FOLSOM PLAN AREA

STORM DRAINAGE MASTER PLAN

VOLUME 1

(REPORT)

CITY OF FOLSOM, CA

OCTOBER, 2014

NAVD 1988 Datum

PREPARED FOR:
CITY OF FOLSOM
PUBLIC WORKS DEPARTMENT
50 NATOMA STREET
FOLSOM, CA 95630

PROJECT DEVELOPER:
FOLSOM PLAN AREA OWNERS GROUP
C/O MACKAY & SOMPS CIVIL ENGINEERS
1552 EUREKA ROAD, SUITE 100
Roseville, CA 95661-3040

PREPARED BY:
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PROJECT TEAM:
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KEN GIBERSON, PE PRINCIPAL ENGINEER
CRAIG ZOLLER, PE PROJECT ENGINEER

Folsom Plan Area Project Information:

Storm Drainage Master Plan Approving Agency:	City of Folsom Public Works Department 50 Natoma Street Folsom, CA 95630
Folsom Plan Area Project Developer:	Folsom Plan Area Owners Group c/o Mackay & Somps Civil Engineers 1552 Eureka Road, Suite 100 Roseville, CA 95661-3040
City of Folsom Planning No.	
Project Assessor's Parcel Numbers:	072-0060-007, 012, 073 thru 085, 072-0070-006, 021(ptn), 0320, 072-0270-138, 147, 072-0231-048, 072-3190-001 thru 009
Storm Drainage Master Plan Engineer:	Mr. Ken Giberson, PE MacKay & Somps Civil Engineers 1552 Eureka Road, Suite 100 Roseville, CA 95661-3040 Job No.: 7919.00
Storm Drainage Master Plan Engineers Seal:	

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Calculations and Design Parameters are in Volume 2 (July 2014)

1.0 EXECUTIVE SUMMARY

The Folsom Plan Area is a comprehensively planned community that proposes to develop approximately 3,566 ± acres consisting of a mix of residential, commercial, employment and public uses, recreational amenities including a significant park system, and open spaces. The Folsom Plan Area (Plan Area) is located in the southeasterly portion of the City of Folsom. The Plan Area is bounded on the north by Highway 50, White Rock Road to the south, Prairie City Road to the west, and the Sacramento/El Dorado County line to the east. Refer to **Exhibit A: Folsom Plan Area – Vicinity Map** to see the location of the Plan Area.

The purpose of the Storm Drainage Master Plan (SDMP) is to analyze, identify and document the Plan Area's existing hydrologic characteristics, identify any existing drainage infrastructure deficiencies, and determine the required on-site and off-site drainage facilities that are necessary such that the downstream drainage impact not exceed existing conditions and that the Plan Area develops in a safe and responsible manner. Developed flows generated by development of the site will be mitigated to less than or equal to the existing conditions.

The Plan Area is located at the eastern edge of the Sacramento Valley and consists of three district topographic regions:

1. Hillside Region. The hillside region includes all the Plan Area lands lying easterly of Placerville Road. This region is dominated by hilly terrain with elevations ranging from 440 to 800 feet above sea level. The hillside slopes range from 5% to 30% with a majority of the slopes averaging 15%.
2. Valley Floor Region. The valley floor region includes the Plan Area lands lying westerly of Placerville Road not including the Alder Creek Region (described below). This region is dominated by gently rolling hills covered with grasslands and some areas of oak woodlands. Elevations in this region range from 220 to 440 feet above sea level. The majority of the slopes within this region range between 0% and 15%.
3. Alder Creek Region. Alder Creek and its seasonal tributaries are present within this region the Plan Area. The creek corridor includes some isolated steep slopes along the edges of the creek and its associated tributaries and seasonal drainages. Additionally, the Alder Creek Region contains extensive native oak woodlands.

Refer to **Exhibit B: Folsom Plan Area – Aerial Photo** to see the Plan Area in its pre-development condition.

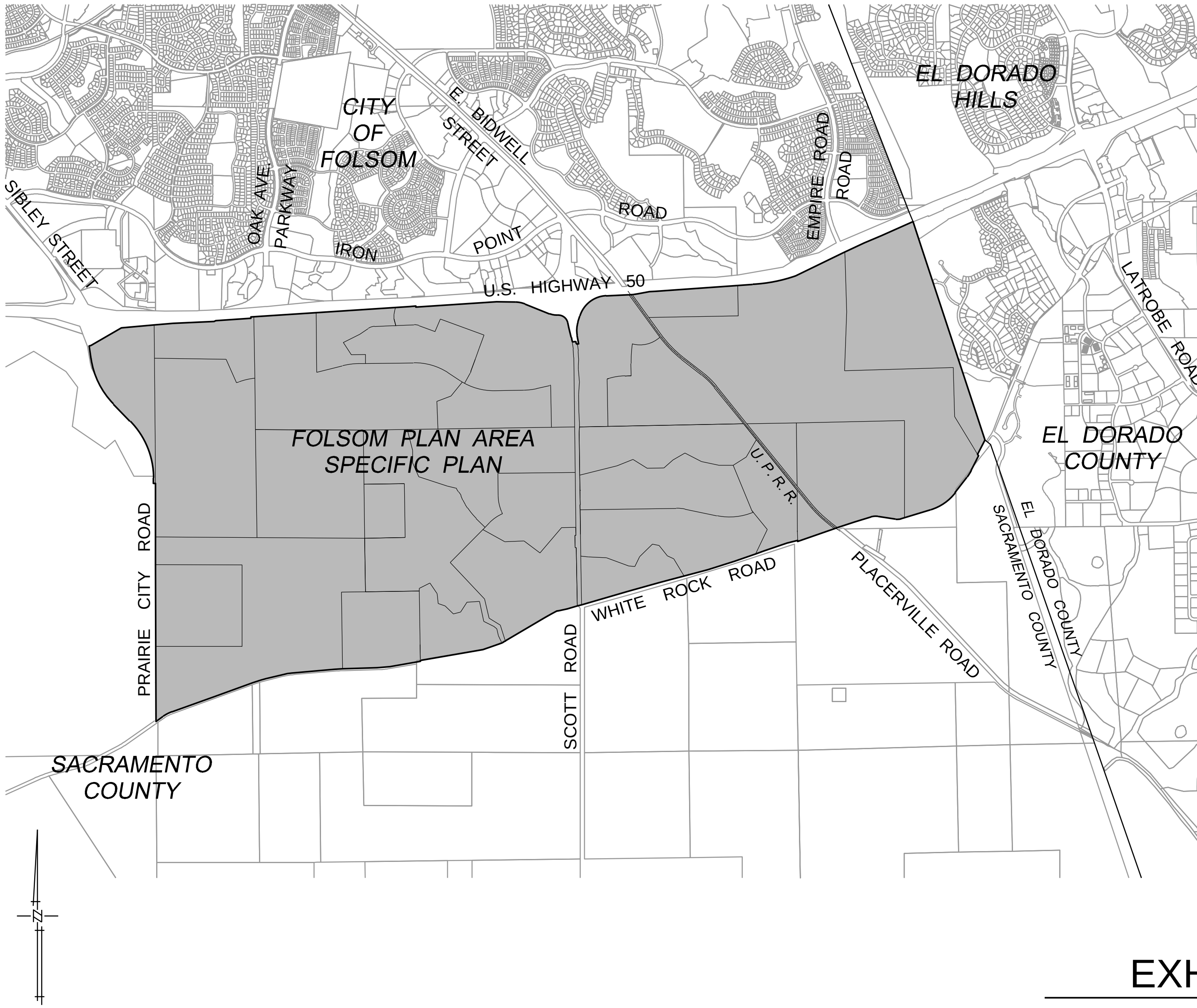

EXHIBIT A

VICINITY MAP

Legend

Boundary

0 500 1000 feet

Exhibit B

Folsom Plan Area

Storm Drainage Master Plan
Existing Aerial Photography

City of Folsom, California
Scale: 1"=500' January 2014

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7919-00

Based on the results of this SDMP, clearly the Plan Area can develop as proposed by constructing storm drainage infrastructure consisting of hydromodification basins, detention basins, pipelines, bridge crossings of Alder Creek, and culvert crossings of its tributaries which will all work together to mitigate the increased storm runoff that will result from the development of the Plan Area.

The storm runoff impacts on Alder Creek due to hydromodification will be mitigated by slowly metering storm runoff out of specially designed extended duration detention basins (hydromodification basins) to match undeveloped runoff rates for storms ranging from 25% of the 2-year storm up to and including the 10-year storm using a flow duration control strategy. These basins could also be used to infiltrate and/or store stormwater for groundwater recharge or irrigation in the future.

Additionally, flows from storm events that exceed the intensity of the 10-year design event up to and including the 100-year design event, will be detained in flood control/detention basins that will be strategically located throughout the Plan Area. In some cases these detention basins will be combined with hydromodification basins in one multi-use facility. For the most part, though. Peak flow attenuation will occur in single purpose drainage and flood control detention basins. Major roadway culverts have been sized to convey the 200-year/24-hour event without overtopping the roadways or flooding the adjacent developable areas within the Plan Area.

Water quality treatment will occur in each of the hydromodification basins. These basins will not only provide hydromodification mitigation, but they will also provide water quality treatment as a byproduct of hydromodification mitigation. Accordingly, these basins will meter flows discharging into the creek systems to avoid the degradation of the creek due to erosion while, at the same time, capture and remove urban pollutants from runoff flows from the development areas prior to discharging the treated flows to the local creek system.

This Study has been prepared to meet FEMA standards for amending the applicable FIRM Panels to delineate the existing flood plain of Alder Creek within the limits of project. It is anticipated that an Existing Conditions LOMR application will be ready to submit to the City's Flood Plain Administrator for acknowledgement and forwarding on to FEMA approximately 60 days following approval of this Study by the City.

Therefore, this Study demonstrates that the Plan Area can develop without exceeding the pre-development peak flow conditions, adversely affecting the existing water quality of the receiving waters in the local creeks, and mitigating for any hydromodification impacts that may be created by development within the Plan Area. In this manner Alder Creek and its tributaries and the downstream watercourses will be protected from the adverse impacts of developing the lands within the Plan Area by constructing the Plan Area drainage Infrastructure discussed and identified in this study. Additional studies will be required by the City of Folsom during project implementation phases which identify the specific design details and parameters for each hydromodification basin and drainage infrastructure component.

1.1 Additional Studies

Additional studies will be required by the City of Folsom during project implementation by a SDMP Amendment process. This Storm Drain Master Plan has been prepared assuming the Folsom Plan Area (FPA) is fully developed - a 100% build-out scenario. While phased build-out of the FPA has not been considered in the preparation of this master plan, significant care was exercised during its preparation to distribute the proposed drainage improvements in such a way that each individual undeveloped parcel, to the maximum extent practical, will be adequately served by the proposed drainage facilities that are located on and/or adjacent to the undeveloped parcels within the FPA (peak flow conveyance, detention basins, water quality basins, and/or hydromodification mitigation facilities).

Nonetheless, as each undeveloped parcel is proposed for development, the applicant will be required to prepare a project level evaluation of the adequacy of the drainage facilities envisioned in this master plan. The work product of this evaluation will be a project level update and amendment of this master plan for the geographic area of the proposed project, in essence a Project Drainage Report (PDR). Each PDR will, in effect, constitute an amendment of this Storm Drainage Master Plan. The purpose of this section is to establish a procedure to be followed and the requirements for the preparation of a Project Drainage Report and amendment of this master plan.

Two steps to preparing the PDR will be permitted by the City:

1. Step 1: Preliminary Evaluation

   A Preliminary Evaluation can be prepared to demonstrate that a proposed project is consistent with the master plan from a drainage perspective. If a proposed project can be found to be consistent with the master plan, then a technical memorandum would be required to be submitted with the project land use entitlement application package (e.g., SPA, Rezone, Tentative Map) documenting the results of the preliminary evaluation.

   Upon submittal of the technical memorandum to the City, Staff would review the preliminary evaluation and determine if it is adequate for use in the CEQA evaluation and land use entitlement process. If deemed adequate by City staff, then the preliminary evaluation would be used by the City during the CEQA and land use approval process to document that the drainage impacts of the proposed project have been properly evaluated and adequately mitigated in the master plan.

   The preliminary evaluation would consist of a comparison of drainage characteristics of the project area as shown in the approved Specific Plan before and after the proposed land use change. The following drainage characteristics at a minimum shall be considered in the preliminary evaluation:

- Impervious ratio of the developed conditions drainage sheds,
- Location of the detention basin,
- Size of the sub-drainage shed served by each detention basin, and
- Any other factors, as applicable, that could affect the drainage characteristics.

If the drainage characteristics of the proposed project are found to be less than or equal to those shown in the master plan for the project area, then it can be reasonably deduced that the drainage flows generated by the proposed project will not exceed those estimated in the master plan. Should such a conclusion be reached, then the preliminary evaluation would be submitted to the City for review. If, on the other hand, the drainage characteristics of the proposed project are higher than shown in the master plan, and it can not be adequately demonstrated in the preliminary evaluation that additional mitigation is feasible (e.g., the required additional detention volume as determined by ratio analysis (or similarly simplified method of analysis) is practically feasible), then Step 2 (Full Analysis) would be required prior to the time of application submittal.

Each preliminary evaluation shall be prepared by a qualified civil engineer duly licensed to practice in the State of California. The City will have sole authority to determine if the results of the preliminary evaluation are acceptable.

2. Step 2: Detailed Evaluation

   A detailed evaluation of the drainage impacts for all proposed projects will be required prior to filing of a final map and/or approval of improvement plans for the proposed project.

   Each PDR shall be prepared by a qualified civil engineer duly licensed to practice in the State of California. The PDR will modify the latest City approved version of the hydrologic, hydraulic and hydromodification models contained in this master plan (or the latest amendment thereto) to reflect any changes in the land use assumptions contained in the models that will result from the proposed project.

   The latest City approved version of the models will then be tested by the applicant's civil engineer to see if the proposed project, on a stand alone basis, can be adequately served by the existing and/or previously approved future drainage facilities. If not, the models shall be updated as needed to reflect any changes that may be needed in the existing and/or previously approved drainage facilities to achieve compliance with the City's drainage standards.

A PDR will then be prepared and submitted to the City Engineer for review and approval by the City. Each PDR shall fully document the design of the proposed drainage facilities that are necessary to adequately serve the project both on a stand alone basis, and at full build-out of the plan area. Project level drainage facilities will not be approved if it is determined that implementation of those facilities will adversely affect existing or future drainage facilities serving the plan area.

The City Engineer will maintain the approved drainage models for subsequent use by future applicants. Additionally, the City Engineer will maintain a log of approved PDR's similar to the example log included in Appendix C.

Each PDR will constitute a new chapter of this master plan. Collectively, this master plan, and all subsequently approved PDR's, will constitute "the drainage master plan" for the plan area. In reality, the master plan will become a living document that will guide the buildout of the drainage facilities within the plan area during development of the FPA over time.

2.0 Introduction

2.1 Overview

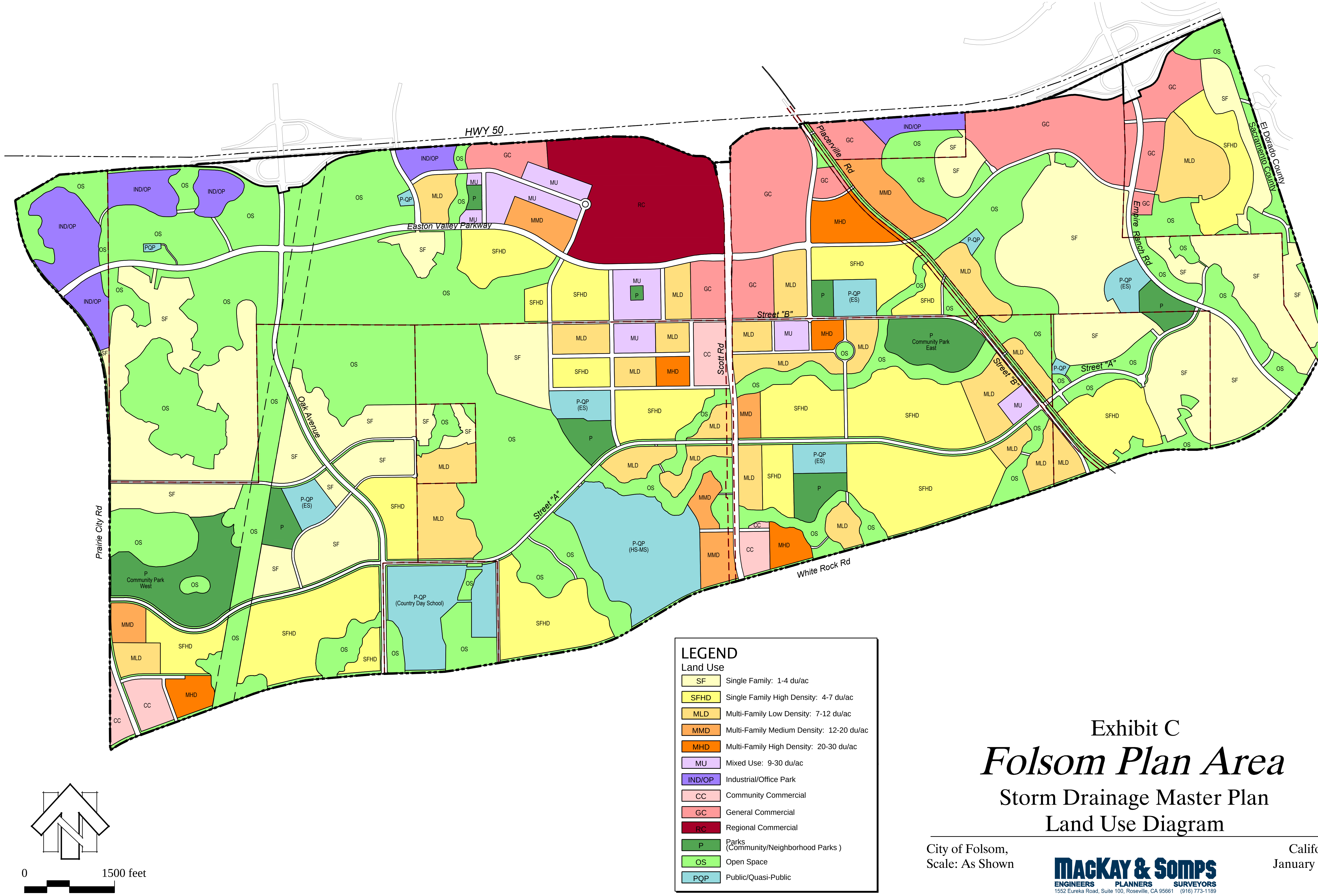
The Plan Area is a proposed 3,566+/- acre development project located in the City of Folsom. The proposed project consists of a mix of residential neighborhoods of diversified densities, a centrally located regional commercial center, a mixed-use town center, several mixed-use neighborhood centers: and schools, parks and open space areas located along Alder Creek and its tributaries. The project site is bounded by on the north by Highway 50, White Rock Road to the south, Prairie City Road to the west, and the Sacramento/El Dorado County line to the east.

