

7 WATERSHED MANAGEMENT PLAN

2021

SACRAMENTO
COUNTY

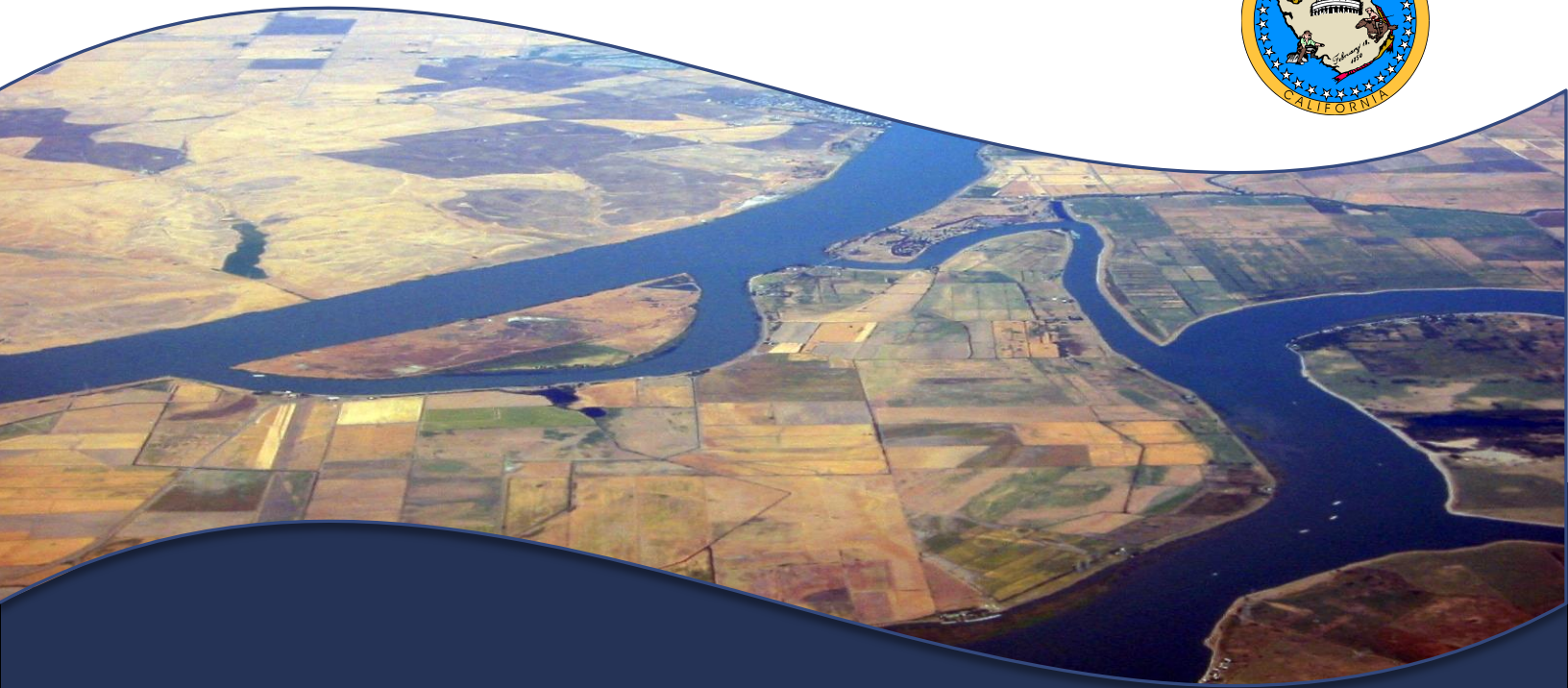


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WATERSHED MANAGEMENT PLAN

PURPOSE AND OVERVIEW

This Watershed Management Plan describes the regulatory framework, planning and coordination to reduce flooding caused by development on a watershed basis in Sacramento County. Development, consisting of buildings, parking lots, streets, gutters, drainage pipes and channels create impervious surfaces and speed up the flow of runoff that result in increases in storm runoff volumes and peak discharges. The impact of proposed development on existing development and hydraulic conveyance systems should always be evaluated.

Sacramento County lies mostly in the trough of the Sacramento Valley in the northern portion of the Central Valley of California. The county is bound on the east by the Sierra Nevada foothills and extends to the southwest into the Sacramento Delta. The county totals 994 square miles and has seven incorporated cities. There are seven incorporated cities in the County of Sacramento including:

- Citrus Heights
- Elk Grove
- Folsom
- Galt
- Isleton
- Rancho Cordova
- Sacramento

The total population of Sacramento County (2020) is 1,555,365.

Jurisdiction	Total Population
Citrus Heights	87,811
Elk Grove	176,154
Folsom	81,610
Galt	25,849
Isleton	828
Rancho Cordova	78,381
Sacramento	510,931
Unincorporated County	593,801
Total	1,555,365

Source: California Department of Finance, 2020 E-1 Report

Additionally, there are three adjacent counties, Placer County, El Dorado County and Sutter County, that have creek watersheds draining into Sacramento County and to the Sacramento River Delta.

The purpose of this plan is to provide an understanding of the region's watershed behaviors to base future decisions on that will reduce the increased flooding from development on a watershed-wide basis.

This plan will:

- Evaluate future conditions
- Identify wetlands and natural areas
- Address the protection of natural channels
- Provided a dedicated funding source for implementing the plan

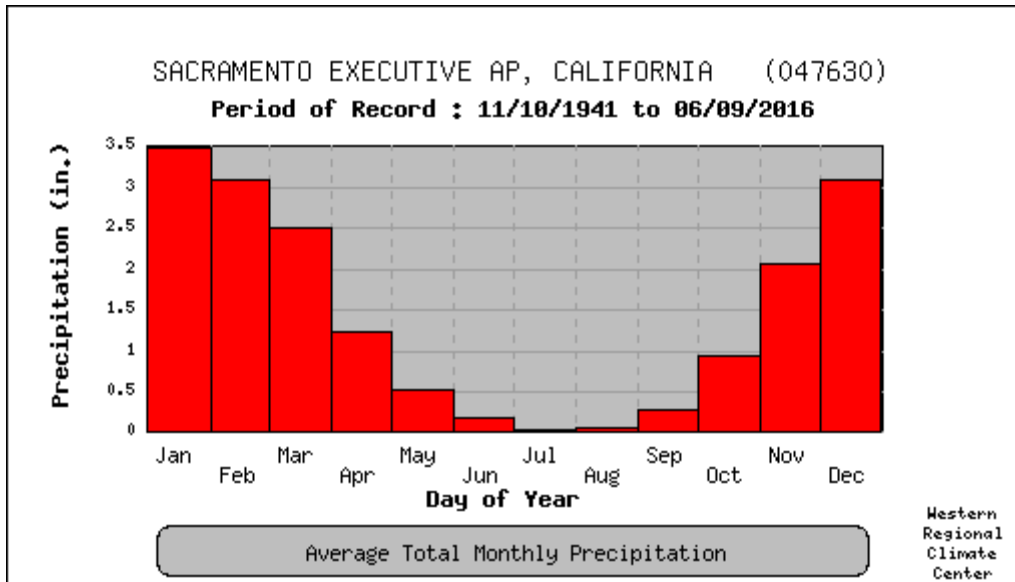
Sacramento County Flood Insurance Rate Maps were first issued March 15, 1979 and the county has continuously been a community in good standing with the National Flood Insurance Program (NFIP). Each city has a Federal Emergency Management Agency (FEMA) NFIP community number and an independent relationship with the NFIP.

The FEMA Community Rating System (CRS), under the Insurance Services Office recommends watershed management planning that is not limited to corporate boundaries. Under CRS Activity 450, a participating community may receive points toward improved rating and lowered flood insurance premiums for preparing a plan such as this and updating that plan every five years.

CONDITIONS

PRECIPITATION

The County experiences most precipitation between November and April. Essentially all of the precipitation that occurs in the area is rain. Based on data gathered at Sacramento FAA Airport between 1941 and 2021, average annual rainfall is approximately 17.63 inches, but can range from wet to dry years. Between 1941 and 2021, recorded annual rainfall ranged from a low of 5.81 inches in 2013 to a high of 33.44 inches in 1983 (Western Regional Climate Center 2021).



Source: Western Regional Climate Center 2021

SOIL TYPE

The prevalent soil in Sacramento County is Soil Conservation Service Type D, tightly bound and low permeability. Summertime humidity is quite low but the winter is more humid with lower temperatures (40 to 60 degrees Fahrenheit). Freezing conditions are rare, but there are often extended periods of fog. Consequently, soil remains quite moist throughout the rainy season. Therefore, land development, in general, has a greater effect on peak flow timing due to routing (gutters, pipes, channels) than volume increases due to increased impervious area (paving and rooftops). Flooding has been a major concern in this county since before the Gold Rush.

FUTURE CONDITIONS

According to the City of Sacramento's General Plan 2035 and Cal-Adapt (climate change scenario planning tool developed by the California Energy Commission) average temperatures in the Sacramento region are projected to rise between four and six degrees by 2100, based on low and high emissions scenarios, respectively (Cal-Adapt 2013). Cal-Adapt uses a method to downscale global climate model data to local and regional resolution under two emissions scenarios; the A-2 scenario represents a business-as-usual future emissions scenario, and the B-1 scenario represents a lower GHG emissions future.

The increase in average temperature is expected to have the following effects:

- **Sea level rise.** Rising sea levels are expected due to temperature increases that cause ocean water to expand, Arctic and glacial ice to melt, and increased amounts of snowpack runoff to enter the sea. California's ocean surface temperature patterns have been warmer than normal for the past

decade, a condition known as Pacific Decadal Oscillation. California sea level appears to have risen by about seven inches over the 20th century and is predicted to rise up to 55 inches by the end of the 21st century. Sacramento's location (70 miles inland coast) limits the most significant effects from sea level rise. However, rising sea levels may lead to levee failures in the Delta causing infrastructure damage, flooding, and saltwater intrusion into groundwater aquifers that may affect Sacramento region groundwater sources. It is also possible that sea level rise could reduce the effectiveness of Delta and nearby Delta levees or increase flood levels in tidally affected reaches of the Sacramento River, if storm flow and tide conditions coincide. An influx of saltwater would degrade California's inland estuaries, wetlands, and groundwater aquifers. Saltwater intrusion could threaten the quality and reliability of California's biggest fresh water supply that is pumped from the southern edge of the Sacramento/San Joaquin River Delta (City of Sacramento 2011).

- **Changes to precipitation patterns.** Precipitation levels are difficult to predict compared to other indicators of climate change. Annual rain and snowfall patterns vary widely from year to year, especially in California. Generally, higher temperatures increase evaporation and decrease snowpack, resulting in a drier climate. A majority of scientific models have shown that northern California precipitation is expected to decrease after 2030. But, more precipitation is expected to fall as rain rather than as snow. According to DWR, the Sacramento region has actually seen an increase in annual precipitation of about one inch over the last century. DWR research from 1901 to 2000 shows that the Sacramento River system runoff volume has remained stable on an annual basis, but there has been a 9 percent reduction in runoff from April through July. This is likely the result of increased winter rainfall and less snowpack storage. DWR anticipates that over the next century the Sacramento region will likely experience a slight increase in annual precipitation, with larger and more intense storms resulting in flood conditions, and longer drought periods. However, according to Cal-Adapt, the Sacramento region is projected to experience a slight decrease in annual precipitation levels (rain and snow) by 2090. It is expected that there will be less snowfall in the Sierra Nevada and the elevations at which snow falls will rise. Coincidentally, there will be less snowpack water storage to supply runoff water in the warmer months. Already it has been documented that California's snow line is rising (City of Sacramento 2011).
- **Increased frequency of extreme events such as heat waves, drought, and storm events.** Extreme heat waves are expected to increase in number by ten times in the Sacramento region and could become an annual event by 2100. Sacramento could experience up to 100 additional days per year with temperatures above 95°F and by 2090, the average July temperature could reach over 104°F. Changes to air and land temperatures will have an impact on the timing, amount, type, and location of precipitation and runoff in the Sacramento and American Rivers watersheds. This will impact the quantity of water supplies, the management of those quantities, the quality of the source

water, and the demand for treated drinking water. DWR has identified anticipated changes to the source water conditions in the watershed that will likely impact the quality of the source waters, including more intense storm events, longer drought periods, reduced snowpack at lower elevations, and earlier spring runoff. Extreme weather is expected to become more common throughout California. More extreme storm events are expected to increase water runoff to streams and rivers during the winter months, heightening flood risks. (City of Sacramento 2011).

These changing conditions are expected to affect our region in the following ways:

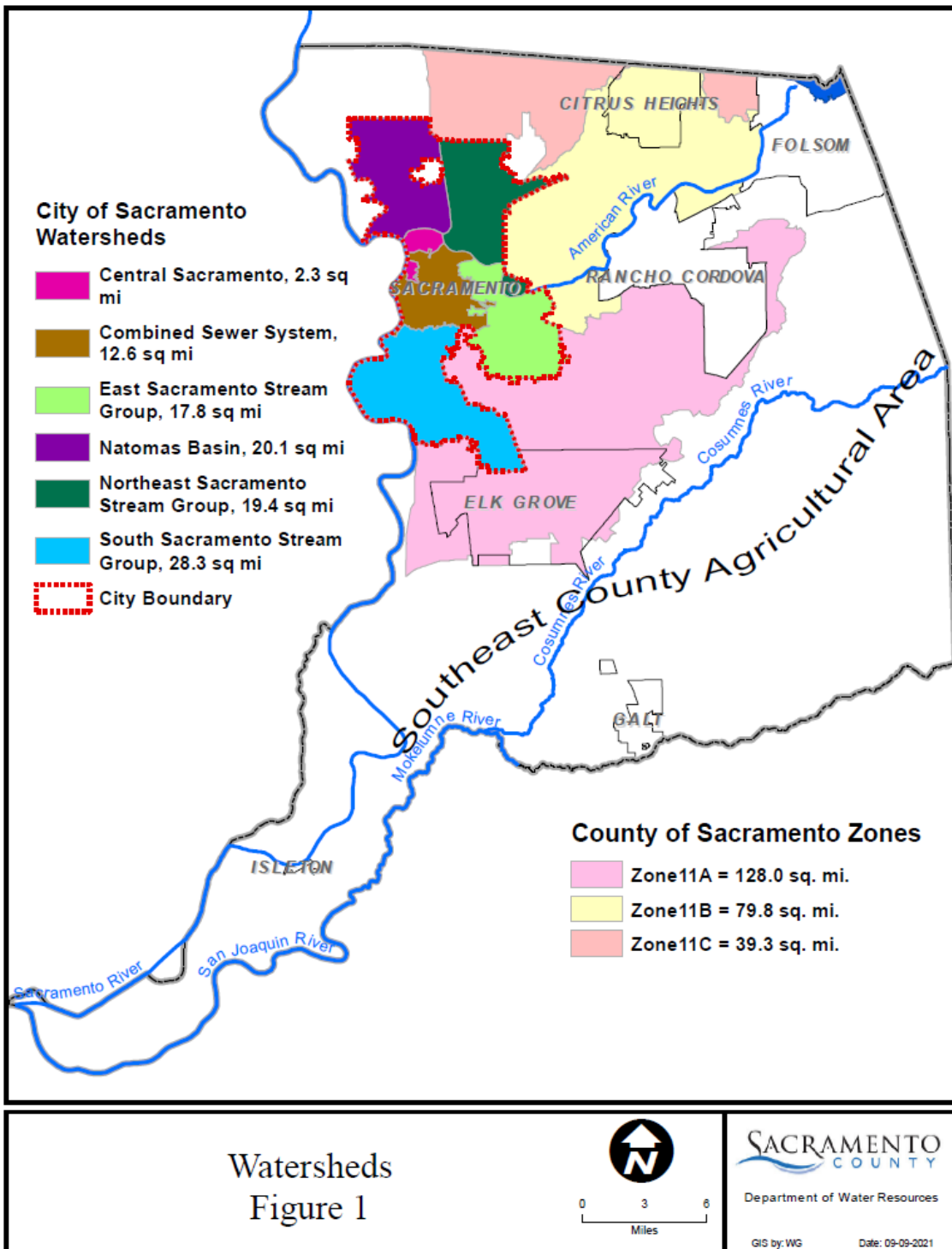
- **Impacts to biological resources:** Habitats that currently support local wildlife are expected to change, forcing plants and animals to either adapt to the new environment or move to more hospitable areas. Some species will be able to adapt to changing habitats by shifting their range or altitudes in order to adjust to rising temperatures. Others, however, might not be able to adapt fast enough to keep pace with the rate of climate change. For some species, climate change may allow them to increase the range of habitat where they can live; however, where plants and animals need to move to survive they may find wildlife corridors blocked or competition from other species (City of Sacramento 2011).
- **Increased risk of flood events:** Warmer ocean surface temperatures have caused warmer and wetter conditions in the Sierra Nevada, increasing flood risk. When the Sacramento or American Rivers are already at peak capacity, additional flows from increased snowpack runoff or storm intensity could cause flooding. During the last 50 years peak flow patterns have increased in the Sacramento River, making floods more likely in the future, especially if there is an increase in intense storms (City of Sacramento 2011).

WATERSHEDS

The urban and urbanizing areas of the County, including the Cities of Rancho Cordova, Elk Grove and Citrus Heights, are divided into three zones of the Sacramento County Water Agency, a statutorily created district operating under the authority of and pursuant to the provisions of the Sacramento County Water Agency Act (West's California Codes, Water Code Appendix, Chapter 66, commencing at Section 66-1, et seq.; Deering's California Codes, Water, Uncodified Acts, Act 6730a). These zones are identified on Figure 1 as 11A, 11B, and 11C, as shown on Figure 1.

