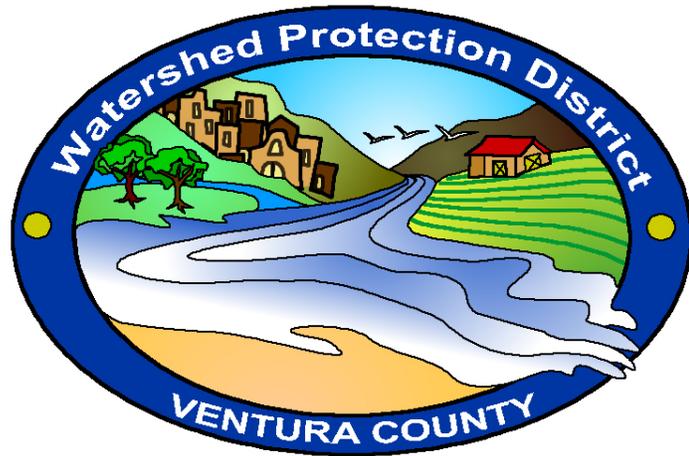


Hydraulic Impact Analysis of the Santa Clara River Floodplain Protection Program

Technical Report



VENTURA COUNTY

WATERSHED PROTECTION DISTRICT

ADVANCE PLANNING SECTION

**Ventura
County
Watershed
Protection
District**

PREPARED BY: YSU

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I. INTRODUCTION

The Santa Clara River watershed as a whole has been relatively pristine in comparison with other large coastal southern California Rivers. However, the rapid growth in population and economic development in the watershed which lies within the counties of Ventura and Los Angeles has raised concerns about the development encroachment into floodplains.

A group of stakeholders from federal, state, and local agencies including The Nature Conservancy (TNC), The Natural Resources Conservation Service (NRCS), Ventura County Farm Bureau, Ventura County Resource Conservation District, and Ventura County Watershed Protection District (VCWPD), to name a few, have worked together to propose a program namely – Santa Clara River Floodplain Protection Program (FPP), to conserve lands containing the highest habitat values in and around the floodplains so that the pristine nature of the watershed can be preserved for generations to come.

The Santa Clara River Floodplain Protection Program has a wide range of implications and long term benefits towards floodplain management, environment, natural habitats protection and restoration, water quality, and groundwater recharge. This technical report is aimed at quantifying the potential benefits of the program from a floodplain management point of view.

II. SANTA CLARA RIVER HDYROLOGY

Using the latest stream gauging information, the VCWPD has updated the peak discharges of the Santa Clara River in a report entitled: "Santa Clara River 2006 Hydrology Update – Phase I". The updated hydrology has been reviewed and accepted by the U.S. Army Corps of Engineers (USACE) Los Angeles District, The Federal Emergency Management Agency (FEMA), and Los Angeles County Flood Control District, and has been applied to the Santa Clara River Flood Insurance Re-Study (FIS) conducted by FEMA. The summary of the updated hydrology is listed below:

Table 1: Summary of Santa Clara River Hydrology

Summary of the Updated Hydrology							Unit: CFS	
Santa Clara River	Return Period							
	2-yr	5-yr	10-yr	20-yr	50-yr	100-yr	200-yr	500-yr
At Co. Line	2,490	8,420	15,700	26,100	45,900	66,600	93,300	140,000
At Fillmore	4,100	13,700	25,600	42,500	74,700	108,400	151,900	227,900
At Sespe Crk	12,500	41,000	71,200	108,600	168,200	221,000	279,700	364,800
At Montalvo	12,800	41,900	72,800	111,000	172,000	226,000	286,000	373,000

This report uses the updated hydrology to conduct a hydraulic analysis.

III. HYDRAULIC ANALYSIS

This report uses the Santa Clara River HEC-RAS model documented in the August 2009 Flood Insurance Study TSDN (Technical Support Data Notebook) prepared by FEMA as a basis for the hydraulic analysis.

The hydraulic analysis is conducted for the following two scenarios:

- The existing conditions, also called the “With Project” condition:

The “With Project” condition assumes all lands in the existing 500-year floodplain would be protected and preserved for land uses existing today. Therefore, there would be no development or encroachment in the floodplains. FEMA HEC-RAS model developed for the FIS study is used for this condition.

- The baseline conditions, also called the “Without Projects” condition:

This modeling condition assumes no lands in the existing 500-year floodplain would be protected and preserved under the floodplain protection program. As a result, it is assumed that approximately 80% of the lands located within the 500-year floodplain of the Santa Clara River (E.J. Remson, Oct. 25, 2010 conference call) would be developed at some points in the future. These developments would be protected with levees built along the Santa Clara River to prevent flooding.