The area north of Highway 50 has several major retail centers that serve nearby residents and multiple office parks. To the east of the Plan Area is El Dorado County with housing developments. To the south of the Plan Area is undeveloped rolling hillsides of grasslands. Aerojet-General Corporation and the proposed Glenborough at Easton and Easton Place developments are located to the west of the Plan Area. Refer to **Exhibit C: Folsom Plan Area – Land Use Diagram** to see the proposed land uses for the Plan Area.

The Plan Area is undeveloped land with relatively poor agricultural soils. The area has mainly been used for cattle grazing. The terrain in the eastern one-third of the Plan Area is hilly grassland terrain with elevations ranging from 440 to 800 feet above sea level situated within the upper reaches of the Alder Creek and Carson Creek watersheds. The western two-thirds of the Plan Area is rolling terrain with elevations ranging from 220 to 440 feet above sea level. This area consists of more grasslands and oak woodlands.

The Manning's roughness coefficients (n-values) for the natural stream channels located within the Plan Area vary from 0.04 in rocky bottom channels of the upstream reaches to 0.06 in the overbank areas of the downstream reach's. Due to the relatively uniform vegetation over the site there are limited variances in the n-values. Other roughness coefficients for the Plan Area include 0.045 for the grazed upstream overbank, 0.05 to 0.06 for grazed overbank with scattered oak trees (based on the density of trees), and 0.048 for the channel bottom in the downstream reach's where vegetation occurs within the channel.[1]

[1] The Mannings coefficients used in this SDMP are based on visual inspection of the various reaches of the existing natural streams within the Plan Area and are consistent with Sacramento County and City of Folsom requirements.



LEGEND

Land Use

SF	Single Family: 1-4 du/ac
SFHD	Single Family High Density: 4-7 du/ac
MLD	Multi-Family Low Density: 7-12 du/ac
MMD	Multi-Family Medium Density: 12-20 du/ac
MHD	Multi-Family High Density: 20-30 du/ac
MU	Mixed Use: 9-30 du/ac
IND/OP	Industrial/Office Park
CC	Community Commercial
GC	General Commercial
RC	Regional Commercial
P	Parks (Community/Neighborhood Parks)
OS	Open Space
PQP	Public/Quasi-Public

Exhibit C

Folsom Plan Area

Storm Drainage Master Plan
Land Use Diagram

City of Folsom,
Scale: As Shown

California
January 2014

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The majority of the Plan Area is within the Alder Creek watershed while smaller portions of the Plan Area are in the Coyote Creek, Buffalo Creek and Carson Creek watersheds. Alder Creek and Buffalo Creek are tributary to the American River, while Coyote Creek and Carson Creek are tributary to the Consumes River. The Folsom Plan Area Storm Drainage Master Plan (Plan Area SDMP) analyzes a watershed of approximately 6,300 acres which drain in to, out of, or through the Project.

2.2 Purpose

The purpose of the Plan Area SDMP is to analyze and document the existing pre-developed watershed characteristics and determine the interim and permanent drainage facilities that are necessary to maintain the receiving watercourses as close as practicable to the current pre-developed receiving watercourse characteristics. The Plan Area SDMP will confirm that the post-developed drainage characteristics will match the pre-developed drainage characteristics of the receiving watercourses in conformance with established design standards, and that the Plan Area develops in a safe and responsible manner.

The Plan Area SDMP investigates several detailed hydrologic and hydraulic modeling scenarios for the entire drainage study area. The electronic data files utilized with this analysis are be provided to the City of Folsom so they will be able to update them as development occurs adjacent to or within the Plan Area. Therefore, as the Plan Area develops the City of Folsom will have a comprehensive understanding of the drainage facilities necessary to meet the goals of maintaining downstream impacts to existing or below existing conditions.

2.3 Previous Studies

There have been several drainage studies prepared for various portions of the Plan Area watershed. These studies are summarized as follows:

1. **North of Highway 50**. The portion of the Alder Creek watershed located north of Highway 50 has had extensive hydrologic studies completed that analyzed hydrologic impacts due to development of this area. These studies, Broadstone Unit No. 2 Drainage Facilities Study and Broadstone Unit No. 3 Drainage Facilities Study were prepared by the Spink Corporation in the late 1990's. This previous studies determined the watercourse impacts due to development of the watershed north of Highway 50, and detailed the required design of the drainage improvements to mitigate those impacts.
2. **Alder Creek Watershed Project – Final Report**. The City of Folsom secured a grant from CALFED to assess the Alder Creek Watershed existing conditions and to prepare a watershed management action plan that provides recommended policies and projects to protect the health of the watershed and the creek as development occurs within the Alder

Creek watershed over time. The Alder Creek Watershed Project was prepared by AECOM in 2010. This SDMP was prepared to be consistent with the findings and recommendations of the watershed study.

3. **Folsom SOI Storm Drainage Plan**. The Folsom Sphere of Influence (SOI) Storm Drainage Master Plan analyzed the Plan Area pre- and post development hydrology, located and preliminarily sized various water quality and detention facilities, prepared flood plain mapping information, and preliminarily sized major storm drainage trunk pipelines. The Folsom Sphere of Influence (SOI) Storm Drainage Master Plan was based on procedures outlined in the Sacramento City/County Drainage Manual and was prepared by Domenichelli & Associates in 2007.

Since the previous drainage studies prepared to date do not necessarily meet the current drainage study criteria established by the City, they will essentially be used as reference material in the preparation of this Plan Area SDMP.[2]

2.4 Existing Conditions

The Plan Area is primarily within the Alder Creek watershed with small portions of the Plan Area within the Carson Creek, Buffalo Creek and Coyote Creek watersheds. The majority of the land within the study area of this Plan Area SDMP is currently undeveloped property with one ranch style home that uses their land for boarding of horses. The vast majority of the Plan Area is currently used as grazing land for livestock.

The rolling terrain of the Plan Area is comprised mostly of annual grasslands and some seasonal wetlands with drainages typical of eastern Sacramento County. Oak woodlands are located in northwestern portion of the Plan Area and are generally clustered around the lower reaches of Alder Creek. The oak woodland comprises approximately 15% of the Plan Area with a majority of it being within the Plan Area's open space land use zone

The Plan Area can be characterized as rolling terrain with elevations above mean sea level ranging from 220 near Prairie City Road to 800 at the headwaters of Alder Creek. The greatest surface relief occurs east of Placerville Road where the elevations climb from 440 feet above sea level to 800 feet. The top of the ridge delineates the Alder Creek watershed from the Carson Creek watershed.

The portion of the Carson Creek watershed that lies within the Plan Area generally drains from the north to the southeast. The Carson Creek watershed exits the Plan Area in three separate locations: two are on the Plan Area's eastern boundary and consist of existing drainages, while the third is on the southern boundary and consist of a culvert under White Rock Road.

[2] The City adopted new drainage requirements in January 2014. The intent of this SDMP is to be consistent with the City's newly adopted standards. This SDMP was prepared in large part prior to the adoption of the City's new standards, but a cursory review of the City's new standards reveals that this SDMP is generally consistent therewith.

The portion of the Alder Creek watershed located within the Plan Area generally drains from the east to the west through the Plan Area. The main branch of Alder Creek, along with several of its tributaries, meander through the Plan Area in a east to west direction.

There is a significant undeveloped off-site area south of White Rock Road that is within the Alder Creek watershed. This area enters the Plan Area from the south through culverts under White Rock Road. There is also a significant developed off-site area north of Highway 50 that drains into the Plan Area through culverts under Highway 50. Eventually all the tributaries connect to Alder Creek and exit the northeast corner of Plan Area by passing under the Prairie City Road bridge.

The portion of the Buffalo Creek watershed that lies within the Plan Area is located in the southwestern corner of the Plan Area and drains from east to the west and exits the plan area through a culvert under Prairie City Road. A very small portion of the Coyote Creek watershed lies within the Plan Area and is situated just to the east of the Buffalo Creek watershed. The Coyote Creek watershed drains from the north to the south and exits the Plan Area through a culvert under White Rock Road.

Refer to **Exhibit D: Folsom Plan Area – Existing Shed Map w/ Compliance Points** to see the watersheds within the Plan Area.

2.5 FEMA Information

The Federal Emergency Management Agency's (FEMA) Flood Insurance Study (FIS) Flood Insurance Rate Maps (FIRMs) encompassing the project are FIRM Panel ID#'s 06067C-0119H, 06067C-0140H, 06067C-0250H, and 06067C-0275H. No floodplain exists within the project or the associated panels thus, the results of this master plan will be used as the basis for mapping the existing flood plain of Alder Creek within the Plan Area.

This Study has been prepared to meet FEMA standards for amending the applicable FIRM Panels to delineate the existing flood plain of Alder Creek within the limits of project. It is anticipated that an Existing Conditions LOMR application will be ready to submit to the City's Flood Plain Administrator for acknowledgement and forwarding on to FEMA approximately 60 days following approval of this Study by the City.

2.6 US Army Corps of Engineers, Section 404 Permitting

The Plan Area is required to secure a Section 404 permit under the Clean Water Act from the United States Army Corps of Engineers (Corps). The Plan Area approach to securing the Section 404 permit will be consistent with other large plan areas in the Sacramento region.

0 500 1000 feet

Legend

95.53 ac.±	Developed Shed Boundary & Acreage
L=547'	Shed Water Route, Centroid & Length
	Drainage Culvert
CP-#	Compliance Point

Note: Datum for this project is NAVD 88.

Exhibit D

Folsom Plan Area

Storm Drainage Master Plan
Existing Shed Map With Compliance Points

City of Folsom, California
Scale: 1"=500'

January 2014
Rev. May 8, 2014

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The strategy to procure the permit consist of bundling a backbone infrastructure permit application, including a comprehensive package of Plan Area wide backbone infrastructure, and approximately eight individual permit applications for the private development projects within the Plan Area. This bundle of applications is currently being reviewed by the Corps. The backbone infrastructure permit is anticipated to be issued in early 2014. The individual permits will then be issued over time. This strategy will enable each development project to proceed independent of the other development projects by relying on the backbone infrastructure permit for common infrastructure improvements.

The Plan Area overall infrastructure plan has been designed to serve the comprehensive needs of the entire Plan Area. The backbone infrastructure permit will allow any individual developer to construct the necessary backbone roadways, sewer pipelines, water mains, booster pump stations, water storage tanks and storm drainage improvements required to serve their project needs. The City of Folsom is the applicant for the backbone infrastructure permit.

The intent of this approach to the Corps of Engineers Section 404 permitting process is to enable the coordinated review of the Plan Area and allow each development project to move forward with construction independent of the other projects once a permit is issued.

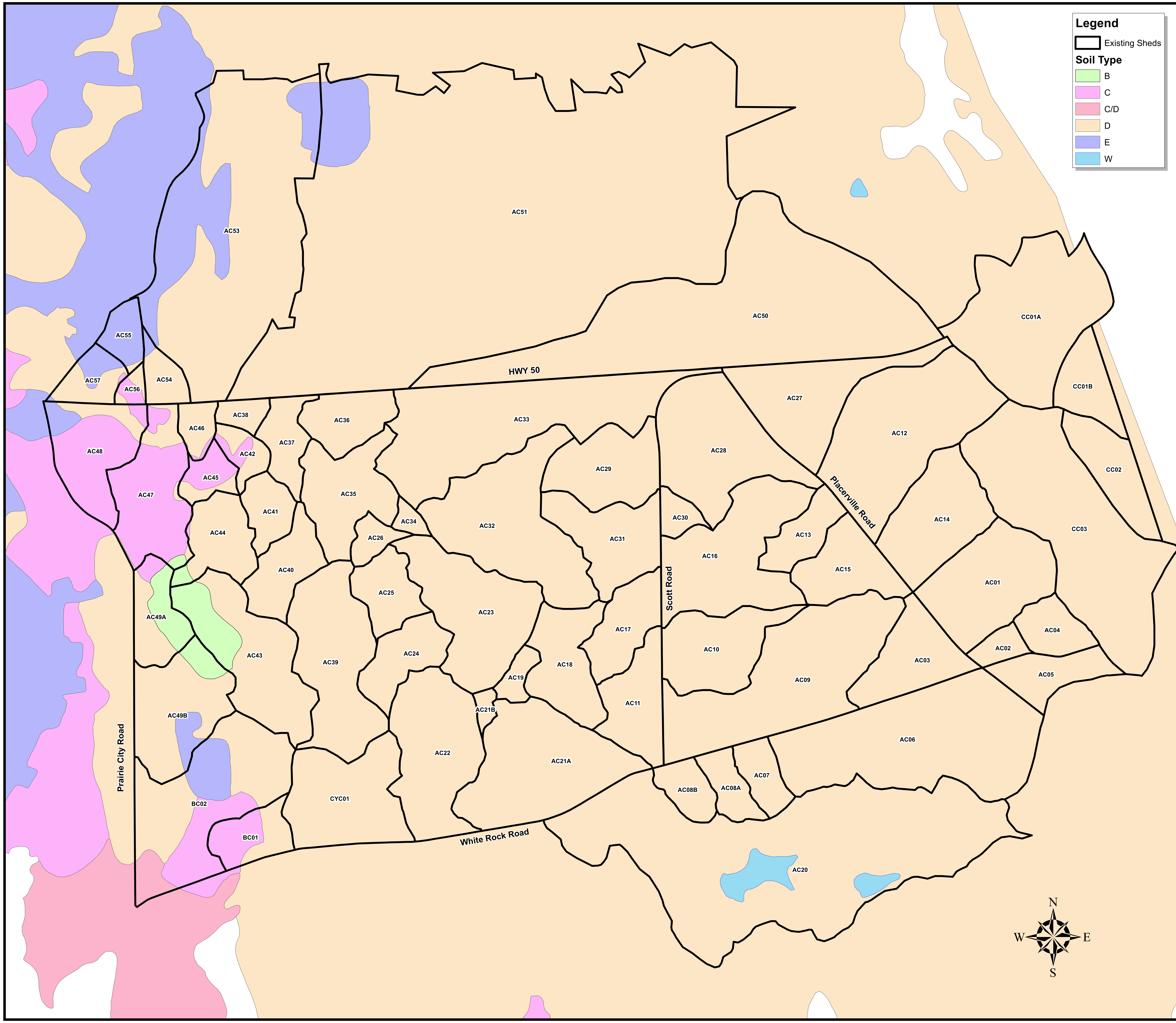
2.7 Soils Information

The soil type classification for each drainage sub shed was determined by using the soils survey of California, Sacramento County. Image files from U.S. Department of Agriculture were downloaded from their web site and referenced into the drainage exhibits for both pre and post conditions. The image files were scaled into the overall watershed plats and poly line areas established where the soils classification is identified as either Type A, B, C, D or E, respectively.[3] These areas are used in the SacCalc model for deriving the hydrology. The overall shed is predominately Type D soil conditions however, in some areas within the Plan Area the soil classifications vary, as seen within **Exhibit E: Soils Existing**.

2.8 Hydrologic Design Criteria

The Plan Area SDMP has been prepared in accordance with the Sacramento County Improvement Standards, Hydrology Standards and Floodplain Management Ordinance, and the requirements of the City of Folsom. Hydraulics analyses have been performed using version 4.1.0 of the US Army Corps of Engineers HEC-RAS program using the unsteady state routines. Hydrographs were produced by utilizing the Sacramento County Hydrologic Calculator, Sac Calc Version 1.1 for each of the drainage sheds.

[3] Permanent water features are shown as “W” soil types.



Area Summary	Soil Type Classification (Acres)						
Shed ID	B	C	C/D	D	E	W	Grand Total
AC01				96.90			96.90
AC02				13.65			13.65
AC03				59.88			59.88
AC04				29.08			29.08
AC05				37.51			37.51
AC06				204.10			204.10
AC07				24.46			24.46
AC08A				23.51			23.51
AC08B				23.57			23.57
AC09				172.54			172.54
AC10				70.92			70.92
AC11				52.73			52.73
AC12				161.40			161.40
AC13				31.24			31.24
AC14				83.53			83.53
AC15				52.85			52.85
AC16				119.68			119.68
AC17				44.64			44.64
AC18				60.90			60.90
AC19				12.32			12.32
AC20				386.16		23.31	409.47
AC21A				132.40			132.40
AC21B				6.04			6.04
AC22				106.73			106.73
AC23				108.47			108.47
AC24				42.21			42.21
AC25				37.16			37.16
AC26				14.25			14.25
AC27				91.02			91.02
AC28				116.74			116.74
AC29				67.17			67.17
AC30				13.24			13.24
AC31				67.23			67.23
AC32				138.42			138.42
AC33				182.44			182.44
AC34				7.27			7.27
AC35				70.10			70.10
AC36				40.26			40.26
AC37				30.58			30.58
AC38				12.54			12.54
AC39				111.26			111.26
AC40				43.02			43.02
AC41				26.55			26.55
AC42		4.95		13.22			18.17
AC43	25.64			81.62			107.26
AC44	2.86	0.41		42.91			46.18
AC45		13.52		6.74			20.26
AC46		1.21		14.53			15.74
AC47	1.66	70.09		11.12			82.88
AC48		54.50		10.38	6.74		71.62
AC49A	17.13	4.12		19.90			41.14
AC49B	9.10			67.92	8.96		85.98
AC50				357.01			357.01
AC51				1007.20	35.20		1042.40
AC53				262.94	85.46		348.40
AC54				17.08	1.82		18.90
AC55				0.87	18.83		19.70
AC56		3.91		3.59			7.50
AC57		0.47		15.58	9.35		25.40
BC01		18.84		15.11			33.96
BC02		33.40	12.15	81.55	20.23		147.33
CC01A				156.00			156.00
CC01B				36.88			36.88
CC02				47.76			47.76
CC03				223.73			223.73
CYC01				95.53			95.53
Grand Total	**56.39**	**205.42**	**12.15**	**5815.88**	**186.59**	**23.31**	**6299.75**

Exhibit E
Folsom Plan Area
Existing Condition
Soil Type Areas

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1552 Eureka Road, Suite 100, Roseville CA. 95661
Job Number: 7919.YR4 Date: January 2014
Rev. May 9, 2014

Document Path: P:\7919\hydro\GisFiles\ExistingConditionSoilTypeAreas.mxd

The City of Folsom has received a new MS4 Permit from the Regional Water Quality Control Board (RWQCB). The RWQCB is now requiring hydromodification mitigation to be addressed in all new discharges to waters under their jurisdiction. The Plan Area SDMP has included hydromodification mitigation measures in it's analysis of the watersheds within the Plan Area.

A permanent open space preserve area is being established along Alder Creek and it's tributaries that will be maintained by the City of Folsom.

2.9 Hydromodification Detention Basin Design

Hydromodification impacts to a watercourse can be mitigated by utilizing several methods. Typically, three methods are generally used; flow duration control, low impact development, and in-stream approaches are used to mitigate the impacts of hydromodification on a watercourse. The Plan Area SDMP will mainly use off-stream detention basins with flow duration control structures included in their design to mitigate for hydromodification impacts to the receiving watercourse.