The City of Sacramento is made up of two major waterways. The confluence of these two major waterways, the Sacramento River and American River, is within the City. The City also encompasses several other streams, creeks, and associated watersheds. The majority of these watersheds drain into the City from the County of Sacramento. The major drainage watersheds in the City can be divided into six groups and geographic areas. These areas are identified on Figure 1 as Natomas Basin, Northeast Sacramento Stream Group, East Sacramento Stream Group, South Sacramento Stream Group, Combined System, and Central Sacramento.

Figure 1: Watershed Boundaries with Calculated Areas



DRY CREEK AND NEMDC AND TRIBUTARIES (ZONE 11C)

The drainage master planning in the Dry Creek and Steelhead Creek (Natomas East Main Drainage Canal, NEMDC) tributary watersheds (Zone 11C) are fully master planned for pending development. These areas are generally large lot agricultural-residential parcels with roadside ditches and culvert crossings. There are two large developments being proposed known as Elverta Specific Plan, and South Placer Vineyard (the latter being in Placer County). The urban area known as Antelope was constructed in the late 1980s and early 1990s and is 86.4% developed and was fully master planned.

WATERSHEDS IN THE DRY CREEK STREAM GROUP

Dry Creek - 4138 acres in Sacramento County draining to the lower NEMDC, then to the American River, there are 48,966 acres upstream in Placer County. The Dry Creek study, dated 1992, was approved by both counties. There is a current effort in Placer County to update the hydrology study for Dry Creek and its tributaries. The two counties have enjoyed a good working relationship and technical cooperative partnership.

Basin A - A tributary to Antelope Creek draining toward Placer County and into Dry Creek. It was part of the Antelope community development master planning in the early 1990's and is fully developed.

Magpie Creek - 3789 acre watershed draining to the former McClellan Air Force Base (now a business park) and is master planned through the Base property and into the City of Sacramento. There is a 2008 study by West Yost that when constructed would serve to reduce flood risk to OptiSolar and adjacent buildings. There is no opportunity for major infill upstream of the McClellan Business Park.

Robla Creek - 5141 acre watershed in the county before it enters the City of Sacramento toward the confluence with Dry Creek and the NEMDC. It is 99.8% developed.

Linda Creek and Tributaries - 3580 acre watershed in Orangevale area draining to the City of Roseville which is a tributary to Dry Creek ultimately draining back to Elverta and Rio Linda in Sacramento County. The Linda Creek watershed is 99.5% developed.

Sierra Creek - 1743 acre watershed draining to Dry Creek in the Antelope community.

The Natomas East Main Drainage Canal (NEMDC) - Also known as Steelhead Creek has a backwater floodplain along the east side. The zoning in the eastern area is generally agricultural residences. American River backwater into the NEMDC is controlled by Pump Station Number D-15, which serves to reduce the base flood elevation upstream. There is a volume concern and there is a mitigation fee component of Zone 11C. No filling is allowed in the NEMDC backwater floodway area unless compensatory excavation is demonstrated. A fee is collected under the Sacramento County Water Agency

Code for the future addition of a pump at this pump station. Currently, floors are set based on a one pump failed scenario which generally provides an extra one foot of freeboard in the backwater area.

NEMDC Tributary 1 flows to the NEMDC and conveys flows from southwest Placer County. There are 1526 acres in Placer County and 865 acres in Sacramento County. South Placer Vineyard Development will pay the Pump Station D-15 mitigation fee.

NEMDC Tributary 2 is a 2744 acre watershed area with no planned infill development, except the Elverta Specific Plan, which will attenuate peak flow and volume impacts with large detention basins.

NEMDC Tributary 3 is a 1567 acre watershed area with no planned infill development, except the Elverta Specific Plan.

East Natomas is an 1816 acre watershed area with no planned infill development.

DRAINAGE STUDIES FOR ZONE 11C (DEVELOPING AREAS, AND AREAS IN NEED OF IMPROVEMENT)

NEMDC Tributaries - Drainage study was developed by Borcalli & Associates in 1994. It is being used by Water Resources to condition development. The precipitation data and land use are still appropriate, as well as the hydrology (HEC-1). The hydraulic model is updated from HEC-2 to HEC-RAS as appropriate.

Elverta Specific Plan - An approved drainage master plan that would include peak flow detention to minimize the impact to Tributaries 1 and 2.

- The Elverta Specific Plan Drainage Master Plan revision was prepared in 2011 by MacKay & Soms Engineers.

Dry Creek Watershed Flood Control Plan - Sponsored by both Placer County Flood Control District and the Sacramento County Water Agency and has been in use since 1992. It is currently being updated by Placer County. It is being used by both Placer County and Water Resources to condition development.

Robla/Magpie Creeks Drainage Study - Developed by Borcalli & Associates for SAFCA, and the City and County of Sacramento in 1998, and updated by Mead & Hunt Engineers in 2007. It is being used by Water Resources to condition development.

Robla and Magpie Creek Diversion Levee CLOMR - Developed by Ensign & Buckley on April 2002.

McClellan Park Magpie Creek Floodplain Improvements - Includes hydrologic and hydraulic modeling for Magpie Creek developed by West Yost in 2011 to revise FEMA floodplain from AO zone to AE zone in area of Idzorek Street. The CLOMR has been approved by FEMA in 2009.

South Placer Vineyard - Drainage study for the County of Placer.

Linda Creek Hydrology - Prepared by Nolte Associates, Inc. (the study contractor) for the Federal Emergency Management Agency (FEMA) under Contract No.EMS-2000-CO-0057 Order No. T002 and completed in September 2004. Both Placer and Sacramento Counties served as a Cooperating Technical Partners (CTP's) for this study.

NATURAL STREAMS GROUP AND TRIBUTARIES (ZONE 11B)

Drainage master planning in the natural streams and areas, draining to the American River (Zone 11B), is deemed 100% master planned. The 'natural streams' are protected by the county zoning code. These natural streams are generally lined with established oak and other vegetation serving as habitat and shade canopy. The county opposes disruption to these sensitive areas encompassing most of the Zone 11B creeks and primary tributaries.

WATERSHEDS IN THE NATURAL STREAM GROUP (ZONE 11B)

American River - 100% master planned and controlled by state and federal regulators. Folsom Dam and a system of certified levees control the flows in this river. Any proposed land development in the lower reach of this 2100 square mile watershed could not have any significant impact on peak flow. RBF Consulting prepared for Sacramento Area Flood Control Agency and the City and County of Sacramento a study and letter of map revision submitted to and approved by FEMA in 2010. MBK Engineers submitted an updated hydrology and hydraulic analysis for the process to certify the levees along the River. This new base flood profile will be mapped with the forthcoming FEMA map revision.

Arcade Creek – 6,508 acre watershed is 98.2% developed with only 54 acres of infill area remaining. There is no valid location for peak flow detention; however, as redevelopment occurs there will be opportunities for installation of stormwater quality treatment devices. Modeling on Arcade Creek was by County Water Resources staff (in 1995-98 and upstream of Auburn Blvd in 2007) and the resulting profile is used where it is higher than recorded high water and FEMA flood insurance study. An additional modeling effort conducted by County Water Resources staff was submitted to FEMA in 2015. The modeling showed 100-year water surface elevations that are significantly higher than the FEMA base flood elevations. **Arcade Creek South Branch** – 1,657 acre watershed in which lies the approved (104 acre) Gum Ranch Specific Plan, which is slated for a peak flow detention basin when the project is constructed by the development interests. The Gum Ranch hydrology study used in the project environmental impact report is deemed current. Upon completion of Gum Ranch development, this watershed will be about 99% developed.

Brooktree Creek - City of Citrus Heights, is 97.8% developed.

Mariposa Creek - City of Citrus Heights, is 97.2% developed.

Carmichael Creek – 2,725 acre watershed draining to the American River. The watershed is 96.8% developed.

Chicken Ranch Slough – 3,722 acre watershed draining to the American river via Pump Station D-05. The watershed is 98.9% developed.

Cripple Creek – 4,327 acre watershed in Citrus Heights draining to Arcade Creek. The watershed is 98.5% developed.

Diablo Creek - 9,48 acre watershed draining to Arcade Creek and is 95.5% developed.

Fair Oaks Stream Group – Comprised of several smaller watersheds draining to the American River totaling 7819 acres and is 97.8% developed.

Manlove Creek – 1,893 acre watershed is 99.9% developed.

Kohler Creek - Also known also as Date Creek, is a 694 acre watershed draining to Arcade creek and is 97.1% developed.

Minnesota Creek – 1,095 acre watershed draining to the American River and is 95.7% developed.

Strong Ranch Slough – 4,573 acre watershed draining to the American River via Pump Station D-05. The shed is 99.3% developed.

Sunrise Creek – The watershed is entirely in the City of Citrus Heights and is 96.1% developed.

Verde Cruz Creek – 1,226 acre watershed draining to Arcade Creek and is 97.3% developed.

Alder Creek– 7,226 acre watershed draining to Lake Natomas reservoir on the American River. There is no need for flood flow or volume detention since the flow is to a federally operated reservoir. There will be hydromodification attenuation basins as well as low impact development measures. A detailed drainage study for Glenborough/Easton Development, dated 2013, was approved for environmental review, additional analysis is needed before the project can proceed to design.

Buffalo Creek – 9,167 acre watershed draining to the American River. The Westborough Drainage Master Plan accounts for the area known as Aerojet which is slated for development. There will be peak flow detention in order to not exacerbate the downstream floodplain. The drainage master plan will be incorporated in the environmental impact report for the forthcoming project.

Mayhew Channel – 2,861 acre watershed draining to the American River. The shed is 96.6% developed.

Boyd Channel - Also known as Boyd Station Channel the 2201 acre watershed drains to the American River and is 95.9% developed.

Cordova/Coloma Stream Group – Comprised of several smaller shed areas draining to the American River totaling 1,728 acres and is 92.6% developed. This is in the City of Rancho Cordova.

DRAINAGE STUDIES FOR ZONE 11B (INFILL DEVELOPMENT AND CAPITAL IMPROVEMENT)

The following is a list of current drainage master plans including existing condition and fully development condition hydrology.

Chicken Ranch Slough - Drainage Master Plan was first developed by Water Resources staff in 1991 to identify solutions to flooding problems. Several large public meetings were held. A lack of consensus on an overall solution resulted in only one part of a recommended plan being implemented – revised channel maintenance procedures. Residences with low finish floor elevations were identified for elevating but home owners were not interested. The HEC-1 and HEC-2 models developed in the study were used as best available information until they were updated by staff in 2006 with SacCalc and HEC-RAS models.

Strong Ranch Slough/Sierra Branch - A drainage study was developed by David Ford Engineers for Water Resources in 2006 to analyze flood control alternatives. Staff expanded on the modeling in 2007 and developed a website and flood warning system for the area. The models are used by staff to analyze capital improvement projects.

D-05 - Drainage pump station that serves Strong Ranch and Chicken Ranch Sloughs. A 2003 Corps of Engineers Feasibility Study identified doubling the capacity of the D-05 pump station as the only feasible solution to reducing flooding in the area. There is no cost-effective solution that provides 100-year protection. A project to perform needed maintenance to the pump motor wiring resulted in a significant increase in motor horsepower and capacity to four of the six pumps. The benefit of the increased capacity is currently being modeled.

Arcade Creek - Water Resources commissioned a drainage study at Auburn Boulevard at the City of Sacramento Border in 2003 by a consultant to determine the level of protection for the Evergreen Estates floodwall. The county applied for and received provisional accreditation of this levee in 2009, but has not submitted the required levee analysis needed to certify the levees. The County submitted as flood study to FEMA in 2015 that included reaches of Arcade and Cripple creeks. The modeling showed 100-year water surface elevations that are significantly higher than the FEMA base flood elevations. The study is under review by FEMA and is currently used for floodplain management.

South Branch Arcade Creek - Drainage studies were performed as referenced in the approved environmental impact reports for the Gum Ranch and Sheltonham developments. Hydrologic models were developed to analyze development impacts and mitigation measures.

Glenborough, Easton, Westborough - Drainage studies were developed associated with the proposed redevelopment of a portion of the GenCorp- Aerojet site in the Alder Creek and Buffalo Creek watersheds. These studies developed hydrologic and hydraulic modeling to determine development impacts and mitigation measures. Current study, by MacKay and Soms is dated 2013 and is being used for environmental review of the project.

Mayhew Drain Levee LOMR - Letter of Map Revision for Mayhew Drain was prepared by RBF Consulting in January 2010 to reflect improvements done by SAFCA, and the ACOE.

American River - American River Letter of Map Revision for American River was prepared by RBF Consulting, LOMR approved by FEMA 2010, mapping 145,000 cfs flow from Folsom Dam as the base flood.

MORRISON CREEK STREAM GROUP (ZONE 11A)

The Morrison Creek Stream Group may be deemed 100% master planned for peak flow, volume, and stormwater pollution prevention. The majority of growth in Sacramento County will occur in this area. Consequently, a great deal of effort has been put forth to master plan the necessary trunk drainage improvements. Ongoing master planning is occurring in the unincorporated County in association with the Vineyard Springs Comprehensive Plan, North Vineyard Station Specific Plan, West Jackson Master Plan, Mather South Community Master Plan, Newbridge Specific Plan, and Jackson Township Comprehensive Plan.

Many of the creeks in this watershed have reaches of natural bed and bank and are home for a variety of plant and animal species. These areas are treated with care and any hydraulic improvements would be only under strict guidance of the state and federal regulators under the Clean Water Act, Endangered Species Act and the California Environmental Quality Act. Thus, permits for creek corridor improvement projects will careful consideration of the habitat value and may include construction of naturalized side slopes, ponds, pools, and native landscaping.

Stormwater pollution prevention during construction and post development storm pollutant discharge treatment are always required. Additional measures are taken, where applicable, to assure minimal hydro-fluvial geomorphology impact due to proposed development by attenuating peak flow and volume.

WATERSHEDS IN THE MORRISON CREEK STREAM GROUP

Elder Creek – 7632 acres, 100% developed condition master planned for the approved North Vineyard Station and Florin Vineyard Specific plans. Master planning is ongoing in the Aspen 8 & 9 mining area, and the Jackson Township Comprehensive Plan area.

Elk Grove Creek- 4019 acres, 100% developed condition master planned for the East Elk Grove Specific Plan, City of Elk Grove.

Florin Creek – 2857 acres, 100% developed condition master planned for the proposed Florin Vineyard Specific Plan. The South Sacramento Stream Group project includes flood protection projects along Florin Creek consisting of channel improvements and construction of a flood control basin which was completed in 2016.

Gerber Creek – 2579 acres, 100% developed condition master planned for the approved North Vineyard Station Specific Plan and the approved Vineyard Springs Specific Plan. The latter is superseded by the North Vineyard Station Drainage Master Plan dated 2004 and subsequent revisions to the modeling to incorporate development planning for the Wildhawk North project. Construction of channel improvements began in 2016 in the upper reaches of Geber Creek in association with North Vineyard Station planned development.

Laguna Creek - Headwaters in the City of Rancho Cordova is 100% master planned for the proposed Sun creek Specific Plan. Laguna Creek between the cities of Elk Grove and Rancho Cordova is fully master-planned in the Vineyard Springs Specific Plan approved documents. The primary flood control facility is the Triangle Rock aggregate pit which mitigates the loss of floodplain due to mining activities south of Florin Road. This facility will help control flood flows that jump from the Laguna Creek to Gerber Creek watershed at the CCTRR railroad embankment. Another detention basin planned just upstream of the railroad embankment will, in combination with the Triangle Rock Basin, fully mitigate cutting off the inter-basin transfer of flows from Laguna Creek to Elder Creek. The total Laguna Creek watershed is 21176 acres draining from just upstream of the City of Rancho Cordova's eastern boundary, through the planned development area over the Folsom South Canal, through Mather Field and preserve areas to the Vineyard Springs development area and into the City of Elk Grove ultimately discharging to Beach Stone Lakes. Elk Grove has modeled the creek up to the northern city boundary (Calvine Road) and County Water Resources has modeled the creek from the top of the shed to Calvine Road. All models are existing condition and developed condition. The study by Wood Rodgers dated 2006 and the study by MacKay & Soms dated 2009 are superseded by the 2015 LOMR model by West Yost.

Laguna Creek and Tributary 1 in the City of Elk Grove was modeled with the 2009 submitted FEMA letter of map revision.

There was a 2020 conditional letter of map amendment submittal to FEMA for upper Laguna Creek flood control at the Southgate Soccer Field Basin Site at Carmencita and the Triangle Aggregate Basin Site north west of Florin Road and Sunrise Blvd.

Morrison Creek – 34592 acres, Upper Morrison Creek is 100% master planned as part of developments in the City of Rancho Cordova. Middle Morrison Creek flood control is occurring at the Aspen 6 aggregate mine where there is a constructed weir. Lower Morrison Creek is in the City of Sacramento and has been fully studied by the Corps of Engineers who are designing a floodwall project. The large Jackson Highway Master Plan area encompasses much of the Morrison Creek watershed immediately upstream of the City of Sacramento. The hydrology study dated 2009 by Wood Rodgers will be succeeded by studies being prepared for the West Jackson Highway Master Plan which encompasses a large area of the Morrison Creek watershed in the county.

Strawberry Creek and Jacinto Creek– Total 5588 acres partially in cities of Elk Grove and Sacramento is almost fully developed and master planned with several flood control and storm water quality detention basins. The study by/for Water Resources 1993 is deemed current.