When levees are coded into the HEC-RAS model, the following practices have been applied:

- If an interested parcel is located completely within the Santa Clara River Floodway as defined by the FEMA flood insurance re-study, then there are no levees assumed.
- If an interested parcel is located partially within the Santa Clara River Floodway, levees would be assumed along river banks or floodway boundary lines.
- If an interested parcel is located within the 100-year floodplain, levees would be assumed along the river banks or floodway boundary lines.

In each of these two modeling scenario, three flood profiles namely 50-year, 100-year, and 500-year are modeled.

IV. MODELING RESULTS AND DICUSSIONS

- **Water Surface Elevations**

A comparison of water surface elevations of the modeling scenarios is listed in Table 2. From the table, we can see that if the river is constrained already by levees or other structures (man-made or natural) on one side of the river, adding levees on the other side of the river would have the most adverse impact in terms of water surface elevations. This is demonstrated at the river section from Victoria Avenue to the UPRR Bridge (river station RS15406 to RS24174) where adding levees on the northern side of the river may raise the 100-year and 500-year water surface elevations as high as 3.39 and 6.89 feet, respectively. On the other hand, if the river has an open floodplain, such as the section from Harbor Blvd. to Victoria Avenue (RS3014 to RS15406), adding levees on the northern side would not raise the water surface elevations as much.

- **Total Storage Volumes**

Table 3 shows the comparison of the total storage volumes which include storages of channel and floodplain of Santa Clara River within Ventura County for the two modeling scenarios. Under existing conditions (“With Project”) the total volume is 66,858 acre-feet (AF). For the “Without Project” scenario, it is 58,053 AF. That is 8,805 AF less compared with the “With Project” condition, or a 13.2% reduction.

The reduction of channel and floodplain storage volume due to the assumed future levee construction may have a potential impact on flood routing. As a result, the peak discharges under the “Without Project” conditions may be

higher than those under existing conditions. However, this HEC-RAS hydraulic model is incapable of quantifying the impact. A hydrologic model such as a HSPF or HEC-HMS is needed to reasonably assess the impact.

The hydrologic impacts of future developments (turning today’s agriculture and open space lands into urban areas) together with the loss of floodplain storage volumes may result in higher flood damages than those estimated in this report.

Table 2: Comparison of Water Surface Elevations of the Modeling Scenarios

River Sta	Min Ch El (ft)	50-yr Water Surface Elevations		100-yr Water Surface Elevations		500-yr Water Surface Elevations		Differences		
		With Project	Without Project	With Project	Without Project	With Project	Without Project	50-Year	100-Year	500-Year
				(ft)	(ft)	(ft)	(ft)		(ft)	ft
210036	838.52	845	845	846.44	846.44	851.17	851.17	0	0	0
209761	836.45	843.61	843.61	845.25	845.25	850.37	850.37	0	0	0
209637	835.71	843.18	843.18	844.95	844.95	850.33	850.33	0	0	0
208766	831.04	838.5	838.5	839.66	839.66	842.92	842.92	0	0	0
208119	827.75	835.09	835.09	836.42	836.42	839.1	839.1	0	0	0
207726	826.02	832.61	832.61	833.28	833.28	836	836	0	0	0
204958	810.91	819.26	819.26	822.91	822.91	830.38	830.38	0	0	0
204269	806.84	818.95	818.95	822.66	822.66	829.91	829.91	0	0	0
203330	801.75	813.64	813.64	817.29	817.29	823.1	823.1	0	0	0
202257	794.7	803.06	803.06	804.48	804.48	808.51	808.51	0	0	0
201236	787.2	799.11	799.11	800.77	800.77	805.6	805.6	0	0	0
200095	779.95	794.19	794.19	795.9	795.9	803.19	803.19	0	0	0
198770	772.46	784.87	784.87	787.48	787.48	793.32	793.32	0	0	0
196662	761.27	776.01	776.01	777.76	777.76	781.53	781.53	0	0	0
193817	746.54	756.5	756.5	758.58	758.58	763.6	763.6	0	0	0
193629	745.12	754.09	754.09	755.97	755.97	760.56	760.56	0	0	0
192767	739.12	749.14	749.14	751.26	751.26	756.64	756.64	0	0	0
191396	732.86	741.7	741.7	743.56	743.56	748.93	748.93	0	0	0
189592	722.97	735.77	735.77	738.74	738.74	745.8	745.8	0	0	0
189136	720.56	733.8	733.8	736.42	736.42	740.41	740.41	0	0	0
189115 NewHall	Bridge							0	0	0
189084	720.1	730.76	730.76	733.02	733.02	739.98	739.98	0	0	0
188028	715.48	725.22	725.22	727.09	727.09	732.22	732.22	0	0	0
187235	712.09	719.86	719.86	721.57	721.57	726.93	726.93	0	0	0
186276	707.17	713.91	713.91	715.01	715.01	718.23	718.22	0	0	-0.01
183682	693.64	699.05	699.05	700.13	700.13	702.56	702.56	0	0	0
181262	679.03	683.98	683.98	684.51	684.5	686.27	686.27	0	-0.01	0