The off-stream detention basins will be strategically located throughout the Plan Area which will capture the upstream developed watershed storm runoff and provide water quality treatment and mitigate for the hydromodification of the receiving watercourse. The off-stream detention basin will meter the storm runoff out of the basin and into the receiving water, closely matching that watercourses pre-development runoff flow rates and durations.

The Plan Area may also include some in-stream measures for mitigating hydromodification impacts to the receiving watercourse. These in-stream measures to mitigate for hydromodification will typically consist of stream embankment stabilization and flow metering at roadway culvert crossings.

While a commonly accepted technique to protect a stream from the detrimental effects of hydromodification impacts, streambed stabilization is not being proposed as a mitigation measure in this Master Plan. In stream hydromodification basins (flow metering at roadway crossings) is proposed for three locations (Detention Basins 6 and 7 immediately upstream of Scott Road and Detention Basin 11 immediately upstream of White Rock Road. These three basins will actually function as “combination” hydromodification and peak flow attenuation basins (water quality mitigation will occur off-stream in thee locations).

The Plan Area will also include the low impact development (LID) approach to mitigating the hydromodification of the receiving watercourse. However, the modeling programs of the various LID's measures has not yet advanced to a point that they can effectively be included in this SDMP. LID measures are typically implemented at the source prior to the runoff entering the detention basin. Once the LID modeling programs advance and become available for inclusion in the design of the detention basin they can be modeled and sized with the benefits of LID's.

Until then, this SDMP will size the detention basin without the capacity reductions that will result from including LID's in their design. This conservative approach will provide each developer with the opportunity to reduce the size of the future detention basin improvements pro-rata to the LID measures that are built into these respective projects.

The off-stream detention basins proposed to be installed within the Plan Area are designed with three separate types of storm water storage components. These separate storm water storage components are stacked on top of each other within the detention basin. The first type of storm water storage is Water Quality Treatment, the second is strictly hydromodification storage, and the third component is storm water storage. This third storage component has its maximum water surface elevation set by the 100-year, 24-hour storm or the 100-year, 10-day storm, whichever is greater.

All roadway crossings of the main branch of Alder Creek will be bridges that span the ordinary high water mark of the creek. When a roadway crosses over a tributary to the creek, a culvert will be installed and these culverts will be sized to meter the runoff through them thus impounding some of the runoff upstream of the culvert for a very short time duration thus creating an in-stream detention basin. These in-stream detention basin's will be sized based the maximum water surface elevation set by the 100-year 24-hour and the 200-year 24-hour storm events.

Each detention basin will have a specifically designed outlet control structure that will attenuate the storm water runoff sufficiently to comply with the hydromodification criteria of the receiving water course. The detention basin outlet control structure detains the storm runoff generated up to a 10-year, 24-hour event and slowly releases the runoff through a series of varying orifice sizes set at varying elevations. The hydromodification component in the detention basin is considered a dead storage volume for the event based peak flow analyses contained in this SDMP. The dead storage volume is included within the detention basin's ultimate volume, but not counted in the storage volume used for peak flow attenuation.

As the water surface in the detention basin rises, the storm water runoff release rate will also increase, matching the receiving water courses pre-development hydromodification parameters. The top of the outlet control structure will have a grated opening. The opening will be sized to pass the 100-year, 24-hour peak flow rate.

Therefore, in the event a storm larger than the 10-year, 24-hour storm occurs or if the outlet control structure orifices malfunction, the rising water level will reach the grated opening at the top of the structure and then be discharged out of the basin. As a backup to the opening on the top of the outlet control structure a portion of the embankment separating the detention basin from the receiving watercourse will have a spillway that will allow storm runoff to pass through the basin.

3.0 Hydrologic Models

This SDMP has been prepared in accordance with the Sacramento City / County Drainage Manual Volume 2: Hydrology Section and the City's design standards. This drainage study utilizes a two step modeling process:

1. **Hydrology**. The hydrology for each existing sub-shed was derived using the Sacramento Hydrological Calculator (SacCalc) as required by the County hydrology standards. The end product of this step was the development of runoff hydrographs for each sub-shed within the Study Area.
2. **Hydraulics**. The hydrographs derived from SacCalc were then incorporated into a HEC-RAS "unsteady state" analysis in order to determine the peak flow and hydraulic grade line. In the case of Alder Creek, this analysis also included the geometry of the existing streambeds. The final product of this step was the output tables with peak flow rates over time and water surface profiles for the main Alder Creek watercourse, as appropriate.

These two steps were utilized in an comprehensive, iterative approach for both flooding and hydromodification analysis. This approach assured that the hydrologic and the hydraulic modeling for both sets of analyses were consistent in terms of modeling details.

First, the existing conditions hydrology was prepared. Then existing conditions hydraulic analysis was prepared to evaluate the existing conditions flooding plain information – the baseline for existing flooding conditions. In parallel, the existing conditions hydrology was utilized to determine the hydromodification baseline information for existing conditions.

Next, the developed conditions hydrology was established. This information was then used to develop the proposed hydromodification improvements that would be needed to mitigate for development impacts created within the Plan Area.

Finally, the modeling results of the developed conditions hydromodification analysis became the basis of the developed flooding analysis. Once completed, then the developed conditions flood plain mapping was prepared.

This study has utilized topography that is based on the North American Vertical Datum of 1988 (NAVD 1988). Accordingly, all data presented in this study refers to the NAVD 1988 datum.

3.1 Existing Conditions Model

In order to determine the hydrologic impacts resulting from development of Plan Area, an analysis was prepared to analyze the "Existing Conditions" of the creek systems within the Study Area. This “Existing Conditions” model provides a baseline for comparison with the “Developed Conditions” models prepared as a subsequent part of this analysis. “Existing Conditions” is defined by the current land uses within the Study Area.

Impervious coverage and soil type information for the various existing conditions sub-sheds within the Study Area were then developed, see Exhibits E and F, respectively. Additionally, water course lengths and the centroids of each existing conditions sub-shed were determined. This data was then input into SacCalc and resultant existing conditions hydrology was determined.

Beginning stage hydrographs for Alder Creek at Prairie City Road (Compliance Point 1 (Alder – Sta 9+00)) were taken for the unsteady flow boundary conditions contained in the HEC-RAS models developed for the downstream Storm Drainage Master Plan for Easton (February 2013 MacKay & Somps). Initial flows for the HEC-RAS models were set at a minor values to assure model stability.

For off-site drainage sheds north of State Route 50, the impervious and pervious land cover areas from the previously prepared drainage studies (see the bibliography in this SDMP for references to these prior studies). For off-site drainage sheds south of White Rock Road, the impervious and pervious land cover areas were determined in accordance with the County’s drainage standards assuming actual imperious land areas (when known) or by using the minimum imperviousness ratios for undeveloped agricultural lands, which ever was greater. These same values were used for the developed conditions model.

Off-site (upstream) drainage sheds have been assumed to maintain their level of discharge onto the project area in perpetuity at or below existing levels. If these off-site lands develop in the future, the peak developed flows from those upstream areas will need to be mitigated with peak flow attenuation, hydromodification and water quality control basins (or other acceptable measures) such that the resultant flows do not exceed the current (existing) rates of flow There are 13 locations where offsite areas drain onto the existing project areas:

Design Events				
Location	Description	2YR/24HR	10YR/24HR	100YR/24HR
South of White Rock Road	AC-O5	35	32	60
South of White Rock Road	AC-06	136	96	170
South of White Rock Road	AC-07	21	21	39
South of White Rock Road	AC-08A	8.3	18	35
South of White Rock Road	AC-08B	9.6	22	41
South of White Rock Road	AC-20	232	146	250
North of Hwy 50	(OFF9F1) AC-56	4.9	11	21
North of Hwy 50	(OFF9F2) AC-55	9.7	21	38
North of Hwy 50	(OFF9F3) AC-57	13	26	49
North of Hwy 50	(OFF9E) AC-54	10	22	41

North of Hwy 50	(OFF9D) AC-53	11	229	414
North of Hwy 50	(OFF8) AC-51	328	660	1176
North of Hwy 50	(OFF6) AC-50	139	282	509

Refer to **Exhibit D: Folsom Plan Area - Existing Shed Map with Compliance Points** to review the map used as the basis for developing the Existing Conditions Model. This map also includes key compliance points that were used to compare existing and developed conditions peak flow rates to be assured that post-development flows were equal to or less than existing peak flow rates

3.1.1 Existing Conditions Peak Flow Rates

Existing flows and hydraulic conditions were analyzed to establish a base line for the proposed conditions and to determine necessary drainage improvements. As explained above, a hydrologic model of the project area watershed was created using the SacCalc computer program. **Table 3.1** provides the 2-year/24-hour, 10-year/24-hour, 100-year/24-hour, 100-year/10-day, and 200-year/24-hour peak flows for each of the existing drainage sheds described above.

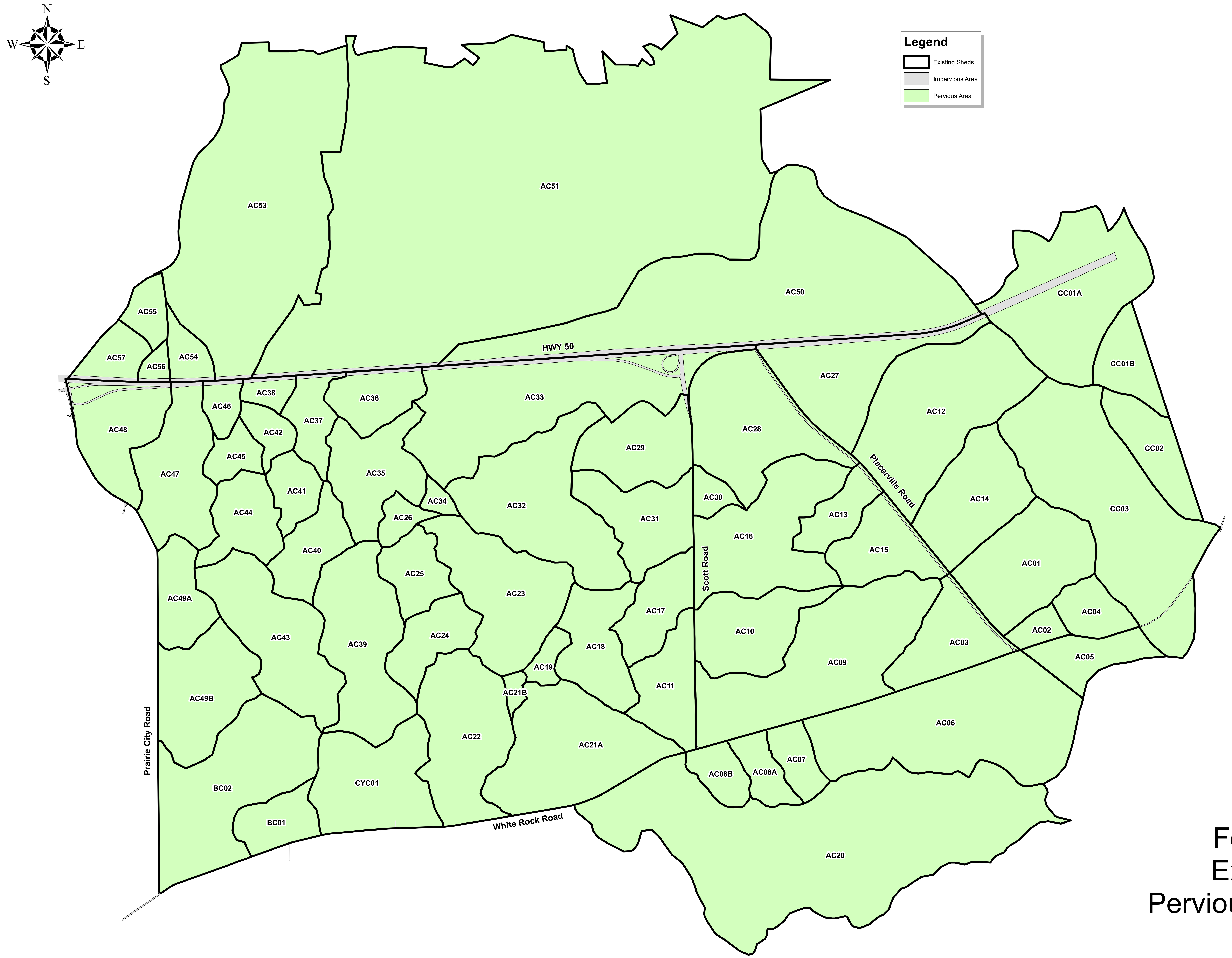
The SacCalc computer program utilizes hydrologic criteria specified by the Sacramento County Hydrology Standards. The shed areas, detailed input parameters and output results (along with model files for existing conditions) are included in **Appendix A** of this report.

Table 3.1 – Existing Conditions Peak Flows

Compliance Point No.	Creek Name	ID/Creek Station	2-Yr/24-Hr Flow (cfs)	10-Yr/24-Hr Flow (cfs)	100-Yr/24-Hr Flow (cfs)	100 Yr/10 Day Flow (cfs)	200-Yr/10 Day Flow (cfs)
CP1	Alder	9+00	1228	2240	3594	3316	3594
CP2	Prairie City	AC49A	15	36	70	32	79
CP3	Prairie City	AC49B	27	62	116	65	131
CP4	Coyote	BC02	36	77	141	99	158
CP5	Coyote	BC01	12	28	54	27	60
CP6	Buffalo	CYC01	28	61	113	72	126
CP7	Alder	131+75	46	99	232	150	232
CP8	Carson	CC03	63	134	243	192	271
CP9	Carson	CC02	21	46	88	49	98
CP10	Carson	CC01	68	149	275	190	307

3.1.2 Existing Conditions Flood Plain

Existing flows and hydraulic conditions were then mapped to yield the existing 100-year/24-hour flood plain for Alder Creek as shown in **Exhibit G: 100-Year Floodplain (Existing)**. A beginning flood plain water surface elevation at Prairie City Road was developed for the HEC-RAS modeling utilizing the ending water surface elevation for the 10-year 24-hour, 100-year 24-hour,100-year 10-day, and 200-year 24-hour events as shown in the Storm Drainage Master Plan for Easton by MacKay & Somps, Inc. (dated February 2013 and approved March 2013) – after adjusting for the datum change from NGVD 1929 to NAVD 1988. The existing conditions flood HEC-RAS analysis is presented in **Exhibit G** of this report.



Area Summary	Surface Type		
Shed ID	Impervious (Acres)	Pervious (Acres)	Grand Total (Acres)
AC01		96.90	96.90
AC02	0.25	13.40	13.65
AC03	1.60	58.29	59.88
AC04	0.29	28.80	29.08
AC05	0.51	37.00	37.51
AC06	1.04	203.06	204.10
AC07	0.17	24.30	24.46
AC08A	0.17	23.34	23.51
AC08B	0.19	23.38	23.57
AC09	1.39	171.15	172.54
AC10	0.25	70.67	70.92
AC11	0.74	51.99	52.73
AC12		161.40	161.40
AC13	0.34	30.90	31.24
AC14		83.53	83.53
AC15	0.95	51.90	52.85
AC16	0.47	119.21	119.68
AC17	0.28	44.35	44.64
AC18		60.90	60.90
AC19		12.32	12.32
AC20	0.58	408.88	409.47
AC21A	0.89	131.51	132.40
AC21B		6.04	6.04
AC22	0.32	106.41	106.73
AC23		108.47	108.47
AC24		42.21	42.21
AC25		37.16	37.16
AC26		14.25	14.25
AC27	8.93	82.09	91.02
AC28	2.28	114.46	116.74
AC29	0.80	66.37	67.17
AC30	0.23	13.00	13.24
AC31	0.41	66.82	67.23
AC32		138.42	138.42
AC33	15.89	166.55	182.44
AC34		7.27	7.27
AC35		70.10	70.10
AC36	2.43	37.84	40.26
AC37	1.56	29.02	30.58
AC38	1.72	10.82	12.54
AC39		111.26	111.26
AC40		43.02	43.02
AC41		26.55	26.55
AC42		18.17	18.17
AC43		107.26	107.26
AC44		46.18	46.18
AC45		20.26	20.26
AC46	1.50	14.25	15.74
AC47	1.51	81.37	82.88
AC48	6.62	65.01	71.62
AC49A	0.43	40.71	41.14
AC49B	0.44	85.54	85.98
AC50	18.80	338.21	357.01
AC51	5.86	1036.54	1042.40
AC53	1.14	347.26	348.40
AC54	1.38	17.52	18.90
AC55		19.70	19.70
AC56	0.89	6.61	7.50
AC57	2.15	23.25	25.40
BC01	0.34	33.61	33.96
BC02	1.15	146.18	147.33
CC01A	9.16	146.85	156.00
CC01B		36.88	36.88
CC02		47.76	47.76
CC03	0.88	222.85	223.73
CYC01	0.63	94.90	95.53
Grand Total	**97.57**	**6202.18**	**6299.75**

Exhibit F
Folsom Plan Area
Existing Condition
Pervious - Impervious Areas

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Job Number: 7919.YR4 Date: January 2014
Rev. May 9, 2014

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3.2 Developed Conditions Model

The "Developed Conditions" model is based on a fully developed Folsom Plan Area. This model utilized the existing conditions model as a starting point and added in the Folsom Plan Area land use plan. Soil type information and impervious coverage for the various developed conditions sub-sheds within the Study Area were developed, see **Exhibit H and I**, respectively.[4] Additionally, water course lengths and the centroids of each developed conditions sub-shed were determined. This data was then input into SacCalc and resultant developed conditions hydrology was determined.

Initial conditions flow parameters for each of the design storm scenarios in the HEC-RAS modeling were increased from the values used in the existing conditions analysis to fill both in-stream hydromodification basins upstream of Scott Road (Detention Basins 6 and 7). The use of these initial, nominal values nominal values assure that the hydromodification volume of these two basins isn't available for peak flow attenuation during major storm events (a conservative assumption). Additionally, the use of these initial values doesn't have an adverse effect on the modeling results contained in this master plan.

Refer to **Exhibit J: Folsom Plan Area – Developed Shed Map w/ Compliance Points** to review the map used as the basis for developing the Developed Conditions Model. This map also includes key compliance points that were earlier developed to enable comparison of existing and developed conditions peak flow rates. The goal clearly being to assure that post-development flows were equal to or less than existing peak flow rates

3.2.1 Proposed Detention Basins

In order to attenuate the developed conditions peak flow rates to be equal to or less than existing conditions peak flow rates a series of 16 detention basins were created throughout the Plan Area. Eleven of the detention basins will be standalone in-line basins. Additionally, five will be Combination, detention and hydromodification, basins either in-line and/or off-line.

[4] The developed conditions acreages shown on Exhibit H and I are approximately 15± acres larger than shown for the existing conditions on Exhibits E and F. This difference consists of an increase in developed conditions footprint where Prairie City Road was realigned westerly (thereby creating a larger developed conditions footprint) and the reduction in developed conditions footprint along the eastern edge of the Plan Area where the development isn't planned to encroach into the Carson Creek open space area as much as originally envisioned.

Legend:

Existing 100 Year Floodplain

10480 / 396.2' — Station / Water Surface Elevation

Note:
1. Datum for this project is NAVD 88.

