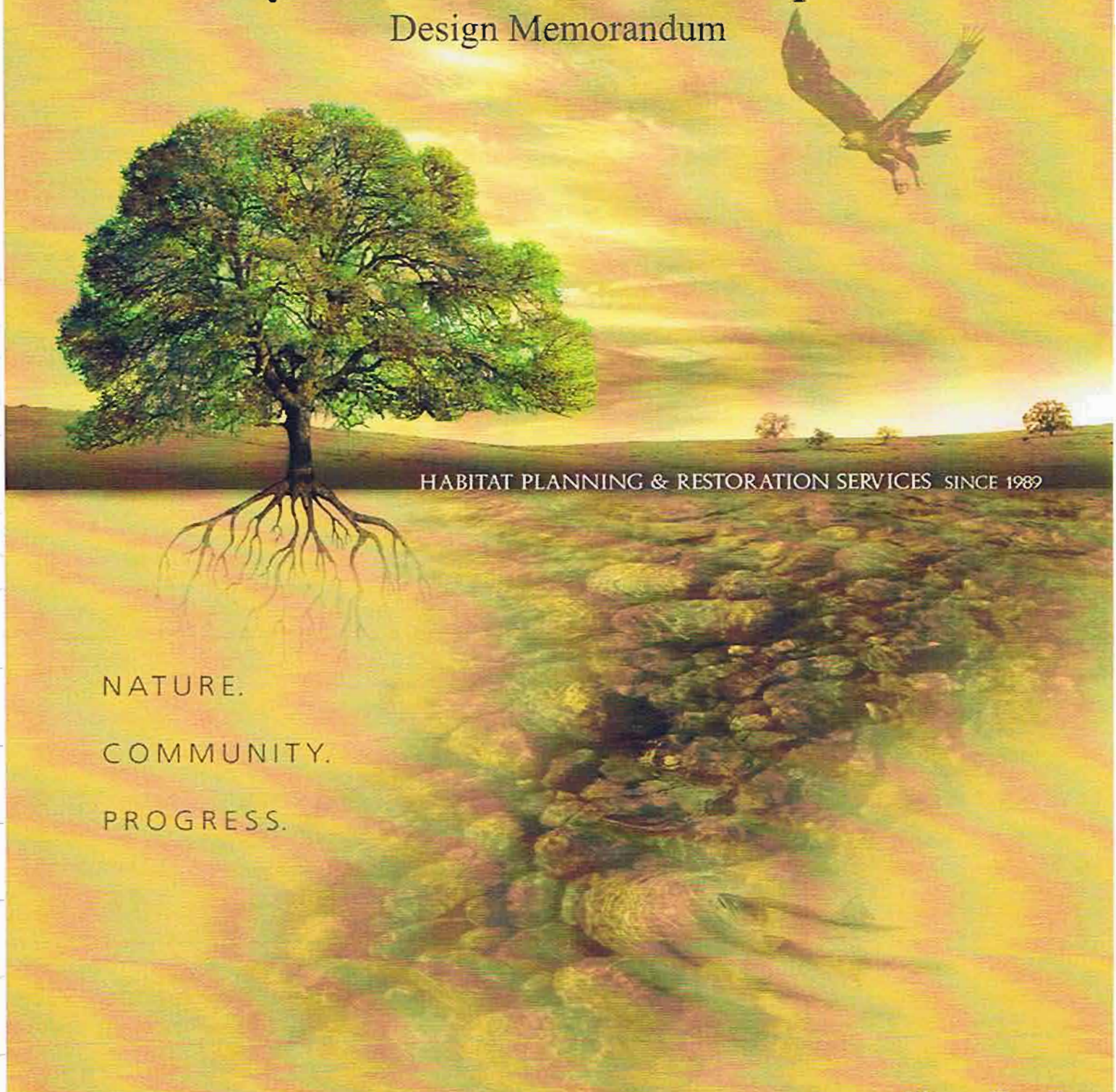
Use the windows on the left to identify the directory of files that you want to convert or summarize. Select the files in the window on the right. The 1st Check box would be used to convert each CSV file to an EXCEL (XLS) file (requires Microsoft Excel). The second checkbox is used to create a summary CSV file of just the maximum flows for each hydrograph. The third checkbox is used to create a summary CSV file of just the total flow volume for each hydrograph file selected.

Appendix K - Project and Condition Assessments

RESTORATION
RESOURCES

Dry Creek Watershed Plan Update

Design Memorandum



RESTORATION RESOURCES
3888 Cincinnati Avenue, Rocklin, CA 95765

Placer County
August 9, 2010

RESTORATION
RESOURCES

August 9, 2010

Mr. Thomas Plummer, P.E.
Civil Engineering Solutions, Inc.
1325 Howe Avenue, Suite 202
Sacramento, CA 95825

RE: Dry Creek Watershed Plan Update

Dear Tom:

Restoration Resources entered a contract with Civil Solutions on June 6, 2010 to provide our professional opinion with regard to potential biological and regulatory constraints to construction of proposed flood water management structures at five different locations within the Dry Creek Watershed in Roseville and Granite Bay California. Restoration Resources staff visited each of the five sites and attempted to discern likely regulatory problems associated with each proposed structure. We also viewed each site with an eye towards habitat mitigation opportunities that could be incorporated in final storm water management planning efforts. We feel that providing mitigation plans along with proposed construction plans will greatly facilitate ultimate project approval and permit acquisition from state and federal regulatory agencies.

In the following pages our "Design Memorandum" presents our best professional opinion of the biological constraints and opportunities for each of the five sites. We believe that two of the sites, Site A – Antelope Creek Upstream of Atlantic Street and Site B – Secret Ravine Upstream of Sierra College Boulevard, are well suited to the proposed flood flow constriction structures and that each could potentially provide opportunities to mitigate unavoidable impacts to protected natural resources lost due to construction of flood management facilities within the Dry Creek Watershed. The other three sites under consideration, Site C – Linda Creek Upstream of Auburn-Folsom Road, Site D – Linda Creek Upstream of Wedgewood Drive, and Site E – Linda Creek Upstream of Old Auburn Road have constraints that, in our opinion, render each of them unusable for the proposed purpose.

We welcome your review of and comment on our Design Memorandum and look forward to providing additional input at some point in the future should you proceed with proposed project design.

Sincerely,

Riley Swift,
President

3868 Cincinnati Avenue Rocklin, CA 95765
Phone 916-408-2990 / Fax 916-408-2999 / Lic. #429252 / www.restoration-resources.net

Dry Creek Watershed Plan Update
Design Memorandum

Placer County,
California

August 9, 2010

Prepared for:

Civil Engineering Solutions, Inc.
1325 Howe Avenue, Suite 202
Sacramento, California 95825
Contact: Mr. Thomas Plummer, P.E.

Prepared by:

Restoration Resources
3888 Cincinnati Avenue
Rocklin, CA 95765
(916) 408-2990
Riley Swift

RESTORATION
RESOURCES

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E Site E Maps
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August 9, 2010

DRAFT
DESIGN MEMORANDUM

Project Name and Number: 29001 Dry Creek Watershed Project
Client Name: Civil Engineering Solutions, Inc.
Contact Person: Thomas Plummer, Jr., P.E.
Email Address: Thomasplummer@civilsolutions.org
Phone Number: (916) 563-7300 **Fax:** (916) 563-7362

Introduction

Restoration Resources completed ground surveys for the five sites in Roseville and Granite Bay, Placer County, California included under the above named contract with its client, Civil Engineering Solutions, Inc (Client). The location of each of the sites can be found on the map in Appendix F at the end of this report. The sites were surveyed in June and July 2010 to determine if there were obvious biological or other resources that might constrain the construction of proposed storm water management structures. While no formal wetland delineations were attempted, the surveyors are well versed in the protocols and clearly understand the parameters that define jurisdictional habitat for the purposes of Department of the Army, Corp of Engineers (ACOE) Clean Water Act (CWA), section 404 wetland fill permits, as well as those used by the California Department of Fish and Game (CDFG) to define their area of jurisdiction for Fish and Game Code section 1600 Streambed Alteration Agreements.

Virtually all work proposed for the Dry Creek Watershed Project will take place in areas that fall under the jurisdiction of CDFG and each proposed structure will necessitate a CWA section 404 permit from ACOE. Completion of the CWA section 404 permits will require Biological Opinions from the National Marine Fisheries Service and the U.S. Fish and Wildlife Service because of potential impacts to listed species of anadromous fish and one insect. Additionally, the final permit will require a review and approval of the project by the state Water Resources Control Board under CWA section 401 and clearance by the State Historic Preservation Office (SHPO) under CWA section 106 related to archeological and historic resources. Therefore, the five sites were surveyed specifically for potential negative effects to critical habitat for state and federally listed species which are protected under the federal Endangered Species Act and state endangered species regulations from proposed construction activities which can in turn negatively influence the permitting process. Restoration Resources prepared maps showing listed plant and animal species recorded within five miles of each site as archived in the CDFG Natural Diversity Data Base (CNDDB) prior to field visits to better inform surveyors of potential occurrences of species of special concern and enable them to look for specific biological resources.

In the future, the proposed work will be further reviewed by local permitting entities where it will need to meet the requirements under the California Environmental Quality Act (CEQA) and, if federal money is provided for construction, the National Environmental Protection Act (NEPA). Under CEQA, certain restrictions to the construction period will be applied to protect nesting raptors and very likely, all migratory birds; therefore, surveys should be conducted for raptors and other birds. Because each of the sites proposed work will be done in relatively mature riparian woodland habitats it can be assumed that no heavy equipment work will be allowed during February through July 15th in order to protect nesting birds from disturbance. Also, it should be expected that conditions imposed upon the project by CDFG in its section 1600 Streambed Alteration Agreement will further restrict the construction season by stating that no work shall be done after October 15th, though in some years it may be possible to extend this date by a month. Furthermore, under CEQA and local permits, as well as the CWA section 401 review, erosion and water quality issues, especially turbidity in receiving streams, will be of primary concern and will require a Storm Water Pollution Prevention Plan (SWPPP) containing a myriad of appropriate Best Management Practices (BMPs) to be carried out and maintained by the contractor during the course of construction.

The following accounts of data gathered during site surveys are generally limited to findings that will likely impinge upon the proposed work. The more generally applicable constraints to the project including the need for formal wetland delineations and protocol level surveys for listed species prior to permit applications are left unsaid. While surveyors examined all exposed soils at cut banks and elsewhere within the sites the NRCS soils maps and descriptions were considered adequate to assess site suitability for proposed structures and for Restoration Resources' conceptual proposals for habitat mitigation (enhancement, restoration, and creation) opportunities which, if developed appropriately, could be used to offset project impacts to important resources and garner agency and public support for the project. Appendices including various maps of each site prepared by Restoration Resources are found at the end of this report.

Site A – Antelope Creek Upstream of Atlantic Street

Site A encompasses the Antelope Creek floodway paralleling I-80 on its west side and extending upstream approximately 1.3 miles from roughly from the Galleria/N. Harding Blvd. creek overcrossing, under the Roseville Parkway overcrossing and nearly reaching the SR-65 overcrossing. The proposed project envisions two storm water detention weir structures located (#1) upstream of the railroad overcrossing and Galleria/N. Harding Blvd. and (2) upstream of the landfill service road overcrossing below Roseville Parkway. During our site visit we first confirmed the proposed weir locations and then determined likely impediments to weir construction and biological impacts resulting from construction and periodic flooding upstream of each weir. Our findings are presented below for each of the proposed structures separately.

Weir #1

Site Constraints: The proposed location for Weir #1 is constrained by an existing underground gas line and a sewer line. We believe that the location of the weir should be moved upstream of the gas line and sewer line access manhole and downstream of the existing storm drain outfall bringing runoff from the base of the railroad grade and adjacent capped landfill site to Antelope Creek. The weir should tie into the existing berm covering the sewer line and be constructed in a manner to allow room on the downstream side of the proposed weir for access to the sewer line where it crosses under the creek or railroad grade for future maintenance needs. The weir should also be constructed so that the spillway elevation is below the sewer line elevation to avoid flooding into the manhole. On the downstream side of the proposed weir we recommend that the earthen fill covering the existing gas line be provided with rock armor over geotextile fabric to provide erosion protection from peak flows, especially those that overtop the proposed weir. The existing maintenance road for the sewer line and landfill site could provide excellent all weather vehicular access to the weir for construction and on-going maintenance operations.

Impacts to existing vegetation from Weir #1 construction at the adjusted location will likely be limited to an approximately 14" diameter at breast height (dbh) Oregon ash and a 12" dbh valley oak with some impacts to minor woody and herbaceous riparian habitat. Fill of protected waters of the U.S. will occur during construction and some impact to waters will likely result from proposed rock armor installation at the weir outfall(s). Impacts to waters of the U.S. and wetlands will require a permit which in turn will require suitable mitigation. Upstream flooding effects to existing protected habitat will be limited to the relatively mature but narrow band of riparian habitat. This zone include numerous oaks, most of which are valley oak, and we do not think that decline in health and vigor or death of these trees will be significant, however, we believe that some oak tree or woodland mitigation is advisable from the outset. A very few elderberries exist on higher ground upstream of the Weir #1 location, but are not likely to be a significant issue.

Since this reach of Antelope Creek is accompanied by several capped landfill areas any proposed construction work and enhanced flood-up zones need to be reviewed in detail with the landfill managers. Numerous ground water monitoring wells exist in the existing and proposed floodplain areas and the potential effects of flooding these facilities are unknown to us. Management activities of landfill managers including vegetation management would necessarily be addressed in any mitigation planning efforts for the site.

Habitat Restoration Opportunities: As can be seen in our Opportunities and Constraints map in Appendix A, we propose an "Oxbow Channel" be constructed in the open area east of Antelope creek just upstream of Weir #1 and identified by RBF Consultants as being within the area of inundation during storm water detention periods. This portion of the existing Antelope Creek floodplain does not currently support wetlands nor oak or riparian habitat likely a result of capping the adjacent landfill site. The created "Oxbow"

should be designed and constructed to allow for multiple overbank flooding and backwatering events during every winter season, but should not allow for juvenile anadromous fish to become stranded during out-migrations. The "Oxbow" concept could allow for creation of fish rearing habitat, as well as seasonal wetland, freshwater emergent marsh edge, willow riparian, oak riparian, and oak woodland for potential mitigation requirements from weir construction in numerous locations in the Dry Creek Watershed. The resultant wetland-related habitats will provide value to many additional wildlife species including western pond turtle and numerous passerine birds.

The excess material generated by the excavation of the "Oxbow" could be used to create mounds or upland habitat islands within the floodplain, as well as providing additional fill for existing creek-bank levees. Upland components within riparian zones and floodplains provide hydrologic and soil conditions suitable for establishment of valley oak and elderberry plantings. If excess fill were generated that needed to be removed from the floodplain for capacity reasons then perhaps it could be used as additional cover for the adjacent petroleum and sewer lines, the landfill cap, and potentially as backfill against the downstream side of the proposed Weir #1.

Moving upstream from the "Oxbow" floodplain lays another, smaller relatively open area on the east side of Antelope Creek that currently supports shrubs and non-native herbaceous cover. This upper terrace floodplain area would be a good candidate for additional oak woodland tree plantings and herbaceous cover enhancement plantings for potential oak tree and oak woodland habitat mitigation. No grading is necessary for this site to be usable for such mitigation; however, some pre- and post-planting weed control efforts are warranted.

Still further upstream and across the creek on the west side there is an area on the lower floodplain terrace that appears to have been used for oak tree mitigation. The relatively recently installed oaks, primarily valley and interior live with occasional blue oaks, are planted in rows and spaced roughly 10-feet on-center. There are areas to the north and south of this plantation that are open and could be used for additional planting, but we suggest in a more ecologically appropriate manner to provide a more diverse and appropriate habitat condition for the area. The existing "oak orchard" seems to have been created to provide the most "bang-for-the-buck" on the smallest patch of dirt possible and it is our belief that as these container oaks mature the more dominate ones will out-compete others and shade out their competitors.

