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A. EXECUTIVE SUMMARY

The 2017 Pleasant Grove/Curry Creek Watershed Mitigation Fee update has updated the hydrological analysis to compute the volumetric storage needs that mitigate the increase in volumetric releases from the City from pre-project (1990) conditions to future buildout of the City’s General Plan. The updated hydrologic modeling concludes that the City needs 2,250 ac-feet of storage to mitigate the impact. This volume increase will be accommodated within the previously adopted concept plans that was produced in 2002 by PWA/URS Consultants and evaluated with the approved Program Level EIR of 2003.

The project consists of two storage basins located on either side (north and south) of Pleasant Grove Creek within the Al Johnson Wildlife Area. The total storage volume available from the combined basins is 2,530 ac-feet.

The estimated cost to complete the construction of the flood control project has been updated to include current construction costs. As of December 31, 2016, the total revenues to the Drainage Mitigation account including interest was \$21,898,866.51 with a total of \$13,038,053.12 being expensed for land purchases, the preparation of the conceptual design report and the program level EIR, and various updates. The remaining balance in the account as of December 31, 2016 is \$8,860,813.39. The costs to construct the flood control project minus the monies on hand have been divided by the remaining yet to be developed land uses to determine the updated drainage impact fee. The following Table shows the existing fee and the proposed updated fee to each land use type.

FEE ITEM	UNIT	Total Land Use Acreage or Lot Count Remaining	Current Fee	2017 Proposed Fee w/o ARSP Contributing	2017 Proposed Fee w/ ARSP Contributing
LDR	Per Unit	7719.0	\$ 451.00	\$ 494.93	\$ 453.79
MDR	Per Unit	5018.0	\$ 451.00	\$ 494.93	\$ 453.79
HDR	Per Unit	5753.0	\$ 372.00	\$ 408.23	\$ 374.30
NC	Per Acre	8.9	\$ 5,853.00	\$ 6,423.12	\$ 5,889.21
CC	Per Acre	386.4	\$ 5,853.00	\$ 6,423.12	\$ 5,889.21
RC	Per Acre	1.0	\$ 5,853.00	\$ 6,423.12	\$ 5,889.21
BP	Per Acre	92.7	\$ 5,853.00	\$ 6,423.12	\$ 5,889.21
LI	Per Acre	279.4	\$ 5,853.00	\$ 6,423.12	\$ 5,889.21
IND	Per Acre	175.6	\$ 5,853.00	\$ 6,423.12	\$ 5,889.21

An alternate single basin option was evaluated. A single basin project would reduce future operational and maintenance costs, and is feasible with the further excavation of the Southern Basin to incorporate the additional needed volumes. An alternate project concept would require additional study and an update of the currently approved Program Level EIR. Any changes to the approved conceptual plans and update to the environmental analysis can be further evaluated at the time that the City moves forward with the final design of the project but are not made part of this fee update at this time.

I. INTRODUCTION/PURPOSE

Since 1990, the City of Roseville has recognized the need for a Regional Mitigation facility to mitigate volumetric impacts from discharging west of the City to areas within Sutter County which can experience flooding. This report applies only to proposed developments within the City of Roseville.

This Pleasant Grove Watershed Mitigation Fee report presents an analysis to determine the total runoff volumetric stormwater impacts resulting from development within the City and which discharge to downstream lands west of the City. Beginning in 1990 the City began to collect a drainage impact fee to be used for a City wide solution that would address this impact. Since the inception of the fee and from time to time the fee has been updated to account for methodology changes, cost adjustments, and newly annexed properties. This update revisits the hydrologic assumptions and methodologies that compute the total runoff volume impacts for the future build-out of the City's current General Plan since the pre-project condition prior to 1990, updates construction costs, includes newly approved Amoruso Ranch Specific Plan area, and re-spreads the fee across the remaining yet to be developed properties within the City and reassesses the Drainage Impact Fee to ensure that adequate funds are collected to complete the project.

This update to the Pleasant Grove/Curry Creek Watershed Mitigation Fee report presents an analysis that determines the total runoff volume (measured in acre feet) impact resulting from development areas within the City of Roseville based on the historic 8-day, (rainfall adjusted to 100-year) storm event of 1986 and the standards within the Placer County Flood Control and Water Conservation District Stormwater Management Manual dated September 1990 (amended 1994, and again in 2004). Additionally, the impact analysis for development currently participating in the Pleasant Grove/Curry Creek Mitigation Fee Program will be updated using the same methodology and standards.

The Pleasant Grove/Curry Creek Mitigation Fee analysis was first introduced in May 1990. Development areas were added to the fee program in 1993. The developments included in the May 1990 & 1993 analysis were the North West Roseville Specific Plan, North Central Specific Plan, North Industrial Plan Area, Infill Plan Area and the Del Webb Specific Plan. The 8-day, 100-year storm event was used in both the 1990 and 1993 initial studies and resulted in the preparation of a Conceptual Design Report (PWA/URS, 2002) that identified the Reason Farms Retention Basin comprising of two retention basins, one each on either side of Pleasant Grove Creek downstream of the City. The southern basin was specified to store 1,850 ac-ft and the northern basin 680 ac-ft. A Final program level Environmental Impact Report (EIR) based on the conceptual design was approved in 2003 and in 2004 the City purchased the Reason Farms/Warrick properties (now known as the Al Johnson Wildlife Preserve) with drainage impact fees previously collected to date.

The most recent update to the fee program occurred in 2006, which continued to analyze the same historic 8-day 100-year storm event as the initial 1990 & 1993 studies, but updated the methodology and assumptions that calculate the runoff volumes based on the current agency requirements and standards. This same 8-day 100-year event is the same design criteria used by

the City of Lincoln for the Twelve Bridges (City of Lincoln 1999), which resulted in a settlement agreement between Sutter County and the City of Lincoln and which will be used in this report for consistency.

The 2006 update included the Memorandum of Understanding (MOU) Areas 1 and 2, the Fiddymont property and Westpark as well as all the specific plan areas in the Pleasant Grove Creek watershed and the Curry Creek watershed, within the City of Roseville at that time. As a result of modifications of the hydrologic methodology within the Placer County Flood Control and Water Conservation District Stormwater Management Manual, the volumetric impacts of the MOU areas were adjusted and the mitigated volume requirements were reduced. As a result, it was determined that the southern basin was more than sufficient to retain and mitigate the impacts computed in that analysis and the northern basin was removed from the cost estimates and computed fees. Costs for construction of the southern basin were also modified for additional Division of Safety of Dams requirements and the potential “rice as wetlands” impacts. In addition, minor changes to account for variable amounts of landscaping by specific plan areas were made.

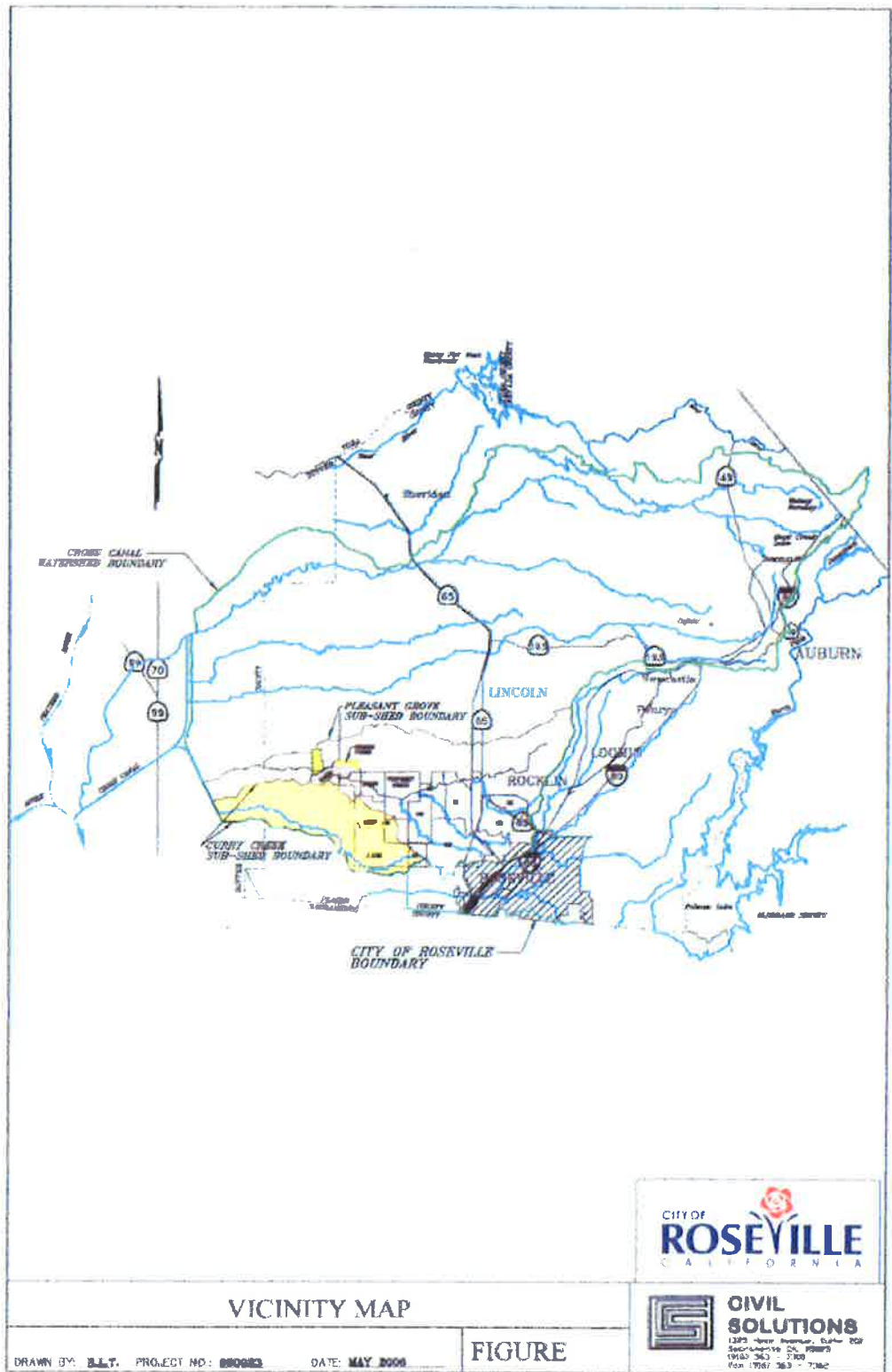
This 2017 update re-verifies land use assumptions, incorporates the final design parameters for Sierra Vista Specific Plan, West Roseville Specific Plan and the Creekview Specific Plan, incorporates an updated Water Balance methodology for computing impact rates by land use type, and adds analysis for the Memorandum of Understanding Development Areas known as Amoruso Ranch Specific Plan.

Exhibit PG-1 shows the Specific Plan Development Areas within the Pleasant Grove and Curry Creek Watershed limits.

The Current Fee Rates being collected by the City are:

TABLE A – CURRENT FEE

FEE ITEM	UNIT	Total Land Use Acreage or Lot Count Remaining	Current Fee
LDR	Per Unit	7719.0	\$ 451.00
MDR	Per Unit	5018.0	\$ 451.00
HDR	Per Unit	5753.0	\$ 372.00
NC	Per Acre	3.9	\$ 5,853.00
CC	Per Acre	386.4	\$ 5,853.00
RC	Per Acre	1.0	\$ 5,853.00
BP	Per Acre	92.7	\$ 5,853.00
LI	Per Acre	279.4	\$ 5,853.00
IND	Per Acre	175.6	\$ 5,853.00



II. WATERSHED CHARACTERISTICS

The projects identified in this report are part of the regional watershed identified as “The Cross Canal Watershed”. The Cross Canal watershed incorporates approximately 292 square miles of land in western Placer County and includes several creeks and tributaries . The main watersheds which discharge into the Cross Canal are Auburn Ravine, Markham Ravine, Pleasant Grove Creek, Coon Creek and Curry Creek.

The development impacts assessed with this report are located within both the Pleasant Grove Creek watershed and the Curry Creek watersheds. Discharge from the Curry Creek watershed has the potential to impact Sutter County, and is therefore, included in the total analysis.

The Pleasant Grove Creek watershed includes approximately 46.5 square miles of partially developed land and generally slopes from east to west to the Cross Canal. The watershed ranges in elevation from 300', near the Town of Loomis, to elevation 45.0', near Sutter County. Bordering Placer County to the west, Sutter County is located west of the City of Roseville's Wastewater Treatment Plant, and the City's Reason Farms Properties.

Oversized Exhibit PG-1 shows the City's Specific Plan development areas within the Pleasant Grove and Curry Creek Watersheds, and shows their context relative to the downstream flooding concerns.

III. WATERSHED STUDY HISTORY

Since the late 1980's, several reports have evaluated the potential developmental impacts from Pleasant Grove Creek and the Cross Canal Watershed. A summary of the reports listed below include all the same developments and watersheds, however, the HEC-1 methodology and soils assumptions may vary with each report. This report did not attempt to review and compare the assumptions between each report, but the assumptions used in this report are consistent with the required standards in the Placer County Stormwater Management and the City of Roseville Drainage Manuals.

1. *The "Northwest Roseville Specific Plan"* prepared in 1989 contained the results of a preliminary study performed by Gill & Pulver Engineers and Morton & Pitalo, Inc.
2. *The "Northwest Specific Drainage Plan"* prepared by Aqua Resources and dated May 1990 analyzed the volume impacts for the following development areas within the City of Roseville:
 - I. Northwest Specific Plan Area
 - II. North Central Specific Plan Area
 - III. Industrial area along Foothills Boulevard
 - IV. The remaining areas of the City of Roseville
3. *The "Auburn Ravine, Coon and Pleasant Grove Creeks Flood Mitigation Plan"* by CH2M Hill and dated June 1993, was developed for the Placer County Flood Control District to analyze the entire Cross Canal Watershed to Sutter County boundary. This analysis estimated peak flows throughout each of the creeks. These peak flows discharge into the cross canal (Auburn, Coon, Pleasant Grove, Markham, and Curry) also, the analysis determined the flooding impacts from future developments throughout western Placer County. The HEC-1 models and subheds developed for this analysis are still used today.

Major findings listed in this report indicate that the major flooding in the Cross Canal watershed occurs as ponding and overland flow from many square miles of land east of the Natomas Cross Canal. Road crossings, land leveling, and channelization within the lower portion of the watershed have likely contributed to the frequency and amount of flooding. This analysis also estimated that flooding depths will increase approximately 0.1' (1/10 of one foot) upstream of the Cross Canal from unmitigated future build out of Placer County.

4. *The "Pleasant Grove Watershed Mitigation Fee Adjustment for the Del Webb Specific Plan"* by The Earth Technology Corporation dated August 6, 1993 analyzed the additional runoff volume and additional cost required to mitigate the Del Webb development impacts.

5. *The “Report on Additional Mitigation within the Cross Canal Watershed”* by Schaaf & Wheeler and dated July 30, 1998 reported possible flood mitigation measures that could be funded for the Pleasant Grove area of Sutter County. The following is a summary of recommended mitigation measures from the study:
 - I. Elevate residential structures east of the Western Pacific Railroad above the base flood elevations
 - II. Protect the Pleasant Grove School, fire station and police station with low berms or flood walls.
 - III. Increase protection to structures west of the Western Pacific Railroad by reinforcing levees.
 - IV. Elevate key roads to maintain access to flooded areas.
 - V. Improve conveyance to local runoff by constructing levees or excavating channels.

As far as we are aware, the findings of this report did not quantify costs of improvements or identify how much of the identified improvements were needed as a result of the activities in Placer County.

6. *Summary Retention Volume Analysis for Memorandum of Understanding Transition Area* prepared by Wood Rogers Inc. dated November 2001 which included the Westpark, 2 MOU areas and the Fiddymont Properties.
7. *Reason Farms Retention Basin Final Conceptual Design Report* prepared by PWA in association with URS and dated May 24, 2002 deals with preliminary sizing and costs for regional retention facility.
8. Each Specific Plan has performed a Master Plan which has assessed the estimated volumetric impacts of each project.
9. *Creekview Specific Plan – Integration of the Bypass Channel Design into the Reason Farms Facility* prepared by CESI, dated December 2010. This study presents the alternative for the Creekview Bypass Channel design and how it will be integrated into the Reason Farms South Basin design.
10. Previous editions of this Fee Basis Analysis, most recently prepared in 2006.

IV. DRAINAGE ANALYSIS

The impact analysis was performed using the 8-day storm duration and methodology from the Placer County Stormwater Management Manual. The difference between the existing pre 1990 conditions and future General Plan build-out conditions volume runoff (in acre-feet) were used as the volume to be mitigated. It was determined that volume impacts were uniform throughout the City, contingent on the following factors: land use, soil type, and elevation. See section VII for design parameters.