Exhibit G

Folsom Plan Area

Storm Drainage Master Plan
Existing 100 Year Flood Map

City of Folsom, California
Scale: 1"=400'
January 2014

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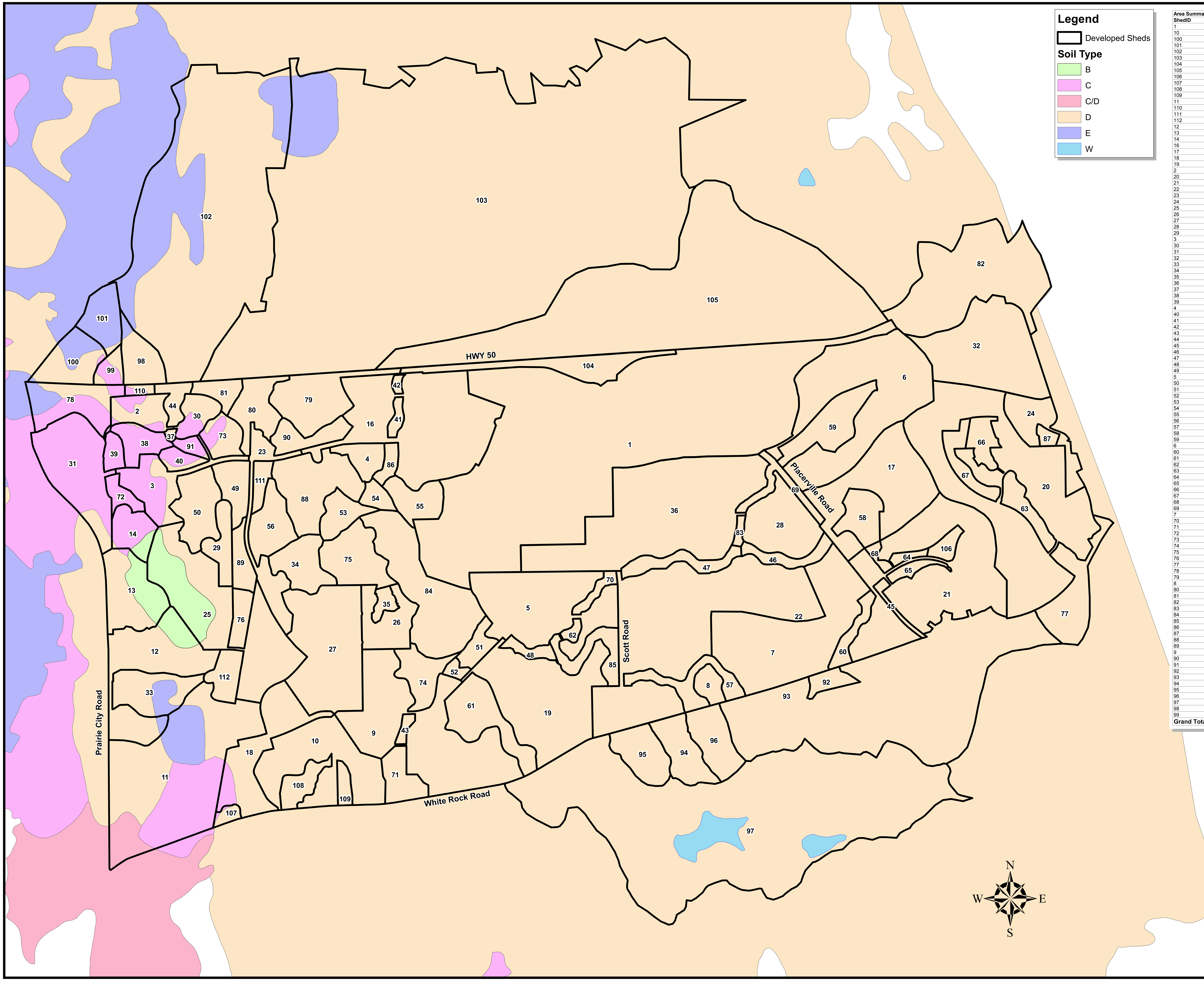

Area Summary	Soil Type Classification (Acres)						
ShedID	B	C	C/D	D	E	W	Grand Total
1				468.08			**468.08**
10				66.83			**66.83**
100		0.47		15.58	9.35		**25.40**
101				0.87	18.83		**19.70**
102				262.94	85.46		**348.40**
103				1007.20	35.20		**1042.40**
104				29.34			**29.34**
105				357.01			**357.01**
106				6.16			**6.16**
107		0.61		3.21			**3.82**
108				12.16			**12.16**
109				5.37			**5.37**
11		45.97	13.93	71.34	20.51		**151.75**
110		1.47		1.53			**3.00**
111				6.95			**6.95**
112				13.44			**13.44**
12	8.69			53.31	1.55		**63.55**
13	14.50	0.54		22.84			**37.88**
14	3.64	13.12		0.26			**17.02**
16				120.56			**120.56**
17				72.35			**72.35**
18		5.66		41.78			**47.44**
19				91.10			**91.10**
2		5.40		11.95			**17.35**
20				174.81			**174.81**
21				130.24			**130.24**
22				178.21			**178.21**
23				25.40			**25.40**
24				24.92			**24.92**
25	29.57	0.07		70.72			**100.36**
26				24.41			**24.41**
27				82.26			**82.26**
28				39.32			**39.32**
29				14.50			**14.50**
3		18.34		11.97			**30.31**
30		4.57		8.29			**12.86**
31		53.54		5.71			**59.25**
32				81.11			**81.11**
33				22.24	7.13		**29.37**
34				22.67			**22.67**
35				5.25			**5.25**
36				158.07			**158.07**
37		0.55		0.58			**1.13**
38		14.08		0.36			**14.44**
39		6.52					**6.52**
4				11.84			**11.84**
40		4.88		2.24			**7.11**
41				4.00			**4.00**
42				1.69			**1.69**
43				2.99			**2.99**
44				8.85			**8.85**
45				3.67			**3.67**
46				10.53			**10.53**
47				14.74			**14.74**
48				6.01			**6.01**
49				15.99			**15.99**
5				83.37			**83.37**
50				27.69			**27.69**
51				9.35			**9.35**
52				3.20			**3.20**
53				14.29			**14.29**
54				6.82			**6.82**
55				18.02			**18.02**
56				22.66			**22.66**
57				19.57			**19.57**
58				18.44			**18.44**
59				29.03			**29.03**
6				116.86			**116.86**
60				9.66			**9.66**
61				34.49			**34.49**
62				2.81			**2.81**
63				13.16			**13.16**
64				2.99			**2.99**
65				5.20			**5.20**
66				11.74			**11.74**
67				13.40			**13.40**
68				3.06			**3.06**
69				11.16			**11.16**
7				105.19			**105.19**
70				5.48			**5.48**
71				16.12			**16.12**
72		7.36					**7.36**
73		4.08		9.67			**13.76**
74				19.42			**19.42**
75				31.12			**31.12**
76				9.94			**9.94**
77				33.54			**33.54**
78		16.95		8.60	6.74		**32.29**
79				37.90			**37.90**
8				8.36			**8.36**
80				22.55			**22.55**
81				9.76			**9.76**
82				106.01			**106.01**
83				2.46			**2.46**
84				71.80			**71.80**
85				16.56			**16.56**
86				5.75			**5.75**
87				3.19			**3.19**
88				44.52			**44.52**
89				11.21			**11.21**
9				114.72			**114.72**
90				15.20			**15.20**
91		4.27		0.24			**4.51**
92				7.66			**7.66**
93				244.65			**244.65**
94				23.51			**23.51**
95				23.57			**23.57**
96				24.46			**24.46**
97				386.16		23.31	**409.47**
98				17.08	1.82		**18.90**
99		3.91		3.59			**7.50**
Grand Total	**56.40**	**212.36**	**13.93**	**5822.71**	**186.59**	**23.31**	**6315.29**

Exhibit H
Folsom Plan Area
Developed Condition
Soil Type Areas

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Rev. May 9, 2014

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Area Summary	Land Use Classification (Acres)																
Shed ID	CC	GC	IND_OP	MHD	MLD	MMD	MU	Offsite Pervious	OS	OS-LC	P	PQP	RC	Roadway	SF	SFHD	Grand Total
1		91.38	10.54	20.03	26.11	22.17	22.00	8.31	36.88		1.15	0.01	110.78	48.03	35.54	35.17	**468.11**
10								1.08	0.29	3.11		19.57		3.46		39.31	**66.83**
100								23.25						2.15			**25.40**
101								19.70									**19.70**
102								347.26						1.14			**348.40**
103								1036.54						5.86			**1042.40**
104		0.00						15.64					0.00	13.69			**29.34**
105								338.21						18.80			**357.01**
106									6.12					0.02	0.01		**6.15**
107								0.41	3.38	0.00				0.03		0.00	**3.82**
108								0.23	11.73	0.10				0.02		0.10	**12.16**
109								0.20	5.06	0.00		0.02		0.07			**5.37**
11	17.32			9.77	9.04	8.56		5.81	25.08	8.12	30.06			8.86	11.04	18.06	**151.73**
110			0.03					0.97	0.70					1.30			**3.00**
111									6.95					0.00			**6.95**
112									13.33	0.00	0.04			0.04	0.03		**13.44**
12								3.88	4.45	0.69	14.82			2.24	37.45		**63.55**
13								3.40	15.26	1.03					18.20		**37.88**
14			0.00						5.13						11.89		**17.02**
16		13.66	9.20		10.58	12.82	25.32		3.58		2.26	1.23		17.53	0.00	24.37	**120.56**
17					10.35				6.60			3.33		1.27	50.79		**72.35**
18								0.54		3.63	0.00	0.00		3.98	13.98	25.31	**47.44**
19						7.21		0.85	0.17	1.63		79.61		1.63			**91.10**
2			16.56						0.39					0.40			**17.35**
20		10.24			11.14				0.89	0.22	5.70	4.48		12.24	124.24	5.66	**174.81**
21					19.07		0.01	1.06	6.93	1.83	4.63	3.49		7.90	51.90	33.43	**130.24**
22	8.52			9.10	9.85	17.74		1.30	0.49	4.28	11.69	9.90		12.00		93.32	**178.21**
23									3.97	1.70				10.44	9.29		**25.40**
24					3.19				2.19					0.78	10.69	8.06	**24.92**
25									26.31	0.91	10.02	10.01		2.09	51.01		**100.36**
26					13.04				2.14					0.00	9.24		**24.41**
27					0.03				1.30	3.36		0.01		6.76	49.95	20.85	**82.26**
28									2.78		26.12			2.48		7.95	**39.32**
29									0.00						14.50		**14.50**
3									5.14			0.82		7.27	17.08		**30.31**
30			11.02						1.58					0.25			**12.86**
31			39.92					8.39	6.54	1.09				2.72	0.59		**59.25**
32		30.77			13.41			0.84	1.28					2.93	14.58	17.30	**81.11**
33									26.37		2.95				0.06		**29.37**
34									22.67						0.00		**22.67**
35									5.25						0.00		**5.25**
36	13.41	15.83		12.04	49.09		6.52		1.66		5.01	10.01		18.57		25.97	**158.12**
37			0.00						1.13								**1.13**
38			0.01						14.44					0.00			**14.44**
39			0.00						6.52					0.00			**6.52**
4									1.61						10.23		**11.84**
40									7.11					0.00			**7.11**
41					0.01		0.01		3.97								**4.00**
42									1.69								**1.69**
43									2.71	0.00		0.27		0.01			**2.99**
44			0.00					1.45	5.89					1.51			**8.85**
45								0.08	3.59	0.00				0.00		0.00	**3.67**
46					0.00				10.52		0.00					0.00	**10.53**
47					0.01				14.42					0.31		0.01	**14.74**
48					0.00				6.00			0.00					**6.01**
49									15.99								**15.99**
5					24.58				2.01	2.95	10.61	11.01		6.57		25.64	**83.38**
50									27.69								**27.69**
51									9.35		0.00						**9.35**
52									3.20								**3.20**
53									14.29								**14.29**
54									6.82						0.00		**6.82**
55									18.02						0.01		**18.02**
56									22.66								**22.66**
Grand Total	39.26	212.93	89.22	50.96	263.55	68.49	59.12	2717.09	1006.21	47.21	125.07	184.44	110.78	268.43	580.59	492.02	6315.37

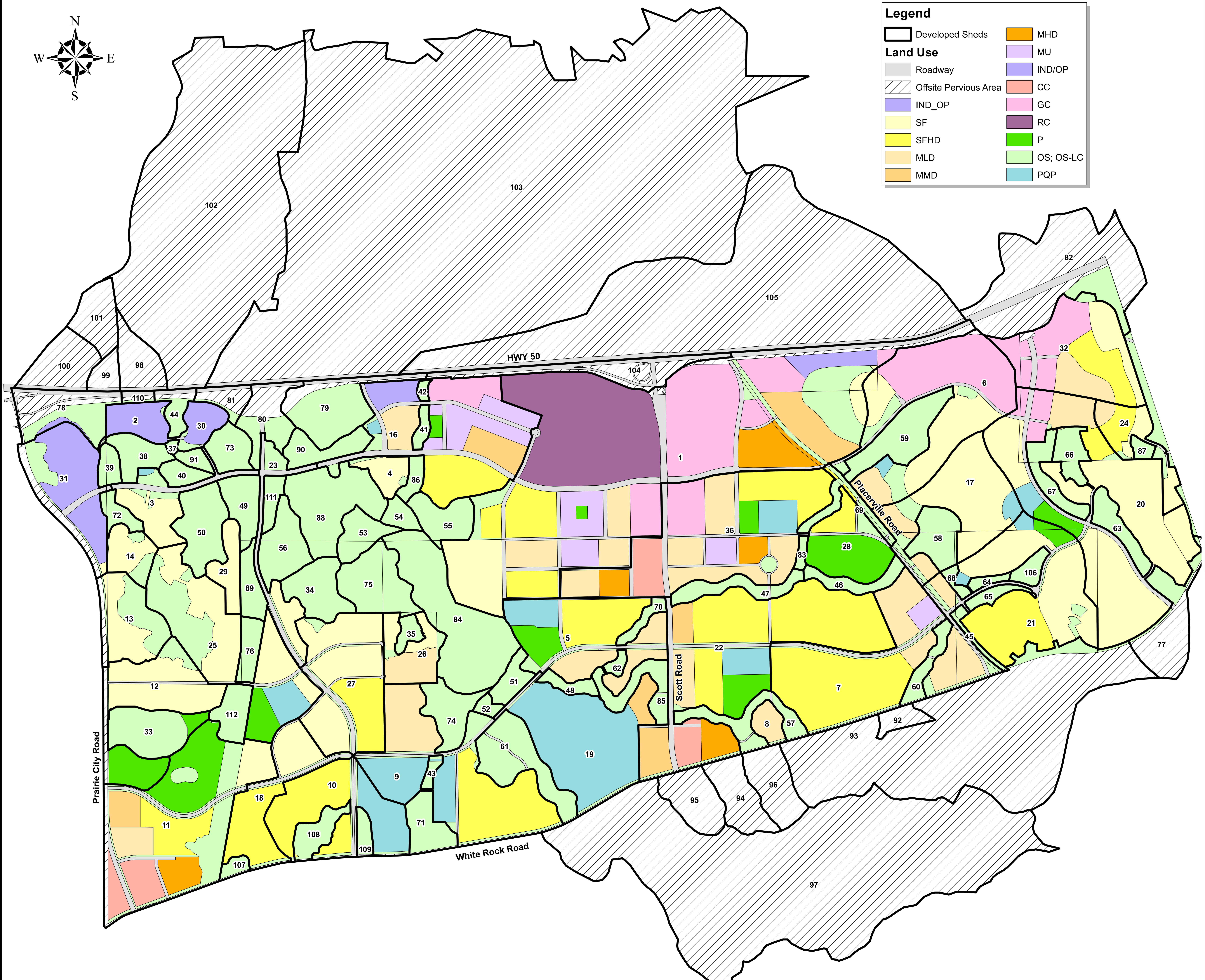

Exhibit I
Folsom Plan Area
Developed Condition
Pervious - Impervious Areas

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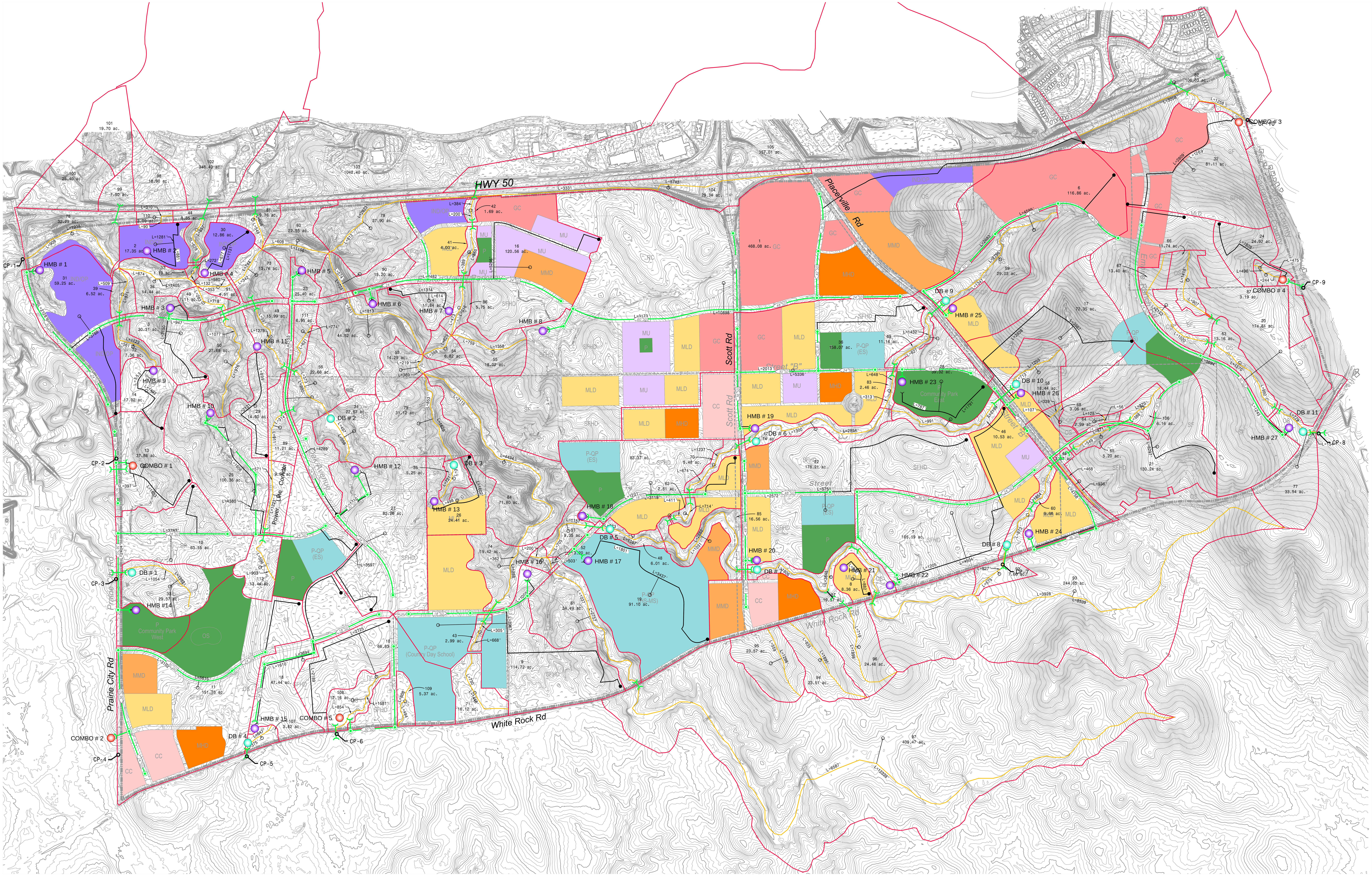
Job Number: 7919.YR4 Date: January, 2014
Rev. May 9, 2014

Document Path: P:\7919\hydro\GisFiles\DevelopedConditionPerviousImperviousAreas.mxd



Legend

- Developed Shed Boundary
- 9 / 114.72 ac. — Shed Identification & Acreage
- Shed Water Route, Centroid & Length
- Shed Water Route, Centroid & Length (Ex for Dev)
- Water Quality - Hydromodification Basin
- Water Quality - Hydromodification Detention Basin
- In-Stream Detention Basin
- Drainage Culvert
- Storm Drain Pipeline
- Bridge
- CP-# — Compliance Point

INFRASTRUCTURE ABBREVIATIONS

DB	Detention Basin
HMB	Hydro-modification Basin
COMBO	Combination Basin

0 500 1000 feet

Note: Datum for this project is NAVD 88.