A small cluster of elderberry shrubs was also found in this area between the creek and the "oak orchard". These shrubs may be at risk of mortality if they are flooded with any frequency or for any duration as a result of the construction of Weir #1. The elevation of the root crowns of these plants should be determined and the potential flood regime established during final resource assessments if the project is to proceed. Transplantation of these shrubs may be possible, but we recommend against it in order to protect the existing stream bank and propose instead planting additional elderberry shrubs on the upland islands created as a part of the "Oxbow" downstream.

If resource agencies require additional fish habitat enhancements as mitigation for project impacts beyond that available from our proposed "Oxbow" creation, we suggest that some work could be done from existing high banks to remove existing concrete rip rap exposed along mostly the left bank of Antelope Creek. And some additional work could be done with the same excavator after concrete slab and rubble removal to create small benches on which native riparian plantings could easily be installed. One of the many potential benefits to the stream environment will be to reduce warming of waters due to the increase of shading provided by streamside plantings of woody species on these steeper banks.

As a general habitat enhancement operation that would carry weight in discussions of mitigation options with regulatory agencies, an invasive exotic weed removal program is recommended. This reach of the creek currently supports some small populations of the particularly pernicious aquatic and riparian weeds. We identified red sesbania, black locust, and perennial pepperweed in riparian zones and parrot's feather in slow-water sections of the creek channel. Each of these species should be controlled or eradicated, if possible. The more ubiquitous Himalayan blackberry extends throughout the riparian zone and in some cases up into adjacent oak woodland habitat. Management of this species is recommended even though eradication is not feasible. Weed control can be done with chemicals in some instances and by manual or mechanical methods in others. Himalayan blackberry can be managed with goat grazing, mechanical means, and correctly timed spraying with appropriately labeled herbicides.

Weir #2

Site Constraints: The proposed location for Weir #2 across Antelope Creek appears to be upstream of the existing service road overcrossing and approximately at or near the location of an existing stream monitoring gage. This location is problematic for two primary reasons. First, construction of the weir at the proposed location would have significant impacts to well developed stream-zone waters of the U.S. and wetlands along with valuable riparian habitat components up and downstream of the weir which developed as a result of beavers damming the stream at the service road overcrossing. And second, much of the work would necessarily be in the water and mucky sediment accumulated on the bottom of the beaver pond and a small willow-covered island would have to be removed, raising the cost of the venture.

Another potential constraint to construction of Weir #2 is the prescribed overflow elevation. Just upstream of the beaver pond and between the pond edge and the post and cable fence separating the creek habitat area from the bike trail is a sewer manhole and other infrastructure facilities placed underground. Based upon our assumption of the proposed weir location it appears that the new weir could not raise water levels much without flooding the manhole and, in some spots even the bike trail making this structure likely not worth the cost in terms of volume detained per dollar.

Opportunities: We believe that Weir #2 should be created by simply removing the beaver dam at the service road/bike trail overcrossing and lowering the existing static

water level to create additional storage volume upstream of the existing barrier. Obviously, removal of the beaver dam is a temporary fix and therefore it would have to be followed by a well designed beaver proof inlet to existing culverts passing stream flows under the service road/bike trail overcrossing. Furthermore, beavers in this reach must be controlled through trapping by experts under a CDFG depredation permit. The City of Roseville currently works with trappers from the Placer County Agricultural Department to remove beavers from the Dry Creek Watershed and this site could be made one of critical importance to all concerned in order to ensure the storm water detention value of the existing structure. We feel that this alternative to a new weir structure could provide significant detention at minimal cost.

Site B - Secret Ravine Upstream of Sierra College Boulevard

Prior to our visit to Site B, draft base maps including aerial photos, property boundaries, potential jurisdictional wetland features, elderberry shrub locations, and a conceptual design of the proposed flood wall along with draft flood impact zones within the site were provided by the Client, Placer County Flood Control Agency, and RBF Consulting. These maps along with soils maps and CNDDB maps prepared by Restoration Resources were taken into the field to verify data represented and to use for recording observations made by Restoration Resources staff.

Data and maps provided to date indicate that a 300’ long flood water detention wall spanning the Secret Ravine creek and its immediate floodplain will be constructed parallel to Sierra College Blvd. roughly 30 to 50 feet from the toe of the slope extending down from the elevated Sierra College Boulevard overcrossing. The conceptual plan indicates that the flood wall will have an opening presumably wide enough to pass the entire low flow volume of the creek and that the opening will span the existing creek channel. Flows in excess of the capacity of this opening will be detained upstream of the wall within the existing upper terrace floodplain. Our site inspection and preliminary vegetation analysis indicates that typical creek incision processes have left much of this upper floodplain terrace abandoned even during higher runoff events. The proposed project should re-attach the creek to much of the upper terrace floodplain area during peak flow periods while reducing downstream affects of flood waters on developed areas within the lower Dry Creek Watershed.

Restoration Resources mission was to evaluate the potential effects of flood wall construction to protected natural resources and to present some conceptual habitat enhancement and mitigation opportunities that may be found within the boundaries of the site. The following discussion is meant to present our preliminary findings in meeting our goals and completing our mission.

Existing Conditions – Westerly Portion

Restoration Resources prepared a map combining the various graphic information data sets provided that depicts the site’s boundaries, topography, resource findings and its

habitat attributes (see Appendix B). As presented, the overall site encompasses approximately 61.41 acres with the westerly portion encompassing 38.7 acres. Access to the site from Sierra College Blvd. is found on the north and south sides of the creek. Some old, dilapidated machinery and equipment can be found along the southerly access road. The northerly roadway provides access to an abandoned building and exposes some old pieces of metal work and small amounts of various wooden construction materials. These access roads are very short but will be important to the implementation of the proposed project, as well as future maintenance and monitoring efforts and therefore should be maintained in their current locations.

The existing topography of the westerly portion of the site, north of the creek channel and bounded by Sierra College Blvd. on the west, a block retaining wall on the north, and an old barbed wire fence extending from the block wall to near the creek on the east, indicates extensive anthropomorphic manipulations, likely resulting from historic gold mining operations. Most of this historic work appears to have been concentrated within and adjacent to natural swales leading toward the creek though pre-settlement topography can only be guessed at for the purposes of this report. It appears that the mining work left conditions that favored colonization by wetland adapted plant species in the bottom portions of some of these swales. These potentially jurisdictional wetland features were marked on maps provided by others and have been reproduced as colored polygons on our attached map and given codes W1 through W4. The topography of the balance of this sub-area can be characterized as a gently rolling terrain, sloped toward the creek with two areas left relatively flat high above the creek floodway. We have identified these upland habitat areas on our map as U1 which supports a typical oak-foothill pine habitat with a ruderal herbaceous layer and U2 and U3 which are far more open and the soil surface is dominated by non-native grasses and weedy broadleaf plants.

We have mapped the provided potential floodway as polygon R1 in the westerly portion of the site where the vegetation type can be described and valley-foothill riparian. The topography indicates a somewhat incised creek channel, perhaps some remnant channel braids, some swale alluvial termini, and some relatively flat floodplain terrace lands. The vegetation within this polygon consists of a nearly closed canopy made up of valley and live oaks on the higher portions and willow, white alder, and valley oak near the creek. The understory is dominated by the non-native Himalayan blackberry and native poison oak. Some locations support other native vines including California wild grape which climb into the overstory creating an overall relatively densely shaded creek zone which provides multiple benefits to fish living in the creek.

South of and up slope of the creek zone in the westerly portion of the site, is found an extensive oak-foothill pine vegetative community mapped as U5 and another upland ruderal grassland community which we mapped as U4. As on the north side of the creek, the presumed natural micro-topography appears to have been altered some time in the historic past. We assume mining occurred within the swales, later agricultural activities may have altered the grassland areas, and some leveling may have occurred as a part of human use for storage of construction related materials and equipment. We are guessing as to the causes, but the surface disturbance is clearly evident. The large trees covering

much of this area as with the north side indicate that the presumed man-caused disturbances are not recent by any means. Our map shows polygon W6 south of the creek which lies just above a previously mapped intermittent drainage and "heritage" oak tree and incorporates the confluence of two existing swales.

The soils of the site are mapped by NRCS as Andregg coarse sandy loam on the hills above the creek floodway and Xerothents, placer areas within the drainageway. These soils are of granitic parent material and a generally can be described as well drained decomposed granite with numerous granite boulder outcroppings. Previous mining operations and perhaps other disturbances have done much to create a seemingly homogenous mix of the mapped soil types in many areas especially along the creek and swales leading to the creek.

Site Constraints

Wetlands: A map of biologic features identified by Jones & Stokes Associates (JSA) provided by our Client, indicated three potential vernal pool fairy shrimp habitat wetlands in the westerly portion of the site. We found the locations mapped by JSA and determined that two are in all likelihood not potential wetlands and certainly not fairy shrimp habitat. The third which is found north of and upslope from the creek between two mapped swales does support some typical vernal pool vegetation over an area of approximately 100 square feet. While it may well be delineated as a wetland, we would not expect this small isolated depression to support fairy shrimp. However, this depression should be avoided and protected during any construction activities thereby eliminating any need for very expensive vernal pool fairy shrimp habitat mitigation.

For the most part we agree with JSA's depiction of other wetland features and sensitive habitats, the bulk of which are found along the creek and the easily identified swales. However, we located each of the mapped seasonal wetland features and found that the JSA map likely overstates their size and importance. The project will impact some waters of the U.S. and some riparian habitat at the weir construction site which will require mitigation. Therefore, a formal wetland delineation will be necessary for ACOE permit application. The flood zone resulting from the project is not likely to negatively affect any of the existing wetland features.

Listed Species: Restoration Resources obtained the CNDDB records for all listed species of plants and animals occurring within a 5-mile of the site in order to better prepare ourselves for on-site surveys and focus our search on specific habitat types.

Vernal Pool Fairy Shrimp: See discussion under *wetland*s above.

VELB: Data provided by others indicated the presence of elderberry shrubs on the site which are habitat for the federally listed threatened valley elderberry longhorn beetle (VELB). Our survey located the five shrubs previously mapped by JSA along with several more individual plants and elderberry clumps with numerous plants and stems larger than 1-inch diameter at ground level. We did not do protocol level surveys because

of significant conflicts with poison oak, but of the stems we were able to examine we did not see any evidence of VELB exit holes. None the less, these shrubs are protected as critical habitat for the insect and should be avoided during the construction process. The shrubs should be mapped appropriately during the wetland delineation process and suitable plant protection measures including minimum setbacks described along with those for protection of delineated wetlands.

If the project, including any habitat restoration for mitigation, proposes to impact the elderberry shrubs with stems greater than 1-inch at ground level, then approval must be given by USFWS under the section 7 consultation required by the CWA during the ACOE permitting. However, we believe that it will not be necessary to adversely impact any of the elderberry shrubs currently existing on the site thereby eliminating this difficult step.

Northwestern Pond Turtle: The JSA map indicates potential habitat for the northwestern pond turtle, a state listed species of special concern, and we do not disagree. The turtle's habitat is indicated within the riparian and creek habitats all along the Secret Ravine drainageway plus one area that appears to have been an impoundment associated with historic mining activities located north and upslope of the creek near the center of the western portion of the site. We believe that this latter area is a good candidate for wetland and riparian habitat enhancement and creation and should this type of work be done as mitigation, then care would need to be taken to ensure that no turtles were in the area at the time of construction. Review of turtle protection measures will likely come from CDFG during the CEQA process for the project and/or conditions will be placed in the ultimate Streambed Alteration Agreement needed for the weir construction.

Salmonids: Salmon and steelhead trout are known to occur in the Dry Creek drainage and in Secret Ravine itself. During our survey we observed several rainbow trout which could potentially be juvenile steelhead. Therefore, we suggest that the proposed weir design must first be "fish friendly" before it can be a detention facility in order for the project to be permitted for construction. Additionally, the timing of work in and adjacent to the creek will have to recognize the need for salmonids to move up and downstream during their annual reproductive cycle. These issues will need to be addressed in the ACOE permit application to provide information for review by the National Marine Fisheries Service (NMFS) and USFWS under section 7 of CWA consultation requirements.

Archeological Resources: Under section 106 of the CWA, it will be necessary for the project proponent to conduct a protocol level search for evidence of historically or archeologically significant sites. We considered this site likely to contain such protected resources and searched very briefly for evidence of Native American use by looking at a number of exposed granite boulder surfaces where mortar (acorn grinding) holes are often found in the region. The third such inspection yielded a hole and its location is identified on our map. We did not look any further for evidence of archeological resources and we are not able to assess the historical value of the existing building sited north of the creek, but it is likely that an expert will turn up more sites that will require

protection and avoidance as the project including any mitigation habitat construction goes forward.

Oak Trees: Oaks including valley oak, interior live oak and blue oak woodlands are protected by state law and individual oak trees are protected by county and city ordinances. The oak-dominated habitats found on this site have all three species represented and individual trees vary in size from saplings to very old, very large, often multi-trunk giants that will require protection and mitigation if damaged. We have left off our map all reference to "heritage oaks" provided in one of the data sets given us because we were not provided any arborists' reports and this designation is largely subjective and interpreted differently in different jurisdictions. That said, it will be important to the project that an updated arborist's report is prepared in which all native trees larger than six-inches diameter breast height (dbh) are identified, tagged, measured and rated for health and vigor. This report is likely to be extensive due to the large number of trees that will be flooded at some interval more frequent than the current case as a result of the project. It is our opinion that while the existing riparian corridor is well forested, the species present are adapted to relatively frequent flooding and although some species such as blue oak will drop out, the site will become more beneficial to valley oaks under the new hydrologic regime. Our depiction of the more frequently flooded zone is found on our opportunities and constraints map. We do not believe that the threat to oaks will seriously constrain the project, though some will certainly be lost and their loss will necessitate appropriate mitigation.

Construction Season: Typically, construction activities in stream zones is limited by CDFG and the state Water Board to the period between April 15 and October 15th to avoid erosion and unwanted sediment transport issues. Additionally, nesting raptors within the stream zone or adjacent habitat can affect the allowable construction period. Under federal migratory bird protection rules, disruption of nesting activities of other migratory birds may also affect the allowable construction window. Bird nesting activities are generally accepted as being over by July 15. Therefore, we feel the estimated construction period should be limited to July 16 through October 15.

During our site surveys, we located juvenile great horned owls and barn owls in the oak-foothill pine habitat. It is likely that other raptors also nest in this habitat type and potentially in the adjacent riparian habitat type. It is also likely that more than one species of federally recognized migratory birds nest on the site. Prior to construction nesting raptor surveys and perhaps migratory bird surveys will be required if the construction season were to be proposed within the nesting season for any of these species.

<u>Site Opportunities:</u>

Site B presents a significant opportunity to provide a rich, diverse assemblage of preserved, enhanced, restored, and created habitats which could well be used for mitigation for project impacts on this and perhaps other sites. Our Opportunities & Constraints map shows the acreages of various habitat types that potentially could be

enhanced or restored thereby creating suitable in-kind mitigation for all proposed project impacts.

Wetlands: Mapped polygons W2, W3, W4, W5, and W6 all present good potential for creation of additional wetland habitat by construction of small, armored overflow weirs at existing outfalls or constrictions in drainageways. Some additional grading would be required to expand the perimeter of several of the existing basins/depressions in conjunction with weir construction, but we believe that costs will be minimal for the gain in wetland habitat and the likelihood of long-term stability of the created/restored habitats is very high. Some additional technical studies such as soils and hydrology along with detailed biological resource mapping will be needed to prepare final design concepts for agency approval. Also, if Site B is to be used for mitigation purposes it will need to be placed under a conservation easement with an appropriate steward and a long-term management plan will have to be prepared and an endowment to support perpetual stewardship duties must be funded.