Unionhouse Creek – 2193 acres tributary to Strawberry Creek and Morrison Creek is 100% master planned for the proposed Florin Vineyard Specific Plan. The developed condition drainage study by Civil Solutions dated 2007 is deemed current.

Whitehouse Creek – 100% master planned and developed in City of Elk Grove.

The South Sacramento Streams Project promoted by Sacramento Area Flood Control Agency with CA Department of Water Resources and the City of Sacramento will control flooding on Elder Creek, Unionhouse Creek, Florin Creek, and Morrison Creek west of Highway 99. The project consisted of levee improvements starting south of the town of Freeport and running easterly into the urbanized areas of the City of Sacramento. The project also included channel improvements along Florin and Unionhouse creeks.

Whitehouse Creek and Elk Grove Creek are tributaries to Laguna Creek which drains to the City of Sacramento then to the Beach Stone Lake Preserve

Strawberry Creek is tributary to Unionhouse Creek draining into the City of Sacramento and the South Sacramento Streams Group flood control project, then to the Beach Stone Lake Preserve.

Beach Stone Lake Tributaries drain the western half of the City of Elk Grove toward the Beach Stone Lake Preserve.

Mitigation of impacts to the Beach Stone Lake floodplain is discussed later in this document.

DRAINAGE STUDIES FOR ZONE 11A (DEVELOPING AREAS)

The following lists the current drainage master plans including existing condition and fully development condition hydrology.

Vineyard Springs Comprehensive Plan - The drainage plan for this planning area was developed by the Spink Corporation in 1999, and updated by Water Resources staff in 2003 and 2007. It was first adopted by the Sacramento County Board of Supervisors in 2003 and most recently in 2007. The plan, along with updates to the design and FEMA model are being used by Water Resources to condition development.

North Vineyard Station Specific Plan - The drainage plan for this planning area was developed by Borcalli & Associates in 2001 and updated by MacKay & Somps Engineers in 2006. It was approved by the Board of Supervisors in 2006. The modeling is going through updates as needed as new information is available, but the plan and revised modeling are being used by Water Resources to condition development.

Florin Vineyard Gap Community Plan - The drainage plan for this planning area was approved by Water Resources in 2007. The modeling is going through updates as needed as new information is available, but the drainage plan and revised modeling are being used by Water Resources to condition development.

Strawberry/Jacinto Creek Drainage Master Plan - This drainage master plan was developed by Water Resources staff in 1993. It was used to regulate pending development in the watersheds at the time, and is still used to condition development. The precipitation data is still appropriate, as well as the hydrology (HEC-1). The hydraulic model is updated from HEC-2 to HEC-RAS as necessary. The land use plan for the remaining undeveloped areas in the watershed is still appropriate.

Lower Laguna Creek Drainage Master Plan - This drainage master plan was developed by Water Resources staff in 1996. It was used to regulate pending development in the watersheds at the time, and is still used to condition development. The precipitation data is still appropriate, as well as the hydrology (HEC-1). The hydraulic model is updated from HEC-2 to HEC-RAS as necessary. The land use plan for the remaining undeveloped areas in the watershed is still appropriate.

Whitehouse Creek Drainage Study - This drainage study was first developed by Water Resources staff in 1996 and updated in 2006. It is being used by Water Resources to condition development.

Upper Morrison Creek - The Rio del Oro, Anatolia, and Sunridge drainage master plans in the City of Rancho Cordova serve to attenuate peak flow at the constraints crossing the Folsom South Canal.

Beach Stone Lake - Zone 11A watersheds converge to Morrison Creek, Laguna Creek which flow through the cities of Sacramento and Elk Grove, respectively, and ultimately to the preserve area known as Beach Stone Lake. In the Zone 11A program, is an impact fee that is collected, and separately accounted, for Beach Stone Lake mitigation. The Beach Stone Lakes Cumulative Impact Analysis dated September 1992 by Ensign and Buckley Consulting Engineers for Sacramento County used the DWR NETWORK unsteady-state hydraulic model to analyze the floodplain and the impacts of Zone 11A development. Subsequently, the Elliott Ranch South floodplain encroachment was presented in the Final Supplemental Environmental Impact Report for Elliott Ranch South General Plan Amendment (County Control Number 98-0617, dated July 1999, and an analysis of the impact of developing Shed B through the East Franklin Specific Plan and Laguna Ridge, in the City of Elk Grove was presented in those EIRs. This model is the current analysis of development impact to Beach Stone Lake.

Arboretum-Waegell Specific Plan - This specific plan for 1,350 acres enclosed by Sunrise Blvd, Jackson Road, and Grant Line Road was prepared by Wood Rodgers on March 24, 2010.

DRAINAGE STUDIES FOR ZONE 11A (CITY OF ELK GROVE)

Laguna Creek and Tributaries (including Elk Grove Creek and Whitehouse Creek)

- Laguna Creek Watershed Management Action Plan, Carmel Brown, CKB Environmental Consulting, Inc., Greg Suba, Environmental Education Services, EDAW, Inc. and Geosyntec Consultants, September 2008.
- Drainage Study for Elk Grove Creek, MacKay & Somps, May 24, 2007.
- Drainage Study for Vintara Park, MacKay & Somps, December 5, 2005.
- East Area Storm Drainage Master Plan Revised Draft Version, Harris & Associates, November 18, 2005.
- Sacramento County Laguna Creek LOMR Hydrologic Data, July 2005.
- Laguna Creek Feasibility Study Final Report, Quincy Engineering, Inc., June 13, 2005.
- Laguna Creek Hydrologic and Hydraulic Analysis, David Ford Consulting Engineers, March 2005.
- Technical Memorandum, Drainage Analysis for Fieldstone Unit 3 and Waterman Ranch Detention Basin within East Elk Grove Specific Plan, Watermark Engineering, Inc., February 10, 2006.
- Upper Laguna Creek Drainage Master Plan, Status Report, Sacramento County Water Resources Division, September 1997.
- East Elk Grove Specific Plan, Preliminary Technical Studies Report, MacKay & Somps, March 1994.
- Laguna Creek Watershed Analysis, David Ford Consulting Engineers, Inc. December 15, 2005.

- Hydrologic and Hydraulic Analysis to Assess Existing Condition for Flood Plain Extents for Whitehouse Creek and Unnamed Tributary to Whitehouse Creek, David Ford Consulting Engineers, Inc, September 2009.
- Storm Drainage Master Plan for Field Stone South, Mackay and Somps, April 6, 2006, revised May 10, 2006.
- Drainage Study for Old Town Mixed Use, RFE Engineers, Inc., revised October, 2006.
- Shops at Calvine, Storm Drainage Study and Plan prepared for Armstrong Development Properties, Inc. Jacobs, June 25, 2009.
- Drainage and Hydraulic Analysis Report Bond Road Widening Project, Engeo Incorporated, September 2, 2004.
- Drainage Report for the bond Road widening Project, David Evans and Associates, January 2007.
- Preliminary Drainage Report for the Bradshaw Widening Project, David Evans and Associates, May 2007.
- Seasons Hydrologic and Hydraulic Study, TSD Engineering, Inc., October 22, 2007, revised January 8, 2008.

Grant Line Channel

- Elk Grove Regional Park and Emerald Lakes Golf Course Storage Capacities, Letter from Psomas to City of Elk Grove, June 2005.
- Grant Line Channel and Pump Station D-39 Hydrologic and Hydraulic Analysis, PSOMAS, March 2005.

Laguna West Lakes

- Design Report, Laguna Creek Unit No.4 Hydrology Study, The Spink Corporation, July 1990.

Lakeside

- Design Report, Lakeside Development Hydrology Study, The Spink Corporation, July 1991.

Sheds A&B

- Drainage Master Plan for Laguna Ridge Specific Plan prepared for the Hodgson Company, updated and revised by WOOD Rodgers, July 2002.
- Laguna Ridge Specific Plan Supplemental Master Drainage Plan for Local Drainage Shed B, Wood Rodgers, May 2005.
- Laguna Ridge Specific Plan Storm Drainage CIP, Wood Rodgers, February 2005.
- East Franklin Interim Drainage Facility Analysis, Wood Rodgers, August 20, 2003.

Shed C

- Laguna Ridge Specific Plan Supplemental Drainage Plan for Local Drainage Shed C, Wood Rodgers, October 2005.
- Master Drainage Plan for Elk Grove Promenade, Local Drainage Area Shed C, Wood Rodgers, October 2005.

Strawberry Creek

- Strawberry and Jacinto Creeks, Drainage Master Plan, Draft Report, County of Sacramento Water Resources Division, July 1993.
- Storm Drainage Master Plan Report, Upper Reach of Middle Branch of Strawberry Creek, Elk Grove/West Vineyard Area, MacKay & Soms, February 5, 1992.

Miscellaneous

- Elk Grove General Plan adopted by the City Council November 19, 2003 and reflecting Amendments through January 5, 2005.
- Draft Laguna West Levee Certification Study, City of Elk Grove and Wallace Kuhl, 2011.

NORTHEAST SACRAMENTO STREAM GROUP

The Northeast Sacramento Stream Group contains 15 internal drainage basins. The existing drainage system serving this area is comprised of storm drains and open drainage channels. Runoff within the watershed is conveyed to sumps through the existing drainage system.

WATERSHEDS IN THE NORTHEAST SACRAMENTO STREAM GROUP

- American River
- Natomas East Main Drainage Canal (NEMDC, a.k.a. Steelhead Creek)
- Dry Creek
- Rio Linda Creek
- Robla Creek
- Magpie Creek Diversion
- Upper Magpie Creek
- Don Julio Creek
- Lower Magpie Creek (a.k.a. Historic Magpie Creek)
- Arcade Creek
- Hagginwood Creek

- Icehouse Ditch
- Sears Ditch
- Chicken Ranch/Strong Ranch Slough (D-05)

DRAINAGE STUDIES IN THE NORTHEAST SACRAMENTO STREAM GROUP

- Basin 83 Master Plan – June 1992
- Basin 95 Master Plan – June 2004
- Basin 109 Master Plan – June 2004
- Basin 117 Master Plan – February 1998
- Basin 144 Master Plan – February 2001
- Basin 151 Master Plan – April 1996
- Basin 152 Master Plan – September 2016
- Basin 153 Master Plan – April 1992
- Basin 157 Master Plan – September 2007
- Basin 158 Master Plan – September 1997
- Magpie Creek Diversion Drainage Study – Brown & Caldwell - May 1985
- Magpie Creek Floodplain Analysis – David Ford – November 2001
- Historic Magpie Creek Memo and Magpie Creek Supplemental Analysis – David Ford –August 2003 & June 2005
- Robla and Magpie Creek Diversion Levee CLOMR, Ensign & Buckley – April 2002
- Magpie Creek 100-year and 200-year Floodplain Mapping – June 2016
- Arcade Creek Watershed Plan – June 2003

EAST SACRAMENTO STREAM GROUP

The East Sacramento Stream Group contains 31 internal drainage basins (City of Sacramento). The existing drainage system serving this area is comprised of storm drains and open drainage channels. Runoff within the watershed is conveyed to sumps through the existing drainage system.

WATERSHEDS IN THE EAST SACRAMENTO STREAM GROUP

- American River
- Morrison Creek
- Sacramento State Ditch
- PG&E Ditch
- Procter Gamble Ditch
- Florin Creek

- Lake House Acres Creek

DRAINAGE STUDIES IN THE EAST SACRAMENTO STREAM GROUP

- Basin 5 Master Plan – June 1996
- Basin 8 Master Plan – June 1996
- Basin 10 Master Plan - February 2000
- Basin 19 Master Plan – June 1996
- Basin 31 Master Plan – May 1999
- Basin 37 Master Plan – April 1996
- Basin 43 Master Plan – April 1996
- Basin 51 Master Plan – August 2006
- Basin 96 Master Plan – June 1996
- Basin 101 Master Plan – June 1996
- Basin 113 Master Plan – May 1999
- Basin 155 Master Plan – October 1997
- Basin G209 Master Plan – February 1997
- Basins G248 Master Plan Drainage Study - January 1998
- Basins G249 Master Plan Drainage Study - January 1998
- Basin G258 North Master Plan – June 2003
- Aspen Basins Drainage Study

SOUTH SACRAMENTO STREAM GROUP

The South Sacramento Stream Group contains 49 internal drainage basins. The existing drainage system serving this area is comprised of storm drains and open drainage channels. Runoff within the watershed is conveyed to sumps through the existing drainage system.

WATERSHEDS IN THE SOUTH SACRAMENTO STREAM GROUP

- Sacramento River
- South Sacramento Drainage Canal
- Willow Slough
- Anderson Slough
- Morrison Creek
- Elder Creek

- Florin Creek
- Unionhouse Creek
- Strawberry Creek
- Laguna Creek
- Jacinto Creek
- Pocket Canal

DRAINAGE STUDIES IN THE SOUTH SACRAMENTO STREAM GROUP

- Sacramento River & Morrison Creek Letter of Map Revision – Wood Rodgers – November 2006
- Morrison Creek Letter of Map Revision – Wood Rodgers – September 2009
- South Sacramento Streams Group Letter of Map Revision – Wood Rodgers – May 2014
- 200-year South Sacramento Streams Group Floodplain Mapping – June 2014 Laguna Creek 200-year and 500-year Floodplain Mapping – June 2016
- Basin 22 Master Plan – November 2003
- Delta Shores Drainage Study
- Basin 23 Master Plan – September 2000
- Basin 25 Master Plan – February 2007
- Basin 26 Master Plan – September 2000
- Basin 35 Master Plan – November 2004
- Basin 54 Master Plan – April 2008
- Basin 108 Master Plan – November 2003
- Basin 67 Master Plan – April 1998
- Basin 68 Master Plan – April 1998
- Basin 69 Master Plan – April 1998
- Basin 115 Master Plan – July 2006
- Basin 139 Master Plan – April 1998
- Basin G252 Master Plan - March 2000
- Basins G269 South Master Plan – November 1996
- Basins G273 Master Plan – November 1996
- Basin 147 Master Plan – December 2019

CENTRAL SACRAMENTO

The Central Sacramento contains 4 internal drainage basins. The existing drainage system serving this area is comprised of storm drains and open drainage channels. Runoff within the watershed is conveyed to sumps through the existing drainage system.

WATERSHEDS IN CENTRAL SACRAMENTO

- American River
- Sacramento River

DRAINAGE STUDIES IN CENTRAL SACRAMENTO

- Basin 52 Master Plan – 2017
- Railyards Development Drainage Study

COMBINED SEWER SYSTEM

The City of Sacramento owns and operates a combined sewer system (CSS) that conveys residential and commercial wastewater and storm water runoff from approximately 11.7 square miles in downtown Sacramento, East Sacramento, Oak Park, and the Land Park area. There are 5.8 square miles of separated areas of the City north, east, and south of the CSS that contribute sanitary flows to the CSS. The CSS serves approximately 205,000 people. The CSS includes four key facilities to manage the collected flow: Sumps 1/1A, Sumps 2/2A, Pioneer Reservoir, and the Combined Wastewater Treatment Plant (CWTP). Sumps 1/1A and 2/2A pump up to 60 million gallons per day (mgd) of flows to the Sacramento Regional County Sanitation District's Regional Wastewater Treatment Plant (SRWTP). Pioneer Reservoir and CWTP provide additional storage and, when needed, primary treatment, and disinfection of combined sewage prior to discharge to the Sacramento River.

WATERSHEDS IN THE COMBINED SYSTEM

- American River
- Sacramento River

DRAINAGE STUDIES IN THE COMBINED SYSTEM

- Combined Sewer System Improvement Plan – July 1995
- Combined Sewer System Improvement Plan Update Report - December 2015

NATOMAS BASIN (COUNTY OF SACRAMENTO)

Located in the northwestern corner of Sacramento County is Natomas Basin Reclamation District 1000. 53,548 acres includes areas of Sutter County, the City of Sacramento, and Unincorporated Sacramento County. 26,449 acres of this reclamation district area is in Sacramento County. Sacramento Area Flood Control Agency with the State of California and the Corps of Engineers is constructing a massive levee improvement project to bring the levees protecting the basin up to FEMA standards and 200-year level of protection (0.5% annual recurrence). The US Army Corps of Engineers lifted their previous certification of this levee system and FEMA remapped the area as an AE flood zone effective December 8, 2008. Building permits will no longer be issued after that date awaiting reaccreditation of the levees and revised

flood insurance rate maps. In 2014, SAFCA, the City of Sacramento and the County requested FEMA remap the Natomas Basin into the Zone A99 floodplain citing the progress made to improve the levees and in securing federal authorization for the project. In 2015, FEMA remapped the entire basin into the Zone A99 floodplain and reincorporated the underlying Zone A floodplain that existed before the remap in 2008. In 2016, the City of Sacramento and Sutter and Sacramento counties contracted to have West Yost study and determine the 100-year and 200-year internal floodplain elevations in the Natomas Basin. The key source of floodwater within the Natomas Basin occurs when the river system spills over a low-hardened section of the northeast levee during very large storms events. Internal drainage canals and pumps to the river system are operated by Reclamation District 1000. Developments are conditioned to attenuate discharge flows to predevelopment levels in areas where Reclamation District 1000 (RD1000) pumps are not being improved.

There is industrial development in the unincorporated county in the Natomas area all draining to reclamation district channels and pump plants. The unincorporated portion of the Natomas area is 87.5% agricultural and 5% developed and 7.5% developing. The 2,000 acre Metro Air Park is currently under development and attenuates its peak flow discharge to the RD1000 channels and pumps. The 6,000 acre North Precinct Plan area is currently under design and will include internal levees and control peak discharge to the RD1000 channel and pumps.