V. MAJOR ASSUMPTIONS

The magnitude of this project requires the assumptions in the hydrologic models to be consistent with all pertinent available information. The following are the major assumptions made in this analysis.

1. The land use estimates for the various projects were consistent with the City of Roseville Planning Department's quarterly development activity report published in December of 2016. The current available fund balance within the drainage impact fund account as of December 31, 2016 was \$6,613,664.00. GIS data for land use, and undeveloped properties were obtained based on August 31, 2016, and adjusted for the lots developed between August and December of 2016. Funds already expended have purchased the Reason Farms property, the preparation of the Program level EIR and Conceptual Design Report prepared by PWA/URS, and Fee Update studies. Funds previously expended and collected will not be used in this analysis. The Fee will be based on remaining program costs, and the available undeveloped properties yet to pay those costs.
2. The basis for design of a mitigation facility was based on the preferred design alternatives of the "Reason Farms Retention Basin Final Conceptual Design Report" prepared by PWA in Association with URS dated May 24, 2002. However, the designs of that plan were "truthed" with 3-D analysis, and revised quantities are included. In addition, the designs were altered to balance earthwork in the South Basin, connect the south Basin to the Creekview Bypass Channel. Alternative designs were prepared in order to develop cost alternatives for additional storage requirements of this revised impact analysis, which include: excavated Southern basin to store 2250 AF, Excavated Southern Basin to store 2500 AF, North Basin Construction to store 680 AF, and a University Creek Stream Restoration Project only alternative.
3. Cost estimate quantities and unit prices have been updated in this analysis to match the updated project layout, and current construction costs. CESI has worked with AuClair Consulting, a consulting engineer familiar with current construction costs, who defined construction cost unit prices that are used in the cost estimates. Michael Thomas Consulting also contributed to review of the cost estimates for the project construction alternatives. Unit prices from the winning bid (April 2017) of the

Antelope Creek Flood Control Project were also used in estimating unit prices for construction items in this project.

VI. ANALYSIS - EVALUATION OF CURRENT AND PROPOSED DEVELOPMENTS WITHIN THE PLEASANT GROVE WATERSHED

This analysis includes an assessment of the development areas currently included in the 1990 Pleasant Grove Creek Mitigation Fee Report and subsequent updates, as well as recently approved plan areas for the westerly expansion of the City.

The following development areas totaling approximately 18,155 acres are included in this Pleasant Grove Mitigation Fee Project Analysis for impact assessments

1. Del Webb Specific Plan Area
2. North Central Specific Plan Area
4. Northwest Specific Plan Area
4. North Industrial Plan Area
5. North Roseville Specific Plan Area
6. Highland Reserve North Area
7. West Roseville Specific Plan (Westpark and Fiddymont)
8. Infill Area
9. Sierra Vista Specific Plan
10. Creekview Specific Plan
11. Amoruso Ranch Specific Plan

The Summary of Land use for each plan by area is presented in TABLE 1.

TABLE 1 – Summary of Development Impact Areas and Land Use

NAME	Del Webb	North Central	Northwest	North Industrial	North Roseville	Highland Reserve	West Roseville	Infill	Sierra Vista	Creekview	MOA	Amoruso
CODE	DW	NC	NW	NI	NR	HR	WR	II	SV	CV	MOA	AR
LANDUSE												
ROAD	83.7	121.8	156.8	93.7	106.3	11.3	112	0.7	157.7	39.1		46.5
LOR	664.8	634.9	1495.3	274.3	216.2	243.8	1593.2	29.8	703.5	160		243.3
LI	1	57.8	0	804.1	0	0	65.1	39.2	0	0		0
OS	37.7	214.5	204.3	171.2	189.1	37.3	736	1722.6	317.4	13.7		14.1
CC	12.7	173.3	112.7	69.2	87.1	162.5	67.3	10.5	237.4	19.1		51.5
IND	0	0.3	0	495.1	0	0	32.9	0	0	0		0
PIOP	4.5	58.2	79.4	0.7	58.4	43.5	148	187.8	71.7	26.1		17.3
WDR	0	45.6	122.4	89.4	63.2	0	130	35.2	322.4	93.3		59.4
PR	377.8	34	347.1	52.8	111.7	37.2	251.9	5.2	185.1	15		22.3
HCR	1	83	83	21.8	42.3	45.5	117.7	0	39.4	16.3		38.3
RC	0	192.6	0	0	0	0	0	0	0	0		0
BP	0	197.6	0	5.4	0	0	0.1	8.5	0	0		0
MC	0	2.3	0	8.9	0	0	0	0	0	0		0
UR	0	0	0	0	0	0	0	0	10.1	0		19.3
TS	0	0	0	0	0	0	0	23.7	0	0		0
TOTAL AREA	1215.2	1743.5	2600.4	2010.5	1468.9	624.1	3278.2	2054.3	2951.1	463.9		543.3

Oversized Exhibit PG-2 identifies the Land Use areas which contribute to the total impact calculations.

1. Infill Area

Note for the Infill Area, a special analysis was performed to determine which land use areas of the plan were developed in 1992 when this fee was established. Much of this area was developed before this time, and are not considered part of the development impacts to be

mitigated by this fee. The Infill areas limits have been revised since 2006 to include the Reason Farms property, and the Waste Water Treatment Plan.

VII. DETERMINATION OF TOTAL DEVELOPMENT IMPACTS

This section details the hydrologic information and assumptions used to generate the existing and developed runoff volumes for the various development areas and land uses. The HEC-1 input analysis was based on parameters and techniques specified in the Placer County Flood Control and Water Conservation District's Stormwater Management Manual (SWMM) dated 1990.

The purpose of this section of the report is to analyze how the 1986 8-day 100-year design storm rainfall impacts the various land uses within each of the developments and determine the runoff volume difference between existing and developed conditions. Additional information presented outside of the context of the SWMM will be referenced.

A. PRECIPITATION DESIGN STORM

To estimate the volume increases in runoff from General Plan development build-out, since 1990 within the Pleasant Grove and Curry Creek watershed boundaries, which are both tributary to the Natomas Cross Canal, a "rainfall excess" computation using 8-day storm duration was performed. The precipitation data was originally developed from gages after the mid February 1986 storm events (worst 8-days on record) as measured at the Roseville Filtration Plant. The precipitation values were then adjusted so the sum of the values for the 8-day period would equal the 100-year precipitation amounts specified in the Placer County Stormwater Management Manual (SWMM). The results are estimated 100-year precipitation data for the 200-foot elevation (per the manual). The total amount of precipitation for the 8-day period is 10.48 inches.

The storm that makes up the basis produces precipitation distributed as shown in the following table:

TABLE I - 1986 8-DAY RAINFALL TOTALS

Adjusted to 100-year 8-day Event Totals

Day	1	2	3	4	5	6	7	8
Incremental Rainfall (in.)	1.07	.25	.49	1.21	1.27	2.10	3.99	.10
Accumulative Rainfall (in.)	1.07	1.32	1.81	3.02	4.29	6.39	10.38	10.48

An 8-day duration storm was chosen for this analysis because the accumulated runoff volumes over long duration storms have impacted low lying residents in Sutter County. A 10-minute time step (the time interval between calculations of flow rates) was utilized in the HEC-1 calculations to be consistent with previous analysis reviewed by Sutter County Public Works.

Precipitation does not occur in this event after hour 178. Precipitation for the rainfall is distributed in 1 hour time increments per the following table:

TABLE IB – DETAILED PRECIPITATION

Time Increment (days)	Time Increment (hours)	Precip. (inches)	Time Increment (days)	Time Increment (hours)	Precip. (inches)	Time Increment (days)	Time Increment (hours)	Precip. (inches)
0.00	0	0	2.50	60	0.03	5.00	120	0.05
0.04	1	0.05	2.54	61	0	5.04	121	0.01
0.08	2	0.1	2.58	62	0.01	5.08	122	0.02
0.13	3	0.07	2.63	63	0	5.13	123	0.03
0.17	4	0.02	2.67	64	0	5.17	124	0.02
0.21	5	0.01	2.71	65	0.01	5.21	125	0.1
0.25	6	0.02	2.75	66	0.02	5.25	126	0.19
0.29	7	0	2.79	67	0.01	5.29	127	0.11
0.33	8	0	2.83	68	0.01	5.33	128	0.04
0.38	9	0	2.88	69	0.01	5.38	129	0.26
0.42	10	0.02	2.92	70	0.02	5.42	130	0.2
0.46	11	0.06	2.96	71	0.01	5.46	131	0.04
0.50	12	0.04	3.00	72	0.12	5.50	132	0.01
0.54	13	0.13	3.04	73	0.5	5.54	133	0
0.58	14	0.05	3.08	74	0.01	5.58	134	0.1
0.63	15	0.06	3.13	75	0	5.63	135	0.07
0.67	16	0.08	3.17	76	0.07	5.67	136	0.11
0.71	17	0.06	3.21	77	0.04	5.71	137	0.12
0.75	18	0.2	3.25	78	0.03	5.75	138	0.15
0.79	19	0.02	3.29	79	0.15	5.79	139	0.1
0.83	20	0.03	3.33	80	0.02	5.83	140	0.25
0.88	21	0.02	3.38	81	0.03	5.88	141	0.01
0.92	22	0.02	3.42	82	0.01	5.92	142	0.04
0.96	23	0	3.46	83	0.06	5.96	143	0
1.00	24	0.01	3.50	84	0.02	6.00	144	0
1.04	25	0.02	3.54	85	0.02	6.04	145	0.01
1.08	26	0.02	3.58	86	0.02	6.08	146	0.02
1.13	27	0	3.63	87	0.02	6.13	147	0
1.17	28	0	3.67	88	0	6.17	148	0
1.21	29	0	3.71	89	0.02	6.21	149	0
1.25	30	0	3.75	90	0.04	6.25	150	0
1.29	31	0	3.79	91	0.01	6.29	151	0.01
1.33	32	0	3.83	92	0.01	6.33	152	0.01
1.38	33	0	3.88	93	0	6.38	153	0.01
1.42	34	0	3.92	94	0	6.42	154	0.01
1.46	35	0	3.96	95	0	6.46	155	0.08
1.50	36	0	4.00	96	0	6.50	156	0.01
1.54	37	0	4.04	97	0	6.54	157	0
1.58	38	0	4.08	98	0.05	6.58	158	0
1.63	39	0	4.13	99	0.03	6.63	159	1.15
1.67	40	0	4.17	100	0.02	6.67	160	0.15
1.71	41	0.02	4.21	101	0.04	6.71	161	0.15
1.75	42	0.12	4.25	102	0.02	6.75	162	0.25
1.79	43	0.03	4.29	103	0	6.79	163	0.8
1.83	44	0.03	4.33	104	0	6.83	164	1
1.88	45	0	4.38	105	0	6.88	165	0.2
1.92	46	0	4.42	106	0.03	6.92	166	0.13
1.96	47	0	4.46	107	0.03	6.96	167	0.05
2.00	48	0	4.50	108	0.1	7.00	168	0.01
2.04	49	0	4.54	109	0.08	7.04	169	0
2.08	50	0	4.58	110	0.09	7.08	170	0
2.13	51	0.05	4.63	111	0.08	7.13	171	0
2.17	52	0.04	4.67	112	0.25	7.17	172	0
2.21	53	0.01	4.71	113	0.2	7.21	173	0.01
2.25	54	0	4.75	114	0.08	7.25	174	0.01
2.29	55	0.05	4.79	115	0.06	7.29	175	0
2.33	56	0.02	4.83	116	0.05	7.33	176	0.01
2.38	57	0.03	4.88	117	0.05	7.38	177	0
2.42	58	0.02	4.92	118	0.01	7.42	178	0.01
2.46	59	0.15	4.96	119	0.07			

Volume totals of runoff can be computed directly via the Rainfall Excess methodology. This mathematical method assumes that runoff volumes can be directly calculated as the total amount of rainfall that exceeds the 1-hour infiltration rates. For the condition where 1-hour infiltration rates exceed the rainfall amount, no runoffs occurs (this is an assumption of the mathematical model). Therefore, for each assumed constant pervious area infiltration rate, a rainfall excess can be calculated for the pervious areas. To quantify the impacts of development the post-project pervious area infiltration is subtracted from the pre-project pervious area infiltration to determine the net volumetric

impact for the 8-day 100-year event. The estimated impact quantities are summarized in the following summary shown in section V-B.

TABLE IC – 8-DAY RUNOFF vs. INFILTRATION (by infiltration rate):
Computation of Runoff Excess
By Infiltration Rate
For 200 Foot Elevation 8-day 100-year
Placer County SWMM Event

Infiltration Rate (in/hour)	Total Excess Runoff (inches)	Total Infiltration (inches)
0	10.47	0.01
0.01	9.22	1.26
0.02	8.25	2.23
0.03	7.52	2.96
0.04	6.9	3.58
0.05	6.36	4.12
0.06	5.91	4.57
0.07	5.51	4.97
0.08	5.15	5.33
0.09	4.84	5.64
0.1	4.54	5.94
0.11	4.29	6.19
0.12	4.06	6.42
0.13	3.86	6.62
0.14	3.68	6.8
0.15	3.5	6.98
0.16	3.37	7.11
0.17	3.24	7.24
0.18	3.11	7.37
0.19	2.98	7.5
0.2	2.86	7.62
0.21	2.78	7.7
0.22	2.7	7.78
0.23	2.62	7.86
0.24	2.54	7.94
0.25	2.46	8.02
0.26	2.41	8.07
0.27	2.37	8.11
0.28	2.33	8.15
0.29	2.29	8.19
0.3	2.25	8.23

B. LAND USE ASSUMPTIONS

An assessment of the various land uses and the estimated percent impervious requirements used in the hydrologic analysis of this report was estimated using the “Land Use Elements” from the City of Roseville’s General Plan dated November 1998. Roseville’s Land Use document described the typical dwelling units per gross acreage and the minimum and maximum densities for each residential land uses. The percent

impervious coverage was estimated from typical projects previously approved by the City of Roseville, and is consistent with the previous 1990 Pleasant Grove Creek Mitigation Fee study. A summary description from the Roseville's General Plan of the major land uses are described below.

Low Density Residential (LDR) - Comprises the majority of the City of Roseville housing supply with lots ranging from 6,000 to 7,500 square feet. Standard dwelling units per gross area range from .5 to 6.9 units per acre. Typically, low density residential lands require minimal grading or disturbance of natural features.

Medium Density Residential (MDR) - Typical land uses are small lot single family, half-plexes, townhouses, condominiums, and mobile home parks. Standard dwelling units range from 7.0 to 12.9 dwelling units per gross acre.

High Density Residential (HDR) - The primary uses are multiple family dwellings in attached units, public parks, resource preservation and open space areas normally developed with apartments or condominiums with multiple story structures. This land use should be applied to lands adjacent to arterial streets, transit linkage, and close proximity to commercial services.

Commercial (CC, NC, RC,) - Community, neighborhood, and regional commercial are intended to accommodate services to surrounding neighborhoods. The various sites include, gas stations, child care facilities, shopping centers, and retail stores.

Business Professional (BP) - The primary uses for this category are professional government, hospitals, and clinics for small and large office uses. Limited commercial uses include banks, restaurants, day care centers, etc. The floor area ratios should range between 20% and 40%.

Industrial (LI, IND) - The light industrial land use category is applied to lands reserved for office, industrial, and development that uses very limited noise or pollutants. The general industrial land use category is intended for areas that tend to generate noise, odor, and smoke. The intent of the general category is to provide a place for industrial uses within the city limits that is properly buffered from other uses. Areas developed under this designation should be located with direct access to major roads, freeways or rail lines. Floor area ratios range from 20% - 50%.

C. HYDROLOGIC SOIL ASSUMPTIONS

The quantity and type of ground cover over a watershed will have a major impact on the infiltration capacity of a soil. The Soils Survey of Placer County, California (Western Part) dated July 1980 was utilized to determine the location of the hydrologic soils group within the City of Roseville limits. Hydrologic soils groups are utilized in watershed planning to estimate runoff from rainfall. The soils in the City of Roseville region as described by the Soils Conservation Service are relatively impervious in the pre-development condition with the majority found in Hydrologic Group D. However, soils

Group B and C are located in some parts of the proposed development areas. Soils Group A is not located within the City of Roseville's boundary limits. Hydrologic Soil Group's are assigned by the National Resource Conservation Service (NRCS) as shown in Exhibit PG-5 for the areas of this analysis. The hydrologic soils are classified in the following four groups:

1. Group A: consist of soils that have a high infiltration rate when thoroughly wet. These soils have a high rate of water transmission and low runoff potential. They are deep, well drained or excessively drained, and consist chiefly of sand, gravel, or both. No soils in the City of Roseville Area are in group A.
2. Group B: consist of soils having a moderate infiltration rate when thoroughly wet. These soils have moderate runoff potential. They are moderately deep well drained, and are medium in textured to moderately coarse textured.
3. Group C: consist of soils having a slow infiltration rate when thoroughly wet. These soils have a slow rate of water transmission and high runoff potential. They soil layer impedes downward movement of water and has a slow infiltration rate.
4. Group D: consist of soils having a slow infiltration rate when thoroughly wet. The rate of water transmission is very slow, and runoff potential is very high. This group includes:
 - i) clay soils that have high shrink-swell potential,
 - ii) soils that have a permanent high water table,
 - iii) soils that have a clay pan or clay layer at or near the surface, and
 - iv) soils that are shallow over nearly impervious material.