VELB: Site B currently supports numerous elderberry shrubs and clumps of elderberry shrubs on high terraces above the floodway. Their presence indicates the suitable nature of the site for future VELB mitigation. As long as vehicular access is maintained and potentially enhanced, the overall site could accommodate a significant number of transplanted elderberry shrubs along with requisite elderberry seedling and associated plant seedling installation making it relatively cost effective for providing this type of mitigation for local public works projects with impacts in need of VELB compensation. As with the potential for wetlands mitigation, a perpetual conservation easement, long-term management plan, and endowment would be required along with a commitment for at least 10 years of protocol level monitoring and reporting to regulatory agencies. Initial plantings would require regular maintenance including irrigation for two to three years and non-chemical weed control. Some replacement planting should be expected in the first three years of establishment maintenance with all maintenance activities being reduced thereafter. This habitat type could provide oak mitigation credits as well.

Oak Trees and Oak Woodlands: Local ordinances and state law require compensatory mitigation for project impacts to oak trees and/or oak woodland habitat. The proposed floodwater detention project will certainly have impacts to these protected resources on Site B and virtually any other site proposed for this type of work. Areas upslope of the creek zone on Site B offer multiple opportunities for oak woodland mitigation. The site lends itself to the more ecologically comprehensive woodland restoration concept as opposed to the more traditional oak plantation/orchard/landscape concept common with “oak tree” mitigations heretofore installed in the region. Woodlands are composed of multiple species of native woody trees, shrubs, and vines along with a herbaceous understory of native perennial grasses and graminoids along with many species of broadleaf plants including typical wildflowers of the foothills.

Restoration Resources has successfully permitted and implemented oak mitigation projects in which we worked from the oak tree paradigm where impacts are measured in “inches at diameter breast height” and mitigations are expressed in numbers of 5- to15-

gallon oak or redwood trees installed in ball parks or street medians to the restored woodland paradigm where all installed plants, the occupied protected land, and the maintenance obligations were considered valuable in replacing the lost oaks. In every case the larger scale mitigation projects will ultimately produce many more oaks than were lost and provide a host of additional habitat values for multiple wildlife species – all at a cost lower than that for installation of many large container sized plants. This habitat type could provide VELB mitigation credits as well.

Site C – Linda Creek Upstream of Auburn-Folsom Road

Prior to our visit to Site C, the Client and RBF Consulting provided a schematic drawing overlaying an aerial photograph of the site. The potential project indicated on this drawing proposes a berm be constructed along the left bank of the Linda Creek tributary and an off-channel detention basin be constructed encompassing something more than the southerly one third of the site. No information is given on the drawing regarding neither the height of the proposed berm nor the depth of the proposed basin. Restoration Resources gathered supporting data and maps and proceeded in the field to verify the constructability and potential constraints to the implementation of the proposed detention facility.

Upon entering the site it was immediately evident that there are multiple existing wetland features and mature oak-dominated riparian vegetation all along the Linda Creek tributary, as well as, significant stands of oak-dominated woodlands throughout the proposed work area. Impacts due to proposed construction to the existing oaks alone would create extensive and expensive mitigation requirements. It should be noted that the site is currently being used as an oak and/or riparian mitigation site (irrigation lines and tree posts supporting installed native riparian trees were found all along the right bank of the tributary). There are also existing sewer lines and manhole covers as well as existing water pipelines paralleling the creek within the proposed area of work. The only area that could potentially be appropriate for a storm water detention basin is the northerly half of the site and it is at an elevation relative to the creek thalweg such that the ability to create a floodwater detention facility at this site seems impractical not to mention that any diversion facility and return facility would have to cross existing sewer and water lines. It is our opinion that the net benefit of creating a detention basin and berm on this site would not exceed impacts associated with the construction. Therefore we do not recommend the use of this site for a flood water detention facility.

Potential Impacts:

- Existing oak trees
- Existing wetland habitat
- Existing riparian habitat
- Existing mitigation plantings
- Potential elderberry shrub impacts throughout
- Salmonid habitat in stream and juvenile entrapment issues

Potential Issues:

- Many existing wetland basins apparently fed by ground water and existing wetland and riparian wetland features including swales
- Extensive mature oak dominated upland and riparian woodlands with potential for multiple impacts to protected resources
- Evidence that portions of the site have been used for oak or riparian mitigation
- Existing water and sewer lines in proposed work areas
- Existing use as landscape pruning dump site

Potential Opportunities:

- Oak mitigation site
- Wetland and riparian wetland and woodland mitigation site
- Elderberry mitigation site

Site D – Linda Creek Upstream of Wedgewood Drive

Site D supports extensive mature riparian woodland and riparian wetland communities within the immediate creek corridor and mature mixed oak-foothill pine woodland rising from near stream bank level to the top of the uppermost slopes adjacent to the channel. The creek corridor is relatively narrow and confined by the steep local topography resulting in a narrow flood impact zone attributable to construction of the proposed weir just upstream of the Wedgewood Road overcrossing. Presumably this narrow zone does not allow for the detention of much flood water unless the weir structure is of significant height in which case flood waters will rise into to the adjacent upland oak woodlands.

This site is located entirely within an exclusive gated residential community adjacent to the Granite Bay Golf Club and the development has strict Covenants, Conditions and Restrictions for architectural and landscaping standards. No private perimeter fencing is visible and most of the pre-existing oaks have been retained within the community presumably to enhance the feeling of living compatibly with nature for the residents. It is our belief that any attempt to construct a large concrete weir across a beloved stream within a community open space will be met with significant resistance. Additionally, the currently existing riparian habitat will be impacted and the adjacent mature live oaks, blue oaks, and foothill pines will likely suffer death from even infrequent flooding. Therefore, it is our opinion that this site is not a good candidate for the flood attenuation project and deserves no further evaluation.

Site E – Linda Creek Upstream of Old Auburn Road

Site E encompasses a relatively incised narrow channel with steep, nearly vertical stream banks bordered by uplands dominated by oak woodland and annual non-native grass/forb vegetative communities. Typical valley riparian woody species including cottonwood and willows are scattered rather sparsely along the length of Linda Creek and found mostly on the left bank. The upland area to the west of the creek identified by RBF Consulting as

suitable for off-channel flood water detention is currently completely occupied by oak tree mitigation plantings regularly tended by City of Roseville personnel.

We believe that it is highly unlikely that the City of Roseville will support complete destruction of this mitigation site without the extraordinary expense of replacing the land area and all the trees and extending tree maintenance and tree survivorship guarantees for some considerable time into the future. The chosen site seems well suited for the type of installation proposed with the berm constructed from spoils excavated within the detention basin; however, we believe that do to its existing use for mitigation, Site E is not a good candidate for the flood control project and, unless cost is of no concern, should not be considered further.

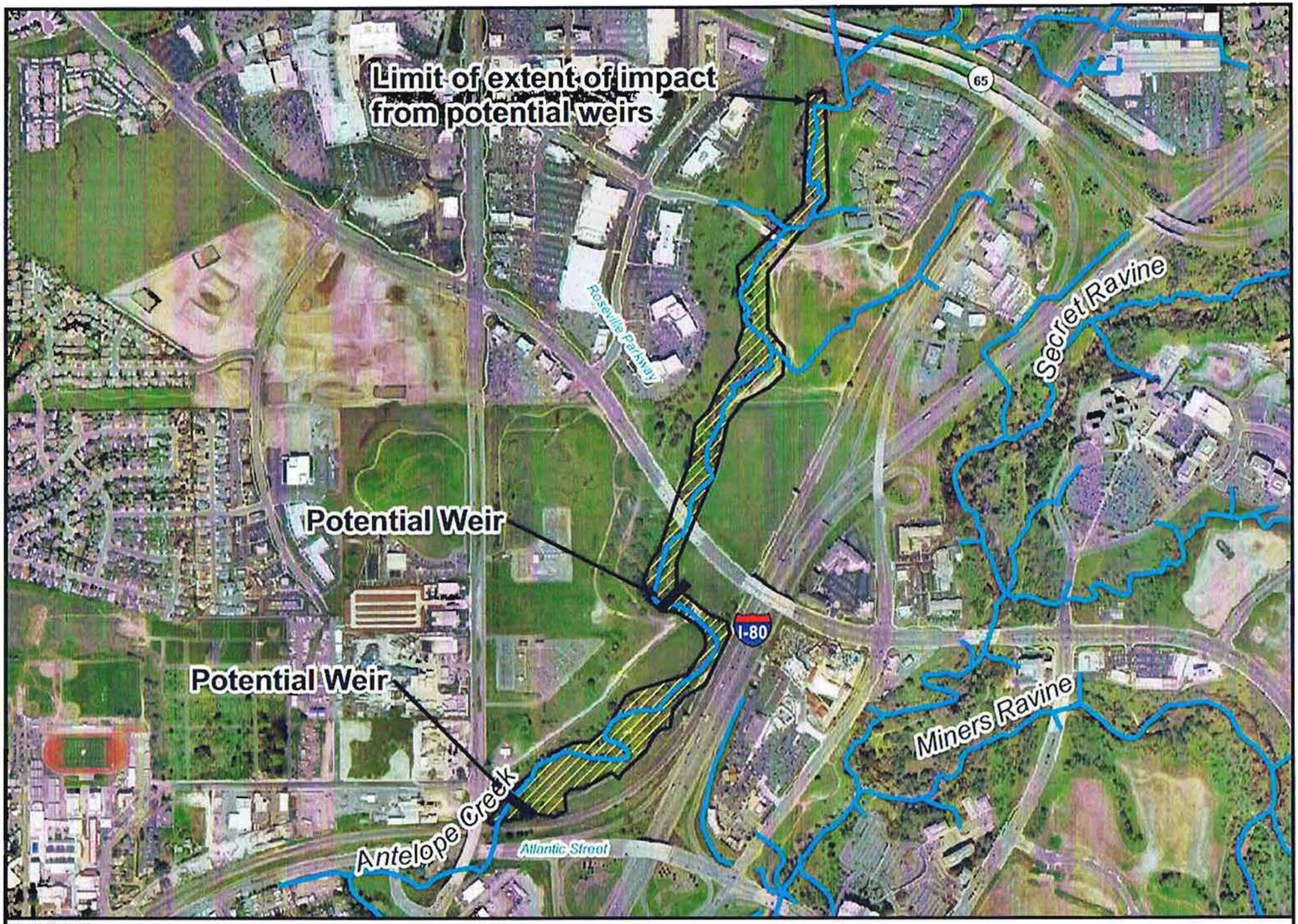
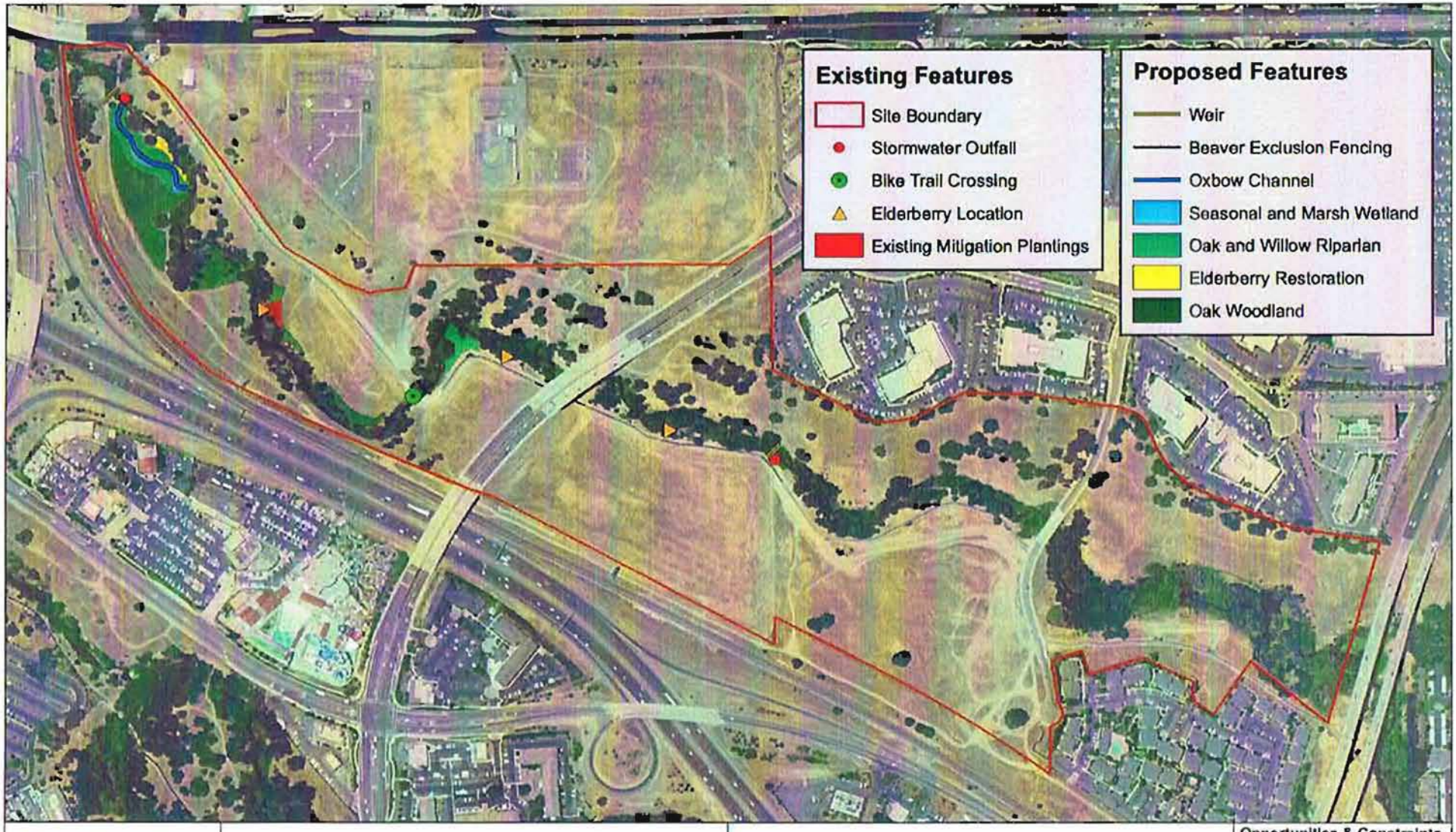


Exhibit 1
Potential Project
Antelope Creek upstream from Atlantic Street

N

0 162.5 325 650 Feet

RBF CONSULTING



RESTORATION RESOURCES

N

0 375 750 1,000 Feet

Site A:
Antelope Creek Upstream of Atlantic Street

Opportunities & Constraints

Dry Creek Watershed
Placer County, CA
July 30, 2010

Site A: Large valley oak within the flood zone. Attention should be given to weir design and duration of flood up to prevent detriment to existing protected vegetation.

Site A: Parrots feather and concrete outfall. Noxious non-native vegetation should be treated and removed as part of the riparian enhancement.

Site A: Open Floodplain on downstream end of Antelope Creek. We suggest this site be used for wetland restoration ("Oxbow").

Site A: Existing Mounds of soil along Antelope Creek may be enhanced and created elsewhere on site to provide hydrologic/soil conditions for elderberry plantings.

Site A: Red sesbania. Noxious non-native vegetation should be treated and removed as part of the riparian enhancement.

Site A: Himalayan blackberry. Noxious non-native vegetation should be treated and removed as part of the riparian enhancement.