180132	672	677.07	677.07	677.93	677.93	679.83	679.83	0	0	0
178251	660.93	665.45	665.45	665.94	665.94	667.68	667.68	0	0	0
176080	647.42	652.31	652.31	653.36	653.36	656.24	656.24	0	0	0
173417	629.71	638.23	638.23	639.38	639.38	642.35	642.35	0	0	0
171940	623.03	630.68	630.68	632.29	632.29	636.54	636.54	0	0	0
170917	618.69	628.74	628.75	630.28	630.29	634.12	634.12	0.01	0.01	0
170439	617.12	628.39	628.4	629.87	629.88	633.56	633.56	0.01	0.01	0
170342 Torr	Culvert							0	0	0
170241	616.09	623.1	623.52	624.51	625.26	627.96	630.95	0.42	0.75	2.99
169166	609.76	617.05	617.14	618.39	618.56	621.65	622.11	0.09	0.17	0.46
168073	604.14	610.82	610.84	612.13	612.13	615.8	615.5	0.02	0	-0.3
167006	598.24	605.32	605.29	606.54	606.56	609.38	609.71	-0.03	0.02	0.33
164728	586.41	591.87	591.94	592.85	592.92	595.72	595.92	0.07	0.07	0.2
162851	575.97	581.91	581.86	582.91	582.92	585.16	585.43	-0.05	0.01	0.27
159920	559.72	565.63	565.7	566.64	566.67	570.04	569.81	0.07	0.03	-0.23
158449	551.98	558.36	558.25	559.89	559.83	563.64	564.69	-0.11	-0.06	1.05
156996	543.69	550.8	551.16	551.95	552.37	555.46	555.38	0.36	0.42	-0.08
155099	533.48	540.82	540.89	541.89	542.22	544.06	546.01	0.07	0.33	1.95
153814	527.11	533.42	533.54	534.58	534.77	537.8	538.4	0.12	0.19	0.6
152211	519.08	526.07	525.97	527.39	527.45	530.4	531.27	-0.1	0.06	0.87
150650	510.63	516.63	516.86	517.57	517.74	520.44	520.63	0.23	0.17	0.19
148547	498.9	505.53	505.5	506.97	506.92	510.73	511.14	-0.03	-0.05	0.41
146490	488.37	495.45	495.77	496.27	496.84	498.96	499.38	0.32	0.57	0.42
145337	482.25	489.52	489.94	490.38	490.91	492.62	493.49	0.42	0.53	0.87
143450	473.45	479.88	479.82	481.08	481.07	483.86	484	-0.06	-0.01	0.14
142330	467.52	473	473.56	473.84	474.57	475.98	477.16	0.56	0.73	1.18
140835	458.79	464.45	465.58	465.25	466.6	467.44	469.32	1.13	1.35	1.88
139312	452.43	457.71	458.24	458.49	459.1	460.65	461.39	0.53	0.61	0.74
137762	443.58	449.25	449.25	450.13	450.13	452.32	452.32	0	0	0
136265	436.11	441.96	441.96	442.79	442.79	445.17	445.17	0	0	0
134554	427.18	432.62	432.61	433.49	433.49	435.51	435.51	-0.01	0	0
133055	418.02	425.16	425.16	426.61	426.61	432.36	432.36	0	0	0
132544	415.14	423.73	423.73	425	425	431.36	431.36	0	0	0
132464 Cham	Bridge							0	0	0
132358	414.14	421.85	421.87	423.29	423.3	426.79	426.65	0.02	0.01	-0.14
131494	410.74	418.37	418.28	419.48	419.42	422.57	422.94	-0.09	-0.06	0.37
130431	406.27	413.33	413.45	414.55	414.68	417.18	416.65	0.12	0.13	-0.53
128972	399.1	406.2	406.57	407.18	407.89	409.49	410.62	0.37	0.71	1.13
127913	394.02	400.25	400.35	401.49	401.6	404.67	404.86	0.1	0.11	0.19
125927	384.55	392.5	392.5	393.64	393.78	396.64	397.11	0	0.14	0.47
123597	373.26	379.33	379.32	380.47	380.29	383.11	383.04	-0.01	-0.18	-0.07
119892	355.31	367.99	369.23	369.2	371.12	371.7	375.06	1.24	1.92	3.36
117806	350.1	361.17	363.46	362.15	364.95	364.22	366.15	2.29	2.8	1.93
116400	344.63	355.66	357.09	356.69	358.63	359.09	359.88	1.43	1.94	0.79