The constant soil infiltration rates listed on Table II by land use are from Table 5-3 in the Placer County Stormwater Management Manual dated September 1, 1990. A detailed soils map in the back of this report (Sheet 1A) shows the hydrologic group locations within the specific land uses in the analysis. Hydrologic soils group Type D encompasses approximately 90% of the City of Roseville with Type B and C the other 10%.

Alternative methods for computing infiltration losses are available, but the Placer County Stormwater Management Manual (SWMM) recommends the use of a constant infiltration rate in the HEC-1 application.

TABLE II - CONSTANT INFILTRATION RATES BY LAND USE AND HYDROLOGIC SOIL TYPE

		% Impervious	Pervious Infiltration RATES			
			TYPE A	TYPE B	TYPE C	TYPE D
LDR	LOW DENSITY RESIDENTIAL	40	0.48	0.25	0.16	0.12
LDR	LOW DENSITY RESIDENTIAL AGE RESTR.	40	0.48	0.25	0.16	0.12
MDR	MEDIUM DENSITY RESIDENTIAL	50	0.48	0.25	0.16	0.12
HDR	HIGH DENSITY RESIDENTIAL	60	0.48	0.25	0.16	0.12
NC	NEIGHBORHOOD COMMERCIAL	70	0.48	0.25	0.16	0.12
CC	COMMUNITY COMMERCIAL	70	0.48	0.25	0.16	0.12
RC	REGIONAL COMMERCIAL	70	0.48	0.25	0.16	0.12
BP	BUSINESS PROFESSIONAL	70	0.48	0.25	0.16	0.12
CBD	CENTRAL BUSINESS DISTRICT	90	0.48	0.25	0.16	0.12
LI	LIGHT INDUSTRIAL	70	0.48	0.25	0.16	0.12
IND	GENERAL INDUSTRIAL	70	0.48	0.25	0.16	0.12
OS	OPEN SPACE	5	0.31	0.16	0.09	0.07
OS	OPEN SPACE PASEO	5	0.31	0.16	0.09	0.07
P/R	PARKS AND RECREATION	5	0.48	0.25	0.16	0.12
P/R	PARK	5	0.48	0.25	0.16	0.12
P/R	POCKET PARK	5	0.48	0.25	0.16	0.12
P/QP	PUBLIC/QUASI PUBLIC	50	0.48	0.25	0.16	0.12
UR	URBAN RESERVE	5	0.31	0.16	0.09	0.07
TR	TRANSFER STATION	70	0.32	0.17	0.11	0.08
R/W	RIGHT OF WAY	85	0.48	0.25	0.16	0.12

Table III below compares the factors and impact rates changes from the 2006 study to this current study. The Impact factors are Acre Feet of storage required per acre of that type of development. The Updated impact rates have been adjusted to reflect:

- Additional properties that were undeveloped in 1992 now being captured in the impact analysis and assigned to neighboring specific plan areas.
- Changes to the National Resource Conservation Service “Hydrologic Soils Group” classifications. (some Type D soils are now shown as Type C soils)
- Changes in the assumed values for infiltration rate and impervious fraction for some development types.
- Refinement of the water balance calculations to include a 1-hour time step.

These changes have a direct correlation with the volume impact of each developed property as seen in Tables III and IV. Oversized Exhibit PG-2 shows the Land Use Areas which remain to be developed and contribute to the Fee. Oversized Exhibit PG-5 shows the current NRCS hydrologic soil group.

TABLE III - IMPACT FACTORS (by land use and hydrologic soil group)

LAND USE TYPE	LAND USE DESCRIPTION	2006 Study % IMP	Current Study % IMP	Change % IMP	2006 Study inf rate (in/hr)	Current Study inf rate (in/hr)	Change inf rate (in/hr)	2006 Study impact rate (af/ac)	Current Study impact rate (af/ac)	Change impact rate (af/ac)
TYPE D SOILS										
LDR	Low Density Residential	40	40	0	0.12	0.12	0	0.072	0.094	0.0218
MDR	Medium Density Residential	50	50	0	0.12	0.12	0	0.126	0.149	0.0231
HDR	High Density Residential	65	60	-5	0.12	0.12	0	0.206	0.204	-0.0016
CC	Community Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
PR	Park	5	5	0	0.12	0.12	0	-0.115	-0.100	0.0151
P/QP	Public/Quasi Public	50	50	0	0.12	0.12	0	0.126	0.149	0.0231
ROAD	Roadways	85	85	0	0.12	0.12	0	0.313	0.343	0.0297
UR	Urban Reserve	5	2	-3	0.07	0.07	0	0	0	0
OS	Open Space	5	2	-3	0.07	0.07	0	0	0	0
LI	Light Industrial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
IND	Industrial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
RC	Regional Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
BP	Business Professional	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
NC	Neighborhood Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
TS	Transportation	70	70	0	0.08	0.12	0.04	0.26	0.260	-0.0003
TYPE C SOILS										
LDR	Low Density Residential	40	40	0	0.16	0.16	0	0.091	0.133	0.0321
MDR	Medium Density Residential	50	50	0	0.16	0.16	0	0.15	0.245	0.0948
HDR	High Density Residential	65	60	-5	0.16	0.16	0	0.239	0.307	0.0675
CC	Community Commercial	70	70	0	0.16	0.16	0	0.269	0.363	0.0932
PR	Park	5	5	0	0.16	0.16	0	-0.116	-0.033	0.0832
P/QP	Public/Quasi Public	50	50	0	0.16	0.16	0	0.15	0.245	0.0948
ROAD	Roadways	85	85	0	0.16	0.16	0	0.358	0.461	0.1023
UR	Urban Reserve	5	2	-3	0.09	0.12	0.03	0	0	0
OS	Open Space	5	2	-3	0.09	0.12	0.03	0	0	0
LI	Light Industrial	70	70	0	0.16	0.16	0	0.269	0.363	0.0932
IND	Industrial	70	70	0	0.16	0.16	0	0.269	0.363	0.0932
RC	Regional Commercial	70	70	0	0.16	0.16	0	0.269	0.363	0.0932
BP	Business Professional	70	70	0	0.16	0.16	0	0.269	0.363	0.0932
NC	Neighborhood Commercial	70	70	0	0.16	0.16	0	0.269	0.363	0.0932
TS	Transportation	70	70	0	0.11	0.16	0.05	0.292	0.363	0.0762
TYPE A & B SOILS										
LDR	Low Density Residential	40	40	0	0.25	0.25	0	0.165	0.201	0.0346
MDR	Medium Density Residential	50	50	0	0.25	0.25	0	0.232	0.270	0.0380
HDR	High Density Residential	65	60	-5	0.25	0.25	0	0.331	0.339	0.0084
CC	Community Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
PR	Park	5	5	0	0.25	0.25	0	-0.054	-0.042	0.0117
P/QP	Public/Quasi Public	50	50	0	0.25	0.25	0	0.232	0.270	0.0380
ROAD	Roadways	85	85	0	0.25	0.25	0	0.464	0.513	0.0489
UR	Urban Reserve	5	2	-3	0.16	0.16	0	0	0	0
OS	Open Space	5	2	-3	0.16	0.16	0	0	0	0
LI	Light Industrial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
IND	Industrial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
RC	Regional Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
BP	Business Professional	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
NC	Neighborhood Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
TS	Transportation	70	70	0	0.17	0.25	0.08	0.382	0.409	0.0268

Table IV identifies the Total Impact Volumes by Specific Plan or Contributing project and compares them to values from previous studies. In addition to the impacts for development, the City has other projects which have made commitments to reserve storage volumes at this facility as listed in Table IV.

TABLE IV – City Development Impacts by Plan Area

Development Area	2006 Fee Study Included Volumes	Stated Volume Impacts From Previous Studies (AF)	Current Study Revised Volume impact (AF)
Del Webb SP	25.56	25.56	57.41
North Central Roseville SP	244.91	244.91	272.3
Northwest Roseville SP	194.61	194.61	239.7
North Area Industrial	367.66	367.66	437.9
North Roseville SP	123.49	123.4	141.3
Highland Reserve North	72.7	72.7	93.5
West Roseville SP	207.21	207.21	293.7
Infill Areas		92.6	92.6
Siema Vista SP (2006 MOU #2)	125.41	125.41	249.2
Wastewater Treatment Plant *		207	207.0
Energy Park *		20	20.0
Creekview Specific Plan (MOU #1)	56.88	55.88	47.3
2016 MOU 1 : Amoruso Ranch SP		67.8	69.0
TOTAL:	1418.43	1824.74	2221.0

* Mitigation Rate per 2006 Fee Update estimated at 120 AF, however, it was only included in the surplus volume for 1850 AF. EIR quantified 207 AF Impact. Energy Park estimated 20 AF in PWA/URS Analysis

Table IV identifies that with the Amoruso Specific Plan, the Volumetric Impact would be 2,221 acre feet. At the time of the writing of this document, the Amoruso Ranch project had not annexed to the City, as a result, both the with and without Amoruso Ranch alternatives will be considered. The without the Amoruso Specific Plan volumetric impact volume would be 2,152 acre feet. Cost alternatives for basins to store each of these amounts are provided and a fee basis computed for both alternatives.

VIII. MITIGATION FACILITY COMPONENTS

The initial Mitigation Facility at Reason Farms that was part of the 2002 Conceptual Design (URS/PWA) and approved in 2003 Program Level EIR, included these three main elements:

- 1) Southern Basin construction would be able to retain 1850 acre feet. (Included in previous Fee)
- 2) Northerly Basin construction would be able to retain 680 acre feet. (Excluded from previous Fee)
- 3) Northern Basin Stream Restoration Project would allow flood waters to pass through the Northern Basin area in a sustainable manner, reducing the potential for erosion, and other geomorphological issues. The Stream Restoration project also will provide peak flow mitigation on University Creek, which will reduce peak flow impacts from development within University Creek, to the Pleasant Grove Creek Watershed. (Excluded from previous Fee)

Project Elements and alternatives to be considered in the Fee Update

Per the Hydrological Analysis completed by CESI in the 2006 update, and modified within this 2017 Update (see Appendix B) current development estimated impacts are higher than the previously designed capacity of the Southern Basin. With this fee update the City has chosen to define the project as the original conceptual 2 basin project as defined within the 2002 PWA Final Conceptual Design Report. The southern basin design remains as previously configured, and the project re-introduces the northern basin (combined storage volume of 2,530 AF). As previously configured, the northern basin would include the complete construction of a full 500 feet width restored University Creek within the basin area. The proposed Southern Basin Design Concept for 1850 AF, with the proposed Northern Basin Design Concept for 680 AF (PWA/URS) is shown on Exhibit PG-4A. The Estimated Remaining Construction and Design Costs are presented in Table V-A in the next section.

As an alternative approach, the study includes a review of a single basin project that could result in efficiencies in future operational costs. The southern basin could be modified to capture the entire 2,250 ac-feet by excavating out the additional volume capacity to add storage capacity to the system. In order for the southern basin to store larger volumes than the 1850 AF previously designed, the basin would need to operate at peak storage at a lower pool elevation (to allow more flood waters to be driven into the basin from the upstream), and accommodate added storage volumes by excavating the lowest ground within the basin. The excavated soils would then be spread on neighboring fields which are identified in the plan to remain above the flood elevations.

Within this reconfigured single basin approach, the complete northern basin would not be included as part project description but rather redefined and developed with a minimized University Creek Stream Restoration component. The Stream Restoration component is considered an optional component, as recently approved developments along University Creek

(Creekview Specific Plan and Amoruso Ranch) could contribute to stream degradation issues through the Reason Farms property to the confluence with Pleasant Grove Creek, where the existing channel has very limited capacity, and flood flows exceed the channel capacity and current create scour issues at the invert of the existing man made channel through the property. The alternate Excavated Southern Basin Design Concept for 2250 AF, with the minimized Stream Restoration project at University Creek (north basin area) is shown on Exhibit PG-4B. The Estimated Remaining Construction and Design Costs for this alternative is presented in Table V-B in the next section.

Because any reconfiguration of the initially evaluated conceptual design would require extensive design changes and environmental review, this fee update does not propose any changes to the original design concepts.

The Southern Basin(included):

In 2002, Phillip Williams and Associates (PWA/URS) prepared a preliminary Southern Basin layout and design to store 1850 acre feet. The basin design included a channelized diversion from Pleasant Grove Creek to the facility, which could divert a portion of the flows during large storm events, into the basin. The capture point was at the upstream end of the Reason Farms property. With the approval of the Creekview Master plan the diversion point was moved further upstream to within the Creekview property which assisted with the efficiency and ability of the project to capture more flood flows from smaller storm events. The revised channel parallels Pleasant Grove Creek within the Creekview property. A system of weirs within the Creekview property and an upstream gate controlled culvert would feed flood waters into the channel. Improvements of the diversion channel within the Creekview property are the responsibility of the developer, and the costs are not included in the Fee Update.

Once the diversion channel enters the Reason Farms property a second connection to Pleasant Grove Creek occurs to permit nuisance flows which discharge from the Creekview project to return to Pleasant Grove creek without entering the northern basin. Downstream of the return channel connection to Pleasant Grove Creek, the main control structure for the basin will be constructed. The main control structure includes 2-6'x6' gate structures and a weir structure placed at the containment storage elevation. This structure would close once the basin was full to prevent capture flood waters from re-entering Pleasant Grove Creek through any of the upstream capture elements.

The excavated channel continues through the storage areas of the basin to a low point outlet location at the southern bank of Pleasant Grove Creek. A 30 inch gate controlled pipe would permit captured flood waters to slowly release back into Pleasant Grove Creek when the basin could be emptied. The emergency spillway for the basin would be located at the main gate control structure. The basin would be designed to sustain depths greater than the design storage elevation, based on the estimated flood elevations which would occur at the main control gate (throughout the basin even though it is doubtful short term peak flows at this location could fill the entire basin to these depths. The Excavated channel would include an access road running along one bank at the top of slope for maintenance access. Ramps to the invert of the channel are provided for maintenance access.

An embankment berm would be located around the perimeter of the basin storage area to contain the captured flood waters with more than 3' feet of freeboard. The berm would be designed to meet California Division of Safety of Dams requirements, FEMA requirements, and the City of Roseville's requirements. An access road would be placed on top of this berm and access ramps would be located at several locations to permit vehicle access for inspection. The entire storage area of the basin would be fenced to prevent vandalism.

The Northern Basin (included):

The original plan included storage north and east of Pleasant Grove Creek along the University Creek corridor. The existing linear confined University Creek through the project property would be re-excavated into a wide meandering creek north of the current location. An inset meandering low flow channel would be constructed within the banks (roughly 600' wide). A containment berm would be placed at the downstream end of the reconstructed channel and along the northeast bank of Pleasant Grove Creek to retain flows within the reconstructed University Creek and its overbank floodplain. A control structure would be placed in this embankment structure at the proposed University Creek outfall to Pleasant Grove Creek. The control structure would be closed during events where storage needed to occur and could be left closed for a prolonged (45 days or more) period if needed. Flows in excess of the design storage depth would overtop a spillway to return to Pleasant Grove Creek.

The Expanded Southern Basin (Alternative Option):

The alternative basin design shown in Exhibit PG-4B, would be able to store 2250 acre feet within a single basin south of Pleasant Grove Creek. In order to increase storage volumes above the 1850 acre feet amount, the storage water surface levels would be dropped by 3 to 5 feet from the original southern basin design, allowing more flood water hydraulically enter the storage basin area. In order to reduce flood levels within the basin and provide the additional storage, low lying areas of the basin would be excavated. Perimeter embankments similar to those shown in the Original Plan would still be needed in this plan to contain waters stored in the basin, although they could be built about 3 feet lower in height than those described in the Original Plan. The excavated soils would be spread on adjacent lands which are currently above the water storage elevations of the basin. The outfall to Pleasant Grove Creek would be moved westward from the location shown in the Original Plan in order to discharge at the western most storage location within the basin and provide additional fall to the creek. All flows entering the Creekview Bypass Channel system would flow through this basin and exit to Pleasant Grove Creek at the downstream end of the basin. At the downstream end of the basin, a control structure would be build. Valves would be used to close the outfall structure when storage was needed, but would normally remain open to allow captured flows to return to Pleasant Grove creek. Once the valves were closed, the basin would fill from the incoming flows. Once the max storage water surface was achieved, additional inflows would overtop a spillway and return to Pleasant Grove Creek.