Site A: Bike trail crossing inlet. Pipes should be cleared and maintained. We suggest a beaver exclusion device be installed upstream of this location

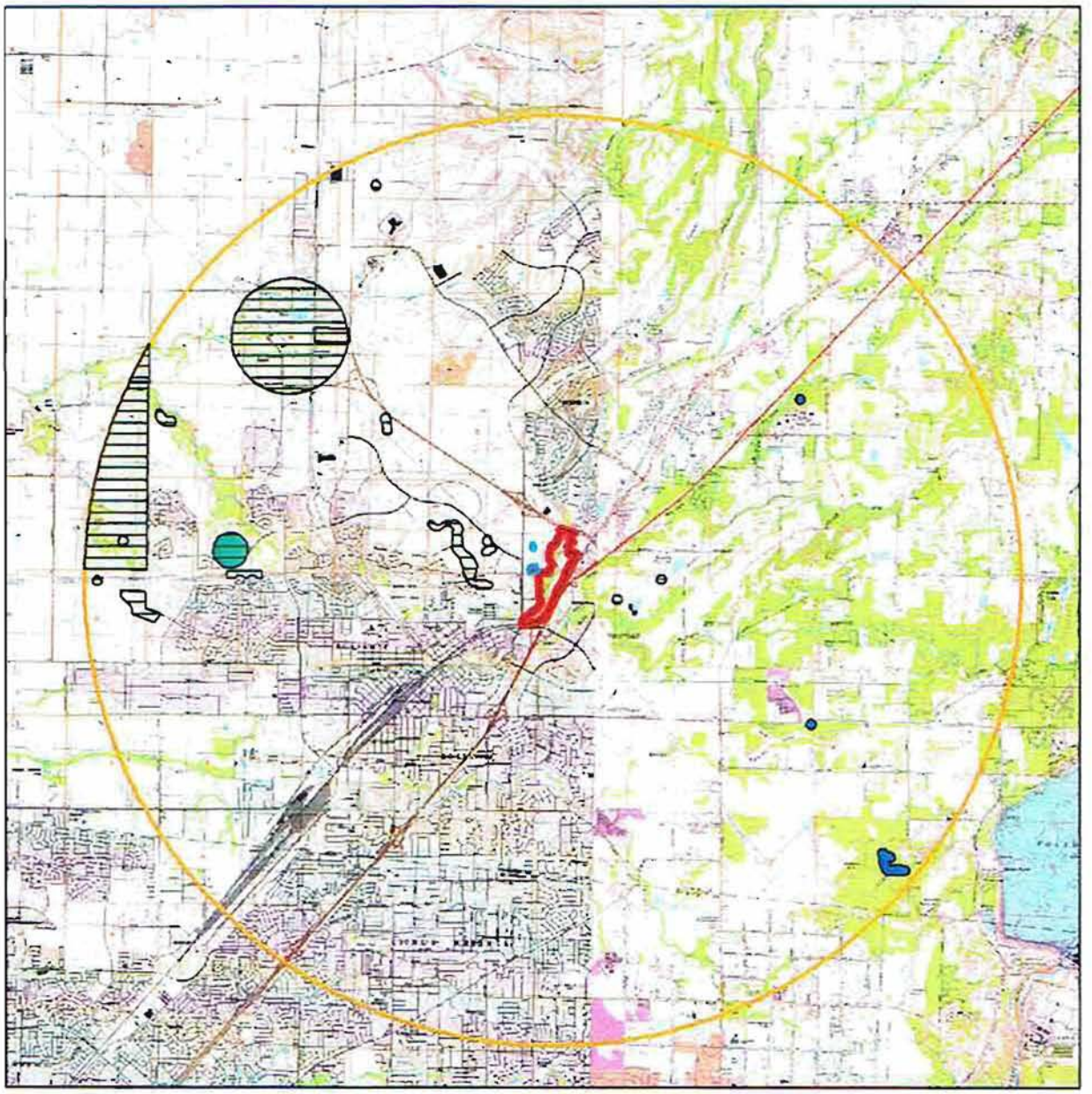
Site A: Bike trail crossing outlet. It is suggested that concrete slabs be removed and disposed of legally off site or used for upland habitat structures.

Site A: Oak tree mitigation plantation. There is a location on Antelope Creek that has been used for what seems to be oak tree mitigation plantings.

Site A: Oak tree mitigation plantation. Trees were planted in dense rows discouraging the development of a diverse and appropriately structured oak riparian woodland

Site A: Lower benches. Adjacent to the oak tree mitigation site at the base of the capped landfill there are sites suitable for additional oak plantings.

Site A: Lower benches. There are multiple locations along Antelope Creek at the base of the capped landfill that are suitable for oak tree mitigation plantings.



Legend

Plant and Animals (Common Name)

- vernal pool tadpole shrimp
- California black rail
- Boggs Lake hedge-hyssop
- Swainson's hawk
- valley elderberry longhorn beetle
- vernal pool fairy shrimp

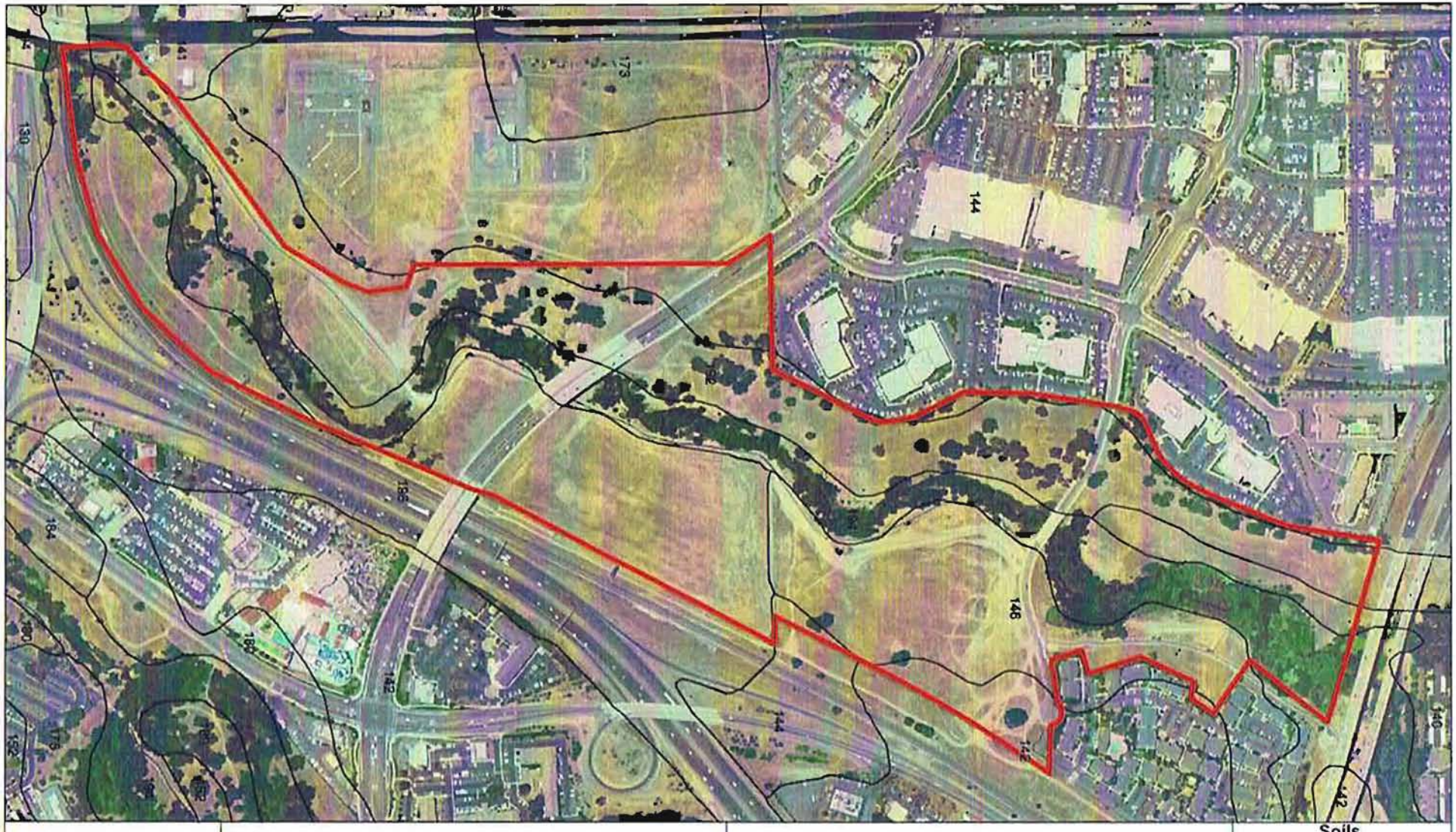
California Natural Diversity Database Map	
Site Analysis- 5 mile radius	
Site A - Antelope Creek (upstream of Atlantic Street)	
Designed By: LRP	Prepared By: RESTORATION RESOURCES
Drafted By: LRP	
Date: 7.30.10 / Job No.: 29001	

Legend

- Site Boundary
- 5mile buffer

1:110,000

0 0.5 1 2 Miles



RESTORATION RESOURCES

0 375 750 1,500 Feet

N

Site A:
Antelope Creek Upstream of Atlantic Street

Soils

Dry Creek Watershed
Placer County, CA
July 30, 2010

Map Unit Description

Placer County, California, Western Part

140 Cometa sandy loam, 1 to 5 percent slopes

Setting

Elevation: 20 to 400 feet
Mean annual precipitation: 10 to 23 inches
Mean annual air temperature: 63 to 63 degrees F
Frost-free period: 260 to 300 days

Composition

Cometa and similar soils: 85 percent
Minor components: 15 percent

Description of Cometa

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Properties and Qualities

Slope: 1 to 5 percent
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low or moderately low (0.00 to 0.06 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Low (about 5.2 inches)

Interpretive Groups

Land capability classification (irrigated): 3e
Land capability (non irrigated): 3e

Typical Profile

0 to 18 inches: sandy loam
18 to 29 inches: clay
29 to 60 inches: sandy loam

Minor Components

Kaseburg soils

Percent of map unit: 5 percent

Fiddyment soils

Percent of map unit: 5 percent

San joaquin soils

Percent of map unit: 4 percent

Alamo soils

Percent of map unit: 1 percent
Landform: Depressions

Map Unit Description

Placer County, California, Western Part

142 Cometa-Ramona sandy loams, 1 to 5 percent slopes

Setting

Elevation: 20 to 3500 feet
Mean annual precipitation: 10 to 23 inches
Mean annual air temperature: 53 to 63 degrees F
Frost-free period: 230 to 320 days

Composition

Cometa and similar soils: 50 percent
Ramona and similar soils: 30 percent
Minor components: 20 percent

Description of Cometa

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Properties and Qualities

Slope: 1 to 5 percent
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low or moderately low (0.00 to 0.06 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Low (about 5.5 inches)

Interpretive Groups

Land capability classification (irrigated): 3e
Land capability (non irrigated): 3e

Typical Profile

0 to 18 inches: sandy loam
18 to 29 inches: clay
29 to 60 inches: sandy loam

Description of Ramona

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Properties and Qualities

Slope: 1 to 5 percent
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Moderate (about 8.2 inches)

Interpretive Groups

Land capability classification (irrigated): 3e
Land capability (non irrigated): 3e

Typical Profile

0 to 6 inches: sandy loam
6 to 14 inches: loam

14 to 55 inches: sandy clay loam
55 to 73 inches: gravelly sandy loam

Minor Components

San joaquin soils
Percent of map unit: 5 percent

Fiddyment soils
Percent of map unit: 5 percent

Alamo soils
Percent of map unit: 5 percent
Landform: Depressions

Xerofluvent soils
Percent of map unit: 5 percent
Landform: Drainageways

146 Fiddyment loam, 1 to 8 percent slopes

Setting

Elevation: 50 to 280 feet
Mean annual precipitation: 19 to 19 inches
Mean annual air temperature: 61 to 61 degrees F
Frost-free period: 230 to 300 days

Composition

Fiddyment and similar soils: 85 percent
Minor components: 15 percent

Description of Fiddyment

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from siltstone

Properties and Qualities

Slope: 1 to 8 percent
Depth to restrictive feature: 20 to 35 inches to Duripan; 28 to 35 inches to Duripan; 35 to 39 inches to Lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Very low (about 2.7 inches)

Interpretive Groups

Land capability classification (irrigated): 4e
Land capability (non irrigated): 4e

Typical Profile

0 to 12 inches: loam
12 to 28 inches: clay loam
28 to 35 inches: indurated
35 to 39 inches: weathered bedrock

Minor Components

Cometa soils

Percent of map unit: 5 percent

Kaseburg soils

Percent of map unit: 5 percent

San joaquin soils

Percent of map unit: 3 percent

Alamo soils

Percent of map unit: 2 percent
Landform: Depressions

152 Inks cobbly loam, 2 to 30 percent slopes

Setting

Elevation: 200 to 2000 feet
Mean annual precipitation: 30 to 30 inches
Mean annual air temperature: 61 to 61 degrees F
Frost-free period: 175 to 270 days

Composition

Inks and similar soils: 80 percent
Minor components: 20 percent

Description of Inks

Setting

Landform: Ridges
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from conglomerate

Properties and Qualities

Slope: 2 to 30 percent
Surface area covered with stones and boulders: 2.0 percent
Depth to restrictive feature: 18 to 22 inches to Paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low or moderately low (0.00 to 0.06 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Very low (about 1.8 inches)

Interpretive Groups

Land capability classification (irrigated): 4e
Land capability (non irrigated): 4e
Ecological site: SHALLOW LOAMY (R018XD076CA)

Typical Profile

0 to 5 inches: cobbly loam
5 to 18 inches: very cobbly loam
18 to 22 inches: unweathered bedrock

Minor Components

Inks varient cobbly loam soils
Percent of map unit: 10 percent

Exchequer very stony loam soils
Percent of map unit: 10 percent

194 Xerofluvents, frequently flooded

Setting

Elevation: 0 to 1500 feet
Mean annual precipitation: 14 to 20 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 270 days

Composition

Xerofluvents, frequently flooded, and similar soils: 90 percent
Minor components: 10 percent

Description of Xerofluvents, frequently flooded

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Properties and Qualities

Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high or high (0.20 to 1.98 in/hr)
Depth to water table: About 30 to 57 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate maximum: 5 percent
Gypsum maximum: 0 percent
Available water capacity: Moderate (about 8.1 inches)

Interpretive Groups

Land capability classification (irrigated): 4w
Land capability (non irrigated): 4w

Typical Profile

0 to 15 inches: stratified loamy sand to fine sandy loam
15 to 37 inches: stratified loamy sand to fine sandy loam to silt loam
37 to 55 inches: stratified loam to silty clay loam to clay

Minor Components

Unnamed soils
Percent of map unit: 10 percent
Landform: Drainageways

196 Xerorthents, cut and fill areas

Setting

Elevation: 400 to 3500 feet
Mean annual precipitation: 8 to 18 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 200 to 300 days

Composition

Xerorthents and similar soils: 90 percent
Minor components: 10 percent

Description of Xerorthents

Setting

Anthropogenic features: Fills
Parent material: Mine spoil or earthy fill

Properties and Qualities

Slope: 2 to 50 percent
Drainage class: Well drained
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Very low (about 0.0 inches)

Interpretive Groups

Land capability (non irrigated): 8e

Typical Profile

0 to 60 inches: variable

Minor Components

Unnamed soils

Percent of map unit: 10 percent

Map Unit Description

Detailed Soil Map Units

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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An identifying symbol precedes the map unit name in the map unit descriptions. Each description indicates the composition of the map unit and selected properties of the components of the unit.

