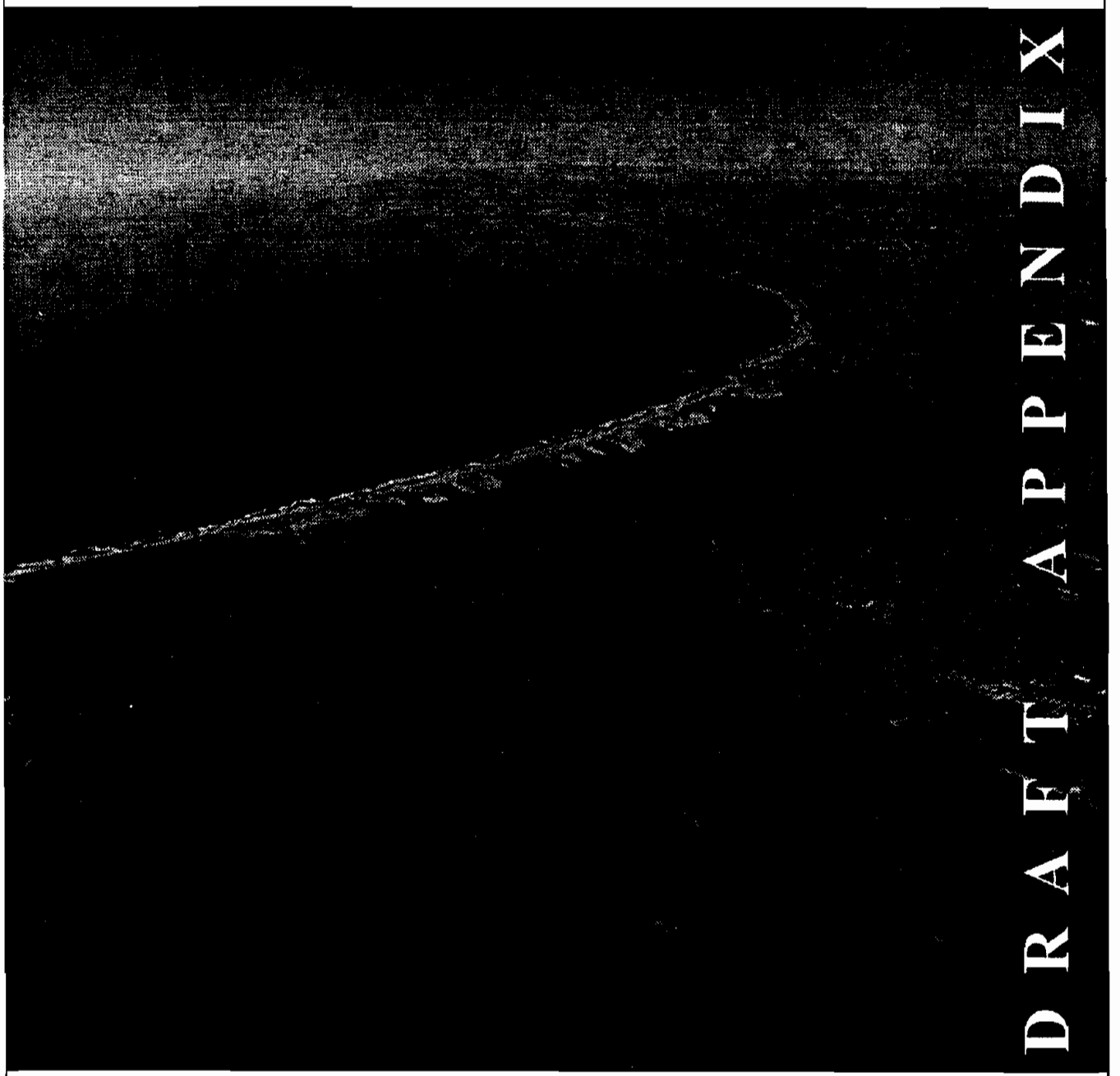
PRELIMINARY ENGINEERING EVALUATION, LOS OSOS/BAYWOOD PARK COMMUNITY DRAINAGE PROJECT

FOR

SAN LUIS COUNTY SERVICE AREA No. 9J

December 1997



DRAFT APPENDIX

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APPENDIX A

DEFINITIONS

A1: Definition of Terms
A2: Definition of Alternatives

Appendix A1
DEFINITION OF TERMS

Aquifer: Porous water-bearing formation of permeable rock, sand, or gravel capable of yielding significant quantities..

Detention or Retention Basin: A constructed depression in the surface of the land to hold water temporarily or for infiltration.

Drainage Area (Basin): A topographical area from which runoff collects to a point. Bounded peripherally by a water parting.

Groundwater: Water in an aquifer or directly above the surface of an aquifer.

Watershed: A region or area from which runoff collects to a particular watercourse or body of water. Bounded peripherally by a water parting.

Appendix A2
DEFINITION OF ALTERNATIVES

Paper Street Note:
Ownership to centerline of road right-of-ways is to the adjacent land owner. Construction of surface improvements, including basins and linear parks, on these right-of-ways within the community would require special consideration regarding condemnation and purchase of property. These right-of-ways may be used for roads and utilities (including storm drains) only.

Basin: Provides a collection and storage point for surface water. Typically used in combination with other surface collection improvements such as storm drains or curb and gutter. *Terminal/Recharge* basin for groundwater recharge or *Detention* Basin to collect and provide metered discharge. May requires land acquisition. *Subsurface* basins are special storage structures that are typically installed below parking lots and used for storm water storage and percolation. A major advantage of using subsurface basins is the reduction of land area normally required for surface basins

Channel: Typically refers to an improved watercourse, such as a concrete or asphalt concrete open channel (i.e.: The *Walker* Channel) that functions by use of gravity. Channels can be used adjacent to roadways or across properties to collect surface drainage

Connect to Sewer: Septic tanks are considered a major contributor to the increase in the upper aquifer groundwater elevations. The reduction and/or elimination of septic tank discharge into the upper aquifer is expected to reduce groundwater surface elevations, thus allowing for additional storage capacity of the basin to percolate surface runoff, and reduce flooding.

Curb & Gutter: Provides for the containment of flows within the street right-of-way. Driveways or other mountable berms may also be required at property entrances to provide access to property while maintaining flows in street.

Diversion around Community: Diversion specifically relates to surface runoff by redirection of surface flow out of a specific groundwater basin, thus reducing over taxation of a basins storage capacity (reduction of flood events). Diversion may require incorporation of pump stations, storm drains, French drains, channels, swales, berms, or some combination of these systems.

Drain to New Sewer System: Phase the proposed sewer system such that the low lying (sump) areas are connected first, then use the extra capacity of the treatment facility in the early stages of laying sewer lines to pump the groundwater from these sump areas to the treatment facility. This would have a two stage benefit. First, the contribution of the septic tanks in these sump areas would be eliminated. Second, the groundwater elevation would be reduced due to pumping, thus allowing additional subsurface storage capacity for percolation of future surface runoff.

Erosion Control: Refers to short term solutions where haybales, silt fences, or other devices can be used to capture sediments (sands and silts) present in surface flows.

French Drain: Convention solution to collect and remove subsurface water. May require additional improvements including outlet structures, and pumping facilities. May also require land acquisition and/or easements.

Linear Park: Areas such as open lots or unpaved streets that can be dedicated to accept surface storm water. This would require designating this right-of-way for broad, vegetated shallow basins used to retain storm water surface runoff thus promoting sedimentation deposition and the removal of contaminants. A series of basins could be proposed for retention, treatment, then discharge which would be hydraulically connected via storm drains, with ultimate discharge into the Bay or other source. During the dry season, these areas could provide passive community recreation possibilities.

Maintenance Program: Many comments received by the community stated regular preventative maintenance program would assist in eliminating some problems. Includes regular cleaning of existing ditches, channels, storm drain facilities, etc., and maintenance of existing diversion and containment facilities.

Porous Pavement: Allows for percolation of runoff through a hard surface, such as a roadway or parking area. Costs associated with the installation and live expectancy of porous pavement are considerable when compared to typical road pavement material.

Pump: Allows for the transfer of collected surface or subsurface water to an alternate discharge site. Alternate discharge sites could include the Bay, agricultural sites, wetlands, linear parks, basins, less impacted aquifers, streams, or the sewer treatment facility. Other pumping alternatives suggest lower of the entire groundwater aquifer to provide storage for storm flows via percolation. Lowering of the groundwater basin may impact existing wetlands, specifically in Los Osos Creek watershed.

Production from Lower to Upper Aquifer: Present water production for the community drinking and landscaping is from the deeper (lower) aquifer due to contamination in the upper aquifer. One possible solution is to change landscape water production for commercial and institutional to the upper aquifer, thus lower the groundwater table of the upper.

Presently the water quality of the upper aquifer has high concentrations of nitrates that prohibits its use as a public water source therefore the lower aquifer is being used. Use of the lower aquifer as a water supply and the upper aquifer as collection (from septic tank discharge etc.) has been determined to be a major contributor to the elevated groundwater levels in the upper aquifer, and subsequent increase in flooding in the Paso Robles and El Moro corridors.

Property Purchase: Acquisition of properties subject to frequent flooding. This property could them be used as a dry weather park, wetland habitat, or similar use.

Raise Foundation: Raising building foundations would eliminate flooding damage of a structure. However, access to the structure would also need to be corrected.

Reconstruct Roadway: Typically applies to paved roads that require horizontal and/or vertical realignment to allow for positive drainage.

Road Closure: Closure of flooded roadways can be used as a short term solution to limit the wave damage produced by vehicular traffic moving through flooded intersections. This wake can aggravate flooding of properties adjacent to roadways.

Storm Drain: Conventional solution to collect and remove surface water. Requires additional improvements including inlets, outlets, and in some cases, pumping facilities. May also require land acquisition and easements. Storm drain systems may be coordinated for installation with the proposed sewer system to save costs. Outlet of a proposed storm drain could be to the Bay, Creeks, recharge sites, basins, linear park, or other locations.

Swale: Refers to a graded swale, such as those found in the El Moro corridor, which are not improved by use of concrete, steel or other materials. Vegetating a graded swale allows for energy dissipation (reduced incidence of erosion) and aids in contaminant removal from surface flows.

Wetland Construction: Similar in function to a *Basin* however wetlands need to be developed in sump areas where ground stays moist year-round. May require acquisition of land.

APPENDIX B

SUMMARY OF EXISTING COMMUNITY PROBLEM AREAS & FACILITIES

B1: Compilation of Documented Drainage Problems
B2: Drainage Problem Addendum Prepared by Drainage Subcommittee
B3: CSA 9J Storm Drain Facilities

ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
1.1	1	Patrick McGibney	Blue Ribbon Survey, 1995-96	1178 2nd Street	Standing water in yard		
1.2	1	Public Comments	CSA 9J Meeting 7/11/96	Amhurst, Santa Ysable, Pasadena Drive and into marsh area			
1.3	1		County Map		Street ponding and sand and silt deposition		
1.4	1		County Map		Cross lot drainage, street ponding, natural sump, and flat grades		
1.5*	1	Marie Smith	Phone conversation 5/27/97	Pasadena, 1st Street, & Santa Lucia	Hump in Pasadena Road diverts surface flows easterly towards residence. Cross lot drainage through two residential lots with discharge to low-lying undeveloped lot where water ponds. No home flooding.	Provide dike or curb and gutter on Pasadena Dr. to keep flows in roadway and flatten existing hump in road	
1.6*	1	Lenord Ambroso	CSA-9J Meeting 6/3/97	Pasadena, 1st Street, & Santa Lucia (owner at 1161 1st St.)	Water on Pasadena has no place to go and travels across his neighbor's yard through his yard to a vacant lot. Same as Item 1.5	Same as Item 1.5	
2.1	2		County Map		Street ponding		
3.1	3	Andrew & Jane Evancho, Jr	Letter to County	1221 12th Street	Property has been subject to flooding after heavy rains for the past 10 years. Believe that flooding was a direct result of the paving of Santa Ynez Ave, 10 years ago. Also belief that the drainage ditch located near the corner of South Bay Blvd. at Los Olivos Ave may also contribute to additional flows.		
3.2	3		County Map		Erosion and Sand/silt deposition		
3.3	3	Paul Reynolds & Marianne Tolchin	Letter to County	1221 12th Street	For the past 10 years the property subject to flooding, have owned property for 12 years. Flooding became more prominent after the County constructed a swale at the corner of South Bay Blvd. & Los Olivos Rd.		
4.1	4	Jeff Rowan	EDA Survey 7/11/96	1188 & 1187 14th St.	Storm water runs from 15th St. through backyard of 1186 14th St. causing flooding of 1188 & 1187 14th St. and long term ponding in 14th St.	1. All uphill homes have water flowing through yard to the downhill (west) homes. 1187 14th St. has a berm in the backyard not allowing water to pass west to 13th-12th-etc. St.	Water remains for months and has covered the entire road on occasion making walking and mail retrieval impossible.
4.2	4	Mike Sylvia	County File	1194 14th St.	The section of 14th Ave north of Santa Ysable floods every winter		
4.4	4	Public Comments	CSA J9 Meeting 7/11/96	1100 block of 14th St.			

*Item added since submittal of WP I.

ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
4.5	4	SLO CO	County File	14th Ave north of Santa Ysable			
4.6	4		County Map		Cross lot drainage		
4.7	4		County Map		Cross lot drainage		
4.8	4		County Map		Cross lot drainage		
4.9	4		County Map		Cross lot drainage		
4.10	4		County Map		Erosion and sand/silt deposition		
5.1	5		County Map		Silt and sand		
6.1	6		EDA Survey 7/11/96		The County feels that flooding of mid blocks between Santa Maria & El Moro (above) is due to spillage of the 7th St. basin. However, this is a preexisting condition		see letter
6.2	6		EDA Survey 7/11/96	Between Pismo & Paso Robles		1. Build basin on unpaved portion of Pismo east of 11th St.	
6.3	6	"Drainage Problems in Los Osos Area"	County File (no date, 11/76)	Properties at 8th @ El Moro	Surface flooding and septic tank failure. At least 2 homes flooded		
6.4	6	Alison Ball	EDA Survey 7/11/96	10th St., westside, 2-3 houses north of Pismo	One house regularly floods, localized problem		
6.5	6	Alison Ball	Letter to County 5/8/95	1412 7th Street	Moved to Los Osos in 1979 and realized that lived in flood prone area. In 1983 home flooded for the first time. Neighbors flooded with only moderate storm events. The storms of 1995 affected even more homes not previously affected. Septic tank failure. Included names of other affected from El Moro, Ramona Lake, Pismo Swale, 15th-16th Streets, Fairchild, Santa Ynez, 11th Ave, Pine @ Ash, Pecho @ Grove, Cimarron	Install culvert along El Moro that could be used for other areas to drain to.	
6.6	6	August Gioia	Blue Ribbon Survey, 1995-96	1352 5th Street	Wash through yard		
6.7	6	Barry & Nancy Rice	Blue Ribbon Survey, 1995-96	1355 5th Street	Wash through yard		
6.8	6	Bill Fellows	Blue Ribbon Survey, 1995-96	1405 9th Street	Septic tank problems, wash through yard, standing water in yard, and single incidence of residential and or garage flooding.		
6.9	6	Bill Hall, Mackie Hall & Tony Hall	Blue Ribbon Survey, 1995-96	1388 6th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residential and or garage flooding, and pumping required to clear yard and residence and or		

*Item added since submittal of WP I.

ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
					garage.		
6.10	6	Bill Richmond	EDA Survey 7/11/96	4th, 5th, & 6th Streets at midblock between El Moro & Santa Maria	Flood homes, two flooded for days after moderate storm. Eleven homes have septic tank problems. FLOOD DAMAGE: 4th: 1334, 1346, 1360, & 1331 5th: 1352, 1346, 1332, 1339, 1345, & 1355 6th: 1385 FLOODING AFTER MOD. STORM 4th: 1346 5th: 1332 6th: many homes	1. Storm drain 2. Berms	
6.11	6	Brian Bailey Valerie Bailey	Letter to County 5//95	915 El Moro Avenue	Intersection of 8th Ave @ El Moro Ave flooded and ran towards 7th Street. Neighbors flood, septic tanks fail.		
6.12	6	CeCe Simpson & Joyce Stockton	Blue Ribbon Survey, 1995-96	1361 6th Street	Wash through yards and single incidence of residential and or garage flooding.		
6.13	6	Charles & Rosemary Sibus	Letter to County	1198 El Moro	El Moro between 12th & 13th Streets sustains substantial water erosion damage from heavy runoff down 13th Street.		Picture of erosion "gully" along El Moro
6.14	6	County Eng. Picture	County File	Flood house near intersection of 7th at El Moro	3/1395 flooding		
6.15	6	County Eng. Picture	County File	6th @ El Moro	3/15/95 flooding		
6.16	6	County Eng. Picture	County File	Flood driveway on El Moro between 6th & 7th St.	3/1395 flooding		
6.17	6	Danielle Rogers	Blue Ribbon Survey, 1995-96	1421-B 7th Street	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear yard and residence and or garage, and failure of existing storm drain facilities.		
6.18	6	David Whitehead	Blue Ribbon Survey, 1995-96	1421 10th Street	Septic tank problems, wash through yard, and single incidence of residential and or garage flooding.		
6.19	6	Deb Hutchins	Blue Ribbon Survey, 1995-96	1380 6th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residential and or garage flooding, and pumping required to clear yard and residence and or garage.		
6.20	6	Debby Cardinali & Jim Shisler	Blue Ribbon Survey, 1995-96	1415 6th Street	Standing water in yard and pumping required to clear yard due to multiple incidences of water entering residence and or garage		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
6.21	6	Deborah Hutchins	Letter to County 5/1/95	1380 6th Street	One and a half feet of water damaged house on 3/10/96. Rest of neighborhood suffered severe damage due to flooding.		
6.22	6	Deena Richmond & Bill Richmond	Blue Ribbon Survey, 1995-96	1345 5th Street	Septic tank problems, wash through yards, and single incidence of residence and or garage flooding.		
6.23	6	Don Bearden	Blue Ribbon Survey, 1995-96	1421 7th Street	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear residence and or garage, and failure of existing storm drain facilities.		
6.24	6	Don Walters & Donna Walters	Blue Ribbon Survey, 1995-96	1346 5th Street	Wash through yard and single incidence of residence and or garage flooding.		
6.25	6	Donald & Eldra Avery	Blue Ribbon Survey, 1995-96	1313 4th Street	Septic tank problems, wash through yard, and standing water in yard.		
6.26	6	Donald Avery	EDA Survey 7/11/96	Center of block bounded by 3rd, 4th, Santa Maria, & El Moro	Runoff for Santa Maria sheets across intersection of 4th & Santa Maria collecting at low portion of block between 3rd & 4th St. Ponding can last for weeks. 1331 4th is flooded regularly in normal years. In combination with excess 7th St. runoff septic systems are under water through the block due to excess ponding. When ponding daylights over 3rd St., additional flooding occurs at 3rd & Santa Maria, subsequently through center of block of 2nd & 3rd Streets and into Business District	1. Storm drains at center of 3rd, 4th & 6th Streets between El Moro & Santa Maria. 2. Storm drains at intersection of 3rd & Santa Maria 3. Divert runoff from Santa Maria from entering 4th St. (this would increase flooding at 3rd & Santa Maria and the Baywood Business District)	see sketch
6.27	6	Donald Lee Avery	Letter to County 5/4/95	Mid block 1300's between 3rd and 4th Streets	Region becomes a virtual lake during heavy rains, flooding of one house, failure of septic systems. On two occasion the "lake" crested the north side of 3rd Ave, filling the intersection of 3rd @ Santa Maria and flooding several businesses on 3rd & 2nd Streets.		
6.28	6	Evelyn Moberg & Steven Moberg	Blue Ribbon Survey, 1995-96	1334 4th Street	Wash through yard and standing water in yard.		
6.29	6	Evelyn Vickerson	Letter to County	9th St.	Contacted Risk Management regarding flood damage in 1992		
6.30	6	G.B. & Arlene Blanchard	Letter to County	APN 038.292.019	Existing properties have channalized their storm flows towards our home	Uphill on 10th St. is a vacant lot that could be used to store water	Curb and gutter
6.31	6	George Boddeker &	Blue Ribbon	1421 8th Street	Septic tank problems, standing water in yard,		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
		Denise Boddeker	Survey, 1995-96		multiple incidences of residential and or garage flooding, prolonged pumping required to clear residence and or garage, and failure of existing storm drain facilities.		
6.32	6	George Marchenko	EDA Survey 7/11/96	Between 10th & 8th	Flow drains along a natural swale through the lots and through holes in fences. Damming occurs when holes are fixed, flooding homes and creating potential for dam failure	1. Divert water down 10th St. (north)	see sketch
6.33	6	Glen Berkovitz & Jane Kerkovitz	Blue Ribbon Survey, 1995-96	870 El Moro	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear residence and or garage, and failure of existing storm drain facilities.		
6.34	6	Glenn E. Harrell	Blue Ribbon Survey, 1995-96	890 El Moro	Septic tank problems and wash through yard		
6.35	6	James Hickok	County File	1404 10th Street	Sandbagging of home to protect from flooding. Runoff threatens property via an area between residences at 1099 11th St. and 1415 11th St. Approximately a 70 acre watershed. The water is being diverted by the County Street via private property, flooding garages etc. on its way towards 8th St. @ El Moro	Storm drain connected to a culvert down El Moro St. from 11th St. to the Bay	
6.36	6	Jeff Loring & Margen Loring	Blue Ribbon Survey, 1995-96	1319 5th Street	Wash through yard		
6.37	6	Jim MacDonald	Blue Ribbon Survey, 1995-96	1337 5th Street	Wash through yard		
6.38	6	Jim Marak & Vera Marak	Blue Ribbon Survey, 1995-96	899 El Moro	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear yard residence and or garage, and failure of existing storm drain facilities.		
6.39	6	Joe Forlippa	Blue Ribbon Survey, 1995-96	1441 10th Street	Septic tank problems, wash through yard, and single incidence of residential and or garage flooding.		
6.40	6	John Ball & Allison Ball	Blue Ribbon Survey, 1995-96	1412 7th Street	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear residence and or garage, and failure of existing storm drain facilities.		
6.41	6	Judith Reilly	Blue Ribbon	1411 7th Street	Septic tank problems, standing water in yard,		

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			Survey, 1995-96		multiple incidences of residential and or garage flooding, prolonged pumping required to clear yard and residence and or garage, and failure of existing storm drain facilities.		
6.42	6	Judith S. Reilly	Letter to County 5/7/95	1411 7th Street	Home was flooded three times. Flooded water remains two months after the last flood. Septic system continues to fail		
6.43	6	Judith S. Reilly	EDA Survey 7/11/96	SW corner of 7th and El Moro	1411 7th St. house floods (inhabitable). Septic tank failure due to flooding	1. Storm drain. 2. Make uphill property owners retain their portions of runoff.	1411 7th St. house began flooding annually beginning 4 years ago
6.44	6	Laurie Johnson	Blue Ribbon Survey, 1995-96	1331 4th Street	Septic tank problems, water through yard, standing water in yard, and multiple flooding of residence and or garage.		
6.45	6	Lesa Duncan	Blue Ribbon Survey, 1995-96	1346 4th Street	Septic tank problems, wash through yard, and single incidence of flooding of residence and or garage		
6.46	6	Margie Dist	Blue Ribbon Survey, 1995-96	1378 6th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residential and or garage flooding, and pumping required to clear yard and residence and or garage.		
6.47	6	Mark Alirevic & Alice Alirevic	Blue Ribbon Survey, 1995-96	1361 4th Street	Septic tank problems		
6.48	6	Mary Martin	Blue Ribbon Survey, 1995-96	1412 6th Street	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear yard and residence and or garage, and failure of existing storm drain facilities.		
6.48	6	Ms. Spellacy	County File	Water ponding at 8th @ El Moro			
6.50	6	Public Comments	CSA J9 Meeting 7/11/96	1345 5th St. Standing water on 4th, 5th & 6th Streets			
6.51	6	Public Comments	CSA J9 Meeting 7/11/96	3rd & 4th Santa Maria to El Moro			
6.52	6	Public Comments	CSA J9 Meeting 7/11/96	1572 9th St. between Paso and Pismo			
6.53	6	Ray Fitch & Lynn Fitch	Blue Ribbon Survey, 1995-96	1378 6th Street	Wash through yards, standing water in yard, and pumping necessary to clear yard.		

*Item added since submittal of WP 1.

ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
6.54	6	Richard Bruner & Alice Bruner	Blue Ribbon Survey, 1995-96	1325 4th Street	Septic tank problems, wash through yard, standing water in yard, flooding of residence and or garage		
6.55	6	Rob Crowe	Letter to County	929 El Moro	Contacted Risk Management regarding flood damage in 1992		
6.56	6	Ronald Lyman & Edie Lyman	Blue Ribbon Survey, 1995-96	1360 4th Street	Wash through yard and standing water in yard.		
6.57	6	Ruth Coafer	Blue Ribbon Survey, 1995-96	1411 8th Street	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear residence and or garage, and failure of existing storm drain facilities.		
6.58	6	Sandy Griswold	Blue Ribbon Survey, 1995-96	1368 5th Street	Wash through yard		
6.59	6	Sandy Vidak	Blue Ribbon Survey, 1995-96	1368 5th Street	Wash through yard and single incidence of residence and or garage flooding.		
6.60	6	SLO CO	County File	El Moro Corridor from 11th Ave west to 3rd Ave			
6.61	6	SLO CO	County File	El Moro Corridor			
6.62	6	South Bay Community Council	County File 2/24/83	8th @ El Moro			
6.63	6	Telegram Tribune	County File	8th @ El Moro	County storm drain and pump cannot keep up with storm flows		
6.64	6	Thomas Kwid	Letter to County 4/29/94	1400 6th Street	Have lived at this address for 23 years and this year water flooded home to 25". A second less sever storm (3" fell) again flooded home to 14" deep. Neighbors have also flooded for the first time.		
6.65	6	Thomas Kwid	County File	1400 6th St.	26 year resident now experiencing flooding due to increase ground water elevations		
6.66	6	Tom Gutry	Blue Ribbon Survey, 1995-96	1373 5th Street	Wash through yard, standing water in yard, and single incidence of residence and or garage flooding.		
6.67	6	Tony & Ann Skelton	Blue Ribbon Survey, 1995-96	1339 5th Street	Wash through yard		
6.68	6	Tony Kwid & Katherine Kwid	Blue Ribbon Survey, 1995-96	1400 6th Street	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear yard and residence and or garage, and failure of existing storm drain facilities.		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
6.69	6	Unknown	County File 3/15/96		County of Emergency Services performed a PDA and found flood damage to 28 homes. The worst hit areas were on 6th, 7th, 8th Streets in the 1400 block where waters rose up to 4 feet		
6.70	6	Valerie Bailey & Brian Bailey	Blue Ribbon Survey, 1995-96	915 El Moro	Septic tank problems, standing water in yard, multiple incidences of residential and or garage flooding, prolonged pumping required to clear yard residence and or garage, and failure of existing storm drain facilities.		
6.71	6	Louis Gibson Hyd. Plan. Engr	County File to RWQCB 7/22/96	8th Ave Pump Station	1984 pump station constructed due to 1983 flooding. Purpose was to drain sump of storm water within 24 hrs. Pump station was unable to keep up with 1995 flood. Groundwater levels have risen 20 feet in 20 years. Groundwater continued to rise in the summer of 1995. County drilled holes in vault and added French drain. November 1995 new 12" force main and temporary pump added. Continued year-round pumping due to groundwater, irrigation from school, backwash from treatment plant, and neighboring homes sump pumps.		
6.72	6		County Map		Cross lot drainage and street ponding		
6.73	6		County Map		Street ponding and insufficient culvert capacity		
6.74	6		County Map		Insufficient swale capacity and street ponding		
6.75	6		County Map		Insufficient swale capacity, street ponding, and natural sump		
6.76	6		County Map		Insufficient swale capacity, cross lot drainage, street ponding, sump conditions, insufficient culvert capacity and sand/silt		
6.77	6		County Map		Erosion		
6.78	6		County Map		Erosion and sand/silt		
6.79	6		County Map		Erosion and Sand/silt		
6.80	6		County Map		Erosion and Sand/silt		
6.81	6		County Map		Erosion and Sand/silt		
6.82	6		County Map		Street ponding and natural sump		
6.83	6		County Map		Erosion and cross lot drainage		
7.1	7	"Drainage Problems in Los Osos Area"	County File (no date, 11/76)	Properties on both sides of Paso Robles between 15th	Includes surface drainage and septic tank failure. 15 homes flooded. Depths of 4' were recorded on		

*Item added since submittal of WP I.

ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
				and 18th	16th just north of Paso Robles. Installed side culverts to reduce road flooding.		
7.2	7	Barbara Coleman	County File	1503 17th Ave & Corner of 17th Ave at Paso Robles Ave	Water ponds at base of driveway and remains for several days.		
7.3	7	Barbara Hope	County File	16th @ Paso Robles	Flooded home	Maintain exist drainage ditch	
7.4	7	CO photos 3/9/95	County File	16th St. @ Paso Robles	Water recharges from groundwater.		
7.5	7	County Note	County File	16th @ Paso Robles	Severe ponding		
7.6	7	County Note	County File	Paso Robles between 15th and 16th Streets	Severe ponding		
7.7	7	Irina Hanley	County File	1360 Paso Robles Ave	House flooded due to septic tank "backup" during storm. Drainage enter the tank via the leach field, which 20' from the exiting CO drainage system	Fix the existing adjacent drainage system to provide better drainage.	
7.8	7	John DeBacker	Blue Ribbon Survey, 1995-96	1539 18th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residence and or garage flooding, and prolonged pumping of yard and residence and or garage.		
7.9	7	John Lopez & Julie Lopez	Blue Ribbon Survey, 1995-96	1491 16th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residence and or garage flooding, prolonged pumping of yard and residence and or garage, and existing storm drainage facilities overcome by storm volumes.		
7.10	7	Kath Chaves & Louis Chaves	Blue Ribbon Survey, 1995-96	1495 16th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residence and or garage flooding, prolonged pumping of yard and residence and or garage, and existing storm drainage facilities overcome by storm volumes.		
7.11	7	Laura John	County File	1515 17th St.		Install culvert in front of house to divert water into the existing ditch on Paso Robles Ave Request house next door stops her septic system for flooding her property	
7.12	7	Leonor Cunningham	Blue Ribbon Survey, 1995-96	1488 16th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residence and or garage flooding, prolonged pumping of yard and residence and or garage, and existing storm drainage facilities overcome by		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
					storm volumes.		
7.13	7	Mark Seaton	Blue Ribbon Survey, 1995-96	1480 16th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residence and or garage flooding, prolonged pumping of yard and residence and or garage, and existing storm drainage facilities overcome by storm volumes.		
7.14	7	Mr & Mrs S. Asuncion	Blue Ribbon Survey, 1995-96	1475 16th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residence and or garage flooding, prolonged pumping of yard and residence and or garage, and existing storm drainage facilities overcome by storm volumes.		
7.15	7	Paul Reynold	County File	15th Street	House on 16th St. (white house" is digging wall and is concerned that water will back up to flood neighbors		
7.16	7	Richard Miller	Letter to County	1503 17th Street	County response to problems.	Clean ditches in the vicinity of 17th St. and Paso Robles Ave. Drainage across private property in the vicinity of 10th St. and El Moro Ave. Install drain pipe from 11th St. to the pumps at 8th & El Moro	
7.17	7	Robert & Leigh Livick	County File	1475 16th Street	Flooding of homes, septic tank failure, flooding of intersection.	Continue storm drain along north side of Paso Robles St. to 15th St. to advert it from crossing properties.	
7.18	7	Sandy Robinson & John Robinson	Blue Ribbon Survey, 1995-96	1450 15th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residence and or garage flooding, prolonged pumping of yard and residence and or garage, and existing storm drainage facilities overcome by storm volumes.		
7.19	7	SLO CO	County File	Paso Robles Ave between 14th and 18th Ave			
7.20	7	South Bay Community Council	County File 2/24/83	16th @ Paso Robles			
7.21	7	South Bay Sun Bulliten	3/3/83	16th Ave @ Paso Robles, Lake Los Osos	Coverage of South Bay Community Council meeting. Groundwater quoted by Clinton Milne to		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
					be 18" below surface.		
7.22	7	Tom Esser	County File	Downhill from 1438 16th Street	Flooding of homes, ponding of water on 16th St. Added gutter on one side of street to 100' from intersection, other still erodes. Installed swale towards South Bay Blvd. but ineffective.		County allowed homes to be built in low lying areas and CO created "quick fixes" that need to be reengineered.
7.23	7	Wilkes/Kwid/Boyd	County File	Paso Robles between 16th & 17th Streets	Sump conditions seen during field trip on 10/19/95		
7.24	7	William Moore	County File	1548 15th Street	Water from 15th Street flood garage at 1546 15th St., and house on occasion. Water comes downhill from the street across the front yard of the adjacent property to the east and uphill then spills into driveway.	Repair exiting swale and berm. Better maintenance program.	
7.25	7	Kathleen N. Chavez	EDA Survey 7/11/96	1400 block of 15th & 16th St. Paso Robles St.	Water on 16th begins on 15th in both the 1400 & 1500 blocks. 7 homes flooded Mar 95. Water towers on 16th overflow to culvert.	1. Drain on 15th and 16th St. 2. Curbs on streets so water does not go through properties	Use pipes instead of culverts. Culverts ineffective and dangerous
7.26	7	Public Comments	CSA J9 Meeting 7/11/96	1442 15th Street			
7.27	7		County Map		Erosion and silt/sand		
7.28	7		County Map		Erosion		
7.29	7		County Map		Erosion, Insufficient culvert capacity, street ponding, and natural sump		
7.30	7		County Map		Cross lot drainage, street ponding, and natural sump		
8.1	8	County Note	County File	Ramona @ 10th	Water overtops 10th Large pond in house at NW corner No ponding on 9th N of Ramona Water crosses through backyard of 1672 8th St. (1660?) Minimal flow at 8th St.		
8.2	8	Dandra Grisback	County File	1700 10th St.	Contacted Risk Management regarding flood damage in 1992		
8.3	8	Jane Lovett	County File	1703 11th Street	County response to Ramona St. drainage problems.		
8.4	8	John Richards	EDA Survey 10/23/96	1650 8th Street	8" deep by 30' wide river in front of home runs into neighbors garage and under their home. Even during dry weather, car wash and/or landscape watering sends water into neighbors home.		
8.5	8	Lorna Bostwick	EDA Phone Conversation	1616 6th Street	Ramona lake created by water flowing from Ramona above 11th, from both sides of 11th.		Pictures of: Drain on east side of 7th

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
			and meeting 10/29/96. Walk site 11/22/96		When the lake overflows 10th St. if follows a diagonal course through and between properties on 10th, 9th, 8th & 7th St. An existing inlet below Ramona is insufficient. The drain extends under Ramona and daylights into a hole on the left side of a 1635 7th St. Flow goes under their driveway and down the side of a 1625 7th St. Overflow follows the same course. Water sheet flows across the backyard and down the north side of 1616 6th St. Water continues to 5th, 4th and then to the Bay Water is coming sooner and with more volume due to more upstream people diverting the water.		below Ramona. Water entering driveway at 1635 7th St. and going to left side of 1625 7th St. Water sheeting across backyard of 1625 7th St. towards back fence of 1616 6th St. Channalized water passing through backyard of 1616 6th St. Channalized water crossing 6th St. diagonally to Pismo and down to Bay
8.6	8	Pavvo Ogren	County File	County Memo to Noel King	7th Street/Ramona swale	Linear Park along Pismo Avenue	
8.7	8	Sandra Grisback	County File	1700 10th St.	Property flooding	Dig and remove all debris from the basin Barricade area during events Plug culvert under 11th St. to keep water from entering basin. Pipe from basin to Ramona Ave to Sweet Springs Build wall around house Raise house County purchase house (lake Ramona)	
8.8	8	Scott Martin	County File	4th St. @ Pismo Ave		Purchase existing home for sale for incorporation of sewer and storm drain lift station.	
8.9	8	SLO CO	County File	The Ramona Avenue Pismo Avenue swale from 11th Ave west to 3rd Ave			
8.10	8	SLO CO	County File	1700 10th Ave			
8.11	8	SLO CO	County File	Linear Park along Pismo Ave	Erosion		
8.12	8	Wayne Gilder	Letter to EDA 10/28/96	1056 Ramona Ave	During rains, Ramona is flooded between 10th to 11th Street. Road closed, cars stuck. Due to road closure, residents must pass through a dangerous intersection. Septic tank failures		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
					causing flooding of home.		
8.13	8	Carol Ann Reinman	EDA Survey 7/11/96	3rd between El Moro and Pismo	Asphalt in front of 1520 3rd St. buckles and is inundated every winter. Very slow percolation	1. Add more gravel road base	County maintenance
8.14	8	Lorna Bostwick	Blue Ribbon Survey, 1995-96	1616 6th Street	Wash through yard		
8.15	8	Richard Ruffel	Blue Ribbon Survey, 1995-96	1681 9th Street	Wash through yard		
8.16	8	Seth & Sansaca Landrum	Blue Ribbon Survey, 1995-96	1630 7th Street	Septic tank problems, wash through yard, standing water in yard, multiple incidences of residential and or garage flooding, and failure of existing storm drain facilities		
8.17	8	Betty Field-Haley & John Haley	County File	4th at Pismo	Water accumulates and floods across 4th St. at Pismo. Pismo appears to be a mini-river		
8.18	8		County Map		Erosion		
8.19	8		County Map		Inadequate culvert capacity and cross lot drainage		
8.20	8		County Map		Erosion and natural sump conditions		
8.21	8	Henry Gentry	Ramona swale ltr Oct 96	1651 8th Street	Property located in the Ramona swale. During intense or even less than intense rainfall, the runoff concentrates at the south end of driveway, cascades northerly over driveway and against garage door, then flows west along the north side of property.		see sketch
8.22	8	Richard Ruffel	Ramona swale ltr 11/4/96	1684 9th Street	Water from Ramona at 9th and from "Lake Ramona" accumulates at driveway and into channel that was constructed by resident. The problem is exasperated when "Lake Ramona" spills. Up to 20 wheel barrels of sand have been removed from front of home after bad storm.		see sketch
9.1	9	Don Asquith	Letter to County 10/6/96	14th & 15th Between Ramona & Pismo	Closed depression on 14th & 15th Streets between Ramona and Pismo.		
10.1	10		County Map		Erosion and cross lot drainage		
11.1	11		County Map		Erosion, insufficient culvert capacity and street ponding		
12.1	12		County Map		Cross lot drainage, sump conditions, and private property obstruction		
13.1	13		County Map		Sand/silt		
13.2	13		County Map		Sand/silt, inadequate culvert capacity, and street ponding		
13.3	13		County Map		Sand/silt, inadequate culvert capacity, and street		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
					ponding		
13.4	13		County Map		Silt/sand		
14.1	14		EDA Survey 7/11/96	Doris runoff to Rosina to Pecho (opposite school)			
14.2	14	"Drainage Problems in Los Osos Area"	County File (no date, 11/76)	Pecho @ Grove	Two leach fields flooded		
14.3	14	Bod Hoffmeyer	Blue Ribbon Survey, 1995-96	510 Henrietta	Septic tank yard, wash through yard, and standing water in yard.		
14.4	14	County Note	County File	Pecho @ Henrietta		Culvert	
14.5	14	County Note	County File	Pecho @ Binscarth	Ponding south to east		
14.6	14	Glen Priddy	Letter to County	Sunnyside and Monarch Grove Schools	Flooding of LOVR at pedestrian access.		
14.7	14	Jo Olmstead	Blue Ribbon Survey, 1995-96	308 Grove	Septic tank problems, wash through yard, standing water in yard and multiple incidences of residence and or garage flooding.		
14.8	14	Melis Wegner	Blue Ribbon Survey, 1995-96	310 Grove	Septic tank problems, wash through yard and standing water in yard.		
14.9	14	Public Comments	CSA J9 Meeting 7/11/96	Southside of Grove Henrietta has an underground spring			
14.10	14	Serma Benson	Blue Ribbon Survey, 1995-96	305 Grove	Septic tank problems, wash through yard and standing water in yard.		
14.11	14	SLO CO	County File	Pecho Rd and Grove Ave			
14.12	14	Thomas & Mary Housel	County File	348 Binscarth Road	Almost every winter the septic tank fills with water. Have it pumped and within 6 hours it refills. Receive runoff from adjacent properties.		
14.13	14	Gradon Stinton	County File	1952 Pine	Contacted Risk Management regarding flood damage in 1992		
14.14	14	James Bower	EDA Survey 7/11/96	Binscarth between Nancy & Maple	Total runoff and erosion south of LOVR dumped on private property north of LOVR. Upland retention basins overflow on to unimproved streets and flows run through yards instead of staying in the streets	1. Storm drain for LOVR and Broderson 2. Curb & Gutter for Ravenna and Palisades north of LOVR 3. Debris basin south of Highland, horizontal diversion collect, treat, recharge 4. Private retention basins for upland property owners	CSA No. 9 community wide drain system for buildout. NEP requires "clean water", min. debris, sediment removal. F&G wants water in Los Osos Creek for steelhead
14.15			County Map		Erosion, cross lot drainage, Sand/silt, and inadequate culvert capacity		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
14.16			County Map		Erosion, inadequate culvert capacity, cross lot drainage, and Sand/silt		
15.1	15	County Note	Letter to County	Doris @ Binscarth	Ponding	Create dip crossing to the north	
15.2	15	Public Comments	CSA J9 Meeting 7/11/96	Dorris @ Binscarth			
16.1	16		EDA Survey 7/11/96	Erosion south of Highland			
16.2	16	Jeffery & Karen Huskey	County File	2316 Bayview Heights	Flooding primarily from Bayview Heights Dr. Sandbagging was necessary	Regrade Bayview Heights, create surface impoundment's, curb and gutter, storm drains.	
16.3	16	Michael Read	County File County File	1234 Bayview Heights	Contacted Risk Management regarding flood damage in 1992		
16.4	16	Public Comments	CSA J9 Meeting 7/11/96	1818 LOVR			
16.5	16	Public Comments	CSA J9 Meeting 7/11/96	Calle Cordoniz "river" empties into existing home at 2595 Bay Vista			
16.6	16	SLO CO	County File	LOVR from 10th Ave to the area west of Palisades Ave			
16.7	16		EDA Survey 7/11/96	Ramona & Pine	Roadbed breaking up from high ground water		
16.8	16		EDA Survey 7/11/96	Pine Ave downstream of Henrietta, west side of street	Sheet flow down Pine (15 cfs Jan 95). Sandbagging required for homes on north side of Henrietta	1. Basin for AREA 5 2. Storm drain pipe on Pine into bay	Have information on sediment loading, flowrates and percolation for AREA 5
16.9	16		EDA Survey 7/11/96	510 Henrietta	Sandbagging required to save lower story of home.		
16.10	16		EDA Survey 7/11/96	Ramona West of Pine			
16.11	16		EDA Survey 7/11/96	LOVR 10th to Broderson			
16.12	16		EDA Survey 7/11/96		Floods of 1994 eroded Ash causing ponding at 536 Ash. Water drains along side of house and through backyard	1. Grade Ash	Improvements can only increase property values, thus increase tax base
16.13	16	"Drainage Problems in Los Osos Area"	County File (no date, 11/76)	Don @ Mitchell	Two properties lost use of leach fields		
16.14	16	Barbara McGee	County File	Skyline @ Ash	Contacted Risk Management regarding flood damage in 1992		
16.15	16	Dorthy Tomilson	County File	587 Ash St.	Contacted Risk Management regarding flood		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
					damage in 1992		
16.16	16	Greg Norton	County File	590 Skyline	Contacted Risk Management regarding flood damage in 1992		
16.17	16	Jack Feist	County File	550 Ash St.	Contacted Risk Management regarding flood damage in 1992		
16.18	16	Jeffery Edwards	County File	Pump Station at Don & Mitchell	Existing pumps could not keep up with storm flows during storm event of 3/10/95	Add more pumps or increase size of existing pumps.	
16.19	16	Mrs King	County File	Skyline @ Ash	Contacted Risk Management regarding flood damage in 1992		
16.20	16	Public Comments	CSA J9 Meeting 7/11/96	Don, Mitchell, and Los Olivos near Rain Tech			
16.21	16	Robert Hoffmeyer	EDA Survey 7/11/96	Corner of Don & Mitchell	End flow point for water sheet-flowing north of Fern Ave, Don Ave and west side of Pine. Pooled water 3' deep and 100' dia (Jan 95)	1. Storm drain along Pine, Don and Fern and retain AREA 5 flows. 2. Install gravity drainage to replace the pressurized drain pipe into the bay (Pump suction at SE corner of Don @ Mitchell)	Would like to see storm water storage and aquifer recharge
16.22	16	SLO CO	County File	The Pine Ash Broderson area			
16.23	16	Tony & Judy Campisi	EDA Survey 7/11/96	Ash between Pine and Broderson	During extreme storms ponding occurs at Broderson & Skyline. Flow through upper properties-down Ash-through lower properties and out to Pine	1. Storm drain for Skyline at Broderson	Use tax revenues to grade and pave all Los Osos streets. Coordinate drainage improvements with sewer improvements.
16.24	16	Walter Karpourczi	County File	530 Ash St.	Contacted Risk Management regarding flood damage in 1992		
16.25	16	Walter Karpowicz & Margaret Karpowicz	Blue Ribbon Survey, 1995-96	530 Ash	Wash through yard and multiple incidences of residence and or garage flooding.		
16.26	16	Public Comments	CSA J9 Meeting 7/11/96	Pine, Ash and AREA 5 (from Exhibit) should be extended beyond Henrietta sump. AREA 5 extended from LOVR uphill of Highland			
16.27	16		County Map		Sand/silt		
16.28	16		County Map		Sand/silt		
16.29	16		County Map		Sand/silt		
16.30	16		County Map		Sand/silt and erosion		