This is the very bottom of the 2100 square mile American River watershed and nearly the bottom of the 27,000 square mile Sacramento River watershed so discharge from RD1000 would not exacerbate peak flow in the river.

NATOMAS BASIN (CITY OF SACRAMENTO)

Southern portions of the Natomas Basin are located in the City of Sacramento. As mentioned above, the Natomas interior drainage canals drain the Natomas Basin. Developments in the area are conditioned to attenuate discharge flows to predevelopment levels using a 2016 unified model. The unified model is maintained by RD1000. The portion of the Natomas Basin that is within the City of Sacramento is mostly built out. Currently, development is underway in the Panhandle and Greenbriar.

Within the City of Sacramento, Drainage Master Plans (internal drainage) have been prepared for the entire area of Natomas located north of I-80 and west of Natomas East Main Drainage Canal. This area was, until recently, a "greenfield" area, served only by natural, primitive, rural, and agricultural drainage systems. The master-planned drainage systems for this area have been installed, and continue to be installed, concurrent with, or just ahead of, urban development.

WATERSHEDS IN THE NATOMAS BASIN (CITY OF SACRAMENTO)

- Sacramento River
- Natomas East Main Drainage Canal (NEMDC, a.k.a. Steelhead Creek)
- East Canal
- West Canal
- Main Canal
- San Juan Ditch
- Bannon Creek

Reclamation District 1000 is preparing an internal drainage study to demonstrate the residual floodplain after the levee system is certified. This study began in 2021.

DRAINAGE STUDIES IN THE NATOMAS BASIN (CITY OF SACRAMENTO)

- 200-year Natomas Basin Interior Drainage Study - May 12, 2016
- Basin 11 Master Plan - December 1997
- Basin 12 Master Plan – March 1999
- Basin 13 Master Plan - August 2001
- Basin 14 Master Plan – August 1997
- Basin 15 Master Plan – December 1997
- Basin 16 Master Plan – December 1997
- Basin 17A and 17B Master Plan – June 1997
- Basin 18 Master Plan - June 1997
- Basin 19 Master Plan - December 1997
- Basin 20 Master Plan – November 1993
- Basin 61 Master Plan – August 2001
- Basin 62 Master Plan – January 2004
- Basin 64 Master Plan – September 2006
- Basin G206 Master Plan – December 1999
- Basin G207 Master Plan – April 2006
- Basin G208 Master Plan – July 1999
- Basin 129 Master Plan -January 2021

SOUTH COUNTY AGRICULTURAL AREA

The Southeastern part of the County is primarily zoned large lot agricultural with a population of 23,509 at an average density of 39 people per square miles. This area is controlled as agricultural land by the County General Plan. The FEMA special flood hazard designation encumbers 31% of the land in this area. The FEMA flood insurance studies and California Department of Water Resources advisory floodplain study suffice to protect the modest amount of expected construction in this area.

Within this area is a proposed specific plan named Cordova Hills. This specific plan area mainly drains to Coyote Creek and Deer Creek. Impacts to these two creeks are being identified through master planning and FEMA mapping.

Cosumnes River is a wild and scenic river with agricultural levees and no flood control. The floodplain assumes levee breaches and is quite wide. The zoning within the floodplain area is large lot agricultural.

Beach Stone Lake floodplain is caused by Laguna and Morrison Creek watershed, Cosumnes River and backwater from the Delta. This expansive floodplain area is zoned large lot agricultural.

The Delta area is protected by levees that were first built during the Gold Rush era and have been subsequently improved by various state and federal programs. The Delta is an integral feature in the state water project providing water to the greater central and southern California agricultural and urban areas. The state and federal governments are working on long term solutions to problems in the delta concerning flood control, habitat, water quality and water supply. The communities of Walnut Grove, Locke, Courtland, Hood, and Freeport in the unincorporated county and incorporated City of Isleton lie in areas of flood risk should there be levee failure on various Delta islands. Internal drainage is managed by Reclamation Districts who are also charged with maintenance of the levee systems. There about 86,000 acres in the FEMA floodplain in the Delta due to levee that are not accredited of which about 35,000 acres were added to the SFHA due to de-accreditation as mapped by FEMA in 2012. With the exception of the towns listed above, the Delta is large lot agricultural zoning.

DRAINAGE STUDIES FOR SOUTH COUNTY AGRICULTURAL AREAS

Upper Cosumnes River Flood Mapping Study - Hydrologic and hydraulic modeling was performed in 2008 by Civil Engineering Solutions, Inc. to update and revise the existing Zone A of the Flood Insurance Rate Map. The total study reach is approximately 9.8 miles from the upstream side of Dillard Road Bridge to approximately one mile upstream of Michigan Bar Road Bridge. FEMA incorporated the revised flood data into a physical map revision effective July 19, 2018.

Dry Creek Watershed Update Plan - This drainage study was prepared by Civil Solutions in April 2011.

Easton Drainage Master Plan - Alder Creek and Buffalo Creek Sheds - 1,400 acre Specific Plan located in Rancho Cordova between Sunrise Blvd, Jackson Road, and Grantline Road was prepared by McKay & Soms in March 2010. A detailed drainage study for the Glenborough/Easton Development was approved for environmental review in 2013, additional analysis is needed before the project can proceed to design.

Cordova Hills Drainage Master Plan - 2,668 acre Specific Plan area is located between Grant Line Road and Scott/Stonehouse Road and south of White Rock Road. The study was prepared by McKay & Soms in March 2011 and is being updated pending comment from Sacramento County.

LIMITED LAND USE AREAS (COUNTY OF SACRAMENTO)

There are large areas of the County that are excluded from the Watershed Management Plan and CRS Activity 450 because of their land use and lack of impact to urban and urbanizing watersheds. Natomas is surrounded by levees and all of the stormwater is pumped from the basin to the river. The south county agricultural areas are zoned large lot agriculture and there is an extremely small level of proposed development.

ORIGINATING OUTSIDE SACRAMENTO COUNTY

The three counties with watersheds draining into Sacramento County are Placer, El Dorado, and Amador counties.

PLACER COUNTY

Dry Creek is the main creek entering Sacramento County from Placer County. It is a master planned creek described later in this report in Zone 11C Drainage Master Plans, and Watershed Agreements. The upper portions of the NEMDC and tributaries drain from Placer County. They are also described in Zone 11C.

EL DORADO COUNTY

Most of the area draining into Sacramento County from El Dorado County is undeveloped. Within that, however, is El Dorado Hills, an 18-square mile residential/commercial master planned community that was developed periodically between 1962 and recent years. It drains into Carson Creek, a tributary to Deer Creek, which feeds into the Cosumnes River and has had negligible impact on Sacramento County. This area is included in the South County Agricultural Area.

AMADOR COUNTY

About 11 square miles of undeveloped (agricultural) watershed drains either directly into, or to Arkansas Creek and then into, the Cosumnes River. This area is included in the South County Agricultural Area.

WETLANDS AND NATURAL AREAS

All grading projects of more than 5-acres in size must obtain a Clean Water Act Section 401 Certification from the State. All work in or near waters of the State and water of the U.S. must obtain permits from Fish and Game and/or Corps of Engineers.

It is noted in the City of Sacramento General Plan that grasslands throughout much of Sacramento historically supported vernal pools and seasonal wetlands. However, much of this habitat has been lost with development. The largest remaining concentration of vernal pool and seasonal wetland habitat is in North Sacramento and Natomas, though significant areas also occur in the Airport-Meadowview and south Sacramento areas and in undeveloped areas.

Vernal pools are ephemeral wetlands that form in shallow depressions underlain by a substrate near the surface that restricts the percolation of water. These depressions fill with rainwater during the fall and winter and can remain inundated until spring or early summer, sometimes filling and emptying numerous times during the rainy season. A flowering community, dominated by characteristic wetland plants, differentiates vernal pools from other seasonal wetlands. Vernal pool plant species likely to occur within the area include the winged water-starwort (*Callitriche marginata*), annual hairgrass (*Deschampsia danthonioides*), horned downingia (*Downingia ornatissima*), coyote thistle (*Eryngium vaseyi*), bractless hedge-hyssop (*Gratiola ebracteata*), slender popcorn flower (*Plagiobothrys stipitatus*), spine-fruit buttercup (*Ranunculus bonariensis*), and purslane speedwell (*Veronica peregrina*).

COUNTY OF SACRAMENTO WETLANDS AND NATURAL AREAS

Careful consideration of endangered species and their habitat is an integral part of all projects in the County. Further, the County General Plan addresses open space under the Conservation Element September 26, 2017 and as later amended. The County Planning Department addresses open space during public outreach and the preferred land use is incorporated in the DMP.

Biological Protection Programs

Many development project applications are evaluated by the Planning and Environmental Review section for impacts to species or habitat protected under the California Environmental Quality Act (CEQA). When such impacts are assessed on a project, project proponents are required to preserve a specified acreage of land possessing equal or better habitat values to mitigate for those impacts. The County provides alternatives for achieving habitat mitigation through the following programs. Click on the links for more information.

Swainson's Hawk Impact Mitigation Program. When Swainson's hawk habitat is impacted as the result of proposed development projects, project approval is conditioned on preservation of land to mitigate for those impacts. The County developed a program that allows projects with less than 40 acres of impact to instead pay into a fund to purchase mitigation land or easements. This alternative is

more reasonable for projects with smaller impacts.

<https://planning.saccounty.net/EnvironmentalDocuments/Pages/SwainsonsHawkOrdinance.aspx>

South Sacramento Habitat Conservation Plan (in progress). Final SSHCP chapters and appendices were released for public review on May 11, 2018. The County of Sacramento and our partners (City of Rancho Cordova, City of Galt, Sacramento County Water Agency, Sacramento Regional County Sanitation District, and the Capital Southeast Connector JPA) are currently engaged in a collaborative effort with state and federal regulatory agencies to complete the South Sacramento Habitat Conservation Plan. For more information please visit the South Sacramento Habitat Conservation Plan website at <http://www.southsachcp.com/>.

[ref. [Biological Protection Programs \(saccounty.net\)](#)]

South Sacramento County

PROJECT SUMMARY

Sacramento County led local efforts to adopt the South Sacramento Habitat Conservation Plan (SSHCP or Plan). The SSHCP encompasses a 317,000 acre area in south Sacramento County and streamlines federal and state permitting for development and infrastructure projects while conserving habitat. An interconnected regional preserve system of over 36,000 acres – roughly 1.2 times the total size of San Francisco - will be created over the next 50 years to protect twenty-eight plant and wildlife species and their natural habitats. The Plan is the first in the nation to include Clean Water Act (CWA) permits issued by the Army Corps of Engineers (USACE) and Endangered Species Act (ESA) permits issued by the U.S. Fish and Wildlife Service (USFWS). Instead of permitting through several separate state and federal agencies, most actions in the Plan area can be permitted through the County Office of Planning and Environmental Review.

The Plan Area is located in the southern portion of Sacramento County. It is divided into two components: inside and outside the Urban Development Area (UDA). All proposed urbanization and some preserves will occur inside the UDA. Most preservation will occur outside of the UDA and help to protect agricultural lands as well as habitat.

SSHCP Covered Activities may be carried out by the Permittee Agencies or by Third Party Project Proponents. The Conservation Strategy and process for Covered Activity project authorization is described in the SSHCP and associated permits. In all cases, language in the permit(s) prevail when different than the SSHCP. The Plan will be made consistent with the permit conditions and language.

The County of Sacramento, newly-formed South Sacramento Conservation Agency, and our partners are currently engaged in a collaborative effort with state and federal regulatory agencies to implement the South Sacramento Habitat Conservation Plan. For more information please visit the South Sacramento Habitat Conservation Plan website at <http://www.southsachcp.com/>.

[ref. [South Sacramento Habitat Conservation Plan \(saccounty.net\)](#)]

CITY OF SACRAMENTO WETLANDS AND NATURAL AREAS

The City has two land use zones, which are used to preserve open space. The first is Open Space, which means land and water essentially without improvements and used for public recreation, enjoyment or scenic beauty, conservation or use of natural resources, production of food or fiber, light and air or an environmental amenity. The second is the American River Parkway- Flood zone (ARP-F), which is an open space zone, which constitutes a designated floodway likely to be inundated by a flood having a one percent per annum chance of occurrence or greater. The ARP-F zone is intended to protect the natural features of property within the floodplain of the American River to prevent erosion and siltation and to preserve valuable open space in accordance with the provisions of the general plan.

MITIGATION ACTIVITIES

The mitigation activities outlined in this plan focus on future peak flows and volumes so that they do not increase over present values. The region deploys different forms of mitigation, but the mitigation tool is regulatory standard. Each community has adopted and enforces standards to insure future development will not impact current 10-year, 100-year, and 200-year peak flows.

Additionally, the management of the Sacramento region's watershed is heavily directed by regulatory standards that pertain to its major flood control systems. These systems are governed by project partnership agreements, the Urban Level of Flood Protection Plan, Executive Order 13690 and the Federal Flood Risk Management Standard, and eventually the American River Common Features General Reevaluation Report. These standards are designed to reduce the impacts of future flood events and preserve current levels of flood protection. Because of these regulations, the region's desired level of protection for its flood control systems is a minimum of 200-year level of protection or protection from 0.5 percent annual chance flood event.

Below is a detailed description of the mitigation activities that are currently in place in the Sacramento region.

STORMWATER AND WATERSHED MANAGEMENT

Regional Stormwater and Watersheds Management Standards

- The *Sacramento City/County Drainage Manual*, Volume 2: Hydrology Standards, 2006 [www.saccounty.net -search: volume 2 hydrology standards]

The *Sacramento City/County Drainage Manual*, Volume 2: Hydrology Standards, was developed jointly by the Sacramento County Water Resources Division and the City of Sacramento Department of Utilities Division of Engineering Services. This volume presents the accepted methods for estimating surface water runoff peak flows and volumes for the analysis and design of drainage facilities in the City and County of Sacramento.

- Stormwater Quality Design Manual, 2018 [www.saccounty.net -search: stormwater quality design. <https://www.beriverfriendly.net/newdevelopment/stormwaterqualitydesignmanual/> The *Stormwater Quality Design Manual for the Sacramento Region* outlines planning tools and requirements to reduce urban runoff pollution to the maximum extent practicable from new development and redevelopment projects.

COUNTY OF SACRAMENTO MANAGEMENT STANDARDS

- Improvement Standards, 2018 [www.saccounty.net -search: improvement standards] <https://engineering.saccounty.net/Pages/ImprovementStandards.aspx>
- Floodplain Management Ordinance, 2017, County Zoning Code [www.saccounty.net -search: floodplain management ordinance] <https://waterresources.saccounty.net/Pages/County-Codes-and-Ordinances.aspx>
- County of Sacramento General Plan, 2011, and the California Central Valley Flood Protection Criteria were added to the Safety Element in 2017.
- Sacramento County Code, latest codes and supplements [www.saccounty.net -search: county code]
- Local Floodplain Management Plan, is in the Local Hazard Mitigation Plan [www.saccounty.net -search: hazard mitigation plan]
- Title 1 and 2 of the Sacramento County Water Agency Code 2004 and the Zone 11 Fee Plan, 2015 [www.saccounty.net -search: zone 11]

CITY OF SACRAMENTO MANAGEMENT STANDARDS

- City of Sacramento Design and Procedures Manual and Improvement Standards, 2018
- Onsite Design Manual, 2020
- Floodplain Management Regulations, City Code Chapter 15 Buildings and Construction, 2017
- Comprehensive Flood Management Plan, 2016
- City of Sacramento General Plan, 2035

COMMUNITY RATING SYSTEM ACTIVITIES

SACRAMENTO COUNTY CRS ACTIVITY 450 – PREREQUISITE

One of the prerequisites to be a Class 4 CRS community or higher is that the community manage runoff from all storms up to and including the 100-year storm (Activity 211.c(b)(ii)). Drainage planning in the County is directed by General Plan Policies, the County Zoning Code including the Floodplain Management Ordinance, and Improvement Standards. Together, these requirements ensure development is protected from flood damage and increased runoff is appropriately mitigated. Additionally, hydrology standards have been adopted by the County for use in drainage planning and design.

Stormwater and Floodplain Management Planning has been County policy since March 9, 1993 with Board of Supervisors adoption of floodplain management policies, and subsequently incorporated into the County's General Plan, adopted December 15, 1993, and amended November 9, 2011. These policies are intended to minimize the loss of life, injury, and property damage due to flood hazards and to strengthen regional flood protection and flood preparedness.