Soils that have profiles that are almost alike make up a "soil series." Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into "soil phases." Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A "complex" consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

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Some surveys include "miscellaneous areas." Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

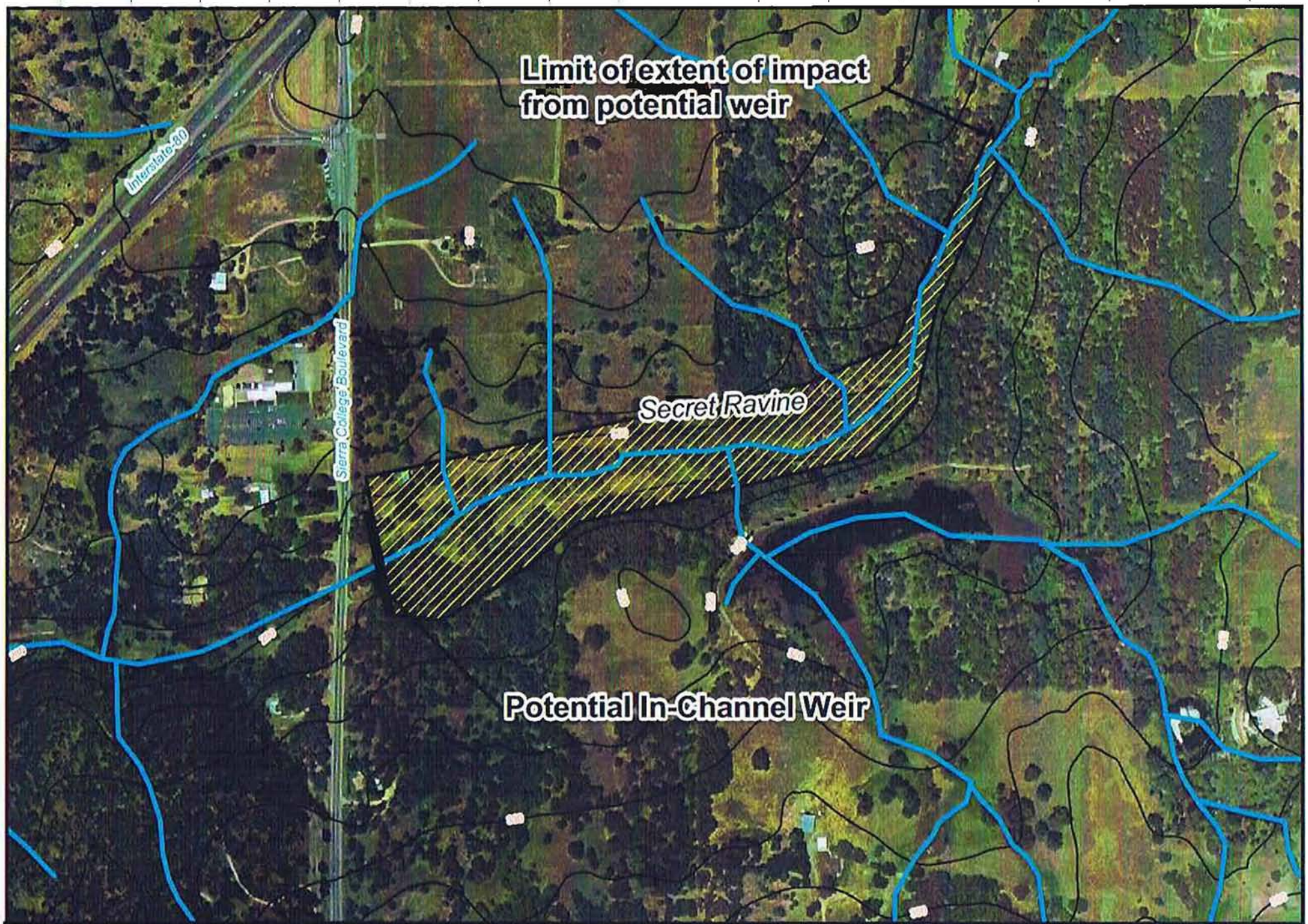
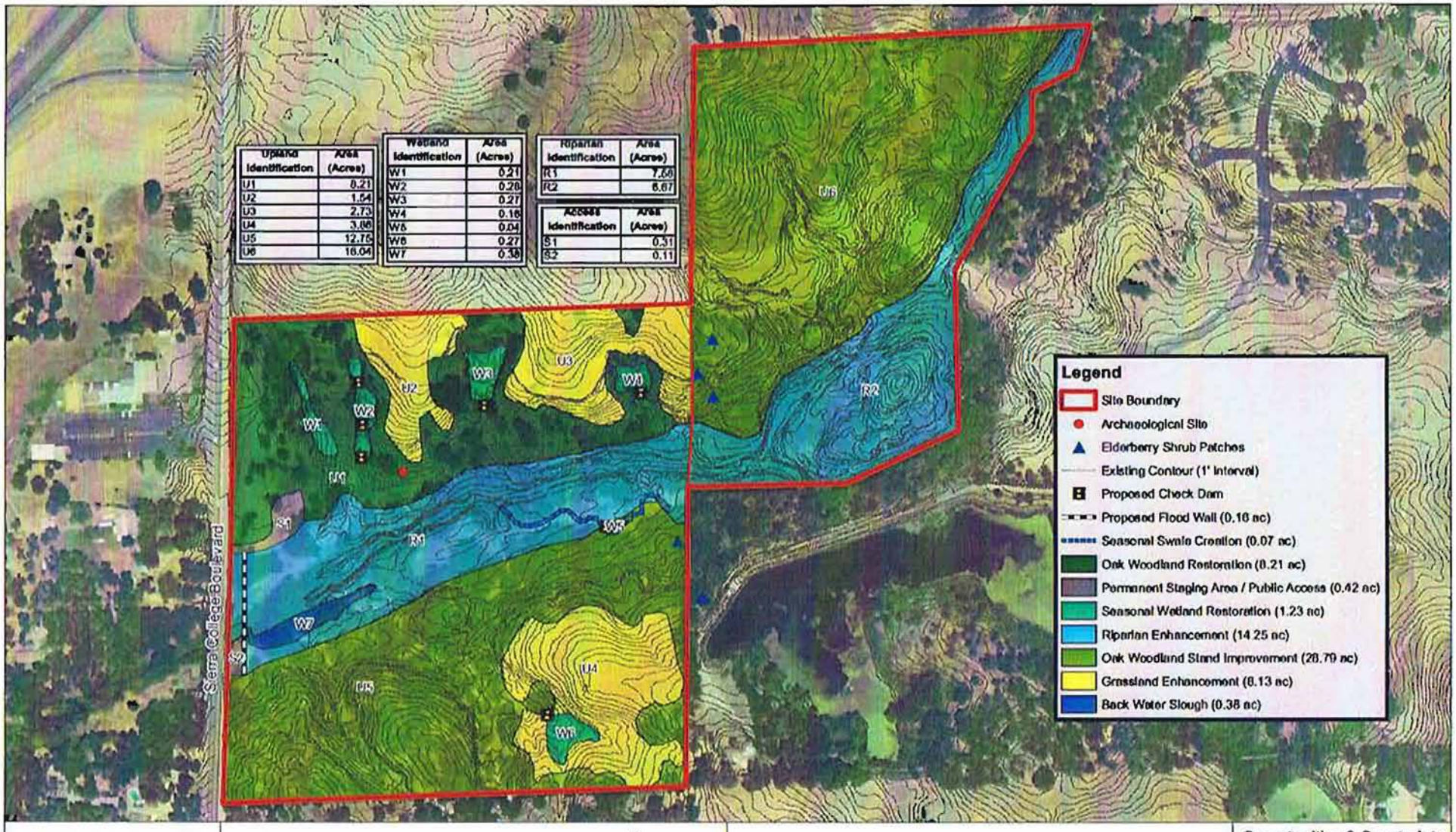


Exhibit 8
Potential Project
Secret Ravine upstream of Sierra College Boulevard

N

0 100 200 400 Feet

RBF CONSULTING



Upland Identification	Area (Acres)
U1	0.21
U2	1.54
U3	2.73
U4	3.86
U5	12.76
U6	16.04

Wetland Identification	Area (Acres)
W1	0.21
W2	0.28
W3	0.27
W4	0.16
W5	0.04
W6	0.27
W7	0.38

Riparian Identification	Area (Acres)
R1	7.58
R2	6.67

Access Identification	Area (Acres)
S1	0.31
S2	0.11

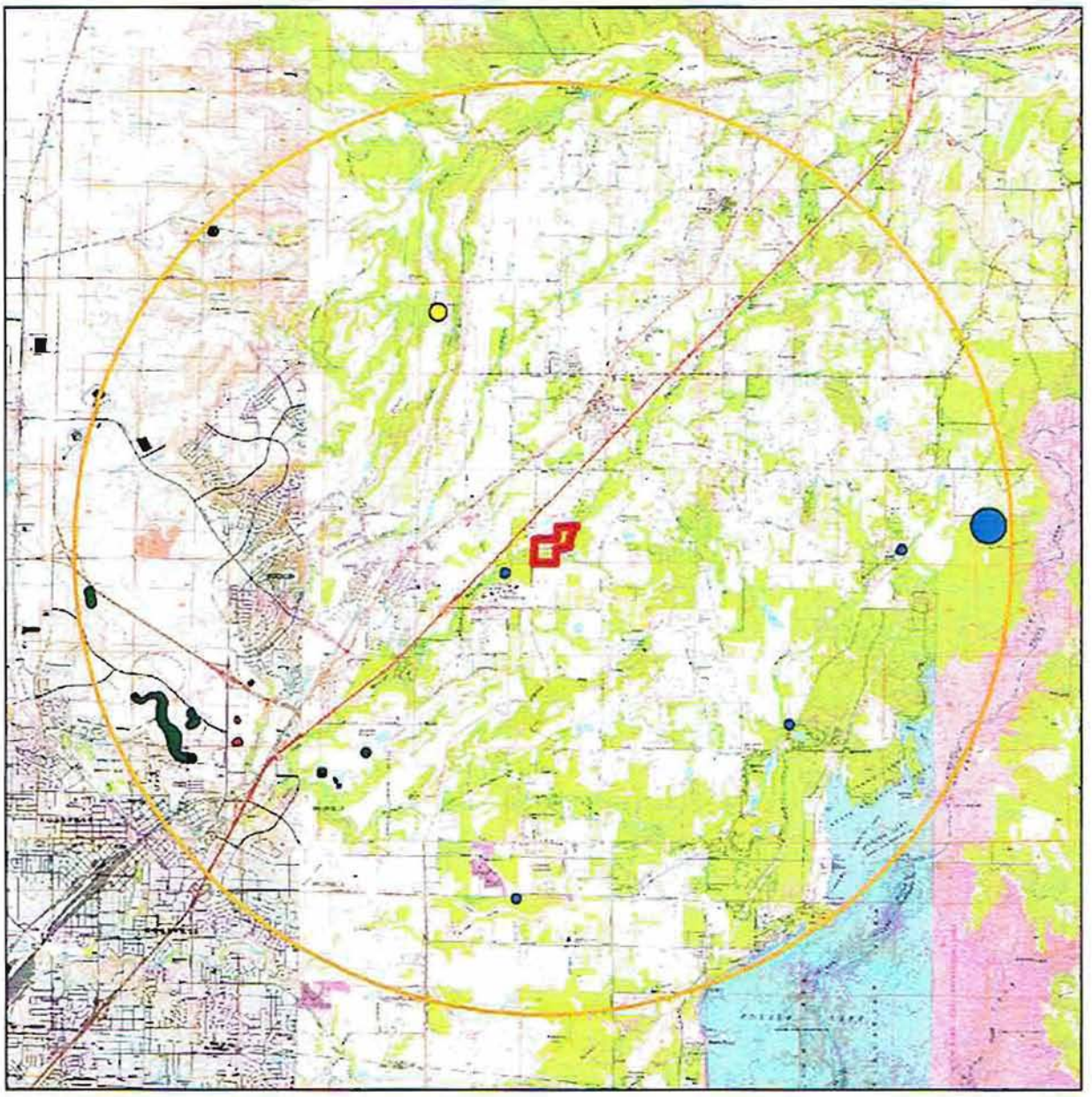
RESTORATION RESOURCES

N

Site B:
Secret Ravine Upstream of Sierra College Boulevard

Opportunities & Constraints

Dry Creek Watershed
Placer County, CA
July 30, 2010



Legend

Plant and Animals (Common Name)

- Boggs Lake hedge-hyssop
- California black rail
- valley elderberry longhorn beetle
- vernal pool fairy shrimp

California Natural Diversity Database Map	
Site Analysis- 5 mile radius	
Site B - Secret Ravine (upstream of Sierra College Boulovard)	
Designed By: LRP	Prepared By: RESTORATION RESOURCES
Drafted By: LRP	
Date: 7.30.10	Job No.: 29001

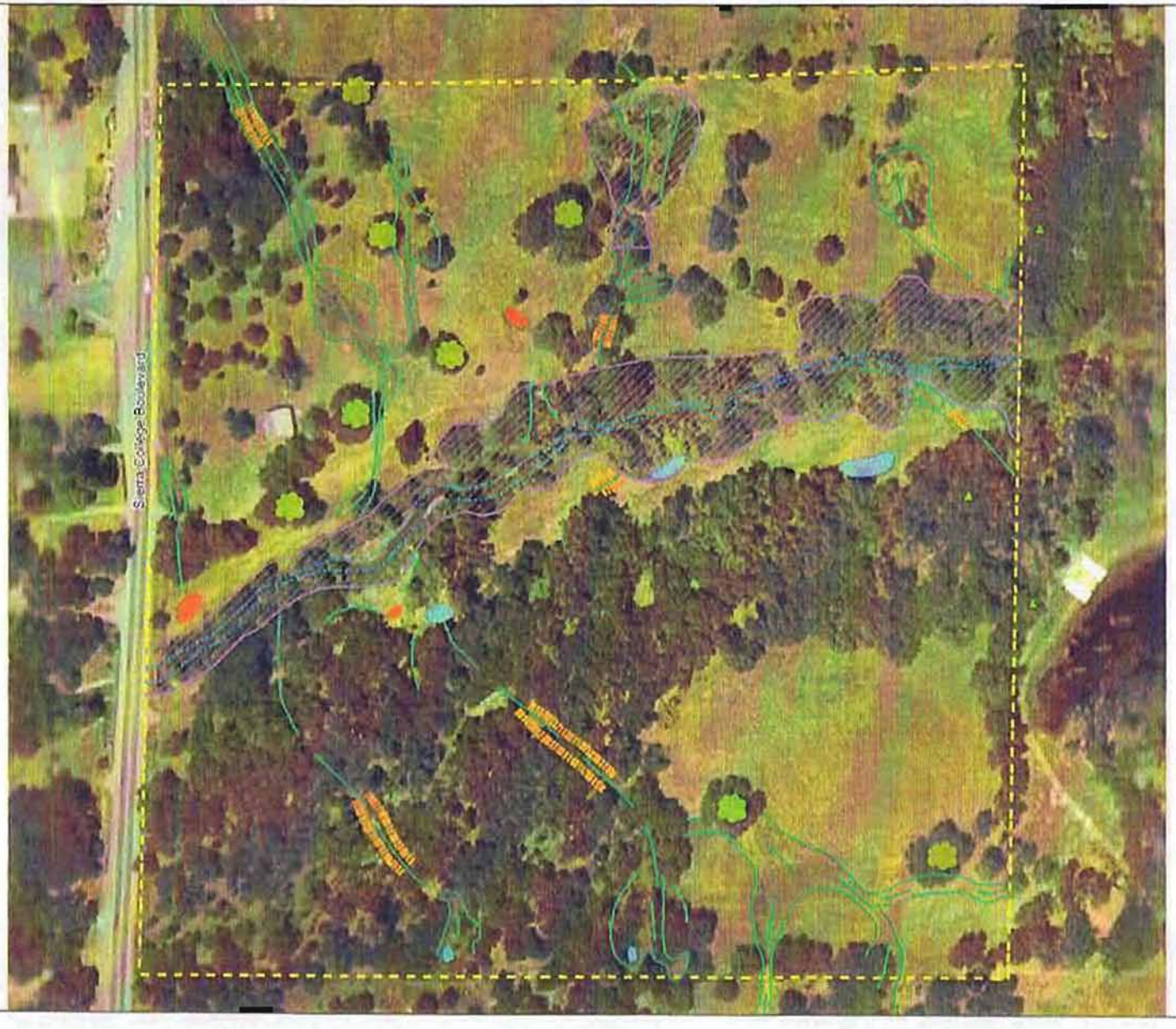
Legend

- Site Boundary
- 5mile buffer

N W E S

1:110,000

0 0.5 1 2 Miles



Biological Resources

Legend

- Swale Flow Direction
- Limit of Swale
- Bed and Bank of Intermittent Stream
- Seasonal Wetland
- Potential Vernal Pool Fairy Shrimp Habitat
- Riparian Woodland
- Elderberry Shrub
- Heritage Oak Tree
- Secret Ravine (Potential Northwestern Pond Turtle Habitat)
- Project Site Boundary

150 75 0
Feet

N

Aerial Photo Source: Google Earth 2005

Notes:
1. Location of identified biological features is approximate. GPS points were not taken for these features.
2. Potential vernal pool fairy shrimp habitat throughout project area requires further investigation to determine suitability.
3. Not all heritage oaks are identified.