115329	342.21	352.12	354.11	353.28	355.86	355.83	359.11	1.99	2.58	3.28
113592	336.44	346.72	348.18	347.5	349.51	349.15	353.31	1.46	2.01	4.16
111978	329.62	338.08	338.87	339.24	340.32	341.94	342.53	0.79	1.08	0.59
110496	324.33	334.03	335.29	335.4	337.17	338.43	341.8	1.26	1.77	3.37
109374	319.74	331.06	331.93	332.49	333.71	335.62	337.79	0.87	1.22	2.17
107433	313.98	324.08	324.42	325.34	325.83	328.15	328.95	0.34	0.49	0.8
105875	308.98	319.27	319.63	320.38	320.96	322.84	324.02	0.36	0.58	1.18
104236	303.26	313.37	313.68	314.52	315.01	317.13	318.08	0.31	0.49	0.95
102556	298.64	308.37	308.47	309.66	309.8	312.6	312.71	0.1	0.14	0.11
100635	292.58	302.48	302.45	303.66	303.61	306.53	306.68	-0.03	-0.05	0.15
99130	286.42	297.24	297.37	298.84	299.14	302.39	303.39	0.13	0.3	1
97139	281.63	294.24	294.55	296.08	296.6	299.77	301.25	0.31	0.52	1.48
95357	274.65	290.54	290.87	292.35	292.73	295.49	296.64	0.33	0.38	1.15
93720	268.35	281.79	281.82	283.31	283.46	287.48	287.88	0.03	0.15	0.4
91724	261.85	276.22	276.36	278.62	278.82	283.88	284.24	0.14	0.2	0.36
90545	258.38	274.4	274.57	277.32	277.52	282.91	283.38	0.17	0.2	0.47
88978	253.45	271.63	271.78	275.41	275.58	281.23	281.63	0.15	0.17	0.4
88076	250.46	270.1	270.11	274.33	274.27	280.03	279.98	0.01	-0.06	-0.05
87179	248.3	268.86	268.81	273.46	273.31	279.24	278.76	-0.05	-0.15	-0.48
85813	244.22	264.76	264.76	271.56	271.56	276.66	276.67	0	0	0.01
85449	243.2	262.44	262.45	269.93	269.93	272.23	272.25	0.01	0	0.02
85333 S Mo	Bridge							0	0	0
85237	242.12	257.09	257.17	258.99	259.26	263.72	264.17	0.08	0.27	0.45
84161	237.17	254.92	255.18	257.04	257.65	261.33	263.33	0.26	0.61	2
83266	234.12	250.94	250.95	252.46	252.54	255.99	256.16	0.01	0.08	0.17
81401	228.46	247.04	247.37	249.2	249.75	254	255.39	0.33	0.55	1.39
79959	223.86	242.47	242.53	244.36	244.49	248.11	250.48	0.06	0.13	2.37
79239	220.55	238.94	239.01	240.63	240.67	244.35	242.38	0.07	0.04	-1.97
78538	218.26	235.71	235.36	237.87	237.93	242.41	242.39	-0.35	0.06	-0.02
78125	217.68	235.18	234.78	237.27	237.32	241.78	241.68	-0.4	0.05	-0.1
76272	210.67	226.68	228	229.14	231.48	234.25	238.68	1.32	2.34	4.43
73761	199.76	224.68	225.97	227.19	229.57	232.13	237.9	1.29	2.38	5.77
72002	195.19	218.14	217.03	220.24	219.93	224.51	226.01	-1.11	-0.31	1.5
70738	192.93	213.35	213.62	215.97	217.01	221.64	224.55	0.27	1.04	2.91
69270	187.86	206.59	206.32	209.19	208.2	212.57	213.33	-0.27	-0.99	0.76
68384	184.88	201.46	201.48	203.72	204.23	209.43	209.01	0.02	0.51	-0.42
66258	180.02	197.93	198	199.46	200.42	203.26	206.8	0.07	0.96	3.54
64389	176.56	192.87	195.03	195.21	198.1	200.1	205.5	2.16	2.89	5.4
62677	171.92	191.9	193.35	194.06	196.32	198.74	203.2	1.45	2.26	4.46
60936	168.36	187.57	188.66	190.2	191.34	195.09	197.64	1.09	1.14	2.55
60586	167.18	187.57	187.72	190.14	190.24	194.88	196.01	0.15	0.1	1.13
59260	164.89	180.44	182.07	181.71	184.7	186.51	190.14	1.63	2.99	3.63
58738	162.91	176.27	176.73	178.19	178.72	182.27	183.87	0.46	0.53	1.6
58586	163.5	175.26	176.81	176.13	178.53	178.96	180.77	1.55	2.4	1.81
58536	139.82	162.93	163.49	165.02	166.67	169.89	173.83	0.56	1.65	3.94