The Northern Stream Restoration Only Project (Alternative Option):

The Northern Stream Restoration Project would re-align the existing channelized University Creek through the Reason Farms Property to its discharge into Pleasant Grove Creek. The existing drainage ditch outfall is an undersized man made irrigation tailwater ditch through the Reason Farms property which discharges into Pleasant Grove Creek. Upstream of the Reason Farms Property, University Creek remains in a natural channel form, and is proposed to continue in that form as the proposed developments occur outside of the 100-year floodplain for this creek. The existing ditch system has significant erosion issues near Pleasant Grove Creek and result in a significant floodplain above it's banks.

The project proposes to reshape the channel form of University Creek through the Reason Farms property to restore a more natural channel form (per PWA design 2002, and CESI grading analysis 2008). The channel form will be constructed with an approximately 500 feet wide floodplain. An inset low flow channel will concentrate low flows through a meandering channel within the floodplain channel. The channel will also be realigned to discharge further downstream than the current outfall location. At the discharge to Pleasant Grove Creek. An embankment will remain, which will be stabilized to release flood flows with less erosion potential than the existing conditions. A culvert through the embankment will control and limit floodwater releases into Pleasant Grove Creek.

Re-vegetation of the stream corridor will be an important component of this project, to help to stabilize the channel from erosion issues, and to improve environmental habitat.

An Access Road will be provided at the Top of Bank of one side of the floodplain channel. The entire limits of the stream restoration channel would be fenced to prevent vandalism

Alternatively, at University Creek, only a Minimized Stream Restoration project could be installed to stabilize the stream system without construction storage facilities. Storage at the Northern Basin is higher in cost due to the excavations needed to create the storage volumes.

Project Alternatives to achieve 2250 AF or greater storage volumes:

Original 2 Basin Plan: The proposed Southern Basin Design Concept for 1850 AF, with the proposed Northern Basin Design Concept for 680 AF (PWA/URS) is shown on Exhibit PG-4A.

Alternative 1 Basin Plan: The proposed Excavated Southern Basin Design Concept for 2250 AF, with the minimized Stream Restoration project at University Creek (north basin area) is shown on Exhibit PG-4B.

The Estimated Remaining Construction and Design Costs for each of the alternatives will be presented in Table V-A and Table V-B in the next section.

IX. COST ALLOCATION

Based on the original 2002 PWA conceptual design of the 2 basin approach and the Alternative 1 basin (south basin) approach, quantity takeoffs were prepared and a cost estimate for the remaining expenses of design and construction were tabulated as presented on exhibits PG-4A and PG-4B. Tables V-A and V-B summarizes the costs of each of the alternatives proposed. The estimated construction costs are presented in current year 2017 values. Detailed cost estimates are provided in Tables VI-A1, VI-A2, VI-B1 and VI-B2.

TABLE V-A – Original 2 Basin Project - Remaining Design and Construction Costs for Project Components

Component	Cost \$
Southern Basin 1850 AF	\$ 7,530,127
Northern Basin 680 AF	\$ 7,185,804
TOTAL \$ =	\$ 14,715,931

TABLE V-B – Alternative 1 Basin Project - Remaining Design and Construction Costs for Project Components

Component	Cost \$
Southern Basin 2250 AF	\$ 9,964,741
North Stream Restoration	\$ 3,995,382
TOTAL \$ =	\$ 13,960,123

The drainage impact fee will be adjusted for inflation by the Construction Cost Index (CCI) based on the 20 City Average, averaged with the CCI for San Francisco on an annual basis.

TABLE VI-A1 – ALTERNATIVE A ESTIMATED COSTS -REASON FARMS RETENTION BASIN-FEE DETERMINATION BASIS – SOUTHERN BASIN COSTS

Reason Farms - Project Alternative 1 - Pleasant Grove Watershed Mitigation Fee Basis - PWA/URS 1850 AF Option
(A Prevailing Wage Project)

Item	Description	Quantity	Unit	Unit \$	Cost \$	Task \$
1	Site Preparation					
	Mobilization	1	LS	\$ 200,000.00	\$ 200,000.00	
	Clear and Grub	78	AC	\$ 3,000.00	\$ 234,000.00	
						\$ 434,000.00
2	Channel Improvements					
	Channel Excavation	550000	CY	\$ 4.00	\$ 2,200,000.00	
						\$ 2,200,000.00
3	Containment Embankment					
	Foundation Work	24000	LF	\$ 18.00	\$ 432,000.00	
	Embankment Fill-Shaping from Local Cut Source	478000	CY	\$ 6.00	\$ 2,868,000.00	
						\$ 3,300,000.00
4	Control Structures and Piping					
	30 inch Pipe	100	LF	\$ 144.00	\$ 14,400.00	
	30 inch Outlet Pipe Valve	1	EA	\$ 22,500.00	\$ 22,500.00	
	Telemetry and control for outlet pipe	1	EA	\$ 25,000.00	\$ 25,000.00	
	6' by 6' Gate Control Structure (Inlet)	3	EA	\$ 150,000.00	\$ 450,000.00	
	4' by 4' Gate Control Structure (Outlet)	2	EA	\$ 100,000.00	\$ 200,000.00	
	Low Flow Inlet Control and Gate Controls	1	EA	\$ 150,000.00	\$ 150,000.00	
	Telemetry and control for Inlet	1	EA	\$ 25,000.00	\$ 25,000.00	
	Armcoflex Weir	6240	SF	\$ 22.00	\$ 137,280.00	
5	Site Appurtenances					
	Access Road (12')	34500	LF	\$ 25.00	\$ 862,500.00	
	Perimeter Fencing	24000	LF	\$ 22.00	\$ 528,000.00	
	Protection Fencing	3000	LF	\$ 20.00	\$ 60,000.00	
	Access Ramps	12	EA	\$ 20,000.00	\$ 240,000.00	
	Landscaping	217300	SF	\$ 3.00	\$ 651,900.00	
	Hydroseal	73	SF	\$ 5,500.00	\$ 401,500.00	
	Slope Protection	160000	SF	\$ 2.00	\$ 320,000.00	
	SWSPPP	1	LS	\$ 5,000.00	\$ 5,000.00	
	Erosion Protection and Winterization	4	LS	\$ 75,000.00	\$ 75,000.00	
CONSTRUCTION SUB-TOTAL						\$ 10,203,580.00
6	CONSTRUCTION SOFT COSTS					
	Engineering and Design (10%)	1	LS	\$1,020,358.00	\$ 1,020,358.00	
	Permitting					
	Project Level EIR preparation	1	LS	\$ 600,000.00	\$ 600,000.00	
	Habitat Mitigation	3	AC	\$ 250,000.00	\$ 750,000.00	
	Division of Dam Safety	1	LS	\$ 125,000.00	\$ 125,000.00	
	Permits	1	LS	\$ 200,000.00	\$ 200,000.00	
Construction Management (3%)	1	LS	\$ 306,179.00	\$ 306,179.00		
						Construction Soft Costs Subtotal = \$ 3,205,537.00
SUB-TOTAL CONSTRUCTION COSTS =						\$ 13,409,117.00
CONTINGENCIES (20%) =						\$ 2,681,823.40
TOTAL CONSTRUCTION COSTS =						\$ 16,090,940.40
7	MISC. PROGRAM COSTS					
	Program Updates and Fee Monitoring					
	Consultant Participation	1	LS	\$ 150,000.00	\$ 150,000.00	
Staff Participation	1	LS	\$ 150,000.00	\$ 150,000.00		
						TOTAL MISC. PROGRAM COSTS = \$ 300,000.00
TOTAL PROJECT COSTS =						\$ 16,390,940.40
AVAILABLE FUNDS =						\$ 8,860,813.39
Additional \$'s Needed to Fund Project =						\$ 7,530,127.01

TABLE VI-A2 - ESTIMATED COSTS - REASON FARMS RETENTION BASIN-FEE DETERMINATION BASIS – NORTH BASIN COST

Reason Farms - North Basin 680 AF Costs - Pleasant Grove Watershed Mitigation Fee Basis (A Prevailing Wage Project)						
Item	Description	Quantity	Unit	Unit \$	Cost \$	Task \$
1	Site Preparation					
	Mobilization	1	LS	\$200,000.00	\$ 200,000.00	
	Clear and Grub	52	AC	\$ 3,000.00	\$ 156,000.00	
	Topsoil Removal and Replacement	39000	CY	\$ 4.00	\$ 156,000.00	
						\$ 512,000.00
2	Channel Improvements					
	Channel Excavation and Channel Shaping	243000	CY	\$ 4.00	\$ 972,000.00	
	Local (nearby) placement of extra soils	158550	CY	\$ 2.50	\$ 396,375.00	
						\$ 1,368,375.00
3	Containment Embankment					
	Foundation Work	1200	LF	\$ 18.00	\$ 21,600.00	
	Embankment Fill-Shaping from Local Cut Source	48000	CY	\$ 6.00	\$ 288,000.00	
	Slope and Erosion Protection	50000	SF	\$ 2.00	\$ 100,000.00	
						\$ 409,600.00
4	Control Structures and Piping					
	Box Culvert or Arch with Natural Invert	200	LF	\$ 755.00	\$ 151,000.00	
	Control Gate and Telemetry	1	EA	\$225,000.00	\$ 225,000.00	
	Armorflex Weir	4000	SF	\$ 22.00	\$ 88,000.00	
						\$ 464,000.00
5	Site Appurtenances					
	Access Road (12")	5000	LF	\$ 25.00	\$ 125,000.00	
	Perimeter Fencing	9000	LF	\$ 22.00	\$ 198,000.00	
	Protection Fencing	1600	LF	\$ 20.00	\$ 32,000.00	
	Access Ramps	6	EA	\$ 20,000.00	\$ 120,000.00	
	Landscaping	304920	SF	\$ 3.00	\$ 914,760.00	
	Hydroseed	45	SF	\$ 5,500.00	\$ 247,500.00	
	SWPPP	1	LS	\$ 5,000.00	\$ 5,000.00	
	Erosion Protection and Winterization	1	LS	\$ 50,000.00	\$ 50,000.00	
						\$ 1,692,260.00
						CONSTRUCTION COST SUBTOTAL = \$ 4,446,235.00
6	CONSTRUCTION SOFT COSTS					
	Engineering and Design (10%)	1	LS	\$444,623.50	\$ 444,623.50	
	Permitting					
	Project Level EIR preparation	1	LS	\$200,000.00	\$ 200,000.00	
	Habitat Mitigation	2	AC	\$250,000.00	\$ 500,000.00	
	Permits	1	LS	\$175,000.00	\$ 175,000.00	
	Construction Management (5%)	1	LS	\$222,311.75	\$ 222,311.75	
						Construction Soft Costs Subtotal = \$ 1,541,935.25
						SUB-TOTAL CONSTRUCTION COSTS = \$ 5,988,170.25
						CONTINGENCIES (20%) = \$ 1,197,634.05
						TOTAL CONSTRUCTION COSTS = \$ 7,185,804.30

**TABLE VI-B1 – ALTERNATIVE A ESTIMATED COSTS -REASON FARMS
RETENTION BASIN-FEE DETERMINATION BASIS – SOUTHERN EXCAVATED
BASIN 2250 AF COSTS**

Reason Farms - Project Alternative 1 - Pleasant Grove Watershed Mitigation Fee Basis - Excavated South Basin Alternative 2250 AF
(A Prevailing Wage Project)

Item	Description	Quantity	Unit	Unit \$	Cost \$	Task \$
1	Site Preparation					
	Mobilization	1	LS	\$ 200,000.00	\$ 200,000.00	
	Clear and Grub	150	AC	\$ 2,500.00	\$ 375,000.00	\$ 575,000.00
2	Channel Improvements					
	Channel excavation	305000	CY	\$ 4.00	\$ 1,220,000.00	
	Excavated Storage Volume (scraper haul)	968000	CY	\$ 1.50	\$ 1,452,000.00	\$ 2,672,000.00
3	Containment Embankment					
	Foundation Work	24000	UF	\$ 18.00	\$ 432,000.00	
	Embankment Fill-Shaping from Local Cut Source	306500	CY	\$ 6.00	\$ 1,839,000.00	
	Fill Placement - Spread Fill and rpl Topsoil (shrink)	673750	CY	\$ 2.00	\$ 1,351,500.00	\$ 4,221,300.00
4	Control Structures and Piping					
	30 inch Pipe	100	UF	\$ 144.00	\$ 14,400.00	
	30 inch Outlet Pipe Valve	1	EA	\$ 22,500.00	\$ 22,500.00	
	Telemetry and control for outlet pipe	1	EA	\$ 25,000.00	\$ 25,000.00	
	6' by 6' Gate Control Structure (Inlet)	2	EA	\$ 150,000.00	\$ 300,000.00	
	4' by 4' Gate Control Structure (Outlet)	2	EA	\$ 100,000.00	\$ 200,000.00	
	Telemetry and control for Inlet	1	EA	\$ 25,000.00	\$ 25,000.00	
	Armorflex Weir	6240	SF	\$ 22.00	\$ 137,280.00	\$ 724,180.00
5	Site Amenities					
	Access Road (12')	34500	UF	\$ 25.00	\$ 862,500.00	
	Perimeter Fencing	24000	UF	\$ 22.00	\$ 528,000.00	
	Protection Fencing	6000	UF	\$ 20.00	\$ 120,000.00	
	Access Ramps	12	EA	\$ 20,000.00	\$ 240,000.00	
	Landscaping	217800	SF	\$ 3.00	\$ 653,400.00	
	Hydroseed	145	SF	\$ 5,500.00	\$ 797,500.00	
	Slope Protection	180000	SF	\$ 2.00	\$ 320,000.00	
	SX/PPP	1	LS	\$ 5,000.00	\$ 5,000.00	
	Erosion Protection and Winterization	1	LS	\$ 75,000.00	\$ 75,000.00	\$ 3,601,400.00
CONSTRUCTION SUB-TOTAL						\$ 11,793,880.00
6	CONSTRUCTION SOFT COSTS					
	Engineering and Design (10%)	1	LS	\$ 1,179,388.00	\$ 1,179,388.00	
	Permitting					
	Project Level EIR preparation	1	LS	\$ 300,000.00	\$ 300,000.00	
	Habitat Mitigation	3	AC	\$ 250,000.00	\$ 750,000.00	
	Division of Dam Safety	1	LS	\$ 125,000.00	\$ 125,000.00	
	Permits	1	LS	\$ 200,000.00	\$ 200,000.00	
	Construction Management (3%)	1	LS	\$ 389,694.00	\$ 389,694.00	
Construction Soft Costs Subtotal =						\$ 3,644,082.00
SUB-TOTAL CONSTRUCTION COSTS =						\$ 15,437,962.00
CONTINGENCIES (20%) =						\$ 3,087,592.40
TOTAL CONSTRUCTION COSTS =						\$ 18,525,554.40
7	MISC. PROGRAM COSTS					
	Program Updates and Fee Monitoring					
	Consultant Participation	1	LS	\$ 150,000.00	\$ 150,000.00	
	Staff Participation	1	LS	\$ 150,000.00	\$ 150,000.00	
TOTAL MISC. PROGRAM COSTS =						\$ 300,000.00
TOTAL PROJECT COSTS =						\$ 18,825,554.40
AVAILABLE FUNDS =						\$ 8,860,813.39
Additional \$'s Needed to Fund Project =						\$ 9,964,741.01

TABLE VI-A2 - ESTIMATED COSTS - REASON FARMS RETENTION BASIN-FEE DETERMINATION BASIS – MINIMIZED STREAM RESTORATION COSTS

Reason Farms - Stream Restoration Project at University Creek - Pleasant Grove Watershed Mitigation Fee Basis
(A Prevailing Wage Project)