Jones & Stokes

LEGEND:

- FLOODPLAIN AREAS 1, 2, & 3 FROM ANDREGG GEOMATICS
- PROPOSED FLOODPLAIN EXTENTS FROM HEC-RAS MODELING AND TOPOGRAPHIC DATA OF CROFTWOOD AREA
- POTENTIAL REVISED BOUNDARY
- POTENTIAL EXPANDED FLOODPLAIN AREA (APPROXIMATELY 87 +/- ACRES)

FIGURE 1
PROJECT FLOODPLAIN LOCATION
SECRET RAVINE
FLOODPLAIN RESTORATION PROJECT
PLACER COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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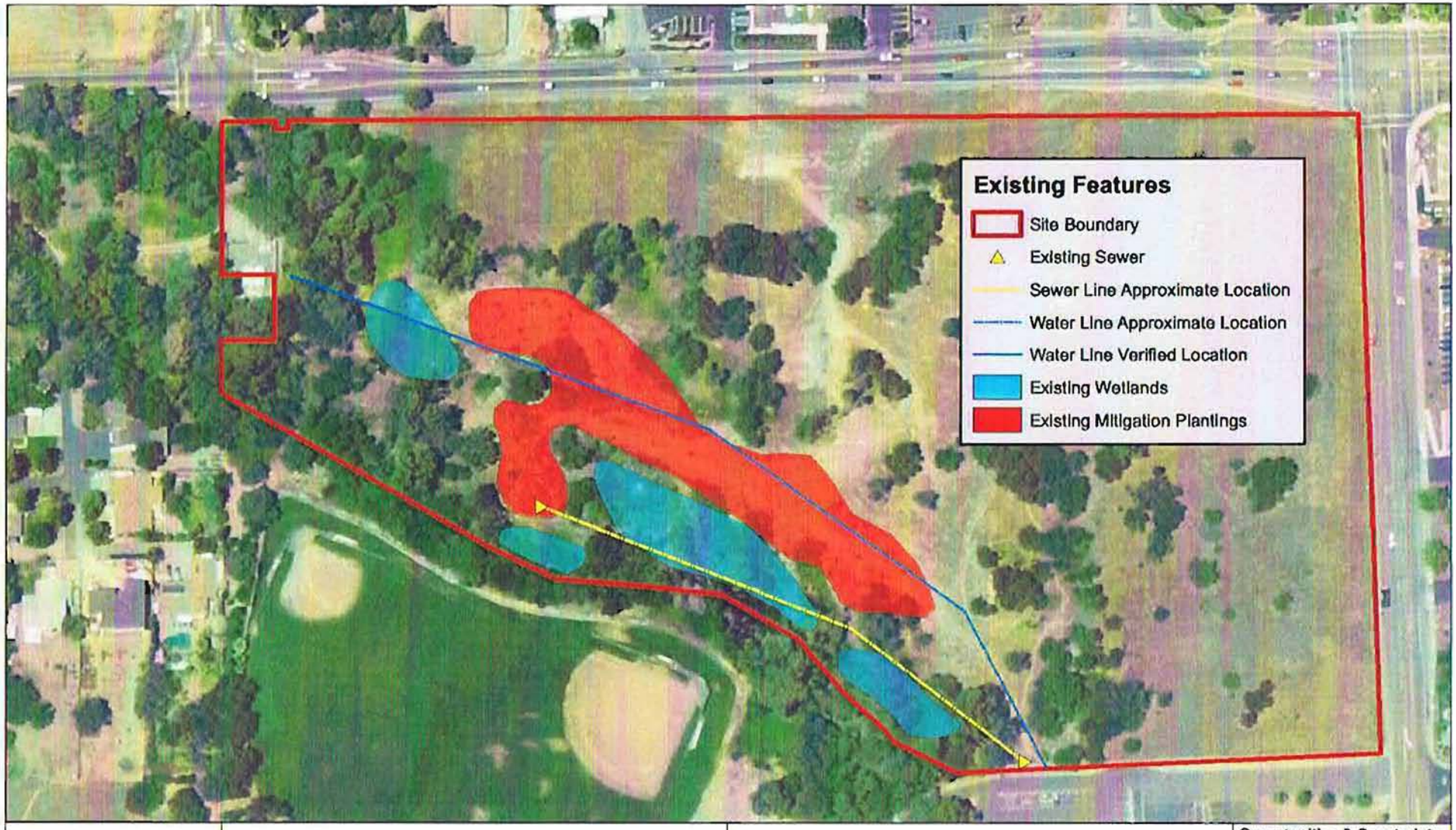
Exhibit 2
Potential Project
Linda Creek upstream Auburn-Folsom Road

N

0 50 100 200 Feet

RBF CONSULTING



RESTORATION RESOURCES

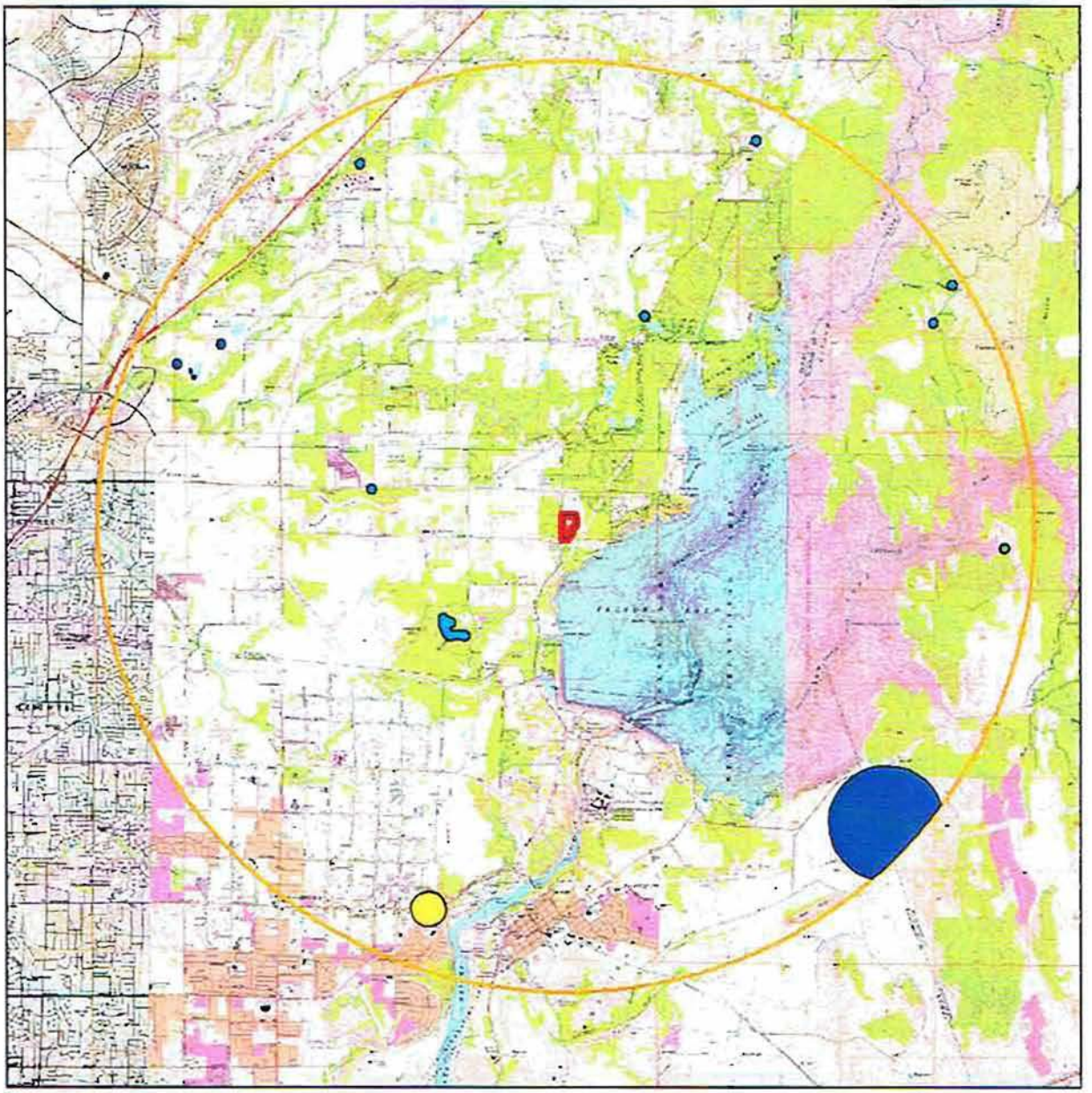
N

0 125 250 500 Feet

Site C:
Linda Creek Upstream of Auburn-Folsom Road

Opportunities & Constraints

Dry Creek Watershed
Placer County, CA
July 30, 2010



Legend

Plant and Animals (Common Name)

- Boggs Lake hedge-hyssop
- California red-legged frog
- Sacramento Orcutt grass
- valley elderberry longhorn beetle
- vernal pool fairy shrimp

California Natural Diversity Database Map	
Site Analysis- 5 mile radius	
Site C - Linda Creek (upstream of Auburn-Folsom)	
Designed By: LRP	Prepared By: RESTORATION RESOURCES
Drafted By: LRP	
Date: 7.30.10	Job No.: 29001

Legend

- Site Boundary
- 5mile buffer

1:110,000

0 0.5 1 2 Miles

RESTORATION RESOURCES

Site C:
Linda Creek Upstream of Auburn-Folsom Road

Soils

Dry Creek Watershed
Placer County, CA
July 30, 2010

Map Unit Description

Placer County, California, Western Part

106 Andregg coarse sandy loam, 2 to 9 percent slopes

Setting

Landscape: Foothills
Elevation: 200 to 1500 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 61 to 61 degrees F
Frost-free period: 200 to 270 days

Composition

Andregg and similar soils: 85 percent
Minor components: 15 percent

Description of Andregg

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from granite

Properties and Qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 29 to 33 inches to Paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low or moderately low (0.00 to 0.06 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Low (about 3.5 inches)

Interpretive Groups

Land capability classification (irrigated): 3e
Land capability (non irrigated): 3e
Ecological site: GRANITIC (R018XD080CA)

Typical Profile

0 to 15 inches: coarse sandy loam
15 to 29 inches: coarse sandy loam
29 to 33 inches: weathered bedrock

Minor Components

Caperton soils

Percent of map unit: 5 percent

Sierra soils

Percent of map unit: 5 percent

Unnamed, mod deep soils

Percent of map unit: 4 percent

Unnamed soils

Percent of map unit: 1 percent
Landform: Drainageways

Map Unit Description

Placer County, California, Western Part

109 Andregg coarse sandy loam, rocky, 2 to 15 percent slopes

Setting

Landscape: Foothills
Elevation: 200 to 1500 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 61 to 61 degrees F
Frost-free period: 200 to 270 days

Composition

Andregg and similar soils: 85 percent
Minor components: 15 percent

Description of Andregg

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from granite

Properties and Qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 29 to 33 inches to Paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low or moderately low (0.00 to 0.06 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Low (about 3.5 inches)

Interpretive Groups

Land capability classification (irrigated): 4e
Land capability (non irrigated): 4e
Ecological site: GRANITIC (R018XD080CA)

Typical Profile

0 to 15 inches: coarse sandy loam
15 to 29 inches: coarse sandy loam
29 to 33 inches: weathered bedrock

Minor Components

Sierra soils

Percent of map unit: 5 percent

Caperton soils

Percent of map unit: 5 percent

Unnamed soils

Percent of map unit: 2 percent

Xerofluvents soils

Percent of map unit: 2 percent
Landform: Drainageways

Unnamed soils

Percent of map unit: 1 percent
Landform: Drainageways

Map Unit Description

Placer County, California, Western Part

196 Xerorthents, cut and fill areas

Setting

Elevation: 400 to 3500 feet
Mean annual precipitation: 8 to 18 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 200 to 300 days

Composition

Xerorthents and similar soils: 90 percent
Minor components: 10 percent

Description of Xerorthents

Setting

Anthropogenic features: Fills
Parent material: Mine spoil or earthy fill

Properties and Qualities

Slope: 2 to 50 percent
Drainage class: Well drained
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Very low (about 0.0 inches)

Interpretive Groups

Land capability (non irrigated): 8e

Typical Profile

0 to 60 inches: variable

Minor Components

Unnamed soils
Percent of map unit: 10 percent

197 Xerorthents, placer areas

Setting

Elevation: 50 to 3200 feet
Mean annual precipitation: 8 to 18 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 150 to 280 days

Composition

Xerorthents and similar soils: 90 percent
Minor components: 10 percent

Description of Xerorthents

Setting

Anthropogenic features: Spoil piles
Parent material: Mine spoil or earthy fill

Properties and Qualities

Slope: 2 to 5 percent
Drainage class: Well drained
Depth to water table: More than 6 feet
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Very low (about 0.0 inches)

Interpretive Groups

Land capability (non irrigated): 7s
Ecological site: PLACER DIGGINGS (R018XD084CA)

Typical Profile

0 to 60 inches: variable

Minor Components

Unnamed soils
Percent of map unit: 10 percent
Landform: Drainageways

Map Unit Description

Detailed Soil Map Units

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

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Soils that have profiles that are almost alike make up a "soil series." Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into "soil phases." Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A "complex" consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