58384	138.72	162.44	163.04	164.42	166.2	168.61	173.26	0.6	1.78	4.65
57346	136.25	159.62	159.97	161.8	162.61	167.03	168.8	0.35	0.81	1.77
56665	134.33	156.61	158.47	159.25	161.43	165.3	168.77	1.86	2.18	3.47
54977	130.3	148.49	151.43	150.47	154.54	154.91	162.59	2.94	4.07	7.68
52968	125.27	143.76	145.03	145.99	147.45	151.22	153.05	1.27	1.46	1.83
50439	121.49	136.31	136.29	138.29	138.21	142.46	141.6	-0.02	-0.08	-0.86
49387	116.82	132.97	133.35	135.27	135.67	141.41	141.76	0.38	0.4	0.35
48842	115.73	131.92	132.27	134.58	134.89	140.76	140.9	0.35	0.31	0.14
48419	114.08	131.29	131.3	134.15	134.08	140.8	140.64	0.01	-0.07	-0.16
45947	107.06	126.58	126.58	129.96	129.96	138.18	138.18	0	0	0
45295	105.54	125.6	125.6	129.06	129.06	136.86	136.86	0	0	0
45084	Los	Bridge						0	0	0
44878	105.8	123.8	123.8	127.06	127.06	134.88	134.88	0	0	0
43729	101.58	119.94	119.94	123.1	123.11	130.63	130.64	0	0.01	0.01
42356	97.8	113.31	113.3	115.03	115.03	119.94	119.94	-0.01	0	0
40799	95.09	109.23	109.25	111.29	111.35	116.13	116.29	0.02	0.06	0.16
39424	91.57	106.2	106.27	108.67	108.84	114.46	114.74	0.07	0.17	0.28
37960	88.36	104.16	104.29	106.78	107.06	112.81	113.19	0.13	0.28	0.38
36441	85.04	101.23	101.53	103.74	104.31	109.58	110.27	0.3	0.57	0.69
34928	81.04	97.2	97.82	99.33	100.43	100.61	100.62	0.62	1.1	0.01
33526	79.15	92.95	93.57	94.96	95.92	99.35	100.41	0.62	0.96	1.06
31962	73.55	89.4	90.5	91.27	92.77	96.04	91.78	1.1	1.5	-4.26
30352	69.92	85.5	86.12	87.33	88.2	87.8	90.77	0.62	0.87	2.97
28932	67.25	81.55	81.82	83.71	83.96	88.73	89.78	0.27	0.25	1.05
27500	64.08	78.83	79.44	81.11	81.73	86.16	87.88	0.61	0.62	1.72
26356	60.31	76.71	77.34	79.05	79.36	84.93	86.88	0.63	0.31	1.95
25132	54.44	74.8	75.84	77.31	77.89	82.07	85.1	1.04	0.58	3.03
24937	Vent	Bridge						0	0	0
24761	52.75	72.1	75.18	76.31	77.01	79.96	83.02	3.08	0.7	3.06
24494	49.61	71.78	75.15	76.27	76.99	80.19	83.37	3.37	0.72	3.18
24293	49.14	71.69	75.07	76.1	76.84	79.86	83.07	3.38	0.74	3.21
24174	UPRR	Bridge						0	0	0
23999	49.31	69.77	71.64	72	75.25	76.79	82.16	1.87	3.25	5.37
22350	45.09	67.98	69.31	70.16	72.84	74.94	81.83	1.33	2.68	6.89
21062	43.31	65.46	67.16	67.13	70.52	71.64	77.51	1.7	3.39	5.87
19944	39.87	61.88	62.44	64.83	65.89	70.22	68.81	0.56	1.06	-1.41
18391	36.44	58.3	58.48	59.92	61.99	64.06	69.03	0.18	2.07	4.97
16954	33.41	57.1	55.87	58.18	60.31	61.09	68.24	-1.23	2.13	7.15
15610	31.24	56.6	53.11	57.37	58.01	59.62	59.6	-3.49	0.64	-0.02
15406	Vict	Bridge						0	0	0
15177	29.56	46.89	48.67	49.67	51.23	52.89	53.65	1.78	1.56	0.76
14627	28.94	46.46	47.8	48.32	50.43	53.45	55.46	1.34	2.11	2.01
13347	25.83	43.96	44.34	45.77	47.16	50.18	53.51	0.38	1.39	3.33