Item	Description	Quantity	Unit	Unit \$	Cost \$	Task \$
1	Site Preparation					
	Mobilization	1	LS	\$ 150,000.00	\$ 150,000.00	
	Clear and Grub	21	AC	\$ 5,000.00	\$ 105,000.00	
						\$ 255,000.00
2	Channel Improvements					
	Channel Excavation and Channel Shaping	108000	CY	\$ 4.00	\$ 432,000.00	
	Local (nearby) placement of extra soils	78000	CY	\$ 2.50	\$ 195,000.00	
						\$ 627,000.00
3	Containment Embankment					
	Foundation Work	500	UF	\$ 18.00	\$ 9,000.00	
	Embankment Fill-Shaping from Local Out Source	12500	CY	\$ 6.00	\$ 75,000.00	
	Slope and Erosion Protection	30000	SF	\$ 2.00	\$ 100,000.00	
						\$ 184,000.00
4	Control Structures and Piping					
	Box Culvert or Arch with Natural Invert	200	UF	\$ 755.00	\$ 151,000.00	
	Armorflex Weir	4000	SF	\$ 22.00	\$ 88,000.00	
						\$ 239,000.00
5	Site Appurtenances					
	Access Road (12')	4000	UF	\$ 25.00	\$ 100,000.00	
	Perimeter Fencing	7000	UF	\$ 22.00	\$ 154,000.00	
	Protection Fencing	600	UF	\$ 20.00	\$ 12,000.00	
	Access Ramps	6	EA	\$ 20,000.00	\$ 120,000.00	
	Landscaping	217800	SF	\$ 3.00	\$ 653,400.00	
	Hydroseed	19	SF	\$ 5,500.00	\$ 104,500.00	
	SWPPP	1	LS	\$ 5,000.00	\$ 5,000.00	
	Erosion Protection and Winterization	1	LS	\$ 50,000.00	\$ 50,000.00	
						\$ 1,198,900.00
						CONSTRUCTION COST SUBTOTAL = \$ 2,503,900.00
6	CONSTRUCTION SOFT COSTS					
	Engineering and Design (10%)	1	LS	\$ 250,390.00	\$ 250,390.00	
	Permitting					
	Project Level EIR preparation	1	LS	\$ 100,000.00	\$ 100,000.00	
	Habitat Mitigation	1	AC	\$ 250,000.00	\$ 250,000.00	
	Permits	1	LS	\$ 100,000.00	\$ 100,000.00	
Construction Management (3%)	1	LS	\$ 125,195.00	\$ 125,195.00		
						Construction Soft Costs Subtotal = \$ 825,585.00
						SUB-TOTAL CONSTRUCTION COSTS = \$ 3,329,485.00
						CONTINGENCIES (20%) = \$ 665,897.00
						TOTAL CONSTRUCTION COSTS = \$ 3,995,382.00

X. FEE BASIS

Table V-A summarized the estimated costs of the construction of the Original 2 Basin Plan. The southern basin would provide 1850 AF and the North Basin would provide roughly 680 AF:

A. Collectable Fee Land Uses to Distribute Construction Cost:

- i. Low Density Residential (LDR)
- ii. Medium Density Residential (MDR)
- iii. High Density Residential (HDR)
- iv. Neighborhood Commercial (NC)
- v. Community Commercial (CC)
- vi. Regional Commercial (RC)
- vii. Business Professional (BP)
- viii. Light Industrial (LI)
- ix. General Industrial (IND)

B. Costs were not spread over the following impact land uses:

- i. Open Space (OS)
- ii. Open Space Pasec (OSP)
- iii. Parks/Recreation (PR)
- iv. Park (PR)
- v. Pocket Park (PR)
- vi. Public Quasi Public (P/QP)
- vii. Transfer Station (TR)
- viii. Right of Way (R/W)
- ix. Urban Reserve (UR)

Exhibit PG-3 Shows the remaining proposed development which will be subject to the Fee.

The proposed 2017 updated drainage fees would be spread to all development areas equally based on land use. Acreage based fees are based on the total development site acreage, excluded those land use types described in section B above.

For the Original 2 Basin Plan, building the South Basin 1850 AF, and North Basin 680 AF, the updated fee schedule for all approved Specific Plans including Amoruso Ranch is shown in Table VII-A1. If Amoruso Ranch is not annexed, the resulting Fee schedule for the remaining approved specific plans is shown in Table VII-A2.

TABLE VII-A1 – COMBINED AREA FEES – ORIGINAL 2 BASIN PROJECT with AMORUSO RANCH CONTRIBUTING

2017 Fee for Original 2 Basin Plan with Amoruso Contributing

FEE ITEM	UNIT	Total Land Use Acreage or Lot Count Remaining	2017 Proposed Fee	2017 Remaining Fee \$'s Generated
LDR	Per Unit	8769	\$ 453.79	\$ 3,979,284.51
MDR	Per Unit	5623	\$ 453.79	\$ 2,551,661.17
HDR	Per Unit	6211	\$ 374.30	\$ 2,324,777.30
NC	Per Acre	8.9	\$ 5,889.21	\$ 52,413.95
CC	Per Acre	437.5	\$ 5,889.21	\$ 2,576,528.56
RC	Per Acre	1	\$ 5,889.21	\$ 5,889.21
BP	Per Acre	92.7	\$ 5,889.21	\$ 545,929.59
LI	Per Acre	279.4	\$ 5,889.21	\$ 1,645,444.75
IND	Per Acre	175.6	\$ 5,889.21	\$ 1,034,144.95
TOTAL =			\$	\$ 14,716,074.00

TABLE VII-A2 – COMBINED AREA FEES – ORIGINAL 2 BASIN PROJECT without AMORUSO RANCH CONTRIBUTING

2017 Fee for Original 2 Basin Plan without Amoruso Contributing

FEE ITEM	UNIT	Total Land Use Acreage or Lot Count Remaining	2017 Proposed Fee	Fee \$'s Generated
LDR	Per Unit	7719.0	\$ 494.93	\$ 3,820,364.67
MDR	Per Unit	5018.0	\$ 494.93	\$ 2,483,558.74
HDR	Per Unit	5753.0	\$ 408.23	\$ 2,348,547.19
NC	Per Acre	8.9	\$ 6,423.12	\$ 57,165.73
CC	Per Acre	386.4	\$ 6,423.12	\$ 2,482,148.92
RC	Per Acre	1.0	\$ 6,423.12	\$ 6,423.12
BP	Per Acre	92.7	\$ 6,423.12	\$ 595,422.85
LI	Per Acre	279.4	\$ 6,423.12	\$ 1,794,618.59
IND	Per Acre	175.6	\$ 6,423.12	\$ 1,127,899.16
TOTAL =			\$	\$ 14,716,148.97

For the Alternative 1 Basin Project, building the Excavated South Basin 2250 AF two different fee schedules and costs are possible based on whether Amoruso Ranch Specific Plan is included. If Amoruso Ranch Specific Plan is not included in the Fee, there would not be a need for the North Stream Restoration Project and only the 2250 AF southern excavated basin would be included in the remaining costs of \$11.8 Million. For the Scenario where Amoruso Ranch Specific Plan is included in the fee the North Stream Restoration Project will also be included as shown in Table VII-B2, with a total remaining cost of \$15.8 Million.

TABLE VII-B1 – COMBINED AREA FEES – ALTERNATIVE 1 BASIN PROJECT with AMORUSO RANCH CONTRIBUTING

2017 - Fees for Alternative 1 Basin Plan

FEE ITEM	UNIT	Total Land Use Acreage or Lot Count Remaining	2017 Proposed Fee	2017 Remaining Fee \$'s Generated
LDR	Per Unit	8769	\$ 307.28	\$ 2,694,538.32
MDR	Per Unit	5623	\$ 307.28	\$ 1,727,835.44
HDR	Per Unit	6211	\$ 253.45	\$ 1,574,177.95
NC	Per Acre	8.9	\$ 3,987.83	\$ 35,491.66
CC	Per Acre	437.5	\$ 3,987.83	\$ 1,744,674.18
RC	Per Acre	1	\$ 3,987.83	\$ 3,987.83
BP	Per Acre	92.7	\$ 3,987.83	\$ 369,671.53
LI	Per Acre	279.4	\$ 3,987.83	\$ 1,114,198.78
IND	Per Acre	175.6	\$ 3,987.83	\$ 700,262.37
TOTAL =				\$ 9,964,838.06

TABLE VII-B2 – COMBINED AREA FEES – ALTERNATIVE 1 BASIN PROJECT without AMORUSO RANCH CONTRIBUTING

2017 - Fees for Alternative 1 Basin Plan

FEE ITEM	UNIT	Total Land Use Acreage or Lot Count Remaining	2017 Proposed Fee	2017 Remaining Fee \$'s Generated
LDR	Per Unit	7719.00	\$ 397.25	\$ 3,066,372.75
MDR	Per Unit	5018.00	\$ 397.25	\$ 1,993,400.50
HDR	Per Unit	5753.00	\$ 327.67	\$ 1,885,085.51
NC	Per Acre	8.90	\$ 5,155.44	\$ 45,883.43
CC	Per Acre	386.44	\$ 5,155.44	\$ 1,992,268.93
RC	Per Acre	1.00	\$ 5,155.44	\$ 5,155.44
BP	Per Acre	92.70	\$ 5,155.44	\$ 477,909.45
LI	Per Acre	279.40	\$ 5,155.44	\$ 1,440,430.44
IND	Per Acre	175.60	\$ 5,155.44	\$ 905,295.58
TOTAL =				\$ 11,811,802.03

XI. CONCLUSION AND RECOMMENDATIONS

With this 2017 fee update, CESI has revised the hydrologic assumptions and updated the construction costs. This provides a more accurate evaluation of the current and future needs of the flood control facility and recalculates the impact fee required to pay for the eventual construction of the facilities.

The conceptual plan completed by PWA/URS in 2002 for the 2 Basin, 1850 AF South Basin and 680 AF North Basin project has been previously studied in a “program” level EIR. Following the work completed to date in the evaluation of the original 2002 PWA/URS Final Conceptual Design Report, this update concludes that the original concept plans are the preferred project moving forward at this time.

Future operational cost savings could be realized if the Alternative 1 Basin Project alternative presented herein was constructed. The excavated 1 Basin Alternative would provide the least expensive alternative, and will offer the City a minimized footprint of flood space on the Reason Farms Property, offering greater flexibility in operation over a wider variety of storm events. Because the 1 Basin Alternative would require further design and an updated Environmental Impact Report, it is recommended that this alternative not be pursued at this time.

City Staff has begun to meet with Placer County Staff regarding potential mitigation of their development area impacts within this facility. If that is to occur, the environmental documents will need to be updated for those issues and the additional storage requirements. The intent would be that if areas external to the City are incorporated into the mitigation facility, that they would pay their full fair share of the cost of the improvements, the land, and the administration of the project, as well as pay their fair share of future operation, management and maintenance of the facility.

City Staff plans to move the project forward with the completion of the “project” level environmental documents within the next couple years. Other alternatives, including the excavated single basin alternative and northern stream restoration project will be reconsidered in those documents.

The recommendation is to adopt the updated fees shown in Table VII-A1 or VII-A2, whichever is applicable based on the inclusion/exclusion of the Amoruso Ranch Specific Plan.

APPENDIX A

ESTIMATORS UNIT PRICE SUPPORT DOCUMENTATION

APPENDIX B

SUPPORT CALCULTIONS FOR FEES AND COSTS

AREAS/LAND USE FROM CITY GIS FILES

NAME	Del Webb	North Central	Northwest	North Industrial	North Roseville	Highland Reserve	West Roseville	Infill	Sierra Vista	Creekview	MOU Amoroso
CODE	DW	NC	NW	NI	NR	HR	WR	IN	SV	CV	AR
LANDUSE											
ROAD	63.7	121.8	156.8	124.9	75.1	44.3	142	0.7	157.7	34.1	46.5
LDR	654.8	534.3	1485.3	204.5	816.2	248.8	1593.2	29.8	305.9	160	243.5
LI	0	57.8	0	204.8	0	0	55.1	30.2	0	0	0
OS	97.7	214.5	204.3	174.2	139.1	37.3	736	0	317.4	137	145
CC	12.7	173.5	112.1	69.2	81.3	162.5	63.3	10.5	237.4	69.1	51.5
IND	0	0.8	0	495.1	0	0	32.9	0	0	0	0
POP	1.5	50.2	79.4	8.7	55.4	48.5	148	187.8	21.7	11.1	17.3
MDR	0	45.5	122.1	60.4	63.2	0	130	0	322.4	68.8	59.4
PR	377.8	94	347.1	52.8	114.1	37.2	251.9	5.2	108.1	16	22.9
HCR	4	33	33	21.8	42.3	45.5	117.7	0	93.4	19.8	38.9
RC	0	192.6	0	0	0	0	0	0	0	0	0
BP	0	151.5	3	5.1	0	0	0.1	2.5	0	0	0
IC	0	2.3	0	8.9	0	0	0	0	0	0	0
UR	0	0	0	0	0	0	0	0	43.1	0	19.3
TS	0	0	0	0	0	0	0	23.7	0	0	0
TOTAL AREA	1215.2	1743.5	2509.4	2041.7	1437.7	524.1	3270.2	296.5	2051.1	453.9	543.3

Del Webb MCRSP NWRSP N. IND NRSP HRN CV SVSP WRSP INFILL

Changes by Landuse (New subtract Old)										
LDR	-0.4	106.51	110.4	-147.6	-100.5	8.8	-169.6	-288.9	-52.5	160
MDR	0	-31.04	-134.6	80.4	-29.2	0	68.8	233.8	58.5	58.8
HDR	0	-44.2	-56.36	21.8	5.8	0.02	-1.2	35.2	66.6	18.8
COMM	0.6	-17.11	-14.5	2.25	-64.1	0.07	-33.9	173.3	-11.5	19.1
Park	6.5	53.23	-31.65	33.88	-3.8	0.48	6	-80.6	251.9	18
POP	1.5	-22.54	-25.63	1.5	-13.7	2.1	10.1	6.7	148	10.1
ROAD	15.9	26.17	53.02	53.6	-3.2	14.07	34.1	59.6	142	34.1
UR	-9.6	0	-48.4	0	-0.37	0	-35.7	40.1	0	0
OS	0.6	45.94	136.8	32.9	5.2	-2.57	-81.3	170.8	36.9	137
NET CH:	15.1	116.96	-10.92	78.73	-203.87	22.97	-202.7	350	640	453.9

TOTAL - OLD ANALYSIS

LDR	855.2	428.29	1375.4	352.1	916.7	240	329.6	994.6	1545.7
MDR	0	77.64	257	0	92.4	0	0	88.6	71.4
HDR	4	127.2	139.36	0	37	45.48	20	58.2	51.1
COMM	12.1	515.71	136.6	1372.15	145.9	162.43	53	64.1	162.9
Park	371.3	40.77	378.75	18.92	117.9	36.72	10	185.7	0
POP	3	72.74	105.03	7.2	69.1	46.4	0	65	0
ROAD	47.8	95.63	103.78	71.3	78.3	30.23	0	98.1	0
UR	9.6	0	48.4	0	0.37	0	35.7	0	0
OS	97.1	168.56	68	141.3	183.9	39.87	218.3	146.5	699.1

Development Area	2006 Fee Study Included Volumes	Stated Volume Impacts From Previous Studies (AF)	Current Study Revised Volume Impact (AF)
Del Webb SP	25.56	25.56	57.41
North Central Roseville SP	244.91	244.91	272.3
Northwest Roseville SP	194.61	194.61	239.7
North Area Industrial	367.66	367.66	437.9
North Roseville SP	123.49	123.4	141.3
Highland Reserve North	72.7	72.7	93.5
West Roseville SP	207.21	207.21	293.7
Infill Areas		92.6	92.6
Sierra Vista SP (2006 MOU #2)	125.41	125.41	249.2
Wastewater Treatment Plant "		207	207.0
Energy Park "		20	20.0
Creekview Specific Plan (MOU #1)	56.88	55.88	47.3
2016 MOU 1 : Amoruso Ranch SP		87.8	69.0
TOTAL:	1418.43	1824.74	2221.0

" Mitigation Rate per 2006 Fee Update estimated at 120 AF, however, it was only included in the surplus volume for 1850 EIR quantified 207 AF Impact. Energy Park estimated 20 AF in PWA/URS Analysis

IMPACTS for 8 day 100-year event

TOTAL DEVELOPMENT AREAS

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	6561.3	615.13
MDR	Medium Density Residential	50	0.14908	872	130.00
HDR	High Density Residential	60	0.20442	526.3	107.58
CC	Community Commercial	70	0.25975	949.3	246.58
PR	Park	5	-0.09991	1188.2	-118.71
P/QP	Public/Quasi Public	50	0.14908	488.7	72.86
ROAD	Roadways	85	0.34275	943.1	323.24
UR	Urban Reserve	2	0.00000	97.2	0.00
OS	Open Space	2	0.00000	1893.3	0.00
LI	Light Industrial	70	0.25975	919.7	238.89
IND	Industrial	70	0.25975	496.3	128.91
RC	Regional Commercial	70	0.25975	192.5	50.03
BP	Business Professional	70	0.25975	173.7	45.12
NC	Neighborhood Commercial	70	0.25975	11.2	2.91
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	73.2	13.40
MDR	Medium Density Residential	50	0.24481	0.5	0.12
HDR	High Density Residential	60	0.30651	14.1	4.32
CC	Community Commercial	70	0.36822	24.1	8.87
PR	Park	5	-0.03235	169.5	-5.57
P/QP	Public/Quasi Public	50	0.24481	4.9	1.20
ROAD	Roadways	85	0.46077	18.3	8.43
UR	Urban Reserve	2	0.00000	2.5	0.00
OS	Open Space	2	0.00000	250.9	0.00
LI	Light Industrial	70	0.36822	7.4	2.72
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	2.4	0.86
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	12.9	2.59
MDR	Medium Density Residential	50	0.26999	19.7	5.32
HDR	High Density Residential	60	0.33939	7.9	2.68
CC	Community Commercial	70	0.40880	0.6	0.25
PR	Park	5	-0.04235	51.2	-2.59
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	5.4	2.77
UR	Urban Reserve	2	0.00000	0.3	0.00
OS	Open Space	2	0.00000	108.5	0.00
LI	Light Industrial	70	0.40880	0.5	0.20
IND	Industrial	70	0.40880	32.5	13.29
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	1901.44