<http://www.per.saccounty.net/PlansandProjectsIn-Progress/Pages/GeneralPlan.aspx>

The following is clipped from the Safety Element of the County General Plan:

[ref. [SAFETY ELEMENT \(saccounty.net\)](#)]

Historically, Sacramento County was much more vulnerable to riverine flooding before the extensive system of dams, levees, overflow weirs, drainage pumping plants, and flood control bypass channels were constructed on the American and Sacramento Rivers and their tributary creeks and drainages. Due to existing infrastructure as well as ongoing maintenance and improvements, Sacramento County is reasonably safe from catastrophic flooding. In fact, the County is ranked among the nation's best on the FEMA Community Rating System (CRS). In 2017, the County was raised from a Class 3 to a Class 2, becoming one of only six Class 2 communities nationwide. Participation in this program, as well as its rise from Class 9 rating in 1992 to Class 2 in 2017, shows that flood protection and floodplain management is very important to the leadership of the County. Nevertheless, the County has flood emergency plans in case of local or regional flooding. There are some areas of the County which may still experience localized flooding. In areas of localized flooding, the risk is reduced by more stringent development standards pursuant to the County Floodplain Management Ordinance. While the probability of catastrophic flooding may be small, the damage potential is high. Sacramento Area Flood Control Agency continues to work diligently to make further improvements to the river flood control systems. Projects that are anticipated to be completed within the planning horizon of this General Plan will continue the County's efforts toward more effective flood protection. These projects include the

raising of Folsom Dam and its dikes, spillway improvements to Folsom Dam, and improvements to various levee systems within the County. The ultimate goal is to improve flood protection along the American River to the California Department of Water Resources' 200-year flood protection standard. (Updated 2016)

Policies in this section address flood avoidance and emergency response, interagency coordination, location and design of public facilities, location and design of new development, floodplain fill, levee protection and the requirements of drainage plans. The policies required by Senate Bill-5 (Machado, 2007) on floodplain management are found in the Conservation Element, the Safety Element and the Safety Element Background document. Conservation Element policies CO-30 & CO-105a stress the importance of preserving natural drainage. Safety Element policies SA-6a-c and SA-37 emphasize the importance of interagency coordination for maintenance of facilities and for emergency response. Policies SA-18a and b require levee setbacks that will allow regular maintenance or emergency repair. A key requirement of Senate Bill-5 is addressed in SA-22a which differentiates between flood-protection standards for project sites that are subject to the Urban Level of Flood Protection (ULOP) requiring 200-year flood protection, and project sites that are subject to the 100-year FEMA flood standard. (Added 2016)

The text and policies of this General Plan use the following definitions for classifying and managing areas subject to flooding. (Added 2016)

The Safety Element Background document contains data required by Senate Bill-5 primarily in the form of mapped data. (Added 2016) Any development located within the Central Valley Flood Protection Board's jurisdiction is required to apply for a permit from the CVFPB per the California Code of Regulations, Title 23 Waters, Division 1, Article 3, Section 6. Their authority extends over (a) the levee section, (b) the waterward area between project levees, (c) a 10-foot-wide strip adjacent to the landward levee toe, (d) within 30 feet of the top of the banks of unleveed project channels, (e) within Designated Floodways adopted by the CVFPB, and (f) activities outside of these limits which could adversely affect the flood control projects. (Added 2011)

Additional floodplain information may be obtained by contacting the Sacramento County Department of Water Resources. The Sacramento County Floodplain Management Ordinance contains additional information regarding safety and development in or near designated floodplains. Historical data on flooding, including locally prepared maps of areas that are subject to flooding, areas that are vulnerable to flooding after wildfires, and sites that have been repeatedly damaged by flooding is available in the Safety Element Background document and the Sacramento County Local Hazard Mitigation Plan. (Added 2011)

SA-5 A comprehensive drainage plan for major planning efforts shall be prepared for streams and their tributaries prior to any development within the 100-year floodplain and/or the 200-year floodplain in areas subject to the Urban Level of Flood Protection, defined by full watershed development without channel modifications. The plan shall:

- a. Determine the elevation of the future 100-year flood and/or the 200-year flood in areas subject to the Urban Level of Flood Protection, associated with planned and full development of the watershed;
- b. Determine the boundaries of the future 100-year floodplain and/or the 200-year floodplain in areas subject to the Urban Level of Flood Protection, for both flood elevations (planned and full development) based on minimum 2-foot contour intervals;
- c. Assess the feasibility of gravity drainage into the existing flowline of the stream;
- d. Assess the feasibility of alternative means of drainage into the stream;
- e. Identify potential locations for sedimentation ponds and other stormwater treatment facilities;
- f. Determine practical channel improvements and/or detention basins to provide the flood control needs of the proposed development;
- g. Determine the location and extent of marsh, vernal pool and riparian habitat;
- h. Develop measures for protecting and mitigating natural habitat;
- i. Develop measures for protecting and mitigating for federal and state listed endangered species;
- j. Develop and ensure implementation of measures that would reduce vector larvae;
- k. Identify appropriate plant species to be included as part of the natural features of the comprehensive drainage plan. (Modified 2016)

SA-6. The County will coordinate with the City of Sacramento, the Army Corps of Engineers, the Sacramento Area Flood Control Agency, and other Federal, State and local governments and agencies to develop a plan to finance, develop and construct flood control project improvements to reduce flooding potential in Sacramento County. The construction of flood control projects along the Sacramento and American Rivers and the immediate connection of local streams to these rivers shall be included in these projects. Such projects should provide 200-year flood protection.

SA-6a. The County will continue to coordinate with parties responsible for flood management facilities and structures (e.g., pump stations, levees, canals, channels, and dams) to provide proper maintenance and/or improvements. (Added 2016)

SA-6b. The County will continue to coordinate with relevant organizations and agencies (e.g., Federal Emergency Management Agency (FEMA) and State of California Department of Water Resources (CADWR)) when updating floodplain mapping, flood management plans, local hazard mitigation plans, and other emergency response plans to consider the impacts of urbanization and climate change on long-term flood safety and flood event probabilities. (Added 2016) SA-6c. The County will continue to coordinate with local, regional, state, and federal agencies to maintain an adequate flood management information base, prepare risk assessments, and identify strategies to mitigate flooding impacts. (Added 2016)

SA-7. In accordance with the County Floodplain Management Ordinance, the County shall locate, when feasible, new essential public facilities outside of flood hazard zones¹, including hospitals and health care facilities, emergency shelters, fire stations, emergency command centers, and emergency communications facilities; or identify construction methods or other methods to minimize damage if these facilities are located in flood hazard zones.

SA-8. Maintain the structural and operational integrity of essential public facilities during flooding.

SA-9. New and modified bridge structures should minimize any increase in water surface elevations of the 100-year floodplain, or the 200-year floodplain in areas subject to the Urban Level of Flood Protection. (Modified 2016)

SA-10. Fill within the 100-year floodplain of creeks outside of the Urban Service Boundary is permissible to accommodate structures (e.g., residential, commercial, accessory) and septic systems, and only when the Board of Supervisors finds that the fill will not impede water flows or storm runoff capacity. Such development shall not cause an increase in base flood elevation of the 100-year floodplain exceeding 0.10 feet, unless analysis clearly indicated that the physical and/or economic use of adjacent property within the floodplain will not be adversely affected. A permit is required if the fill is within the jurisdiction of the Central Valley Flood Protection Board.

SA-11. The County shall implement the improvement of natural drainage channels and certain floodplains for urbanized or urbanizing portions of the County to reduce local flooding. Such improvements shall comply with the General Plan policies contained in the Conservation Element, Urban Streams, and Channel Modification Section.

SA-12. The County shall continue local efforts that encourage implementation of the Federal Flood Insurance Program.

SA-13. Where new upstream development in Sacramento County will increase or potentially impact runoff onto parcels downstream in a neighboring jurisdiction, such as the City of Sacramento, Sacramento County will coordinate with the appropriate neighboring jurisdiction to mitigate such impacts.

SA-14. The County shall require, when deemed to be physically or ecologically necessary, all new urban development and redevelopment projects to incorporate runoff control measures to minimize peak flows of runoff and/or assist in financing or otherwise implementing Comprehensive Drainage Plans.

SA-15. The County shall regulate, through zoning and other ordinances, land use and development in all areas subject to potential flooding and prohibit urban uses on unprotected flood land.

SA-16. Deny creation of parcels that do not have buildable areas outside the 100-year floodplain, or the 200-year floodplain in areas subject to the Urban Level of Flood Protection, unless otherwise allowed in the Floodplain Management Ordinance. (Modified 2016)

SA-17. For residential zoning, the area outside the 100-year floodplain, or the 200-year floodplain in areas subject to the Urban Level of Flood Protection, must be contiguous or reasonably situated to provide buildable area for a residence and associated structures. Examples of structures include swimming pools, sheds, barns, detached garages, and other outbuildings that are normally associated with residential development. There may be exceptions (such as the Delta area) as allowed in the Floodplain Management Ordinance. (Modified 2016)

SA-18. Vehicular access to the buildable area of newly created parcels must be at or above the 10-year flood elevation. Exceptions may be made when the existing public street from which access is obtained is below the 10-year flood elevation. There may be exceptions (such as the Delta area) as allowed in the Floodplain Management Ordinance.

SA-18a. Provide unobstructed access to levees on county-owned lands, whenever practicable, for maintenance and emergencies. Require setbacks and easements to provide access to levees from private property. (Added 2016)

SA-18b. Urban flood control levees should have adequate setbacks consistent with local, regional, State, and federal design and management standards. (Added 2016)

SA-19. Creation of lots that require watercourse crossings for single lots, or that will likely encourage watercourse crossings to be built by property owners (lots with useable area on both sides of a watercourse) will not be allowed unless a detailed hydraulic study is approved by Water Resources and there is found to be no adverse impact in accordance with the County Floodplain Management Ordinance

SA-20. Levees for the purpose of floodplain reclamation for development shall be strongly discouraged. Floodplain restoration shall be encouraged to provide flood protection and enhancement and protection of a riparian ecosystem.

SA-21. If levee construction is approved to reclaim floodplain for new development, 200- year flood protection is required.

SA-22. Areas within a 100-year floodplain, or within the 200-year floodplain in areas subject to the Urban Level of Flood Protection, shall not be up-zoned to a more intensive use unless and until a Master Drainage Plan is prepared that identifies areas of the floodplain that may be developed. (Modified 2016)

SA-22a. Sacramento County will evaluate development projects and all new construction located within a defined Flood Hazard Zone (FHZ) to determine whether the 200-year Urban Level of Flood Protection or 100-year FEMA flood protection applies, and whether the proposed development or new construction is consistent with that standard. Prior to approval of development projects or new construction subject to either standard, the appropriate authority must make specific finding(s) related to the following:

a. Urban Level of Flood Protection standard (200-year) applies to projects in a Flood Hazard Zone that meet certain criteria, developed by the State of California Department of Water Resources, related to urbanization, watershed size and potential flood depth.

b. Federal Emergency Management Agency (FEMA) standard of protection (100- year) applies to projects in a Special Flood Hazard Area that are not subject to the Urban Level of Flood Protection. (Added 2016)

SA-22b. New development shall be elevated as required by the applicable flood standards (100-year, or 200-year in areas subject to the Urban Level of Flood Protection) and should be constructed to be resistant to flood damage consistent with the Floodplain Management Ordinance. (Added 2016)

From the Agricultural Element of the County's General Plan (Amended December 17, 2019)

AG-29. The County shall minimize flood risks to agricultural lands resulting from new urban developments by:

- Requiring that such developments incorporate adequate runoff control structures and/or
- Assisting implementing comprehensive drainage management plans to mitigate increased risks of farmland flooding resulting from such developments.

Implementation Measure:

A. Require as a condition for project approval that developments in newly urbanizing areas of the County either:

- Incorporate runoff control measures adequate to contain the additional runoff from a 24-hour storm event with a 100-year recurrence interval that the project site would generate after it is developed, relative to the runoff from such a storm generated by the site before development, or
- Conform to applicable standard conditions implementing comprehensive flood management plans.

Floodplain Management Ordinance Requirements:

The current Sacramento County Floodplain Management Ordinance is dated 2017, found online at www.StormReady.org (search floodplain management ordinance).

906-06 (H) No new construction or substantial improvements or development may occur without the approval of the Floodplain Administrator and without demonstrating that the cumulative effect of the proposed development when combined with all other existing and anticipated development will not have adverse impacts to downstream, upstream, or adjacent properties, and the FEMA mapping requirements of section 905-08 are met.

Improvement Standards requirements:

<http://www.engineering.sacounty.net/Pages/ImprovementStandards.aspx>

- 9-1.G- All new structures shall be protected from the 100-year (1-%) flood event. Certified pad elevations shall be set at least one and two tenths foot (1.2') above all sources of 100-year flooding.
- 9-1.H- The design of a new storm drain system shall include consideration of the downstream creek or storm drain. The consulting engineer shall show that the existing storm water system can convey the proposed drainage without adverse flooding, erosion or other water quality impacts to upstream, downstream or adjacent facilities or areas; or that such facilities or areas are being improved or protected to the point where the drainage can be conveyed without adverse impacts.

SacCalc is freeware developed by the Sacramento County Department of Water Resources and is available by searching SacCalc at www.saccodwr.org. SacCalc is a Windows platform for the Sacramento hydrology preprocessor and is used with Army Corps of Engineers HEC-1 program to analyze the 100-year storm. Hydraulics is calculated using Army Corps of Engineers HEC-RAS, UNET, or other appropriate software. There is no limitation on how large or small the project is nor where it is located within a drainage shed area. All projects must account for their impacts and mitigate as appropriate.

COUNTY CRS ACTIVITY 450- CREDIT CRITERIA

Another prerequisites to be a Class 4 CRS community or higher is to obtain 90 points (before the impact adjustment map) for meeting all the credit criteria for the Watershed Management Plan activity.

- Analyze and mitigate up to and including 100-yr event -
Sacramento County requires analysis of pipe flow using the Nolte curves established in mid 1960s. This equates to about 2-5 year return frequency though the 100-year runoff for every development project to ensure no adverse impact. Open channel flow typically requires analysis of the 10-year and 100-year. New development on virgin streams typically requires a broader analysis to ensure no adverse impact to hydro-fluvial-geomorphology (erosion, deposition and habitat value)
- Management future peak flow and volumes –
Sacramento County does not necessarily require peak flow detention at the end of every storm drain pipe. Flood control is better achieved as a larger master plan often including side channel detention with a weir that spills water when necessary. End of pipe basins are often used for stormwater quality and hydro-modification mitigation (first flush storm through 10 year storm events).
- Manage runoff from all storms up to and including 25 year event -
Sacramento County requires management of runoff from the first flush storm through the 100-yr storm. This is true for a small in-fill project or a large master plan community.
- Projects identify and avoid or mitigate existing wetlands and other natural open spaces -

The first place a developer will go upon conceiving their proposed project, with their consultant's wetland report in hand, is the US Army Corps of Engineers for consultation.

- Setback development from existing natural streams and minimize impact to those natural functions- The County learned long ago not to crowd the natural streams. Newer developments leave ample room for the stream
- Channel improvement projects should use natural or "soft" approaches
Early development of Sacramento County used concrete lining of urban streams. The County drainage staff realizes that the maintenance of such facilities is problematic water undermines an edge or corner of a concrete panel tossing it into the channel. The newer approach is to leave the channel natural or to improve it so that it is 'more natural' as is the case on Elder Creek in the North Vineyard Station community.

This Watershed Management Plan is updated in coordination with the Local Hazard Mitigation Plan, in a collaborative manner with the cities in Sacramento County.

Sacramento County Water Agency Zone 11 Trunk Drainage Fee Program

Sacramento County and the Cities of Elk Grove, Rancho Cordova and Citrus Heights are located within Zone 11 of the Sacramento County Water Agency Zone 11 programs. Zone 11 is subdivided by regional watershed areas 11A (draining to Morrison Creek / Beach Stone Lakes), 11B (draining to American River), and 11C (draining to Dry Creek / Natomas East Main Drainage Canal). The Zone 11 drainage impact fees pay for the installation and improvement of trunk drainage systems. The Sacramento County Water Agency is a separate subdivision of the state enveloping the cities of Citrus Heights, Rancho Cordova, and Elk Grove.

The Stormwater Utility was established in 1995 over an area of the Water Agency known as Zone 12. This program funds drainage maintenance and capital improvements in the urban areas of unincorporated Sacramento County and the cities of Citrus Heights, Rancho Cordova, and Elk Grove.