11659	22.47	35.7	35.29	37.94	36.9	41.59	41.88	-0.41	-1.04	0.29
11169	21.83	36.42	36.54	37.6	37.8	40.22	40.53	0.12	0.2	0.31
10126	20.26	34.83	34.97	35.89	36.09	38.32	38.58	0.14	0.2	0.26
8849	17.71	29.94	29.98	31.25	31.24	34.15	34.14	0.04	-0.01	-0.01
7665	14.06	27.62	27.62	29.11	29.11	31.96	31.96	0	0	0
5860	10.68	24.09	24.09	25.4	25.4	28.2	28.2	0	0	0
4659	8.34	21.54	21.54	22.74	22.74	25.68	25.68	0	0	0
3592	6.81	18.91	18.91	20.04	20.04	23.32	23.32	0	0	0
3174	6.07	18.07	18.07	19.16	19.16	22.66	22.66	0	0	0
3014 Harb	Bridge							0	0	0
2838	6	17.61	17.61	18.68	18.68	21.06	21.06	0	0	0
2033	5.7	14.27	14.27	14.99	14.99	16.55	16.55	0	0	0

Table 3. Comparison of Storage Volumes of Channel and Floodplain for Modeling Scenarios

Scenarios	50-Year		100-Year		500-Year	
	With Project	Without Project	With Project	Without Project	With Project	Without Project
Total Volume (AF)	51,435	45,645	66,858	58,053	107,396	97,540
Differences (AF)	5,790		8,805		9,856	
% Reduction	11		13		9	

- Inundation Areas, # of Home Flooded, and Values of Flood Damages**

Inundation areas, # of homes flooded, and values of flood damages for the 50-year, 100-year, and 500-year flood events are compared in Tables 4 and 5.

From these tables, it is appropriate to conclude that the total inundation areas for a given 100-year flood event might change only slightly from the existing conditions to the assumed future conditions (from 15,737 acres to 15,765 acres). However, the locations of these 100-year flood inundation areas would change from one place to another, from upstream to downstream, and primarily from currently the agriculture lands/open spaces to urban areas, which are mostly concentrated in the City of Oxnard. As a result, the number of homes as well as the values of flood damages would increase dramatically (from 2,957 homes to 6,063 homes, and from \$181 million to \$385 million, respectively), if the lands in floodplains would not be protected by the FPP program.

For a 500-year flood event, the total inundation areas might decrease from the existing 20,511 acres to 19,922 acres under the assumed future conditions. As a result, the number of homes as well as the values of flood damages would increase dramatically from 6,476 homes to 28,104 homes and from \$512 million to \$1,560 million, respectively.

For a 50-year flood event, the total inundation areas might decrease from the existing 14,546 acres to 10,660 acres under the assumed future conditions. This indicates that during a smaller flood event, the increased floodplains in the downstream as a result of the assumed future developments may be smaller than the floodplains the developments would have reduced in the upstream. As a result, the number of homes as well as the values of flood damages would not change dramatically (from 1,819 homes to 1,852 homes and from \$73 million to \$94 million, respectively).

The damage estimates are based on figures from the US Dept. of Housing and Urban Development and based on the assessed values of existing structures. According to the HUD flood damage estimate method, flood damages are estimated based on structure and content values. Content values are assumed to be 35% of structure values for residential buildings and 100% for commercial buildings.

The Santa Clara River Levee upstream of Highway 101 (SCR-1 levee) is assumed to provide 100-year flood protection under “With Project” (existing) conditions. This assumption is based on the fact that the preliminary FEMA flood insurance study has shown that the levee has sufficient freeboard during a 100-year flood event, even though the levee will need to be certified by the community and accredited by FEMA under their Levee Certification Program. The levee would not provide 100-year flood protection under “Without Project” conditions because of lack of freeboard.

Please refer to Figures 1 and 2 for floodplains for the two scenarios.