LAND USE TYPE	LAND USE DESCRIPTION	2006 Study % IMP	Current Study % IMP	Change % IMP	2006 Study inf rate (in/hr)	Current Study inf rate (in/hr)	Change inf rate (in/hr)	2006 Study impact rate (af/ac)	Current Study impact rate (af/ac)	Change impact rate (af/ac)
TYPE D SOILS										
LDR	Low Density Residential	40	40	0	0.12	0.12	0	0.072	0.094	0.0218
MDR	Medium Density Residential	50	50	0	0.12	0.12	0	0.126	0.149	0.0231
HDR	High Density Residential	65	60	-5	0.12	0.12	0	0.206	0.204	-0.0016
CC	Community Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
PR	Park	5	5	0	0.12	0.12	0	-0.115	-0.100	0.0151
P/Q/P	Public/Quasi Public	50	50	0	0.12	0.12	0	0.126	0.149	0.0231
ROAD	Roadways	85	85	0	0.12	0.12	0	0.313	0.343	0.0297
UR	Urban Reserve	5	2	-3	0.07	0.07	0	0	0	0
OS	Open Space	5	2	-3	0.07	0.07	0	0	0	0
LI	Light Industrial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
IND	Industrial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
RC	Regional Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
BP	Business Professional	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
NC	Neighborhood Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
TS	Transportation	70	70	0	0.08	0.12	0.04	0.26	0.260	-0.0003
TYPE C SOILS										
LDR	Low Density Residential	40	40	0	0.16	0.16	0	0.091	0.183	0.0921
MDR	Medium Density Residential	50	50	0	0.16	0.16	0	0.15	0.245	0.0948
HDR	High Density Residential	65	60	-5	0.16	0.16	0	0.239	0.307	0.0676
CC	Community Commercial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
PR	Park	5	5	0	0.16	0.16	0	-0.116	-0.033	0.0832
P/Q/P	Public/Quasi Public	50	50	0	0.16	0.16	0	0.15	0.245	0.0948
ROAD	Roadways	85	85	0	0.16	0.16	0	0.368	0.461	0.1028
UR	Urban Reserve	5	2	-3	0.09	0.12	0.03	0	0	0
OS	Open Space	5	2	-3	0.09	0.12	0.03	0	0	0
LI	Light Industrial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
IND	Industrial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
RC	Regional Commercial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
BP	Business Professional	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
NC	Neighborhood Commercial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
TS	Transportation	70	70	0	0.11	0.16	0.05	0.282	0.368	0.0782
TYPE A & B SOILS										
LDR	Low Density Residential	40	40	0	0.25	0.25	0	0.156	0.201	0.0346
MDR	Medium Density Residential	50	50	0	0.25	0.25	0	0.232	0.270	0.0380
HDR	High Density Residential	65	60	-5	0.25	0.25	0	0.331	0.330	0.0001
CC	Community Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
PR	Park	5	5	0	0.25	0.25	0	-0.054	-0.042	0.0117
P/Q/P	Public/Quasi Public	50	50	0	0.25	0.25	0	0.232	0.270	0.0380
ROAD	Roadways	85	85	0	0.25	0.25	0	0.461	0.513	0.0489
UR	Urban Reserve	5	2	-3	0.16	0.16	0	0	0	0
OS	Open Space	5	2	-3	0.16	0.16	0	0	0	0
LI	Light Industrial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
IND	Industrial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
RC	Regional Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
BP	Business Professional	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
NC	Neighborhood Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
TS	Transportation	70	70	0	0.17	0.25	0.08	0.382	0.409	0.0268

IMPACTS for 8 day 100-year event

DEL WEBB

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	648.5	60.80
MDR	Medium Density Residential	50	0.14908	0	0.00
HDR	High Density Residential	60	0.20442	4	0.82
CC	Community Commercial	70	0.25975	12.7	3.30
PR	Park	5	-0.09991	283.8	-28.35
P/QP	Public/Quasi Public	50	0.14908	3.9	0.58
ROAD	Roadways	85	0.34275	58	19.88
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	82	0.00
LI	Light Industrial	70	0.25975	0	0.00
IND	Industrial	70	0.25975	0	0.00
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	0	0.00
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	6.2	1.14
MDR	Medium Density Residential	50	0.24481	0	0.00
HDR	High Density Residential	60	0.30651	0	0.00
CC	Community Commercial	70	0.36822	0	0.00
PR	Park	5	-0.03285	47	-1.54
P/QP	Public/Quasi Public	50	0.24481	0.6	0.15
ROAD	Roadways	85	0.46077	4.5	2.07
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	15.7	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	0	0.00
MDR	Medium Density Residential	50	0.26999	0	0.00
HDR	High Density Residential	60	0.33939	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	47	-1.99
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	1.1	0.56
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	57.41

IMPACTS for 8 day 100-year event

NORTH CENTRAL

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	523.3	49.06
MDR	Medium Density Residential	50	0.14908	46.6	6.95
HDR	High Density Residential	60	0.20442	82.5	16.86
CC	Community Commercial	70	0.25975	162.4	42.18
PR	Park	5	-0.09991	94	-9.39
P/QP	Public/Quasi Public	50	0.14908	46.6	6.95
ROAD	Roadways	85	0.34275	121	41.47
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	166.1	0.00
LI	Light Industrial	70	0.25975	67.8	17.61
IND	Industrial	70	0.25975	0.8	0.21
RC	Regional Commercial	70	0.25975	192.6	50.03
BP	Business Professional	70	0.25975	159.4	41.40
NC	Neighborhood Commercial	70	0.25975	2.3	0.60
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	11.5	2.11
MDR	Medium Density Residential	50	0.24481	0	0.00
HDR	High Density Residential	60	0.30651	0.5	0.15
CC	Community Commercial	70	0.36822	11.1	4.09
PR	Park	5	-0.03285	0	0.00
P/QP	Public/Quasi Public	50	0.24481	3.8	0.88
ROAD	Roadways	85	0.46077	0.8	0.37
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	48.4	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	2.2	0.81
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	0	0.00
MDR	Medium Density Residential	50	0.26999	0	0.00
HDR	High Density Residential	60	0.33939	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	0	0.00
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	272.34

IMPACTS for 8 day 100-year event

NORTHWEST ROSEVILLE

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	1480.6	138.81
MDR	Medium Density Residential	50	0.14908	122.3	18.23
HDR	High Density Residential	60	0.20442	78.9	16.13
CC	Community Commercial	70	0.25975	110.3	28.65
PR	Park	5	-0.09991	326.3	-32.60
P/QP	Public/Quasi Public	50	0.14908	79.4	11.84
ROAD	Roadways	85	0.34275	153.0	52.71
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	177.8	0.00
LI	Light Industrial	70	0.25975	0	0.00
IND	Industrial	70	0.25975	0	0.00
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	8.8	2.29
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	5.2	0.95
MDR	Medium Density Residential	50	0.24481	0.1	0.02
HDR	High Density Residential	60	0.30651	4.1	1.26
CC	Community Commercial	70	0.36822	1.8	0.66
PR	Park	5	-0.03205	20.8	-0.68
P/QP	Public/Quasi Public	50	0.24481	0	0.00
ROAD	Roadways	85	0.46077	3	1.38
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	28.7	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0.2	0.07
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	0	0.00
MDR	Medium Density Residential	50	0.26999	0	0.00
HDR	High Density Residential	60	0.33939	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	0	0.00
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51281	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0.2	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	239.73

IMPACTS for 8 day 100-year event

NORTH INDUSTRIAL

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	201.7	18.91
MDR	Medium Density Residential	50	0.14908	80.4	11.99
HDR	High Density Residential	60	0.20442	21.8	4.46
CC	Community Commercial	70	0.25975	60.2	15.64
PR	Park	5	-0.09991	51.3	-5.13
P/QP	Public/Quasi Public	50	0.14908	8.5	1.27
ROAD	Roadways	85	0.34275	91.7	31.43
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	117.6	0.00
LI	Light Industrial	70	0.25975	796.8	206.97
IND	Industrial	70	0.25975	462.6	120.16
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	5.4	1.40
NC	Neighborhood Commercial	70	0.25975	8.9	2.31
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	0	0.00
MDR	Medium Density Residential	50	0.24481	0	0.00
HDR	High Density Residential	60	0.30651	0	0.00
CC	Community Commercial	70	0.36822	0	0.00
PR	Park	5	-0.03285	1.5	-0.05
P/QP	Public/Quasi Public	50	0.24481	0.2	0.05
ROAD	Roadways	85	0.46077	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	28.2	0.00
LI	Light Industrial	70	0.36822	7.4	2.72
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	2.8	0.56
MDR	Medium Density Residential	50	0.26999	0	0.00
HDR	High Density Residential	60	0.33939	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	0	0.00
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	2	1.03
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	28.4	0.00
LI	Light Industrial	70	0.40880	0.5	0.20
IND	Industrial	70	0.40880	32.5	13.29
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	427.21

IMPACTS for 8 day 100-year event

NORTH ROSEVILLE

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	802.8	75.26
MDR	Medium Density Residential	50	0.14908	63.2	9.42
HDR	High Density Residential	60	0.20442	42.8	8.75
CC	Community Commercial	70	0.25975	80.4	20.88
PR	Park	5	-0.09991	97.9	-9.78
P/QP	Public/Quasi Public	50	0.14908	55.1	8.21
ROAD	Roadways	85	0.34275	104.2	35.71
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	118.5	0.00
LI	Light Industrial	70	0.25975	0	0.00
IND	Industrial	70	0.25975	0	0.00
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	0	0.00
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.16311	6.6	1.21
MDR	Medium Density Residential	50	0.24481	0	0.00
HDR	High Density Residential	60	0.30651	0	0.00
CC	Community Commercial	70	0.36822	1.4	0.52
PR	Park	5	-0.03265	2.9	-0.10
P/QP	Public/Quasi Public	50	0.24481	0.2	0.05
ROAD	Roadways	85	0.46077	1.4	0.65
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	60.5	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	6.8	1.36
MDR	Medium Density Residential	50	0.26999	0	0.00
HDR	High Density Residential	60	0.33339	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	13.3	-0.56
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	0.9	0.41
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	10	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	152.00

IMPACTS for 8 day 100-year event

HIGHLAND RESERVE

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	248.8	23.33
MDR	Medium Density Residential	50	0.14908	0	0.00
HDR	High Density Residential	60	0.20442	45.5	9.30
CC	Community Commercial	70	0.25975	162.5	42.21
PR	Park	5	-0.09991	37.2	-3.72
P/QP	Public/Quasi Public	50	0.14908	48.5	7.23
ROAD	Roadways	85	0.34275	44.3	15.18
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	36.7	0.00
LI	Light Industrial	70	0.25975	0	0.00
IND	Industrial	70	0.25975	0	0.00
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	0	0.00
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	0	0.00
MDR	Medium Density Residential	50	0.24481	0	0.00
HDR	High Density Residential	60	0.30651	0	0.00
CC	Community Commercial	70	0.36822	0	0.00
PR	Park	5	-0.03285	0	0.00
P/QP	Public/Quasi Public	50	0.24481	0	0.00
ROAD	Roadways	85	0.46977	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0.5	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	0	0.00
MDR	Medium Density Residential	50	0.26999	0	0.00
HDR	High Density Residential	60	0.33939	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	0	0.00
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL =	93.53

IMPACTS for 8 day 100-year event

SIERRA VISTA

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	705.9	66.18
MDR	Medium Density Residential	50	0.14908	322.4	48.06
HDR	High Density Residential	60	0.20442	93.4	19.09
CC	Community Commercial	70	0.25975	237.4	61.66
PR	Park	5	-0.09991	105.1	-10.50
P/QP	Public/Quasi Public	50	0.14908	71.7	10.69
ROAD	Roadways	85	0.34275	157.7	54.05
UR	Urban Reserve	2	0.00000	40.1	0.00
OS	Open Space	2	0.00000	317.4	0.00
LI	Light Industrial	70	0.25975	0	0.00
IND	Industrial	70	0.25975	0	0.00
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	0	0.00
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	0	0.00
MDR	Medium Density Residential	50	0.24481	0	0.00
HDR	High Density Residential	60	0.30651	0	0.00
CC	Community Commercial	70	0.36822	0	0.00
PR	Park	5	-0.03285	0	0.00
P/QP	Public/Quasi Public	50	0.24481	0	0.00
ROAD	Roadways	85	0.48077	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	0	0.00
MDR	Medium Density Residential	50	0.26999	0	0.00
HDR	High Density Residential	60	0.33939	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	0	0.00
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	249.24

IMPACTS for 8 day 100-year event

Creekview

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	157.6	14.78
MDR	Medium Density Residential	50	0.14908	58.7	8.75
HDR	High Density Residential	60	0.20442	18.8	3.84
CC	Community Commercial	70	0.25975	19.1	4.96
PR	Park	5	-0.09991	16	-1.60
P/QP	Public/Quasi Public	50	0.14908	10.1	1.51
ROAD	Roadways	85	0.34275	32.8	11.24
UR	Urban Reserve	2	0.00000	37.2	0.00
OS	Open Space	2	0.00000	95	0.00
LI	Light Industrial	70	0.25975	0	0.00
IND	Industrial	70	0.25975	0	0.00
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	0	0.00
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	0.6	0.11
MDR	Medium Density Residential	50	0.24481	0.4	0.10
HDR	High Density Residential	60	0.30651	0	0.00
CC	Community Commercial	70	0.36822	0	0.00
PR	Park	5	-0.03285	0	0.00
P/QP	Public/Quasi Public	50	0.24481	0	0.00
ROAD	Roadways	85	0.46077	0.9	0.41
UR	Urban Reserve	2	0.00000	2.6	0.00
OS	Open Space	2	0.00000	26.3	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	1.8	0.36
MDR	Medium Density Residential	50	0.26999	9.7	2.62
HDR	High Density Residential	60	0.33939	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	0	0.00
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	0.5	0.26
UR	Urban Reserve	2	0.00000	0.3	0.00
OS	Open Space	2	0.00000	15.7	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	47.34

IMPACTS for 8 day 100-year event

WEST ROSEVILLE

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	1548.6	145.18
MDR	Medium Density Residential	50	0.14908	120	17.89
HDR	High Density Residential	60	0.20442	100.3	20.50
CC	Community Commercial	70	0.25975	52.8	13.71
PR	Park	5	-0.09991	153.7	-15.36
P/QP	Public/Quasi Public	50	0.14908	147.6	22.00
ROAD	Roadways	85	0.34275	133.2	45.85
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	637.2	0.00
LI	Light Industrial	70	0.25975	55.1	14.31
IND	Industrial	70	0.25975	32.9	8.55
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	0.1	0.03
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	43.1	7.89
MDR	Medium Density Residential	50	0.24481	0	0.00
HDR	High Density Residential	60	0.30651	9.5	2.91
CC	Community Commercial	70	0.36822	9.6	3.61
PR	Park	5	-0.03285	97.4	-3.20
P/QP	Public/Quasi Public	50	0.24481	0.3	0.03
ROAD	Roadways	85	0.46077	7.7	3.55
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	44.6	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20053	1.5	0.30
MDR	Medium Density Residential	50	0.26999	10	2.70
HDR	High Density Residential	60	0.33939	7.9	2.68
CC	Community Commercial	70	0.40880	0.6	0.25
PR	Park	5	-0.04235	0.9	-0.04
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	1	0.51
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	54.2	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	293.71

IMPACTS for 8 day 100-year event

AMORUSO RANCH

LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.09375	243.5	22.83
MDR	Medium Density Residential	50	0.14908	58.4	8.71
HDR	High Density Residential	60	0.20442	38.3	7.83
CC	Community Commercial	70	0.25975	51.5	13.38
PR	Park	5	-0.09991	22.9	-2.29
P/QP	Public/Quasi Public	50	0.14908	17.3	2.58
ROAD	Roadways	85	0.34275	46.5	15.94
UR	Urban Reserve	2	0.00000	19.9	0.00
OS	Open Space	2	0.00000	145	0.00
LI	Light Industrial	70	0.25975	0	0.00
IND	Industrial	70	0.25975	0	0.00
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	0	0.00
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.18311	0	0.00
MDR	Medium Density Residential	50	0.24481	0	0.00
HDR	High Density Residential	60	0.30651	0	0.00
CC	Community Commercial	70	0.36822	0	0.00
PR	Park	5	-0.03285	0	0.00
P/QP	Public/Quasi Public	50	0.24481	0	0.00
ROAD	Roadways	85	0.46077	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	0	0.00
MDR	Medium Density Residential	50	0.26999	0	0.00
HDR	High Density Residential	60	0.33939	0	0.00
CC	Community Commercial	70	0.40880	0	0.00
PR	Park	5	-0.04235	0	0.00
P/QP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51281	0	0.00
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	0	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
				TOTAL=	68.97

APPENDIX C

TECHNICAL MEMORANDUM ON PROJECT ALTERNATIVES AND IMPACT ANALYSIS CHANGES



**CIVIL ENGINEERING
SOLUTIONS, INC.**

590 E Street
Lincoln Ca. 95648
916.645-5700
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Technical Memorandum

To: City of Roseville
Attn: Chris Kraft
Date: April 20, 2017
Regarding: Discussion of Impact Changes 2006 to Current Study

Dear Chris;

This memorandum will summarize the changes in computed impacts from the 2006 Fee study to the Current Study.