Activity 450 of the Community Rating System calls for certain prerequisites listed and responded to below:

- a. *"The community must have adopted a watershed management master plan for one or more of the watersheds that drain into the community, and the plan must identify the natural drainage system and constructed channels."*

Sacramento County has adopted the following Drainage Master Plans (DMP) associated with watersheds, or particular development projects. The Zone 11 and watershed is indicated in parenthesis:

- Vineyard Springs Comprehensive Plan (Zone 11A, upper Laguna Creek and upper Gerber Creek)

- North Vineyard Station Specific Plan (Zone 11A, Elder and Gerber Creeks)
- Florin Vineyard Gap Community Plan (Zone 11A, Morrison, Florin, Elder, Gerber, Unionhouse)
- Dry Creek Watershed Flood Control Plan (Zone 11C, Rio Linda)
- Strawberry/Jacinto Creek Drainage Master Plan (Zone 11A)
- Lower Laguna Creek Drainage Master Plan (Zone 11A)
- Whitehouse Creek Drainage Study (Zone 11A)
- Robla/Magpie Creeks Drainage Study (Zone 11C)
- Chicken Ranch Slough (Zone 11B)
- Strong Ranch Slough/Sierra Branch Drainage Study (Zone 11B)
- Natomas East Main Drain (NEMDC) Tributaries (Zone 11C)
- West Galt Drainage Study
- East Elk Grove (Zone 11A, Laguna Creek and Elk Grove Creek)
- East Franklin Drainage Master Plan (Zone 11A, Beach-Stone Lakes)
- Metro Air Park Master Drainage Study (Natomas Basin)
- Easton / Glenborough Specific Plan (Alder Creek)
- Sunridge Specific Plan (the upper reaches of Morrison and Laguna Creeks), part of the Sunrise-Douglas Comprehensive Plan (Zone 11A)
- Elverta Specific Plan Drainage Master Plan (Zone 11C, NEMDC tributaries)
- Arcade Creek Map Revision (Zone 11B)
- Cordova Hills Specific Plan Drainage Study (Deer Creek)
- Mather South Specific Plan Drainage Study (Zone 11A, Morrison Creek)
- Newbridge Specific Plan Drainage Study (Zone 11A, Morrison Creek, Laguna Creek)
- Jackson Township Specific Plan Drainage Report (Zone 11A, Morrison Creek, Elder Creek and Laguna Creek)
- West Jackson Highway Specific Plan Area Master Drainage Plan (Zone 11A, Morrison Creek)
- Natomas North Precinct Master Drainage Plan (Natomas Basin)

COOPERATION BETWEEN AGENCIES

Additional watershed management plans are being planned and will be coordinated by the Sacramento Area Flood Control Agency (SAFCA) to regulate drainage through State and Federal flood control projects. SAFCA will assist in the development of watershed management plans associated with SAFCA sponsored flood control projects along Arcade Creek, Dry Creek (North), and the Morrison Creek Stream Group.

a. The following drainage master plans have been adopted (with the County as one of the local agencies) in projects with the US Army Corps of Engineers, the cities and Sacramento Area Flood Control Agency:

- South Sacramento County Steams Flood Control
- North Sacramento County Streams Accreditation
- American River Common Features
- Natomas Levee Improvement Project
- Arcade Creek Flood Insurance Study

b. *“The community must have adopted regulatory standards that are based on the plan and receive credit under SMR in Section 452.a”*

Each DMP must be consistent with Sacramento County General Plan Policies and Improvement Standards, and 1996 Hydrology Standards. The countywide policies are described in the document and further described in the Multi-Hazard Mitigation Plan. Drainage analysis is required for every project. Each DMP is incorporated in the Environmental Impact Report and the subsequent Mitigation and Monitoring Report Program (MMRP). The MMRP gives mitigation (e.g. construct channel improvements consistent with DMP) and timelines (e.g. prior to building Permits) and entity responsible for overseeing implementation (e.g. improvement plans shall be consistent with DMP and shall be approved by Sacramento County Department of Water Resources). The implementation of the DMP and MMRP becomes a condition of approval of the project.

c. *“The plan’s regulatory standards manage future peak flows so that they do not increase over present values.”*

Sacramento County has constructed many detention basins and is in the process of developing many more.

New development must show that any impacts are mitigated prior to the Sacramento County Board of Supervisors adoption of an EIR for the development to proceed. Each creek or watershed is unique, and is analyzed accordingly. Depending on the location in the watershed, the state of existing drainage facilities and/or existing residences, and downstream hydraulic conditions, the mitigation measures for impacts of development could range from no increase in flows (and/or volumes) for the 2- through 500-year event, or no measures at all. If management of peak flows runoff was not necessary, then the comprehensive drainage master plan established that existing structures and/or storm drain systems were not affected by the increase in peak flow. Typically however, DMP’s result in detention that provides no increase in peak flows for the 10-year (because it could impact existing storm drain outfalls) and 100-year (because it could affect residential finish-floor elevations). This usually results in mitigation of the 10-through 100-year events.

d. *“The plan’s regulatory standards require management of runoff from all storms up to and including the 25-year event.”*

Watershed areas that have already been urbanized must abide by the County stormwater permit issued by the state Water Board. Policies are being developed regarding low impact development and hydro-modification measures that will protect stream systems by controlling discharges from developed areas to pre-development flow rates up to the 10-year event. Development will be required to incorporate follow the process and standards described in the Sacramento Stormwater Quality Partnership Hydromodification Management Plan in order to implement the hydromodification management in accordance with the stormwater permit.

For developing areas, depending on the location in the watershed, the state of existing drainage facilities and/or existing residences, and downstream hydraulic conditions, the mitigation measures for impacts of development could range from no increase in flows (and/or volumes) for the 2- through 500-year event or no measures at all. Typically, however, drainage master plans (DMP) result in detention that provides no increase in peak flows for the 10-year (because it could impact existing storm drain outfalls) and 100-year (because it could affect residential finish-floor elevations). This usually results in mitigation of the 10-through 100-year events.

COUNTY WATERSHED MASTER PLAN (WMP)

The CRS credit criteria for Activity 450 and County policies and standards require certain analyses in planning for new development. Activities defining this watershed management plan are listed and responded to below:

a. *Up to and including 100-yr event (Activity 452.b (1) credit criteria).*

All drainage master plans and drainage studies in the County consider storms from return frequencies ranging up to the 1% annual probability storm (100-year event) and include mitigation for more frequent events as required. The 10-year water surface elevation or hydraulic grade line are required to evaluate a development project’s compliance with improvement standards. Additionally, some studies are required to demonstrate a project is protected from the 200-year storm event.

b. *Management of future peak flows and volumes (Activity 452.b (1) credit criteria).*

All drainage master plans must consider future condition hydraulic impacts and projects in the watershed must take appropriate mitigation actions. General Plan Policy SA-14 requires projects to incorporate

runoff measures to reduce flooding. Project impacts and mitigation measures are included in the environmental document and projects are appropriately conditioned during the entitlement process.

Managing peak flow and water surface elevation upstream and downstream, through a range of model storms include the 100-year, are the typical measure of flood mitigation. Volume is controlled when necessary for mitigation under the California Environmental Quality Act. Examples when volume mitigation is important is a system that drains to a pond due to pumping or a hydraulic constraint. There may be environmental concerns to mitigate volume even to the extent of summertime irrigation runoff depending on the habitat needs of the receiving waters.

c. The plan manages runoff from all storms up to and including the 25-year event (Activity 452.b (4) credit criteria).

The Sacramento County's Hydrology Standards are available online at www.saccodwr.org. Drainage master plans must consider effect of design storms ranging in duration from 6-hour to 10-day and frequency from 2-year to 500-year. The critical duration is defined for each project and used for the design of the channel and/or detention basin.

The 10-day hydrograph is used for modeling volume impacts while the 1-day hydrograph is used for peak flow.

d. Plan identifies existing wetlands and/or other natural open space to be preserved from development to provide natural attenuation, retention, or detention of runoff.

Projects involving the discharge of fill material into the waters of the United States and wetlands must obtain a Clean Water Act Section 401 certificate from the state. All work in or near waters of the state and waters of the US must obtain permits from Fish and Game and/or the Corps of Engineers. Careful consideration of endangered species and their habitat is an integral part of all projects in the county. Further, the County General Plan addresses open space under the conservation element. The County Planning Department addresses open space during public outreach and the preferred land use is incorporated in the DMP.

There are approved Habitat Conservation Plans for Natomas and South Sacramento County and several wetland preserve areas.

e. Prohibiting development, alteration, or modification of existing natural channels.

Natural Stream are to be protected and wherever practical restored to natural stream functions. Stream courses provide necessary drainage for stormwater runoff, open space, aesthetic value, public linear

recreation, and natural beneficial ecological functions. In the early days of land development in Sacramento County, some streams (sloughs) were concrete lined. This was later deemed inappropriate and the County determined to protect the remaining natural streams.

The Natural Streams Combining Zoning District, as shown on the Comprehensive Zoning Plan, is used to regulate building permits and land development to protect and preserve the natural character and amenities of the designated streams. The Natural Streams are listed in Chapter 4, Section 4.5 of the Sacramento County Zoning Code, as follows:

- Arcade Creek from Fair Oaks Blvd to Greenback Lane
- Arcade Creek South Branch from Fair Oaks Blvd to 1100 feet east of Kenneth Avenue
- Brooktree Creek from the confluence with Arcade Creek to Auburn Blvd
- Carmichael Creek from Ancil Hoffman Park to Walnut Road
- Chicken Ranch Slough from Cottage Way to 350 feet west of Garfield Avenue
- Coyle Creek from 400 feet south of the confluence with Brooktree Creek to Madison Avenue*
- Cripple Creek from Kenneth Avenue to 400 feet north of Central Avenue
- Kohler Creek from the confluence with Arcade Creek to Madison Avenue
- Linda Creek length within Sacramento County (Orangevale)
- Minnesota Creek from the American River to 550 feet north of Olive Street
- Strong Ranch Slough from Arden Way to 800 feet east of Walnut Avenue
- Verde Cruz Creek from its confluence with Arcade Creek to 1800 feet west of Dewey Drive

*Note - Any of the listed reaches that are in land use authority of an incorporated city will not be subject to these regulations but will be bound by regulations of that city.

f. Requiring that channel improvement projects use natural or “soft” approaches.

Land Use Adjacent to Creeks and Streams

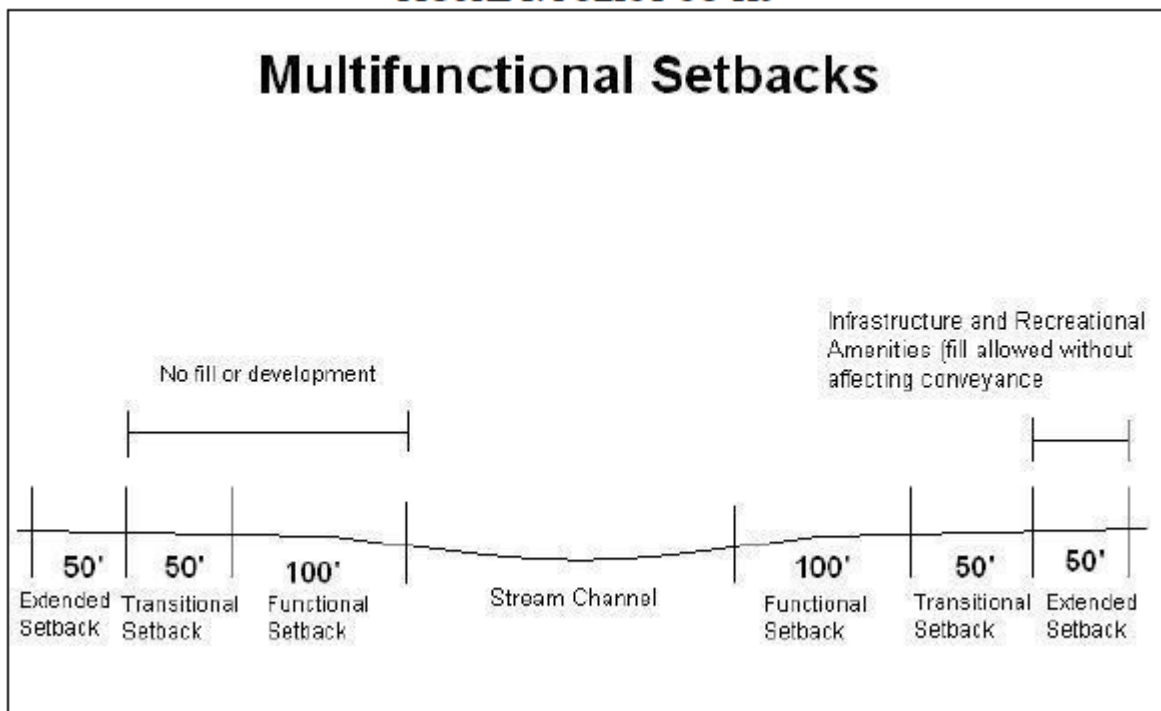
Pursuant to the guidance of the Conservation Element of the Sacramento County General Plan, land development adjacent to creeks and streams are to be consistent with natural values. Natural creeks and streams have many beneficial functions and serve to convey flood water safely when properly preserved. Natural meander should be allowed and the natural function of the floodplain shall be managed in a matter that respects both the value of habitat and flood conveyance. Preserving existing natural streams; examples being Arcade Creek, Dry Creek, and Laguna Creek, has proven to be a sustainable approach. On occasion, improving natural creek channels; examples being Elder Creek and Gerber Creek, can add long term riparian habitat value and function while minimizing annual maintenance cost. Design and maintenance of creeks and stream should (with reference Conservation Element in the Zoning Code):

- Include consideration of low flow needed to maintain summertime habitat (CO-109)

- Be analyzed using a range of Manning’s ‘n’ values, up to an appropriately high value, thereby allowing for the maturing of beneficial vegetation (CO-110)
- Be considerate of wetland and riparian habitat value and where possible retain or recreate the natural channel with the historical ecological integrity of the stream (CO-111)
- Not line natural streams with concrete and impervious materials (CO-112)
- Encourage revegetation with natural native plant species appropriate to natural substrate conditions and avoid introduction of nonindigenous species (CO-113)
- Be done in a manner that protects or enhances the function as flood control, water quality improvement, habitat, and public interface including education opportunities where appropriate (CO-114)
- Provide urban buffer or setback of 50’ to 100’ (or more) from the top of the channel bank to encourage and protect riparian habitat functions (CO-115)

Figure 1 from the Conservation Element CO-115 describes typical buffer areas, to allow beneficial and natural function with drainage and flood control, when land development is proposed adjacent to a natural stream.

FIGURE 1: POLICY CO-115



g. *If the watershed plan was prepared in coordination or as a part of the floodplain management plan credited in Activity 510.*

All of the DMP's are consistent with the Local Hazard Mitigation Plan and County Standards.

Freeboard for New Buildings in B, C, D, and X Zones (FRX) - regulations that require the applicant provide positive drainage away from the building site

The county improvement standards and floodplain management ordinance require, in addition to FEMA flood studies that all new structures be protected from the 1% annual recurrence storm with at least 18 inches of freeboard. This requirement is found in the Improvement Standards Section 9-15, Section 10-4 and Section 10-5. It is also seen in the floodplain management ordinance that a local flood hazard is treated the same as a FEMA special flood hazard area.

(State Mandated) California's adoption of the IBC and the IRC which require positive drainage away from the foundation.

Legal basis: California Health and Safety Code, Sections 18901 and 18949, administered by the California Building Standards Commission. Positive drainage requirement is within Section 1804.4 Site Grading of the California Building Code.

Erosion and Sedimentation Control Regulations (ESC) - minimize erosion from land disturbed due to construction or farming.

(State Mandated) Requirement that construction projects of greater than 1 acre require erosion and sediment control measures.

Legal basis: 2009-0009-DWQ Construction general permit:

https://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.html

Water Quality Regulations (WQ) - regulations that improve the quality of stormwater runoff.

(State Mandated) Participation in the State NPDES Program.

Legal basis: California Regional Water Quality Control Board MS4 permit, Order No. R5-2008-0142 (NPDES No. CAS082597)

CITY OF SACRAMENTO CRS ACTIVITY 450 – PREREQUISITE

The City of Sacramento is not part of the Sacramento County Water Agency, but the City and County have a long-standing cooperative understanding on stormwater mitigation. The City of Sacramento responds to the CRS prerequisites as follows:

a. *“The community must have adopted a watershed master plan for one or more of the watersheds that drain into the community, and the plan must identify the natural drainage system and constructed channels.”*

The City has Drainage Master Plans for many of its watersheds for localized flooding, natural drainage system and constructed channels, and development driven studies.

b. *“The community must have adopted regulatory standards for new construction in the watershed based on the plan that are based on the plan and receive credit under SMR in Section 452.a.”*

The City has adopted regulatory standards for new construction which are in alignment with this plan.

13.08.145 Mitigation of drainage impacts; design and procedures manual for water, sanitary sewer, storm drainage, and water quality facilities.

A. When property that contributes drainage to the storm drain system or combined sewer system is improved or developed, all stormwater and surface runoff drainage impacts resulting from the improvement or development shall be fully mitigated to ensure that the improvement or development does not affect the function of the storm drain system or combined sewer system, and that there is no increase in flooding or in water surface elevation that adversely affects individuals, streets, structures, infrastructure, or property.

The City’s Design & Procedures Manual also requires that developments within the City of Sacramento shall be provided with storm drainage facilities that will, at minimum, provide 100-year protection to structures and 10-year protection to streets.

c. *“The plan’s regulatory standards manage future peak flows so that they do not increase over present values.”*

Our Drainage Master Plans identify a “preferred plan” that is usually the least-cost alternative that provides the required level of performance to mitigate peak flows and volumes. By virtue of being on the downstream half of local stream systems, the City can control the release of water with the City’s pump stations and drainage basins without increasing peak flows in the receiving streams.

The City of Sacramento has also emphasized the value of detention basins in solving flooding problems. The primary purposes of a detention basin are to mitigate flooding, to lessen the impact of peak flows on existing or proposed infrastructure (pump stations, channels and pipelines) and to improve water quality. Detention basins are also effective because they lessen the impact on receiving streams, they provide the best opportunity to obtain mandated water quality benefits, and they provide a variety of secondary use benefits.

d. *“The plan’s regulatory standards require management of runoff from all storms up to and including the 25-year event.”*

The City’s separated? Drainage system consists of 94 sumps and pumps, 140 drainage basins, many miles of improved channels and a vast network of pipes and drainage inlets that control runoff. Detention basins have been constructed in Sacramento since 1955. Ten were built before 1985. In the last 14 years, 50 more detention basins have been constructed and there are plans to build many more to help eliminate flooding. The City’s Master Planning Program requires performance standards include eliminating street flooding during a 10-year storm and to prevent property damage and public safety hazards for a 100-year storm.

e. *“Any plan that is more than five years old, the community must evaluate the plan to ensure that it remains applicable to current conditions.”*

The WMP will be evaluated and revised every five years along with the County-wide Multi-Hazard Mitigation Plan (Section 510).

CITY OF SACRAMENTO WATERSHED MASTER PLAN (WMP)

The City of Sacramento requires certain analyses in planning for new development. Activities defining this watershed management plan are listed and responded to below:

a. *Up to and including the 100-year event (Activity 452.b (1) credit criteria).*

The City’s Master Planning Program has performance standards that include eliminating street flooding during a 10-year storm and preventing property damage and public safety hazards for a 100-year storm. Where applicable by State of California standards, many areas of the city are required to meet the 200-year storm.

b. *Management of future peak flows and volumes (Activity 452.b (1) credit criteria).*

The City’s Master Planning Program - requires performance standards that include eliminating street flooding during a 10-year storm and preventing property damage and public safety hazards for a 100-year storm for future development. By virtue of the City being on the downstream end of local stream systems, the peak flows and volumes can be controlled by the City’s pump stations and detention basins in the receiving stream.