- Affected Agriculture Lands/Open Space and Estimated Crop Composition in Santa Clara River Floodplain

Based on Ventura County “Parcel” GIS database, it is estimated that approximately 3,026 acres, 3,710 acres, and 5,619 acres of agriculture or open space lands are located within the 50-year, 100-year, and 500-year floodplains under existing (“With Project”) conditions. Table 4 also shows how these numbers change during the Without Project conditions.

Also based on Ventura County “Parcel” GIS database, the composition of agricultural crops is estimated and shown in Table 6. This information is for reference only because actual crops on the ground may change over time.

Table 6: Crop Composition in SCR Floodplain

Crop	Percentage
Truck Crops	27.14
Orchard Mixed	19.10
Avocados	0.23
Oranges	13.92
Lemons	8.31
Orchard Mixed	5.61
Pasture and Range Land	14.38
Nursery Crops	8.22
Field and Seed Crops	2.02
Grapefruit	0.49
Greenhouses	0.57
Total	100.00

Using FEMA's modeling results and GIS generates slightly different floodplain inundation areas.

- Approximately 7,964 acres of lands now located within the FEMA defined floodway,
- Approximately 3,301 acres of mostly agriculture and open space lands located between the floodway fringe of the 100-year floodplain boundary (areas between floodway and 100-year floodplain boundaries), and
- Approximately 4,108 acres of lands if the floodway fringe is extended to the 500-year floodplain boundaries.

Either set of these estimates should be considered as within an acceptable range of approximations.

V. CONCLUSIONS

The proposed Floodplain Protection Program will preserve approximately **3,026** acres of mostly agriculture and open space lands for flood storage and flood reduction during a 50-year flood event. It will preserve approximately **3,710** acres of lands located within the floodway fringe (areas between floodway and 100-year floodplain boundaries), or approximately **5,619** acres of lands if the floodway fringe is extended to the 500-year floodplain boundaries, and prevent them from future developments. The proposed FPP program will also provide additional protection to approximately **7,964** acres of lands now located within the FEMA defined floodway.

It is estimated that the FPP program can provide a significant life and safety benefits, as well as a significant economic benefits from a flood reduction perspective. Anticipated reduction in flood damages to the communities are about \$21 million during a 50-year event, \$204 million during a 100-year event, and \$1,048 million during a 500-year flood event.

Table 4: Comparison of Inundation Areas, # of Homes Flooded

	Inundation Area (acres)						# Of Homes Flooded			# of Other Properties Flooded		
	Agriculture land			Total								
	50-Year	100-Year	500-Year	50-Year	100-Year	500-Year	50-Year	100-Year	500-Year	50-Year	100-Year	500-Year
With Project	3026	3710	5619	14,546	15,737	20,511	1,819	2,957	6,476	709	898	1,350
Without Project	1033	2743	4515	10,660	15,765	19,922	1,852	6,063	28,104	540	989	2,181

Table 5: Flood Damage Estimates

Frequency	Scenario	Residential Properties (x \$1,000)							Industrial & Commercial Properties (x \$1,000)									
		Structure Damages			Content Damages*				Total Residential Damages	Structure Damages			Content Damages**				Total Commercial Damages	Total Damages
		Structure Value	Damage Factor	Structure Damages	Content Value	Damage Factor	Content Damages	Structure Value		Damage Factor	Structure Damages	Content Value	Damage Factor	Content Damages				
50-Year	With Project	\$383,210	0.0900	\$34,489	\$134,124	0.0900	\$12,071	\$46,560	\$79,173	0.1630	\$12,905	\$79,173	0.1760	\$13,934	\$26,840	\$73,400		
	Without Project	\$385,305	0.1300	\$50,090	\$134,857	0.1700	\$22,926	\$73,015	\$44,812	0.2470	\$11,069	\$44,812	0.2370	\$10,620	\$21,689	\$94,704		
100-Year	With Project	\$614,373	0.1300	\$79,868	\$215,031	0.1700	\$36,555	\$116,424	\$134,534	0.2470	\$33,230	\$134,534	0.2370	\$31,885	\$65,114	\$181,538		
	Without Project	\$1,080,697	0.1800	\$194,525	\$378,244	0.2200	\$83,214	\$277,739	\$187,918	0.2770	\$52,053	\$187,918	0.2950	\$55,436	\$107,489	\$385,228		
500-Year	With Project	\$1,099,076	0.1800	\$197,834	\$384,677	0.2200	\$84,629	\$282,463	\$401,242	0.2770	\$111,144	\$401,242	0.2950	\$118,366	\$229,510	\$511,973		
	Without Project	\$4,194,904	0.2000	\$838,981	\$1,468,216	0.2800	\$411,101	\$1,250,081	\$478,187	0.2960	\$141,543	\$478,187	0.3530	\$168,800	\$310,343	\$1,560,425		

Notes:

* According to FEMA HUD flood damage curves, residential content value is assumed to be 35% of structure value

** According to FEMA HUD flood damage curves, commercial and industrial content value is assumed to be 100% of structure value.