Table 1 below summarizes the Impact Quantities for each impact source stated in previous studies, and currently computed

TABLE 1 – Comparison of Impact Quantities by Source

Development Area	2006 Fee Study Included Volumes	Stated Volume Impacts From Previous Studies (AF)	Current Study Revised Volume Impact (AF)
Del Webb SP	25.56	25.56	57.41
North Central Roseville SP	244.91	244.91	272.3
Northwest Roseville SP	194.61	194.61	239.7
North Area Industrial	367.66	367.66	437.9
North Roseville SP	123.49	123.4	141.3
Highland Reserve North	72.7	72.7	93.5
West Roseville SP	207.21	207.21	293.7
Infill Areas		92.6	92.6
Sierra Vista SP (2006 MOU #2)	125.41	125.41	249.2
Wastewater Treatment Plant *		207	207.0
Energy Park **		20	20.0
Creekside Specific Plan (MOU #1)	55.88	55.88	47.3
2016 MOU 1 : Amoruso Ranch SP		87.8	69.0
TOTAL :	1418.43	1824.74	2221.0

* Mitigation Rate per 2006 Fee Update estimated at 120 AF, however, it was only included in the surplus volume for 1850 AF. EIR quantified 207 AF Impact. Energy Park estimated 20 AF in PWA/URS Analysis

The 1418 amount used in the 2006 fee update study as a basis for sizing the basin to 1850 acre feet, noted that is expected that the excess capacity would accommodate the then un-finalized estimated impacts for the Infill Areas, Wastewater Treatment Plant, Energy Park and future development areas. At the time the Wastewater treatment plant impact was being estimated at 120 AF but was not included in the impact quantities, except for one of the proposed basis of fee spread which would have given a higher fee to the MOU areas and West Roseville SP.

Knowing what we do today, the real impact quantity estimate for the 2006 update would have been 1824.74 acre feet(AF). The currently estimated computed impacts are 2221 AF. The change in computed impact volumes is a result of a combination of:

1. Additional properties that were undeveloped in 1992 now being captured in the impact analysis and assigned to neighboring specific plan areas.
2. Changes in the underlying soils classifications of the developing properties to a more permeable classification which increases the rate of impact. Latest NRCS soils mapping is included in current study.
3. Changes in the assumed values for infiltration rate and impervious fraction for some development types.
4. A refinement to the Water Balance calculations for establishment of impact rates for the various parameters.

Tables 3 thru 11 at the end of this document summarize the differences in the land use basis assumptions for each hydrologic soils group, comparing the 2006 land use assumptions to the Current Study land use assumptions, for each specific plan area. Exhibit PG-1 shows the land areas included in each of the specific plan areas. Exhibit PG-2 shows the development land use assumptions utilized in the analysis, for all properties that were considered undeveloped at the time the fee was established. Exhibit PG-5 shows the underlying hydrologic soils group for the same developing properties. Please let us know if you feel any revisions are needed for any of these areas.

Item 1) For the current study, CESI performed an analysis looking at a 1992 Google images aerial to determine what properties were developed vs, undeveloped within the Pleasant Grove/Curry Creek watershed and within the City of Roseville. We excluded the SR-65 and Interstate 80 Freeway corridors from this analysis. We found a number of properties adjacent to the specific plan areas that were not developed in 1992, but the current City land use plan shows a development land use on them. These properties were included in the current study per the City land use plan, and assigned to be included in the adjacent specific plan land use computations. These properties are evident in tables 3 to 11, where an increase in total specific plan area is shown. The Sierra Vista SP land use shows a considerable increase from the 2006 analysis as MOU area #2.

Item 2) Exhibit PG-5 shows the latest hydrologic soils group classifications for the Impact Fee planned development properties. It is noted that some previously classified Type D soils have been re-classified as Type C soils. We continue to assign Type CD soils as Type D soils in the current analysis. It would also appear that 2006 study also had some land use areas with "assumed" soil types which were not based on spatial analysis with the NRCS base mapping available at that time.

Item 3) Table 2 below compares the Land Use Parameter assumptions and impact rates for each of the hydrologic soils groups for the 2006 Study and the Current Study.

TABLE 2 – Comparison of Assumed Rates 2006 to Current

LAND USE TYPE	LAND USE DESCRIPTION	2006 Study % IMP	Current Study % IMP	Change % IMP	2006 Study inf rate (in/hr)	Current Study inf rate (in/hr)	Change inf rate (in/hr)	2006 Study impact rate (af/ac)	Current Study impact rate (af/ac)	Change impact rate (af/ac)
TYPE D SOILS										
LDR	Low Density Residential	40	40	0	0.12	0.12	0	0.072	0.094	0.0218
MDR	Medium Density Residential	50	50	0	0.12	0.12	0	0.126	0.149	0.0231
HDR	High Density Residential	65	60	-5	0.12	0.12	0	0.206	0.204	-0.0016
CC	Community Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
PR	Park	5	5	0	0.12	0.12	0	-0.115	-0.100	0.0151
P/QP	Public/Quasi Public	50	50	0	0.12	0.12	0	0.126	0.149	0.0231
ROAD	Roadways	85	85	0	0.12	0.12	0	0.313	0.343	0.0297
UR	Urban Reserve	5	2	-3	0.07	0.07	0	0	0	0
OS	Open Space	5	2	-3	0.07	0.07	0	0	0	0
LI	Light Industrial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
IND	Industrial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
RC	Regional Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
BP	Business Professional	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
NC	Neighborhood Commercial	70	70	0	0.12	0.12	0	0.233	0.260	0.0267
TS	Transportation	70	70	0	0.08	0.12	0.04	0.26	0.260	-0.0003
TYPE C SOILS										
LDR	Low Density Residential	40	40	0	0.16	0.16	0	0.091	0.183	0.0921
MDR	Medium Density Residential	50	50	0	0.16	0.16	0	0.15	0.245	0.0948
HDR	High Density Residential	65	60	-5	0.16	0.16	0	0.239	0.307	0.0675
CC	Community Commercial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
PR	Park	5	5	0	0.16	0.16	0	-0.116	-0.033	0.0832
P/QP	Public/Quasi Public	50	50	0	0.16	0.16	0	0.15	0.245	0.0948
ROAD	Roadways	85	85	0	0.16	0.16	0	0.358	0.451	0.1028
UR	Urban Reserve	5	2	-3	0.09	0.12	0.03	0	0	0
OS	Open Space	5	2	-3	0.09	0.12	0.03	0	0	0
LI	Light Industrial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
IND	Industrial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
RC	Regional Commercial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
BP	Business Professional	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
NC	Neighborhood Commercial	70	70	0	0.16	0.16	0	0.269	0.368	0.0992
TS	Transportation	70	70	0	0.11	0.16	0.05	0.292	0.368	0.0762
TYPE A & B SOILS										
LDR	Low Density Residential	40	40	0	0.25	0.25	0	0.166	0.261	0.0946
MDR	Medium Density Residential	50	50	0	0.25	0.25	0	0.232	0.270	0.0380
HDR	High Density Residential	65	60	-5	0.25	0.25	0	0.331	0.339	0.0084
CC	Community Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
PR	Park	5	5	0	0.25	0.25	0	-0.054	-0.042	0.0117
P/QP	Public/Quasi Public	50	50	0	0.25	0.25	0	0.232	0.270	0.0380
ROAD	Roadways	85	85	0	0.25	0.25	0	0.464	0.513	0.0489
UR	Urban Reserve	5	2	-3	0.16	0.16	0	0	0	0
OS	Open Space	5	2	-3	0.16	0.16	0	0	0	0
LI	Light Industrial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
IND	Industrial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
RC	Regional Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
BP	Business Professional	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
NC	Neighborhood Commercial	70	70	0	0.25	0.25	0	0.364	0.409	0.0448
TS	Transportation	70	70	0	0.17	0.25	0.08	0.382	0.409	0.0268

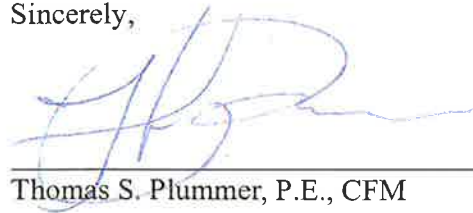
Please let us know if you would like to change any of the parameters used in the updated study. Overall there was very little change in the assumed factors. There was a larger change in the water balance calculations generating an increased runoff volume using the same factors as the previous study.

Item 4) The new water balance analysis is being reviewed separate from this memorandum. The new analysis does show an increase in impact for most land uses, assuming the same parameters as the 2006 study.

Finally, we have reviewed the capabilities of the Southern basin to accommodate the 2221 AF of impact currently computed. As you know, without excavation of storage volumes, the current basin design (PWA/URS) can accommodate 1850 AF of peak storage, assuming flood forecasting to a 7 day advanced interval. The basin volume cannot be increased without performing additional improvements not previously scoped. Excavating the additional storage volume + a little extra to drive additional volumes hydraulically into the basin would be able to increase the storage capacity of the basin above the 2221 acre feet need. The previously provided "Excavated Basin" basis cost estimate (also included here at the end of the document) would accommodate these additional volumes without requiring modification of the bypass channel design. Another alternative would be to construct the northern basin.

Please let us know if there is any additional information you require, please contact me at (916) 645-5700.

Sincerely,

A handwritten signature in blue ink, appearing to read 'T. Plummer', is written over a horizontal line.

Thomas S. Plummer, P.E., CFM

TABLE 7 – Comparison of North Roseville SP Impacts

IMPACTS for 8 day 100-year event						NORTH ROSEVILLE		
LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)	141.27 NRSP NEW	123.4 NRSP OLD Land Use	Difference Land Use
TYPE D SOILS								
LDR	Low Density Residential	40	0.09375	802.8	75.26	802.8	916.7	-113.9
MDR	Medium Density Residential	50	0.14908	63.2	9.42	63.2	92.4	-29.2
HDR	High Density Residential	60	0.20442	42.8	8.75	42.8	37	5.8
CC	Community Commercial	70	0.25975	80.4	20.88	80.4	108.9	-28.5
PR	Park	5	-0.09991	97.9	-9.78	97.9	117.8	-19.9
P/QP	Public/Quasi Public	50	0.14908	55.1	8.21	55.1	69.1	-14
ROAD	Roadways	85	0.34275	104.2	35.71	72.9	78.3	-5.4
UR	Urban Reserve	2	0.00000	0	0.00	0		0
OS	Open Space	2	0.00000	118.5	0.00	118.5	148.9	-30.4
LI	Light Industrial	70	0.25975	0	0.00	0		0
IND	Industrial	70	0.25975	0	0.00	0		0
RC	Regional Commercial	70	0.25975	0	0.00	0		0
BP	Business Professional	70	0.25975	0	0.00	0		0
NC	Neighborhood Commercial	70	0.25975	0	0.00	0		0
TS	Transportation	70	0.25975	0	0.00	0		0
TYPE C SOILS								
LDR	Low Density Residential	40	0.18311	6.6	1.21	6.6		6.6
MDR	Medium Density Residential	50	0.24481	0	0.00	0		0
HDR	High Density Residential	60	0.30651	0	0.00	0		0
CC	Community Commercial	70	0.36822	1.4	0.52	1.4		1.4
PR	Park	5	-0.03285	2.9	-0.10	2.9		2.9
P/QP	Public/Quasi Public	50	0.24481	0.2	0.05	0.2		0.2
ROAD	Roadways	85	0.46077	1.4	0.65	1.4		1.4
UR	Urban Reserve	2	0.00000	0	0.00	0		0
OS	Open Space	2	0.00000	60.5	0.00	60.5		60.5
LI	Light Industrial	70	0.36822	0	0.00	0		0
IND	Industrial	70	0.36822	0	0.00	0		0
RC	Regional Commercial	70	0.36822	0	0.00	0		0
BP	Business Professional	70	0.36822	0	0.00	0		0
NC	Neighborhood Commercial	70	0.36822	0	0.00	0		0
TS	Transportation	70	0.36822	0	0.00	0		0
TYPE A & B SOILS								
LDR	Low Density Residential	40	0.20058	6.8	1.36	6.8		6.8
MDR	Medium Density Residential	50	0.26999	0	0.00	0		0
HDR	High Density Residential	60	0.33939	0	0.00	0		0
CC	Community Commercial	70	0.40880	0	0.00	0		0
PR	Park	5	-0.04235	13.3	-0.56	13.3		13.3
P/QP	Public/Quasi Public	50	0.26999	0	0.00	0		0
ROAD	Roadways	85	0.51291	0.8	0.41	0.8		0.8
UR	Urban Reserve	2	0.00000	0	0.00	0		0
OS	Open Space	2	0.00000	10	0.00	10	35	-25
LI	Light Industrial	70	0.40880	0	0.00	0		0
IND	Industrial	70	0.40880	0	0.00	0		0
RC	Regional Commercial	70	0.40880	0	0.00	0		0
BP	Business Professional	70	0.40880	0	0.00	0		0
NC	Neighborhood Commercial	70	0.40880	0	0.00	0		0
TS	Transportation	70	0.40880	0	0.00	0		0
				TOTAL=	152.00	1437.50	1604.10	-166.60

TABLE 8 – Comparison of Highland Reserve Land Use/Soils

IMPACTS for 8 day 100-year event				HIGHLAND RESERVE		93.53	72.7	
LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)	HRM HR NEW	HRN OLD Land Use	Difference Land Use
TYPE D SOILS								
LDR	Low Density Residential	40	0.09375	248.8	23.33	248.8	248.8	0
MDR	Medium Density Residential	50	0.14908	0	0.00	0	0	0
HDR	High Density Residential	60	0.20442	45.5	9.30	45.5	45.48	0.02
CC	Community Commercial	70	0.25975	162.5	42.21	162.5	162.43	0.07
PR	Park	5	-0.09991	37.2	-3.72	37.2	36.72	0.48
PQP	Public/Quasi Public	50	0.14908	48.5	7.23	48.5	46.4	2.1
ROAD	Roadways	85	0.34275	44.3	15.18	44.3	30.23	14.07
UR	Urban Reserve	2	0.00000	0	0.00	0	0	0
OS	Open Space	2	0.00000	36.7	0.00	36.7	39.87	-3.17
LI	Light Industrial	70	0.25975	0	0.00	0	0	0
IND	Industrial	70	0.25975	0	0.00	0	0	0
RC	Regional Commercial	70	0.25975	0	0.00	0	0	0
BP	Business Professional	70	0.25975	0	0.00	0	0	0
NC	Neighborhood Commercial	70	0.25975	0	0.00	0	0	0
TS	Transportation	70	0.25975	0	0.00	0	0	0
TYPE C SOILS								
LDR	Low Density Residential	40	0.18311	0	0.00	0	0	0
MDR	Medium Density Residential	50	0.24481	0	0.00	0	0	0
HDR	High Density Residential	60	0.30651	0	0.00	0	0	0
CC	Community Commercial	70	0.36822	0	0.00	0	0	0
PR	Park	5	-0.03285	0	0.00	0	0	0
PQP	Public/Quasi Public	50	0.24481	0	0.00	0	0	0
ROAD	Roadways	85	0.46877	0	0.00	0	0	0
UR	Urban Reserve	2	0.00000	0	0.00	0	0	0
OS	Open Space	2	0.00000	0.5	0.00	0.5	0.5	0.5
LI	Light Industrial	70	0.36822	0	0.00	0	0	0
IND	Industrial	70	0.36822	0	0.00	0	0	0
RC	Regional Commercial	70	0.36822	0	0.00	0	0	0
BP	Business Professional	70	0.36822	0	0.00	0	0	0
NC	Neighborhood Commercial	70	0.36822	0	0.00	0	0	0
TS	Transportation	70	0.36822	0	0.00	0	0	0
TYPE A & B SOILS								
LDR	Low Density Residential	40	0.20058	0	0.00	0	0	0
MDR	Medium Density Residential	50	0.26999	0	0.00	0	0	0
HDR	High Density Residential	60	0.33939	0	0.00	0	0	0
CC	Community Commercial	70	0.40880	0	0.00	0	0	0
PR	Park	5	-0.04235	0	0.00	0	0	0
PQP	Public/Quasi Public	50	0.26999	0	0.00	0	0	0
ROAD	Roadways	85	0.51291	0	0.00	0	0	0
UR	Urban Reserve	2	0.00000	0	0.00	0	0	0
OS	Open Space	2	0.00000	0	0.00	0	0	0
LI	Light Industrial	70	0.40880	0	0.00	0	0	0
IND	Industrial	70	0.40880	0	0.00	0	0	0
RC	Regional Commercial	70	0.40880	0	0.00	0	0	0
BP	Business Professional	70	0.40880	0	0.00	0	0	0
NC	Neighborhood Commercial	70	0.40880	0	0.00	0	0	0
TS	Transportation	70	0.40880	0	0.00	0	0	0
				TOTAL=	93.53	624.00	609.93	14.07