In addition, the City’s Floodplain Ordinance (Section 15.104.040) states that, “proposed construction or development shall not result in any increase in flood levels during the occurrence of the base flood”. Development driven Drainage Master Plans must consider existing and future hydraulic impacts. New

projects in the watershed must appropriately mitigate these impacts. Development project impacts and required mitigation measures are included in environmental documents and conditioned during the entitlement process.

c. The plan manages runoff from all storms up to and including the 25-year event (Activity 452.b (4) credit criteria).

The City's Design and Procedure Manual requires development to manage runoff for up to a 100-year storm. Specific performance criteria differentiates between greenfield development and infill development, but all development is required to manage runoff for up to a 100-year storm.

Non-leveed channels shall, at a minimum, be designed to convey the 100-year, 10-day storm event while providing one foot of freeboard. Leveed channels shall, at a minimum, be designed to convey the 200-year, 10-day storm with 3 feet of freeboard.

d. Plan identifies existing wetlands and/or other natural open space to be preserved from development to provide natural attenuation, retention, or detention of runoff.

All grading projects of more than 5-acres size must obtain a Clean Water Act Section 401 Certification from the State. All work in or near waters of the State and water of the U.S. must obtain permits from Fish and Game and/or Corps of Engineers.

The City has two land use zones, which are used to preserve open space. The first is Open Space, which means land and water essentially without improvements and used for public recreation, enjoyment or scenic beauty, conservation or use of natural resources, production of food or fiber, light and air or an environmental amenity. The second is the American River Parkway- Flood zone (ARP-F), which is an open space zone, which constitutes a designated floodway likely to be inundated by a flood having a one percent per annum chance of occurrence or greater. The ARP-F zone is intended to protect the natural features of property within the floodplain of the American River to prevent erosion and siltation and to preserve valuable open space in accordance with the provisions of the general plan.

e. Plan was prepared in coordination with or as part of the community's floodplain management plan credited under Activity 510.

This Plan was prepared in coordination as an appendix with the County Local Hazard Mitigation Plan.

STANDARDS FOR DEVELOPMENT

DESIGN STANDARDS AND REVIEW – COUNTY OF SACRAMENTO

Piped storm drain systems are designed to convey the County design flow which approximates the peak run off from a 5-year storm event. The larger less frequent storm events exceed the pipe capacities and travel through streets and overland from the upper shed areas to the receiving creek. Water is typically allowed to pond in streets up to 30-minutes (+/-) until the storm subsides. Development designers must analyze the 100-year, 1% annual recurrence, storm event and assure that ponding and overland flow is safely managed and that freeboard is adequate for each new structure. The impact downstream and adjacent to the proposed development must also be analyzed and mitigated.

Large development plan areas, known as specific plans and community plans, must prepare a detailed drainage study often including channel improvements and peak flow detention basins. Computer modeling is done for a watershed downstream to a point of confluence and/or hydraulic constraint. By doing so, the peak flow and volume as well as routing and storm centering are correctly analyzed using dynamic modeling tools.

New levees to reclaim floodplain are discouraged and whenever such are proposed they must be constructed to at least a 200-year (0.5% annual recurrence) level of protection in areas subject to State Urban Level of Protection criteria, and meet FEMA certification standards (44CFR65.10).

All discretionary applications are routed to Water Resources for comments and conditions. The County has a computer system that tags all parcels with known flood hazards and all building permits for those parcels are routed to Water Resources for review and approval.

From the safety element of the General Plan:

- SA-14. The County shall require, when deemed to be physically or ecologically necessary, all new urban development and redevelopment projects to incorporate runoff control measures to minimize peak flows of runoff and/or assist in financing or otherwise implementing Comprehensive Drainage Plans.

Improvement Standards require:

- 9-1G All new structures shall be protected from the 100-year (1-%) flood event.
- 9-1H The design of a new storm drain system shall include consideration of the downstream creek or storm drain. The consulting engineer shall show that the existing storm water system can convey the proposed drainage without adverse flooding, erosion or other water quality impacts to upstream, downstream or adjacent facilities or areas; or that such facilities or areas are being improved or protected to the point where the drainage can be conveyed without adverse impacts.

HYDROLOGY STANDARDS

Sacramento County developed hydrology standards that were adopted in 1996 and have been approved for FEMA map revisions. These standards include regional rainfall tables of depth-duration-frequency; design storms of various durations, infiltration rates based on land use and soil type, and employ the unit hydrograph theory. Hydrology is modeled using the SacCalc Sacramento Calculator and hydraulics is modeled using tools from the US Army Corps of Engineers Hydraulic Engineering Center (HEC) or proprietary tools like XPSWIMM and Mike- 11.

Hydrology modeling includes a range of storms from 6-hours to 10-days, from 50% annual recurrence to 1% annual recurrence. Small watersheds tend to respond to short duration storms while larger shed areas and those with basins and convergences must consider the volume and routing characteristics of the longer duration storm event. There is also the ability to model record storm events and continuous simulation.

The County has three hydrologic rainfall zones. Sacramento County developed a hydrology calculator known as SacCalc, which is available at no cost to consulting engineers. SacCalc is a preprocessor to the US Army Corps of Engineers HEC-1 hydrology computer program. The program (freeware found at www.saccodwr.org search: SacCalc) allows modeling of a wide range of storm events, table shown below. The user may develop a hydrograph for a watershed of specified size, shape, slope, roughness, soil type and land use for a range of storms 2 year 6 hour through 500 year 10 day.

Recurrence interval	6h	12h	24h	36h	5d	10d
500 yr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
200 yr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
100 yr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50 yr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25 yr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 yr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 yr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 yr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Adjustments

Use total watershed area for the storm area

Specify storm area: 0 sq mi

Use frequency factor

Help

Flood control detention basins are constructed when there is need to attenuate impacts to peak flow in a watershed. Such basins are generally designed as off-line taking the peak flow off of an open channel. Stormwater quality basins are used to treat storm water pollution by maintaining a residence time at zero velocity allowing suspended solids to settle before the water is discharged, normally by gravity, to the adjacent open channel. Combined basins have a flood control volume over a permanently wet volume serving as storm water pollution prevention. Basins are designed to be aesthetic amenities for the developing community.

Urban drainage is conveyed by piped storm drain systems to the nearest open channel, creek or stream. Water quality treatment is required in accordance with the county's storm water permit from the State Regional Water Quality Control Board under Section 401 of the Clean Water Act. This is a joint permit with the cities, the County and our neighboring county of Placer as well as the City of Roseville. The group prepared a Stormwater Quality Design Manual, dated 2007. www.saccodwr.org click on Stormwater Quality.

Hydromodification and geomorphologic studies are being prepared for urbanizing watersheds to assure minimized impact to the erosion and deposition characteristics of the streambed. This is regulated by the State Regional Water Quality Control Board and the findings will be made a part of the forthcoming regional permit. It is not anticipated that mitigation for hydromodification will have an impact on the FEMA 100-year floodplain but it will likely require additional care in the design of developments including low impact development features, attenuating flows below the 10-year event.

The Sacramento County Department of Water Resources Drainage Development and Hydrology Section reviews all grading and drainage projects in the County for conformance with drainage improvement standards and the Floodplain Management Ordinance. A grading permit is required for any project that moves more than 350 cubic yards of soil. Improvement plans are required for any on-site or off-site development and for any drain pipe other than a driveway culvert. All grading plans and improvement plans are reviewed and approved by Water Resources to assure adherence to design standards. Staff also assures that new homes are constructed safely above the highest determined base flood elevation whether mapped on the FEMA Flood Insurance Rate Map or designated by County study including future condition hydrology.

COOPERATIVE TECHNICAL PARTNERSHIPS AND WATERSHED AGREEMENTS

Sacramento County has a cooperative technical partnership agreement with each of its seven cities as part of the FEMA map modernization project.

SACRAMENTO COUNTY AND PLACER COUNTY

Dry Creek conveys flows from Placer County. The Dry Creek drainage study dated 1992 was a joint effort of both the counties of Placer and Sacramento. Placer County agreed to attenuate peak flow impacts. Sacramento County agreed to pay a fair share impact fee for development in watersheds draining toward Placer County (Linda Creek and north flowing Dry Creek Tributaries such as Parkway Greens).

Placer County has prepared an update flood study for Dry Creek, Civil Engineering Solutions and RBF Consulting 2011.

The South Placer Vineyard proposed development north of the Sacramento County line drains mostly to Steelhead Creek, known also as Natomas East Main Drainage Canal, tributaries. The development is conditioned to pay the Steelhead Creek Fair Share Fee as described in the Zone 11C Engineer's Report dated 2015.

SACRAMENTO COUNTY AND CITY OF SACRAMENTO

The following watersheds flow from the County to the City: Morrison, Elder, Gerber, Florin, Unionhouse, Strawberry, Whitehouse, Laguna and Elk Grove Creeks in the south. Dry, Magpie, Robla, and Arcade Creek and the American River in the north. Natomas interior drainage canal, NEMDC, and the Sacramento River in the Natomas basin.

The South Sacramento Streams Group Project is an ongoing US Army Corps of Engineers project working in partnership with the State and the Sacramento Area Flood Control Agency as the local sponsors for the benefit of the County and City. The project included a floodwall project in the City of Sacramento on the following creeks:

- Lower Morrison
- Florin
- Elder
- Unionhouse

The South Sacramento Stream Group Project also includes channel work along the Florin and Unionhouse Creek and the construction of a flood control detention basin along Florin Creek. The County of Sacramento, the City of Sacramento, and SAFCA are coordinating on a plan to ensure these flood protection measures are not compromised by upstream development.

A drainage study was performed on Upper Morrison Creek by a consultant for Water Resources. The study focused on a reach of aggregate strip mines from the City boundary upstream to the Aspen VI/Vineyard I mining pit just upstream of Jackson Road. High flows from the channel are diverted into the Aspen VI/Vineyard pit over a weir constructed in a realigned channel. This weir controls peak flows

downstream. The study developed hydrologic (SacCalc) and hydraulic (HEC-RAS) models that are being used for planned development throughout the reach. It also ensures that design flows for the South Sacramento Streams Group flood control projects will not be exceeded. Additional analysis is being conducted in relation to the master planning for the West Jackson Highway Plan which will include a revision to the FEMA floodplain for the upper reaches of Morrison Creek.

SACRAMENTO COUNTY AND CITY OF RANCHO CORDOVA

Rancho Cordova has their own drainage and floodplain management staff. Rancho Cordova detached from the Sacramento County Water Agency Zone 11A trunk drainage impact fee program in 2020. The City of Rancho Cordova charges city residents a Rancho Cordova Stormwater Utility Fee to pay for the bulk of drainage program operation and maintenance services. Generally, Rancho Cordova is upstream of the trunk drainage in the unincorporated county.

SACRAMENTO COUNTY AND CITY OF ELK GROVE

Elk Grove has their own drainage and floodplain management staff but the City still lies within Zone 11A of the Sacramento County Water Agency and participates in the regional trunk drainage development fee program. City residents pay an Elk Grove Storm Water Utility Fee for drainage services provided by the City. All of the watersheds in the City have been master-planned. The city sits low in the county watersheds and drains to the Beach Stone Lake floodplain. Development in Zone 11A pay a Beach Stone Lake volume mitigation fee held in a trust for a future project. The Laguna West and Laguna Stonelake projects paid lump sum fees toward Beach Stone Lake Mitigation. Proposed projects for agricultural residences in the Beach Stone Lake floodplain include elevation, berms, and walls. The County Department of Water Resources pays flood insurance premiums for many homes in this floodplain from interest earned on funds held in the account.

Upstream watersheds draining into the City of Elk Grove include Strawberry Creek and Laguna Creek. Strawberry Creek is built out. Laguna Creek is master-planned and there is a flow rate at the city border that will be held as the maximum 100-year peak. This is memorialized in a FEMA Letter of Map Revision. The County is planning to utilize a large aggregate mine as a peak flow detention basin, known as Triangle Rock, to control flood flows while allowing a range of lower frequency flows to maintain aquatic habitat and geomorphologic characteristics.

COUNTY OF SACRAMENTO AND CITY OF CITRUS HEIGHTS

Citrus Heights is almost entirely built-out and is located in the upstream (northeast) portion of the natural stream watersheds. The largest infill is at Gum Ranch on South Branch Arcade Creek, which is slated for a regional detention basin. This basin will serve to attenuate peak flow immediately downstream and at the confluence with Arcade Creek.

The City of Citrus Heights is in Zone 11B and residents pay the Stormwater Utility Fee. The City's General Services Department provides over site for its drainage program, however, the bulk of City drainage services are provided by under an agreement with the County of Sacramento.

CITY OF FOLSOM

The City of Folsom is at the top of its watersheds and drains directly to the American River. Because of this there is little interaction between agencies regarding drainage and floodplain issues.

CITY OF GALT

The City of Galt is located in the middle of the rural unincorporated south County and is a pass-through for upstream rural County runoff as it drainage southwest. Deadman's Gulch and Hen Creek are the two primary watersheds serving the City. There is much cooperation between the City of Galt and the County of Sacramento Department of Water Resources associated with managing flows in these watersheds. Peak flow detention is not deemed necessary on the main branches of these streams, but there is need for detention basins to attenuate flow where there are storm drain system deficiencies. Much of the area is topographically flat and the defined drainage systems handle about a 2-year storm event.

West Galt Drainage Study

This drainage study was developed by Water Resources in 2003. It was approved for use by Sacramento County and the City of Galt. It is being used by Water Resources to condition development. The precipitation data and land use are still appropriate, as well as the hydrologic (HEC-1) and hydraulic (HEC-RAS) methods.

CITY OF ISLETON

The City of Isleton is a relatively small area of development on the rural and agricultural lands of Andrus Island. All runoff on Andrus Island drains to agricultural/ drainage ditches operated by RD545 and then

pumped to the Sacramento River. The RD545 drainage system is sized for all runoff including Isleton, and discharges to the Sacramento River are not significant.

FUTURE MITIGATION STRATEGIES

To help determine mitigation strategies for the region, an accurate and comprehensive picture of the future conditions is needed. The development of a watershed modeling project to create models for each major waterway impacting the region would provide a foundation for all stakeholders to plan for the future and not increase peak flows and volumes. Information from a unified model can be utilized to determine high priority mitigation projects and the impacts of proposed development projects.

The County, City of Sacramento, and SAFCA will work together to develop mitigation strategies that ensure future development does not increase the risk of flooding in these communities. Additional watershed management plans and agreements will be developed related to development and drainage facilities in the Dry Creek (North), Arcade Creek, and South Sacramento Stream Group (Morrison Creek) watersheds.

FUNDING

SACRAMENTO COUNTY FUNDING

Sacramento County Storm Water Utility funds maintenance and improvement of existing storm drain systems within the urban services area. This fee is billed bi-monthly on the County Utility Bill. Routine repairs and improvements are made on a continuous basis throughout the unincorporated county. Citizens are encouraged to call the drainage hotline at Call 311 (or 916-875-4311, go online at www.311.saccounty.net, or download the Sac County 311 Connect mobile app) to request immediate maintenance, improvement projects, or on-site technical assistance related to all drainage matters. The County Stormwater Utility is defined as the area known as Zone 12 of the Sacramento County Water Agency and includes the urban areas of unincorporated county and the cities of Elk Grove, Citrus Heights, and Rancho Cordova.

The Sacramento County Water Agency Zone 11 Drainage Impact Fee Program has been in existence since 1965. New storm drainage systems are generally constructed by contractors working for private

developers. Drainage fees are collected prior to improvement plan approval on a schedule rate based on percent impervious area impact to the watershed. Components of the fee include piped storm drain, open channel peak flow impact, detention volume impact, and stormwater quality. Zone 11 is divided into three sheds, 11A is the Morrison Creek and Beach Stone Lake Stream Groups, 11B is natural streams draining toward the American River, 11C is the Dry Creek and Natomas East Main Drainage Canal shed area. The fees collected are used to finance comprehensive drainage plans for urban streams.

Developers are credited and reimbursed for construction of trunk drainage facilities that are permanent and efficient systems in accordance with County standards. Trunk drainage is defined as a 30-acre watershed area or greater within a Zone of the Sacramento County Water Agency Drainage Fee Plan.

Supplemental drainage fee plans are prepared for specific plan areas where there are costs associated with trunk drainage that are not covered by Zone 11, such as environmental mitigation and channel rights-of-way.

CITY OF SACRAMENTO FUNDING

Operation, maintenance, repair and rehabilitation (OMR&R) of the City's water, sewer, drainage, and flood control facilities is the Department of Utilities' (DOU) first task. For this reason, the revenues that make up the DOU budget are first allocated to OMR&R. Any surplus may be used for new facilities, and/or improvements to existing facilities.