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
16.31	16		County Map		Erosion, inadequate culvert capacity, street ponding and sand/silt		
16.32	16		County Map		Sump area		
16.33	16		County Map		Erosion and sand/silt		
16.34	16		County Map		Inadequate culvert capacity		
16.35*	16	Robert Hoffmeyer	CSA 9J Mtg 6/3/97	Ash St erosion	Surface flows erode Ash Street carrying deposits onto and down Pine Ave for deposition at Mitchell Drive.	Provide sediment trap on Ash Street to contain sediments.	
17.1	17	SLO CO	County File	Santa Ynez at 9th Ave			
17.2	17	SLO CO	County File	Santa Ynez at 11th Ave			
17.3	17	Esther Susoeff	Blue Ribbon Survey, 1995-96	1758 7th Street	Septic tank problems and standing water in yard		
17.4	17	Norma Galloway	Letter to County	Central Coast Coffee	Contacted Risk Management regarding flood damage in 1992 Possibly due to the poor performance of the William Brothers basins		
17.5	17	Larry O'Hanlon	County File	1836 6th Street	Rear property floods lot. This rear property receives flows from the street.		
17.6	17	D. Paul Wilson	EDA Survey 7/11/96	9th St. @ Santa Ynez	Water flows past channel on Santa Ynez and down 9th Street flooding 1976 9Th	1. Storm swale at 9th & Santa Ynez could be lowered to ensure high velocity flow down 9th St. from Los Olivos is intercepted and directed down Santa Ynez 2. Berms to contain water in street	see sketch
17.7			County Map		Sand/silt and cross lot drainage		
17.8			County Map		Sand/silt and cross lot drainage		
17.9			County Map		Sand/silt and cross lot drainage		
17.10			County Map		Erosion, inadequate swale capacity, cross lot drainage, private property obstruction, and sand-silt		
17.11			County Map		Erosion and street ponding		
17.12			County Map		Erosion and street ponding		
17.13			County Map		Cross lot drainage and street ponding		
18.1	18		County File	Nipomo @ 13	Water ponding even in light storms		
18.2	18	Daniel & Kathie Sperow	EDA Survey 7/11/96	Nipomo @ 12th	Floods 1878 12th St. Most water appears to come off Nipomo. Problem was worsened due to County regarding shoulder area	1. Storm drain	Regrade and improvements of contributing properties should require retention. Increase in building has

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
							increase flooding over the years
18.3	18	Linsy Jackson	EDA Survey 7/11/96	1877 12th Street	Water runs under walls		phone conversation
18.4	18	Public Comments	CSA J9 Meeting 7/11/96	1878 12th Street Nipomo @ 13th St.			
19.1	19	County Note	County File	Santa Ynez @ Mountain View	Ponding		
20.1	20	SLO CO	County File	Santa Ynez at Fairchild west to 11th Ave			
22.1	22	"Drainage Problems in Los Osos Area"	County File (no date, 11/76)	Los Olivos	Surface flooding of 1173 Los Olivos and the next three properties westerly		
22.2	22	Clinton Milne County Engineer	County Memo 3/6/92		Basin at Los Olivos and Fairchild designed to handle LOVR widening runoff, 50 yr-10 hr event. An inlet was installed to reduce the flooding along Los Olivos and Fairchild. This basin was not intended to fix this flooding area.		
22.3	22	South Bay Community Council	County File 2/24/83	Los Olivos @ PTK Elect Don @ Mitchell			
23.1	23		County Map		erosion and sand/silt		
23.2	23		County Map		erosion and sand/silt		
23.3	23		County Map		sand/silt		
23.4	23		County Map		sand/silt		
23.5*	23	Mark Connelly	Ltr from Greg M. 6/3/97	1782 Sage Ave	The County maintains a ditch along Sage to its northerly end. As part of the subdivision, a drainage easement was dedicated on his property, which is not regularly maintained. Due to sediment loading, water in the street ponds up to two feet making driveway inaccessible. Homes do not flood.		
24.1	24		County Map		Street ponding and sand/silt		
24.2			County Map		Private property flow obstruction		
25.1	25		EDA Survey 7/11/96	Overflow of County Basin			
25.2	25	"Drainage Problems in Los Osos Area"	County File (no date, 11/76)	Cabrillo Estates	Erosion problems from runoff originating from Cabrillo Estates and carried north from Travis Way		
25.3	25	CSA #9 Advisory Group Meeting	9/30/82	Erosion problems	Erosion problems from Cabrillo Estates. End of Rodman Drive and north of Travis Drive		
25.4	25	John & Rosella	Letter to County	2500 Quail Lane			

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ITEM	DRAIN AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
		Pavelich					
25.5	25	South Bay Community Council	County File 2/24/83	Erosion of Cabrillo Estates at end of Rodman			
25.6	25	Susy Bauman	Letter to County	2626 Rodman Dr.	Property is in a low area that receives drainage from adjacent properties and tends to accumulate in septic tank		
25.7	25	Wayne Hoit	EDA Survey 7/11/96	Monarch Grove	Cabrillo Estates basin has overflowed and flooded the Monarch Grove area	1. County should scarify bottom of basin at least once per year to increase basin percolation. 2. Route basin drainage into pipe which connect to exist pipe on east side of golf course (installed for Sunset Terrace project)	
25.8	25		County Map		Sand/silt		
25.9	25		County Map		Sand/silt		
25.10	25		County Map		Sand/silt		
25.11	25		County Map		Sand/silt		
26.1	26		County Map		Erosion, cross lot drainage, street ponding and silt -sand deposition		
27.1	27	Mitch & Amy Alter-Gantz	Blue Ribbon Survey, 1995-96	2210 Cimarron	Wash through yard and multiple incidences of residence and or garage flooding		
27.2	27	SLO CO	County File	LOVR at Cimarron			
27.3	27		County Map		Erosion, cross lot drainage, street ponding, and sand/silt		
27.4*	27	Jennifer McCalb	CSA 9J Mtg 6/3/97	LOVR at Cimarron	Water floods over Cimarron at LOVR causing dangerous traffic conditions.	Culvert under LOVR and down Sombrero with outlet north of the existing Agricultural fields.	
		"Drainage Problems in Los Osos Area"	County File (no date, 11/76)		About 50 "bird baths", principally the Baywood Park area.		
		County Board of Supervisors	Board Order 10 4/12/83		Construct Walker Ditch and culverts in the Paso Robles sump Install pump station with Bay discharge at 8th @ El Moro Install pump station with Bay discharge at Don @ Mitchell Install pump station at Los Olivos with discharge easterly in Los Olivos, northerly in Fairchild,		

*Item added since submittal of WP I.

ITEM	DRAIN. AREA	NAME OF RESPONDEE	FILE	LOCATION OF PROBLEM	RESPONDEES DESCRIPTION	RESPONDEES SOLUTION	RESPONDEE'S COMMENTS
					easterly in Santa Ynez to an existing drainage easement under S. Bay Blvd. and into Eto Creek.		
		Hazard Mitigation Grant Program Application	1/24/96	Flooding problems began to be documented with the storms of 1978 & 1983.	Population of the area jumped from a few thousand to 14,000 between the late 1960's and to the end of the 1980's.		
		Unknown	County File 3/78		In 1978 the Army Corps indicated that minor channel damage occurred as a result of flooding. It is likely that minor localized flooding of 2 to 3 homes occurred as well.		

*Item added since submittal of WP I.

ATTACHMENT TO SWAMP MAP #1
FOR
EDA DRAINAGE AREA STUDY 6 / 97

IN INTERPRETING THIS MAP / LEGEND THE FOLLOWING CONDITIONS MUST BE ACKNOWLEDGED:

1) IN NO WAY DOES THIS DOCUMENT CLAIM TO CONTAIN ALL OF THE ADDRESSES OF PEOPLE AND PROPERTIES SUSTAINING FLOOD / STORM DAMAGE AND PROBLEMS DURING THE WINTER STORMS OF 1995.

2) THE ADDRESSES DESIGNATED ON SWAMP MAP #1 WERE DERIVED FROM LISTS DEVELOPED BY INTERESTED RESIDENTS AT LOCALLY ORGANIZED MEETINGS, WERE THE RESULTS OF NEIGHBORS CANVASSING DOOR TO DOOR IN THEIR NEIGHBORHOODS, WERE TAKEN FROM LETTERS SENT BY RESIDENTS TO COUNTY OFFICIALS AND WERE TAKEN FROM DOCUMENTS PREPARED BY E.D.A.

3) NOT ALL ADDRESSES EXPERIENCING 1995 STORM / FLOODING PROBLEMS LOCATED IN ZONE J ARE LISTED AS:

A) NOT ALL RESIDENTS ARE / WERE AVAILABLE FOR COMMENT AND NO ADDRESS WAS LISTED WITHOUT DIRECT REFERRAL AS NOTED IN #2 ABOVE.
B) NOT ALL RESIDENTS ARE / WERE WILLING TO DISCUSS THEIR PROBLEMS WITH THOSE CANVASSING NEIGHBORHOODS.
C) SOME OF THE SOURCES USED FOR THE INFORMATION PRESENTED ARE NOW TWO AND A HALF YEARS OLD, AND CURRENT OWNERS OR RENTERS MAY BE DIFFERENT AND MAY BE UNAWARE OF PAST PROBLEMS OR POTENTIAL FUTURE PROBLEMS.

4) CONDITIONS HAVE CHANGED SINCE THE 1995 STORMS / FLOODING AS ZONE J HAS MADE SOME CHANGES, INDIVIDUAL RESIDENTS HAVE ATTEMPTED TO SOLVE THEIR OWN PROBLEMS BY VARIOUS MEANS AND OTHER RESIDENTS MAY NOW EXPERIENCE PROBLEMS BECAUSE OF THE ABOVE CHANGES.

5) PROBLEMS AFFECTING LARGE AREAS, SUCH AS FOUND ALONG LOS OSOS VALLEY ROAD IN THE CIMMERON AREA AND BETWEEN MONARCH SCHOOL AND THE SHOPPING DISTRICT, THE DOCUMENTED PROBLEMS AND FAILURES OF THE RETENTION PONDS FOR THE CABRILLO ESTATES AND THE BAYVIEW HEIGHTS DEVELOPMENTS AS WELL AS THE EFFECTS OF HIGH GROUND WATER IN VARIOUS AREAS HAVE BEEN OMITTED FROM THIS MAP / LEGEND.

6) AND ANY NEW COMMUNITY SURVEY WOULD BRING FORTH MANY MORE PROBLEMS THAT HAVE NOT YET COME TO LIGHT. AN EXAMPLE CAN BE FOUND IN THE JUNE 3RD 1997 DRAINAGE BLUE RIBBON COMMITTEE MEETING AT WHICH NEW PROBLEM RELATED TO THE 1995 FLOODING WERE BROUGHT TO LIGHT.

FLOOD RELATED DAMAGE CATEGORIES

DAMAGE CATEGORIES TO PERSONAL PROPERTY

1) SEPTIC PROBLEMS
2) WASH THROUGH YARD
3) STANDING WATER IN YARD
4) WATER ENTER HOUSE/GARAGE/BUSINESS ONCE
5) WATER ENTER HOUSE/GARAGE/BUSINESS MULTIPLE DUE TO SURFACE FLOOD
6) WATER ENTER HOUSE/GARAGE/BUSINESS MULTIPLE DUE TO SURFACE FLOOD AND RISING GROUND WATER
7) PUMPING NECESSARY TO CLEAR YARD DUE TO #5
8) PUMPING NECESSARY TO CLEAR YARD DUE TO #6
9) PUMPING NECESSARY TO CLEAR HOUSE/GARAGE DUE TO #5
10) PUMPING NECESSARY TO CLEAR HOUSE/GARAGE DUE TO #6
11) PUMPING NECESSARY OVER A PROLONGED PERIOD DUE TO #6
12) EXISTING STORM WATER CONTAINMENT FACILITIES OVERCOME BY SURFACE FLOODING

FLOOD ADDRESS / CATEGORY / PHONE LIST

EL MORO CORRIDOR

NAME		ADDRESS	CATEGORIES	PHONE
Mark Alfirevic	8	1361 4th	1	528-5246
Alice Alirevic				
Richard Bruner	3	1325 4th	1,2,3,4	528-1637
Barbara Bruner				
Lesa Duncan	6	1346 4th	1,2,4	528-7226
Laurie Johnson	4	1331 4th	1,2,3,5	
Ronald Lyman	7	1360 4th	2,3	528-4650
Edie Lyman				
Evelyn Moberg	5	1334 4th	2,3	528-3206
Steven Moberg				
Donald & Eldra Avery	2	1313 4th	1,2,3	528-6114
Tom Gutry	17	1373 5th	2,3,4	
Jeff Loring	9	1319 5th	2	528-0911
Margen Loring				
Deena Richmond	12	1345 5th	1,2,4	528-2431
Bill Richmond				
Sandy Vidak	16	1368 5th	2,4	
Don Walters	13	1346 5th	2,4	
Donna Walters				
Jim Mac Donald	10	1337 5th	2	528-7680
Barry & Nancy Rice	15	1355 5th	2	528-4943
Tony & Ann Skelton	11	1339 5th	2	
August Gioia	14	1352 5th	2	
Sandy Griswold	16	1368 5th	2	
Lorna Bostwick	26	1616 6th	2	528-5392
Debby Cardinali	25	1415 6th	3,7	528-2950
Jim Shisler				
Margie Dist	19	1378 6th	1,2,3,5,7,9	534-0201
Ray Fitch	20	1379 6th	2,3,7	528-2783
Lynn Fitch				
Bill Hall	22	1388 6th	1,2,3,5,7,9	528-4074

Mackie Hall					
Tony Hall					528-4118
Deb Hutchins	21	1380	6th	1,2,3,5,7,9	528-3227
Tony Kwid	23	1400	6th	1,3,6,8,10,11,12	528-0169
Katherine Kwid					
Mary Martin	24	1412	6th	1,3,6,8,10,11,12	528-8632
CeCe Simpson	18	1361	6th	2,4	528-1098
Joyce Stockton					
John Ball	28	1412	7th	1,3,6,10,11,12	528-0429
Allison Ball					
Don Bearden	29	1421	7th	1,3,6,10,11,12	528-6216
Judith Reilly	27	1411	7th	1,3,6,8,10,11,12	528-3579
Danielle Rogers	29	1421-B	7th	1,3,6,8,10,11,12	528-4124
Esther Susoeff	31	1758	7th	1,3	528-5905
Seth Landrum	30	1630	7th	1,2,3,6,12	528-7534
Zanzara Landrum					
George Boddeker	33	1421	8th	1,3,6,10,11,12	528-5740
Denise Boddeker					
Ruth Coafer	32	1411	8th	1,3,6,10,11,12	528-1466
Kathy West	44	1431	8th	1,3,6,10,11,12	
Bill Fellows	34	1405	9th	1,2,3,4	528-3872
Richard Ruffel	35	1681	9th	2	929-1343
Joe Forlippa	37	1441	10th	1,2,4	528-4861
David Whitehead	36	1421	10th	1,2,4	934-0094(h)
Valerie Bailey	42	915	El Moro	1,3,6,8,11,12	534-1003
Brian Bailey					
Glen Berkovitz	43	870	El Moro	1,3,6,10,11,12	310-397-4105
Jane Berkovitz					
Glenn E. Harrell	40	890	El Moro	1,2	
Jim Marak	41	899	El Moro	1,3,6,8,10,11,12	528-2184
Vera Marak					
ROMONA SWALE					
	58	1600	4th	2,3	
Scott Martin	59	1597	4th	2,3	

Don Fox	60	1598 4th	3	
Suzan Berry	61	1600 5th	1,4	
Richard Berry				
Lynn Nagahara	62	1605 6th	2,4	528-7373
Ken Nagahara				
Pat Johnson	63	1612 6th	1,2,4	528-2227
		1625 7th	2,3,5	
Mike Gorman	64	1638 7th	1	
Dorothy Pierce	66	1672 8th	2	
Dianne Draeger	67	1657 8th	2	
Hank Gentry	68	1651 8th	2,3,5	
Tom Cujini	69	1641 8th	2	
John Richards	70	1650 8th	2	
	71	1660 8th	2	
	72	1673 9th	2	
	77	1690 9th	2,3	
	78	1696 9th	2,3	
Josie Freitas	73	1030 Ramona	2,3	
Packard	74	1056 Ramona	2,3	
Jane Lovett	75	1703 11th	1,3,6	
Ed Quitana	76	1695 11th	road access problems	

FLOOD ADDRESS / CATEGORY / PHONE LIST

GROVE

NAME		ADDRESS	CATEGORIES	PHONE
Serma Benson	52	305 Grove	1,2,3	528-2395
Jo Olmstead	53	308 Grove	1,2,3,6	528-5155
Melia Wegner	54	309 Grove	1,2,3	528-7424

ASH

NAME		ADDRESS	CATEGORIES	PHONE
Walter Karpowicz	55	530 Ash	2,5	528-1463
Margaret Karpowicz				
Dorthy Tomilson	56	567 Ash	2,5	528-7701

HENRIETTA

Bob Hoffmeyer	57	510 Henrietta	2	534-9535

FLOOD ADDRESS / CATEGORY / PHONE LIST

16TH AND AJOINING AREA[1]

NAME		ADDRESS	CATEGORIES	PHONE
Mr&Mrs S. Asuncion	45	1475 16th	1,2,3,4,5,7,9,11,12	534-1633
Kathy Chaves	46	1495 16th		528-5345
Louis Chaves				
Leonor Cunningham	47	1488 16th		534-0925
John Lopez	48	1491 16th		528-5238
Julie Lopez				
Sandy Robinson	49	1450 15th		528-3728
John Robinson				
Mark Seaton	50	1480 16th		528-8688
John DeBacker	51	1539 18th	1,2,3,4,5,7,9,11	528-6522

[1]At least seven addresses not listed above need to be added to this list but were no available at this printing.

AREA	Santa Ysable, Pasadena to 600 Block			INLET		OUTLET	COND		PIPE		Q
1	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
1.1	1	SANTA MARIA	SW SANTA MARIA @ PASADENA	CMP CULVERT	SUMP	SWALE	9" SILT	18	40	CMP	3.6
1.2	2	PASADENA	PASADENA AT PARK	CROSS GUTTER	SUMP	SWALE				CONC	

AREA	Santa Lucia			INLET		OUTLET	COND		PIPE		Q
2	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
2.1	1	4TH	N END OF 4TH ST	1'x1' TRAP CHNL	OPEN	BAY		NA	20	AC	109

AREA	Santa Ysable, 700 Block to 1200 Block			INLET		OUTLET	COND		PIPE		Q
3	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
3.1	1	SANTA YSABLE	SANTA YSABLE @ 10TH	CMP CULVERT	SUMP	SWALE		18	60	CMP	10

AREA	Santa Ysable, 1300 Block to 1600 Block			INLET		OUTLET	COND		PIPE		Q
4	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
4.1	1	SANTA YSABEL	NE SANTA YSABLE @ 14th	CMP CULVERT	SUMP	SWALE	9" SILT	18	60	CMP	10
4.2	2	11TH	N END OF 11TH	TYPE C3	SUMP	10TH		18	250	ACP	10

AREA	Santa Ysable, 1600 Block to South Bay Blvd.			INLET		OUTLET	COND		PIPE		Q
5	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
5.1	1	SANTA YSABEL	NE SANTA YSABLE @ 17tH	6x3 DI	SUMP	SWALE	GOOD	18	60	CMP	10
5.2	2	17th	SW 17th @ SANTA YSABLE	6x3 DI	SUMP	BASIN 5.C	GOOD	18	350	CMP	10

AREA 5 BASINS						INLET			OUTLET		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
5.A	4	ROAD BASIN	0.03 AF	TERMINAL	NA	NA	NA	NA	NA	NA	NA
5.B	5	ROAD BASIN	0.03 AF	TERMINAL	NA	NA	NA	NA	NA	NA	NA
5.C	6	SANTA YSABLE	0.35 AF	TERMINAL	PROJECT	15	ACP	NA	NA	NA	NA

AREA	El Moro Depression, 300 Block to 1400 Block			INLET		OUTLET	COND		PIPE		Q
6	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
6.1	1	2nd	NE 2nd @ EL MORO	4x3 DI	SUMP	BAY		18	150	CMP	10

AREA 7	Paso Robles Depression, 1400 Block and 1800 Block			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
7.1	1	PASO ROBLES	N PASO ROBLES @ 17TH	CULVERT	SUMP	SWALE	9" SILT	18	50	CMP	10
7.2	2	PASO ROBLES	BET 17TH & 18TH	CULVERT	SUMP	OMP 7.3		15	60	PVC	6
7.3	3	PASO ROBLES	NW PASO ROBLES @ 18TH	36" OMP	SUMP	SWALE		18	50	CMP	10
7.4	4	PASO ROBLES	SW PASO ROBLES @ 18TH	CULVERT	SUMP	WALKER CHNL		18	50	CMP	10
7.5	5	WALKER DITCH	PASO ROBLES @ 18TH	2'x2.5' CHNL	OPEN	54" CULVERT	GOOD	NA	700	CONC	183

AREA 8	Ramona/Pismo Depression, 300 Block to 1300 Block			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
8.1	1	RAMONA	S RAMONA @ 11th	CULVERT	SUMP	SWALE	PLUGGED	18	40	CMP	10
8.2	2	RAMONA	S RAMONA @ 9th	CULVERT	SUMP	SWALE		18	50	CMP	10
8.3	3	3rd STREET	BET PISMO & EL MORO	CULVERT	SUMP	BAY		24	50	HDPE	20

AREA 9	14th to 17th Depression between Pismo & Ramona			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
9.1	1	16TH	16TH BET PISMO & RAMONA	TYPE G3 INLET	SUMP	BASIN 9.A		6	350	PVC	1

AREA 9 BASINS						INLET			OUTLET		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
9.A	2	17TH ST BASIN	0.08 AF	RETENTION	CHNL		CONC	PROJ	6	PVC	CMPA

AREA 12	14th to 17th Depression between Pismo & Ramona			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
12.1	1	SOUTH BAY BLVD.	L.O. Jr. HIGH	CULVERT	SUMP	LOS OSOS CRK	GOOD	54	800	CMP	150
12.2	2	SOUTH BAY BLVD.	S OF PISMO	CULVERT	SUMP	LOS OSOS CRK	GOOD	28x20	100	CMPA	17

AREA 13	Monarch & Sea Pines			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
13.1	1	SOLANO	NE SOLANO @ BUTTE	4x2 DI	SUMP	BAY		18	40	CMP	10
13.2	2	SOLANO	SW SOLANO @ BUTTE	4x2 DI	SUMP	DI 13.1		18		CMP	10
13.3	3	PECHO VALLEY	SE PECHO @ MONTANA	4x3 DI	INTERCEPT	MONARCH		18		HDPE	10
13.4	4	PECHO VALLEY	E PECHO @ RODMAN	ARCH	SUMP	SWALE		43x27	100	CMPA	45
13.5	5	RODMAN	E PECHO @ RODMAN	TYPE 2 INLET	INTERCEPT	CMPA 13.4		24	34	CMP	20

AREA	The Broderson, Skyline & Pine Depression			INLET		OUTLET	COND		PIPE		Q
16	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
16.1	1	LOVR	E OF RAVENNA	CMP CULVERT	SUMP	SWALE		18	80	CMP	10
16.2	2	LOVR	E OF PALISADES	CMP CULVERT	SUMP	SWALE		36	80	CMP	55
16.3	3	N WOODLAND	BET RAVENNA & PALISADES	3x2 DI	SUMP	CMP 16.2		18	200	CMP	10
16.4	4	S WOODLAND	BET RAVENNA & PALISADES	3x2 DI	SUMP	DI 16.3		18	50	CMP	10
16.5	5	N MANZANITA	BET RAVENNA & PALISADES	3x2 DI	SUMP	DI 16.4		18	200	CMP	10
16.6	6	S MANZANITA	BET RAVENNA & PALISADES	3x2 DI	SUMP	DI 16.5		18	50	CMP	10
16.7	7	N LILAC	BET RAVENNA & PALISADES	3x2 DI	SUMP	DI 16.6		18	200	CMP	10
16.8	8	S LILAC	BET RAVENNA & PALISADES	3x2 DI	SUMP	DI 16.7		18	50	CMP	10
16.9	9	N MAR VISTA	BET RAVENNA & PALISADES	3x2 DI	SUMP	DI 16.8		18	200	CMP	10
16.10	10	BROADERSON	BET BROADERSON & RAVENNA	CHANNEL	SUMP	LOVR		NA	1100	CONC	
16.11	10	BAYVIEW HEIGHT	W BAY VIEW BET BAY OAKS & LOVR	4x3 DI	INTERCEPT	CURB DRAIN		12	40	RCP	3.5
16.12	11	BAYVIEW HEIGHT	E BAY VIEW BET BAY OAKS & LOVR	4x3 DI	INTERCEPT	DI 16.11		30	40	RCP	35
16.13	12	BAY OAKS	S SIDE E OF BAYVIEW HEIGHTS	4x3 DI	SUMP	DI 16.12		30	250	RCP	35
16.14	13	BAY OAKS	N SIDE E OF BAYVIEW HEIGHTS	4x3 DI	SUMP	DI 16.13		24	40	RCP	20
16.15	15	PALISADES	PALISADES @ LOVR	CULVERT	SUMP	DITCH		18	40	CMP	10
AREA 16 BASINS						INLET			OUTLET		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
16.A	14	SKYLINE BASIN	0.40 AF	TERMINAL	NA	NA	NA	NA	NA	NA	NA
AREA	Los Osos Valley South			INLET		OUTLET	COND		PIPE		Q
17	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
17.1	1	RAMONA	RAMONA NEAR SWEET SPINGS PARK	CULVERT	SUMP	SWALE	GOOD	12	70	CMP	3.5
17.2	2	RAMONA	RAMONA NEAR SWEET SPINGS PARK	TYPE C3 DI	SUMP	SWALE	GOOD	18	30	CMP	10
17.3	3	BROADERSON	SE RAMONA @ BRODERSON	6x3 DI	SUMP	SWALE	POOR	24	175	CMP	20
17.4	4	RAMONA	NE RAMONA @ BRODERSON	4x3 DI	SUMP	CMP	GOOD	18	30	CMP	10
17.5	5	LOS OLIVOS	LOS OLIVOS	RISER		BASIN (22.A)		6	1150	PVC	1
17.6	6	11TH	BET LOS OLIVOS & SN YNEZ	2x0.5' CHNL		10TH ST			250	CONC	
AREA	Santa Ynez & Mountain View			INLET		OUTLET	COND		PIPE		Q
19	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
19.1	1	MOUNTAIN	NW MOUNTAIN @ LOS OLIVOS	3x2 DI	INTERCEPT	SWALE	PLUGGED	12	80	CMP	3.5
19.2	2	S. BAY BLVD.	BET MOUNTAIN @ S. BAY BLVD.		SUMP	42" CMP		6	400	PVC	1

AREA 21	Vons Basin			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
AREA 21 BASINS						**INLET**			**OUTLET**		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
21.A	1	VONS BASIN	1.1 AF	TERMINAL	PROJECT	12	CMP	NA	NA	NA	NA

AREA 22	Fairchild Basin			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
22.1	1	LOS OLIVOS	SE LOS OLIVOS @ FAIRCHILD	6x3 DI	SUMP	DI 22.2		18	40	CMP	10
22.2	2	FAIRCHILD	SE FAIRCHILD @ LOS OLIVOS	6x3 DI	INTERCEPT	DI 22.3		18	40	CMP	10
22.3	3	FAIRCHILD	SW FAIRCHILD @ LOS OLIVOS	6x3 DI	INTERCEPT	BASIN 22.A		18	40	CMP	10
22.4	4	FAIRCHILD	E SIDE N OF LOVR	4x3 DI	INTERCEPT	MH		18	30	CMP	10
22.5	5	LOVR	NE LOVR @ FAIRCHILD	6x3 DI	INTERCEPT	MH		24	45	CMP	20
22.6	6	LOVR	SE LOVR @ FAIRCHILD	6x3 DI	INTERCEPT	DI 22.5		18	45	CMP	10
AREA 22 BASINS						**INLET**			**OUTLET**		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
22.A	7	FAIRCHILD BASIN	2.4 AF	TERMINAL	HW	18	CMP	NA	NA	NA	NA
22.B	8	PRIVATE BASIN	1.5 AF	TERMINAL				NA	NA	NA	NA

AREA 23	South Bay Blvd. & Los Osos Valley Rd to Los Osos Creek			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
23.1	1	WILLOW	W SIDE WILLOW N OF ANDRE	3x2 BOX	SUMP	ETO CRK	GOOD	12			10
23.2	2	LOVR	LOVR @ S. BAY BLVD.	SWALK DRAIN	INTERCEPT	SWALE		NA	NA	NA	
23.3	3	S. BAY BLVD.	S. BAY BLVD.	CULVERT	SUMP	SWALE		42	150	CMP	85
23.4	4	WILLOW	WILLOW @ LOS OSOS VALLEY RD	DBL. CMP	SUMP	SWALE	GOOD	15	60	CMP	13
23.5	5	NIPOMO	NIPOMO @ ETO CREEK	CULVERT	SUMP	ETO CREEK			40		

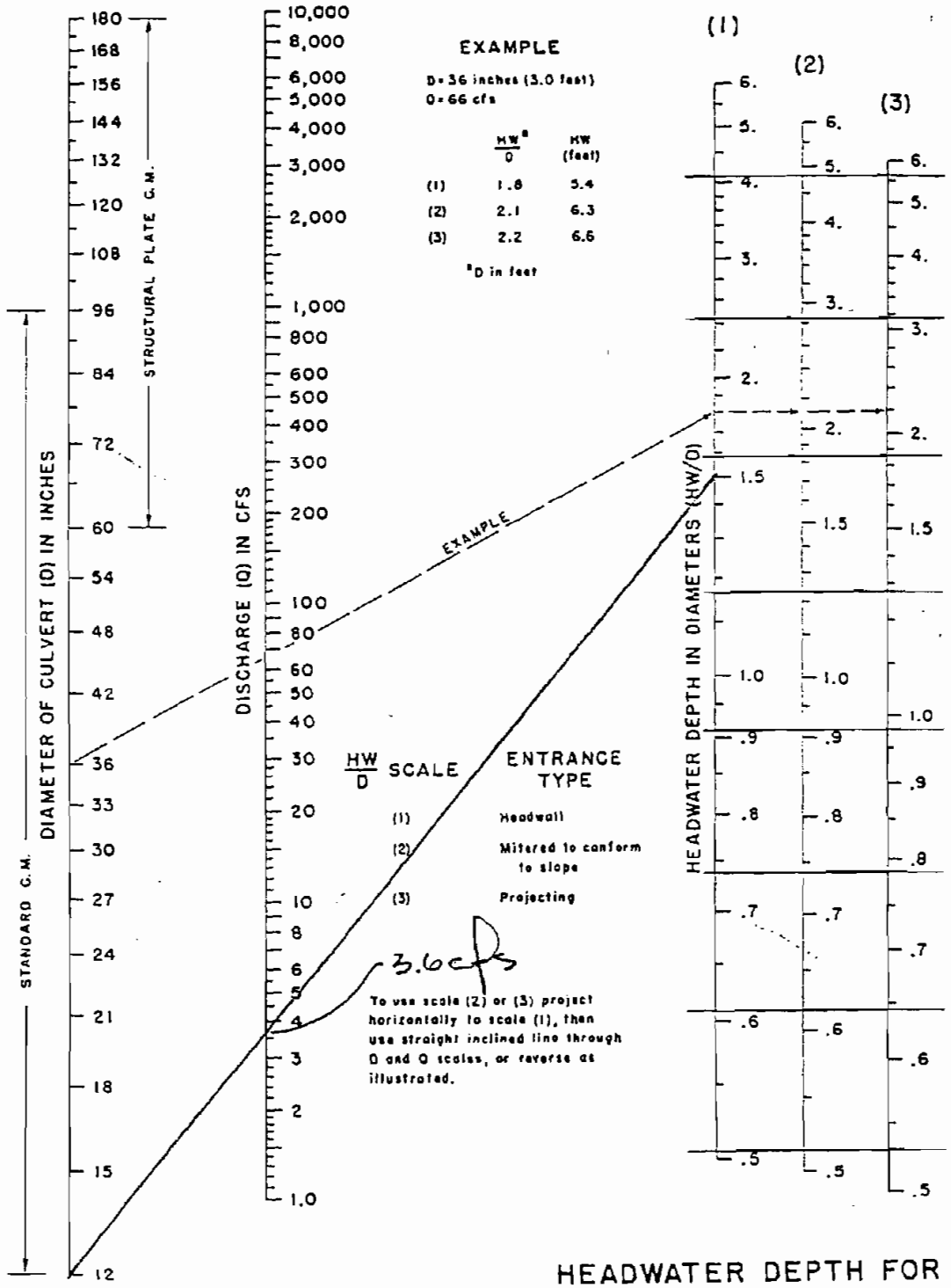
AREA 24	Los Osos Valley Rd & Buckskin to Los Osos Creek			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
24.1	1	PALOMINO	NW PALOMINO @ MARTINGALE	3x2 DI	SUMP	DI 24.2	GOOD	24	40	RCP	20
24.2	2	PALOMINO	NE PALOMINO @ MARTINGALE	3x2 DI	SUMP	LOS OSOS CRK	2" SILT	18	250	CMP	10

AREA	Cabrillo Heights & Vista de Oro			INLET		OUTLET	COND		PIPE		Q
25	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
25.1	1	ROSINA	SE ROSINA @ PECHO	4x3 DI	INTERCEPT	MH		18	150	RCP	10
25.2	2	LOVR	N SIDE LOVR AT SCHL PLAYGRND	4x3 DI	INTERCEPT	MH		18	400	RCP	10
25.3	3	LOVR	S LOVR @ PECHO	6x3 BOX	SUMP	MH		30		RCP	35
25.4	4	LOVR	S LOVR @ CULVERT OUTLET	6x3 BOX	INTERCEPT	DI 25.3		30		RCP	35
25.5	5	DORIS	W OF DORIS & PARALLEL	2x2 CHNL	OPEN	DI 25.4	GOOD		1360	CONC	120
AREA 25 BASINS						INLET			OUTLET		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
25.A	6	SEA PINES BASINS	NA	STAGED	HW	30	RCP	SWALE	NA	NA	BAY
AREA	Cabrillo Heights & Vista de Oro			INLET		OUTLET	COND		PIPE		Q
25	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
25.6	7	LOS ARBOLES	NW LOS ARBOLES @ LOS PADRES	3x2 DI	INTERCEPT	BASIN 25.B		18	150	CMP	10
25.7	8	LOS ARBOLES	NE LOS ARBOLES @ LOS PADRES	3x2 DI	INTERCEPT	DI 25.6		18	40	CMP	10
25.8	9	VISTA	W END OF VISTA CI	3x2 DI	SUMP	DI 25.9		12	300	CMP	3.5
25.9	10	PECHO	NE PECHO @ MONTANA	3x2 DI	INTERCEPT	BASIN 25.B		18	50	CMP	10
AREA 25 BASINS						INLET			OUTLET		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
25.B	11	LOS ARBOLES BASIN	0.55 AF	TERMINAL	HW	12 & 18	CMP	NA	NA	NA	NA