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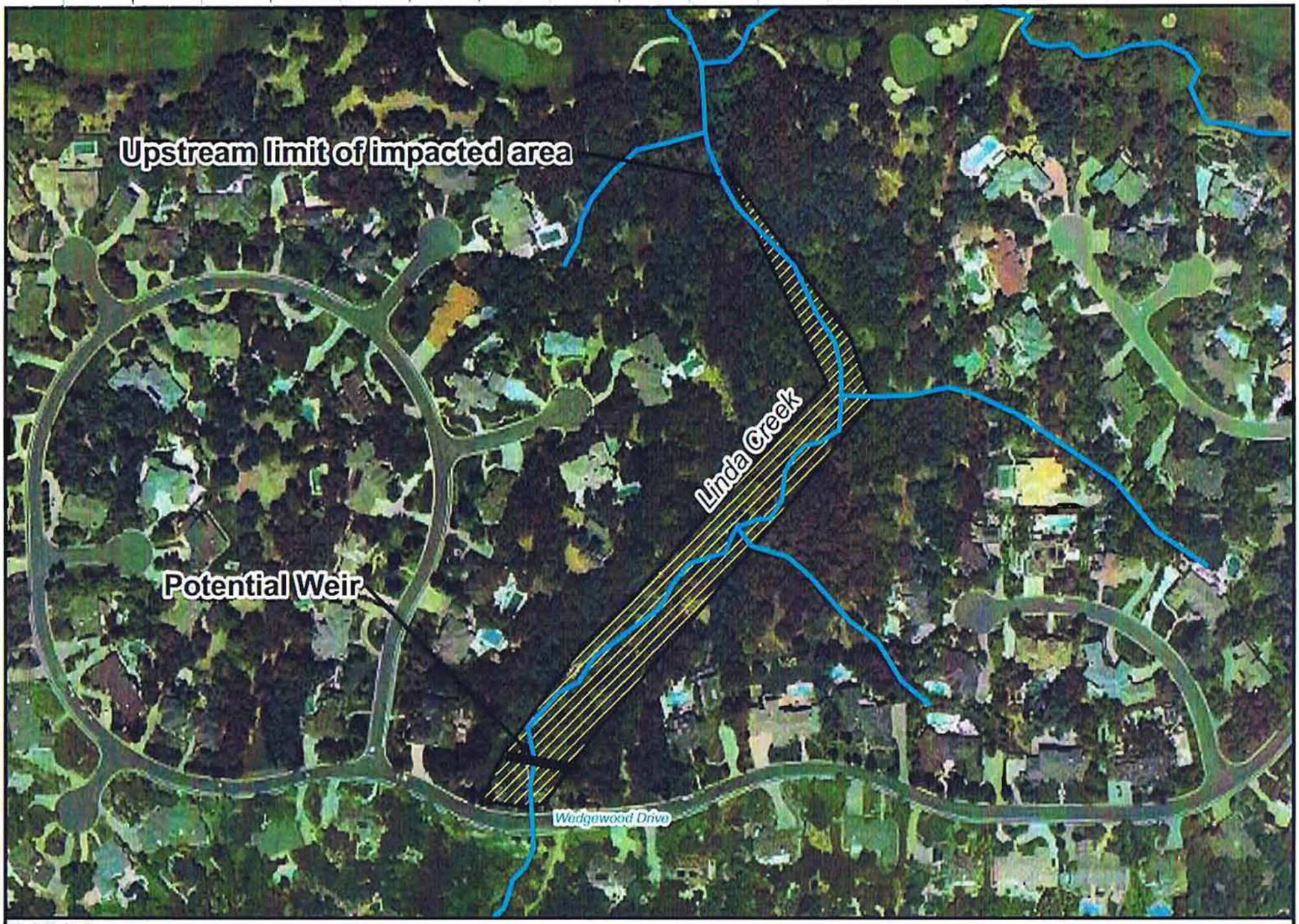


Exhibit 3
Potential Project
Linda Creek upstream from Wedgewood Drive

N

0 40 80 160 Feet

RBF CONSULTING

RESTORATION RESOURCES

N

0 125 250 500 Feet

Site D:
Linda Creek Upstream of Wedgewood Drive

Opportunities & Constraints

Dry Creek Watershed
Placer County, CA
July 30, 2010

Map Unit Description

Placer County, California, Western Part

129 Caperton gravelly coarse sandy loam, 2 to 30 percent slopes

Setting

Landscape: Foothills
Elevation: 200 to 1500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 61 to 61 degrees F
Frost-free period: 220 to 270 days

Composition

Caperton and similar soils: 85 percent
Minor components: 15 percent

Description of Caperton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from granite

Properties and Qualities

Slope: 2 to 30 percent
Depth to restrictive feature: 18 to 22 inches to Paralithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low or moderately low (0.00 to 0.06 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Very low (about 1.8 inches)

Interpretive Groups

Land capability classification (irrigated): 6e
Land capability (non irrigated): 6e
Ecological site: SHALLOW GRANITIC (R018XD098CA)

Typical Profile

0 to 18 inches: gravelly coarse sandy loam
18 to 22 inches: weathered bedrock

Minor Components

Andregg soils

Percent of map unit: 10 percent

Shenendoah soils

Percent of map unit: 2 percent

Unnamed, mod. deep soils

Percent of map unit: 2 percent

Unnamed soils

Percent of map unit: 1 percent
Landform: Drainageways

RESTORATION RESOURCES

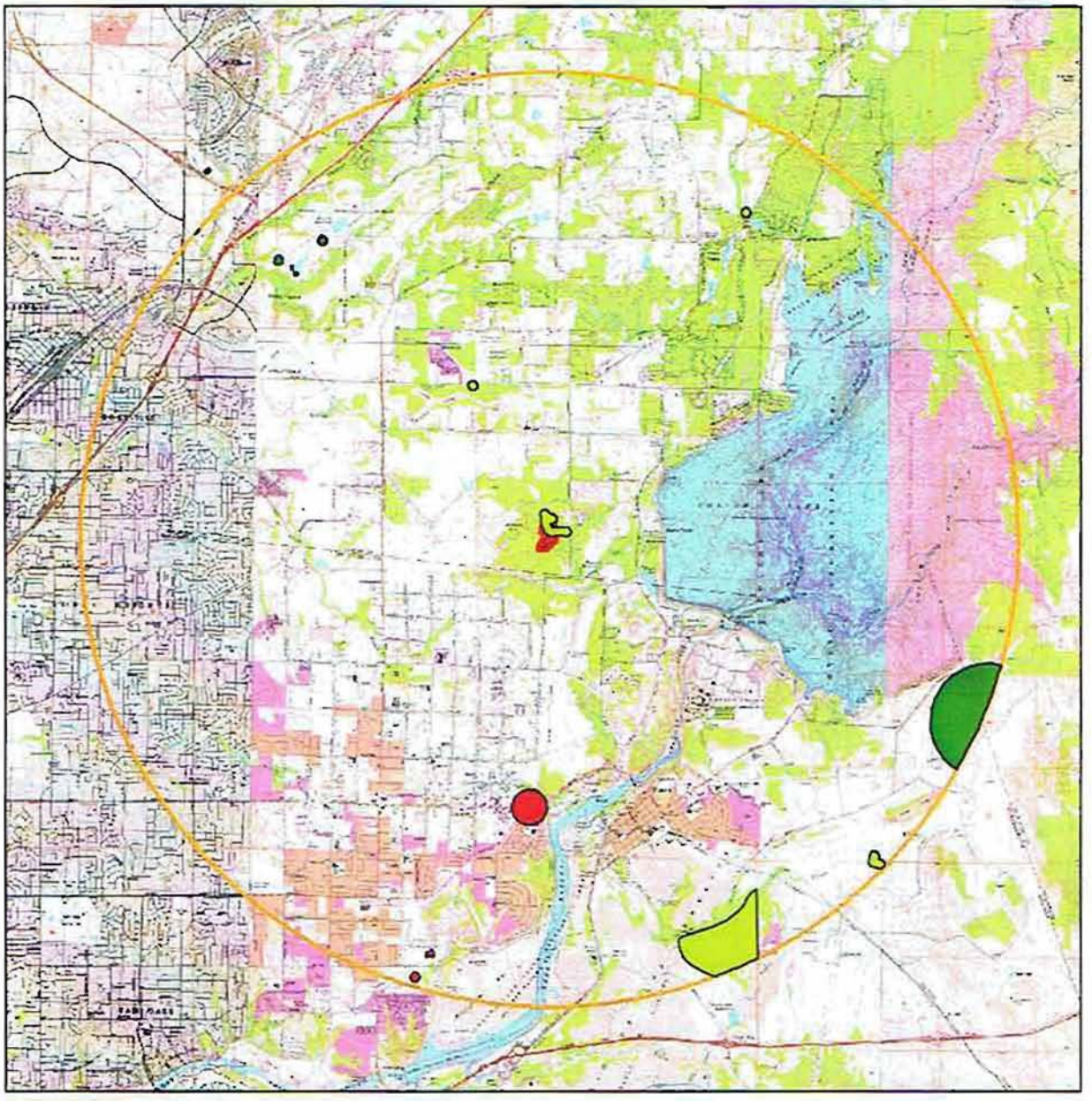
N

0 125 250 500 Feet

Site D:
Linda Creek Upstream of Wedgewood Drive

Opportunities & Constraints

Dry Creek Watershed
Placer County, CA
July 30, 2010



Legend

Plant and Animals (Common Name)

- Boggs Lake hedge-hyssop
- Sacramento Orcutt grass
- valley elderberry longhorn beetle
- vernal pool fairy shrimp

California Natural Diversity Database Map	
Site Analysis- 5 mile radius	
Site D - Linda Creek (upstream of Wedgewood Drive)	
Designed By: LRP	Prepared By: RESTORATION RESOURCES
Drafted By: LRP	
Date: 7.30.10	Job No.: 29001

Legend

- Site Boundary
- 5mile buffer

1:110,000

0 0.5 1 2 Miles

N W E S

Map Unit Description

Detailed Soil Map Units

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Appendix E

Exhibit 4
Potential Project
Linda Creek upstream from Old Auburn Road

N

RBF CONSULTING

RESTORATION RESOURCES

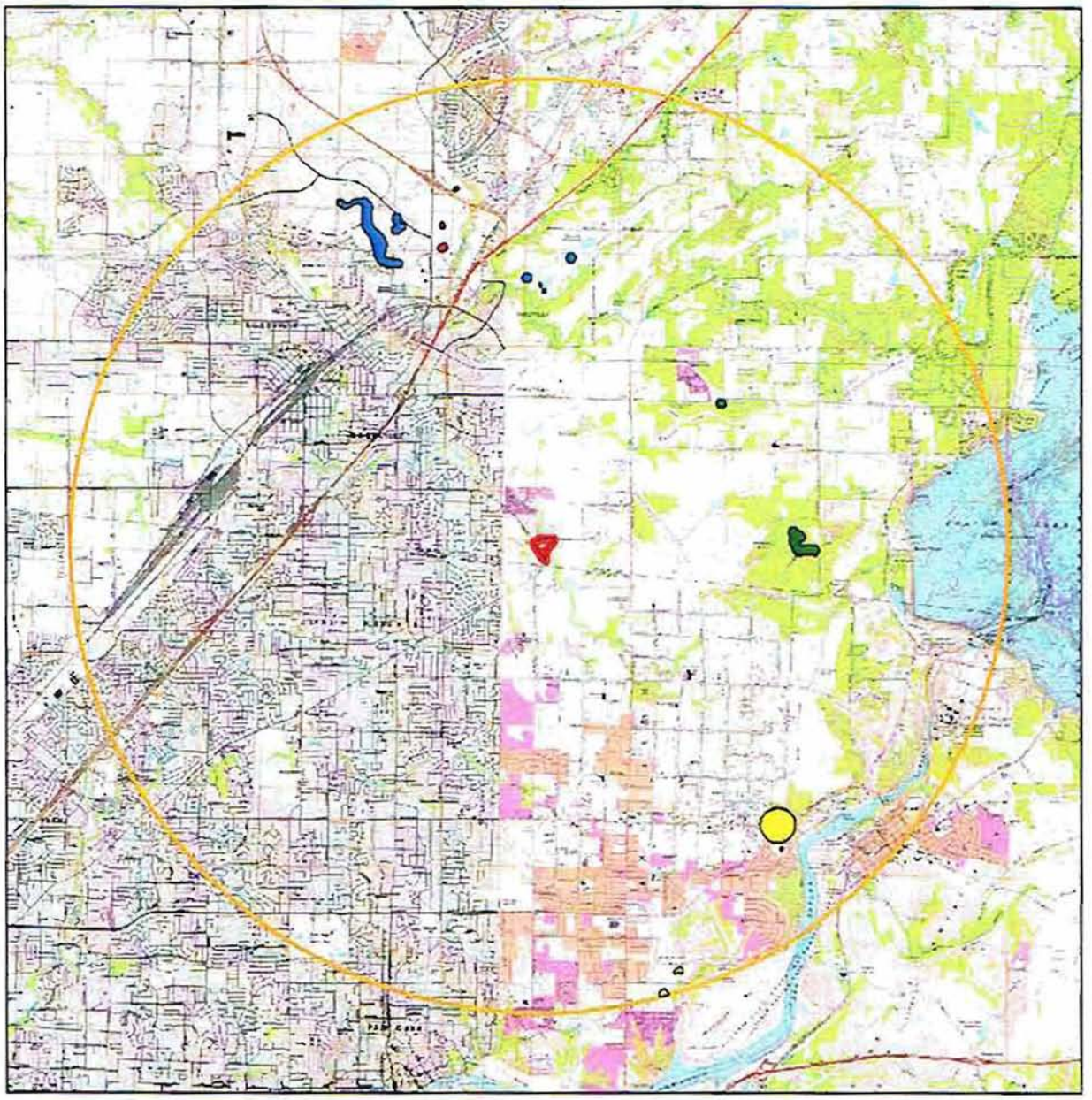
N

0 125 250 500 Feet

Site E:
Linda Creek Upstream of Old Auburn Road

Opportunities & Constraints

Dry Creek Watershed
Placer County, CA
July 30, 2010



Legend

Plant and Animals (Common Name)

- Boggs Lake hedge-hyssop
- Sacramento Orcutt grass
- valley elderberry longhorn beetle
- vernal pool fairy shrimp

California Natural Diversity Database Map	
Site Analysis- 5 mile radius	
Site E - Linda Creek (upstream of Old Auburn Road)	
Designed By: LRP	Prepared By: RESTORATION RESOURCES
Drafted By: LRP	
Date: 7.30.10	Job No.: 29001

Legend

- Site Boundary
- 5mile buffer

1:110,000

0 0.5 1 2 Miles

N W E S

RESTORATION RESOURCES

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0 125 250 500 Feet

Site E:
Linda Creek Upstream of Old Auburn Road

Soils

Dry Creek Watershed
Placer County, CA
July 30, 2010

Map Unit Description

Placer County, California, Western Part

146 Fiddyment loam, 1 to 8 percent slopes

Setting

Elevation: 50 to 280 feet
Mean annual precipitation: 19 to 19 inches
Mean annual air temperature: 61 to 61 degrees F
Frost-free period: 230 to 300 days

Composition

Fiddyment and similar soils: 85 percent
Minor components: 15 percent

Description of Fiddyment

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from siltstone

Properties and Qualities

Slope: 1 to 8 percent
Depth to restrictive feature: 20 to 35 inches to Duripan; 28 to 35 inches to Duripan; 35 to 39 inches to Lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate maximum: 0 percent
Gypsum maximum: 0 percent
Available water capacity: Very low (about 2.7 inches)

Interpretive Groups

Land capability classification (irrigated): 4e
Land capability (non irrigated): 4e

Typical Profile

0 to 12 inches: loam
12 to 28 inches: clay loam
28 to 35 inches: indurated
35 to 39 inches: weathered bedrock

Minor Components

Cometa soils
Percent of map unit: 5 percent

Kaseburg soils
Percent of map unit: 5 percent

San joaquin soils
Percent of map unit: 3 percent

Alamo soils
Percent of map unit: 2 percent
Landform: Depressions

194 Xerofluvents, frequently flooded

Setting

Elevation: 0 to 1500 feet
Mean annual precipitation: 14 to 20 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 270 days

Composition

Xerofluvents, frequently flooded, and similar soils: 90 percent
Minor components: 10 percent

Description of Xerofluvents, frequently flooded

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Properties and Qualities

Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high or high (0.20 to 1.98 in/hr)
Depth to water table: About 30 to 57 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate maximum: 5 percent
Gypsum maximum: 0 percent
Available water capacity: Moderate (about 8.1 inches)

Interpretive Groups

Land capability classification (irrigated): 4w
Land capability (non irrigated): 4w

Typical Profile

0 to 15 inches: stratified loamy sand to fine sandy loam
15 to 37 inches: stratified loamy sand to fine sandy loam to silt loam
37 to 55 inches: stratified loam to silty clay loam to clay

Minor Components

Unnamed soils

Percent of map unit: 10 percent
Landform: Drainageways

Map Unit Description

Detailed Soil Map Units

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description indicates the composition of the map unit and selected properties of the components of the unit.