Exhibit J

Folsom Plan Area

Storm Drainage Master Plan

Developed Shed Map With Compliance Points

City of Folsom, California

Scale: 1"=500'

January 2014

Rev. May 08,2014

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7919-00

Also, these detention basins will be designed to meet the requirements of the contributing watershed with one foot of freeboard to basin top of bank elevations. In addition, to ensure safety of proposed houses from flood damage, the proposed pads of adjacent homes will be designed to be at least 2.0 feet higher than the maximum water surface elevation of the downstream release point, including roads, at detention basins.

All detention basins will operate independently of each other. Basins located along Alder Creek will be discharge to the creek after partially mitigating peak flow, and fully mitigating hydromodification and water quality impacts, from their respective watersheds. In some cases water quality basins will be separate and apart from the adjacent hydromodification and detention basins. The remainder of the peak flow attenuation for the basins along Alder Creek will occur in Alder Creek itself, which has significant naturally occurring in-stream and over-bank storage capacity.

All detention basins will be designed in anticipation of embankment failure or overtopping via overland releases that will direct flood waters away from downstream residential and commercial structures. In this way, failure or overtopping of a detention basin will not pose a flood risk to downstream residential and commercial

The basins that drain to the three other creeks in the area (Buffalo, Coyote and Carson Creeks) will, likewise, operate independently of each other. These basins, though, will fully mitigate for the peak flow, hydromodification and water quality impacts from their respective watersheds prior to discharge to the local surface water drainage courses. Again, in some cases water quality basins will be separate and apart from the adjacent hydromodification and detention basins.

3.2.2 Developed Conditions Peak Flow Rates (Attenuated)

The developed conditions attenuated peak flows are summarized in **Table 3.3: Developed Conditions Attenuated Peak Flows**. The results of the Developed Conditions Model clearly confirm that a fully developed Plan Area will generate peak flow rates that are at or below Existing Conditions peak flow rates.

The characteristics of these basins are summarized in **Table 3.2: Proposed Detention Basin Statistics**.

Table 3.2: Proposed Detention Basin Statistics

Basin Number	Modeling Number	Basin Bottom Elevation	Top of Hydromod Riser Elev.	Spillway Elevation	Top of Berm Elevation	Basin Surface Area (Acres)	Basin Volume (Ac. Ft.)
Combo 1	COMMB1	306.0	309.6	309.6	316.0	1.12	6.69
Combo 2	COMMB2	302.0	309.2	309.2	314.0	2.09	15.74
Combo 3	COMMB3	600.0	604.5	604.5	610.0	2.66	17.22
Combo 4	COMMB4	608.0	614.9	614.9	620.0	0.69	2.58
Combo 5	COMMB5	347.0	351.6	351.6	357.0	1.93	11.73
DB1	DBB1	310.0	N/A	315.0	318.0	2.57	9.49
DB2	DBB2	312.0	N/A	315.0	320.0	3.95	17.79
DB3	DBB3	336.0	N/A	341.0	344.0	3.32	15.93
DB4	DBB4	333.0	N/A	342.0	343.0	2.43	12.96
DB5	Trib1-3197.1	334.0	N/A	N/A	356.0	10.91	90.07
DB6	Trib2-3742.97	376.0	385.1	385.1	391.0	3.06	24.36
DB7	Trib1-7090	360.0	370.9	370.9	378.0	6.52	41.65
DB8	Trib1-13175	432.0	N/A	N/A	448.0	1.84	11.52
DB9	DBB9	480.0	489.1	489.1	500.0	1.79	16.76
DB10	DBB10	490.0	N/A	497.0	500.0	0.34	1.76
DB11	DBB11	530.0	541.8	541.8	546.0	2.73	19.96
						Total	**316.21**

Table 3.3: Developed Conditions Attenuated Peak Flows

Compliance Point No.	Creek Name	Creek Station	2-Yr/24-Hr Flow (cfs)	10-Yr/24-Hr Flow (cfs)	100-Yr/24-Hr Flow (cfs)	100 Yr/10 Day Flow (cfs)	200-Yr/24- Hr Flow (cfs)
CP1	Alder	9+00	964	1940	3243	2926	3585
CP2	Prairie City	AC49A	4	17	49	29	57
CP3	Prairie City	AC49B	13	28	56	51	71
CP4	Coyote	BC02	28	72	118	98	129
CP5	Coyote	BC01	2	6	22	22	23
CP6	Buffalo	CYC01	16	45	91	64	103
CP7	Alder	131+75	37	82	126	118	133
CP8	Carson	CC03	47	104	176	176	192
CP9	Carson	CC02	15	28	59	30	66
CP10	Carson	CC01	49	118	223	173	251

3.2.3 Existing and Developed Conditions Peak Flow Rates

All detention volumes are required to attenuate developed conditions peak flows down to existing conditions levels will be provided within the Plan Area. A comparison of existing conditions peak flows and developed conditions attenuated peak flows is shown in **Table 3.4: Existing and Developed Conditions Peak Flows**.

The required basin volumes and associated statistics are shown in **Table 3.5: Required Detention Basins**. The bold numbers shown in **Table 3.5** represent the maximum detention volume for a particular detention basin. SacCalc input and results for the developed conditions models are presented (along with model files for both conditions) in **Appendix A** of this report.

The outlet structure of each basin will include a set of low flow culverts with an overflow pipe and an overflow weir. Hydromodification orifices will be included in each outlet structure to control the release of low intensity flows. The required detention volume is "stacked" above the required Hydromodification volume. Detailed outlet structure design is beyond the scope of this SDMP and will be determined at the time of improvement plan design.

Table 3.4: Existing and Developed Conditions Peak Flows

Compliance Point Number	Existing Conditions (cfs)					Developed Conditions w/ Detention (cfs)				
	2-yr/ 24-hr	10-yr/ 24-hr	100-yr/ 24-hr	100-yr/ 10-day	200-yr/ 24-hr	2-yr/ 24-hr	10-yr/ 24-hr	100-yr/ 24-hr	100-yr/ 10-day	200-yr/ 24-hr
CP1	1228	2240	3594	3316	3594	964	1940	3243	2926	3585
CP2	15	36	70	32	79	4	17	49	29	57
CP3	27	62	116	65	131	13	28	56	51	71
CP4	36	77	141	99	158	28	72	118	98	129
CP5	12	28	54	27	60	2	6	22	22	23
CP6	28	61	113	72	126	16	45	91	64	103
CP7	46	99	232	150	232	37	82	126	118	133
CP8	63	134	243	192	271	47	104	176	176	192
CP9	21	46	88	49	98	15	28	59	30	66
CP10	68	149	275	190	307	49	118	223	173	251

Table 3.5: Required Detention Basins

Det. Basin No.	Modeling Number	Hydro-Mod Volume (Ac-Ft)	2-Year 24-HR		10-Year 24-HR		100-Year 24-HR		100-Year 10-Day		200-Year 24-HR	
			Volume (AC-FT)	WSE	Volume (AC-FT)	WSE	Volume (AC-FT)	WSE	Volume (AC-FT)	WSE	Volume (AC-FT)	WSE
Combo1	COMMB1	2.4	1.5	308.3	2.3	309.4	3.1	310.4	2.7	309.9	3.2	310.5
Combo2	COMMB2	10.3	7.9	307.8	10.1	309.0	13.0	310.6	11.8	310.0	13.7	311.0
Combo3	COMMB3	8.6	5.6	603.0	7.5	604.0	9.6	604.9	9.1	604.7	10.0	605.1
Combo4	COMMB4	0.9	0.8	614.4	1.0	614.9	1.2	615.4	1.0	614.9	1.3	615.7
Combo5	COMMB5	5.8	4.3	350.5	5.7	351.5	7.2	352.4	6.6	352.1	7.5	352.6
DB1	DBB1	N/A	0.2	310.2	1.5	311.6	4.1	314.3	4.0	314.2	4.3	313.5
DB2	DBB2	N/A	1.7	312.7	5.3	314.2	9.3	315.6	9.4	315.6	9.8	315.8
DB3	DBB3	N/A	0.5	336.2	1.2	336.6	2.3	337.1	2.2	337.0	2.6	337.2
DB4	DBB4	N/A	0.1	333.1	0.3	333.4	1.5	335.1	1.6	335.2	1.9	335.4
DB5	Trib1-3197.1	N/A	5.5	340.3	25.8	346.1	66.1	351.6	68.8	351.9	77.8	352.8
DB6	Trib2-3742.97	11.3	4.9	381.2	11.8	385.2	19.1	388.2	17.7	387.7	20.9	388.8
DB7	Trib1-7090	16.1	24.5	372.9	32.8	374.5	39.3	375.6	40.5	375.8	41.7	376.0
DB8	Trib1-13175	N/A	0.0	429.7	0.1	431.6	0.5	434.6	0.3	433.9	0.7	435.2
DB9	DBB9	4.9	4.9	489.0	4.9	489.0	5.8	490.0	5.1	489.2	6.1	490.3
DB10	DBB10	N/A	0.1	490.8	0.6	493.8	1.5	497.2	1.5	497.2	1.6	497.5
DB11	DBB11	14.4	6.4	538.3	11.3	540.6	17.7	543.1	17.5	543.1	19.2	543.7
	Total		**68.9**		**122.2**		**201.36**		**199.3**		**222.3**	

Note: Elevations shown are NAVD 1988 Datum.

Clearly, the results of this analysis indicated that the proposed detention basins, in conjunction with the in-stream detention proposed for the Alder Creek corridor, are adequately sized to attenuate the peak developed flows to less than existing conditions.

3.2.4 Developed Conditions Flood Plain

Pre-developed flows and hydraulic conditions were then mapped to yield the existing 100-year/24-hour flood plain for Alder Creek as shown in **Exhibit G: 100-Year Floodplain Existing**. Post development flood plain water surface elevations in Alder Creek are at or below existing condition at the project limits (see **Exhibit K: 100-Year Floodplain Developed**). The developed conditions flood HEC-RAS analysis is presented (along with model files for developed conditions) are included in **Appendix A** of this report.

This Master Plan has been prepared in anticipation of future FEMA mapping requirements for Alder Creek (greater than one (1) square mile drainage shed area). The hydrologic and hydraulic modeling used in this Master Plan have been prepared to comply with FEMA flood mapping criteria. The resultant existing and developed conditions flood plain mapping contained herein complies with FEMA Standards. Conformance to FEMA standards should make the preparation of CLOMR and LOMR's for the proposed developments within the Folsom Plan Area.

3.2.5 Flood Plain Mapping Amendments

As explained in this master plan, the existing conditions flood plain of Alder Creek has been analyzed and mapped in **Exhibit G.** Also, as mentioned elsewhere in this master plan, the City is requiring the FPA proponents to prepare and file a Letter of Map Revision (LOMR) with FEMA to officially add this flood plain to the the applicable FEMA Flood Insurance Rate Map(s) (FIRM's).

Over time, as development within the FPA is proposed, the City will require applicants to analyze and map any proposed changes in the flood plain of the creek that will result from each proposed development. In each case, the City will require the applicant to prepare and file a Conditional Letter of Map Revision (CLOMR) with FEMA prior to approval of grading plans that would impact the existing flood plain, provide "grading certification" that the grading conformed to the approved CLOMR, and prepare and file all necessary documentation to assist the City and/or FEMA to subsequently issue a final LOMR.

All FEMA mapping, grading certifications, and all other requirements of FEMA and/or the City relating to flood plain mapping and management must be prepared by a qualified civil engineer duly licensed to practice in the State of California. The provisions of this section of the master plan are intended to supplement, not replace, all existing and future requirements of the City and/or FEMA as they relate to flood plain mapping and management.

3.3 Hydromodification Mitigation Model

The City of Folsom, in cooperation with the Sacramento Stormwater Quality Partnership (SSQP), has developed a Hydromodification Management Plan (HMP) to comply with its 2008 NPDES MS4 Permit from the Central Valley RWQCB. The RWQCB has been requiring jurisdictions seeking renewal of their MS 4 Permits to include hydromodification mitigation as a requirement for receiving a renewed MS 4 Permit.

While the timing for final adoption of the HMP by the RWQCB is not known with certainty at this time, it is prudent at this time to introduce the project's strategy for compliance with the HMP requirements as currently drafted. Hydromodification mitigation has become an important part of the preparation of storm drainage master plans.

The hydromodification strategy that will be employed for the Plan Area consists of the enlargement of the detention basins described above to provide the additional capacity required for hydromodification mitigation and/or the creation of standalone hydromodification basins, as appropriate. Per the requirements of the Draft HMP, the Plan Area will utilize flow duration control structures in each of the detention basins to accomplish flow matching in the downstream creek systems.

Exhibit K

Folsom Plan Area

Storm Drainage Master Plan
Developed 100 Year Flood Map

City of Folsom, California
Scale:1"=400'
January 2014

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To this end, SSQP has developed the Sacramento Area Hydrology Model (SAHM), a user-friendly software interface developed that utilizes behind-the-screen continuous simulation modeling of the developed conditions for the range of flows from 25% of the two-year storm event (25% Q_2) to the ten-year storm event (Q_{10}). SAHM provides an easy to use watershed basin data input platform and produces easy to interpret compliance point output results. The objective of SAHM is to allow the designer to vary the size of a hydromodification basin and outlet works until post-development flows meet the pre-development compliance criteria set forth in the HMP.

Hydromodification basins may not empty quickly due to the slow release rate of the hydromodification flow duration control structures. Accordingly, for flood control purposes it has been assumed that all of the hydromodification basins are full at the beginning of the 10-year/24-hour, 100-year/24-hour, 100-year/10-day, and 200-year/24-hour storm events. These basins will drain through the hydromodification flow duration control structures while the discharge from these larger events are temporarily detained and then released from the detention basin into the downstream drainage system via the overflow pipe and/or overflow weir provided in each basin.

In the case of those basins within the Alder Creek watershed, the bulk of the peak flow attenuation will occur in the creek corridor itself. In the alternative situation, for those basins discharging to the other surface water drainage courses surrounding the project, peak flow attenuation will occur in the detention basin itself.

Detailed hydromodification modeling was performed for the Plan Area utilizing the SAHM software. Each hydromodification basin was modeled and outlet orifices were sized using SAHM to mitigate for the impacts from development of that portion of the Plan Area. The network of basins along Alder Creek was also modeled as a system. This real time simulation was performed to demonstrate the ability of the overall Alder Creek system of hydromodification basins to mitigate adverse impacts at downstream compliance points.

Hydromodification modeling results are presented in **Table 3.6: Summary of Hydromodification Results**, while the full hydromodification reports are contained in **Appendix E (Vol 2)**. Based on these modeling results, the proposed detention basins are adequately sized to mitigate the hydromodification impacts of the project.

Table 3.6: Summary of Hydro-modification Results

Interim sizing and outlet structure configuration for water-quality/hydromodification control basins for the Folsom SOI specific plan. Note that basins were sized for hydromodification compliance on a cumulative basis within the project area and where flows exit the project boundary. Outlet structures were optimized to show compliance with the Sacramento HMP using the Sacramento Area Hydrology Model at the project planning scale, and are not intended as design-level configurations that are ready for construction. Additional optimization and design is required during the detailed design phase for each portion of the project.