AREA 25	Cabrillo Heights & Vista de Oro			INLET		OUTLET	COND		PIPE		Q
	No	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
25.10	1	MADERA	N OF MADERA @ SAN DOMINICO	4x3 DI	SUMP	MADERA 25.C	GOOD	36	25	CMP	55
25.11	2	MADERA	S OF MADERA @ SAN DOMINICO	4x3 DI	SUMP	MH	GOOD	36	25	CMP	55
25.12	3	MADERA	NW OF MADERA @ RODMAN	4x3 DI	SUMP	MH	GOOD	18	25	ACP	10
25.13	4	MADERA	SW OF MADERA @ RODMAN	4x3 DI	SUMP	MH	GOOD	27	0	ACP	28
25.14	5	RODMAN	SE OF RODMAN @ MADERA	4x3 DI	INTERCEPT	MH	GOOD	18	52	ACP	10
25.15	6	RODMAN	NE OF RODMAN @ TRAVIS	9x3 DI	SUMP	MH	GOOD	33	40	ACP	45
25.16	7	TRAVIS	N OF TRAVIS @ CROCKETT	3x3 DI	INTERCEPT	MH	GOOD	15	40		6.5
25.17	8	TRAVIS	SW OF TRAVIS @ CROCKETT	3x3 DI	INTERCEPT	MH	GOOD	15	10		6.5
25.18	9	TRAVIS	SE OF TRAVIS @ W CROCKETT	3x3 DI	INTERCEPT	DI 25.16	GOOD	24	50	CMP	20
25.19	10	TRAVIS	N OF TRAVIS @ E CROCKETT	TYPE C3 INLET	INTERCEPT	MH	GOOD	15	25		6.5
25.20	11	TRAVIS	SW OF TRAVIS @ E CROCKETT	3x3 DI	INTERCEPT	MH	GOOD	15	25		6.5
25.21	12	TRAVIS	SE OF TRAVIS @ E CROCKETT	3x3 DI	INTERCEPT	DI 25.20	GOOD	24	60	CMP	20
25.22	13	TRAVIS	NW AT ELBOW	3x3 DI	SUMP	MH	GOOD	15	20		6.5
25.23	14	TRAVIS	NE AT ELBOW	3x3 DI	SUMP	DI 25.22	GOOD	15	30		6.5
25.24	15	TRAVIS	S AT ELBOW -END	3x3 DI	SUMP	24"	GOOD	15	15		6.5
25.25	16	RODMAN	NW OF RODMAN @ BOWIE	20x3 SIDE INLET	INTERCEPT	PIPE	GOOD		5		
25.25	17	BOWIE	N SIDE BOWIE	4x3 DI	SUMP	PIPE	GOOD	18	20	ACP	10
25.27	18	BOWIE	S SIDE BOWIE	4x3 DI	SUMP	PIPE	GOOD	18	20	ACP	10
25.28	19	SAN JACINTO	N SIDE SAN JACINTO	4x3 DI	SUMP	DI 25.27	GOOD	18	318	ACP	10
25.29	20	SAN JACINTO	S SIDE SAN JACINTO	4x3 DI	SUMP	DI 25.28	GOOD	18	40	ACP	10
25.30	21	RODMAN	S SIDE RODMAN	20'x3' SIDE INLET	INTERCEPT	PIPE	GOOD		0		
25.31	22	RODMAN	S SIDE RODMAN-END	20'x3' SIDE INLET	INTERCEPT	BEGIN	GOOD		0		
25.32	23	AUSTIN	W END OF AUSTIN	BOX INLET	SUMP	BOWIE CURB	GOOD	18	255	CMP	10
25.33	24	RODMAN	SE RODMAN @ ALAMO	6x2 DI	INTERCEPT	RODMAN CURB	GOOD	18	250	PVC	10
25.34	25	RODMAN	E END OF RODMAN	CULVERT	SUMP	SWALE	GOOD	18	25	CMP	10

AREA 25 BASINS						INLET			OUTLET		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
25.C	25	MADERA	6.6 AF	TERMINAL	HW	36	AC	SPILL	42	AC	PECHO

AREA	Bayridge & Oak Ridge			INLET		OUTLET	COND		PIPE		Q
26	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
26.1	1	BAY OAKS DRIVE	N BAY OAKS @ DEL MAR	4x3 DI	SUMP	BASIN 26.A	GOOD	24	35	CMP	20
26.2	2	BAY OAKS DRIVE	S BAY OAKS @ DEL MAR	4x3 DI	SUMP	DI 26.1	GOOD	24	40	CMP	20
26.3	3	TIERRA WAY	N BET OAK RIDGE & REDWOOD	2x2 DI	SUMP	BASIN 26.B	GOOD	18	20	CMP	10
26.4	4	TIERRA WAY	S BET OAK RIDGE & REDWOOD	2x2 DI	SUMP	DI 26.3	GOOD	18	40	CMP	10
26.5	5	LAS ENCINAS	W CUL-DE-SAC	3x2 DI	SUMP	BASIN 26.C	GOOD	12	125	CMP	3.5
26.6	6	LAS ENCINAS	E CUL-DE-SAC	4x3 DI	SUMP	BASIN 26.D	GOOD	18	100	CMP	10
26.7	7	TIERRA WAY	E CUL-DE-SAC	4x3 DI	SUMP	BASIN 26.E	GOOD	18	100	CMP	10
26.8	8	BAY VISTA LN	BET BAY VISTA & GREEN OAKS	CULVERT	SUMP	GREEN OAKS	GOOD	30"	220		35
AREA 26 BASINS						INLET			OUTLET		
		NAME	*STORAGE*	*TYPE*	*TYPE*	*DIA*	*MAT*	*TYPE*	*PIPE*	*MAT*	*DEST*
26.A	9	BAY OAKS BASIN	3.0 AF	TERMINAL	HW	24	CMP	SPILL	NA	NA	LOVR
26.B	10	TIERRA BASIN	0.7 AF	TERMINAL	HW	18	CMP	NA	NA	NA	NA
26.C	11	LAS ENCINAS W	0.03 AF	TERMINAL	HW	12	CMP	NA	NA	NA	NA
26.D	12	LAS ENCINAS E	0.07 AF	TERMINAL	HW	18	CMP	NA	NA	NA	NA
26.E	13	TIERRA E	0.15 AF	TERMINAL	HW	18	CMP	NA	NA	NA	NA
AREA	Los Osos Valley Road at Cimmaron			INLET		OUTLET	COND		PIPE		Q
27	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
27.1	1	SOMBRERO	N END OF SOMBRERO	CULVERT	SUMP	SWALE	SILT	18	40	CMP	10
27.2	2	LOVR	UNDER LOVR E OF SOMBRERO	CULVERT	SUMP	SWALE	GOOD	36	225	CMP	55
27.3	3	LOVR	UNDER LOVR E OF SOMBRERO	CULVERT	SUMP	SWALE	GOOD	30	225	CMP	35
27.4	4	LOVR	N LOVER, E OF SOMBRERO	3x2 DI	INTERCEPT	SWALE	GOOD	12	10	CMP	3.5
27.5	5	LOVR	SOMBRERO	CULVERT	SUMP	SWALE	SILT	8	40	CMP	1
27.6	6	LOVR	SOMBRERO	CULVERT	SUMP	SWALE	SILT	6	40	CMP	1
27.7	7	CIMMERON	LOVR	CULVERT	SUMP	SWALE	SILT	18	40	CMP	10
AREA	Los Osos Valley Road			INLET		OUTLET	COND		PIPE		Q
LOVR	*No*	*ROAD*	*LOCATION*	*TYPE*	*COND*	*TO*		*DIA*	*LGTH*	*MAT*	*(max. est)*
LOVR.1	1	LOVR	S LOVR @ LOS OSOS CRK	OL-7 DI	INTERCEPT	LOS OSOS CRK	GOOD	30	0	RCP	35
LOVR.2	2	LOVR	S LOVR @ LOS OSOS CRK	OL-7 DI	INTERCEPT	24" RCP	GOOD	30	0	RCP	35
LOVR.3	3	LOVR	N LOVR @ LOS OSOS CRK	3.5x2 DI	INTERCEPT	LOS OSOS CRK	GOOD			RCP	
LOVR.4	4	LOVR	S LOVR @ BUCKSKIN	OL-10 DI	INTERCEPT	24" RCP	GOOD	18	50	RCP	10
LOVR.5	5	LOVR	NW LOVR @ BUCKSKIN	OL-7 DI	INTERCEPT	24" RCP	GOOD	18	115	RCP	10
LOVR.6	6	LOVR	N LOVR BET WILLOW & BUCKSKIN	OL-7 DI	INTERCEPT	24" RCP	GOOD	18	20	RCP	10
LOVR.7	7	LOVR	S LOVR BET WILLOW & BUCKSKIN	OL-7 DI	INTERCEPT	24" RCP	GOOD	18	120	RCP	10
LOVR.8	8	LOVR	LOVR @ WILLOW	CULVERT	SUMP	2.5x6" CHNL	GOOD	18	146	CMP	10
LOVR.9	9	OAK RIDGE	SE OAK RIDGE @ LOVR	GT-3 DI	INTERCEPT	21" RCP	GOOD	21	0	RCP	14
LOVR.10	10	OAK RIDGE	E OAK RIDGE	OL-14 DI	INTERCEPT	DI LOVR.6	GOOD	18	100	RCP	10



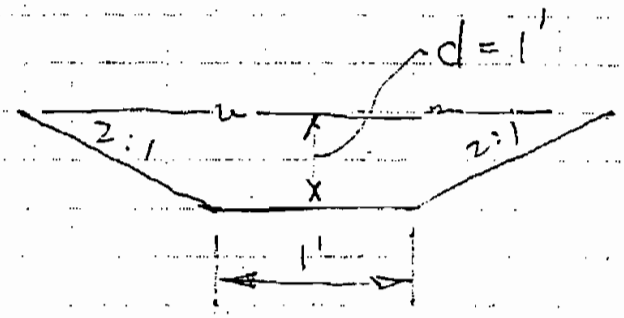
HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

ENGINEERING DEVELOPMENT ASSOCIATES, INC.
1320 Nipomo Street
SAN LUIS OBISPO, CALIFORNIA 93401
(805) 549-8658 FAX 549-8704

JOB _____
SHEET NO. _____ OF _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

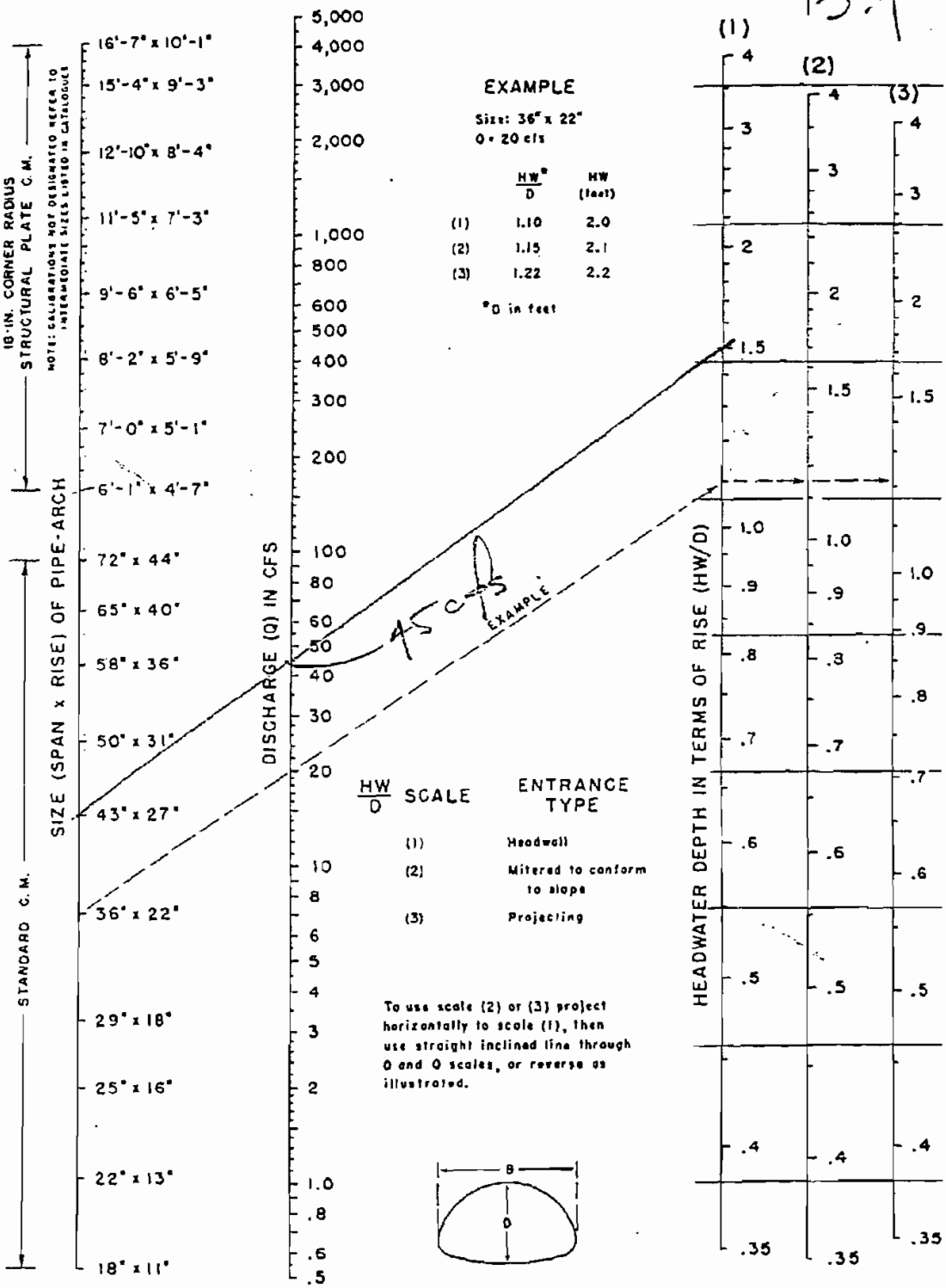
A.C. LINED 2.1



$a = 3$
$P = 5.47$
$r = .55$
$S = .30$

$Q = \frac{1.486}{.015}(.55)^{2/3} \times 3 \times .3^{1/2}$
$= 100$ cfs

13.4



HEADWATER DEPTH FOR C. M. PIPE-ARCH CULVERTS WITH INLET CONTROL

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APPENDIX C

SUPPLEMENTARY ENVIRONMENTAL DATA

C1: Recharge of the Los Osos Groundwater Basin from Septic Tank Discharge, Rainfall, and Landscape Irrigation
C2: Clarification of Well Level Data
C3: Groundwater Issues
C4: Environmental Considerations of Selected Alternatives
C5: Ranking of Alternatives Based Upon Environmental Impacts

Appendix C1
RECHARGE OF THE LOS OSOS GROUNDWATER BASIN FROM SEPTIC-TANK DISCHARGE, RAINFALL AND LANDSCAPE IRRIGATION

A. PURPOSE OF THIS APPENDIX

The rising groundwater conditions in several of the problem areas of the community are attributed in large part to increased recharge of the shallow groundwater due to: 1) septic-tank discharge; and 2), increased runoff from impervious surfaces in urbanized areas. Since implementation of a sewer project will substantially eliminate septic-tank discharge in many of the problem areas, estimation of the relative balance between septic-tank discharge and increased urban runoff is critical to any determination of the long-term need for, and extent of, drainage improvements.

This appendix addresses information relevant to this estimate based on: 1) information developed by the US Geological Survey (USGS) in their study of the groundwater basin; and 2), information that may be inferred from the variations in the rates of rising groundwater in certain wells as affected by variations in rainfall and densities of urbanization. This information is discussed below.

B. INFORMATION FROM THE USGS STUDY

1. Basin wide Relationships

The balance between recharge of groundwater from rainfall, return flow from landscape irrigation, and septic tank discharge can be extracted from the simulated water budgets in Table 6 of the USGS report for years 1970-77 and 1986 as follows:

Table C1-1
DISTRIBUTION OF RECHARGE OF THE LOS OSOS GROUNDWATER BASIN FOR YEARS 1970-77 AND 1986

	Recharge in AFY from:				Percent from:		
Year(s)	Septic-Tank Discharge	Landscape Returns	Rainfall	Total	Septic-Tank Discharge	Landscape Returns	Rainfall
1970-77	740	150	1,300	2,190	34%	7%	59%
1986	1,550	330	2,530	4,410	35%	7%	58%

That the percentage distributions of recharge from rainfall, septic-tank discharge and landscape returns are approximately the same for these two periods is apparently a coincidence. The level of development approximately doubled between 1970-77 and 1986, and septic-tank discharge and landscape returns increased accordingly. Year 1986 was a moderately wet year, and recharge from rainfall also doubled.

The USGS report has also estimated recharge from rainfall, septic-tank discharge and landscape returns under normal, wet and dry climatic conditions in Table 8, Alternative 1 (p. 52) for year-2010 development conditions, then estimated at a population of approximately 35,000, as follows:

Table C1-2
DISTRIBUTION OF RECHARGE OF THE LOS OSOS GROUNDWATER BASIN FOR WET, NORMAL AND DRY YEARS

	Recharge in AFY from:				Percent from:		
Type of Year	Septic-Tank Discharge	Landscape Returns	Rainfall	Total	Septic-Tank Discharge	Landscape Returns	Rainfall
Wet	2,600	580	8,950	12,130	21%	5%	74%
Normal	2,600	540	2,180	5,320	49%	10%	41%
Dry	2,600	610	1,250	4,460	58%	14%	28%

The values listed above apply to future conditions as envisioned during the preparation of the USGS report (year-2010 population of 35,000), and recharge from both septic-tank discharge and rainfall would be substantially less for an existing population of about 15,000 and also for lesser projected buildout populations. Also, these values for recharge are for the groundwater basin as a whole, and most of the areas with drainage problems are in the more densely urbanized portions of the community.

2. Relationships in Urbanized Areas

As a part of their analysis of groundwater recharge, the USGS developed rates of recharge for various densities of development. Runoff increases as urban density increases because impervious areas increase. In most communities, this increased runoff is carried away by storm drain systems. However, in much of Los Osos, the increased runoff infiltrates to the groundwater system because of: 1) an absence of drainage systems; 2) the sand-dune topography that includes undrained (i.e., closed) or poorly drained depressions; and 3), the high infiltration rates of the sand soils. Rates of recharge from septic-tank discharge and irrigation return flow also increase with increasing urban density. The rates of recharge of rainfall, septic-tank discharge, and return flow from landscape irrigation for various development conditions from USGS Tables 2 and 3 are as follows (see Figure C1-1):

Table C1-3
RECHARGE OF THE LOS OSOS GROUNDWATER BASIN FOR DIFFERING DEVELOPMENT INTENSITIES IN THE YEARS 1970-77 AND 1986

		Approx.		Total Recharge (AFY) for:			
	Type of	Units/	Area	1970-77 Conditions		1986 Conditions	
Zone	Development	Acre	(acres)	Total	Per Acre	Total	Per Acre
1	High den. res.	4	1,162	760	0.654	2,000	1.721
2	Med. den. res.	2	271	110	0.406	270	0.996
4	Low den. res.	1	367	*110	0.300	*240	0.654
6	Undeveloped	0	1,142	*100	0.088	*150	0.131

* Values reversed from USGS Table 3 pending further clarification.

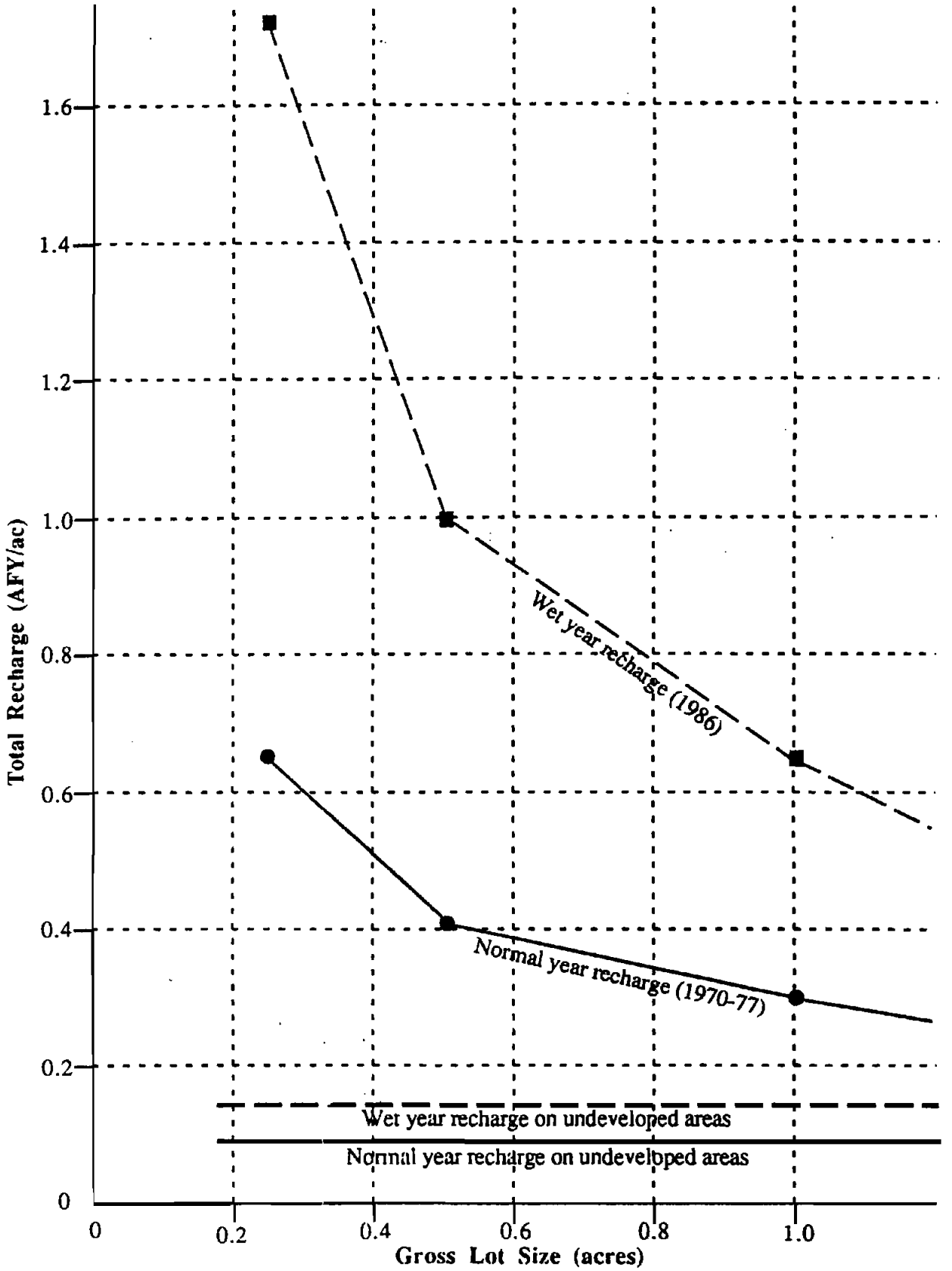

Figure C1-1. Plot of total recharge of rainfall, septic-tank discharge and landscape irrigation for normal and wet year climatic conditions at full buildout of 4, 2 and 1 unit/acre and undeveloped conditions from Table 1-3.

The component of recharge attributable to septic-tank discharge can be estimated from total recharge from this source and the number of residential units. For 1986 conditions, total recharge from septic-tank discharge is estimated at 1,550 AF (USGS, Table 6), and the number of residential units is reported by DWR (Figure 5) as approximately 5,600, which yields a rate of Figure C1-1. Recharge plot recharge of 0.277 AF/unit. If the 1986 value of 0.277 AF/unit for recharge from septic-tank discharge is applied to the values in the table above for 1986 conditions, the "split" recharge from rainfall and landscape irrigation for this year can be estimated as follows:

Table C1-4
DISTRIBUTION OF RECHARGE OF THE LOS OSOS GROUNDWATER BASIN
FOR DIFFERING DEVELOPMENT INTENSITIES IN 1986

		Approx.		1986 Recharge (AFY/ac):			
Zone	Type of Development	Units/ Acre*	Area (acres)	Recharge Total	Septic Discharge	Rainfall & Irrig.	Percent Septic
1	High den. res.	4	1,162	1.721	1.108	0.613	64%
2	Med. den. res.	2	271	0.996	0.554	0.442	56%
4	Low den. res.	1	367	0.654	0.277	0.377	35%
6	Undeveloped	0	1,142	0.131	0.000	0.131	0%

* The assignment of these approximate development densities to the areas listed results in a total of 5,557 residential units.

For 1970-77 conditions, total recharge from septic-tank discharge is estimated at 740 AF, and the average number of residential units is reported by DWR as 2,900, which yields a rate of recharge of 0.255 AF/unit. This development condition is very close to half that of 1986 conditions, and the approximate number of units per acre are revised to half that in Table C1-4 above. If these revised densities and the 1970-77 value of 0.255 AF/unit for recharge from septic-tank discharge are applied to the values in Table A1-3 for 1970-77 conditions, the "split" in recharge from septic discharge and that from rainfall and landscape irrigation for this period can be estimated as follows:

Table C1-5
DISTRIBUTION OF RECHARGE OF THE LOS OSOS GROUNDWATER BASIN
FOR DIFFERING DEVELOPMENT INTENSITIES IN THE YEARS 1970-77

		Approx.		1970-77 Recharge (AFY/ac):			
Zone	Type of Development	Units/ Acre*	Area (acres)	Recharge Total	Septic Discharge	Rainfall & Irrig.	Percent Septic
1	High den. res.	2	1,162	0.654	0.510	0.144	78%
2	Med. den. res.	1	271	0.406	0.255	0.151	63%
4	Low den. res.	.5	367	0.300	0.127	0.173	42%
6	Undeveloped	0	1,142	0.088	0.000	0.088	0%

* The assignment of these approximate development densities to the areas listed results in a total of 2,779 residential units.

3. Summary of Information from the USGS Report

Based on information provided in the USGS report:

1. On a basin-wide basis, recharge of the shallow groundwater body tends to be dominated by recharge of rainfall which is approximately 75% of recharge in wet years when flooding would be a significant problem, decreasing to about 40% in normal rainfall years, and 30% in dry years.

2. In the high density residential areas where flooding has been exacerbated by shallow groundwater conditions, septic-tank discharge tends to be the dominant component of recharge, ranging from about 80% of recharge in normal years down to about 65% in moderately wet years. Even in very wet years such as 1995, recharge from septic-tank discharge probably would have exceeded recharge from rainfall in the high density residential areas.

C. INFORMATION FROM WELL LEVEL CHANGES

1. Useful Well-Level Histories

It may be feasible to make estimates from well-level variations of the relative influence on ground-water recharge of septic-tank discharge and landscape irrigation versus infiltration of rainfall. Septic-tank discharge and returns from landscape irrigation should be roughly proportional to the level of urban development, while infiltration of rainfall should be roughly proportional to rainfall and development density.

Review of the water-level histories of wells in the Los Osos groundwater basin monitored by the County Engineering Department has identified two wells that exhibit water-level variations of sufficient magnitude to be potentially useful for this purpose. These are the old CSA No 9 shallow well at 8th and El Moro (7Q1) and the old well at the Chevron Station on Los Osos Valley Road (18Q1).

The variations in groundwater levels in these wells are shown on Figure C1-2. Both wells show a relatively steady rise in water levels up through about 1980 to 1984, after which the rates of rise are significantly less (7Q1) or the levels decline (18Q1). At both wells, the effects of the dry period beginning in 1984 resulted in declining groundwater levels except for a small rise in 1986. After 1986, groundwater levels were stable at well 7Q1 and strongly declining at well 18Q1 until the end of the drought in 1991 when the rising condition was reestablished.

2. Factors Influencing Rising Groundwater

Increased urbanization in the South Bay would have directly increased the recharge of the shallow aquifer in the South Bay by increasing septic-tank discharge and infiltration from landscape irrigation. The rate of increase of this component of recharge should have been approximately proportional to the rate of urbanization. The rate of rise or fall of the shallow groundwater would also be significantly influenced by the rainfall in any year as discussed in the section above.

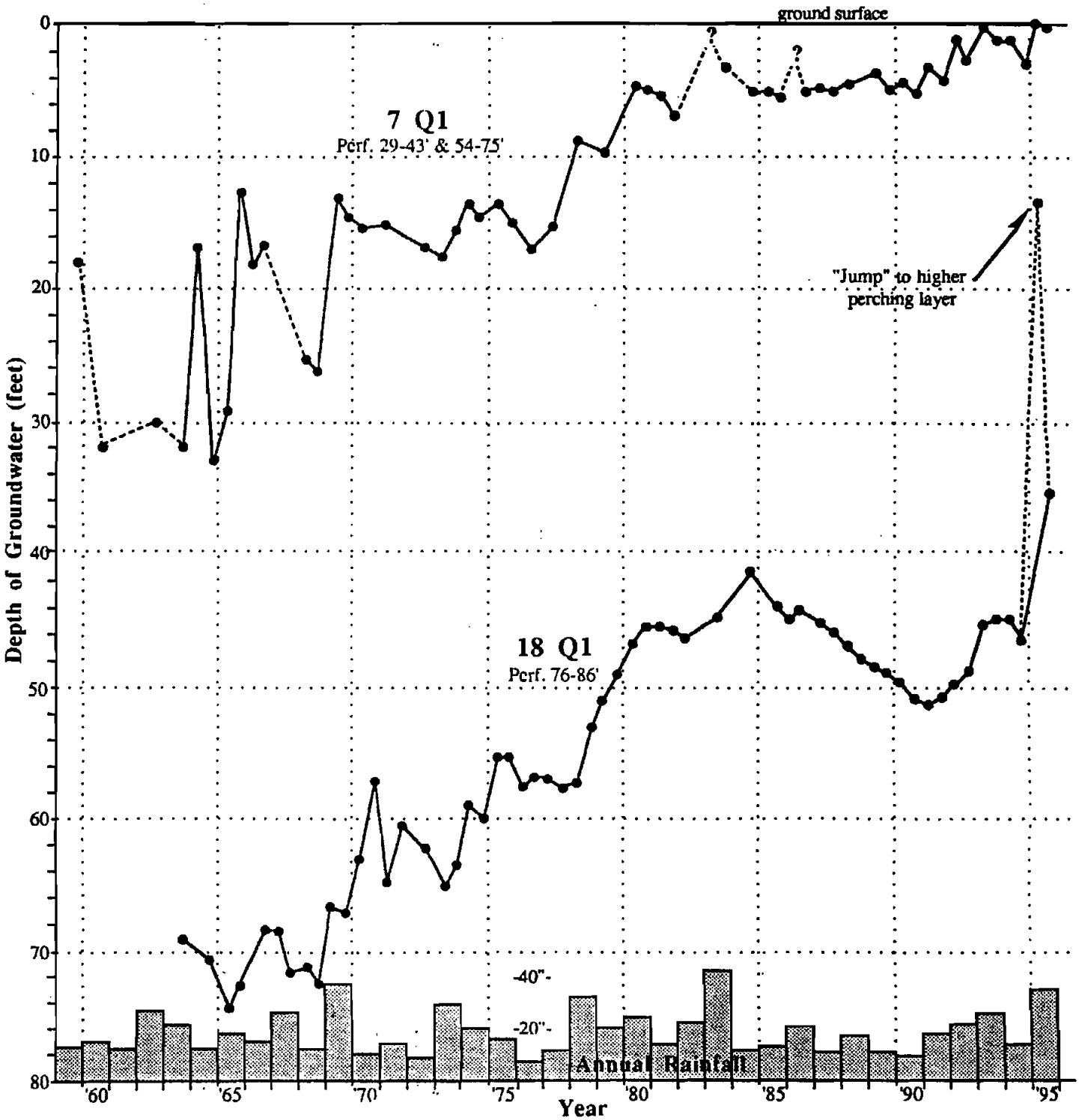

Figure C1-2. Plots of groundwater levels in wells 7Q1 at 8th and El Moro and 18Q1 at the Chevron Station for the period Fall 1959 through Fall 1995. The plot of annual rainfall at Los Osos is provided for comparison of rainfall with changes in groundwater levels.

These three factors affecting variations in groundwater levels are complicated by both rates of outflow and delays in recharge reaching the monitored wells. The rise in groundwater resulting from all sources of recharge is not directly proportional to recharge because, as groundwater rises, the rate of outflow increases due to the increased gradient. Thus, there is a limit to the extent to which increased recharge can produce a rise in groundwater level, and the closer the level is to that limit, the less the effect of yearly variations.

In addition, examination of the year-by-year variations in groundwater levels at the wells shown on Figure B1-2 indicates that there is often a delay in the effects of the recharge actually being recorded at a monitoring well. This delaying affect appears to be the most pronounced at well 18Q1 where there is a perching layer above the interval perforated in this well, but there also appears to be delaying effects at well 7Q1. Thus, a reliable quantitative analysis of well-level variations to extract the relative contributions of rainfall versus septic-tank discharge would require monitoring data from the uppermost portions of the saturated interval. This information is available for the most recently drilled monitoring wells, but most of the documented rise in groundwater occurred Figure C1-2 Well plot before these wells were drilled.

There may also be an additional complicating factor in that the old dune sands are significantly more permeable than the sands in the underlying Paso Robles Formation. Thus, should groundwater rise into these sands, it would drain off much more rapidly than if it were contained within the Paso Robles sands. Thus, there is theoretically a "lid" on the rising groundwater condition in that it probably cannot be maintained for any substantial period of time above the contact of the old dune sands with the Paso Robles Formation. There are strong indications that this condition is affecting shallow groundwater levels in that: 1) the problem areas significantly affected by shallow groundwater are in areas where the Paso Robles Formation is at or very near the surface; and 2), shallow groundwater levels in areas with significant thicknesses of underlying dune sand appear to have "peaked-out" in the early 1980's, and variations since that time have been minimal.

Based on the considerations above, well-level changes have not been used to extract more definitive relationships between groundwater changes due to recharge of septic-tank effluent and that due to variations in rainfall. However, it can be noted that the relatively consistent rise in groundwater in both of the wells shown on Figure C1-2 tends to substantiate that a large part of the effect is due to a constant condition, presumably septic-tank discharge. The effect is the most pronounced at well 7Q1 which is surrounded by high density development. It is less pronounced at well 18Q1 (significant decline during the 1984-1991 dry period) where development up gradient is lower density.

Appendix C2
CLARIFICATION OF WELL LEVEL DATA

1. Other Sources of Water Level Information

Point Source Nitrate Study

Location	Water Depth	Date	Ground Elev.	Water Elev.	1995 Elev.	Comments
1213 13th St.	57	Mar '92	102	45	45	No sig. change in near wells
1336 14th St.	57	Mar '92	105	48	48	No sig. change in near wells
740 Santa Maria	16	Mar '92	20	4	10	Est. from topo relationships
1810 Ferrell	10	Mar '92	57	47	49	Est. from 18L4
1850 Ferrell	10	Mar '92	63	53	55	Est. from 18L4

M&E Broderson Recharge Investigation

Location	Water Depth	Date	Ground Elev.	Water Elev.	1995 Elev.	Comments
M&E Boring #8	158	Nov. '95	185	27	27	No adjustment attempted
M&E Boring #9	42	Nov. '95	50	8	8	No adjustment attempted
M&E Boring #12	59	Nov. '95	70	11	13	Est. from 13L5
M&E Boring #14	21	Nov. '95	50	29	29	No adjustment attempted

2. Reliability of Data from Monitored Wells

During the course of preparation of the shallow groundwater elevation map, it became apparent that water levels in wells in the southeastern part of the community not only reflect the differing hydraulic heads of the upper and lower aquifers, but also differing heads depending on the level within the upper aquifer. The effect is most apparent in the area east of South Bay Boulevard and north of Los Osos Valley Road where the shallowest groundwater elevations are in the range of 30 to 40 feet while the elevations of surfacing groundwater in nearby Willow Creek (a.k.a. Eto Creek) are in the range of 50 to 75 feet. This effect is attributed to perching layers or "downward decreasing head gradients" as use in the USGS analysis.

For this reason, the monitoring data from shallow wells have been ranked as follows:

1. The monitoring wells drilled in 1982 for the Brown & Caldwell study (triangles on Figure II-7) were drilled only a few feet into the first groundwater encountered, and these wells are considered the most reliable measure of the elevation of, and depth to the shallowest groundwater as it may affect flooding conditions.

2. Areas of surfacing groundwater that are persistent (e.g., Willow Creek, the creek in the Oak Preserve) or that occur during and continuing after periods of heavy rainfall (e.g., the El Moro and Paso Robles depressions) are considered the next most reliable as indicating groundwater within approximately 5 feet of the surface.

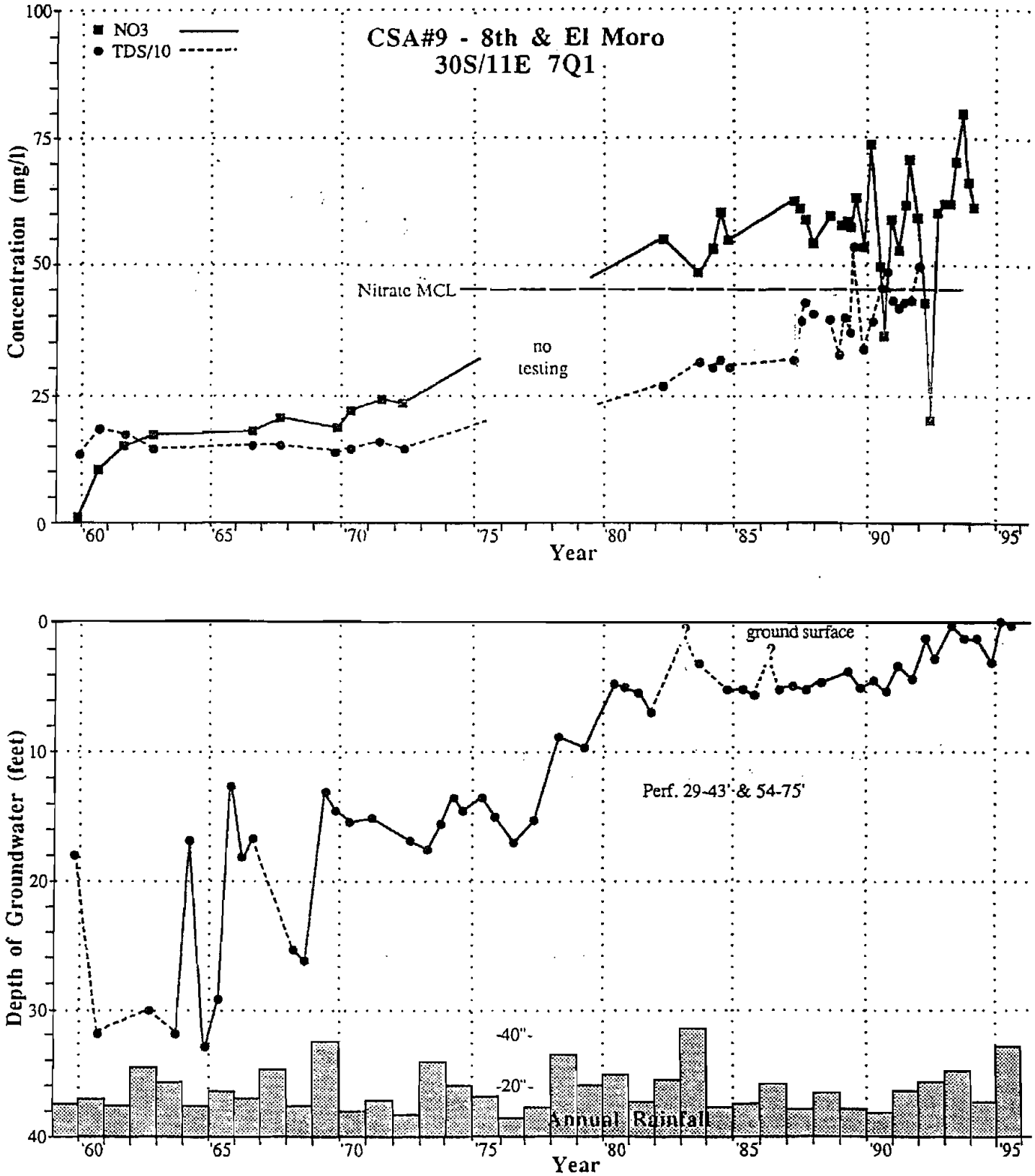

Figure C3-1 Plot of depth of groundwater and annual rainfall (bottom) and concentrations of nitrate (NO3) and total dissolved solids (TDS) at well 30S/11E 7Q1 located at 8th and El Moro.

The more logical interpretation of the shallow soil units was demonstrated by the excavations for the Monarch Grove School, particularly the deep cuts for the large leach field that underlies the playground at the west end of the site. These excavations were examined by the *Morro Group* almost daily after grading ceased in the afternoon. The cuts on the east side of the playground exposed layers of clayey silt inclined to the north approximately parallel to the natural ground surface, and the sand in the bottom of the excavation for the playground included medium to coarse grained units with gravel, including cobbles up to 4 inches in diameter. Thus, the geological unit beneath this site is not old dune sand, but rather the bedded sands and clayey silts of the upper Paso Robles Formation.

The distribution of old sand dunes in the area of the community generally north of Los Osos Valley Road is shown on Figure C3-2. This figure is a portion of an aerial photograph taken by the Soil Conservation Service in June 1949 before development of the area had become significant, but with just enough of a road pattern to provide location. The lighter toned areas are old sand dunes with varying degrees of vegetative cover, while the linear areas of medium gray tone trending west-northwest are inter-dunal depressions underlain by upper Paso Robles Formation. The most obvious example is the area of medium gray tone south of the Junior High School site (i.e., beneath the track and soccer field) and extending westerly to approximately 14th Street between El Moro and Paso Robles Avenues. While these interdunal depressions are small in comparison to the areas of old sand dunes, it is these depressions that are now the locations of most of the drainage problems involving surfacing groundwater.

b. Upper Paso Robles Formation

The upper Paso Robles Formation is present beneath the old sand dunes and it is at or near the surface in the depressions between the sand dunes. This unit is composed primarily of sand, but it also includes beds of clayey silt, clayey fine sand and some clay between the beds of sand. These relationships are illustrated by the annotated electric log (E-log) of the CSA 9A deep well at 8th and El Moro shown on Figure C3-3. This well was drilled in early 1986 to replace the shallow well at this location because of the increasing nitrate contamination of the shallow aquifer. The properties of the saturated soils/rocks measured by the E-log are explained at the bottom of the figure. Significant points to note include:

1. The upper 125 feet of this well penetrated the upper aquifer (upper Paso Robles Fm.). This unit is composed primarily of sands, but with one clayey zone and probably several silty zones with moderately reduced permeability. This zone is distinct in that the consistently high resistivity of the sand zones indicates consistently fresher water in these sands as compared to that of the sands below the thick clay zone (AT-2 on Figure C3-3).