Soils that have profiles that are almost alike make up a "soil series." Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into "soil phases." Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A "complex" consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

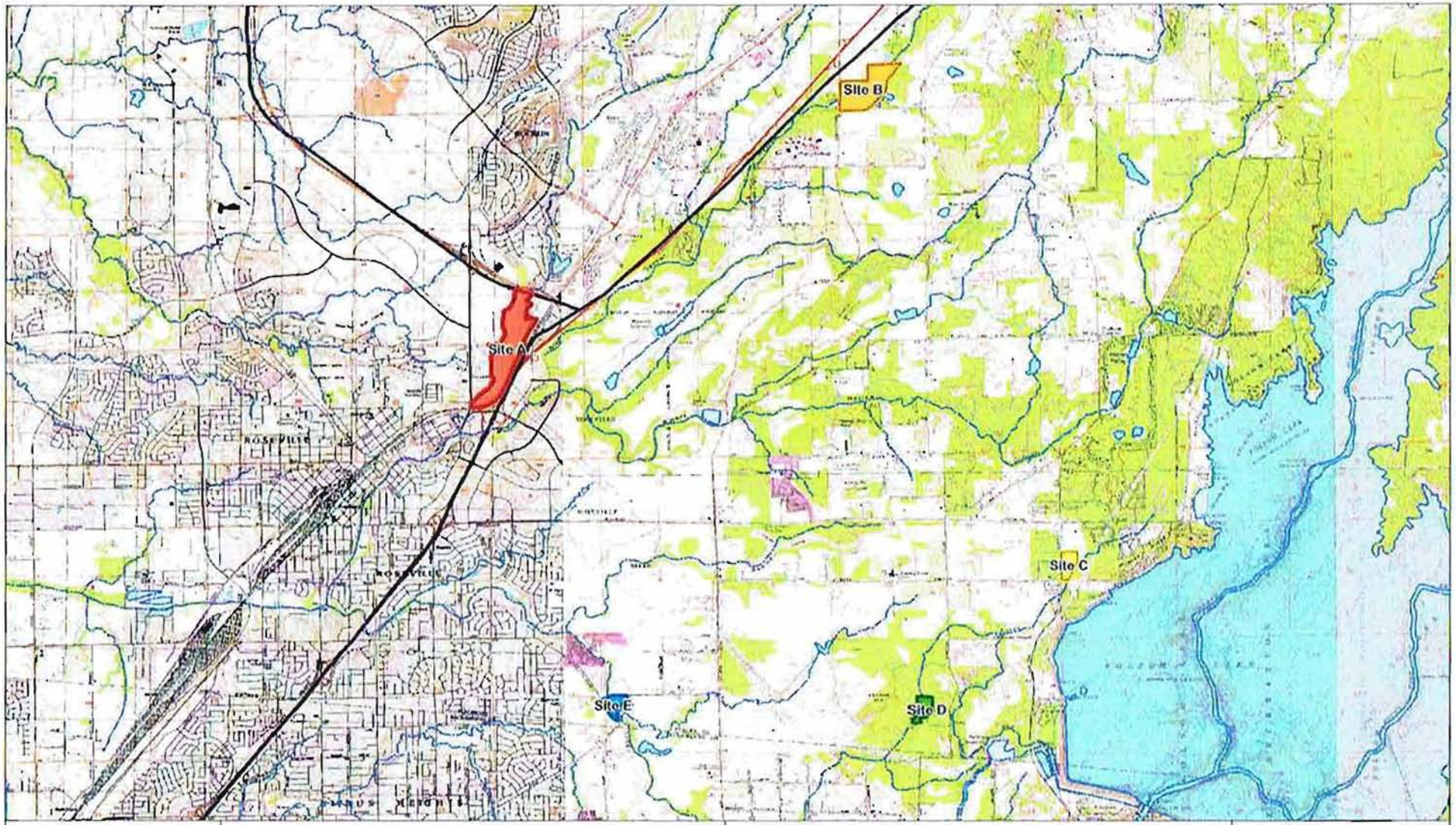
An "association" is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An "undifferentiated group" is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include "miscellaneous areas." Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

Appendix F



RESTORATION RESOURCES

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Dry Creek Watershed
Site Location Map

Site Locations

Dry Creek Watershed
Placer County, CA
July 30, 2010

Appendix L - Funding Plan Supporting Information

Table 1.
Proposed Drainage Facilities and Costs
Dry Creek Watershed Flood Control Plan
Placer County Flood Control District

2010 Dollars

	Total Cost	(Less) Current Dry Creek Trust Fund Balance [1]	Net Cost
Option 1 Implementation of Antelope Creek flood flow reduction project plus ALERT system upgrades	$3,601,000	($1,400,000)	$2,201,000
Option 2 Implementation of Antelope Creek and Secret Ravine flood flow reduction projects plus ALERT system upgrades	$6,835,000	($1,400,000)	$5,435,000
Option 3 Implementation of all five flood flow reduction projects plus ALERT system upgrades	$9,794,000	($1,400,000)	$8,394,000

[1] The proposed projects in Options 1-3 will both mitigate impacts generated by new development as well as correct the existing deficiencies from 1992 to 2010, the period during which fees comprising the Dry Creek Trust Fund were collected.

Table 2A-1.
Maximum Drainage Impact Fees Applicable to New Development: **Option 1**
Dry Creek Watershed Flood Control Plan
Placer County Flood Control District

Land Use	Projected Acres of New Development at Build-out [2]	Average % Impervious	Impervious Acres	Cost Allocation: Total Cost	Cost Allocation: Per Impervious Acre	Assumed DU/Acre (avg)[3]	Total Units	Maximum Fee
Residential								
Single Family (4 du/acre and less) [1]	10,708.0	17%	1,827.2	$1,399,125	$766	0.75	8,031	$174 /unit
High Density (greater than 4 du/acre)	75.5	66%	49.6	$38,015	$766	7.00	528	$71 /unit
Commercial/Industrial	2,120.1	47%	997.6	$763,860	$766			$360 /gross acre
Total	12,903.6		2,874.5	$2,201,000	$766		8,559	

[1] Single Family Residential comprised of Rural Residential, Rural Estates, Low Density Residential, and Medium Density Residential land use designations.
[2] New development based on the difference between the estimated acreage at General Plan buildout and 2007 conditions, excluding the downstream areas in Sacramento County where the impacts from new development will not be mitigated by the proposed drainage facilities.
[3] Dwelling units per acre based on assumptions in 1992 Dry Creek plan. For single family residential, based on weighted average.

Table 2A-2.
Maximum Drainage Impact Fees Applicable to New Development: **Option 1A** Based on $500,000 for Antelope Creek Project from Proposition 84 Grant
Dry Creek Watershed Flood Control Plan
Placer County Flood Control District

Land Use	Projected Acres of New Development at Build-out [2]	Average % Impervious	Impervious Acres	Cost Allocation Total Cost	Cost Allocation Per Impervious Acre	Assumed DU/Acre (avg)[3]	Total Units	Maximum Fee
Residential								
Single Family (4 du/acre and less) [1]	10,708.0	17%	1,827.2	$1,081,287	$592	0.75	8,031	$134 /unit
High Density (greater than 4 du/acre)	75.5	66%	49.6	$29,379	$592	7.00	528	$55 /unit
Commercial/Industrial	2,120.1	47%	997.6	$590,334	$592			$278 /gross acre
Total	12,903.6		2,874.5	$1,701,000	$592		8,559	

[1] Single Family Residential comprised of Rural Residential, Rural Estates, Low Density Residential, and Medium Density Residential land use designations.
[2] New development based on the difference between the estimated acreage at General Plan buildout and 2007 conditions, excluding the downstream areas in Sacramento County where the impacts from new development will not be mitigated by the proposed drainage facilities.
[3] Dwelling units per acre based on assumptions in 1992 Dry Creek plan. For single family residential, based on weighted average.

Table 2B.
Maximum Drainage Impact Fees Applicable to New Development: **Option 2**
Dry Creek Watershed Flood Control Plan
Placer County Flood Control District

Land Use	Projected Acres of New Development at Build-out [2]	Average % Impervious	Impervious Acres	Cost Allocation Total Cost	Cost Allocation Per Impervious Acre	Assumed DU/Acre (avg)[3]	Total Units	Maximum Fee
Residential								
Single Family (4 du/acre and less) [1]	10,708.0	17%	1,827.2	$3,454,905	$1,891	0.75	8,031	$430 /unit
High Density (greater than 4 du/acre)	75.5	66%	49.6	$93,871	$1,891	7.00	528	$177 /unit
Commercial/Industrial	2,120.1	47%	997.6	$1,886,224	$1,891			$890 /gross acre
Total	12,903.6		2,874.5	$5,435,000	$1,891		8,559	

[1] Single Family Residential comprised of Rural Residential, Rural Estates, Low Density Residential, and Medium Density Residential land use designations.
[2] New development based on the difference between the estimated acreage at General Plan buildout and 2007 conditions, excluding the downstream areas in Sacramento County where the impacts from new development will not be mitigated by the proposed drainage facilities.
[3] Dwelling units per acre based on assumptions in 1992 Dry Creek plan. For single family residential, based on weighted average.

Table 2C.
Maximum Drainage Impact Fees Applicable to New Development: **Option 3**
Dry Creek Watershed Flood Control Plan
Placer County Flood Control District

Land Use	Projected Acres of New Development at Build-out [2]	Average % Impervious	Impervious Acres	Cost Allocation Total Cost	Cost Allocation Per Impervious Acre	Assumed DU/Acre (avg)[3]	Total Units	Maximum Fee
Residential								
Single Family (4 du/acre and less) [1]	10,708.0	17%	1,827.2	$5,335,874	$2,920	0.75	8,031	$664 /unit
High Density (greater than 4 du/acre)	75.5	66%	49.6	$144,977	$2,920	7.00	528	$274 /unit
Commercial/Industrial	2,120.1	47%	997.6	$2,913,149	$2,920			$1,374 /gross acre
Total	12,903.6		2,874.5	$8,394,000	$2,920		8,559	

[1] Single Family Residential comprised of Rural Residential, Rural Estates, Low Density Residential, and Medium Density Residential land use designations.
[2] New development based on the difference between the estimated acreage at General Plan buildout and 2007 conditions, excluding the downstream areas in Sacramento County where the impacts from new development will not be mitigated by the proposed drainage facilities.
[3] Dwelling units per acre based on assumptions in 1992 Dry Creek plan. For single family residential, based on weighted average.

Table 3A. Impervious Area by Jurisduction

Impervious Area (square-miles)

		Placer County	Roseville	Rocklin	Loomis	Sacramento County	Total
2007	Single Family Residential	4.93	2.31	1.30	0.68	0.64	9.86
	High Density Residential	0.14	0.24	0.15	0.00		0.53
	Commercial/Industrial	0.49	2.89	0.99	0.46	0.01	4.85
	Other	0.41	0.83	1.08	0.04	0.02	2.39
	Total	**5.97**	**6.28**	**3.52**	**1.19**	**0.67**	**17.63**
		Placer County	Roseville	Rocklin	Loomis	Sacramento County	Total
Build-out	Single Family Residential	6.56	2.48	2.05	0.90	0.73	12.72
	High Density Residential	0.17	0.27	0.16	0.00		0.61
	Commercial/Industrial	0.82	3.30	1.74	0.53	0.01	6.40
	Other	0.18	0.88	1.13	0.03	0.00	2.22
	Total	**7.73**	**6.94**	**5.08**	**1.46**	**0.74**	**21.95**
		Placer County	Roseville	Rocklin	Loomis	Sacramento County	Total
Increase from 2007 to Build-out	Single Family Residential	1.63	0.16	0.75	0.22	0.10	2.86
	High Density Residential	0.03	0.03	0.02	0.00	0.00	0.08
	Commercial/Industrial	0.33	0.41	0.75	0.07	0.00	1.56
	Other	-0.23	0.05	0.05	-0.02	-0.02	-0.17
	Total	**1.76**	**0.66**	**1.56**	**0.27**	**0.07**	**4.32**

Source: RBF 7/21/11

Note: Commercial/Industrial category includes schools and other public structures

Table 3B. Total Area by Jurisdiction

Total Area (square-miles)

		Placer County	Roseville	Rocklin	Loomis	Sacramento County	Total
2007	Single Family Residential	34.59	5.80	2.81	4.54	4.54	52.28
	High Density Residential	0.20	0.38	0.25	0.00		0.83
	Commercial/Industrial	0.62	4.03	1.70	0.61	0.01	6.97
	Other	15.66	4.03	5.29	2.18	1.22	28.39
	Total	**51.08**	**14.23**	**10.05**	**7.33**	**5.78**	**88.46**

		Placer County	Roseville	Rocklin	Loomis	Sacramento County	Total
Build-out	Single Family Residential	46.32	6.19	4.61	6.58	5.30	69.01
	High Density Residential	0.25	0.42	0.27	0.00		0.94
	Commercial/Industrial	1.03	4.63	3.92	0.70	0.01	10.28
	Other	3.47	2.97	1.27	0.04	0.45	8.21
	Total	**51.07**	**14.21**	**10.07**	**7.33**	**5.76**	**88.45**

		Placer County	Roseville	Rocklin	Loomis	Sacramento County	Total
Increase from 2007 to Build-out	Single Family Residential	11.73	0.40	1.80	2.04	0.76	16.73
	High Density Residential	0.05	0.04	0.03	0.00	0.00	0.12
	Commercial/Industrial	0.41	0.60	2.22	0.09	0.00	3.31
	Other	-12.19	-1.06	-4.02	-2.13	-0.77	-20.18
	Total	**0.00**	**-0.02**	**0.02**	**0.00**	**-0.01**	**-0.01**

Table 4. Operations and Maintenance, and Capital Replacement Cost Estimate

Capital Replacement Costs				
	i=	0.06	n=	50
Project	**50-year basis**	**Maintenance**	**Future Replacement**	**Annualized Replacement**
Miners Ravine Off-channel Detention Basin	$500,000	$15,000	$ 9,210,077	$ 31,722
Antelope Creek at Atlantic Street	$684,000	$20,520	$ 12,599,386	$ 43,396
Secret Ravine at Sierra College Boulevard	$437,000	$13,110	$ 8,049,607	$ 27,725
Linda Creek at Old Auburn Road	$130,250	$3,908	$ 2,399,225	$ 8,264
Linda Creek at Wedgewood Drive	$171,975	$5,159	$ 3,167,806	$ 10,911
Linda Creek near Auburn-Folsom Road	$128,750	$3,863	$ 2,371,595	$ 8,168
Total		**$61,559**		**$ 130,186**

Current O&M & Capital Replacement Costs	
Miners Ravine Off-channel Detention Basin	
Annual basin maintenance (CCC)	$ 8,000
Annual landscaping maintenance (Cagwin)	$ 4,000
Special Liability Insurance Policy	$ 17,000
Annual Incidental	$ 3,000
ALERT System	$ 14,000
Total O&M	**$ 46,000**
Miners Ravine Annualized Replacement Cost	$ 32,000
Total Current O&M + Capital Replacement Costs	**$ 78,000**

Future O&M & Capital Replacement Costs	
Current O&M + Capital Replacement Cost	$ 78,000
Antelope Creek O&M	$ 21,000
Antelope Creek Annualized Replacement Cost	$ 43,000
Annual Software Maintenance & Technical Support	$ 6,000
Annual Gage Maintenance (7 new sites – 2 visits per year)	$ 26,000
Total Future O&M & Capital Replacement Costs	**$ 174,000**

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