Basin	Water Quality Volume	Water quality orifice [1, 2]		Combined Water Quality/ Hydromodification Control volume [7]	Lower hydromodification orifice			Upper hydromodification orifice			Flowline of HM basin overflow
		Width	Height		Width	Height	Flowline Stage [3]	Width	Height	Flowline Stage [3]	
	(ac-ft)	*(ft)*	*(ft)*	*(ac-ft)*	*(ft)*	*(ft)*	*(ft)*	*(ft)*	*(ft)*	*(ft)*	*(ft)*
Combo 1 (5)	0.51	0.33	0.33	2.42	0.50	1.5	1.2	4.8	0.83	2.7	3.6
Combo 2 (5)	3.51	0.42	0.42	10.32	1.0	1.0	2.9	5.3	2.4	4.8	7.2
Combo 3 (5)	2.92	0.50	0.50	8.60	1.5	0.5	1.7	4.5	2.3	2.2	4.5
Combo 4 (5)	0.52	0.08	0.17	0.92	1.7	0.33	5.5	8.0	0.58	5.9	6.9
Combo 5 (5)	1.70	0.33	0.33	5.79	0.67	1.0	1.6	4.6	1.8	2.8	4.6
HMB 1 (6)	2.38	0.25	0.25	--	--	--	--	--	--	--	8.0
HMB 2	1.11	0.21	0.17	2.02	0.58	0.25	5.4	0.67	2.0	6.0	8.0
HMB 3	0.68	0.17	0.17	2.02	0.67	0.33	3.9	1.5	1.0	5.5	8.0
HMB 4	0.69	0.17	0.17	1.48	0.25	0.5	3.7	1.0	1.5	4.5	6.0
HMB 5	0.78	0.17	0.17	2.02	0.5	0.5	4.3	1.2	2.0	6.0	8.0
HMB 6 (6)	5.39	0.42	0.33	--	--	--	--	--	--	--	7.2
HMB 7	0.19	0.08	0.17	0.70	0.25	0.5	1.5	1.0	1.5	2.5	4.0
HMB 8	20.42	0.67	0.67	48.23	1.8	1.8	10.4	3.6	7.1	12.8	20.0
HMB 9	0.25	0.13	0.13	1.17	0.25	0.33	1.9	0.83	2.2	3.5	5.7
HMB 10	1.62	0.33	0.25	6.13	0.5	0.83	2.6	2.9	2.5	5.0	7.6
HMB 11	0.25	0.13	0.13	0.92	0.25	0.50	1.9	1.5	1.5	3.5	5.0
HMB 12 (8)	1.70	0.25	0.25	4.31	1.0	0.50	4.0	3.1	2.5	7.0	8.0
HMB 13	0.60	0.17	0.13	1.93	0.33	0.50	3.6	0.83	2.6	5.1	7.8
HMB 14	1.02	0.38	0.33	4.59	0.50	0.50	2.0	2.0	2.4	4	6.5
HMB 15	1.07	0.29	0.25	9.48	0.25	0.25	1.9	0.5	4.2	5.4	9.6
HMB 16 (9)	3.08	0.50	0.42	18.84	1.0	1.0	2.0	2.5	1.9	3.3	9.2
HMB 17	2.71	0.38	0.33	8.68	1.2	0.5	3.2	3.0	2.7	5.3	8.0
HMB 18	2.24	0.33	0.33	6.77	1.0	0.5	3.1	3.8	1.9	4.7	7.2
DB 6 (11)	--	--	--	10.06	1.0	3.5	0.0	3.0 / 4.0	0.5 / 4.4	3.5 / 4.0	8.4
HMB 19	6.39	0.42	0.42	--	--	--	--	--	--	--	10.0
DB 7 (11)	--	--	--	16.06	1.0	3.0	0.0	1.8 / 8.0	2.0 / 5.2	3.5 / 5.7	10.9
HMB 20 WQ	5.16	0.42	0.33	--	--	--	--	--	--	--	10.0
HMB 21	0.28	0.08	0.21	0.55	0.33	0.25	2.0	1.6	0.83	2.5	3.4
HMB 22	2.88	0.33	0.33	7.88	0.83	2.0	4.5	4.75	2.1	7.0	9.1
HMB 23 (10)	0.66	0.25	0.25	9.41	0.33	0.67	1.1	--	--	--	8.8
HMB 24	2.87	0.33	0.33	8.44	1.8	0.67	4.3	3.0	3.7	6.3	10.0
DB 9 (11)	--	--	--	4.90	0.83	3.0	0.0	3.0	3.5	5.3	9.1
HMB 25 WQ (13)	3.93	0.33	0.33	4.21	2.0	0.4	7.6	--	--	--	8.0
HMB 26	1.39	0.25	0.25	6.33	0.33	2.0	3.5	1.0	5.1	6.0	11.1
DB 11 (12)	--	--	--	14.41	1.0	1.0	0.0	2.3	5.7	6.0	11.8
HMB 27 WQ (12)	3.81	0.33	0.33	--	--	--	--	--	--	--	7.8

Notes:

1 Water quality orifices sized to drain water quality volume 40 to 48 hours.

2 The base of all water quality orifices is set at a depth of 0.0 feet.

3 The flowline stage of the hydromodification orifices corresponds to the bottom of the stated orifice.

4 Width, depth, and stage reported to the nearest tenth of a foot, except where values are less than one foot. In such cases, values are to the nearest half-inch, reported as decimal feet.

5 Values for Combo 1, 2, 3, 4, and 5 are for water quality and hydromodification volumes only. These basins are also used for flood control (on top of the hydromodification control volume); characteristics of that portion of the basin are reported separately.

6 Basin passes HM standards in Alder Creek downstream of discharge point using only the water quality volume for storage.

[7] Basin sizes are conservative in that they do not account for any reductions in hydromodification volume that may be provided by incorporation of LID practices, distributed water quality treatment features (e.g. rain gardens) or self-treating impervious areas.

[8] HMB 12 discharges just upstream of DB2; the point-of-compliance for this basin is at the outlet of DB2.

[9] HMB 16 detains an additional 4.9 acre-feet above the actual required HM storage volume (13.9 af) to compensate for basin deficiencies further downstream; the HM basin is topped by a 3-foot weir outlet with a flowline of 5.9 feet up to the basin maximum of 10.0 feet

[10] HMB 23 is sized to over-detain flows in the mid-range of hydromod control for compliance at the outlet of HMB 19/DB9 further downstream; this altered configuration also results in compliance for hydromodifciation requirements in-stream at the discharge point of HMB 23.

[11] DB 6, 7, and 9 are used for in-stream hydromodification control, and control volumes listed are for HM controls only; water quality treatment at adjacent developed area is provided by off-stream water quality basins WQ 19, 20, and 25, respectively. DB 6 and DB 7 were designed with three HM orifices; the "Upper hydromodification orifice" columns have the information for both of the uppermost orifices.

[12] The post-project watershed draining to DB 11 contains a separate water quality basin (WQ 27) to treat urban runoff prior to entering DB 12; DB 12 provides both hydromodification and flood control functions, though volumes listed here do not include the flood control volume.

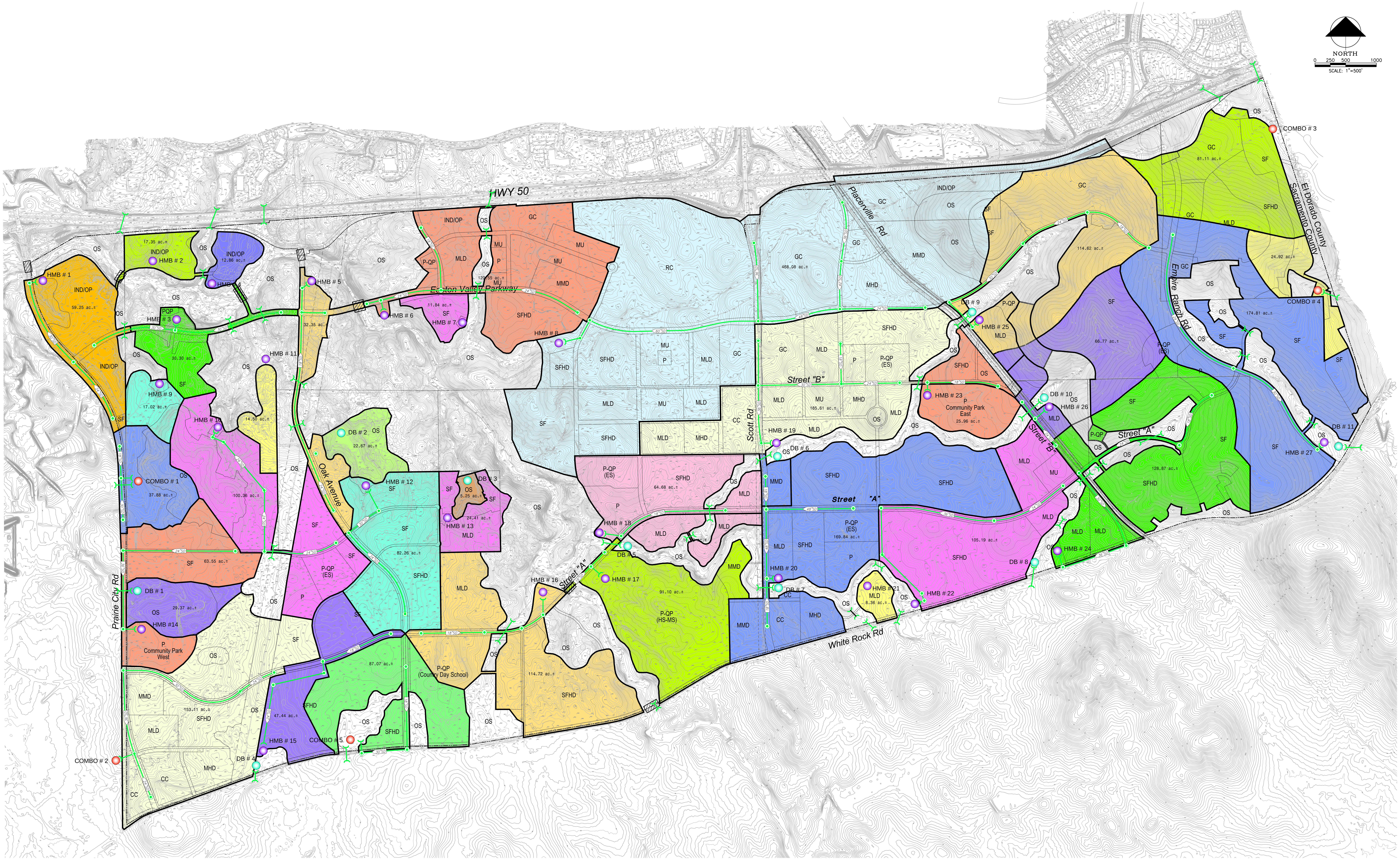
[13] Basin WQ 25 includes the water quality treatment volume and a small portion of the hydromodification control volume. The remainder of the HM control volume is contained in DB 9.

The detailed hydromodification results for the post-developed hydromodification flows are clearly less than or equal to the pre-developed conditions at the 10 analysis compliance points described within this study, with one exception at HMB25/DB9. A section of Alder Creek near Compliance Point #7 flowing to the south-west leaves the project boundary across White Rock Rd. and meanders to a point approximately 2,700-feet to the west and re-enters the site via a roadway culvert flowing to the north-west. This section of Alder Creek will be treated before draining off-site and back on-site.

The volumes of the hydromodification basins evaluated in this hydromodification analysis have not been optimized. It is envisioned that optimization of the basins will occur during the preparation of site specific land development applications (tentative map approvals and/or development plans reviews) when the various site development characteristics are know with greater certainty.

Hydromodification basins could be utilized in the future to help recycle stormwater runoff. For example, the basins could be used to infiltrate stormwater for groundwater recharge purposes. Additionally, these basins could be used in the future to store stormwater for future irrigation of landscape and open space areas within the plan area.

Refer to **Exhibit L: Detention Basin Shed Map** to see the locations of the proposed Water Quality and Detention Basins.



Legend

- 59.4 ± AC. — Developed Detention Boundary & Acreage
- Hydromodification Basin
- Combination Basin (Hydromodification - Detention)
- In-Stream Detention Basin
- DRAINAGE CULVERT
- STORM DRAIN PIPELINE
- BRIDGE

Note:

1. Datum for this project is NAVD 88.

Exhibit L

Folsom Plan Area

Storm Drainage Master Plan
Detention Basin Shed Map

City of Folsom, Scale: 1"=500'

California January 2014

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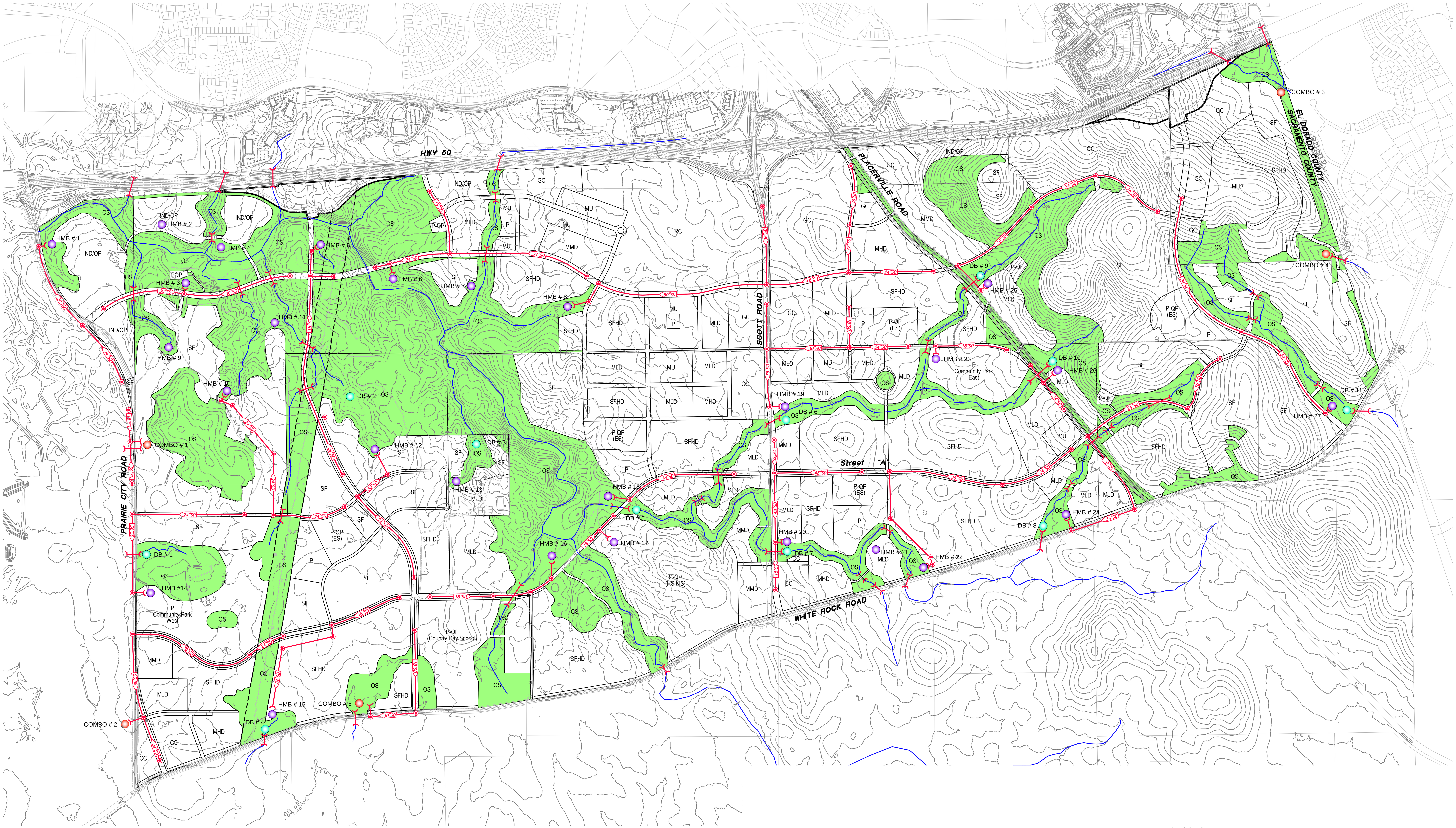
4.0 Backbone Stormwater Infrastructure System

The conceptual backbone stormwater infrastructure system for the Plan Area is shown on **Exhibit M: Conceptual Backbone Stormwater Infrastructure**. This conceptual system diagram has been developed from preliminary drainage calculations based on the proposed conditions developed shed areas. Project specific drainage calculations for this conceptual system will be performed on a project-by-project basis as each of the various properties within the Plan Area are proposed for development.

It is important to note that the backbone stormwater infrastructure includes facilities that are sized for multiple events. The trunk drainage system in the major roads has been sized for the 10-year design event, as has the hydromodification facilities (specifically for the 25% Q_2 – Q_{10}). The detention facilities have been sized for the greater of the 100-year/24-hour event or the 100-year/10-day event. Finally, the major roadway crossings have been sized to handle the 200-year/24-hour event.



INFRASTRUCTURE ABBREVIATIONS

SD	Storm Drain
DB	Detention Basin
HMB	Hydro-modification Basin
COMBO	Combination Basin

INFRASTRUCTURE LEGEND

- STORM DRAIN SYSTEM
- OFF-STREAM WATER QUALITY/HYDROMODIFICATION BASIN
- OFF-STREAM WATER QUALITY/HYDROMODIFICATION/DETENTION BASIN
- IN-STREAM DETENTION BASIN (10 YEAR, 24 HOUR STORMS & ABOVE)

NOTE:

1. Utilities alignments are shown outside of right-of-way for clarity. Utilities will be built within the right-of-ways and easements.
2. Datum for this project is NAVD 88.

0 600 1200 feet

Exhibit M

Folsom Plan Area

Storm Drainage Master Plan
Conceptual Backbone Stormwater Infrastructure

City of Folsom,
Scale: 1"=600'

California
January 2014

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5.0 Basin Design & Maintenance Considerations

There are numerous detention, hydromodification and water quality basins proposed within the Plan Area. While the location of each basin has generally been determined and preliminary sketches of how each basin will fit into its surroundings, it is beyond the scope of this SDMP to provide detailed site layouts for each basin.

5.1 General Locations & Design Requirements

There are five (5) general types or classes of detention basins proposed in this master plan as shown in **Table 5.1**. The general locations of each of these basins are shown on **Appendix D.**

Two of these basins are somewhat unique in their layout and design (Basin Nos. HMB-19 and DB-6). These two basins will be very similar in layout and design. The general location, size, and shape of Basin No. DB-6 is shown on **Exhibit N: Illustrative Detention Basin Exhibit**. The exhibit and parameters described within **Appendix F (Vol 2)** indicate some of the key design requirements for each basin. A more detailed design of each basin will occur in conjunction with individual land use entitlement applications as they occur over time.

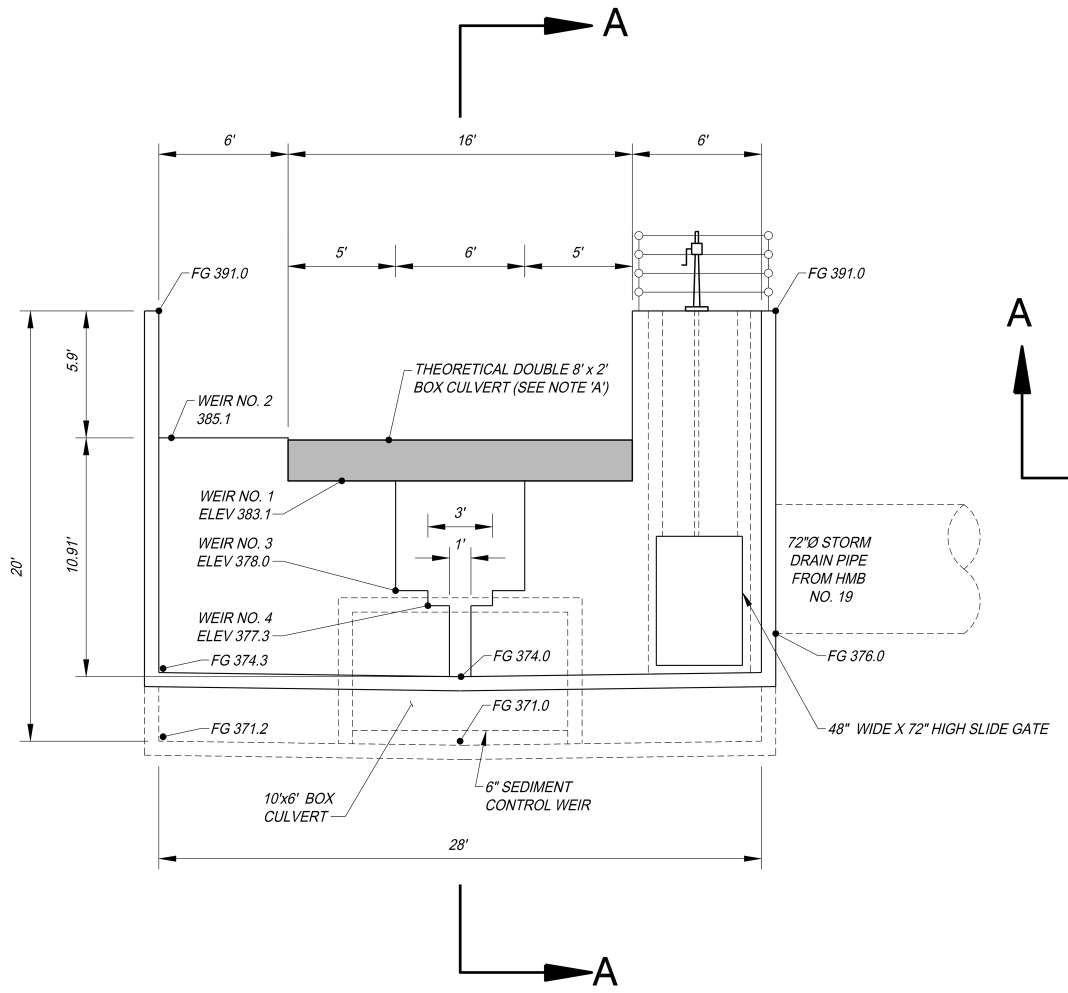
5.2 Prototypical Basin Layout

The layout and configuration of the five general basin types are included in this SDMP for illustrative purposes. These prototypical basins are shown in **Appendix D.** These prototypical basins are highly representative of the design of each of the other basins envisioned to be constructed within the Plan Area.