2. The upper aquifer is underlain by a 100-foot zone composed predominately of clay. This clay zone blocks the downward movement of infiltrating water, so that it has no place to go except move laterally in the shallow sands or rise to the surface as shown on Figure C3-1.

Figure C3-2 Aerial photograph of the central and easterly parts of Los Osos/Baywood Park taken in 1949. The light areas are old sand dunes with varying degrees of vegetative cover, and the linear areas of medium grey tone are interdunal depressions underlain by Paso Robles Formation. The photograph was taken June 4, 1949 at near zero tide. Scale: 1"=1,500'.

2. Geologic Structure and Faulting

a. Structure of the Los Osos Groundwater Basin

The Los Osos groundwater basin is shaped in the form of an asymmetric trough that is inclined toward the west (plunging syncline). Bedding on the south flank of the basin is inclined toward the north at about 10° (20%), and that on the north flank is inclined toward the southwest at about 1.5° to 2° (3-4%). The axis (i.e., bottom) of the basin is approximately parallel to and just north of Los Osos Valley Road (Figure C3-4). The basin is bounded on the south by the Los Osos fault (Strand A), and on the northeast by the eroded edge of the water-bearing Paso Robles Formation.

b. Los Osos Fault

Since completion of the studies of the groundwater basin by the USGS (Yates & Wiese, 1988) and the Department of Water Resources (DWR, 1989), evidence has mounted that the groundwater basin is cut by a strand of the Los Osos fault that extends from near the west end of Calle Cordoniz northwesterly generally along Bayview Heights Drive and Bush Street to Sweet Springs at the edge of Morro Bay. This fault is informally designated "Strand B" to distinguish it from the main strand of the Los Osos fault which trends east-west along the northerly fringe of the Irish Hills (Figure C3-4). Near the library, groundwater levels are approximately 40 feet higher on the northeast side of the fault than on the southwest side (Figure C3-5). To the southeast, the separation of groundwater levels across the fault appears to increase to about 100 feet.

The Strand B fault separates areas of very different groundwater conditions. Areas having shallow or surfacing groundwater are confined to the area northeast of Strand B. To the southwest of the fault, groundwater levels have fluctuated moderately with varying climatic conditions. However, they have not risen near-continuously as they have in some areas to the northeast of Strand B, and drainage problems to the southwest of the fault are limited to the low-lying areas near the Bay.

The potential for using ground-penetrating radar (GPR) to further define the location of the Los Osos fault has been recently investigated on an experimental basis by Gary Mann and Don Asquith. One line was run across Strand B in an open area just south of Ramona Avenue which clearly defined an anomaly at a point along the line only about 10 feet west of the location of the fault more generally located from the groundwater data. The GPR records and the geologic interpretation of these records are shown on Figure C3-6. It is clear from this experimental data that there is good potential for further delineating this fault using this method. Confirming the details of the interpretation of the GPR data would require trenching to expose the fault relationships.

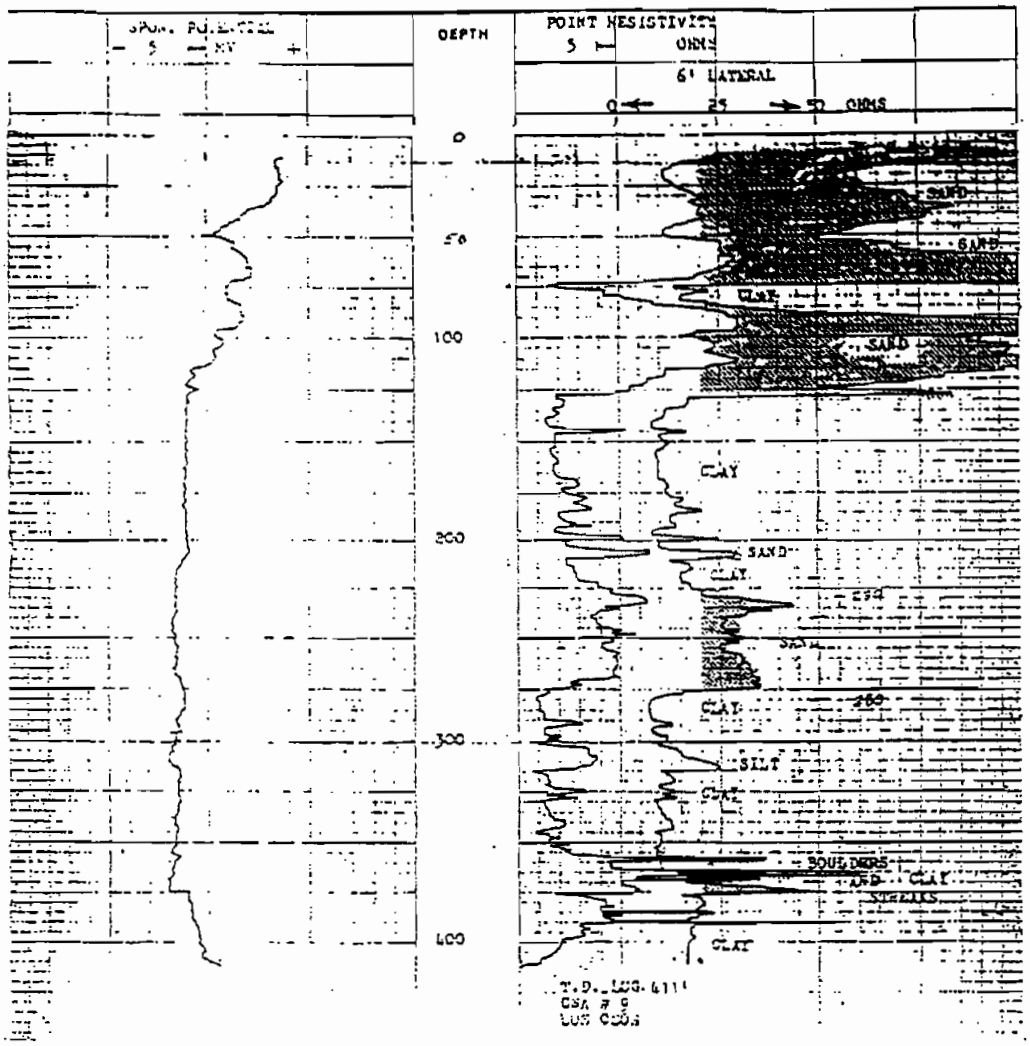

Figure C3-3 Electric log (E-log) of CSA#9 deep well at 8th and El Moro (30S/11E 7Q3). The shallow sand section (upper aquifer) is shown in the interval from the surface to a depth of 125 feet. The shallow sands are separated from the deeper sand (lower aquifer) now being produced by the clay zone (aquitard AT-2) between 125 and 225 feet. The much higher resistivity of the shallow sands indicates that they contain less mineralized water. The interpretation of sand, silt and clay zones is by the logging technician.

Technical Explanation of Log

The two curves on the right are the point resistivity (shallow penetration) and 6' lateral (deeper penetration). Since the rock material is essentially non-conductive, the log measures the resistivity of the fluid in the rock and the continuity of the fluid (i.e., the degree to which the fluid is continuous and, therefore, capable of conducting an electric current).

The curve on the left is the self-potential (SP) or "battery-effect" between the drilling mud and the fluid in the rocks. Normally, a deflection to the left indicates sand. However, in this case, the fluid in the upper aquifer is fresher (less mineralized) than the drilling fluid, and the SP is "reversed" (right deflection indicates fresh-water sand).

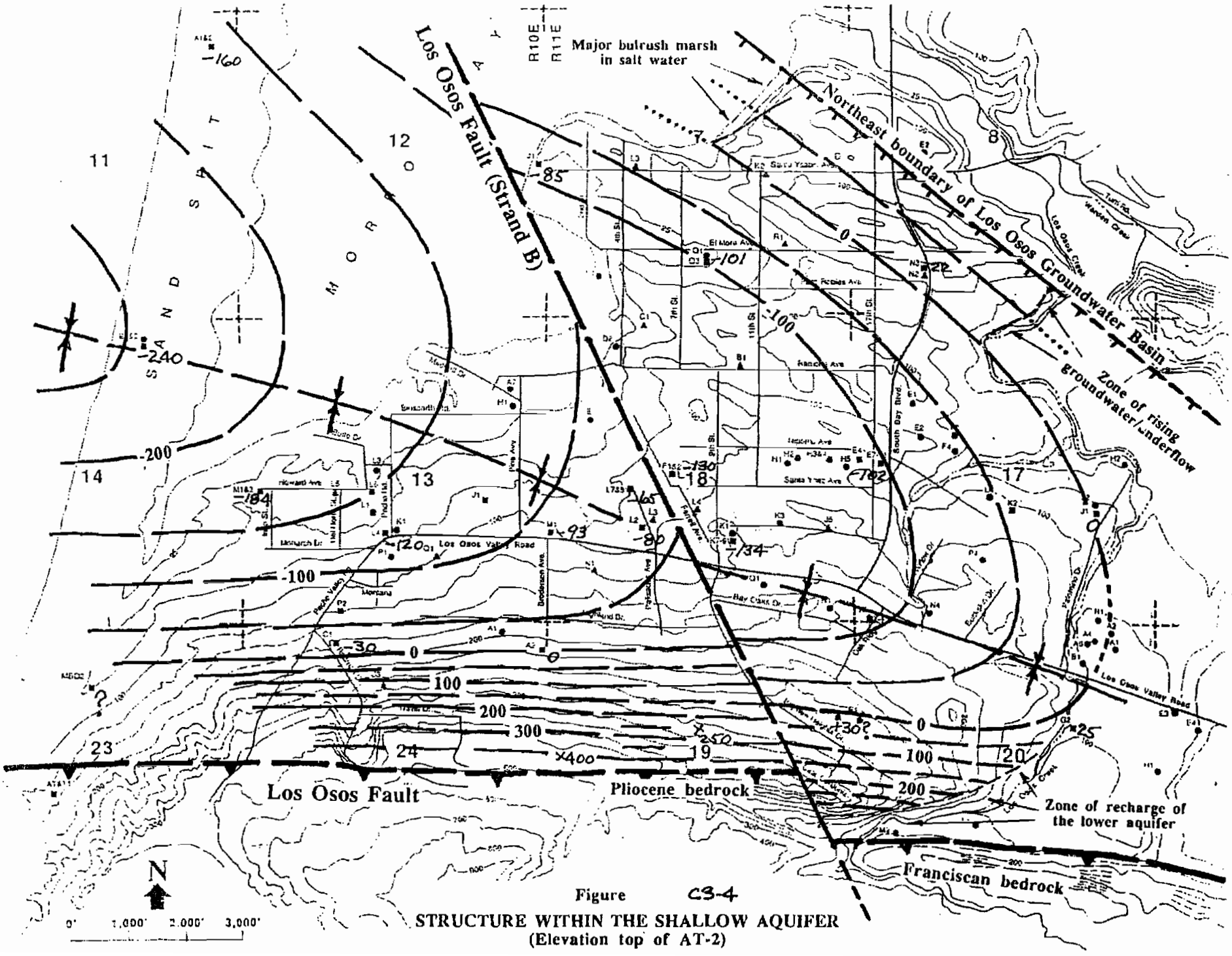

Figure C3-4

STRUCTURE WITHIN THE SHALLOW AQUIFER
(Elevation top of AT-2)

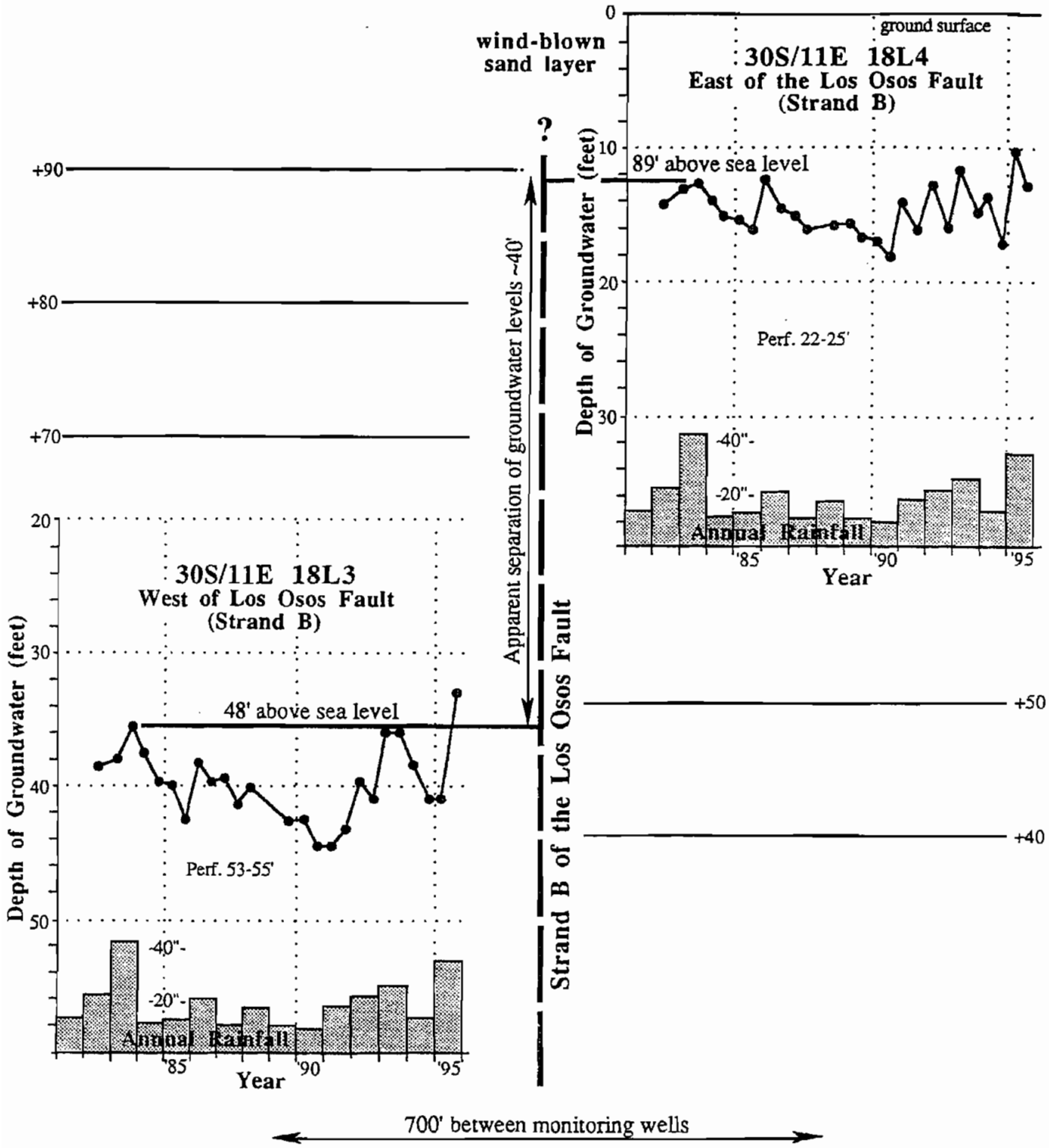

Figure C3-5 Plot of water-level separation across Strand B of the Los Osos fault between monitoring well 30S/11E 18L3 on Ferrell St. and and 18L4 near the library.

3. Elevation of Shallow Groundwater

a. Data Sources

Figure C3-6, Elevation of Shallow Groundwater, Spring 1995, has been constructed based on County monitored wells completed in the shallow zone, locations of surfacing groundwater, and other sources such as the test sites for the point-source nitrate study (B&V Waste Science, 1993, Table 3) and the monitoring wells drilled by Metcalf & Eddy (1996, Appendix B) for the study of the Broderson recharge site. The water-surface elevations from wells are based on Spring 1995, unless the Fall 1995 elevation was higher. Adjustments to well levels taken at other times and the reliability's of water levels in wells are summarized in Appendix A2. Areas of surfacing groundwater utilized in preparing Figure II-7 include Willow Creek (a.k.a. Eto Creek), Los Osos Creek east of the Los Osos Middle School, and the problem areas in the El Moro, Paso Robles and Ramona depressions.

b. Areas of Differing Groundwater Conditions

The South Bay can be divided into three areas having substantially different groundwater conditions. The area west of Strand B of the Los Osos fault is characterized by relatively low groundwater elevations and groundwater gradients. The primary features in this area are a groundwater "high" in the area of concentrated surface recharge west of the library, and a modest "low" in the area of pumping of shallow groundwater west of Pecho Valley Road. Otherwise, groundwater elevations increase toward the Los Osos fault, suggesting significant flow through or over the top of the fault.

East of the Los Osos fault, groundwater elevations are generally higher and the gradients are steeper. The most prominent groundwater feature in this area is the "high" centered near the intersection of 13th Street and Ramona Avenue. The presence of this "high" is controlled in large part by the presence of surfacing groundwater in the Ramona and Paso Robles depressions.

In the area east of the Los Osos fault and generally southeast of Los Olivos Avenue, these steeper gradients are complicated by a sequence of clayey layers in the upper aquifer that "perch" the shallowest groundwater at successively higher elevations toward the south. Groundwater conditions in this area are very complex, and well control is limited. Since no problems areas have been identified in the area south of Los Osos Valley Road, shallow groundwater contours have not been extended into the southerly part of this complex area.

4. Depth to Shallow Groundwater

a. Map Preparation

Figure II-8 shows the Depth to Shallow Groundwater, Spring 1995, based on the difference between the elevation of shallow groundwater (Figure C3-6) and surface elevations. The surface elevations are based on the most recent topography prepared for the sewer project (1-foot contour interval), supplemented by the topography (5-foot contour interval) prepared for the Phase Two - Basis of Design Report (Engineering-Science, 1997) in areas not contoured at the more detailed scale. Differences of up to 5 feet between the two sets of topographic data have been adjusted by paralleling the older topography between the presumably more accurate elevations from the more recent survey.

b. Areas of Differing Depths to Groundwater

Areas having significantly different depths to groundwater follow generally the separation of groundwater conditions across the Los Osos fault. Except for the shallow groundwater at the fringe of the Bay, all of the areas having drainage problems controlled primarily by shallow groundwater are east of the fault, as are the areas of consistently surfacing groundwater along Willow Creek and the unnamed creek in the Los Osos Oak Preserve. In this area, depths to groundwater are primarily in the range of 5 to 40 feet with areas of deeper groundwater being limited primarily to narrow zones along the crests of the larger sand dunes.

West of the Los Osos fault, groundwater is consistently deeper over relatively large areas.

C. EFFECTS OF URBAN DEVELOPMENT

The rising groundwater conditions in the area of the community northeast of Strand B of the Los Osos fault is probably the result of changes in recharge and pumping as a result of urban development. The period from about 1963 through 1983, during which much of the rise occurred, was very wet in comparison to other wet and dry cycles in the 126-year rainfall history of the county. However, the reduced rainfall during the dry period from 1984 through 1990 did not result in comparable declines in water levels, and the problem must be attributed to a condition other than climate.

1. Septic Tank Discharge

At the present time, most of the water used for domestic purposes in the community is pumped from the lower aquifer. Of this pumpage, approximately 65% is used within the home, and essentially all of that is discharged to the upper aquifer from septic tanks. Based on the analysis by the USGS (Yates & Wiese, 1988), the volume of return water from this source for average conditions and 1986 development levels is 1,550 acre-feet per year. Depending on location within the basin, most of this discharge remains within the upper aquifer, and little, if any, returns to the lower aquifer from which is was pumped. (See discussion of Upper Paso Robles Formation above.)

In the early stages of development of the area, most of the domestic water was pumped from the shallow aquifer. However, as nitrate concentrations in the shallow wells increased, it became necessary to drill to the deeper, uncontaminated aquifers to maintain acceptable quality. With implementation of the sewer project, it is expected that nitrate levels will decline, and the shallow groundwater can again be used for domestic purposes. This would substantially reduce or eliminate this component of the shallow groundwater problem as well as reducing the nitrate concentrations that now make widespread use of this water uneconomic.

2. Recharge of Urban Runoff

In most urban areas, increased runoff from the increased impervious surfaces, such as roofs, driveways and roads, is collected and disposed of by various types of flood control facilities. In the South Bay, however, flood control facilities are limited because: 1) major sections of the community were developed before such facilities were required; and 2), there was not an apparent need for such facilities in the early stages of urbanization because the high infiltration rates of the very sandy soils tended to naturally dispose of the increased runoff. However, as urbanization increased, the capabilities of the underlying soil to naturally dispose of increased urban runoff became saturated, particularly during wet years, and areas with flooding problems have progressively expanded.

3. Combined Effects of Urban Recharge

Recharge of the groundwater basin for various conditions of development were studied by the USGS (Yates & Wiese, 1988) as a part of the development of the computer-model of the basin, and this information has been examined in Appendix B1 to extract the components of recharge that will continue with implementation of the sewer project and those that will change. The conclusions of this analysis are as follows:

1. On a basin-wide basis, recharge of the shallow groundwater body tends to be dominated by recharge of rainfall which is approximately 75% of recharge in wet years when flooding would be a significant problem, decreasing to about 40% in normal rainfall years, and 30% in dry years.

2. In the high density residential areas where flooding has been exacerbated by shallow groundwater conditions, septic-tank discharge tends to be the dominant component of recharge, ranging from about 80% of recharge in normal years down to about 65% in moderately wet years. Even in very wet years such as 1995, recharge from septic-tank discharge probably would have exceeded recharge from rainfall in the high density residential areas.

In addition, long-term well histories that may provide additional insight into this question were examined, and it was concluded that there are so many variables involved, that individual well histories cannot be relied on at this time to substantially improve on the relative contributions of the various components of urban recharge as developed by the USGS in 1987. However, it can be noted that the relatively consistent rise in groundwater in both of the wells used for this analysis tends to substantiate that a large part of the effect is due to a constant condition, presumably septic-tank discharge. The effect is the most pronounced at the well at 8th and El Moro which is surrounded by high density development. It is less pronounced at the well on Los Osos Valley Road where development up gradient is lower density. These effects may be further clarified by re-examination of the groundwater model in a study now in progress by the water purveyors in the community.

D. DISPOSAL VERSUS CONSERVATION OF RUNOFF

A major concern of the community is that runoff be recharged to the shallow groundwater aquifer to the maximum extent feasible to minimize the need for imported water. The feasibility of increasing recharge of runoff as a part of any flooding solution will depend on location and climatic condition. That is, it is obvious from the existing distribution of shallow groundwater conditions (Figure C3-7) that increasing recharge in the area northeast of the Los Osos fault would be highly problematic unless removing septic-tank discharge results in a very substantial lowering of the groundwater "high" in this area. And, even if significant lowering does occur in this area under normal conditions of rainfall, it may be necessary to have facilities in place to dispose of excess runoff during very wet years and wet climatic cycles such as occurred between 1978 and 1983.

On the other hand, most of the area southwest of the Los Osos fault has relatively deep groundwater conditions, and it should be feasible to store excess runoff in this area except perhaps in very wet years, and provided it is extracted for beneficial use before it reaches the areas of shallow groundwater at the fringe of the bay. This area is also proposed for recharge, storage and extraction of treated wastewater from all of the community because it is the only area suitable for this purpose. Therefore, any increased recharge of runoff in this area would have to be operated in close coordination with the recharge of wastewater from the Broderson site.

E. BAY DISCHARGE AND WATER QUALITY

A potential solution to the drainage problems in some of the areas is the pumping of accumulated runoff and surfacing groundwater to the bay. A system of this type has been in place in the El Moro depression since 1983, and a similar system was installed in the Paso Robles depression in 1995. The El Moro system pumps at 8th and El Moro and discharges from a pipe in the bay off of the west end of El Moro Avenue. The Paso Robles system pumps at 16th and Paso Robles Avenue and discharges to the surface drainage system east of 18th Street. From this point, the pumpage flows to Los Osos Creek and to the bay.

A significant environmental concern in the operation of these systems is the quality of the water discharged to the bay, be it directly or via Los Osos Creek. It has been assumed that, because these waters include rising groundwater, they include some component of septic-tank effluent. The septic tank effluent includes, at a minimum, nutrients such as nitrate, and in areas where the septic-tank leach fields have been "flooded-out", it may also contain pathogens.

1. Nutrient Discharge

Nutrient discharges are occurring naturally at the known freshwater springs and marshes along the southerly edge of Morro Bay. Testing conducted in 1994 for the County Engineering Department yielded the following nutrient concentrations:

	Nutrient Concentration (mg/l)	
Location	as N	as NO3
Sweet Springs, at the spring	15.6	68.6
Small stream near north end of 7th St.	15.4	67.8
Marsh near north end of 11th St.	12.3	54.1

These values are about 150% of the maximum contaminant level (MCL) for nitrate in drinking water, and they are in the same range as the average concentrations of nitrates in the shallow groundwater in the community. While there is now no specific evidence to indicate that these nutrients are having a detrimental effect on the Bay (Morro Group/Tenera, 1990), the quality of these waters will be a significant consideration in the evaluation of the environmental impacts of problem solutions involving discharge to the bay.

2. Pathogen Discharge

Of greater concern is the concentration of potential pathogens in discharges to the bay. The Regional Water Quality Control Board (RWQCB) began testing for coliform bacteria in bay waters in 1996, including locations along the fringe of the South Bay. Based on this short period of testing, total coliform was as high as 5,000 MPN/100 ml and fecal coliform was as high as 1,700 MPN/100 ml on March 18, 1996 near the discharge pipe from the pumping from the El Moro corridor (data from Katie Kropp, RWQCB). The higher coliform concentrations tend to be associated with samples that are less diluted by seawater as indicated by lower electrical conductivity.

Samples taken in Cuesta by-the-Sea inlet recorded as high as 700 MPN/100 ml total coliform and 500 MPN/100 ml fecal coliform on this same date. These samples had conductivities indicating about 12% freshwater components, while the higher concentrations in the sample noted above from near the discharge pipe had a conductivity indicating a 70% freshwater component. The preliminary implications of these data are that septic-tank discharge in areas of shallow groundwater in the urbanized

areas of the South Bay are contaminating freshwater flows to the bay fringe. And, where shallow groundwater surfaces and becomes a significant part of the urban runoff, this surface runoff would also contribute to contamination of the bay.

The State Department of Health Services (DHS) routinely monitors coliform contamination in bay waters as they may affect aquiculture in the bay. In the past, coliform concentrations have sometimes exceeded acceptable limits during periods of heavy runoff, and it has been necessary to temporarily shut down shellfish harvesting until the levels declined to below acceptable limits. However, it has been reported in recent meetings of the Urban Discharge Issue Group of the Morro Bay National Estuary Program (Mark Jeude, Preharvest Shellfish Sanitation Unit, Department of Health Services) that background levels of coliform have been increasing, and that it may soon be necessary to shut down shellfish harvesting for prolonged periods of time.
Based on data available at this time, the natural discharge of shallow groundwater at the bay fringe, and waters having significant components of groundwater that are pumped to the bay, are having an adverse effect on bay water quality, particularly as it affects aquiculture. Therefore, it is anticipated that solutions to flooding problems that involve increased discharge of surfacing groundwater directly to the bay may not be acceptable from an environmental standpoint, and alternative solutions may be required.

F. REFERENCES

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Appendix C4

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ALTERNATIVES

A. SOLUTIONS INVOLVING DISCHARGE OF EXCESS GROUNDWATER TO MORRO BAY OR LOS OSOS CREEK (Category 1 Problem Areas)

Some potential solutions to flooding problems in areas affected by surfacing groundwater involve the disposal of this excess water by disposal to Morro Bay or to Los Osos Creek, a major tributary of the bay. The quality of this potential discharge is a significant concern because the shallow groundwater includes varying concentrations of septic-tank effluent, and evidence is increasing that the natural flow of this groundwater to the bay is having a detrimental effect on its water quality. While implementation of the Los Osos sewer project will eventually eliminate this effluent from the shallow groundwater, potential short-term solutions must take into account the quality of the shallow groundwater as it now exists.

It should be noted that the scope of this investigation has not included additional testing of groundwater or surface water quality, and the evaluation of potential impacts of the discharge of these waters to the bay or the creek is based on existing information. Should additional testing or further investigations of local areas be required to refine the impacts, these would be the subject of further environmental review as may be required for an identified solution.

1. Existing Conditions

A. Discharge of Shallow Groundwater to Morro Bay

1) Natural Discharge

a. Springs and Seeps

Existing discharges of shallow groundwater to Morro Bay were investigated as a part of the study of *Freshwater Influences on Morro Bay* by the Morro Group/Tenera (1990). This study identified numerous marshes and a few discrete springs (e.g., Sweet Springs) along the fringe of the back bay in Los Osos, Baywood Park and Cuesta-by-the-Sea, and also in Shark Inlet and on the sand spit. The distribution of these marshes and springs indicates that the source of the fresh water is the shallow aquifer of the Los Osos groundwater basin.

In addition to the known and observable discharges of shallow groundwater to the bay, there are various reports of springs and surfacing freshwater within the bay itself as discussed by the Morro Group/Tenera (1990, p. IV-19 to IV-26). While the reports of these springs are somewhat conjectural, the geologic conditions in the bay (e.g., the long-term stability of back bay channels) and the hydrologic conditions in the shallow aquifer almost require that they be there. These unseen discharges may substantially exceed the observable and measurable discharges.

b. Hydrogeologic Constraints on Groundwater Flow

The hydrogeologic constraints on groundwater flow in the upper (shallow) aquifer of the Los Osos groundwater basin are shown on Figure C4-1. This cross section extends from Los Osos Creek east of the Middle School, west-northwesterly through the Paso Robles depression, the El Moro depression, Baywood Point, and across the back bay to the sand spit. As shown on the section, the shallow groundwater is constrained from moving downward by the "confining beds" that Figure H-1 Hydrogeologic cross section separate the upper and lower aquifers. Since these confining beds are folded in the shape of a broad trough (Figure II-5), the only

direction that the groundwater can flow is westerly to northwesterly as shown by the arrows on the section.

To the west, there are two impediments to groundwater flow: the Los Osos fault (Strand B); and the saltwater wedge beneath the sand spit. The Los Osos fault is known to be a significant barrier to groundwater flow along its landward extent (Figures II-6 and II-7), and it is probably also a barrier beneath the back bay near Baywood Point. However, even if this fault is not a significant barrier to flow, the saltwater wedge beneath the sand spit would block any flow of freshwater that may get through the fault barrier. The presence of this wedge is documented by measurements in Sand Spit monitoring well #1 [well 11A1 (shallow) & 11A2 (deep)] which show salinities of 30 parts per thousand (ppt) in the upper aquifer (i.e., saltwater), and "relatively fresh" water in the upper part of the lower aquifer at 6 ppt (Yates and Wiese, 1988, Table 4, p. 30).

On the other hand, there are freshwater marshes on the sand spit along the margin of the bay, and there is a cluster of fresh water springs in a depression on the sand spit just south of the line of section of Figure H-1. These relationships are consistent with there being a saltwater wedge under the sand spit beginning at the shoreline on the ocean side, and inclined landward at a slope of about 40:1 as shown on Figure C4-1.

With this configuration, the accumulated groundwater (infiltrated rainfall and septic-tank discharge) flows westerly off the groundwater "high" (see Figure II-7) toward Strand B of the Los Osos fault which is known to be a significant barrier to groundwater flow along its landward extent. The most likely areas of groundwater surfacing in the bay would be south of Baywood Point between the fault and the 3rd Street marsh, and north of Baywood Point to the east of the main tidal channel. Any groundwater flow that manages to bypass the fault barrier would be forced upward and into the bay by the more dense saltwater wedge as shown by the arrows on Figure C4-1.

These relationships also apply to the groundwater flow on the west side of Strand B of the Los Osos fault. With a saltwater wedge beneath the Sand Spit, and the confining layer separating the upper and lower aquifers, all of the outflow from the shallow aquifer west of the Los Osos fault is constrained to rise within the bay. The only way it can "escape" is if the saltwater-freshwater interface is lower in Monitoring well #1 which would allow the flow of freshwater beneath the sand spit to the ocean. This cannot be disproved because the perforated intervals in the sand spit monitoring wells are in the lower part of the upper aquifer, and the E-logs of these wells do not extend to the surface. However, given the ready availability of the more dense seawater through the porous sands of the ocean shoreline, it is likely that the saltwater wedge begins at the westerly edge of the sand spit as shown on Figure C4-1.

c. Quality of Shallow Groundwater

The shallow groundwater in the South Bay is known to carry relatively large quantities of nutrients, and the concentrations of nitrate routinely measured in the shallow aquifer are in the range of 60 to 70 mg/l, or about 150% of the maximum contaminant level (MCL) for safe drinking water. In addition, during periods of prolonged rainfall, groundwater levels rise to the surface in some of the problem areas which "floods-out" the septic-tank leach fields and even the septic tanks themselves. This results in the direct discharge of unoxidized effluent to the shallow groundwater, and possibly also undigested fecal material from the septic tank. It should be emphasized that this process occurs whether the septic-tank system is otherwise in proper working order or not. Once the leach field becomes inundated by groundwater, it cannot function properly.

More recently, the County has tested some of the springs at the edge of the bay for nitrate and total dissolved solids, and the RWQCB has conducted testing of the bay water for both nitrate

and coliform bacteria. This testing suggests that South Bay septic discharge is reaching the bay in relatively large amounts from both natural springs and seepage, and from pumpage from the areas of flooding along El Moro Avenue. (See also Section C3, Bay Discharge and Water Quality.)

2) Pumping to the Bay

The County now pumps accumulated runoff to the bay from the areas of flooding along El Moro Avenue. While the intent of this action is to pump surface water, it is clear that the waters at the surface of the ground also include rising groundwater, and that pumping some groundwater to the bay by this mechanism is unavoidable if the flooding in these areas is to be alleviated. It is also clear from the distribution of high coliform levels, both as to location and time, that the pumped water is only one source of the contamination, and that the natural flow of shallow groundwater to the bay is probably the much larger source.

a. Discharge of Shallow Groundwater to Los Osos Creek

Very little is known about the quality of the waters in lower Los Osos Creek. Testing was conducted by the County in late 1983 and 1984 of waters from Los Osos Creek at the horse ranch, at the Los Osos Valley Road bridge and near Eto Lake, and from Eto Creek at Nipomo Avenue, and from Eto Lake (Morro Group, 1987, Volume II, Appendix C-4, Surface Water Quality Data). None of these tests indicated unusually high concentrations of nitrate, and no testing for bacteria was conducted.

While there are no reliable data, it may be presumed from groundwater gradients, and conditions in the creek and its tributaries, that significant amounts of groundwater drain to Los Osos Creek. First, both Eto Creek and the creek in the Los Osos Oak Preserve are fed by surfacing groundwater. Second, the gradients on the east flank of the major groundwater "high" east of the Los Osos fault (see Figure II-7) are toward Los Osos Creek, with the closest point of the creek being near the east end of Pismo Avenue along the south side of the soccer field at the Middle School. Third, as Los Osos Creek begins to go dry below the Los Osos Valley Road bridge in the late spring or early summer, the underflow surfaces beginning at the east end of Pismo Avenue extended, and increases downstream into the wetland. Based on a comparison of 1949 aerial photographs (essentially pre-development) with existing conditions, the wetlands east of the Middle School have expanded several fold during this period (Figures C4-2 and C4-3).

The conditions described above suggest that relatively large amounts of groundwater are flowing to Los Osos Creek from developed areas to the west. Based on structure of the confining layer (Figure II-5), the flows from upstream of approximately Pismo Avenue extended are probably from the upper aquifer, while those from downstream are from the lower aquifer. Since the surface flow increases rapidly downstream of Pismo Avenue, most of the water flowing into the wetlands during the dry season is probably from the lower, uncontaminated aquifer. However, some flow from the contaminated upper aquifer is probably present, and moderately elevated nitrate and pathogen levels should be expected. However, the levels should be substantially lower than those in the shallow groundwater flowing directly to the bay as discussed in the section above.

b. Biological Considerations associated with discharge to Bay or Los Osos Creek

Nutrient enrichment has been identified as one of the primary problems confronting the nation's estuaries based on the *Morro Bay Nutrient Study Discussion Paper*, by the Morro Bay National Estuary Program (MBNEP), (1997). Impacts of nutrient enrichment include increased algal growth, decreased water clarity, and reduced dissolved oxygen levels. Fish kills and loss of estuary vegetation, such as, sea grass beds are common consequences of increased nutrient levels. In addition, high levels of bacteria can have adverse effects on vegetation and wildlife species utilizing estuaries.

Currently, high levels of nutrients and bacteria are being documented entering Morro Bay through its tributary creeks, natural seepage of shallow groundwater containing concentrations of septic-tank effluent, and from surface and groundwater discharge facilities. According to the MBNEP, the bay currently shows some indications of eutrophication, including large quantities of algae, such as, *Ulva* and *Enteromorpha* visible in the back bay, which are opportunistic in nutrient rich environments. Rapidly increasing coverage of intertidal mudflats with algae and temporary closures to commercial oyster harvest are indications of the increased levels of nitrates and bacteria in the bay. However, majority of the bay completely flushes during tidal changes and the overall impacts of nutrients and bacteria on the health of the estuary are uncertain. There is a need for further examination of the current impacts of nutrients and bacteria on the estuary, and an overall assessment of probable impacts associated with future projects. The MBNEP is planning to begin extensive studies on these issues in the near future.

Pumping of surfacing groundwater directly to the bay has potential to significantly impact existing biological resources due to the varying concentrations of septic-tank effluent being focused in a specific area of the estuary during periods of flooding. This alternative is not expected to significantly increase the overall levels of contamination of the bay, only focus the contamination in moderate quantities during short periods of time. The magnitude of impacts to biological resources as a result of short term pumping of surface water is uncertain until the overall impacts of nutrients and bacteria discharging naturally to the estuary are studied in further detail. There are many variables involved with this alternative as a project, requiring a detailed study and further evaluation of potential impacts to biological resources.

Expanded duration of pumping of both surface water and groundwater to the bay has potential to significantly impact existing biological resources of the estuary. This alternative would significantly increase the concentration of contaminants being discharged to the bay over a expanded period of time. The magnitude of impacts to biological resources as a result of expanded duration of pumping groundwater is uncertain until the overall impacts of nutrients and bacteria discharging naturally to the estuary are studied in further detail. As discussed above, there are many variables involved with this alternative as a project, requiring a detailed study and further evaluation of potential impacts to biological resources.

Discharging of surfacing groundwater directly to lower Los Osos Creek has potential to substantially reduce nutrient levels and pathogen content by allowing the groundwater to be filtered by the riparian and wetland vegetation before it reaches the bay. There is evidence and documentation that wetland vegetation is capable of reducing nitrate levels in wastewater discharge. However, dependent upon the amount of contaminants present and known capability of lower Los Osos Creek to filter contaminants of the discharged groundwater, this alternative has potential to significantly impact the riparian and wetland habitat of that area, (e.g., increase in vegetative growth of both native and non-native species, adverse impacts to rare, threatened, and/or endangered species). There are many variables involved with this alternative as a project, requiring a detailed study and further evaluation of potential impacts to biological resources in order to ensure that adequate mitigation measures are implemented. The balance of potential beneficial impacts to the bay and potential significant adverse impacts

to lower Los Osos creek would have to be evaluated in further studies containing input from all responsible and regulating agencies.

c. Archaeological Implications

Archaeological resources are defined as any prehistoric site, object, or structure recognized by a community, ethnic group, or social group as having potential scientific, traditional, religious, or other value. Archaeological resources are remains associated with previous human activity, either prehistoric or historic.

The individual problem areas and solutions for the project are located within the territory historically occupied by the Chumash Indians. There are numerous significant Chumash archaeological sites located throughout the Los Osos area and in the vicinity of the problem area solutions. The significant amount of cultural resources found in Los Osos indicates it once had a major concentration of Chumash Indian activity. Problem area solutions which involve minor or heavy construction activities have the potential to significantly impact archaeological resources, regardless of the location or size of the project site. County requires archaeological surveys to be performed by qualified archaeologists prior to any ground disturbing activities as standard mitigation. In addition, the termination of all construction activities is required in the event that archaeological resources are discovered on site during the construction process of any project.

d. Social Considerations

The proposed problem areas solutions have the potential to impact the public services of the Los Osos area due to short term construction impacts. These services include the local school district, fire department, police department, and numerous other utility and service providers in the area. Each proposed solution may involve minor or heavy construction activities on problem area roadways causing temporary roadway closure or traffic diversions via alternate routes. Majority of these impacts will be considered less than significant, and of short duration with the requirement of some standard mitigation measures.