SANTA CLARA RIVER WATERSHED

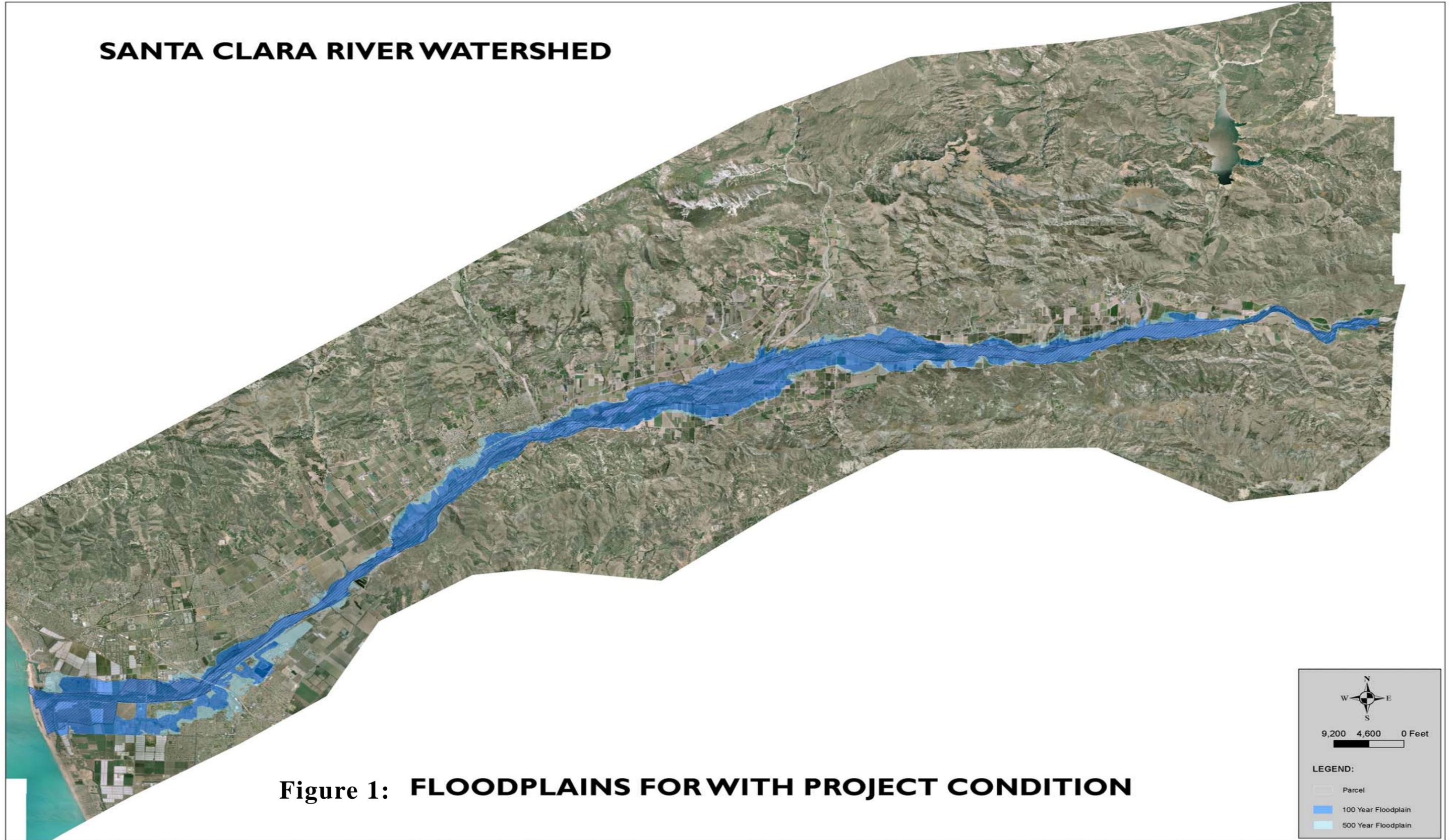


Figure 1: FLOODPLAINS FOR WITH PROJECT CONDITION

SANTA CLARA RIVER WATERSHED