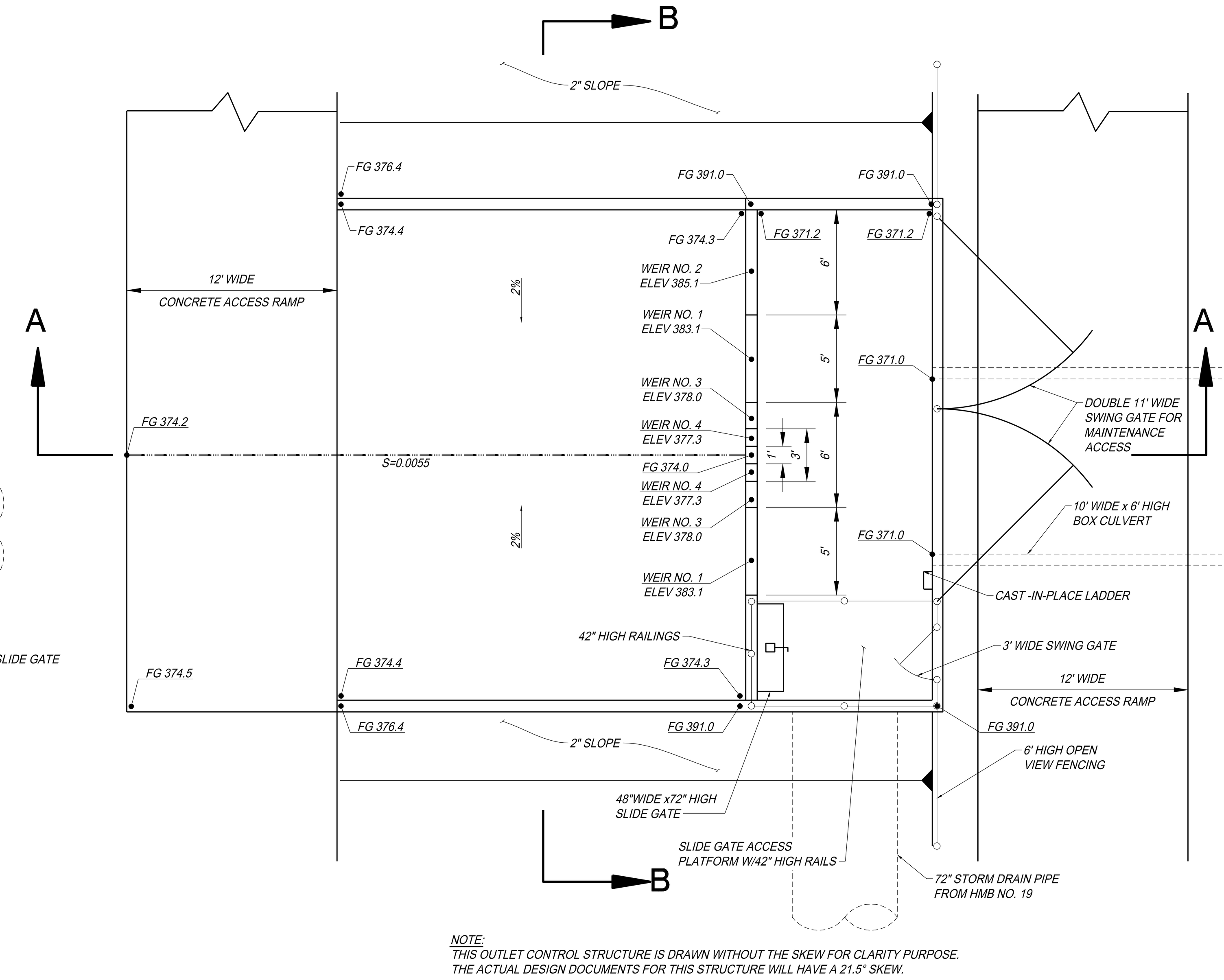
5.3 Additional Design Considerations

The detention basins are a key component of a comprehensive storm water management and water quality system that extends throughout the developed portions of the Plan Area. In addition to the basins, the system includes underground pipe conveyances and all of the surface components of that system (including inlets, filters, maintenance access, and outfall structures). The overall drainage system will convey and treat storm runoff from the Plan Area without reliance on on-site LID design features. As development of individual parcels occurs, each developer can incorporate LID design features into the on-site design of the project and reduce the size of the water quality and hydromodification basins accordingly.

Basin No.	Table 5.1: Basin Type					
	Type 'A' Off-Stream Water Quality & Hydro-Modification Basin	Type 'B' Off-Stream Water Quality Basin	Type 'C' Off-Stream Combination Basin (Water Quality, Hydro-Modification & Flood Attenuation)	Type 'D' In-Stream Hydro-Modification & Flood Attenuation Basin	Type 'E' In-Stream Flood Attenuation Basin	Type 'F' Existing Pond In-Stream Flood Attenuation Basin
COMBO #1			X			
COMBO #2			X			
COMBO #3			X			
COMBO #4			X			
COMBO #5			X			
DB #1					X	
DB #2						X
DB #3						X
DB #4					X	
DB #5					X	
DB #6				X		
DB #7				X		
DB #8					X	
DB #9				X		
DB #10					X	
DB #11				X		
HMB #1		X				
HMB #2	X					
HMB #3	X					
HMB #4	X					
HMB #5	X					
HMB #6		X				
HMB #7	X					
HMB #8	X					
HMB #9	X					
HMB #10	X					
HMB #11	X					
HMB #12	X					
HMB #13	X					
HMB #14	X					
HMB #15	X					
HMB #16	X					
HMB #17	X					
HMB #18	X					
HMB #19		X				
HMB #20		X				
HMB #21	X					
HMB #22	X					
HMB #23	X					
HMB #24	X					
HMB #25	X					
HMB #26	X					
HMB #27		X				

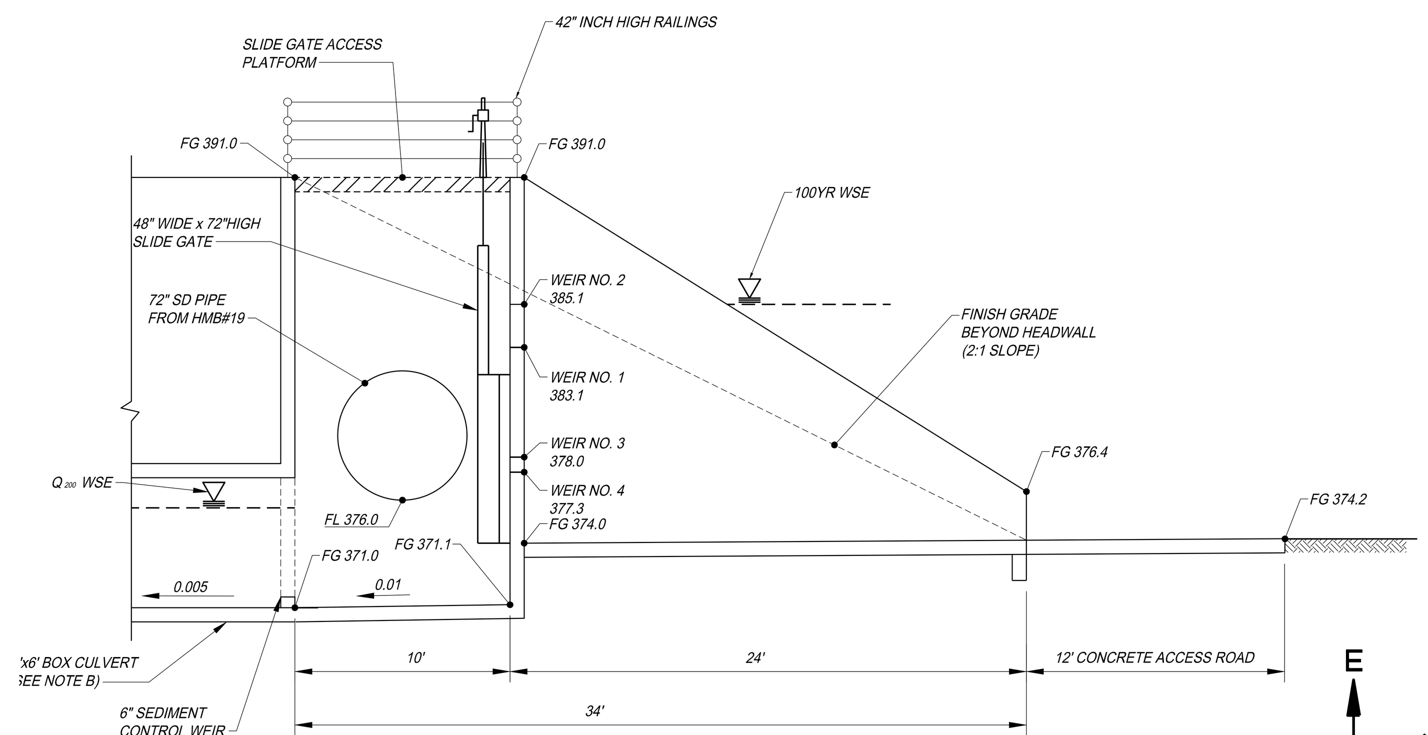


SECTION A-A



NOTE:
THIS OUTLET CONTROL STRUCTURE IS DRAWN WITHOUT THE SKEW FOR CLARITY PURPOSE. THE ACTUAL DESIGN DOCUMENTS FOR THIS STRUCTURE WILL HAVE A 21.5° SKEW.

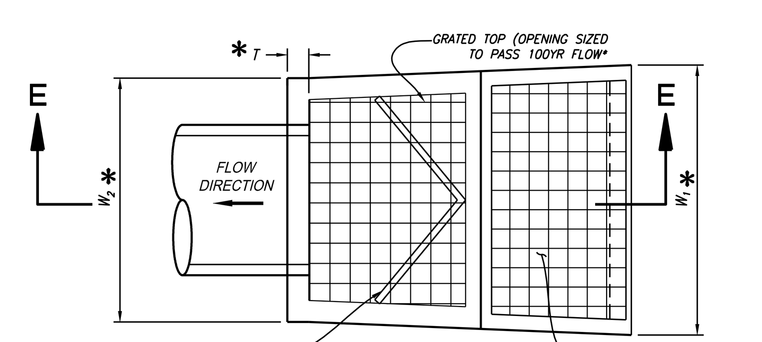
PLAN VIEW
SCOTT ROAD
DETENTION BASIN NO. 6 - OUTLET STRUCTURE
SCALE: 1"=5'



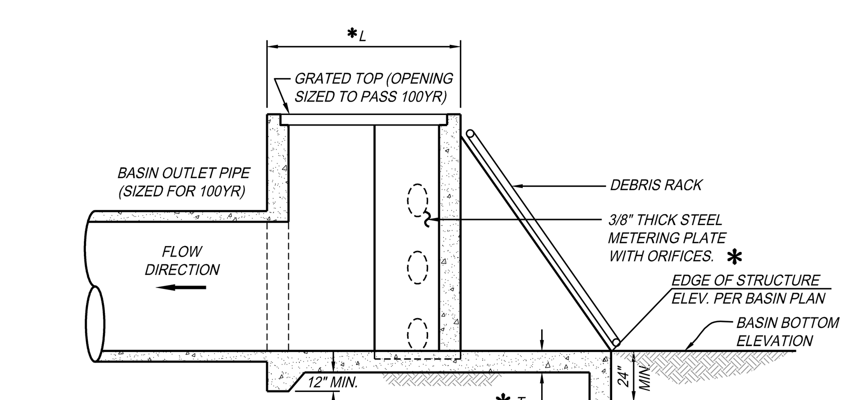
ELEVATION SECTION B-B
SCOTT ROAD
DETENTION BASIN NO. 6 - OUTLET STRUCTURE
SCALE: 1"=5'

NOTE A:
THE HYDRAULIC CAPACITIES OF WEIR #1 IS INTENDED TO BE THE EQUIVALENT OF THE THEORETICAL CAPACITY OF THE DOUBLE 8'x2' BOX CULVERT INCLUDED IN THE HEC-RAS MODEL. THE FINAL DESIGN OF THIS WEIR WILL BE ADJUSTED AS NEEDED TO RESTRICT THE 100-YR FLOWS TO MATCH THE CAPACITY OF THE THEORETICAL BOX CULVERT. THIS SAME APPROACH WILL BE USED TO SIZE THE 100-YR WEIRS OF SIMILAR STRUCTURES IN THE PLAN AREA.

NOTE B:
THIS 10'x6' BOX CULVERT WILL BE DESIGNED TO CONVEY UP TO THE 200-YR FLOWS THAT OVERTOP WEIR #2. THE THEORETICAL BOX CULVERT SHOWN IN THE HEC-RAS MODEL WILL NOT BE CONSTRUCTED. THIS SAME APPROACH WILL BE USED TO SIZE THE 200-YR BOX CULVERTS OF SIMILAR STRUCTURES IN THE PLAN AREA.

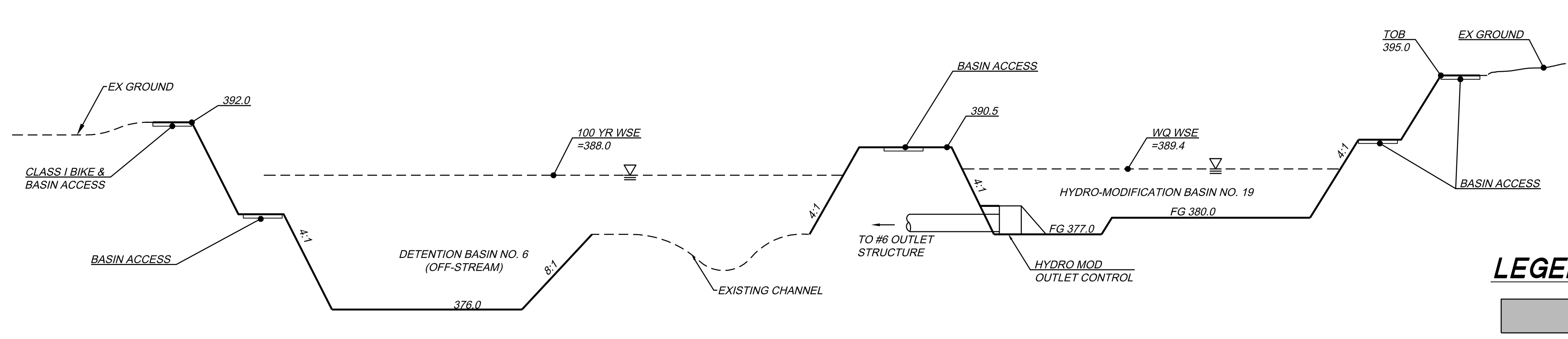


DETAIL 'D'
NTS
* TO BE DETERMINED AT TIME OF FINAL DESIGN.

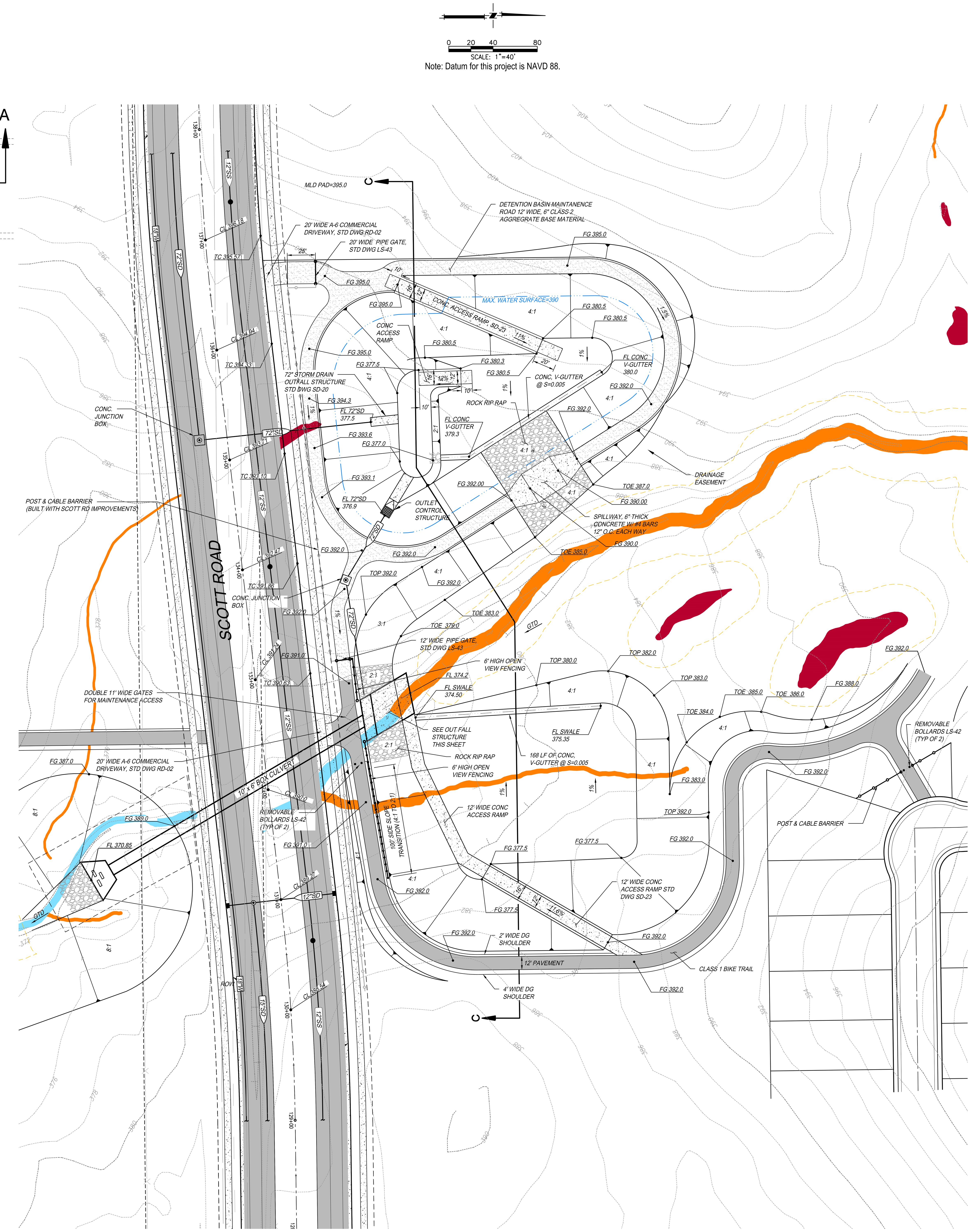


SECTION E-E
NTS
* TO BE DETERMINED AT TIME OF FINAL DESIGN.