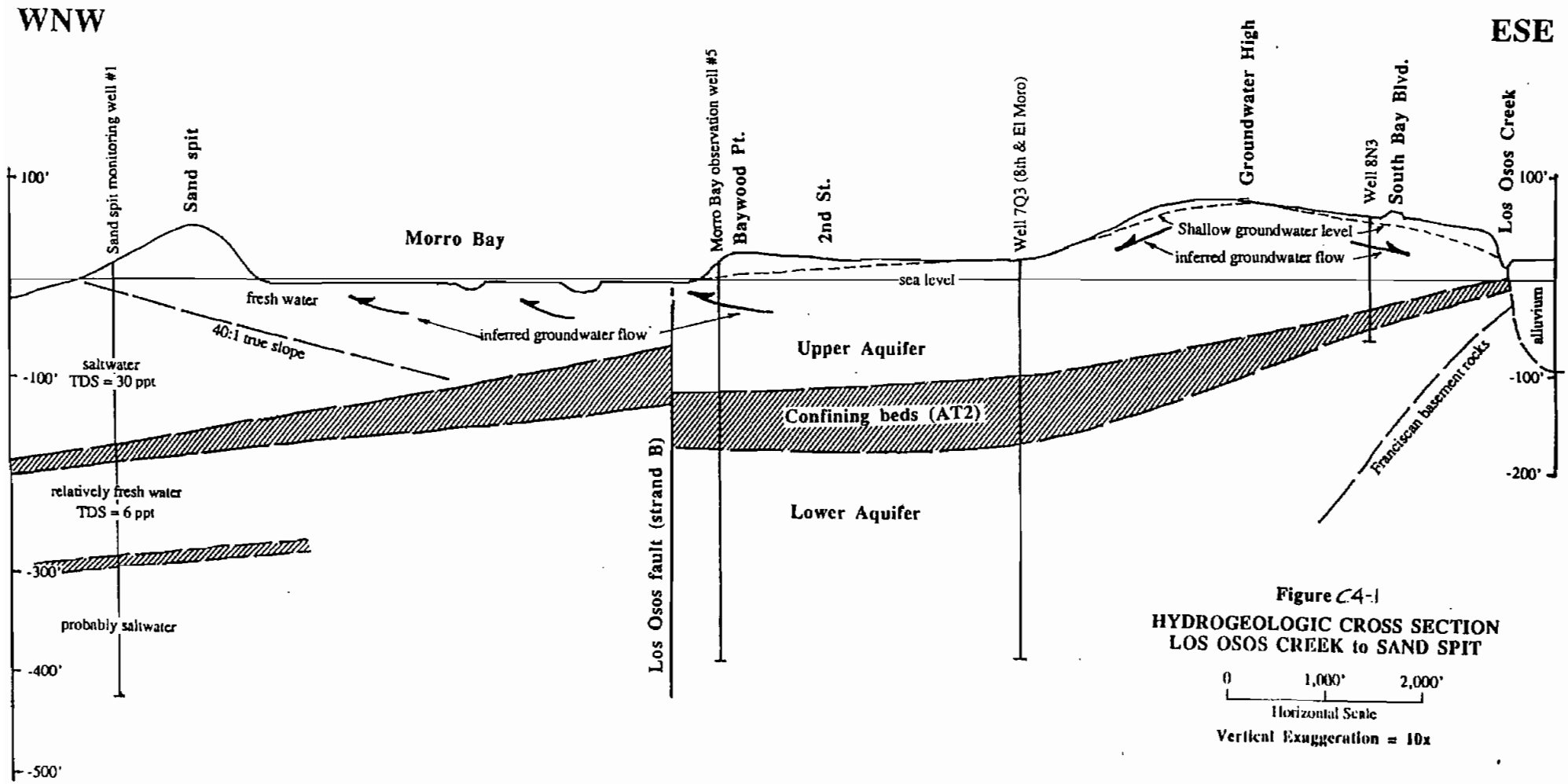


Figure C4-1
HYDROGEOLOGIC CROSS SECTION
LOS OSOS CREEK to SAND SPIT

0 1,000' 2,000'
Horizontal Scale
Vertical Exaggeration = 10x

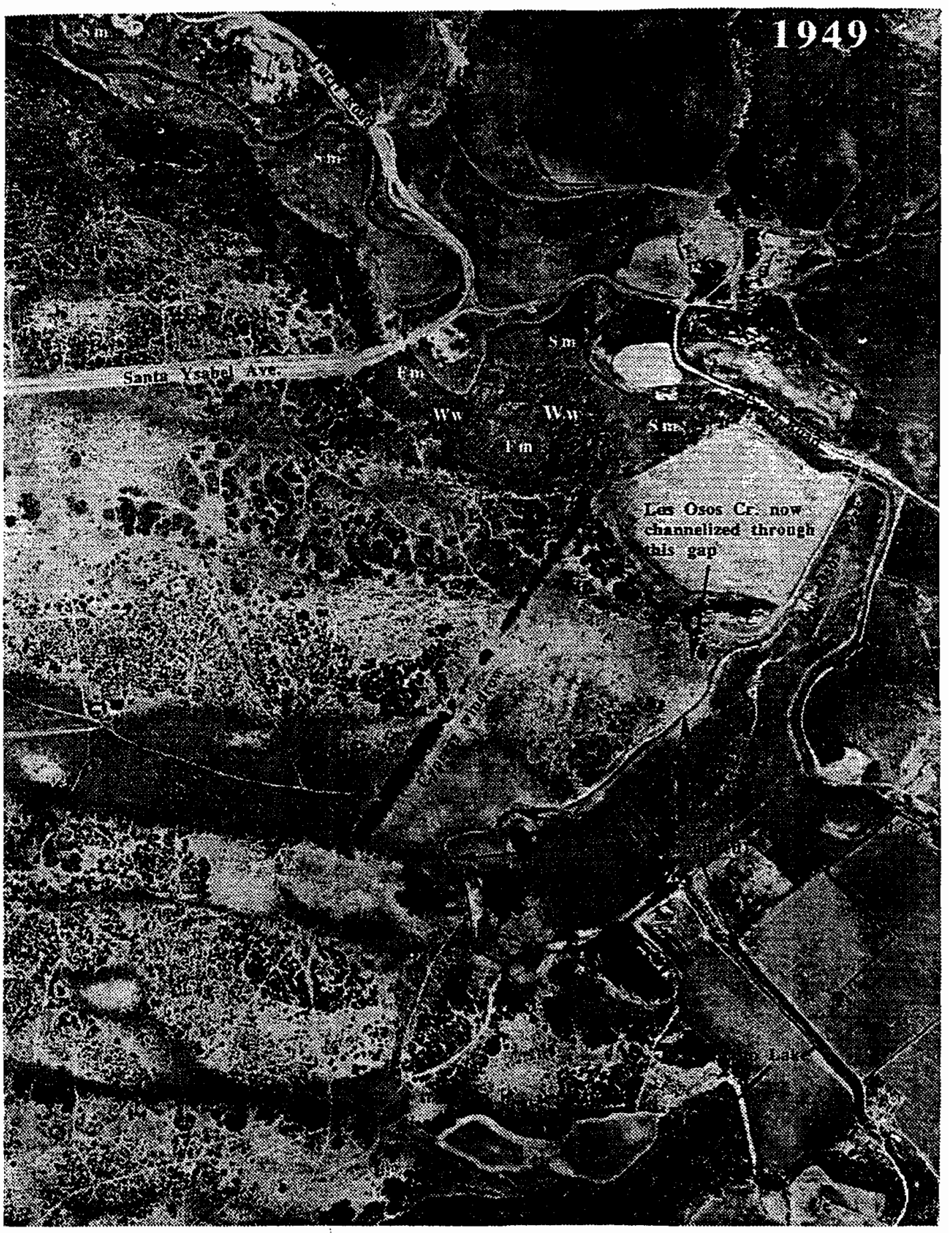


Figure C4-2 Aerial photograph of lower Los Osos Creek in 1949 showing limits of wetland vegetation at that time. Vegetation types are based on comparison with existing conditions and vegetation height and topography from stereographic examination. Scale of photo is approximately 1"=700'. Ww = Willow woodland; Fm = Freshwater marsh; Sm = Salt marsh.

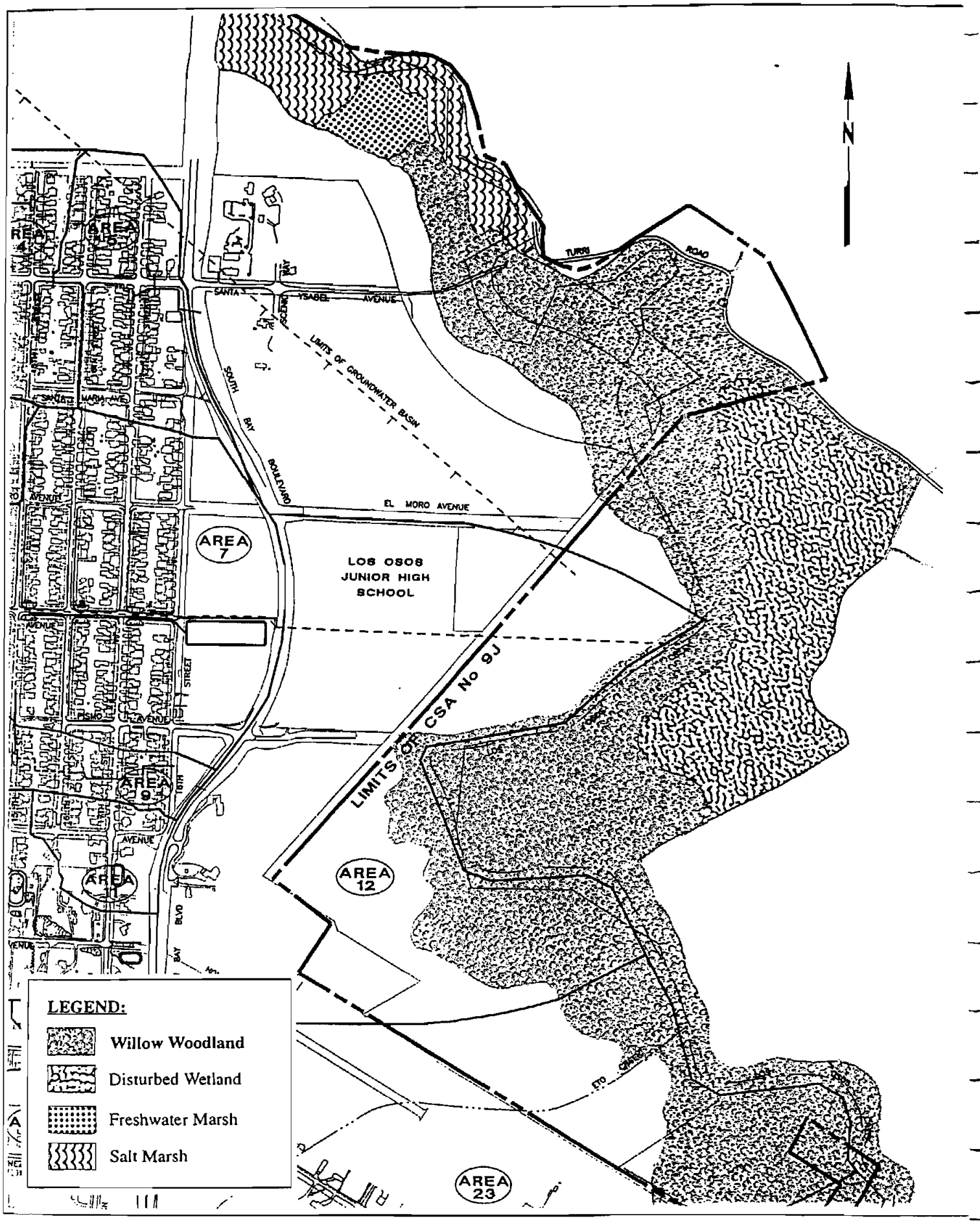


Figure C4-3

Approximate Extent of Wetland Vegetation Communities of lower Los Osos Creek

Approximate Scale: 1" = 700'

B. Alternative Solution Strategies

1) Inland Areas

Alternative solutions to those flooding problems exacerbated by surfacing groundwater, and not at the fringe of the bay, are based on the following considerations:

a. Implementation of the sewer project is expected to result in a decline of groundwater levels in the affected areas which would substantially alleviate the problem of persistent ponding, and also eliminate further additions of nutrients and pathogens to the underlying groundwater. Assuming the rate of decline after elimination of septic-tank discharge would approximate the average rate of rise during development, the average rate of decline in the El Moro depression is estimated at approximately 1 foot/year. The near-term period in which the problem may persist is estimated at 5 to 10 years, depending on rainfall, after cessation of septic-tank discharge.

b. The discharge of shallow groundwater carrying nutrients and pathogens to the bay is now occurring naturally, and any reduction in the nutrient and pathogen content would be an improvement. The only substantial differences between this natural flow to the bay and pumping the accumulated waters to the bay is that the pumped water is diluted by surface runoff, and as "a project", it would be subject to investigation and regulation.

c. A substantial reduction in the pathogen and nitrate content of the local groundwater may be achieved by lowering the depth to groundwater to 5 to 8 feet below the ground surface which would provide a zone of aeration normally associated with properly functioning septic-tank systems. Lowering the water table would require that pumping be expanded to periods when there is no flooding and inundation, and that the permits for existing facilities or new facilities be amended to include pumping of groundwater.

The volume of water to be pumped to achieve this condition would be substantial. In the El Moro depression, for example, to lower the groundwater in the flooded areas by about 8 feet, it would probably be necessary to extract the groundwater to an average depth of about 4 feet over an area of about 200 acres (area of Drainage Area 6). Assuming a specific yield of 18%, the volume of groundwater involved would be approximately 150 acre-feet. Maintaining the lowered condition until the sewer is functional would depend, in part, on the amount of rainfall, as most of the septic-tank discharge and infiltrating rainfall would have to be pumped out each year to maintain the condition.

d. A substantial reduction in nutrient content, and possibly some reduction in pathogen content, may be achieved by pumping the accumulated water to a wetland. The most likely location would be the wetland on Los Osos Creek east of the Middle School. Wetland vegetation is well known for reducing nitrate concentrations. The degree to which wetlands may also reduce pathogens is unknown.

Pumping the waters to Los Osos Creek, instead of directly to the bay, would increase annual costs by the additional pumping head of approximately 50 feet, and it would require the installation of pipe to connect the facilities on El Moro to those on Paso Robles Avenue. Directing all the discharge to the existing drainage facilities in the Paso Robles Avenue area could require significant improvements to these facilities. However, the primary thrust of combining dry-season pumping and discharge to Los Osos Creek would be to utilize the existing drainage facilities when they are otherwise not needed to convey local runoff.

e. The discharge of contaminants in "first flush" runoff events can be avoided by providing a retention/sedimentation basin as a part of solutions involving direct discharge to the bay or other sensitive receiving waters. The required retention capacity need not be large because "first flush" rainfall events normally generate a relatively small volume of runoff. This approach would be particularly applicable to solutions in problem areas requiring direct discharge to the bay from large urbanized areas such as Drainage Area 16.

Alternatively, it may be difficult to provide significant retention in some of the more developed sections of the community that also have shallow groundwater problems such as Area 6 (El Moro depression). These areas are relatively flat where runoff accumulates, and infiltration predominates over runoff in the early stages of the rainfall season. However, the discharge to the bay of some "first flush" runoff from areas of this type may be unavoidable if the flooding solution is to be viable in other respects.

Based on the considerations discussed above, alternative solutions to the near-term flooding problems involving surfacing groundwater in the inland areas include:

a. Pumping of surface water to Morro Bay during periods of inundation.
b. Expanded duration of pumping to Morro Bay to lower groundwater levels.
c. Pumping of surface water to Los Osos Creek during periods of inundation.
d. Expanded duration of pumping to Los Osos Creek to lower groundwater levels.

For the solutions above, "pumping" includes increased rates of pumping if existing facilities are inadequate, and "surface water" includes surfacing groundwater. "Pumping" in Alternatives "b" and "d" includes shallow groundwater as well as surface water.

In addition to the basic alternative scenarios related to discharge to the bay or Los Osos Creek, some alternatives involve a difference in approach as to collecting the runoff and surfacing groundwater. The basic scenario would be to continue with the existing system of street drainage which involves very little control because of the general absence of curb-and-gutter and storm drains. The modified scenarios would include curb-and-gutter to better control the street runoff, and the installation of some storm drains to pick up and dispose of the runoff better controlled by the curb-and-gutter.

With either of these sub-scenarios the total volume of water and the total volume of contaminant of a specified concentration would remain the same because the stabilized condition at the end of a particular "flooding" event requires a return to the conditions before the event occurred. With the controlled runoff sub-scenario, the initial discharge would have lower concentrations of contaminants because it would be higher in surface runoff as opposed to surfacing groundwater. However, the contaminant concentrations during the later stages of the "flooding" event, which involve primarily surfacing groundwater, would increase because the dilution of the septic-tank discharge by infiltrating runoff would be proportionally reduced.

The discussion above is intuitive and generalized because there are no data on the variations in contaminant concentrations in the accumulated waters over time in any of the "flooding" events that have occurred to date. Therefore, it is not possible to further refine or quantify the differences in contaminant concentrations that may result from either of these two approaches.

2) Bay Fringe

Application of the solution strategies, developed above for the inland problem areas, is probably not feasible for problem areas near the bay fringe because it would require a large number of extraction wells and a complex water-disposal system. Groundwater in these areas is naturally very shallow, and a rise of only a few feet results in "problem" conditions. Lowering the groundwater near the bay fringe by more than a few feet could result in seawater intrusion of the shallow aquifer, and maintaining the delicate balance between eliminating the problem condition

but not inducing seawater intrusion could be very difficult and expensive. The state of the problems in these areas is probably not so great as to warrant such an undertaking to solve the near-term problems until the sewer is implemented.

3. Potential Impacts of Solutions

A. Water Quality

1) Nitrate Concentrations in Groundwater

A large amount of data is available on the nitrate concentrations in the shallow aquifer of the Los Osos groundwater basin. While the concentrations vary considerably both in time and by location, a reasonable average for estimating environmental effects is approximately 60 to 70 mg/l, or about 150% of the MCL for drinking water. This value is consistent with that measured at springs at the edge of the bay, and with that of "denitrified" percolating effluent below septic-tank leach fields in Los Osos.

2) Bacterial Concentrations in Groundwater

Bacterial concentrations are normally described in terms of the total and fecal coliform concentrations because it is an "indicator species" that is relatively easy to identify. The State Department of Health Services (DHS) standards require that total coliform at public beaches (i.e., public contact) should not exceed an average over a 30-day period of 1,000 MPN/100 ml. The Regional Water Quality Control Board (RWQCB) standard for public contact is based on the average fecal coliform not exceeding 200 MPN/100 ml in a 30-day period.

Recent monitoring by the RWQCB of the water quality in the back bay has revealed fecal coliform levels near Baywood Park pier as high as 1,700 MPN/100 ml at low tide, primarily freshwater in bay water, and as high as 5,000 MPN/100 ml in freshwater springs in Baywood Park (National Estuary Program, 1997). Much higher values have been measures during rainfall events, particularly "first flush" events in the fall, but it is the very high concentrations in the springs that is of the greatest concern in this review.

Bacteria concentrations in shallow groundwater are not normally a problem, even with septic-system disposal, because the zone of aeration beneath the leach field normally eliminates bacterial contamination. However, if the zone of aeration is eliminated by rising groundwater, then the bacteria from the septic system are not eliminated, and they become entrained in the shallow groundwater.

3) Combinations of Mixed Surface Water and Groundwater

The quality of potential discharges to Morro Bay or to Los Osos Creek from the problem areas involving surfacing groundwater would be expected to vary over a wide range depending on the intensity and duration of individual rainfall events and the groundwater level at the time of the event. For "first flush" events in the fall when the rainfall intensity is normally low, the runoff should be expected to be relatively high in bacterial and nutrient contamination, but very low in groundwater components. "First flush" runoff events are normally low in volume, and dilution in bay water would be expected to rapidly reduce contaminant concentrations.

As the rainfall season progresses and groundwater levels rise, the quality of the runoff should improve, but the component of contaminated groundwater is likely to increase. The volumes of these later events would be higher in total volume, and more significant as to ongoing effects on the bay. The quality of the potential discharge would depend on the balance between the relatively good-quality runoff and the more-contaminated groundwater. The poorest quality discharge would

be expected as runoff declines and surfacing groundwater continues. Actual concentrations cannot be accurately predicted because these conditions have not be monitored. However, the worst-case condition is expected to be that for surfacing groundwater undiluted by runoff, which from the discussions above would be approximately 60-70 mg/l nitrate and 5,000 MPN/100 mg/l fecal coliform.

B. Potential Impacts of Alternatives

1) No Project

With the no project alternative, existing natural discharges of contaminated groundwater and occasionally contaminated surface runoff would continue. The pumping of excess surface water from the El Moro depression, which periodically includes surfacing groundwater, would also continue at existing rates. "Flooding" problems continue as in the past in problem areas. These conditions would be expected to continue until approximately 1 to 3 years after implementation of the sewer project in the affected areas, at which time groundwater levels and contaminant concentrations are expected to begin to decline.

2) Pumping of Surface Water to the Bay

Increasing the rate of pumping of surface water from the problem areas is not expected to significantly increase the overall levels of contamination of the bay. If these waters are not pumped to the bay on the surface, they would act to maintain higher hydraulic gradients over a longer period of time which increases the subsurface discharge of groundwater over this period. However, pumping the water to the bay on the surface hastens this process. This would result in higher volumes of contaminated groundwater reaching the bay during periods of pumping, but less when pumping ceases. Considering dilution by bay water, the resulting concentrations of contaminants would be expected to increase over existing conditions during periods of pumping, but decrease below existing conditions when pumping is not required.

The effects on the shellfish industry in the bay would depend on the tradeoffs between having temporarily higher levels of contaminants as compared to lower levels during periods when pumping is not required.

3) Expanded Duration of Pumping to the Bay

Increasing the duration, and possibly the rate of pumping of both surface water and groundwater to the bay to lower groundwater to a level that would allow proper functioning of the septic-tank systems would substantially increase the volume of contaminated groundwater added to the bay waters over the period of expanded pumping. Concentrations of contaminants would be expected to increase significantly over this period. However, if the groundwater levels can be drawn down in the problem areas so that they function properly, then the overall effect would be to significantly reduce the total bacterial contamination during the period until the sewer system is implemented in these areas.

As with the scenario above, the effects on the shellfish industry in the bay would depend on the tradeoffs between having temporarily higher levels of contaminants as compared to lower levels after groundwater levels have been lowered. The primary difference in the scenarios would be that the differences would be more pronounced.

4) Pumping of Surface Water to Los Osos Creek

Both of the above scenarios could be modified to pump the accumulated water to the wetland on lower Los Osos Creek. If this were to be limited to periods of flooding in the problem areas, the

creek would likely be in a state of high flow and the wetland vegetation would be dormant. With these conditions, the potential benefits of circulating these waters through a wetland would probably be minimal.

5) Expanded Duration of Pumping to Los Osos Creek
With the expanded pumping scenario, however, discharge would continue into the dry season when the wetlands vegetation could act to reduce nutrient concentrations and possibly also the concentrations of bacteria.

4. Potential Mitigation Measures
With either of the two scenarios above involving pumping and discharge during the dry season, it may be feasible to concentrate discharge during those periods when the tidal flux is at a maximum, and when any discharge would be more rapidly carried out of the bay. This approach would be more easily controlled with direct discharge to the bay rather than cycling it through the wetlands on Los Osos Creek which would tend to smooth out the flow.

B. DISCHARGE OF SURFACE RUNOFF TO MORRO BAY NOT INVOLVING SURFACING GROUNDWATER (Category 2 Problem Areas)

A. Existing Conditions

1) Problem Conditions
The problem area most likely to result in solutions involving a significant increase in the discharge of surface runoff to Morro Bay is that in Drainage Area 16. Problem flooding is experienced primarily near the corner of Skyline and Broderson after large volumes of runoff have accumulated on the Morro Shores project site as a result of runoff from upslope in Drainage Areas 16B, C, D, E and F, a total of 570 acres.

Depths to groundwater near the corner of Skyline and Broderson in the spring of very wet years (i.e., 1995) are approximately 20 feet, which would appear to preclude surfacing groundwater as a significant cause of flooding in this area. However, from descriptions of surfacing groundwater by local residents, and the tendency of the problem to develop in the later stages of severe rainfall events, it appears that temporary mounding of groundwater is occurring during severe storms. Once the mounding reaches the surface, additional infiltration is precluded, and the runoff from upslope continues across the Morro Shores site and into the residences to the northwest.

The presence of the postulated temporary mounding has not been documented, as a monitoring well (M&E Boring #14, see Appendix B2) has only recently been established in this area, and the routine monitoring by the County Engineering Department is conducted twice a year, in the spring and the fall. To prove the existence of the mounding during severe storms, it would be necessary to install a stage recorder in a new well on the site, or in M&E Boring #14 near by, to get a continuous record of groundwater levels during severe storms.

2) Problem Solutions
If temporary mounding of groundwater is the root cause of the problem, then establishing an infiltration basin, or basins, on the Morro Shores site will not solve the problem. The only viable solution would be to convey the excess water to the bay or to some other infiltration site the location of which has not been identified.

3) Solutions with Sewer Implementation

Solutions to this problem must take into account the future operation of the Broderson recharge site which is now proposed to be located about a half mile to the south of this problem area. Modeling by Metcalf and Eddy (1996, Fig. 5-5) of the groundwater mound that would be generated by recharging treated wastewater at this site indicates that this approach is feasible. However, until the project is actually in operation, there will be questions as to how much additional recharge is feasible in this area during wet, normal and dry years from other sources such as runoff that has been captured in basins. Therefore, any solution in this problem area should have the flexibility of either discharging to the bay or infiltrating the runoff as recharge.

2. Potential Impacts of Solution

A. Discharge to the Bay

It is our understanding that an increase in the discharge of freshwater to the bay would be environmentally beneficial to the bay provided the discharge does not contain significant sediment or contaminants. The primary concern in this regard is the "first flush" rainfall event in the fall which tends to pick up most of the accumulated waste of the previous dry season, and is high in nitrates and bacterial contaminants. Since the first rains in the fall tend to be relatively low in volume, and groundwater levels would also be relatively low at the start of the recharge season, impacts of "first flush" runoff to the bay would be avoided as long as an infiltration basin capable of retaining the runoff from such events is included in system.

B. Point of Discharge

The point of discharge to the bay is also of concern, as there are numerous natural wetlands at the edge of the bay in the area downslope from this problem area. The most likely location is the existing area of discharge at the north end of Broderson Avenue. Figure C4-4 shows wetland features in this area in 1949 and 1990. The existing discharge system conveys runoff from the mobile home park and local streets northerly along the east side of Broderson Avenue in an open ditch and into the Sweet Springs Preserve. At this point, the runoff does not flow directly to the bay, but rather is diverted westerly by local topography into the area annotated "East Spring" on Figure C4-4.

This wetland feature, and the two to the west annotated "Central Spring" and "West Spring", are interpreted to be freshwater springs because they have persisted since the earliest aerial photographs of the area in 1949 and 1956. Monitoring by this author in 1990 and 1991 detected some reduced levels of salinity in these features, but it is unclear if this was due to rising groundwater within the features themselves or surfacing groundwater in the adjacent freshwater marshes.

It should also be noted that the "East Spring" has previously been identified (Perspective Planning, 1988) as habitat of the endangered saltmarsh bird's beak, a brackish-water plant that requires periodic freshwater inundation of otherwise salty environments. For this reason, it is assumed herein, for purposes of this review, that additional flow of freshwater into this marsh would probably not have a significant adverse impact on this species. However, additional environmental review of this issue would be required at such time as a specific project proposing increased freshwater discharge to this wetland feature would be developed.

3. Potential Mitigation Measures

The primary concern regarding increased freshwater discharge to the bay, and/or the wetlands at the edge of the bay, is the avoidance of significant sediment or contaminant inflow. This can be accomplished by including an infiltration/sedimentation basin in the design of the problem solution which would be capable of retaining and infiltrating the runoff from "first flush" events.

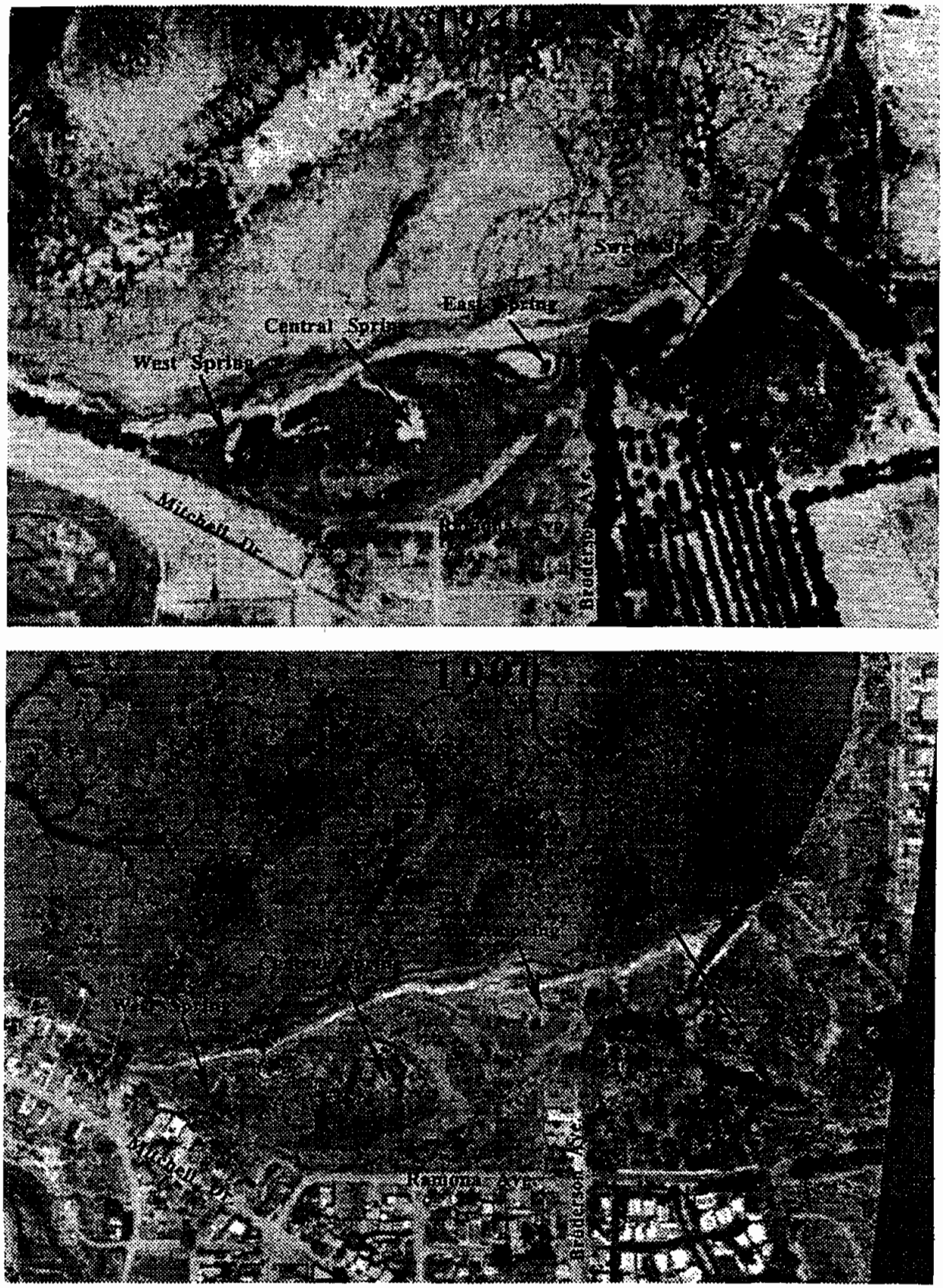


Figure C4-4 Aerial photographs taken in 1949 (top) and 1990 (bottom) of the area in the vicinity of the existing discharge to the bay at the north end of Broderson Avenue. The scale of both photographs has been adjusted to approximately 1"=500'.

4. Other Points of Discharge to the Bay
While the north Broderson discharge point is expected to be the most significant point of additional freshwater discharge to the bay that may arise out of this study, additional discharge to the Pecho marsh between Butte Drive and Pecho Road or Cuesta inlet may occur as the result of drainage improvements in the western part of the community. Aerial photographs of the area of these bay fringe features in 1949 and 1990 are shown on Figure C4-5.

It is interesting to note that the area along the south side of Grove Street that now has shallow groundwater problems was apparently part of the Pecho marsh in 1949. Also, the area of what is now Cuesta inlet was a large spring-like feature before it was dredged in the late 1950's.

C. CONSERVATION OF POTENTIAL RECHARGE OF GROUNDWATER

Based on the analysis of groundwater conditions beneath the community in Section II, there is now no capacity in the shallow groundwater system east of the Los Osos fault to store excess runoff without exacerbating the existing "flooding" problems in the areas under review in this study. However, with implementation of the sewer project, the shallow groundwater levels east of the Los Osos fault should decline, and projects to conserve excess runoff as groundwater recharge may be feasible in the future. This condition should not be expected to develop sooner than about 5 to 10 years after sewer implementation.

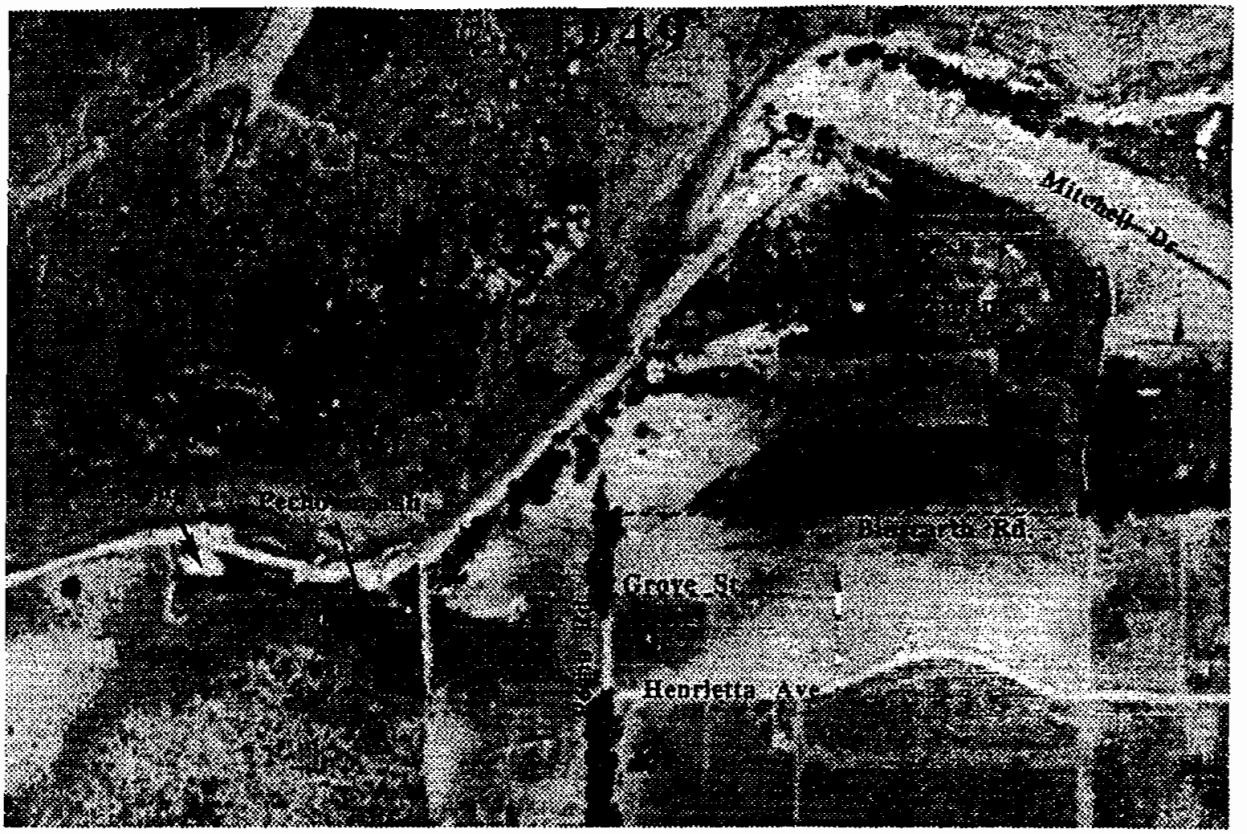
Small amounts of increased recharge of runoff may be feasible in the near-term in the area west of the Los Osos fault, particularly if drought conditions should return to the area. However, until the sewer project is functional, and shallow extraction wells can be implemented in the area south of the Henrietta bluff, increased recharge west of the Los Osos fault may exacerbate the surfacing groundwater conditions at the bay fringe north of Henrietta Avenue.

In the long-term, much of the storage capacity of the area west of the Los Osos fault may be required to store treated wastewater prior to its being extracted downslope and reused. The functioning of this recharge and extraction system will depend in large part on the degree to which the aquitard separating the upper and the lower aquifers prevents recharge of the lower aquifer from this source. Depending on how this system actually functions, recharging significant additional amounts of excess runoff to the groundwater may or may not be feasible.

D. ADDITIONAL REFERENCES

National Estuary Program, 1997, *Draft Bacteria Action Plan:* prepared by the staff of the National Estuary Program and published in "Turning the Tide", January 1997.

Perspective Planning, 1988, *Sweet Springs Marsh Resource Enhancement and Access Management Plan:* prepared for Morro Coast Audubon Society and the California Coastal Conservancy by Perspective Planning, March 1988.



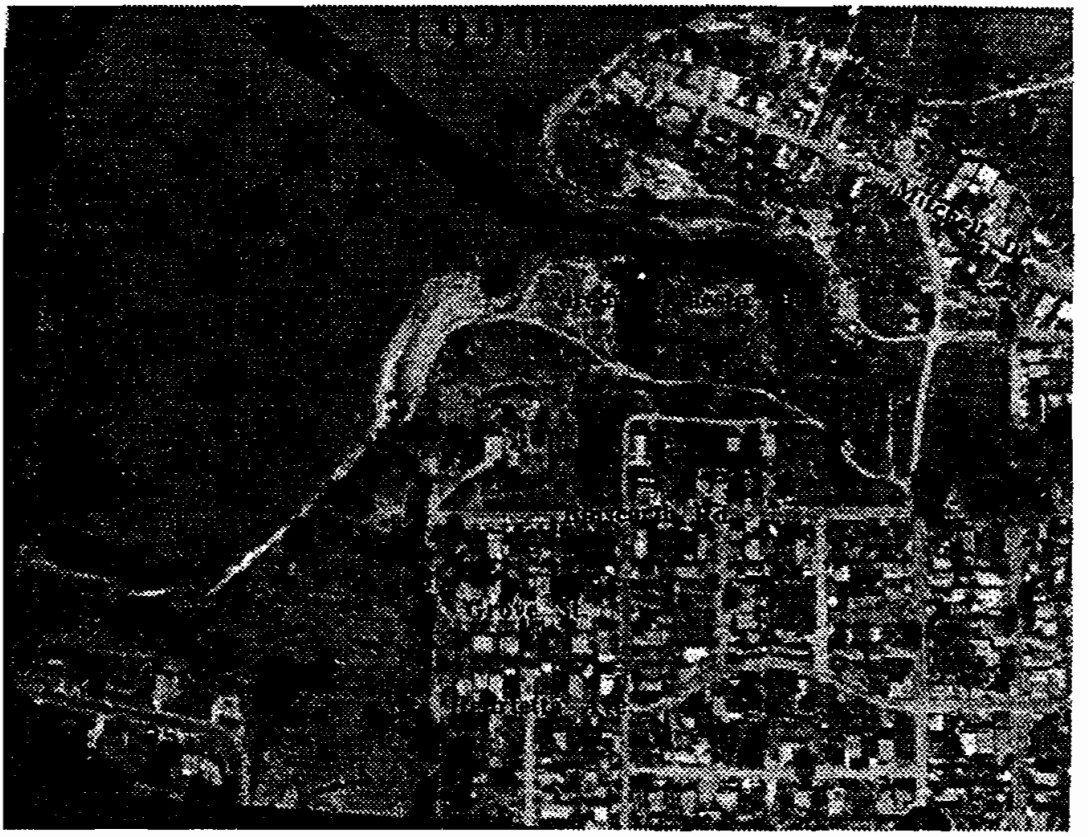


Figure C4-5 Aerial photographs taken in 1949 (top) and 1990 (bottom) of the area in the vicinity of the Pecho marsh and the northerly part of Cuest-by-the-Sea. The Cuesta inlet and connecting channel were dredged in the late 1950's. The alignments of Binscarth Rd. and Grove St. have been added to the 1949 photo for ease of location. Note that, from the tone, the area on the south side of Grove St. was probably once part of the Pecho marsh. The scale of both photographs has been adjusted to approximately 1"=500'.

Appendix C5

RANKING OF ALTERNATIVES BASED UPON ENVIRONMENTAL IMPACTS

RANKING CRITERIA OF SOLUTIONS

The following is a breakdown and description of the various resource areas listed on the matrices used in the preliminary evaluation of the problem area solutions:

Water Quality: Evaluates solution's potential to impact Morro Bay or Los Osos Creek due to discharge of shallow groundwater or rain season first flush surface water containing components of failing septic-tank systems, (e.g., nitrates, coliform bacteria, etc.).

Riparian or Wetland Habitat: Evaluates solution's potential to impact the biological resources of the riparian or wetland habitat in or near each problem area, (e.g., Morro Bay Estuary).

Coastal Scrub or Oak Woodland: Evaluates solution's potential to impact the biological resources of coastal scrub or oak woodland habitat in or near each problem area.