TABLE 11 – Comparison of West Roseville SP Land Use/Soils

IMPACTS for 8 day 100-year event

WEST ROSEVILLE

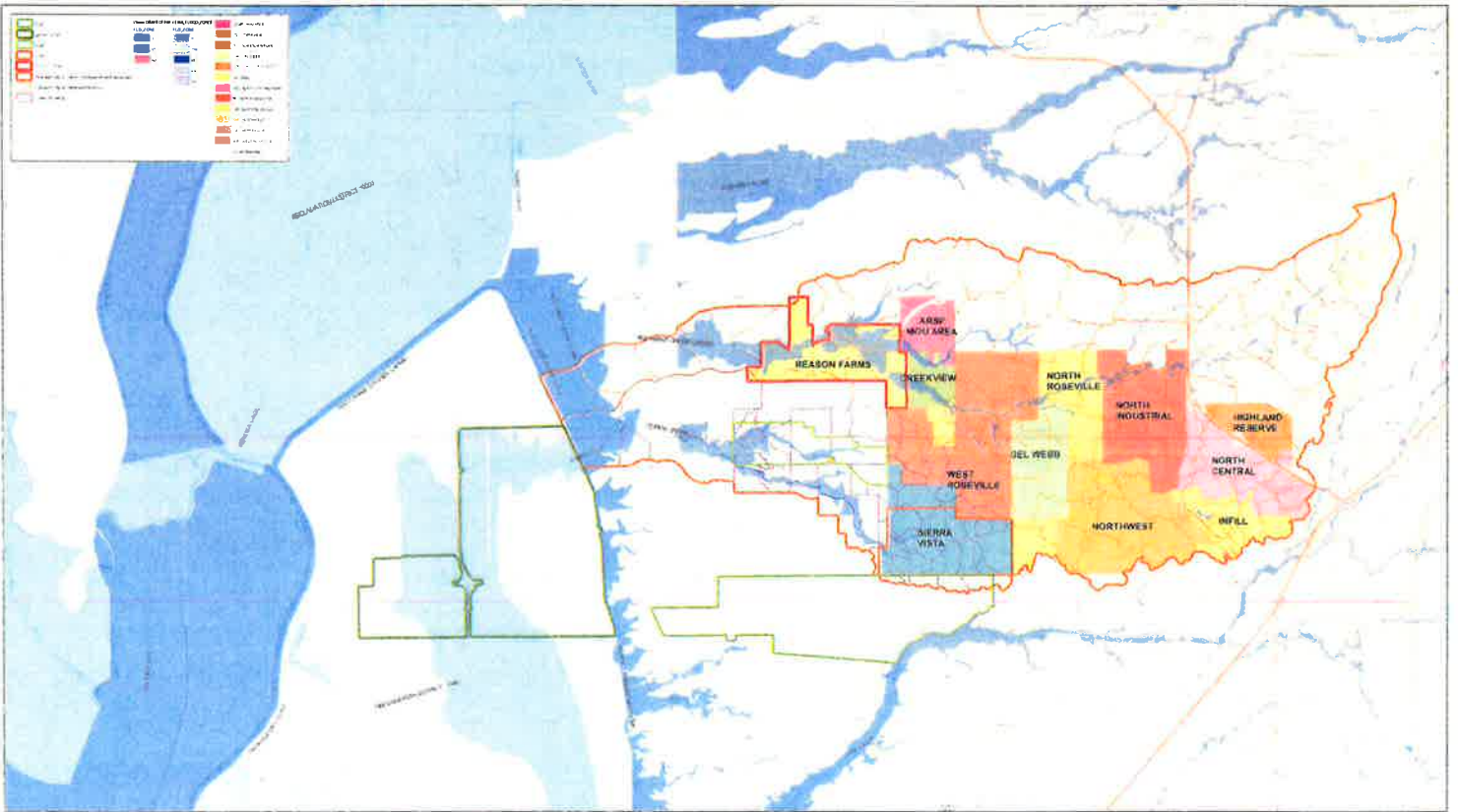
LAND USE TYPE	LAND USE DESCRIPTION	% IMPERVIOUS	IMPACT RATE (AF/ACRE)	LAND USE AREA (ACRE)	LAND USE IMPACT (ACRE FT)
TYPE D SOILS					
LDR	Low Density Residential	40	0.89375	1548.6	145.18
MDR	Medium Density Residential	50	0.14908	120	17.89
HDR	High Density Residential	60	0.20442	100.3	20.50
CC	Community Commercial	70	0.25975	52.8	13.71
PR	Park	5	-0.09991	153.7	-15.35
PIQP	Public/Quasi Public	50	0.14908	147.6	22.00
ROAD	Roadways	85	0.34275	133.2	45.65
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	537.2	0.00
LI	Light Industrial	70	0.25975	55.1	14.31
IND	Industrial	70	0.25975	32.9	8.55
RC	Regional Commercial	70	0.25975	0	0.00
BP	Business Professional	70	0.25975	0.1	0.03
NC	Neighborhood Commercial	70	0.25975	0	0.00
TS	Transportation	70	0.25975	0	0.00
TYPE C SOILS					
LDR	Low Density Residential	40	0.16311	43.1	7.89
MDR	Medium Density Residential	50	0.24461	0	0.00
HDR	High Density Residential	60	0.30551	9.5	2.91
CC	Community Commercial	70	0.36822	9.9	3.61
PR	Park	5	-0.03295	97.4	-3.20
PIQP	Public/Quasi Public	50	0.24461	0.3	0.07
ROAD	Roadways	85	0.45077	7.7	3.55
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	44.5	0.00
LI	Light Industrial	70	0.36822	0	0.00
IND	Industrial	70	0.36822	0	0.00
RC	Regional Commercial	70	0.36822	0	0.00
BP	Business Professional	70	0.36822	0	0.00
NC	Neighborhood Commercial	70	0.36822	0	0.00
TS	Transportation	70	0.36822	0	0.00
TYPE A & B SOILS					
LDR	Low Density Residential	40	0.20058	1.5	0.30
MDR	Medium Density Residential	50	0.26999	10	2.70
HDR	High Density Residential	60	0.33939	7.9	2.68
CC	Community Commercial	70	0.40880	0.6	0.25
PR	Park	5	-0.04235	0.9	-0.04
PIQP	Public/Quasi Public	50	0.26999	0	0.00
ROAD	Roadways	85	0.51291	1	0.51
UR	Urban Reserve	2	0.00000	0	0.00
OS	Open Space	2	0.00000	54.2	0.00
LI	Light Industrial	70	0.40880	0	0.00
IND	Industrial	70	0.40880	0	0.00
RC	Regional Commercial	70	0.40880	0	0.00
BP	Business Professional	70	0.40880	0	0.00
NC	Neighborhood Commercial	70	0.40880	0	0.00
TS	Transportation	70	0.40880	0	0.00
TOTAL=				293.71	

293.71		207.21		Difference
WRSP WR NEW	WRSP OLD Land Use	WRSP OLD Land Use	Difference Land Use	
1548.6	1594.8			-46.2
120	64.2			55.8
100.3	37.4			62.9
52.8	34.8			18
153.7	165			-12.3
147.6	145.6			2
133.2	84.6			48.6
0				0
537.2	534.2			103
55.1	45.9			9.2
32.9	53.8			-20.9
0				0
0.1	19.6			-19.5
0				0
0				0
TYPE C SOILS				
43.1	1.1			42
0				0
9.5				9.5
9.9				9.9
97.4	0.9			96.5
0.3	0.1			0.2
7.7	6.8			0.9
0				0
44.5	57.9			-13.3
0	0.2			-0.2
0				0
0				0
0				0
0				0
0				0
TYPE A & B SOILS				
1.5	49.8			-48.3
10	7.2			2.8
7.9				7.9
0.6	13.7			-13.1
0.9	102.5			-101.7
0	3.2			-3.2
1	22			-21
0				0
54.2	107			-52.8
0				0
0	8.8			-8.8
0				0
0				0
0				0
0				0
TOTAL=		3270.00	3162.00	108.00

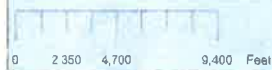
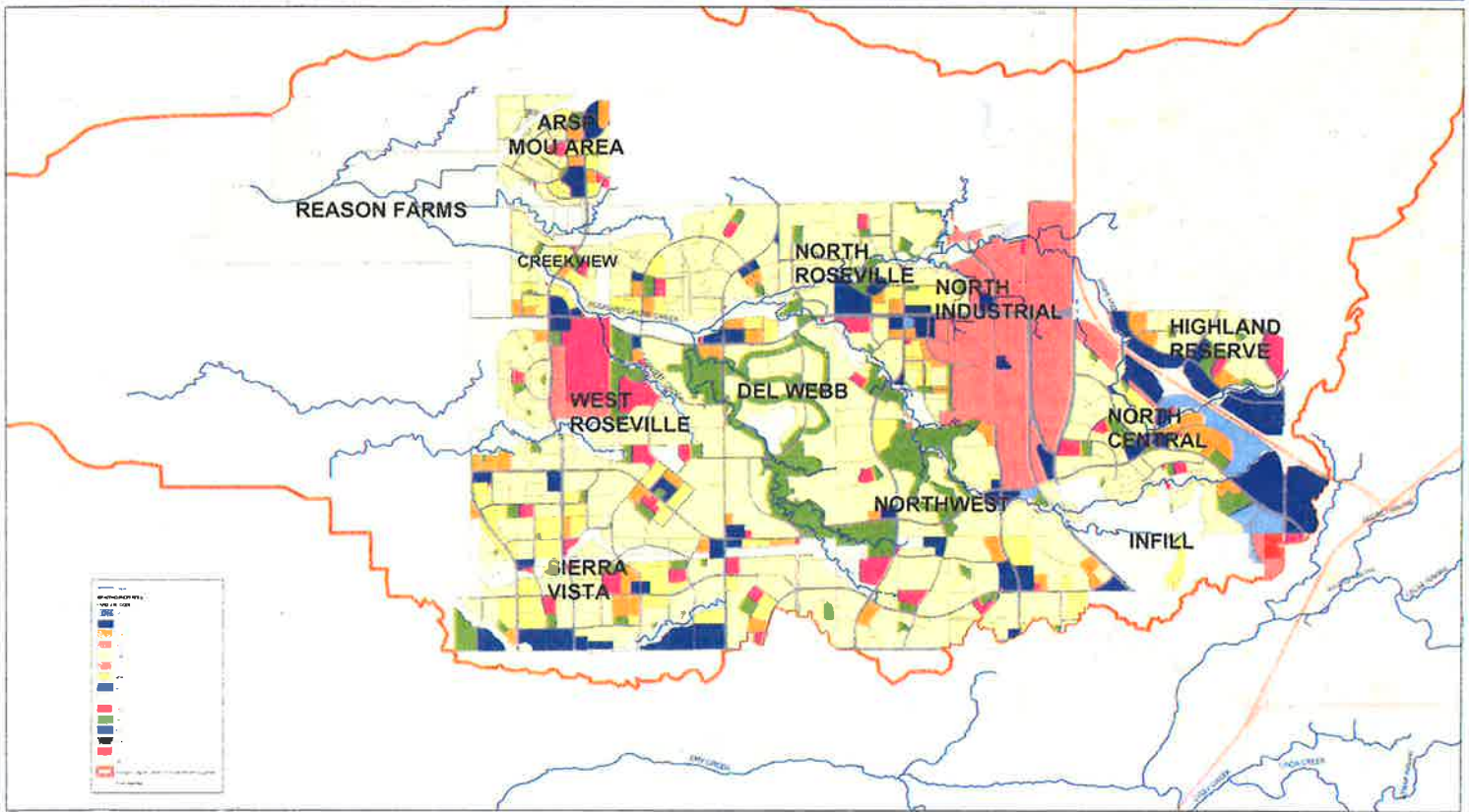
APPENDIX D

OVERSIZED EXHIBITS

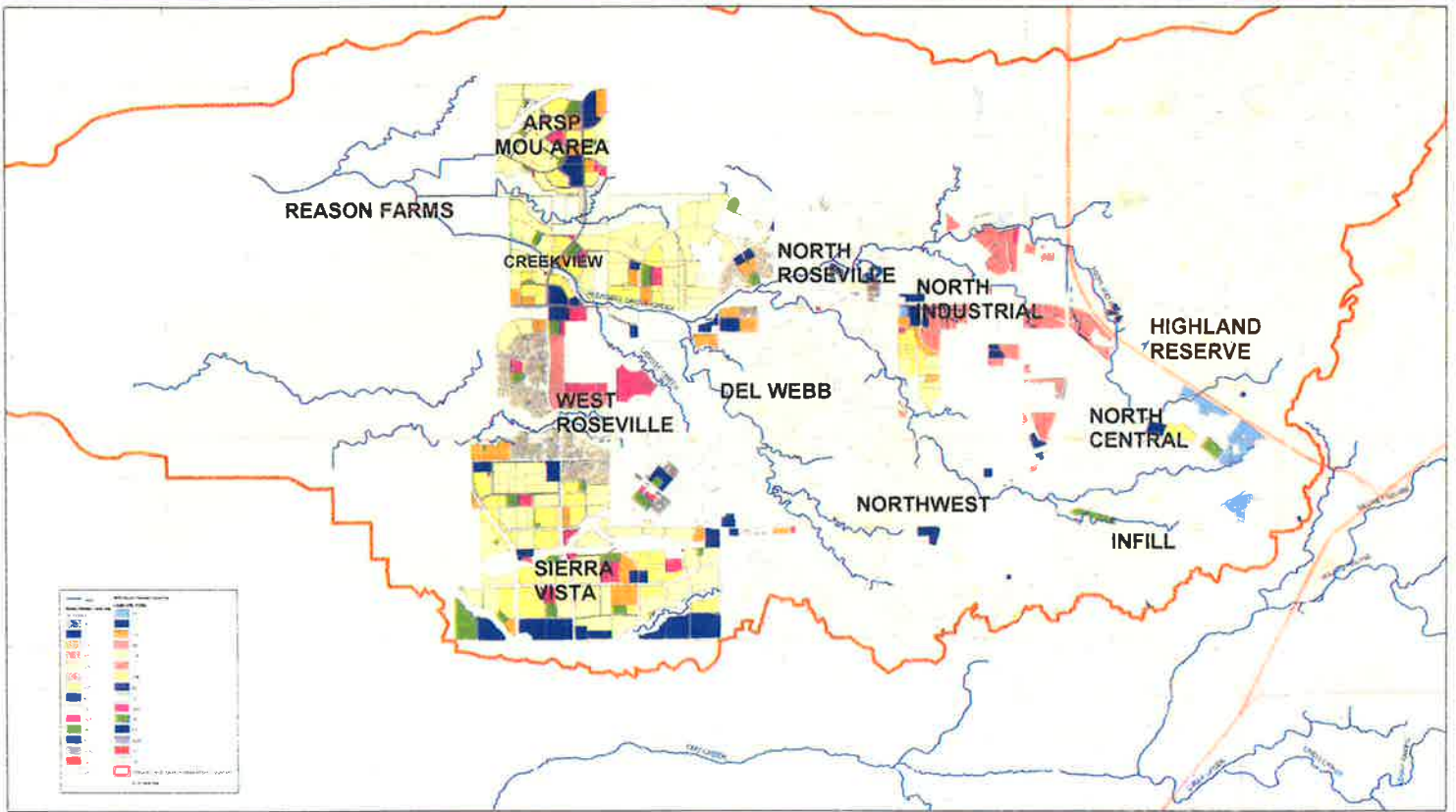
2017 UPDATE TO THE PGWMF



2017 UPDATE TO THE PGWMF



2017 UPDATE TO THE PGWMF



CIVIL ENGINEERING SOLUTIONS, INC.

CITY OF ROSEVILLE



PGWMF - REMAINING DEV CONTRIBUTING TO FEE AS OF AUGUST 2016

PG-4

2017 UPDATE TO THE PGWMF