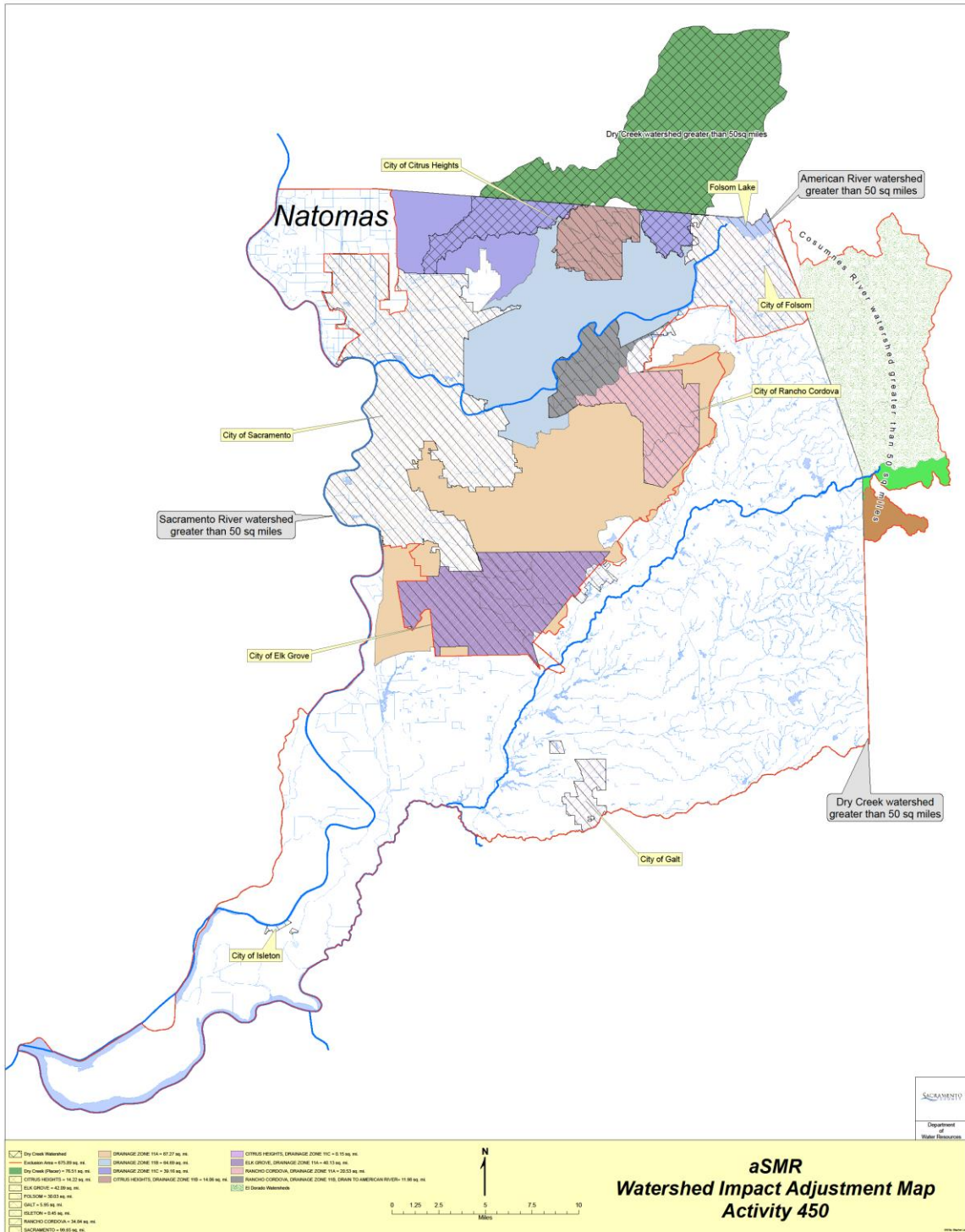
DOU has an annual budgeting process, which determines whether any funds will be available for capital improvements, and, if so, how much will be allocated to water, sewer, drainage, and flood control. DOU's drainage unit has a Drainage Master Planning process that identifies desirable drainage improvement projects, and a prioritization process, which sorts the recommended projects according to cost-effectiveness.

When the annual budget for drainage improvements is known, the drainage unit looks through the recommended drainage improvement projects, focusing on the ones that have highest priority. From this list, the decision-makers will usually set aside any projects whose estimated cost exceeds available funds, and make final selections among the remaining projects.

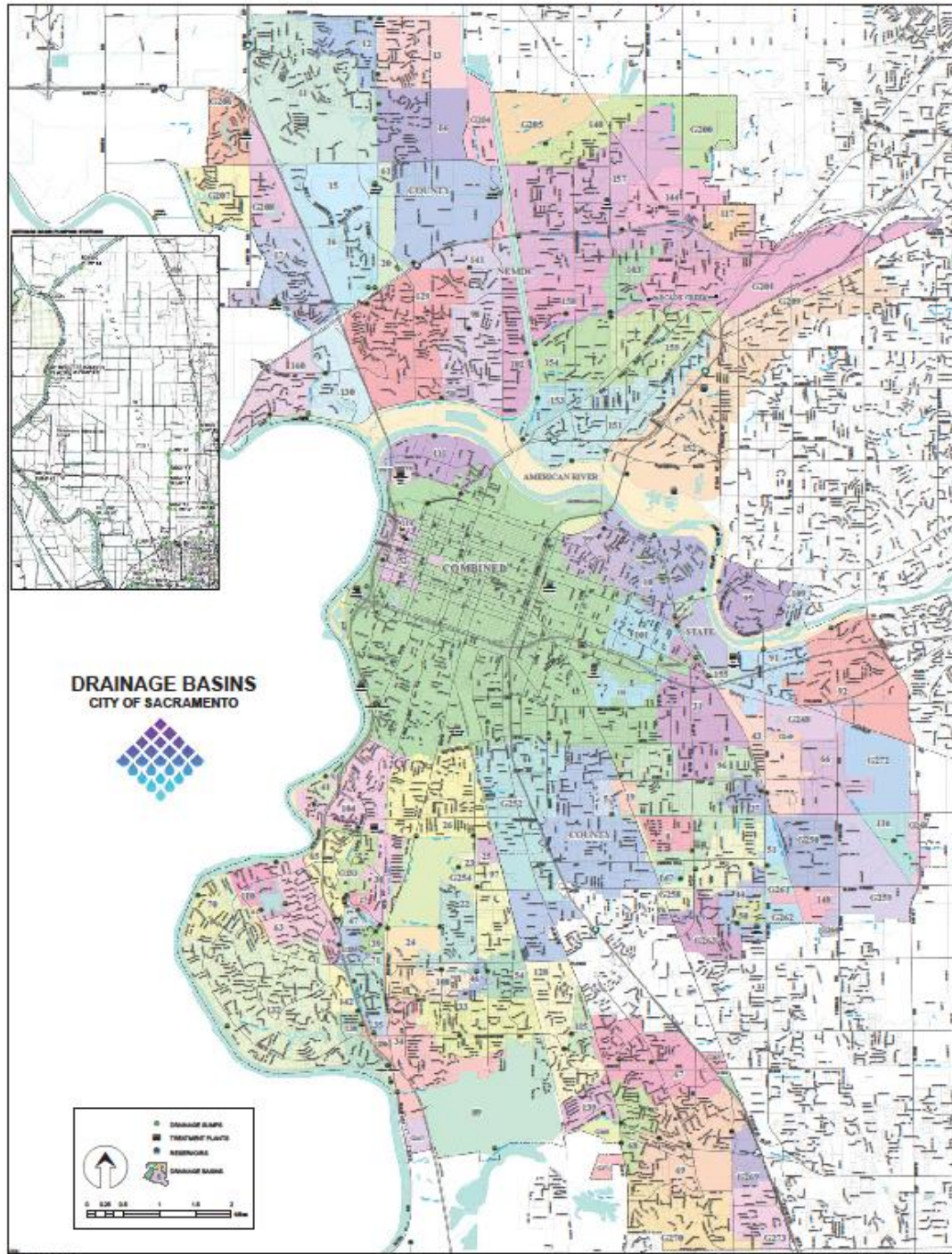
ATTACHMENTS

- A. Sacramento County Stormwater Impact Adjustment Map (Activity 450 SMR)
- B. City of Sacramento Map of Drainage Basins
- C. Existing County of Sacramento Detention Basins

Attachment A: Sacramento County Stormwater Impact Adjustment Map (Activity 450 SMR)



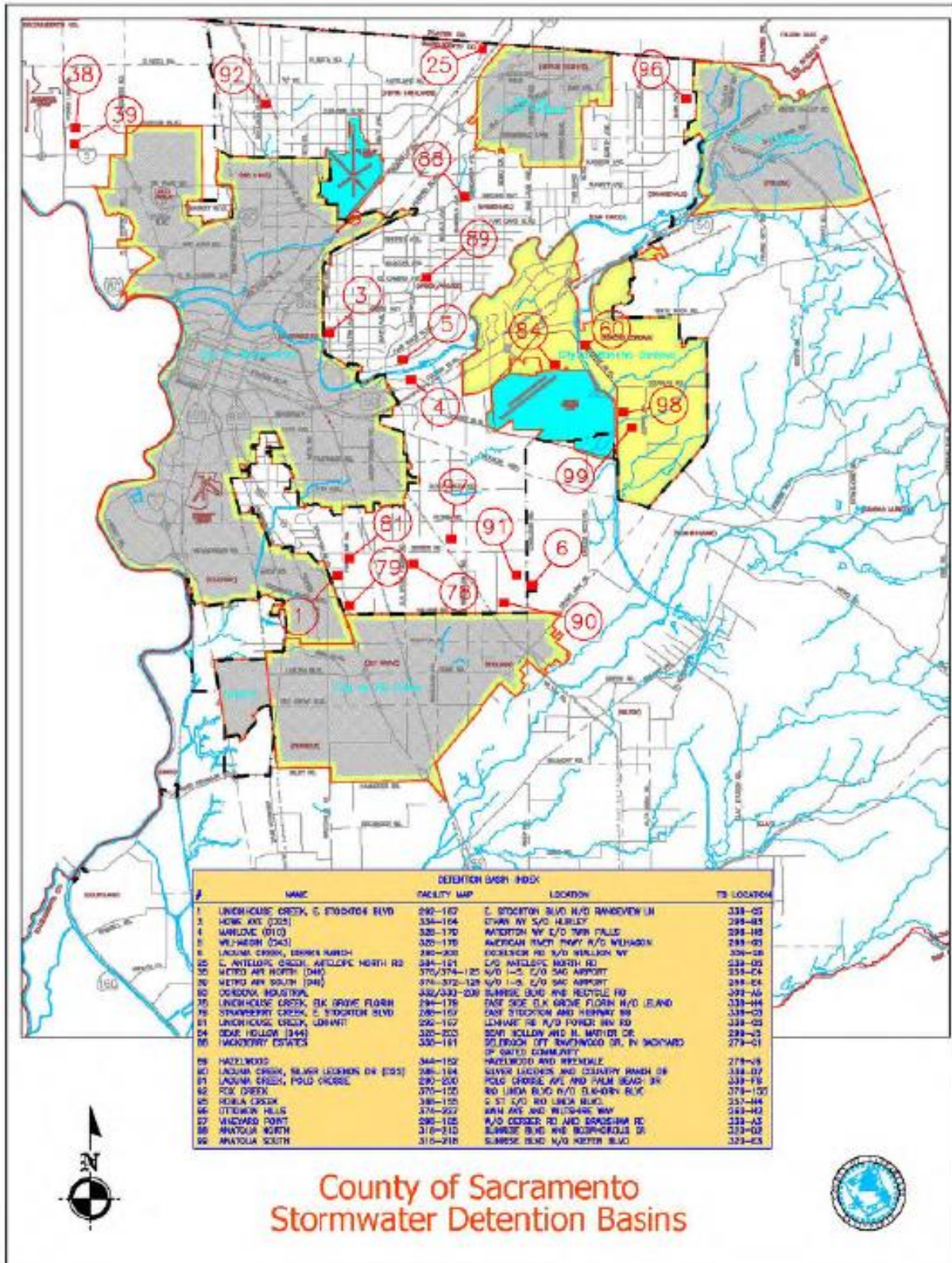
Attachment B: City of Sacramento Map of Drainage Basins



Attachment C: Sacramento County Detention Basins

DETENTION BASIN INDEX				
#	NAME	FACILITY MAP	LOCATION	TB LOCATION
1	UNIONHOUSE CREEK, E. STOCKTON BLVD	292-167	E. STOCKTON BLVD N/O RANGEVIEW LN	338-C5
3	HOWE AVE (D05)	334-184	ETHAN WY S/O HURLEY	298-B3
4	MANLOVE (D10)	328-179	WATERTON WY E/O TWIN FALLS	298-H6
5	WILHAGGIN (D43)	328-179	AMERICAN RIVER PKWY W/O WILHAGGIN	298-G5
6	LAGUNA CREEK, DIERKS RANCH	290-200	EXCELSIOR RD S/O STALLION WY	339-G6
25	E. ANTELOPE CREEK, ANTELOPE NORTH RD	384-191	E/O ANTELOPE NORTH RD	239-D5
38	METRO AIR NORTH (D49)	376/374-125	N/O I-5, E/O SAC AIRPORT	256-E4
39	METRO AIR SOUTH (D49)	374-372-125	N/O I-5, E/O SAC AIRPORT	256-E4
60	CORDOVA INDUSTRIAL	332/330-209	SUNRISE BLVD AND RECYCLE RD	300-A5
78	UNIONHOUSE CREEK, ELK GROVE FLORIN	294-179	EAST SIDE ELK GROVE FLORIN N/O LELAND	338-H4
79	STRAWBERRY CREEK, E. STOCKTON BLVD	288-167	EAST STOCKTON AND HIGHWAY 99	338-C5
81	UNIONHOUSE CREEK, LENHART	292-167	LENHART RD W/O POWER INN RD	338-C5
84	BEAR HOLLOW (D44)	328-203	BEAR HOLLOW AND N. MATHER DR	298-J5
88	HACKBERRY ESTATES	358-191	DELBROOK OFF RAVENWOOD DR, IN BACKYARD OF GATED COMMUNITY	279-C1
89	HAZELWOOD	344-182	HAZELWOOD AND WRENDALE	278-J6
90	LAGUNA CREEK, SILVER LEGENDS DR (D22)	286-194	SILVER LEGENDS AND COUNTRY RANCH DR	339-D7
91	LAGUNA CREEK, POLO CROSSE	290-200	POLO CROSSE AVE AND PALM BEACH DR	339-F8
92	FOX CREEK	376-155	RIO LINDA BLVD N/O ELKHORN BLVD	376-155
95	ROBLA CREEK	388-155	G ST E/O RIO LINDA BLVD.	257-H4
96	OTTOMON HILLS	374-227	MAIN AVE AND WILTSHIRE WAY	260-H2
97	VINEYARD POINT	298-185	W/O GERBER RD AND BRADSHAW RD	339-A3
98	ANATOLIA NORTH	316-215	SUNRISE BLVD AND BOSPHOROUS DR	320-D2
99	ANATOLIA SOUTH	316-218	SUNRISE BLVD N/O KIEFER BLVD	320-E3

Detention Basin Map



DETENTION BASIN INDEX				
#	NAME	FACILITY MAP	LOCATION	TB LOCATION
1	UNDERHOUSE CREEK, C STOCKTON BLVD	290-167	C. STOCKTON BLVD N/O RANSDOWN LN	338-02
2	HONG AVE (202)	354-164	OWAN AV N/O HURLEY	288-82
3	WAREHOE (010)	320-170	AMERICAN WY E/O TURN FALLS	288-18
4	WILKINSON (243)	320-170	AMERICAN TRACT HWY N/O WILKINSON	288-03
5	LACUNA CREEK, BRINKS MURCH	280-200	DOUGLASS RD N/O WILLIAM WY	308-28
6	C. ANTELOPE CREEK, ANTELOPE NORTH RD	281-124	C/O ANTELOPE NORTH RD	338-02
7	METRO AIR NORTH (248)	370/374-125	N/O I-5, E/O SAC AIRPORT	338-04
8	METRO AIR SOUTH (248)	374-372-128	N/O I-5, E/O SAC AIRPORT	288-04
9	OSBORNS INDUSTRIAL	342/343-200	BURRIS BLVD W/O RECYCLE RD	392-06
10	UNDERHOUSE CREEK, ELK GROVE FLOTH	294-176	EAST SIDE ELK GROVE FLOTH N/O LEAND	338-44
11	STANDERTY CREEK, C. STOCKTON BLVD	280-167	S/O STOCKTON AND HERRING RD	338-02
12	UNDERHOUSE CREEK, LORANT	292-167	LEHWAVE RD N/O POWER INN RD	338-02
13	DEER HOLLOW (344)	320-203	SONN SCOLLON W/O N. MATTHE DR	288-02
14	WACKERLY ESTATES	330-181	S/O CEDAR COMMUNITY	278-01
15	HAZELWOOD	344-152	HAZELWOOD AND WRENDALE	278-08
16	LACUNA CREEK, SILVER LAGOONS DR (202)	286-184	SILVER LAGOONS AND CELESTIAL WASH DR	338-07
17	LACUNA CREEK, FOLD CHORSE	290-200	FOLD CHORSE AVE AND PALM BEACH DR	338-19
18	ROCK CREEK	370-120	N/O LINDA BLVD N/O BLANDIN BLVD	378-10
19	ROCK CREEK	388-120	S. ST. LOU. RD LINDA BLVD	337-44
20	OTTOMER HILLS	374-222	WAIN AVE AND WILDGARE WY	348-42
21	WARDEN POINT	290-102	N/O GEORGE RD AND BRADSHAW RD	338-02
22	ANATOLA NORTH	310-212	BURRIS BLVD W/O BODIPROUS DR	338-02
23	ANATOLA SOUTH	310-218	BURRIS BLVD N/O KEETER BLVD	338-02

**County of Sacramento
Stormwater Detention Basins**