Species of Special Concern: Evaluates solution's potential to impact rare, threatened, or endangered species and their habitat in or near each problem area. This includes those classified, or recommended for classification (i.e., "candidate"), as "endangered" or "threatened" under the federal Endangered Species Act, Calif. Fish and Game Code, Department of Fish and Game, and the Calif. Native Plant Society. (e.g., Morro shoulderband snail, red-legged frog, Morro Bay kangaroo rat, Morro Manzanita).

Archaeological Resources: Evaluates solution's potential during the construction process to impact archaeological resources in or near each problem area.

Visual Resources: Evaluates solution's potential to impact the visual resources in or near each problem area, (i.e., short term construction impacts and long term impacts visible from a public roadway in Los Osos).

Traffic: Evaluates solution's potential to impact the traffic flow in or near each problem area during the construction process of the proposed action.

Air Quality: Evaluates solution's potential to impact the air quality in or near each problem area during the construction process of the proposed action.

Noise: Evaluates solution's potential to increase noise volumes in or near each problem area during the construction process of the proposed action.

Public Services: Evaluates solution's potential to impact public services in or near each problem area during the construction process of the proposed action, (e.g., fire department, police department, local school system).

NUMBER CLASSIFICATION

The number classification system used on the matrices is designed to evaluate the full range of proposed solutions and their perspective impacts on the environment. The use of the matrices involved not only identifying potential impacts but also classifying them numerically by their severity or extent of impact to the environment. With this concept, each solution is classified with a numeric value of (1 through 4), based on the severity of impact to the individual ranking criteria. The following is a brief description of the numbering system used:

1 = Potentially significant unavoidable adverse impact, (class 1).
2 = Potentially significant but mitigable impact, (class 2).
3 = Less than significant impact with some standard mitigation required, (class 3).
4 = Insignificant impact, (class 4).

The number ratings on the matrices reflect increased degree of severity with the number (1) being the most severe. This preliminary evaluation did not consider, nor recommend the mitigation measures required to lessen each specific impact to a level of insignificance. The primary goal of the matrices was to identify the potential significant impacts and assign numeric values based on the degree of severity.

TABLE C5-1: APPROACH TO INTEGRATING ENVIRONMENTAL REVIEW REQUIREMENTS

Requirement	Scoping Process	Draft Document	Final Document	Decision Making
NEPA	Notice of Intent	Draft EIS	Final EIS	Lead Agency decision and Record of Decision
CEQA	Notice of Preparation	Draft EIR	Draft EIR	Lead Agency decision and Notice of Decision
ENDANGERED SPECIES ACT (7)	Request species list	Biological assessment	Biological opinion	
CLEAN WATER ACT (404)	Define objectives, Screen alternative; Submit permit application.	Draft 404(b)(1) analysis	Final 404(b)(1) analysis	Corps of Engineers issues 404 permit (after 401 certification or waiver)
NATIONAL HISTORIC PRESERVATION ACT (106)	Identify and evaluate historic and archeological properties	Draft effects assessment	Memorandum of Agreement	
CLEAN AIR ACT CONFORMITY (NON-TRANSPORTATION PROJECT)	Determine whether the conformity requirement applies	Preliminary analysis (comparison to de minimus levels)	Detailed modeling analysis if necessary	Federal agency issues conformity determination
PUBLIC INVOLVEMENT	Scoping meetings	Public comment; Public hearing	Public comment	

APPENDIX D

SUPPLEMENTARY ENGINEERING DATA

D1: General Assumptions and Calculation Sheets
D2: Tributary Area Flowrate Calculation Sheets
D3: Preliminary Cost Estimation Worksheets
D4: Cost Estimate for Highland Retention Basin

Appendix D1
GENERAL ASSUMPTIONS AND CALCULATION SHEETS

1. *Storm Drains, Channels & Swales:*
   Estimated capacities for proposed culverts and storm drains within the individual tributary areas were based on a 25-year design storm event, assuming full-buildout conditions, applying the Rational Equation (Q=CiA), and utilizing the *San Luis Obispo County Engineering Department Standard Improvement Specifications and Drawings*, Section 11-351.1504 and Drawing Numbers: D-2, D-3, D-4, & D-6. Note that for storm events exceeding the design standards used in this report, flooding problems are expected to reoccur at areas presently experiencing problems. Refer to Section IV-2, Design Criteria, for additional information.

   Pressure Flow
   All pipe diameters were estimated using the *Bureau of Public Roads* "Headwater Depth for Concrete Pipe Culverts with Inlet Control", with an initial headwater to depth ratio $\left(\frac{HW}{D}\right)$ of 1.5 times the pipe diameter.

   Open Channel Flow
   Manning's Equation, $Q_{25}=\frac{1.49}{n}AR^{0.67}S^{0.5}$, was used for all open channel swale and channel estimated designs and sized for a 25-year storm event, no freeboard.

2. *Basins:*
   Estimated capacities for proposed detention basins and retention basins were determined as follows:

   Detention Basins:
   A two step process was used to estimate a detention (Retarding Basin per County definition) basin volumes. The first step was to determine the allowable bleeder flowrate ($Q_{bleeder}$) from a basin. This utilizes Rainfall-Intensity-Duration curves for a 2-year storm event, a C value assuming the drainage area is undeveloped, and the rational equation ($Q_{bleeder}=C_{undeveloped}iA$).

The second step utilizes County Standards for Rainfall-Intensity-Duration curves of a theoretical 50-year storm event, 10-hour intensity, and having a 10-hour duration. For every 5 minute duration interval, beginning at 10 minutes and continuing to 10 hours, a specific intensity is determined (from County Drawing C-6), and a corresponding flowrate and basin volume is calculated using the following equations:

Eq. 1. Flowrate in cubic feet per second: $Q_{50} = Ci_{duration}A = CAi_{duration}$ *(where CA remains constant)*

Eq. 2. Basin volume in acre feet: $\text{Vol.} = (Q_{50} - Q_{bleeder}) \times (\frac{60\ sec}{min}) \times (\text{duration [minutes]})$

Equation 2 subtracts the bleeder flowrate from the estimated flowrate for a given duration and intensity. For each 5 minutes interval (duration), a unique basin volume is computed. The maximum volume computed over the 10 hour period is then applied as the estimated required basin capacity for the specific Alternative. A computer program, written by Keith Crowe of Engineering Development Associates, which applies this methodology was used to determine basin capacities.

Retention Basins:
The estimated volume for a proposed retention basin (Infiltration Basin per County definition) utilizes County Standards and was determined using the same methodology for Detention basins but not allowing for bleeder flows. The revised equations were used:

Eq. 1. Flowrate in cubic feet per second: $Q_{50} = Ci_{duration}A = CAi_{duration}$ *(where CA remains constant)*

Eq. 3. Basin volume in acre feet: $\text{Vol.} = (Q_{50}) \times (\frac{60\ sec}{min}) \times (\text{duration [minutes]})$

3. *Pumping Assumptions*:
It is not correct to think of lowering the groundwater at each of the problem areas, it is more appropriate to think of lowering the ground water of the entire basin. The calculations used to estimate the pumpage required assumes that we lower the groundwater basin all the way "upstream" (along the groundwater surface elevation maps), much the same way that you would define a watershed for runoff. Therefore, it is necessary to look at the basin as a whole.

Placement of pumping wells could have significant impact on the success of a pumping program. For example, if we put a well at 14th Street and Ramona Avenue, this "mound" in the groundwater surface may drop very quickly and, even drop more than the required 5 to 8 feet as the general groundwater falls. However, for maximum benefit it would probably be more appropriate to focus pumping lower down on the groundwater surface "slope". It is much too complex to address in this report but there are computer models available that would help design the "well field".

It appears that the existing pumping plants on El Morro may be a good choice for pumping groundwater. However, this should be just one of multiple stations separated by (something like) 75% of the "radius on influence" of the wells, located low on the piezometric surface.

Possible problems? If we are all wrong and the groundwater is rising because of leakage between aquifers (or another reason) then pumping may not be a practical solution. Until the sewer is hooked up we will be battling septic tank contribution to the groundwater, and associated contamination

risks. Pumping the groundwater could spread contamination through the aquifer (the contaminants move with the water). If the contamination is not already widespread then pumping could pose an environmental problem.

4. *Street Widening:*
Where curb and gutter improvements are proposed as an Alternative, the existing roadway will need to be widened per County Engineering Standards. The required width will need to be determined by County Engineering at the time the project is designed based on the road's classification (using Average Daily Traffic, ADT and other criteria) for the particular road. For purposes addressing this requirement in the cost estimation, existing roadways were assumed to be 20' wide (having two 10' travel lanes) and *would need* to be widened to 36' (having two 10' travel lanes and two 8' parking) at a minimum. A roadside swale has been presented as an alternative to curb & gutter. It is assumed that no existing street widening will be required for the roadside swale alternative.

5. *Costs:*
Estimated costs as presented in the worksheets include costs associated with construction only. The following percentages can be applied to the construction subtotal provided in the calculation sheets (Appendix D3).

Contingency:	20% of subtotal
Engineering, Surveying, Construction Management:	15% of subtotal
Permitting & Environmental:	15% of subtotal
Total	50%

Sample calculation:
If the construction subtotal cost for a particular alternative is $100,000, then the estimated grand total of the alternative's cost would be calculated as follows:

Subtotal (from calculation sheets)	**$100,000**
Contingency (20%)	$20,000
Engineering/Surveying/Construction (15%)	$15,000
Permitting (15%)	$15,000
Total Estimated Project Cost:	**$150,000**

Or, more simply, add 50% to the Subtotal to get the Total Estimated Project Cost:

$100,000 + (0.50 x 100,000) = **$150,000**

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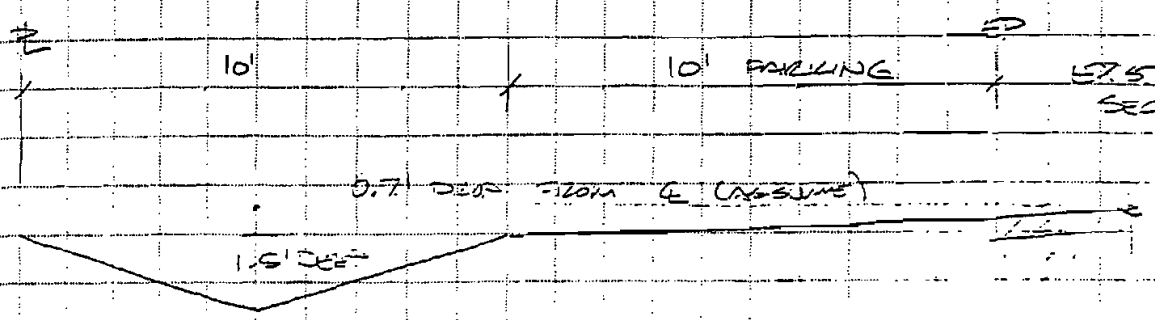


$A = (2)(1/2)(5)(1.5) = 7.5$ sf

$P = (2)(\sqrt{(2.5)^2 + (2.25)^2}) = 10.44$

$R = A/P = 7.5/10.44 = 0.718$

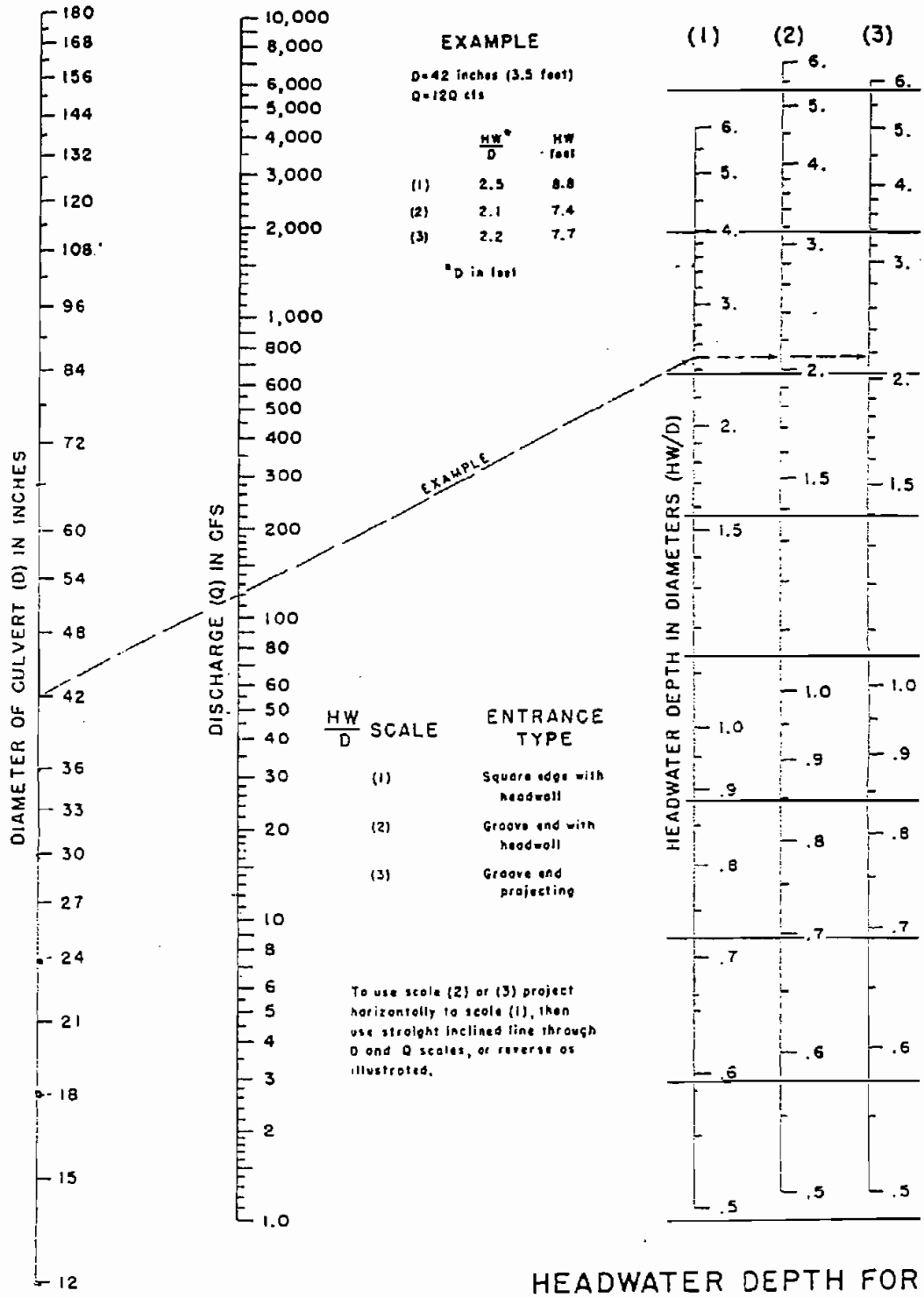
$n = 0.015$, $S = 2\%$

$Q = VA = \frac{1.49}{n} R^{2/3} S^{1/2} A$

$= \left(\frac{1.49}{0.015}\right)(0.718)^{2/3}(0.02)^{1/2}(7.5)$

$= \underline{84 \text{ CFS}}$ MAX CAPACITY @ 2% GRADE

MAX SIZE PRESENTED, ACTUAL CHANNEL NEEDS WILL DEPEND ON DRAINAGE AREA BEING CONSIDERED.



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

Revisions				Approvals		
Description	By	Approved	Date	County Engineer		9-3-75
				Recommended by Deputy Co. Eng.		8/29/75

TABLE OF COEFFICIENT RUNOFF CHART

	TYPE OF DEVELOPMENT	TYPE OF SOIL**	COEFFICIENT OF RUNOFF FOR* SLOPE <2%:	2% to 10%:	>10%
URBAN	20,000 sq. ft.	C	.35	.40	.45
		S	.25	.35	.40
	10,000 sq. ft.	C	.40	.45	.55
	"	S	.30	.40	.45
	6,000 sq. ft.	C	.45	.55	.65
	"	S	.35	.40	.50
	APARTMENTS	C	.50	.60	.70
	"	S	.40	.50	.60
	INDUSTRIAL	C	.55	.65	.75
	"	S	.45	.55	.65
	COMMERCIAL	C	.75	.80	.85
	"	S	.70	.75	.80
RURAL	DENSE VEGETATION	C	.15	.25	.35
	"	S	.10	.15	.20
	MODERATE VEGETATION	C	.20	.30	.40
	"	S	.15	.20	.25
	SPARSE VEGETATION	C	.25	.35	.45
	"	S	.20	.25	.30
	IMPERVIOUS; PAVED, ETC.		.85	.90	.95

* Note: These values are intended to be a minimum; higher values may be required by the County Engineer.

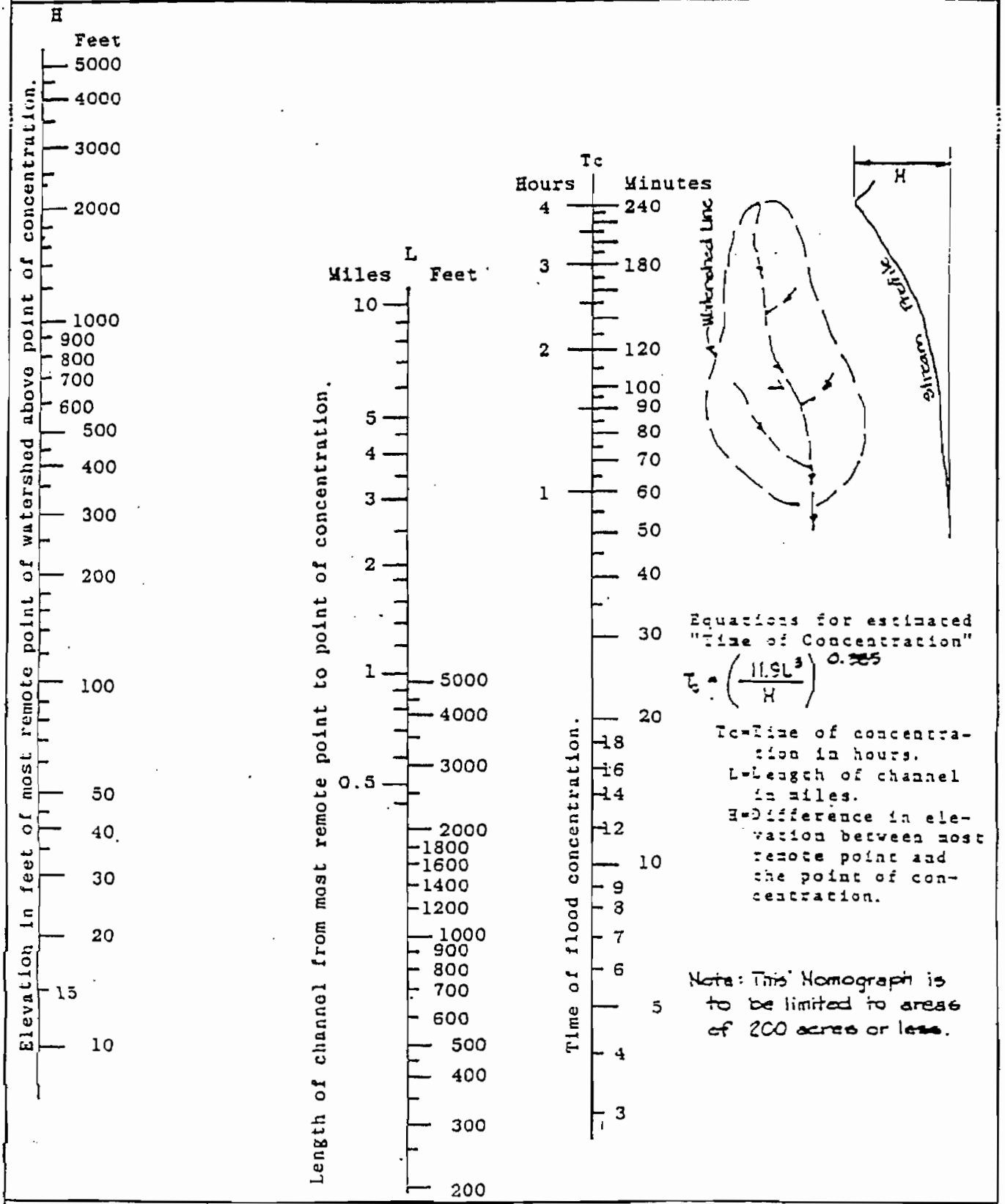
** Note: Soil Type

C = Clay, Adobe, Rock or Impervious Material

S = Sand, Gravel, Loam or Pervious Material

Specification Ref	COUNTY OF SAN LUIS OBISPO ENGINEERING DEPARTMENT	Scale:
	TABLE OF COEFFICIENT	Drawing No.

Revisions				Approvals		
Description	By	Approved	Date	County Engineer		9-2-75
				Recommended by Deputy Co. Eng.	Clinton Milne	8/29/75



Equations for estimated "Time of Concentration"

$$T_c = \left(\frac{11.9L^3}{H}\right)^{0.385}$$

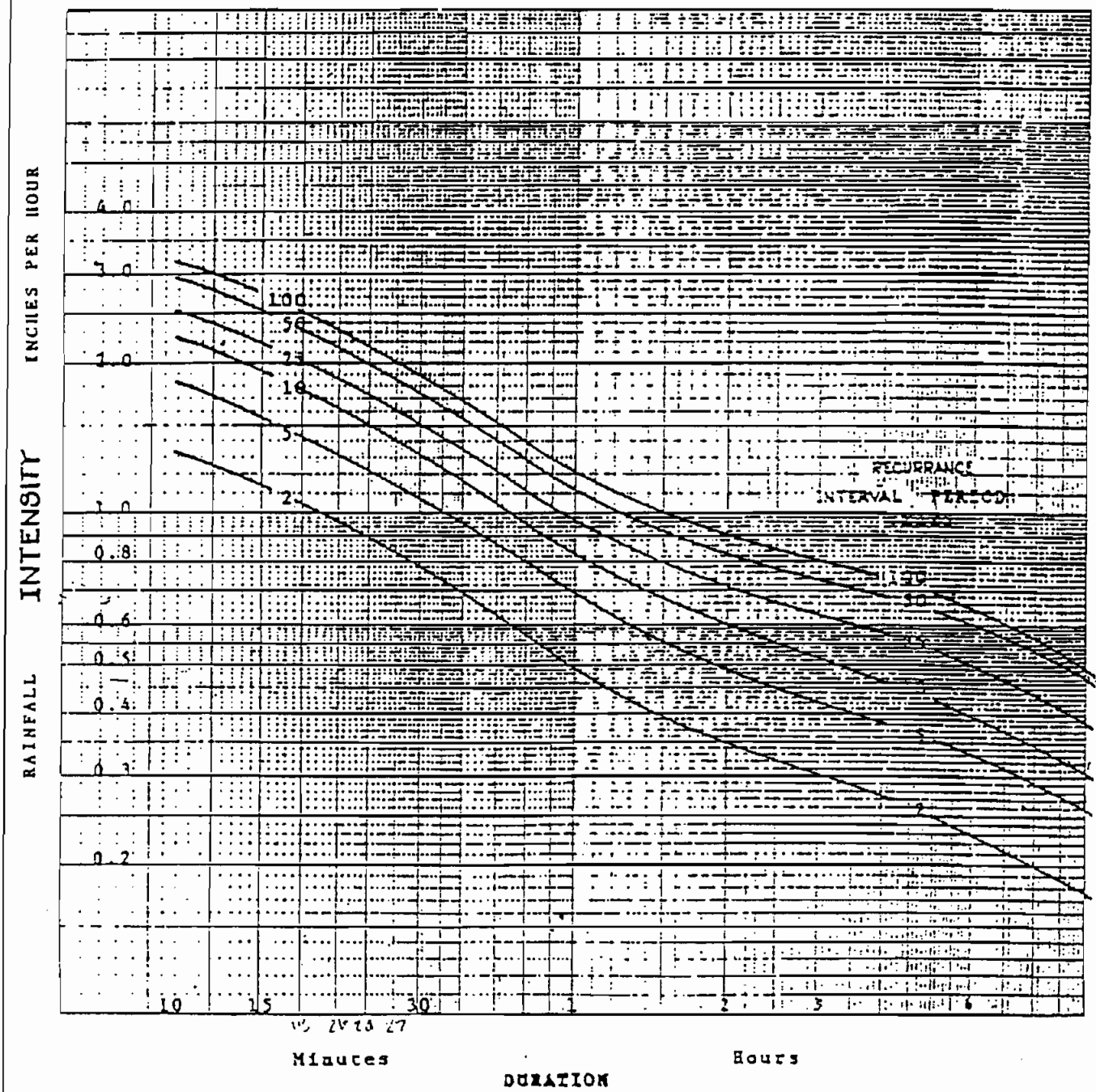
Tc=Time of concentration in hours.
L=Length of channel in miles.
H=Difference in elevation between most remote point and the point of concentration.

Note: This Nomograph is to be limited to areas of 200 acres or less.

Specification Ref	COUNTY OF SAN LUIS OBISPO ENGINEERING DEPARTMENT NOMOGRAPH	Scale:
		Drawing No.

Revisions				Approvals	
Description	By	Approved	Date	County Engineer	
				Recommended by Deputy Co. Eng.	8/28/75

AREAS OF AVERAGE ANNUAL RAINFALL
OF 14 TO 18 INCHES



Specification Ref.	COUNTY OF SAN LUIS OBISPO ENGINEERING DEPARTMENT	Scale.

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
by
Engineering Development Associates
Keith V. Crowe, P.E.
- 1994, Engineering Development Associates

Los Osos
Job Number 4.4

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 15 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	13050
15	2.5	16875
18	2.3	18630
21	2.1	19845
24	2	21600
27	1.8	21870
30	1.7	22950
35	1.6	25200
40	1.55	27900
45	1.4	28350
50	1.29	29025
55	1.19	29452
60	1.12	30240
66	1.07	31779
72	1.02	33048
78	.98	34398
84	.94	35532
90	.92	37260
96	.89	38448
102	.86	39474
108	.85	41310
114	.84	43092
120	.82	44280
150	.77	51975
180	.74	59940
210	.7	66150
240	.68	73440
270	.66	80190
300	.64	86400
330	.62	92070
360	.6	97200
420	.56	105840
480	.54	116640
540	.5	121500
600	.47	126900

Maximum Volume is 126900 Cubic Feet
for a 600 Minute Storm

2.9 AF ADDITION TO
S.B. BLVD BASIN @
SANTA ISABEL

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ALT 6.6a & 6.6b (CONT)
El Moro Storm Drain

$Q_{25} = CiA$
$= (0.5)(1.7)(175\ ac)$
$= 150\ cfs$
use 54" ϕ culvert

Box culvert under 2nd st
$A = (\frac{\pi}{4})(55)^2 = 24\ sf$ Adjust equiv area to $\frac{\pi}{4} = 1$
Assume max height = 3' open channel
$24/3 = 8'$
Check
$A = 24\ sf$
$P = (2 \times 8) + (2 \times 3) = 22$
$R = A/P = 24/22 = 1.10$
$s = 0.5\%$ $n = 0.025$

$Q = (\frac{1.49}{0.025})(24)(1.10)^{2/3}(0.005)^{1/2} = 108\ cfs < 150\ cfs$

Try 3x10
$A = 30$
$P = 26$ $Q_{25} = (\frac{1.49}{0.025})(30)(1.16)^{2/3}(0.005)^{1/2} = 140\ cfs \approx 150\ cfs$
$R = 1.16$

use 3x10

ALT 7.4 culvert
$Q_{25} = CiA$ $A = 6.4\ ac$ $C = 0.5$ $i = 2.2$
$= (0.5)(2.2)(6.4)$
$= 70\ cfs$

use 36" ϕ culvert

PUMP ENTIRE GROUNDWATER AQUIFER

ALT 6.4, 6.5, 7.3, & AVL 8.5

Assume porosity = 0.25
Lower Entire NW side of groundwater basin
Area of groundwater basin tributary to 8th & El Morro
20250000 sq ft 464.9 ac
Assumes area of 4500' x 4500' (swag scaled from map)

Total Volume of water that must be removed to lower piezometric surface by:
5 ft

is 25312500 cu ft
1.89E+08 gal
581.095 ac-ft

Pump Q (gpm)	Time to Pump	
250	526	days
500	263	days
750	175	days
1000	131	days
1250	105	days
1500	88	days
1750	75	days
2000	66	days
2250	58	days
2500	53	days

If average annual rainfall is 18 in/yr
If the fraction that infiltrates is 90%

Then an average of 16.2 in/yr of surface water is added to the aquifer
This is the equivelant of 64.8 in/yr of rise in water table due to average annual rainfall

To "maintain" water level about 27337500 cubic feet
2.04E+08 gallons
627.6 ac-ft should be pumped from aquifer in average year

Pump Q (gpm)	Time to Pump	
100	1420	days
200	710	days
300	473	days
400	355	days
500	284	days
600	237	days
700	203	days
800	178	days
900	158	days
1000	142	days

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
by
Engineering Development Associates
Keith V. Crowe, P.E.
- 1994, Engineering Development Associates

Los Osos
Job Number Alt 7.4

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 84 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	73080
15	2.5	94500
18	2.3	104328
21	2.1	111131
24	2	120960
27	1.8	122472
30	1.7	128520
35	1.6	141120
40	1.55	156240
45	1.4	158760
50	1.29	162540
55	1.19	164934
60	1.12	169344
66	1.07	177962
72	1.02	185068
78	.98	192628
84	.94	198979
90	.92	208656
96	.89	215308
102	.86	221054
108	.85	231336
114	.84	241315
120	.82	247968
150	.77	291060
180	.74	335664
210	.7	370440
240	.68	411264
270	.66	449064
300	.64	483840
330	.62	515592
360	.6	544320
420	.56	592704
480	.54	653184
540	.5	680400
600	.47	710640

ximum Volume is 710640 Cubic Feet 16.3 AF
or a 600 Minute Storm

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ALT 8.2-8.3 CULVERT UNDER 11th ST

$Q_{25} = (0.5)(2.2)(18)$ $A_{ADJ} = 18$ AC
$= 20$ CFS
USE 24" ϕ CULVERT OR 18" ϕ either side of street

ALT 8.6

$Q = CiA$
$= (0.5)(2.2)(96)$ OVERSIZE FOR FACTOR OF SAFETY, $i = 2.2$
$= 105$ CFS

USE 48" ϕ CULVERT MAY DOWNSIZE ON PSMO AVE DUE TO GRADE

ALT 9.2 15th & 16th STREETS

$Q_{25} = CiA = (0.5)(2.2)(2.8)$
$= 3.0$ CFS
USE 18" ϕ CULVERTS

ALT 9.3 - CROSS LOT

$Q_{25} = (0.5)(2.2)(5.6)$
$= 6.2$ CFS

USE 18" ϕ CULVERT

TO RETAIN ENTIRE AREA IN EXIST BASIN
$Q_{50/10/10} = (0.5)(0.47)(16) = 3.76$ CFS
$3.76 \times 3600 \times 10 \times 1/43560 = 3.10$ AF NOT ENOUGH ROOM PASS FLOW THRU BASIN.

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
by
Engineering Development Associates
Keith V. Crowe, P.E.
- 1994, Engineering Development Associates

Los Osos
Job Number Alt 9.2

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 2.8 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	2436
15	2.5	3150
18	2.3	3477
21	2.1	3704
24	2	4032
27	1.8	4082
30	1.7	4284
35	1.6	4704
40	1.55	5207
45	1.4	5292
50	1.29	5417
55	1.19	5497
60	1.12	5644
66	1.07	5932
72	1.02	6168
78	.98	6420
84	.94	6632
90	.92	6955
96	.89	7176
102	.86	7368
108	.85	7711
114	.84	8043
120	.82	8265
150	.77	9702
180	.74	11188
210	.7	12348
240	.68	13708
270	.66	14968
300	.64	16127
330	.62	17186
360	.6	18144
420	.56	19756
480	.54	21772
540	.5	22680
600	.47	23688

ximum Volume is 23688 Cubic Feet 0.5 AF
r a 600 Minute Storm

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ALT 10.2 - CULVERT BETWN 14th & 15th ST.

$Q_{25} = ci\,A$ $A_{ADJ} = 8$ ac

$= (0.5)(2.2)(8)$

$= 9$ cfs

USE 18" ϕ CULVERTS

ALT 10.4 - CULVERT @ 17th ST

$Q_{25} = ci\,A = (0.5)(2.2)(26)$

$= 30$ cfs

USE 24" ϕ CULVERT

ALT 13.3 - SOLANO @ [illegible]

AREA 50 ac ADJ

$Q_{25} = (0.5)(2.2)(50)$

$= 55$ cfs

36" ϕ CULVERT

ALT 14.1c - STORM DRAIN

$A_{ADJ} = 11$ ac

$Q_{25} = (0.5)(2.2)(11)$

$= 12$ cfs

USE 18" ϕ CULVERT

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
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Los Osos
Job Number Alt 10.2

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 8 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	6960
15	2.5	9000
18	2.3	9936
21	2.1	10584
24	2	11520
27	1.8	11664
30	1.7	12240
35	1.6	13440
40	1.55	14880
45	1.4	15120
50	1.29	15480
55	1.19	15708
60	1.12	16128
66	1.07	16948
72	1.02	17625
78	.98	18345
84	.94	18950
90	.92	19872
96	.89	20505
102	.86	21052
108	.85	22032
114	.84	22982
120	.82	23616
150	.77	27720
180	.74	31968
210	.7	35280
240	.68	39168
270	.66	42768
300	.64	46080
330	.62	49104
360	.6	51840
420	.56	56448
480	.54	62208
540	.5	64800
600	.47	67680

aximum Volume is 67680 Cubic Feet 1.6 AF
or a 600 Minute Storm

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
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Los Osos
Job Number Alt 10.3

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 26 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	22620
15	2.5	29250
18	2.3	32292
21	2.1	34398
24	2	37440
27	1.8	37908
30	1.7	39780
35	1.6	43680
40	1.55	48360
45	1.4	49140
50	1.29	50310
55	1.19	51051
60	1.12	52416
66	1.07	55083
72	1.02	57283
78	.98	59623
84	.94	61588
90	.92	64584
96	.89	66643
102	.86	68421
108	.85	71604
114	.84	74692
120	.82	76752
150	.77	90090
180	.74	103896
210	.7	114660
240	.68	127296
270	.66	138996
300	.64	149760
330	.62	159588
360	.6	168480
420	.56	183456
480	.54	202176
540	.5	210600
600	.47	219960

Maximum Volume is 219960 Cubic Feet 5 AF
For a 600 Minute Storm

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
by
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Los Osos
Job Number Alt 11.2a

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 11 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	9570
15	2.5	12375
18	2.3	13662
21	2.1	14552
24	2	15840
27	1.8	16038
30	1.7	16830
35	1.6	18480
40	1.55	20460
45	1.4	20790
50	1.29	21285
55	1.19	21598
60	1.12	22176
66	1.07	23304
72	1.02	24235
78	.98	25225
84	.94	26056
90	.92	27324
96	.89	28195
102	.86	28947
108	.85	30294
114	.84	31600
120	.82	32472
150	.77	38115
180	.74	43956
210	.7	48510
240	.68	53856
270	.66	58806
300	.64	63360
330	.62	67518
360	.6	71280
420	.56	77616
480	.54	85536
540	.5	89100
600	.47	93060

ximum Volume is 93060 Cubic Feet 2.1 AF
r a 600 Minute Storm

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
by
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Los Osos
Job Number Alt 16.1b

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 360 acres, with a C of .25

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	156600
15	2.5	202500
18	2.3	223560
21	2.1	238139
24	2	259200
27	1.8	262440
30	1.7	275400
35	1.6	302400
40	1.55	334800
45	1.4	340200
50	1.29	348300
55	1.19	353430
60	1.12	362880
66	1.07	381348
72	1.02	396576
78	.98	412776
84	.94	426384
90	.92	447120
96	.89	461376
102	.86	473688
108	.85	495720
114	.84	517103
120	.82	531360
150	.77	623700
180	.74	719280
210	.7	793800
240	.68	881280
270	.66	962280
300	.64	1036800
330	.62	1104840
360	.6	1166400
420	.56	1270080
480	.54	1399680
540	.5	1458000
600	.47	1522800

aximum Volume is 1522800 Cubic Feet 35 AF
or a 600 Minute Storm

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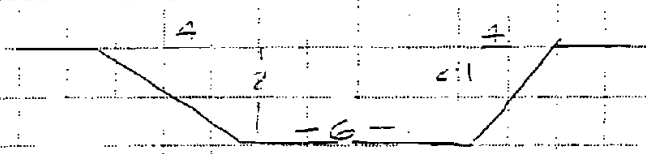
ALT 16.1c DIVERSION SWALE

$Q_{25} = CiA$ $C = 0.25$, $i = 2.2$ $A = 360$ AC ADJUSTED
$= (0.25)(2.2)(360)$
$= 200$ cfs



$S = 2\%$
$n = 0.025$
$A = 2\sqrt{10} + 6 = 13.3$
$P = 2\sqrt{10} + 6 = 2.3$
$R = 4/6 = 1.5$

$Q_{25} = \left(\frac{1.49}{0.025}\right)(13.3)(1.49)^{2/3}(0.02)^{1/2}$
$= 200$ cfs $= 200$ cfs OK

CULVERT UNDER PICO VALLEY
$Q_{25} = 200$ cfs
USE 60" ϕ CULVERT

ALT 16.2b LOS OSOS SUBWATERSHED
AREA NORTH OF LOVR = 475 AC 360 AC IN USE

$C = [(115\text{ AC} \cdot 0.5) + (360\text{ AC} \cdot 0.25)]/475 = 0.3$ ADJ C TRUE

$Q_{25} = (0.3)(1.8)(475)$ 256 cfs
USE 60" ϕ PIPE IN LOVR

VOL CONTRIB TO FEDERAL BASIN (FROG, CAM) = 55.4 AF

ALT 16.2c, MAIN SHORES BASIN
ADD 50 AC OF AREA 162, $A_{total} = 50 + 475 = 525$ AC
$C = (360 \cdot 0.25) + (165 \cdot 0.5)/5.5 = 0.33$

$Q_{25} = (0.33)(1.8)(525) = 312$ cfs
USE 72" ϕ CULVERT

VOL OF M... ...