HYDROMODIFICATION OUTLET CONTROL STRUCTURE



DETENTION HYDRO-MOD BASIN
SECTION C-C
NTS



LEGEND

PAVEMENT

CONCRETE

6" CLASS 2 AB MATERIAL

Exhibit N

Folsom Plan Area

Storm Drainage Master Plan
Illustrative Detention Basin

City of Folsom, California
Scale: As Shown
July 2014

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The detention basins may hold water during and immediately after each storm.

The storm water and water quality features throughout the Plan Area are an integrated management system. The detention facilities will be located at the edge of the drainage corridor where they will intercept run-off from the adjacent development areas before the water enters the main corridor. The basins will provide water quality treatment for urban run-off before such water enters the open space areas. Urban run-off water will first flow through the basin where water quality treatment will occur.

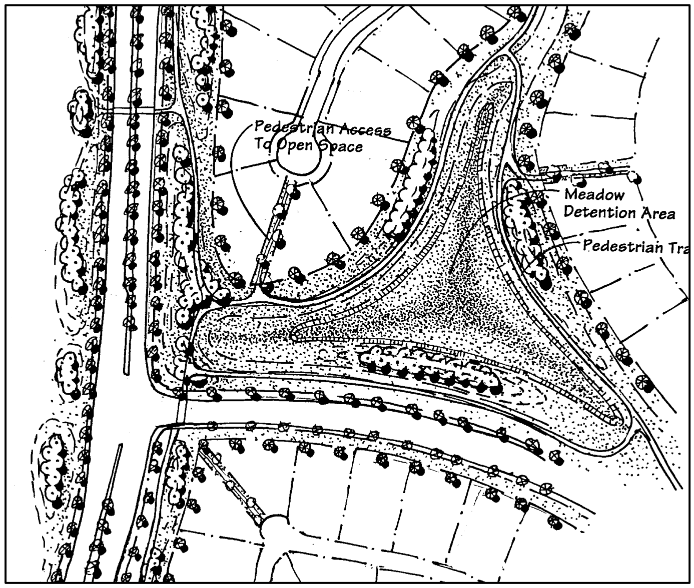
Although storm water management and water quality improvement are the primary functions, the detention facilities will also provide an aesthetic and informal recreation function. The basins will be an integral element of the amenities in open space buffer areas that also include naturalized landscaping and a bike and pedestrian trail system. Minor amenities such as benches, trashcans, and picnic tables may be located near the detention basins to enhance their recreational value. All improvements must be located outside of wetland preserve areas.

Typical basin feature located in the open space buffer areas will provide water quality treatment and storm water detention.

The detention basins will be visual amenities that include naturalized landscaping such as willow and native oaks, as well as native companion plant groundcovers and shrubs. With consideration to maintenance, requirements for the basin's primary functions of storm water management and water quality enhancement the design may allow for placement of boulders or other naturally occurring features that would enhance the aesthetics of the facility. The banks of the basins will be designed and graded such that public safety fencing shall not be required in most cases.

The basins will appear as a visual amenity and extension of the adjacent land use. Pedestrian paseos and other open space features could be designed into medium and high-density residential uses. Such facilities would include small basins and swales that are an integral part of the feature landscaping and interconnected with the overall storm water management system. The incorporation of these types of LID features into the on-site designs can reduce the size of the water quality and hydromodification features in the detention basins.

The parking areas in non-residential and multi-family residential uses may also function as part of the storm water management system. Parking areas and pedestrian areas may include landscaping features that function as storm water storage and water quality enhancements.



Individual subdivisions may include small basins as an entry feature.

Some basins may be located adjacent to and at the lower end of parks located throughout the Plan Area. In these instances, the basins will include a portion that is typically quite shallow and will appear as an extension of the park. The basin will serve as a water quality enhancement feature that treats pollutants coming from the park turf and parking areas.

Multiple detention facilities allow for phased development of the Plan Area. Basins can be designed and constructed on a phased basis to accommodate the storm flow from small sub-areas, and expanded over time as the need arises. Final design of each detention basin will occur as individual neighborhoods are developed and the need for mitigation of flows arises.

5.4 Detention Basin O & M Considerations

The proposed detention basins within the Plan Area will require going operation and maintenance to assure they are functional over an extended period. Each basin will require an operation and maintenance plan that will need to be approved with the construction plans for the facility.

Parking lot landscaping can include water quality improvement features (LID features).

The purpose of this section is to identify and suggest the key considerations that should be included in a Basin Operation and Maintenance Plan (O&M Plan). In addition to O&M activities fall into several categories:

1. **Routine Maintenance Activities**. Primary maintenance activities include vegetation management and sediment removal, although mosquito abatement will be a concern if the detention basin is designed to include permanent pools of standing water. The following list of suggested routine maintenance activities, and the frequency at which they will be conducted, are shown in **Table 5.2: Routine Maintenance Activities**.
2. **Prohibitions**. The use of pesticides and quick release fertilizers should be minimized, and the principles of integrated pest management (IPM) followed. The following is a list of suggested prohibitions:
    - Employ non-chemical controls (biological, physical and cultural controls) before using chemicals to treat a pest problem.
    - Prune plants properly and at the appropriate time of year.
    - Provide adequate irrigation for landscape plants. Do not over water.
    - Limit fertilizer use unless soil testing indicates a deficiency. Slow-release or organic fertilizer is preferable. Check with municipality for specific requirements.

Table 5.2: Routine Maintenance Activities		
No.	**Maintenance Task**	**Frequency of Task**
1	Conduct annual vegetation management during the summer, removing weeds and harvesting vegetation. Remove all grass cuttings and other green waste.	Once a year
2	Trim vegetation at beginning and end of wet season to prevent establishment of woody vegetation, and for aesthetics and mosquito control.	Twice a year (spring and fall)
3	Evaluate health of vegetation and remove and replace any dead or dying plants. Remove all green waste and dispose of properly.	Twice a year
4	If turf grass is included in basin design, conduct regular mowing and remove all grass cuttings. Avoid producing ruts when mowing.	As needed
5	Remove sediment from the basin when the sediment level reaches the level shown on the finished grade marker and dispose of sediment properly.	As needed
6	Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of basin volume and dispose of sediment properly.	Every 10 years, or as needed to maintain 2 in. clearance below low-flow orifice
7	Remove accumulated trash and debris from the extended detention basin at the middle and end of the wet season and dispose of trash and debris properly.	Twice a year (January and April)
8	Irrigate during dry weather.	As needed
9	Inspect extended detention basin using the attached inspection checklist.	Quarterly, or as needed

- Pest control should avoid harming non-target organisms, or negatively affecting air and water quality and public health. Apply chemical controls only when monitoring indicates that preventative and non-chemical methods are not keeping pests below acceptable levels. When pesticides are required, apply the least toxic and the least persistent pesticide that will provide adequate pest control. Do not apply pesticides on a prescheduled basis.
- Sweep up spilled fertilizer and pesticides. Do not wash away or bury such spills.
- Do not over apply pesticide. Spray only where the infestation exists. Follow the manufacturer's instructions for mixing and applying materials.
- Only licensed, trained pesticide applicators shall apply pesticides.

- Apply pesticides at the appropriate time to maximize their effectiveness and minimize the likelihood of discharging pesticides into runoff. With the exception of pre-emergent pesticides, avoid application if rain is expected.
- Unwanted/unused pesticides shall be disposed as hazardous waste.
- Standing water shall not remain in the treatment and/or hydromodification management measures for more than five days, to prevent mosquito generation. Should any mosquito issues arise, contact the Sacramento-Yolo Mosquito & Vector Control District (SYMVCD), as needed for assistance. Mosquito larvicides shall be applied only when absolutely necessary, as indicated by the SYMVCD, and then only by a licensed professional or contractor.
- Contact information for SYMVCD is as follows:

  Sacramento-Yolo Mosquito & Vector Control District
  8631 Bond Road
  Elk Grove, CA 95624
  Phone 800-429-1022
  Fax (916) 685-5464

3. **Inspections**. A suggested detention basin inspection and Maintenance checklist is shown in **Appendix G (Vol 2)**. This or a similar checklist could be used to conduct periodic inspections (monthly or as needed) to identify needed maintenance, and record maintenance that is conducted.

6.0 LID Measures

Various Low Impact Design (LID) strategies can be incorporated into the design of each of the individual developments within the Plan Area, if desired. However, the hydromodification and water quality facilities proposed in this SDMP are adequate in accommodate site development without the need to utilize site-based LID strategies.

Using small, economical landscape features, LID techniques work as a system to slow, filter, evaporate, and infiltrate surface runoff at the source. LID design calculations for a reduction in the required water quality and hydromodification volumes have not been incorporated in the calculations for this SDMP, but may be included in future drainage studies prepared for small lot tentative map approvals within the Plan Area.

LID strategies to address water quality fall under the two broad categories of **Practices** and **Site Design**. The most common concepts are summarized below:

- **Practices:**

  Basic LID strategy for handling runoff is to (1) reduce the volume of runoff and (2) decentralize flows. Common methods include:

  - **Bio-retention cells** typically consist of grass buffers, sand beds, a ponding area for excess runoff storage, organic layers, planting soil and vegetation.
  - **Vegetated swales** function as alternatives to curb and gutter systems, usually along residential streets or highways. They use grasses or other vegetation to reduce runoff velocity and allow filtration, while high volume flows are channeled away safely to a larger water quality management facility.
  - **Filter strips** can be designed as landscape features within parking lots or other areas, to collect flow from large impervious surfaces. They may direct water into vegetated areas or special sand filters that capture pollutants and gradually discharge water over a period of time.
  - **Disconnected impervious areas** direct water flows collected from structures, driveways, or street sections, into separate localized detention cells instead of combining it in drain pipes with other runoff.
  - **Cistern collection systems** can be designed to store rainwater for dry-period irrigation, rather than channeling it to streams. Smaller tanks that collect residential roof drainage are often called "rain barrels" and may be installed by individual homeowners. Some collection systems are designed to be installed directly under

permeable pavement areas, allowing maximum water storage capacity while eliminating the need for gravel beds.

- **Site Design:**
  - **Decreasing Impervious Surfaces** can be a simple strategy to address water quality and avoid problems from storm water runoff and water table depletion, by reducing surfaces that prevent natural filtration. Methods may include reducing roadway surfaces, permeable pavement surfacing, vegetative roof systems
  - **Planning site layout and grading to natural land contours** can minimize grading costs and retain a greater percentage of the land's natural hydrology. Contours which function as filtration basins can be retained or enhanced for water quality and quantity, and incorporated into the landscaping design.
  - **Natural Resource Preservation and Xeriscapes** can be used to minimize the need for irrigation systems and enhance property values.
  - **Clustering Homes** on slightly smaller lot areas can allow more preserved open space to be used for recreation, visual aesthetics, and wildlife habitat.

Specific LID strategies that could be used to fulfill the current and future requirements for storm water quality treatment and hydromodification may include the following potential LID measures:

- **Site Design Measures**
  1. Protect slopes, channels and other areas particularly susceptible to erosion and sediment loss.
  2. Maximize the protection of natural drainage features and vegetation.
  3. Minimize impervious areas and break up or disconnect the flow of runoff over impervious surfaces.
  4. Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.
  5. Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.
  6. Install LID stormwater planters.
  7. Separate sidewalks from street curb and gutters.
  8. Install drought tolerant and storm water appropriate planting.

- **Source Control Measures**
  1. Storm Drain Stenciling and Signage
  2. Outdoor Material Storage Area Design
  3. Outdoor Trash Storage Area Design
  4. Loading/Unloading area Design
  5. Vehicle and Equipment Wash Area
- **Treatment Control Measures**
  1. Bio-Swales
  2. Grass Swales
  3. Wet Pond
  4. Stormwater Planter
  5. Pervious Pavements
  6. Grass Filter Strips

This SDMP suggests a pragmatic approach be utilized in the selection of technically appropriate and aesthetically pleasing LID measures in accordance with the good engineering and planning practices. Specific LID measures should be selected on the basis of being both practical and cost effective.

7.0 Comparison of Drainage Master Plans Results

7.1 Introduction

The Alder Creek watershed includes the vast majority of the areas proposed for development in the Folsom Plan Area and the Storm Drain Master Plan for Easton development areas. Likewise, these two developments, while they have other minor drainage shed areas that are tributary to other creek systems, constitute the vast majority of the Alder Creek watershed area. The other two additional areas that make up the Alder Creek watershed are (1) some 1819.31± acres of developed lands lying northerly of State Route 50 within the City of Folsom and (2) approximately 723 ± acres of undeveloped agricultural lands lying south of White Rock Road.

Since the Alder Creek watershed is for all intents and purposes made up of these two projects, it is important to make a comparison of the results of the Storm Drain Master Plan for Easton (the “Easton Study” - 2013 MacKay & Somps) with those contained in this storm drain master plan (the “Folsom Study”) to determine if the findings of both master plans are reasonably consistent.

7.2 Consistency Analysis

The results of the two studies actually correlate very well. While prepared with slightly different methodologies, the resultant flows and impacts are very similar, certainly within the margin of error that is inherent in hydrologic and hydraulic modeling approaches of the two studies.

From a peak flow (flooding) perspective, the results of the two studies differ in only one, but less than significant way. From a hydromodification perspective, the two studies utilized different hydromodification impact analysis methods, both of which are permitted by the HMP. While different in analysis techniques, the two methods mitigated for the respective project related impacts to a level that is equal to or less than existing conditions.

7.2.1 Peak Flow Comparison

The Easton Study was prepared utilizing an existing peak discharge for the Alder Creek watershed discharging from the Folsom Plan Area at Prairie City Road using an unsteady state SacCalc hydrology analysis with the Muskingum-Cunge Method of stream routing for the upstream Alder Creek watershed. The Folsom Study utilized SacCalc hydrology with the HEC-RAS method of routing for the upstream Alder Creek watershed.

The existing conditions peak flow for Alder Creek at Prairie City Road in the Easton Study was determined to be 4,009 cfs during the 100-year / 24-hour event. It was assumed in the Easton Study that developments in the Folsom Plan Area would be required to attenuate their peak flows at Prairie City Road to not exceed this peak flow rate. The same event in the Folsom Study yielded a peak flow of 3,593 cfs for existing conditions and a peak flow of 3,343 cfs for developed conditions.

Clearly, the peak flow rate for existing and developed conditions in the Folsom Study are less than the peak flow rate assumed in the Easton Study. Accordingly, one can see that the Easton Study was based on a conservative estimate of existing peak flows from the Folsom Plan Area. The Easton Study flood analysis was based on a larger existing conditions flow rate than was determined in the Folsom Study for both existing and developed conditions. This is a conservative finding,

7.2.2 Hydromodification Comparison

As stated earlier, the two studies utilized two different, but equally accepted methodologies to analyze the hydromodification impacts of the two projects. The Easton Study utilized the Erosion Potential Method (E_p Method) while the Folsom Study utilized the Sacramento Area Hydrologic Model (SAHM Method).

The results of the Easton Study, which was based on SacCalc hydrology and historical rainfall records, demonstrated that the hydromodification mitigation measures proposed for the Storm Drain Master Plan for Easton project reduced post development flows in the stream to be equal to pre-development flows throughout the 25%Q_2 to Q_{10} flow range. This is evident since the resultant E_p Ratio (the comparison of erosion potential in the stream before and after development) for the Easton Study ranged from 0.95 to 1.01 for an average of 1.00 for all river stations.

In the E_p Method, an E_p Ratio of 1.00 demonstrates that post development flows do not exceed pre-development levels while ratios greater than 1.00 indicate that post development flows exceed existing conditions. Similarly, E_p Ratios less than 1.00 indicate that post development flows are less than existing conditions.

Additionally, the literature clearly indicates that E_p Ratios greater than 1.00 are permissible.[5] From a practical perspective, E_p Ratios no greater than 1.20 have been found to be acceptable by many agencies based on the findings in the literature.

The likelihood of an increased probability of stream bank and bed instability and erosion dramatically increase when E_p Ratios exceed the 1.20 value. Below this level the probability of increased stream bed and bank instability and erosion are very low. Accordingly, given the natural resiliency of the Alder Creek stream system to erosion, E_p Ratios greater than 1.00 but less than or equal to 1.20 should be permissible.

[5] See recommendation from the “Laguna Creek Watershed Management Action Plan and the Upper Laguna Creek Corridor Master Plan – Final Report”, Laguna Creek, Sacramento County, California (Section 5.2.4 “Erosion Potential (E_p)” at Page 5-14. Prepared by Geosyntec Consultants – November 2007) under the direction of CKB Environmental Consulting (Ms. Carmel Kinsella Brown).

The results of the Folsom study hydromodification analysis demonstrated that the proposed hydromodification mitigation measures reduced post development flows in the stream to be less than pre-development levels for the same flow range. In essence this is equivalent to an E_p Ratio less than 1.0.

Clearly, since both projects met the HMP requirements independently, and neither exceeded existing conditions flow rates under developed conditions, the cumulative effect of the two projects is less than existing conditions for the entire reach of the creek. If both projects that encompass the entire watershed of Alder creek (sans the already developed lands north of US 50 in the City and the undeveloped agricultural lands south of White Rock Road) have met their HMP requirements without raising the Ep Ratio in the stream above 1.00, then one can reasonably deduce that the cumulative impact of both projects is less than existing conditions as it relates to the creek itself.

7.3 Summary of Comparisons

Accordingly, while a comprehensive analysis of both projects (the Storm Drain Master Plan for Easton and Folsom Plan Area) hasn't been prepared, based on the above described comparisons of the results of the two studies (the Easton Study and Folsom Study), one can reasonably conclude that the two studies have effectively evaluated the cumulative effects on the creek system from these two projects. When compared, the results of these two studies clearly indicate that the two studies are consistent and conservative with respect to flood and hydromodification mitigation.

8.0 Conclusion

Based on the results of this SDMP, the Folsom Plan Area can develop as proposed. This SDMP has analyzed the existing and required on-site and off-site drainage facilities that are necessary to maintain downstream drainage, water quality, and hydromodification impacts equal to or below existing conditions. Additional studies may be required by the City during project implementation, especially as the Plan Area land use plan changes over time and as individual tentative map applications are submitted and processed.

9.0 References

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Clear Creek Solutions, Inc., Sacramento Area Hydrology Model (SAHM), August 2013

10.0 Appendixes

Appendix A: Report and Calculation CD-ROM

Appendix B: Large Format Exhibits

Appendix C: Project Drainage Report Log

Appendix D: Prototypical Basin Exhibits