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
by
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Los Osos
Job Number 16.2b

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 475 acres, with a C of .3

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	247950
15	2.5	320625
18	2.3	353970
21	2.1	377055
24	2	410400
27	1.8	415530
30	1.7	436050
35	1.6	478800
40	1.55	530100
45	1.4	538650
50	1.29	551475
55	1.19	559597
60	1.12	574560
66	1.07	603801
72	1.02	627912
78	.98	653562
84	.94	675108
90	.92	707940
96	.89	730512
102	.86	750006
108	.85	784890
114	.84	818748
120	.82	841320
150	.77	987525
180	.74	1138860
210	.7	1256850
240	.68	1395360
270	.66	1523610
300	.64	1641600
330	.62	1749330
360	.6	1846800
420	.56	2010960
480	.54	2216160
540	.5	2308500
600	.47	2411100

aximum Volume is 2411100 Cubic Feet 55.4 AF
or a 600 Minute Storm

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
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Los Osos
Job Number Alt 16.2c

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 525 acres, with a C of .33

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	301455
15	2.5	389812
18	2.3	430353
21	2.1	458419
24	2	498960
27	1.8	505197
30	1.7	530145
35	1.6	582120
40	1.55	644490
45	1.4	654885
50	1.29	670477
55	1.19	680352
60	1.12	698544
66	1.07	734094
72	1.02	763408
78	.98	794593
84	.94	820789
90	.92	860706
96	.89	888148
102	.86	911849
108	.85	954261
114	.84	995425
120	.82	1022868
150	.77	1200622
180	.74	1384614
210	.7	1528065
240	.68	1696464
270	.66	1852389
300	.64	1995840
330	.62	2126817
360	.6	2245320
420	.56	2444904
480	.54	2694384
540	.5	2806650
600	.47	2931390

Maximum Volume is 2931390 Cubic Feet 67.3 AF
for a 600 Minute Storm

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ALT 17.3A SAN LUIS STORM DRAIN

AREA = 42AC, T_c = 20m, i = 1.9

Q_{25} = (0.5)(1.9)(42) = 40cfs

USE 30" ϕ CULVERT

ALT 17.3b NIPOMO STORM DRAIN

A = 56AC i = 1.9

Q_{25} = (0.5)(1.9)(56)

= 53 cfs

USE 36" ϕ CULVERT

ALT 23.2 - REPLACE CULVERT

Q_{25} = (0.5)(2.2)(10) = 11 cfs

USE 15" ϕ CULVERT

ALT 16.4b

A = 25 AC i = 2.2

Q_{25} = ci A = (0.5)(2.2)(25)

= 27.5 cfs

USE 24" ϕ CULVERT

Modified Rational Method
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Los Osos
Job Number Alt 17.2a

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 98 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	85260
15	2.5	110250
18	2.3	121716
21	2.1	129653
24	2	141120
27	1.8	142884
30	1.7	149940
35	1.6	164640
40	1.55	182280
45	1.4	185220
50	1.29	189630
55	1.19	192423
60	1.12	197568
66	1.07	207622
72	1.02	215913
78	.98	224733
84	.94	232142
90	.92	243432
96	.89	251193
102	.86	257896
108	.85	269892
114	.84	281534
120	.82	289296
150	.77	339570
180	.74	391608
210	.7	432180
240	.68	479808
270	.66	523908
300	.64	564480
330	.62	601524
360	.6	635040
420	.56	691488
480	.54	762048
540	.5	793800
600	.47	829080

ximum Volume is 829080 Cubic Feet 19 AF
r a 600 Minute Storm

Modified Rational Method
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using County of San Luis Obispo IDF data
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Los Osos
Job Number Alt 17.2b

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 34 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	29580
15	2.5	38250
18	2.3	42228
21	2.1	44981
24	2	48960
27	1.8	49572
30	1.7	52020
35	1.6	57120
40	1.55	63240
45	1.4	64260
50	1.29	65790
55	1.19	66759
60	1.12	68544
66	1.07	72032
72	1.02	74908
78	.98	77968
84	.94	80539
90	.92	84456
96	.89	87148
102	.86	89474
108	.85	93636
114	.84	97675
120	.82	100368
150	.77	117810
180	.74	135864
210	.7	149940
240	.68	166464
270	.66	181764
300	.64	195840
330	.62	208692
360	.6	220320
420	.56	239904
480	.54	264384
540	.5	275400
600	.47	287640

aximum Volume is 287640 Cubic Feet 6.6 AF
or a 600 Minute Storm

Modified Rational Method
for Detention Basin Volume
using County of San Luis Obispo IDF data
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Los Osos
Job Number Alt 18.3

Average Annual Rainfall between 14 and 18 in per year
50 Year Storm

Developed Area of 22 acres, with a C of .5

Release rate set at 0 cfs

Duration (min)	Intensity (in/hr)	Volume (cuft)
10	2.9	19140
15	2.5	24750
18	2.3	27324
21	2.1	29105
24	2	31680
27	1.8	32076
30	1.7	33660
35	1.6	36960
40	1.55	40920
45	1.4	41580
50	1.29	42570
55	1.19	43197
60	1.12	44352
66	1.07	46609
72	1.02	48470
78	.98	50450
84	.94	52113
90	.92	54648
96	.89	56390
102	.86	57895
108	.85	60588
114	.84	63201
120	.82	64944
150	.77	76230
180	.74	87912
210	.7	97020
240	.68	107712
270	.66	117612
300	.64	126720
330	.62	135036
360	.6	142560
420	.56	155232
480	.54	171072
540	.5	178200
600	.47	186120

ximum Volume is 186120 Cubic Feet 4.3 AF
r a 600 Minute Storm

ALT 21 & 22

Fairchild/Vons Basins

Basin	Capacity (ac-ft)	Runoff Generated 100-year (ac-ft)	50-year (ac-ft)	10-year (ac-ft)
Fairchild 1	2.6	7	5.6	3.8
Fairchild 2	0.6			
Von's 1	1.9	2.4	1.9	1.4
Von's 2	0.2			
Total	5.3	9.4	7.5	5.2

If all the basin are "connected" then an additional volume of 2.2 ac-ft
to meet a 50-year storm criteria for Area 21 and Area 22 combined 3549 cu-yards

Tributary Area Flow Calculations, Appendix D2:

Flowrates calculated for the individual tributary areas (Areas 1-27) were estimated utilizing the TR-20 method. The TR-20 method was used over the County's Rational Equation because of its to perform time-dependant analysis and to analyze tributary areas larger than 200 acres. TR-20 was used on tributary areas smaller than 200 acres to present comparable methods throughout the study area. The following information was used for TR-20 modeling:

Per the Soil Survey for San Luis Obispo County, California, Coastal Parts, soils in the Los Osos/Baywood Park area soil numbers 104 and 105.

104 Baywood Fine Sand, 2% to 9% slopes.

"This is a very deep, somewhat excessively drained, undulating and gently rolling is on stabilized sand dunes near the coast. It formed in deposits of windblown sand. Areas are irregular in shape and range for 10 to 3000 acres. The natural vegetation is mainly brush with small areas of conifers or hardwoods. Elevation ranges from 0 feet to 500 feet. The average annual precipitation ranges from 15 to 20 inches, and the average annual air temperature is about 58° F. The average frost-free season ranges from 325 to 350 days, depending on location. Permeability of this Baywood soil is rapid, and the available water capacity is low. Surface runoff is slow or medium. The hazard of soil blowing is high, and the hazard of water erosion is medium. The effective rooting depth is 60 inches or more. This soils repels water when dry but has a rapid intake rate once is moist."

105 Baywood fine Sands, 9% to 15% slopes.

(Same description as 104)

Baywood fine sand is hydrologic soil group A

Applicable Curve Numbers for soil group A"

Paved Roads	74-98
Dirt Roads	72-76
Urban	
Low density	69-71
Med. density	71-73
High density	73-75
Commercial	89
Industrial	81
(by lot size)	
1/8 ac or less (65% imp)	77
¼ ac (38% imp)	61
1/3 ac (30% imp)	57
½ ac (25% imp)	54
1 ac (20% imp)	51
2 ac (12% imp)	46
Scrub (native brush)	25-30
Grass-Oak (native oaks with understory of forbs and annual grass)	29-33

Per NOAA Atlas 2- Precipitation-Frequence Atlas of the western United States, VXI-California the following rainfall data applies to the Los Osos/Baywood Park area.

Freq.	Duration	Rainfall
100-yr	24 hr	5.5 to 6 in
50-yr	24 hr	5.0 in
25-yr	24 hr	4.5 in
10-yr	24 hr	4.0 in
5-yr	24 hr	3.0 to 3.5 in
2-yr	24 hr	2.5 in

Because the area is located west of the Sierras and south of San Francisco Bay, a Type I storm (as defined by SCS for TR-20/55) applies.

All calculations represent full buildout conditions with the selection a high applicable Curve Numbers for best representation of non-porous surfaces.

Calculation of Catchment Lag and Time of Concentration

There are many definitions and equations addressing catchment lag and time of concentration. I prefer to define catchment lag as time elapsed from the centroid of effective rainfall to the peak of runoff.

Time of concentration is defined (almost universally) as the time it takes for water to travel from the most remote point in the catchment to the point of concern.

There are loose relationships between the two, the most common being that $t_{lag} = 0.6t_c$.

County of San Luis Obispo Engineering Standards and Specifications uses the relationship $T_c = (11.9L^3/H)^{0.385}$ to determine time of concentration. However, the standard drawing carries the note that the equation is limited to areas of 200 acres or less. One reason for the area limitation is that a shape factor becomes more significant as area increases.

In the their report "San Luis Obispo County Streams Hydrology for Survey Report for Flood Control and Allied Purposes" (Plate 12) by the Army Corps of Engineers adopts the relationship $T_{lag} = 1.2(LxL_{ca}/S^{0.5})^{0.38}$.

By inspecting the two equations, it is apparent that their form is very close, i.e. both are expressions of length divided by slope raised to the 0.38 power, the Corps is really a function of L raised to the 5/2 power, the county's is L raised to the 6/2 power. What is the difference? the Corps lag expression accounts for the shape of the watershed by introducing the L_{ca} factor - accounting for the length to the center of the area of the watershed - a factor that is not considered in the county's equation.

Ponce, in Engineering Hydrology, Principles and Practices (Prentice Hall, 1989) says "In practice, catchment lag is empirically related to catchment characteristics. A general expression for catchment lag is the following:

$t_{LAG} = C(LL_{CA}/S^{0.5})^N$

where L describes length, L_{ca} is a measure of shape, and S relates to relief."

It is clear to me that the County's time of concentration is a simplification of the general equation. The simplification being that an average shape is assumed (no Lca). For comparison, the following table compares the results of the two equations for the special case that $L_{CA} = 0.20L$. It is obvious that similar results are achieved for the special case typical of small watersheds.

Length (miles)	Length to CA	delta H	Tc County	Tc Corps
0.25	0.05	25	0.152 hr	0.158 hr
0.5	0.10	50	0.258 hr	0.267 hr
1	0.20	100	0.441 hr	0.452 hr
1.5	0.30	150	0.602 hr	0.616 hr

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JOB NM:	Los Osos/Baywood Drainage Study								(805)549-8658/eda@edainc.com
CALC BY:	kvc								
CHK BY:									
						AREA 1			
Tributary at Santa Ysabel at Pasadena / Morro Bay									
Area		1853152	sq ft		Hydrigic Soil Group		A		
		43	ac		Average CN		75	6000 sq ft lots typ	
		0.066	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		72	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		6	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		2710	ft		24 hr 2 year rain		2.5	in	
		0.513	mi						
Average Slope		129	ft/mi						
Lca		1180	ft						
		0.223	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.21	hours						
Time of Concentration		0.349078	hours						
Peak Flows									
100-year	**56**	**cfs**							
50-year	**44**	**cfs**							
25-year	**35**	**cfs**							
10-year	**28**	**cfs**							

					Engineering Development Associates				
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JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					AREA 2				
Tributary at north end of Third at Morro Bay (no distinct point of concentration)									
Area		1119370	sq ft		Hydrigic Soil Group		A		
		26	ac		Average CN		75	6000 sq ft lots typ	
		0.040	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		72	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		6	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		250	ft		24 hr 2 year rain		2.5	in	
		0.047	mi						
Average Slope		1394	ft/mi						
Lca		75	ft						
		0.014	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.02	hours						
Time of Concentration		0.031489	hours						
Peak Flows									
100-year	**43**	**cfs**							
50-year	**34**	**cfs**							
25-year	**29**	**cfs**							
10-year	**23**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					AREA 3				
Tributary at north end of Eighth St at Morro Bay									
Area		1282506	sq ft		Hydrigic Soil Group		A		
		29	ac		Average CN		75	6000 sq ft lots typ	
		0.046	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		123	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		6	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		2200	ft		24 hr 2 year rain		2.5	in	
		0.417	mi						
Average Slope		281	ft/mi						
Lca		685	ft						
		0.130	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.14	hours						
Time of Concentration		0.226108	hours						
Peak Flows									
100-year	**42**	**cfs**							
50-year	**33**	**cfs**							
25-year	**28**	**cfs**							
10-year	**22**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 4				
Tributary at north end of Tenth Street at Morro Bay									
Area		2185113	sq ft		Hydrigic Soil Group		A		
		50	ac		Average CN		75	6000 sq ft lots typ	
		0.078	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		150	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		6	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		3110	ft		24 hr 2 year rain		2.5	in	
		0.589	mi						
Average Slope		244	ft/mi						
Lca		1315	ft						
		0.249	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.20	hours						
Time of Concentration		0.339238	hours						
Peak Flows									
100-year	**66**	**cfs**							
50-year	**52**	**cfs**							
25-year	**43**	**cfs**							
10-year	**34**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 5				
Tributary to Basin at Santa Ysabel and South Bay Boulevard									
Area		1143755	sq ft		Hydrigic Soil Group		A		
		26	ac		Average CN		75	6000 sq ft lots typ	
		0.041	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		120	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		77.5	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1150	ft		24 hr 2 year rain		2.5	in	
		0.218	mi						
Average Slope		195	ft/mi						
Lca		150	ft						
		0.028	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.06	hours						
Time of Concentration		0.106328	hours						
Peak Flows			**Peak Elevation in Basin**						
100-year	**41**	**cfs**	**84.8**	**msl**					
50-year	**33**	**cfs**	**83.7**	**msl**					
25-year	**28**	**cfs**	**83.1**	**msl**					
10-year	**22**	**cfs**	**82.3**	**msl**					

							Engineering Development Associates		
DATE:	28-Aug-97						**ENGINEERING DEVELOPMENT ASSOCIATES**		
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					AREA 6A				
Tributary to South end of Second Street at Morro Bay									
Area		2680460	sq ft		Hydrigic Soil Group		A		
		62	ac		Average CN		75	6000 sq ft lots typ	
		0.096	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		80	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		6	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		2325	ft		24 hr 2 year rain		2.5	in	
		0.440	mi						
Average Slope		168	ft/mi						
Lca		860	ft						
		0.163	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.17	hours						
Time of Concentration		0.277552	hours						
Peak Flows									
100-year	**84**	**cfs**							
50-year	**66**	**cfs**							
25-year	**56**	**cfs**							
10-year	**44**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 6B				
Tributary to Eighth Street and El Morro Avenue									
Area		4651490	sq ft		Hydrigic Soil Group		A		
		107	ac		Average CN		75	6000 sq ft lots typ	
		0.167	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		112	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		24	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		2480	ft		24 hr 2 year rain		2.5	in	
		0.470	mi						
Average Slope		187	ft/mi						
Lca		675	ft						
		0.128	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.15	hours						
Time of Concentration		0.254126	hours						
Peak Flows									
100-year	**150**	**cfs**							
50-year	**118**	**cfs**							
25-year	**97**	**cfs**							
10-year	**77**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010								1320 Nipomo Street/San Luis Obispo, CA 93401
JOB NM:	Los Osos/Baywood Drainage Study								(805)549-8658/eda@edainc.com
CALC BY:	kvc								
CHK BY:									
					Area 6C				
Tributary to Seventh Street near Paso Robles Avenue									
Area		852260	sq ft		Hydrigic Soil Group		A		
		20	ac		Average CN		75	6000 sq ft lots typ	
		0.031	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		116	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		60	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		2300	ft		24 hr 2 year rain		2.5	in	
		0.436	mi						
Average Slope		129	ft/mi						
Lca		1160	ft						
		0.220	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.20	hours						
Time of Concentration		0.325875	hours						
Peak Flows									
100-year	**27**	**cfs**							
50-year	**21**	**cfs**							
25-year	**18**	**cfs**							
10-year	**14**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 6D				
Tributary to Sixth Street and El Morro Avenue									
Area		775910	sq ft		Hydrlgic Soil Group		A		
		18	ac		Average CN		75	6000 sq ft lots typ	
		0.028	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		70	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		21	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1235	ft		24 hr 2 year rain		2.5	in	
		0.234	mi						
Average Slope		209	ft/mi						
Lca		255	ft						
		0.048	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.08	hours						
Time of Concentration		0.131864	hours						
Peak Flows									
100-year	**28**	**cfs**							
50-year	**22**	**cfs**							
25-year	**18**	**cfs**							
10-year	**14**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1958-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 7A				
Tributary to Pump at 16th & Paso Robles									
Area		3624200	sq ft		Hydrigic Soil Group		A		
		83	ac		Average CN		75	6000 sq ft lots typ	
		0.130	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		150	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		70	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1600	ft		24 hr 2 year rain		2.5	in	
		0.303	mi						
Average Slope		264	ft/mi						
Lca		1000	ft						
		0.189	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.14	hours						
Time of Concentration		0.234039	hours						
Peak Flows									
100-year	**118**	**cfs**							
50-year	**93**	**cfs**							
25-year	**77**	**cfs**							
10-year	**61**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 8A				
Tributary to W. End of Paso Robles Avenue at Morro Bay									
Area		2908928	sq ft		Hydrigic Soil Group		A		
		67	ac		Average CN		75	6000 sq ft lots typ	
		0.104	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		115	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		6	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		3226	ft		24 hr 2 year rain		2.5	in	
		0.611	mi						
Average Slope		178	ft/mi						
Lca		1475	ft						
		0.279	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.23	hours						
Time of Concentration		0.381502	hours						
Peak Flows									
100-year	**86**	**cfs**							
50-year	**67**	**cfs**							
25-year	**56**	**cfs**							
10-year	**43**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 8B				
Tributary to Ninth and Ramona									
Area		102922	sq ft		Hydrlgic Soil Group		A		
		2	ac		Average CN		75	6000 sq ft lots typ	
		0.004	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		120	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		83	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		515	ft		24 hr 2 year rain		2.5	in	
		0.098	mi						
Average Slope		379	ft/mi						
Lca		100	ft						
		0.019	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.04	hours						
Time of Concentration		0.059197	hours						
Peak Flows									
100-year	**4**	**cfs**							
50-year	**3**	**cfs**							
25-year	**3**	**cfs**							
10-year	**2**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study							(805)549-8658/eda@edainc.com	
CALC BY:	kvc								
CHK BY:									
					Area 8C				
Tributary to 10th adn Ramona									
Area		1161512	sq ft		Hydrigic Soil Group		A		
		27	ac		Average CN		75	6000 sq ft lots typ	
		0.042	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		90	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		78	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1450	ft		24 hr 2 year rain		2.5	in	
		0.275	mi						
Average Slope		44	ft/mi						
Lca		520	ft						
		0.098	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.15	hours						
Time of Concentration		0.247482	hours						
Peak Flows									
100-year	**38**	**cfs**							
50-year	**30**	**cfs**							
25-year	**25**	**cfs**							
10-year	**20**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 9				
Tributary to 18th, between Ramona and Pismo									
Area		679862	sq ft		Hydrlgic Soil Group		A		
		16	ac		Average CN		75	6000 sq ft lots typ	
		0.024	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		120	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		93	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1860	ft		24 hr 2 year rain		2.5	in	
		0.352	mi						
Average Slope		77	ft/mi						
Lca		745	ft						
		0.141	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.17	hours						
Time of Concentration		0.280292	hours						
Peak Flows									
100-year	**26**	**cfs**							
50-year	**20**	**cfs**							
25-year	**18**	**cfs**							
10-year	**14**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 10				
Tributary to San Luis Ave. at South Bay Boulevard									
Area		1484037	sq ft		Hydrigic Soil Group		A		
		34	ac		Average CN		75	6000 sq ft lots typ	
		0.053	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		120	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		90	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1925	ft		24 hr 2 year rain		2.5	in	
		0.365	mi						
Average Slope		82	ft/mi						
Lca		1000	ft						
		0.189	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.19	hours						
Time of Concentration		0.313329	hours						
Peak Flows									
100-year	**57**	**cfs**							
50-year	**45**	**cfs**							
25-year	**38**	**cfs**							
10-year	**30**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 11				
Tributary to South Bay Boulevard, S'ly of Ramona									
Area		475216	sq ft		Hydrlgic Soil Group		A		
		11	ac		Average CN		75	6000 sq ft lots typ	
		0.017	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		120	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		90	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1100	ft		24 hr 2 year rain		2.5	in	
		0.208	mi						
Average Slope		144	ft/mi						
Lca		510	ft						
		0.097	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.11	hours						
Time of Concentration		0.176338	hours						
Peak Flows									
100-year	**18**	**cfs**							
50-year	**15**	**cfs**							
25-year	**13**	**cfs**							
10-year	**10**	**cfs**							

								Engineering Development Associates	
DATE:	28-Aug-97							ENGINEERING DEVELOPMENT ASSOCIATES	
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 12				
Area		6320000	sq ft		Hydrigic Soil Group		A		
		145	ac		Average CN		75	6000 sq ft lots typ	
		0.227	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		152	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		20	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		3000	ft		24 hr 2 year rain		2.5	in	
		0.568	mi						
Average Slope		232	ft/mi						
Lca		2000	ft						
		0.379	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.24	hours						
Time of Concentration		0.39625	hours						
Peak Flows									
100-year	129	cfs							
50-year	97	cfs							
25-year	71	cfs							
10-year	56	cfs							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 13				
Tributary to Solano and Butte									
Area		4512292	sq ft		Hydrigic Soil Group		A		
		104	ac		Average CN		75	6000 sq ft lots typ	
		0.162	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		150	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		12	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		4430	ft		24 hr 2 year rain		2.5	in	
		0.839	mi						
Average Slope		164	ft/mi						
Lca		1330	ft						
		0.252	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.25	hours						
Time of Concentration		0.420208	hours						
Peak Flows									
100-year	**115**	**cfs**							
50-year	**88**	**cfs**							
25-year	**68**	**cfs**							
10-year	**54**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 14				
Tributary to Pecho at Binscarth									
Area		3150801	sq ft		Hydrigic Soil Group		A		
		72	ac		Average CN		75	6000 sq ft lots typ	
		0.113	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		110	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		8	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		3515	ft		24 hr 2 year rain		2.5	in	
		0.666	mi						
Average Slope		153	ft/mi						
Lca		1270	ft						
		0.241	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.23	hours						
Time of Concentration		0.38328	hours						
Peak Flows									
100-year	**93**	**cfs**							
50-year	**73**	**cfs**							
25-year	**59**	**cfs**							
10-year	**47**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 15				
Tributary to Doris between Binscarth and Lupine									
Area		1318661	sq ft		Hydrigic Soil Group		A		
		30	ac		Average CN		75	6000 sq ft lots typ	
		0.047	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		100	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		6	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		2100	ft		24 hr 2 year rain		2.5	in	
		0.398	mi						
Average Slope		236	ft/mi						
Lca		760	ft						
		0.144	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.14	hours						
Time of Concentration		0.238785	hours						
Peak Flows									
100-year	**42**	**cfs**							
50-year	**33**	**cfs**							
25-year	**28**	**cfs**							
10-year	**22**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-07				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1958-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 16A				
East end of Skyline Drive									
Area		1524600	sq ft		Hydrigic Soil Group		A		
		35	ac		Average CN		75	6000 sq ft lots typ	
		0.055	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		105	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		50	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		2560	ft		24 hr 2 year rain		2.5	in	
		0.485	mi						
Average Slope		113	ft/mi						
Lca		890	ft						
		0.169	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.19	hours						
Time of Concentration		0.314285	hours						
Peak Flows									
100-year	**48**	**cfs**							
50-year	**38**	**cfs**							
25-year	**32**	**cfs**							
10-year	**25**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1958-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 16B				
South Side LOVR - Sump w'ly of Ravenna									
Area		2831400	sq ft		Hydrigic Soil Group		A		
		65	ac		Average CN		75	6000 sq ft lots typ	
		0.102	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		600	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		98	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		5520	ft		24 hr 2 year rain		2.5	in	
		1.045	mi						
Average Slope		480	ft/mi						
Lca		2200	ft						
		0.417	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.27	hours						
Time of Concentration		0.451253	hours						
Peak Flows									
100-year	**56**	**cfs**							
50-year	**41**	**cfs**							
25-year	**28**	**cfs**							
10-year	**22**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1958-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 16C				
Tributary to South Bay Boulevard, S'ly of Ramona									
Area		4617360	sq ft		Hydrlgic Soil Group		A		
		106	ac		Average CN		75	6000 sq ft lots typ	
		0.166	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		960	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		98	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		6800	ft		24 hr 2 year rain		2.5	in	
		1.288	mi						
Average Slope		669	ft/mi						
Lca		2500	ft						
		0.473	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.29	hours						
Time of Concentration		0.481425	hours						
Peak Flows									
100-year	**115**	**cfs**							
50-year	**88**	**cfs**							
25-year	**68**	**cfs**							
10-year	**54**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 16D				
South Side LOVR - Sump w'ly of Palisades									
Area		8760888	sq ft		Hydrigic Soil Group		A		
		201	ac		Average CN		75	6000 sq ft lots typ	
		0.314	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		960	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		98	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		6800	ft		24 hr 2 year rain		2.5	in	
		1.288	mi						
Average Slope		669	ft/mi						
Lca		2500	ft						
		0.473	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.29	hours						
Time of Concentration		0.481425	hours						
Peak Flows									
100-year	**95**	**cfs**							
50-year	**61**	**cfs**							
25-year	**30**	**cfs**							
10-year	**24**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
				Area 16E & 16F					
South Side LOVR - Sump w'ly of Palisades									
Area		7139454	sq ft		Hydrlgic Soil Group		A		
		164	ac		Average CN		75	6000 sq ft lots typ	
		0.256	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		360	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		98	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		5000	ft		24 hr 2 year rain		2.5	in	
		0.947	mi						
Average Slope		277	ft/mi						
Lca		2000	ft						
		0.379	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.28	hours						
Time of Concentration		0.46543	hours						
Peak Flows									
100-year	**79**	**cfs**							
50-year	**51**	**cfs**							
25-year	**25**	**cfs**							
10-year	**20**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 17A				
Tributary to Ramona between Broderson and Fourth									
Area		3691340	sq ft		Hydrigic Soil Group		A		
		85	ac		Average CN		75	6000 sq ft lots typ	
		0.132	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		105	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		25	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		2325	ft		24 hr 2 year rain		2.5	in	
		0.440	mi						
Average Slope		182	ft/mi						
Lca		780	ft						
		0.148	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.16	hours						
Time of Concentration		0.26351	hours						
Peak Flows									
100-year	**119**	**cfs**							
50-year	**94**	**cfs**							
25-year	**77**	**cfs**							
10-year	**61**	**cfs**							

								Engineering Development Associates	
DATE:	28-Aug-97							ENGINEERING DEVELOPMENT ASSOCIATES	
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study							(805)549-8658/eda@edainc.com	
CALC BY:	kvc								
CHK BY:									
					Area 17B				
San Luis & Nipomo Ave east of 8th Street									
Area		2998040	sq ft		Hydrlgic Soil Group		A		
		69	ac		Average CN		75	6000 sq ft lots typ	
		0.108	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		110	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		50	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		3483	ft		24 hr 2 year rain		2.5	in	
		0.660	mi						
Average Slope		91	ft/mi						
Lca		1931	ft						
		0.366	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.30	hours						
Time of Concentration		0.494527	hours						
Peak Flows									
100-year	83	cfs							
50-year	64	cfs							
25-year	53	cfs							
10-year	42	cfs							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 17C				
Santa Ynez & Los Olivos Ave east of Palisades									
Area		2674645	sq ft		Hydrlgic Soil Group		A		
		61	ac		Average CN		75	6000 sq ft lots typ	
		0.096	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		130	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		80	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		3620	ft		24 hr 2 year rain		2.5	in	
		0.686	mi						
Average Slope		73	ft/mi						
Lca		1180	ft						
		0.223	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.26	hours						
Time of Concentration		0.434013	hours						
Peak Flows									
100-year	**76**	**cfs**							
50-year	**59**	**cfs**							
25-year	**48**	**cfs**							
10-year	**38**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 17D				
Downtown Los Osos									
Area		725793	sq ft		Hydrigic Soil Group		A		
		17	ac		Average CN		75	6000 sq ft lots typ	
		0.026	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		130	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		105	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1165	ft		24 hr 2 year rain		2.5	in	
		0.221	mi						
Average Slope		113	ft/mi						
Lca		775	ft						
		0.147	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.13	hours						
Time of Concentration		0.221136	hours						
Peak Flows									
100-year	**24**	**cfs**							
50-year	**19**	**cfs**							
25-year	**15**	**cfs**							
10-year	**12**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010								1320 Nipomo Street/San Luis Obispo, CA 93401
JOB NM:	Los Osos/Baywood Drainage Study								(805)549-8658/eda@edainc.com
CALC BY:	kvc								
CHK BY:									
					Area 18				
Area		871200	sq ft		Hydrigic Soil Group		A		
		20	ac		Average CN		75	6000 sq ft lots typ	
		0.031	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		117	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		105	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		700	ft		24 hr 2 year rain		2.5	in	
		0.133	mi						
Average Slope		91	ft/mi						
Lca		500	ft						
		0.095	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.10	hours						
Time of Concentration		0.16099	hours						
Peak Flows									
100-year	**29**	**cfs**							
50-year	**23**	**cfs**							
25-year	**19**	**cfs**							
10-year	**15**	**cfs**							

							Engineering Development Associates		
DATE:	28-Aug-97						ENGINEERING DEVELOPMENT ASSOCIATES		
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 19A				
Area		1808760	sq ft		Hydrlgic Soil Group		A		
		42	ac		Average CN		75	6000 sq ft lots typ	
		0.065	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		132	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		100	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1680	ft		24 hr 2 year rain		2.5	in	
		0.318	mi						
Average Slope		101	ft/mi						
Lca		600	ft						
		0.114	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.14	hours						
Time of Concentration		0.23587	hours						
Peak Flows									
100-year	59	cfs							
50-year	46	cfs							
25-year	38	cfs							
10-year	30	cfs							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 19B				
Area		465485	sq ft		Hydrigic Soil Group		A		
		11	ac		Average CN		75	6000 sq ft lots typ	
		0.017	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		160	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		120	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		1115	ft		24 hr 2 year rain		2.5	in	
		0.211	mi						
Average Slope		189	ft/mi						
Lca		400	ft						
		0.076	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.09	hours						
Time of Concentration		0.153414	hours						
Peak Flows									
100-year	**17**	**cfs**							
50-year	**13**	**cfs**							
25-year	**11**	**cfs**							
10-year	**9**	**cfs**							

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 21				
Von's Basin									
Area		350550	sq ft		Hydrigic Soil Group		A		
		8	ac		Average CN		75	6000 sq ft lots typ	
		0.013	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		135	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		118	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		890	ft		24 hr 2 year rain		2.5	in	
		0.169	mi						
Average Slope		101	ft/mi						
Lca		365	ft						
		0.069	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.09	hours						
Time of Concentration		0.153308	hours						
Peak Flows			**Peak Elevation in Basin**						
100-year	**14**	**cfs**	**119.7**	**msl**					
50-year	**12**	**cfs**	**118.1**	**msl**					
25-year	**10**	**cfs**	**117.0**	**msl**					
10-year	**8**	**cfs**	**115.8**	**msl**					

					Engineering Development Associates				
DATE:	28-Aug-97				**ENGINEERING DEVELOPMENT ASSOCIATES**				
JOB No.:	2-1956-010					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 22				
Fairchild Basin									
Area		1256240	sq ft		Hydrigic Soil Group		A		
		29	ac		Average CN		75	6000 sq ft lots typ	
		0.045	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		160	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		120	ft msl		24 hr 10 year rain		4	in	
		q			24 hr 5 year rain		3.25	in	
Longest Path		1700	ft		24 hr 2 year rain		2.5	in	
		0.322	mi						
Average Slope		124	ft/mi						
Lca		360	ft						
		0.068	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.11	hours						
Time of Concentration		0.187451	hours						
Peak Flows			**Peak Elevation in Basin**						
100-year	**42**	**cfs**	**130.4**	**msl**					
50-year	**34**	**cfs**	**127.3**	**msl**					
25-year	**28**	**cfs**	**125.4**	**msl**					
10-year	**22**	**cfs**	**123.5**	**msl**					

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 23				
Fairchild Basin									
Area		9539640	sq ft		Hydrigic Soil Group		A		
		219	ac		Average CN		75	6000 sq ft lots typ	
		0.342	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		160	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		60	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		4000	ft		24 hr 2 year rain		2.5	in	
		0.758	mi						
Average Slope		132	ft/mi						
Lca		1500	ft						
		0.284	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.26	hours						
Time of Concentration		0.441181	hours						
Peak Flows									
100-year	**270**	**cfs**							
50-year	**210**	**cfs**							
25-year	**172**	**cfs**							
10-year	**136**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010								1320 Nipomo Street/San Luis Obispo, CA 93401
JOB NM:	Los Osos/Baywood Drainage Study								(805)549-8658/eda@edainc.com
CALC BY:	kvc								
CHK BY:									
					Area 24				
Fairchild Basin									
Area		4750000	sq ft		Hydrigic Soil Group		A		
		109	ac		Average CN		75	6000 sq ft lots typ	
		0.170	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		200	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		20	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		12500	ft		24 hr 2 year rain		2.5	in	
		2.367	mi						
Average Slope		76	ft/mi						
Lca		500	ft						
		0.095	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.30	hours						
Time of Concentration		0.497592	hours						
Peak Flows									
100-year	**128**	**cfs**							
50-year	**100**	**cfs**							
25-year	**82**	**cfs**							
10-year	**65**	**cfs**							

									Engineering Development Associates
DATE:	28-Aug-97								**ENGINEERING DEVELOPMENT ASSOCIATES**
JOB No.:	2-1956-010						1320 Nipomo Street/San Luis Obispo, CA 93401		
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
Area 25									
Tributary to Los Osos Valley Road at Pecho									
Area		17689698	sq ft		Hydrigic Soil Group		A		
		406	ac		Average CN		75	6000 sq ft lots typ	
		0.635	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		960	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		70	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		6500	ft		24 hr 2 year rain		2.5	in	
		1.231	mi						
Average Slope		723	ft/mi						
Lca		2200	ft						
		0.417	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.27	hours						
Time of Concentration		0.444247	hours						
Peak Flows									
100-year	**153**	**cfs**							
50-year	**91**	**cfs**							
25-year	**35**	**cfs**							
10-year	**28**	**cfs**							

					Engineering Development Associates				
JOB No.:	8/28/97					1320 Nipomo Street/San Luis Obispo, CA 93401			
JOB NM:	Los Osos/Baywood Drainage Study						(805)549-8658/eda@edainc.com		
CALC BY:	kvc								
CHK BY:									
					Area 27				
Tributary to Los Osos Valley Road at Cimarron									
Area		8750000	sq ft		Hydrigic Soil Group		A		
		201	ac		Average CN		55		
		0.314	sq mi		24 hr/100 year rain		5.75	in	
					24 hr 50 year rain		5	in	
Elev at High Point		440	ft msl		24 hr 25 year rain		4.5	in	
Elev at Low Point		80	ft msl		24 hr 10 year rain		4	in	
					24 hr 5 year rain		3.25	in	
Longest Path		5000	ft		24 hr 2 year rain		2.5	in	
		0.947	mi						
Average Slope		380	ft/mi						
Lca		2000	ft						
		0.379	mi						
Time of Concentration/Lag Time									
for n = 0.05									
Lag Time		0.26	hours						
Time of Concentration		0.438162	hours						
Peak Flows									
100-year	**115**	**cfs**							
50-year	**76**	**cfs**							
25-year	**43**	**cfs**							
10-year	**34**	**cfs**							

CATEGORY: 1
AREA: 6
ALTERNATIVES: 6.2-6.5

ENGINEERING DEVELOPMENT ASSOCIATES
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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 6.2						
	CURB & GUTTER	4,000	LF	13.00	$52,000	
	8' ROAD WIDEN, BOTH SIDES	32,000	SF	2.35	$75,200	2" AC / 6" base
	SUBTOTAL:				$127,200	
ALT 6.3						
	CURB & GUTTER	4,000	LF	13.00	$52,000	
	8' ROAD WIDEN, BOTH SIDES	32,000	SF	2.35	$75,200	2" AC / 6" base
	FORCE MAIN	4,500	LF	12.00	$54,000	
	SUBTOTAL:				$181,200	
ALT 6.4						
	CURB & GUTTER	4,000	LF	13.00	$52,000	
	8' ROAD WIDEN, BOTH SIDES	32,000	SF	2.35	$75,200	2" AC / 6" base
	INSTALL WELL FIELD	4	EA	20000.00	$80,000	
	HYDRAULIC STUDY	1	LP	15000.00	$15,000	
	DISCHARGE PIPING	1	LP	25000.00	$25,000	
	SUBTOTAL:				$247,200	
ALT 6.5						
	CURB & GUTTER	4,000	LF	13.00	$52,000	
	8' ROAD WIDEN, BOTH SIDES	32,000	SF	2.35	$75,200	2" AC / 6" base
	INSTALL WELL FIELD	4	EA	20000.00	$80,000	
	HYDRAULIC STUDY	1	LP	15000.00	$15,000	
	DISCHARGE PIPING	1	LP	25000.00	$25,000	
	SUBTOTAL:				$247,200	

CATEGORY: 1
AREA: 6
ALTERNATIVE: 6.6a

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT. ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 6.6a-SANTA MARIA AVE					
36" STORM DRAIN	1,400	LF	45.00	$63,000	
30" STORM DRAIN	1,000	LF	40.00	$40,000	
24" STORM DRAIN	800	LF	35.00	$28,000	
ROAD INLET	17	EA	2200.00	$37,400	
SAWCUT & REPLACE ROADWAY	3,200	LF	10.00	$32,000	
MANHOLES	8	EA	2500.00	$20,000	
SUBTOTAL:				$220,400	
WITH FULL CURB & GUTTER					
CURB & GUTTER	4,500	LF	13.00	$58,500	
8' WIDENING, BOTH SIDES	36,000	SF	2.35	$84,600	2" AC / 6" base
CROSS GUTTER & SPANDRELS	12	EA	3500.00	$42,000	
SUBTOTAL:				$185,100	
WITH HALF CURB & GUTTER					
CURB & GUTTER	2,250	LF	13.00	$29,250	
8' WIDENING, BOTH SIDES	18,000	SF	2.35	$42,300	2" AC / 6" base
CROSS GUTTER & SPANDRELS	6	EA	3500.00	$21,000	
SUBTOTAL:				$92,550	
ALT 6.6a EL MORO AVE					
3'x5' BOX CULVERT UNDER 1st ST	500	LF	105.00	$52,500	
54" STORM DRAIN	1,400	LF	68.00	$95,200	
48" STORM DRAIN	700	LF	62.00	$43,400	
42" STORM DRAIN	600	LF	55.00	$33,000	
36" STORM DRAIN	600	LF	45.00	$27,000	
24" STORM DRAIN	400	LF	35.00	$14,000	
ROAD INLET	22	EA	2200.00	$48,400	
SAWCUT & REPLACE ROADWAY	4,200	LF	10.00	$42,000	
MANHOLE	12	EA	2500.00	$30,000	
SUBTOTAL:				$385,500	

CATEGORY: 1
AREA: 6
ALTERNATIVE: 6.6b

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
	ALT 6.6b-SANTA MARIA AVE					
	36" STORM DRAIN (DEEP)	1,100	LF	60.00	$66,000	
	36" STORM DRAIN	300	LF	45.00	$13,500	
	30" STORM DRAIN	1,000	LF	40.00	$40,000	
	24" STORM DRAIN	1,800	LF	35.00	$63,000	
	ROAD INLET	17	EA	2200.00	$37,400	
	SAWCUT & REPLACE ROADWAY	4,200	LF	10.00	$42,000	
	MANHOLES	8	EA	2500.00	$20,000	
	SUBTOTAL:				**$281,900**	
	WITH FULL CURB & GUTTER					
	CURB & GUTTER	4,500	LF	13.00	$58,500	
	8' WIDENING, BOTH SIDES	36,000	SF	2.35	$84,600	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	12	EA	3500.00	$42,000	
	SUBTOTAL:				**$185,100**	
	WITH HALF CURB & GUTTER					
	CURB & GUTTER	2,250	LF	13.00	$29,250	
	8' WIDENING, BOTH SIDES	18,000	SF	2.35	$42,300	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	6	EA	3500.00	$21,000	
	SUBTOTAL:				**$92,550**	
	ALT 6.6b EL MORO AVE					
	3'x5' BOX CULVERT UNDER 1st ST	500	LF	105.00	$52,500	
	54" STORM DRAIN	1,400	LF	68.00	$95,200	
	48" STORM DRAIN	700	LF	62.00	$43,400	
	42" STORM DRAIN	600	LF	55.00	$33,000	
	36" STORM DRAIN	600	LF	45.00	$27,000	
	24" STORM DRAIN	400	LF	35.00	$14,000	
	ROAD INLET	22	EA	2200.00	$48,400	
	SAWCUT & REPLACE ROADWAY	4,200	LF	18.00	$75,600	
	MANHOLE	12	EA	2500.00	$30,000	
	SUBTOTAL:				**$419,100**	

CATEGORY: 1
AREA: 6
ALTERNATIVE: 6.6c

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 6.6c						
	SWALE	6,000	LF	30.00	$180,000	Roadside swale, both sides
	10' WIDENING, BOTH SIDES w/ BASE	60,000	SF	0.75	$45,000	4" CLASS II BASE
	CULVERTS	12	EA	900.00	$10,800	
	36" STORM DRAIN	1,200	LF	45.00	$54,000	Intercept at 1st St
	CULVERTS	12	EA	900.00	$10,800	
	MANHOLES	3	EA	2500.00	$7,500	
	SUBTOTAL:				$308,100	
WITH FULL CURB & GUTTER						
	CURB & GUTTER	4,500	LF	13.00	$58,500	
	8' WIDENING, BOTH SIDES	36,000	SF	2.35	$84,600	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	12	EA	3500.00	$42,000	
	SUBTOTAL:				$185,100	
WITH HALF CURB & GUTTER						
	CURB & GUTTER	2,250	LF	13.00	$29,250	
	8' WIDENING, BOTH SIDES	18,000	SF	2.35	$42,300	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	6	EA	3500.00	$21,000	
	SUBTOTAL:				$92,550	

CATEGORY: 1
AREA: 7
ALTERNATIVE: 7.2-7.4

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT. ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 7.2 w/ CURB AND GUTTER					
CURB & GUTTER	5,600	LF	13.00	$72,800	
8' WIDENING, BOTH SIDES	44,800	SF	2.35	$105,280	2" AC / 6" base
CROSS GUTTER & SPANDRELS	6	EA	3500.00	$21,000	
SUBTOTAL:				$199,080	
ALT 7.2 w/ SWALES					
SWALE	5,600	LF	30.00	$168,000	AC Roadside swale, both sides
10' WIDENING, BOTH SIDES w/ BASE	56,000	SF	0.75	$42,000	4" CLASS II BASE
24" CULVERTS	12	EA	600.00	$7,200	
SUBTOTAL:				$217,200	
ALT 7.3 w/ CURB AND GUTTER					
CURB & GUTTER	5,600	LF	13.00	$72,800	
8' ROAD WIDEN, BOTH SIDES	44,800	SF	2.35	$105,280	2" AC / 6" base
INSTALL WELL FIELD	4	EA	20000.00	$80,000	
HYDRAULIC STUDY	1	LP	15000.00	$15,000	
DISCHARGE PIPING	1	LP	25000.00	$25,000	
SUBTOTAL:				$298,080	
ALT 7.3 w/ SWALES					
SWALE	5,600	LF	30.00	$168,000	AC Roadside swale, both sides
10' WIDENING, BOTH SIDES w/ BASE	56,000	SF	0.75	$42,000	4" CLASS II BASE
24" CULVERTS	12	EA	600.00	$7,200	
INSTALL WELL FIELD	4	EA	20000.00	$80,000	
HYDRAULIC STUDY	1	LP	15000.00	$15,000	
DISCHARGE PIPING	1	LP	25000.00	$25,000	
SUBTOTAL:				$337,200	

CATEGORY: 1
AREA: 7
ALTERNATIVE: 7.2-7.4

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 7.4 w/ CURB AND GUTTER						
	CURB & GUTTER	5,600	LF	13.00	$72,800	
	8' WIDENING, BOTH SIDES	44,800	SF	2.35	$105,280	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	6	EA	3500.00	$21,000	
	RETENTION BASIN	6	AF	16000.00	$100,800	
	SUBTOTAL:				$299,880	
ALT 7.4 w/ SWALES						
	SWALE	5,600	LF	30.00	$168,000	AC Roadside swale, both sides
	10' WIDENING, BOTH SIDES w/ BASE	56,000	SF	0.75	$42,000	4" CLASS II BASE
	CULVERTS	12	EA	600.00	$7,200	
	48" STORM DRAIN	700	LF	60.00	$42,000	
	30" STORM DRAIN	300	LF	40.00	$12,000	
	ROAD INLETS	7	EA	2200.00	$15,400	
	MANHOLES	3	EA	2500.00	$7,500	
	RETENTION BASIN	6	AF	16000.00	$100,800	
	SUBTOTAL:				$394,900	

CATEGORY: 1
AREA: 8
ALTERNATIVE: 8.2 - 8.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 8.2						
	CURB & GUTTER	2,600	LF	13.00	$33,800	
	8' WIDENING, BOTH SIDES	20,800	SF	2.35	$48,880	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	2	EA	3500.00	$7,000	
	18" CULVERT	50	LF	25.00	$1,250	
	SWALE TO PUMP STATION	150	LF	8.50	$1,275	
	PUMP STATION	1	EA	15000.00	$15,000	
	FORCE MAIN	2,200	LF	12.00	$26,400	
	SUBTOTAL:				$133,605	
ALT 8.3						
	CURB & GUTTER	2,600	LF	13.00		
	8' WIDENING, BOTH SIDES	20,800	SF	2.35	$48,880	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	2	EA	3500.00	$7,000	
	18" CULVERT	50	LF	25.00	$1,250	
	SWALE TO PUMP STATION	150	LF	8.50	$1,275	
	PUMP STATION	1	EA	15000.00	$15,000	
	FORCE MAIN	2,800	LF	12.00	$33,600	
	SUBTOTAL:				$107,005	

CATEGORY: 1
AREA: 8
ALTERNATIVE: 8.4-8.5

ENGINEERING DEVELOPMENT ASSOCIATES
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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 8.4						
	CURB & GUTTER	2,600	LF	13.00	$33,800	
	8' WIDENING, BOTH SIDES	20,800	SF	2.35	$48,880	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	2	EA	3500.00	$7,000	
	18" CULVERT	50	LF	25.00	$1,250	
	SWALE TO PUMP STATION	150	LF	8.50	$1,275	
	PUMP STATION	1	EA	15000.00	$15,000	
	FORCE MAIN	2,200	LF	12.00	$26,400	
	INSTALL WELL FIELD	4	EA	20000.00	$80,000	
	HYDRAULIC STUDY	1	LP	15000.00	$15,000	
	DISCHARGE PIPING	1	LP	25000.00	$25,000	
	SUBTOTAL:				$253,805	
ALT 8.5						
	CURB & GUTTER	2,600	LF	13.00	$33,800	
	8' WIDENING, BOTH SIDES	20,800	SF	2.35	$48,880	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	2	EA	3500.00	$7,000	
	18" CULVERT	50	LF	25.00	$1,250	
	SWALE TO PUMP STATION	150	LF	8.50	$1,275	
	PUMP STATION	1	EA	15000.00	$15,000	
	FORCE MAIN	2,800	LF	12.00	$33,600	
	INSTALL WELL FIELD	4	EA	20000.00	$80,000	
	HYDRAULIC STUDY	1	LP	15000.00	$15,000	
	DISCHARGE PIPING	1	LP	25000.00	$25,000	
	SUBTOTAL:				$260,805	

CATEGORY: 1
AREA: 8
ALTERNATIVE: 8.6-8.8

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 8.6						
	48" STORM DRAIN	1,700	LF	60.00	$102,000	
	48" STORM DRAIN THRU RESIDENTIAL	700	LF	75.00	$52,500	Through residential properties
	ROAD INLET	14	EA	2200.00	$30,800	
	MANHOLE	12	EA	2500.00	$30,000	
	SAWCUT & REPAIR STREET	1,700	LF	10.00	$17,000	
	SUBTOTAL:				**$232,300**	
ALT 8.7						
	CURB & GUTTER	2,500	LF	13.00	$32,500	
	8' WIDENING, BOTH SIDES	20,000	SF	2.35	$47,000	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	3	EA	3500.00	$10,500	
	18" CULVERT	50	LF	25.00	$1,250	
	CONSTRUCT CO. STD D-4	2	EA	850.00	$1,700	
	CONSTRUCT EARTH LINED SWALE	250	LF	8.50	$2,125	
	SUBTOTAL:				**$95,075**	
ALT 8.8						
	CURB & GUTTER	2,500	LF	13.00	$32,500	
	8' WIDENING, BOTH SIDES	20,000	SF	2.35	$47,000	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	3	EA	3500.00	$10,500	
	18" CULVERT	50	LF	25.00	$1,250	
	CONSTRUCT CO. STD D-4	2	EA	850.00	$1,700	
	SUBTOTAL:				**$92,950**	

CATEGORY: 2
AREA: 1
ALTERNATIVE: 1.2-1.4

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 1.2						
	SWALE TO BAY	200	LF	8.50	$1,700	
	CLEAR & GRUB	1	AC	1500.00	$750	
	SUBTOTAL:				$2,450	
ALT 1.3						
	DEMO & REMOVE ROAD	7,500	SF	2.50	$18,750	
	STREET BARRICADE	1	EA	1000.00	$1,000	
	GRADED PARKING AREA	10,000	SF	0.75	$7,500	Base material only
	WETLAND RESTORATION	1	LS	30000.00	$30,000	
	SUBTOTAL:				$57,250	
ALT 1.4						
	DOUBLE 18" CULVERT	100	LF	50.00	$5,000	
	SWALE TO BAY	200	LF	8.50	$1,700	
	CLEAR & GRUB	1	LS	1500.00	$1,500	
	SUBTOTAL:				$8,200	

CATEGORY: 2
AREA: 14
ALTERNATIVE: 14.1b-14.2d

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 14.1b						
	CURB & GUTTER	6,000	LF	13.00	$78,000	
	8' WIDENING, BOTH SIDES	48,000	SF	2.35	$112,800	2" AC / 6" base
	REGRADE ROADWAY (RAISE)	800	LF	4.00	$3,200	
	SWALE TO WETLAND	300	LF	8.50	$2,550	
	SUBTOTAL:				$196,550	
ALT 14.1c						
	18" STORM DRAIN	80	LF	25.00	$2,000	
	ROAD INLET	1	EA	2200.00	$2,200	
	SAWCUT & REPAIR STREET	80	LF	10.00	$800	
	SUBTOTAL:				$5,000	
ALT 14.2b						
	CURB & GUTTER	600	LF	13.00	$7,800	
	8' WIDENING, BOTH SIDES	4,800	SF	2.35	$11,280	2" AC / 6" base
	REGRADE ROADWAY (RAISE)	600	LF	4.00	$2,400	
	RECONSTRUCT EXIST DRIVEWAY	3	EA	650.00	$1,950	
	SUBTOTAL:				$23,430	
ALT 14.2c						
	SWALE TO BAY	300	LF	8.50	$2,550	
	CROSS-GUTTER IN EXIST PAVEMENT	1	EA	3500.00	$3,500	
	SUBTOTAL:				$6,050	
ALT 14.2d						
	18" STORM DRAIN	300	LF	25.00	$7,500	
	ROAD INLET	1	EA	2200.00	$2,200	
	SAWCUT & REPAIR STREET	300	LF	10.00	$3,000	
	OUTLET STRUCTURE	1	EA	1850.00	$1,850	
	SUBTOTAL:				$14,550	

CATEGORY: 2
AREA: 15
ALTERNATIVE: 15.2-15.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 15.2						
	CURB & GUTTER	2,400	LF	13.00	$31,200	
	8' WIDENING, BOTH SIDES	19,200	SF	2.35	$45,120	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	1	EA	3500.00	$3,500	
	OVERSIDE DRAIN	1	EA	650.00	$650	
	SWALE TO BAY	200	LF	8.50	$1,700	
	18" CULVERT (UNDER DORIS)	80	LF	35.00	$2,800	
	SAWCUT & REPAIR STREET	80	LF	10.00	$800	
	SUBTOTAL:				$85,770	
ALT 15.3						
	CURB & GUTTER	400	LF	13.00	$5,200	
	8' WIDENING, BOTH SIDES	3,200	SF	2.35	$7,520	2" AC / 6" base
	OVERSIDE DRAIN (FEARN)	1	EA	650.00	$650	
	SUBTOTAL:				$13,370	

CATEGORY: 3
AREA: 16
ALTERNATIVE: 16.1b-16.1e

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 16.1b						
	RETENTION BASIN	35	AF	16000.00	$560,000	
	DIVERSION SWALE	7,500	LF	8.75	$65,625	2" AC / 6" base
	CLEARING AND GRUBBING	4	AC	2000.00	$8,000	
	BASIN OVERFLOW	3	EA	4500.00	$13,500	
	HYDROSEED	4	AC	1250.00	$5,000	
	SUBTOTAL:				$652,125	
ALT 16.1c						
	RETENTION BASIN	35	AF	16000.00	$560,000	
	DIVERSION SWALE	7,500	LF	8.50	$63,750	
	CLEARING AND GRUBBING	4	AC	2000.00	$8,000	
	BASIN HEADWALL	3	EA	1800.00	$5,400	
	24" STORM DRAIN	4,500	LF	35.00	$157,500	
	STORM DRAIN MANHOLE	10	EA	2500.00	$25,000	
	HYDROSEED	4	AC	1250.00	$5,000	
	SUBTOTAL:				$824,650	
ALT 16.1d						
	CLEARING AND GRUBBING	4	AC	2000.00	$8,000	
	RIP-RAP DIVERSION SWALE	10,200	LF	12.50	$127,500	
	HYDROSEED	4	AC	1250.00	$5,000	
	SUBTOTAL:				$140,500	
ALT 16.1e						
	CLEARING AND GRUBBING	4	AC	2000.00	$8,000	
	GRADE SWALE	9,600	LF	12.50	$120,000	
	GEOTEXTILE LINING	9,600	LF	9.00	$86,400	
	HYDROSEED	4	AC	1250.00	$5,000	
	SUBTOTAL:				$219,400	

CATEGORY: 3
AREA: 16
ALTERNATIVE: 16.2b-16.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT. ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 16.2b FERRELL BASIN STORM DRAIN					
72" STORM DRAIN	2,000	LF	100.00	$200,000	
60" STORM DRAIN	4,000	LF	80.00	$320,000	
54" STORM DRAIN	900	LF	68.00	$61,200	
48" STORM DRAIN	1,000	LF	62.00	$62,000	
42" STORM DRAIN	300	LF	55.00	$16,500	
24" STORM DRAIN	400	LF	35.00	$14,000	
ROAD INLET	12	EA	2200.00	$26,400	
SAWCUT & REPLACE ROADWAY	8,600	LF	18.00	$154,800	
MANHOLE	10	EA	2500.00	$25,000	
SEDIMENTATION BASIN	0.1	AF	16000.00	$1,120	
SUBTOTAL:				**$881,020**	
ALT 16.2c MORRO SHORES STORM DRAIN					
72" STORM DRAIN	2,000	LF	100.00	$200,000	
60" STORM DRAIN	3,000	LF	80.00	$240,000	
48" STORM DRAIN	1,000	LF	62.00	$62,000	
36" STORM DRAIN	300	LF	50.00	$15,000	
ROAD INLET	12	EA	2200.00	$26,400	
SAWCUT & REPLACE ROADWAY	3,100	LF	18.00	$55,800	
MANHOLE	10	EA	2500.00	$25,000	
SEDIMENTATION BASIN	0.1	AF	16000.00	$1,120	
SUBTOTAL:				**$625,320**	
ALT 16.3					
CURB & GUTTER	5,250	LF	13.00	$68,250	
8' WIDENING, BOTH SIDES	42,000	SF	2.35	$98,700	2" AC / 6" base
CROSS GUTTER & SPANDRELS	2	EA	3500.00	$7,000	
OVERSIDE DRAIN	1	EA	650.00	$650	
RIP-RAP VELOCITY REDUCER	2	TNS	100.00	$200	
SUBTOTAL:				**$174,800**	

CATEGORY: 3
AREA: 16
ALTERNATIVE: 16.4a-16.5

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 16.4a						
	CURB & GUTTER	4,800	LF	13.00	$62,400	
	8' WIDENING, BOTH SIDES	38,400	SF	2.35	$90,240	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	6	EA	3500.00	$21,000	
	SWALE TO BAY	200	LF	8.50	$1,700	
	18" CULVERT (UNDER RAMONA)	80	LF	35.00	$2,800	
	SAWCUT & REPAIR STREET	80	LF	10.00	$800	
	SLURRY CROSSING	80	LF	7.50	$600	
	SUBTOTAL:				$179,540	
ALT 16.4b						
	CURB & GUTTER	4,800	LF	13.00	$62,400	
	8' WIDENING, BOTH SIDES	38,400	SF	2.35	$90,240	2" AC / 6" base
	CROSS GUTTER & SPANDRELS	6	EA	3500.00	$21,000	
	18" STORM DRAIN	1,000	LF	30.00	$30,000	
	24" STORM DRAIN	900	LF	35.00	$31,500	
	ROAD INLET	7	EA	2200.00	$15,400	
	SAWCUT & REPLACE ROADWAY	4,800	LF	18.00	$86,400	
	MANHOLE	3	EA	2500.00	$7,500	
	SUBTOTAL:				$344,440	
ALT 16.5						
	CROSS GUTTER & SPANDRELS	1	EA	3500.00	$3,500	
	VEGETATED SWALE	200	LF	8.50	$1,700	
	HYDROSEED	1	AC	1250.00	$625	
	OVERSIDE DRAIN	1	EA	650.00	$650	
	SUBTOTAL:				$6,475	

CATEGORY: 3
AREA: 27
ALTERNATIVE: 27.2-27.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 27.2						
	CLEAN & IMPROVE EXIST CHANNEL	1,000	LF	5.50	$5,500	Improve exist flowline, remove sedimentation
	CREATE MOUND W/ EXCAVATED MAT.	600	LF	3.50	$2,100	Use sediments removed from exist channel to construct
	SUBTOTAL:				$7,600	low berm on westside of channel.
ALT 27.3						
	DOUBLE 18" RCP STORM DRAIN	80	LF	25.00	$2,000	Under Cimarron
	42" RCP STORM DRAIN		LF			East side of Sombrero. Tie to exist swale
	ROAD INLETS		EA			
	MANHOLES		EA			
	INLET/OUTLET STRUCTURE	2	EA	5000.00	$10,000	
	SUBTOTAL:				$12,000	

CATEGORY: 4

AREA: 17

ALTERNATIVE: 17.2a-17.3a

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT. ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 17.2a FERRELL RECHARGE BASIN					
CONSTRUCT RECHARGE BASIN	19	AF	16000.00	$304,000	
SUBTOTAL:				**$304,000**	
ALT 17.2b SANTA YNEZ BASIN w/ CURB & GUTTER					
CONSTRUCT RECHARGE BASIN	7	AF	16000.00	$105,600	
CURB & GUTTER	2,400	LF	13.00	$31,200	
8' WIDENING, BOTH SIDES	19,200	SF	2.35	$45,120	2" AC/4" base
SUBTOTAL:				**$181,920**	
ALT 17.2b SANTA YNEZ BASIN w/ SWALE					
CONSTRUCT RECHARGE BASIN	7	AF	16000.00	$105,600	
CONSTRUCT "V" DITCH	2,400	LF	30.00	$72,000	
BASE SHOULDER	24,000	SF	0.75	$18,000	
SUBTOTAL:				**$195,600**	
ALT 17.3a SAN LUIS STORM DRAIN					
18" STORM DRAIN	1,300	LF	30.00	$39,000	
24" STORM DRAIN	800	LF	35.00	$28,000	
30" STORM DRAIN	700	LF	40.00	$28,000	
ROAD INLET	10	EA	2200.00	$22,000	
SAWCUT & REPLACE ROADWAY	2,800	LF	10.00	$28,000	
MANHOLE	3	EA	2500.00	$7,500	
SUBTOTAL:				**$152,500**	

CATEGORY: 4
AREA: 17
ALTERNATIVE: 17.3b-17.4

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT. ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 17.3b FERRELL/NIPOMO STORM DRAIN					
CURB & GUTTER	1,000	LF	13.00	$13,000	
8' WIDENING, BOTH SIDES	8,000	SF	2.35	$18,800	2" AC / 6" base
18" STORM DRAIN	2,700	LF	30.00	$81,000	
30" STORM DRAIN	2,000	LF	40.00	$80,000	
36" STORM DRAIN	2,300	LF	35.00	$80,500	
ROAD INLET	18	EA	2200.00	$39,600	
SAWCUT & REPLACE ROADWAY	7,000	LF	10.00	$70,000	
MANHOLE	5	EA	2500.00	$12,500	
SUBTOTAL:				$395,400	
ALT 17.4 SANTA YNEZ BASIN					
CURB & GUTTER	1,400	LF	13.00	$18,200	
ROAD REGRADE AND PAVE	11,200	SF	2.35	$26,320	2" AC/6" base
SUBTOTAL:				$44,520	

CATEGORY: 4
AREA: 19
ALTERNATIVE: 19.2-19.4

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 19.2						
	18" STORM DRAIN	60	LF	25.00	$1,500	
	RECHARGE BASIN	0.8	AF	16000.00	$12,800	
	RETENTION BASIN	0.3	AF	16000.00	$4,800	
	SWALE	100	LF	8.50	$850	
	SAWCUT & REPAIR STREET	60	LF	10.00	$600	
	PURCHASE PROPERTY FOR BASIN	60	SF	30.00	$1,800	
	SUBTOTAL:				$22,350	
ALT 19.3						
	18" STORM DRAIN	250	LF	25.00	$6,250	
	SWALE	400	LF	8.50	$3,400	
	SAWCUT & REPAIR STREET	250	LS	10.00	$10	
	SUBTOTAL:				$9,660	
ALT 19.4						
	18" STORM DRAIN	120	LF	25.00	$3,000	
	SWALE	600	LF	8.50	$5,100	
	SAWCUT & REPAIR STREET	120	LS	10.00	$10	
	SUBTOTAL:				$8,110	

CATEGORY: 4
AREA: 21
ALTERNATIVE: 21.2-21.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 21.2						
	36" STORM DRAIN	800	LF	45.00		Hydraulically connect basins
	ROAD INLET	2	EA	2200.00	$4,400	
	MANHOLE	2	EA	2500.00	$5,000	
	RECHARGE BASIN	2	AF	16000.00	$35,200	
	SUBTOTAL:				$44,600	
ALT 21.3						
	(refer to Alternative 17.3b)					

CATEGORY: 4
AREA: 22
ALTERNATIVE: 22.2-22.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 22.2						
	(Same as Alt 21.2)					
ALT 22.3						
	(Same as Alt 17.3b)					

CATEGORY: 5
AREA: 9
ALTERNATIVE: 9.2-9.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 9.2						
	12" STORM DRAIN	800	LF	25.00	$20,000	
	ROAD INLET	2	EA	2200.00	$4,400	
	OUTLET ENCASEMENT	2	EA	500.00	$1,000	Daylight storm drain to existing roadway
	SAWCUT & REPAIR STREET	800	LF	10.00	$8,000	
	SUBTOTAL:				$33,400	
ALT 9.3						
	18" STORM DRAIN	800	LF	25.00	$20,000	
	12" STORM DRAIN	300	LF	25.00	$7,500	
	INLET	2	EA	1850.00	$3,700	
	SAWCUT & REPAIR STREET	1,100	LF	10.00	$11,000	
	REMOVE EXIST STORM DRAIN	300	LF	8.50	$2,550	
	INSTALL 18" BLEEDER PIPE	500	LF	25.00	$12,500	
	SUBTOTAL:				$57,250	
ALT 9.4						
	DEMO & REMOVE EXIST ROADWAY	14,000	LF	1.25	$17,500	
	GRAVEL FILL TO 15"	662	CY	30.00	$19,860	
	POROUS PAVEMENT	210	TN	40.00	$8,400	
	SUBTOTAL:				$45,760	

CATEGORY: 5
AREA: 10
ALTERNATIVE: 10.2-10.4

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT. ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 10.2					
18" STORM DRAIN	300	LF	25.00	$7,500	through existing lots
ROAD INLET	2	EA	2200.00	$4,400	
RETENTION BASIN	1.6	AF	16000.00	$25,600	
PURCHASE PROPERTY FOR BASIN	8,700	SF	10.00	$87,000	
BASIN INLET STRUCTURE	1	EA	1850.00	$1,850	
CONSTRUCT "V" DITCH	1,200	LF	30.00	$36,000	
BASE SHOULDER	12,000	SF	0.75	$9,000	
18" STORM DRAIN	320	LF	35.00	$11,200	
ROAD INLET	3	EA	2200.00	$6,600	
SUBTOTAL:				$189,150	
ALT 10.3					
24" STORM DRAIN	100	LF	35.00	$3,500	
DETENTION BASIN	1.8	AF	16000.00	$28,800	
RETENTION BASIN	5.0	AF	16000.00	$80,000	
ROAD INLET	1	EA	2200.00	$2,200	
BASIN INLET STRUCTURE	1	LS	1850.00	$1,850	
PURCHASE PROPERTY FOR BASIN	27,442	SF	10.00	$274,420	
SUBTOTAL:				$390,770	
ALT 10.4					
24" STORM DRAIN	100	LF	35.00	$3,500	
SWALES	1,000	LF	8.50	$8,500	
SAWCUT & REPAIR STREET	100	LF	10.00	$1,000	
SUBTOTAL:				$13,000	

CATEGORY: 5
AREA: 18
ALTERNATIVE: 18.2-18.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 18.2						
	(Same as Alt 17.3b)					
ALT 18.3						
	DETENTION BASIN	1.5	AF	16000.00	$24,000	
	RETENTION BASIN	4.0	AF	16000.00	$64,000	
	SWALE	300	LF	8.50	$2,550	
	CROSS-GUTTER & SPANDREL	1	EA	3500.00	$3,500	In existing road
	SUBTOTAL:				$94,050	

CATEGORY: 6
AREA: 2
ALTERNATIVE: 2.2-2.3b

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 2.2						
	MAINTENANCE					Clean debris from roadway
	SUBTOTAL:					
ALT 2.3a						
	CURB & GUTTER	1,400	LF	13.00	$18,200	
	8' WIDENING, BOTH SIDES	11,200	SF	2.35	$26,320	2" AC / 6" base
	OVER SIDE DRAIN	1	EA	650.00	$650	
	18" STORM DRAIN	100	LF	25.00	$2,500	
	RIP-RAP VELOCITY REDUCER	3	TNS	100.00	$300	
	SUBTOTAL:				$47,970	
ALT 2.3b						
	CONSTRUCT "V" DITCH	1,400	LF	30.00	$42,000	
	BASE SHOULDER	14,000	SF	0.75	$10,500	
	OVER SIDE DRAIN	1	EA	650.00	$650	
	18" STORM DRAIN	100	LF	25.00	$2,500	
	RIP-RAP VELOCITY REDUCER	3	TNS	100.00	$300	
	SUBTOTAL:				$55,950	

CATEGORY: 6
AREA: 3
ALTERNATIVE: 3.2-3.4a

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 3.2						
	CURB & GUTTER	4,300	LF	13.00	$55,900	
	8' WIDENING, BOTH SIDES	32,000	SF	2.35	$75,200	2" AC / 6" base
	CROSS-GUTTER AND SPANDREL	7	SF	3500.00	$24,500	
	OVER SIDE DRAIN	1	EA	650.00	$650	
	RIP-RAP VELOCITY REDUCER	2	TNS	100.00	$200	
	SUBTOTAL:				$156,450	
ALT 3.3						
	CONSTRUCT "V" DITCH	4,300	LF	30.00	$129,000	
	BASE SHOULDER	43,000	SF	0.75	$32,250	
	24" STORM DRAIN	1,600	LF	35.00	$56,000	
	OVER SIDE DRAIN	1	EA	650.00	$650	
	RIP-RAP VELOCITY REDUCER	2	TNS	100.00	$200	
	SAWCUT & REPLACE ROADWAY	400	LF	12.00	$4,800	
	SUBTOTAL:				$222,900	
ALT 3.4a						
	24" STORM DRAIN	350	LF	35.00	$12,250	
	18" STORM DRAIN	100	LF	35.00	$3,500	
	ROAD INLET	4	EA	2200.00	$8,800	
	OVER SIDE DRAIN	1	EA	650.00	$650	
	RIP-RAP VELOCITY REDUCER	2	TNS	100.00	$200	
	SAWCUT & REPLACE ROADWAY	450	LF	12.00	$5,400	
	SUBTOTAL:				$30,800	

CATEGORY: 6
AREA: 3
ALTERNATIVE: 3.4b

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 3.4b						
	CONSTRUCT "V" DITCH	4,300	LF	30.00	$129,000	
	BASE SHOULDER	43,000	SF	0.75	$32,250	
	24" STORM DRAIN	1,600	LF	35.00	$56,000	
	18" STORM DRAIN	100	LF	35.00	$3,500	
	ROAD INLET	4	EA	2200.00	$8,800	
	OVER SIDE DRAIN	1	EA	650.00	$650	
	RIP-RAP VELOCITY REDUCER	2	TNS	100.00	$200	
	SAWCUT & REPLACE ROADWAY	1,700	LF	12.00	$20,400	
	SUBTOTAL:				$250,800	

CATEGORY: 6
AREA: 4
ALTERNATIVE: 4.2-4.4

ENGINEERING DEVELOPMENT ASSOCIATES
1320 Nipomo Street/San Luis Obispo, CA 93401
phone: (805)549-8658 fax: 805.549.8704 email: eda@edainc.com

PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 4.2						
	DIVERSION SWALE	1,800	LF	8.50	$15,300	
	GEOTEXTILE LINING	1,800	LF	3.50	$6,300	
	CLEAR, GRUB & GRADING	1,800	LF	2.50	$4,500	
	SUBTOTAL:				$26,100	
ALT 4.3						
	30" STORM DRAIN	1,000	LF	40.00	$40,000	
	24" STORM DRAIN	300	LF	35.00	$10,500	
	18" STORM DRAIN	600	LF	25.00	$15,000	
	ROAD INLETS	6	EA	2200.00	$13,200	
	SAWCUT & REPLACE ROADWAY	1,900	LF	10.00	$19,000	
	SUBTOTAL:				$97,700	
ALT 4.4						
	24" STORM DRAIN	1,400	LF	35.00	$49,000	
	18" STORM DRAIN	300	LF	25.00	$7,500	
	ENLARGE EXIST BASIN	3	AF	16000.00	$46,400	
	PROPERTY PURCHASE FOR BASIN	200	SF	30.00	$6,000	
	SAWCUT & REPLACE ROADWAY	1,700	LF	10.00	$17,000	
	SUBTOTAL:				$125,900	

CATEGORY: 6
AREA: 11
ALTERNATIVE: 11.2a-11.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 11.2a						
	RETENTION BASIN	2.1	AF	16000.00	$33,600	
	DETENTION BASIN	0.8	AF	16000.00	$12,800	
	OVERSIDE DRAIN	1	EA	650.00	$650	
	CURB & GUTTER	1,400	LF	13.00	$18,200	
	8' WIDENING, BOTH SIDES	11,200	SF	2.35	$26,320	2" AC/6" base
	SUBTOTAL:				$91,570	
ALT 11.2b						
	RETENTION BASIN	2.1	AF	16000.00		
	DETENTION BASIN	0.8	AF	16000.00	$12,800	
	OVERSIDE DRAIN	1	EA	650.00	$650	
	SWALE	800	LF	8.50	$6,800	
	CROSS GUTTER IN EXIST STREET	1	EA	3500.00	$3,500	
	SUBTOTAL:				$23,750	
ALT 11.3						
	SWALE	1,000	LF	8.50	$8,500	
	CROSS GUTTER IN EXIST STREET	1	EA	3500.00	$3,500	
	SUBTOTAL:				$12,000	

CATEGORY: 6
AREA: 13
ALTERNATIVE: 13.2-13.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 13.2						
	SWALE	2,000	LF	8.50	$17,000	
	CLEAN EXIST DEBRIS	1	LS	1850.00	$1,850	
	SUBTOTAL:				**$18,850**	
ALT 13.3						
	CURB & GUTTER	300	LF	13.00	$3,900	
	REMOVE EXIST CROSS-GUTTER	8	EA	550.00	$4,400	
	REGRADE INTERSECTION	14,500	SF	2.35	$34,075	2" AC/6" base
	REPLACE EXIST CULVERT/INLETS	1	EA	1500.00	$1,500	Solano at Butte Drive
	DOUBLE 36" STORM DRAIN	400	LF	100.00	$40,000	
	ROAD INLET	2	LF	2200.00	$4,400	
	SUBTOTAL:				**$88,275**	

CATEGORY: 6
AREA: 23
ALTERNATIVE: 23.2-23.3

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 23.2						
	30" STORM DRAIN	50	LF	40.00	$2,000	
	ROAD INLET	1	EA	2200.00	$2,200	
	SWALE	200	LF	8.50	$1,700	
	SAWCUT & REPAIR EXIST STREET	50	LF	10.00	$500	
	REPAIR EXIST INLET	1	LS	1500.00	$1,500	
	SUBTOTAL:				$7,900	
ALT 23.3						
	DEMO EXIST ROAD INLET	1	LS	1500.00	$1,500	
	INSTALL CROSS-GUTTER IN EXIST ROAD	1	EA	2200.00	$2,200	
	OVERSIDE DRAIN	1	EA	650.00	$650	
	SWALE	200	LF	8.50	$1,700	
	SUBTOTAL:				$6,050	

CATEGORY: 6
AREA: 25
ALTERNATIVE: 25.1b-25.4b

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PRELIMINARY CONSTRUCTION COST ESTIMATE

CAT.	ITEM	QUANT	UNIT	COST/UNIT	COST	DESCRIPTION
ALT 25.1b						Scarify and remove sediments & debris on regular interval
	BASIN MAINTENANCE	1	LS	2500.00	$2,500	
ALT 25.1c						
	GRADE EXIST UNDEVELOPED LOTS	25	LOT	450.00	$11,250	
ALT 25.3b						
	DIVERSION CHANNEL	3,000	LF	30.00	$90,000	Installed in densely vegetated hillside
ALT 25.3c						
	DIVERSION CHANNEL	7,250	LF	30.00	$217,500	Installed in densely vegetated hillside
	CLEAR, GRUB & GRADE	3	AC	1500.00	$4,500	
	SUBTOTAL:				$222,000	
ALT 25.4b						
	MAINTENANCE		LS			Clean exist inlets and area surrounding inlets

ENGINEERING DEVELOPMENT ASSOCIATES, INC.
1320 Nipomo Street
SAN LUIS OBISPO, CALIFORNIA 93401
(805) 549-8658 FAX 549-8704

JOB: Los Osos Valley Road
SHEET NO. ____ OF ____
CALCULATED BY: EDM DATE: 4/16/97
CHECKED BY: ____ DATE: ____
SCALE: ____

COUNTY STANDARDS REQUIRE DETENTION BASIN VOLUME BE BASED ON 50 YR EVENT, 10 HOUR DURATION, 10 HOUR INTENSITY. FOR PURPOSES OF SIZING, THE FOLLOWING ESTIMATED DESIGN IS FOR A 2 YR EVENT

ESTIMATED Q:

$Q_2 = CiA$
$= (0.25)(0.175)(295 ac)$
$= 13$ CFS

ESTIMATED VOLUME:

13 CFS × 3600 s × 10 hr = 468,000 CF

ASSUME 8' MAX DEPTH PER CO STD TO ESTIMATE SURFACE AREA:

$\frac{468,000 \text{ CF}}{8'} = 58500$ SF

AREA = 58500 SF (240' × 240')

SEE ATTACHED EXHIBIT

COST:

- DOUBLE EARTHWORK TO CATCH SLOPE
  (468,000 CF × 2)(43560) × 16000 $/AF = $343,800
- DIVERSION SWALES $127,500
  Σ = $471,300

+ 35% = $635,000

TOTAL COST EXCLUDING EIR OR EIS REPORT
$635,000

PRODUCT 204-1 (Single Sheets) 205-1 (Padded) NEBS Inc. Groton, Mass. 01471 To Order PHONE TOLL FREE 1-800-225-6380

Area 4 Solution: Road Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE	3	1	3	3	1	3	2	16	N	SEE APPENDIX E3	1.7
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.8/2.1
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	3	1	3	3	17	N	SEE APPENDIX E3	1.9
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP	2	2	3	1	2	3	2	15	N	SEE APPENDIX E3	1.4
DIVERSION-STORM DRAIN									N		1.2
DRAIN TO NEW SEWER SYSTEM									N	SEE APPENDIX E3	1.3/2.2
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN	3	2	3	3	1	2	2	16	N	SEE APPENDIX E3	1.6
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	SEE APPENDIX E3	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY	2	2	3	2	1	2	3	15	N	NAS-Would not solve problem	
ROAD CLOSURE	3	3	1	3	1	3	3	17	N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	3	3	2	2	3	3	18	Y		1.1
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY	2	3	1	2	3	2	3	16	Y		1.5/2.3
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 5 Solution: Road Siltation	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE									N	NAS-Safety, cost, not a solution	
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL	2	3	2	3	3	3	3	19	Y		1.2
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM	3	3	3	3	3	3	3	21	Y		1.1
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN									N	NAS-No positive drainage	
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 6 Solution: Cross lot drainage	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE									N	NAS-Safety, cost, not a solution	
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	SEE APPENDIX E3	
CURB AND GUTTER	2	2	3	2	2	2	3	16	Y		2.1
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N		1.2
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM	3	1	3	2	2	3	2	16	N	SEE APPENDIX E3	1.4/2.4
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN	3	2	2	1	2	2	2	14	N	SEE APPENDIX E3	1.3
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	SEE APPENDIX E3	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER	3	2	3	1	2	2	2	15	Y	Upgrade existing pump station	1.1
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	1	3	2	2	3	2	15	Y		1.5
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY	2	3	1	3	3	2	3	17	Y		2.2
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER	3	1	3	3	2	3	2	17	N	SEE APPENDIX E3	1.6/2.3
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 7 Solution: Cross lot drainage	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE									N	NAS-Safety, cost, not a solution	
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	2	2	2	3	16	Y		2.1
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM	3	1	3	2	2	3	2	16	N	SEE APPENDIX E3	1.4/2.4
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN	3	2	2	2	2	2	2	15	N	SEE APPENDIX E3	1.3
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	SEE APPENDIX E3	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER	2	2	3	2	2	3	2		N	Install permanent pumps	1.1/1.2
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN									N		1.5
STORM DRAIN-ACROSS PRIVATE PROPERTY	2	1	3	2	2	3	2	15	Y	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY	2	3	1	3	3	2	3	17	N	SEE APPENDIX E3	2.2
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER	3	1	3	3	2	3	2	17	N	SEE APPENDIX E3	1.6/2.3
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 8 Solution: Cross lot drainage	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-disruption	
BASIN-SUBSURFACE									N	NAS-disruption	
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.2
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY	2	2	1	3	3	2	3	16	N	SEE APPENDIX E3	1.5
CURB AND GUTTER	2	2	3	2	2	2	3	16	Y		1.7
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	SEE APPENDIX E3	
DRAIN TO NEW SEWER SYSTEM	3	1	3	2	2	3	2	16	N	SEE APPENDIX E3	1.6
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	SEE APPENDIX E3	
LINEAR PARK	3	2	1	2	3	2	3	16	N	SEE APPENDIX E3	1.3
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT	2	2	3	2	2	3	2	16	Y		1.4
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	SEE APPENDIX E3	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	2	2	2	3	2	15	Y		1.1
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 9 Solution: Cross lot drainage	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE	2	2	3	2	2	3	2	16	Y		1.3
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.2
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	2	2	2	3	16	N	SEE APPENDIX E3	1.5
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N		1.7
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM	3	1	3	2	2	3	2	16	N	SEE APPENDIX E3	1.6
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	SEE APPENDIX E3	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	1	3	2	2	3	2	15	Y		1.1
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY	2	3	1	3	3	2	3	17	Y		1.4
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 10 Solution: Road Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE	3	1	3	3	1	3	2	16	N	SEE APPENDIX E3	1.2
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.1
CHANNEL (CONCRETE)									N	NAS-Safety, cost, not a solution	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	3	1	3	3	17	N	SEE APPENDIX E3	1.3
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM	3	2	3	2	2	2	2	16	N	SEE APPENDIX E3	1.4
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN									N	NAS-No positive drainage	
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 11 Solution: Road Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE	3	1	3	3	1	3	2	16	N	SEE APPENDIX E3	1.2
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.1
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	3	1	3	3	17	N	SEE APPENDIX E3	1.3
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM	3	2	3	2	2	2	2	16	N	SEE APPENDIX E3	1.4
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN									N	NAS-No positive drainage	
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 12: No Reported Problems	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE									N	NAS-Safety, cost, not a solution	
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN									N	NAS-No positive drainage	
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 13 Solution: Road Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	N	SEE APPENDIX E3	1.2
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	3	1	3	3	17	Y		1.1
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Required for new curb & gutter	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	3	3	2	2	3	3	18	Y		1.3
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY	2	3	2	2	3	2	3	17	Y		1.4
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 14 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	3	2	2	2	15	Y		3.1
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	3	2	2	3	17	Y		1.6/3.4
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM	2	2	3	1	3	3	2	16	N	SEE APPENDIX E3	1.4/2.1
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN	3	2	3	2	3	2	3	18	N	SEE APPENDIX E3	1.2
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY	2	2	2	2	2	3	2	15	Y		1.5
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	SEE APPENDIX E3	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS	2	1	1	3	1	3	2	13	N	SEE APPENDIX E3	1.3
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	2	2	3	2	2	15	N	SEE APPENDIX E3	1.1/3.2
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE	2	3	2	2	3	2	3	17	N	SEE APPENDIX E3	3.3
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 15 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE									N	NAS-Safety, cost, not a solution	
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	3	2	2	3	17	Y		2.1
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM	2	2	3	1	3	3	2	16	N	SEE APPENDIX E3	2.4
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN	3	2	3	2	3	2	3	18	N	SEE APPENDIX E3	1.2
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	2	2	2	3	2	15	N	SEE APPENDIX E3	1.1/2.2
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE	2	3	2	2	3	2	3	17	Y		1.3/2.3
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 16 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	3	2	2	2	2	15	Y		2.3/3.2/4.2/5.1
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	3	2	2	3	17	Y		3.1
DIVERSION-BERM	2	3	2	2	3	2	3	17	Y		2.4
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	SEE APPENDIX E3	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN	3	2	3	2	3	2	3	18	N	SEE APPENDIX E3	6.3
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT	3	2	2	2	2	3	2	16	Y		2.2
LINEAR PARK									N	SEE APPENDIX E3	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER	2	2	2	2	2	3	2	15	N	SEE APPENDIX E3	1.1/1.2
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY	2	2	3	3	2	2	3	17	N	SEE APPENDIX E3	5.2/6.1
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	3	2	2	3	2	2	16	N	SEE APPENDIX E3	.1/3.3/4.1
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY	2	3	2	2	3	2	3	17	Y		2.5/6.2
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 17 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-percolation	
BASIN-SUBSURFACE	3	2	3	2	2	3	2	17	N	SEE APPENDIX E3	1.4
BASIN-TERMINAL/RECHARGE	2	2	3	2	2	2	2	15	Y		1.3/2.1
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	SEE APPENDIX E3	
CURB AND GUTTER	2	2	3	3	2	2	3	17	Y		1.1
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	SEE APPENDIX E3	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN	2	2	3	2	2	2	2	15	N	SEE APPENDIX E3	1.6
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	2	2	3	2	2	15	Y		1.2
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY	2	2	2	3	2	2	2	15	Y		2.2
VEGETATED SWALE	2	3	2	2	3	2	3	17	Y		1.5
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 18 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.1
CHANNEL (CONCRETE)	2	2	2	3	2	2	2	15	Y		1.3
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER	2	2	3	2	2	2	3	16	N	SEE APPENDIX E3	1.5
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP	2	2	2	2	2	3	3	16	Y		1.4
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	SEE APPENDIX E3	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	3	3	2	2	3	17	Y		1.2
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 19 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.1
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	3	3	2	2	3	17	Y		1.2
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 20 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.2
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY	2	2	3	2	2	2	2	15	Y		1.3
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	3	3	2	2	3	17	Y		1.1
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 21 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.2
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY	2	2	3	2	2	2	2	15	Y		1.3
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	3	3	2	2	3	17	Y		1.1
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 22 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION	2	2	2	2	2	2	3	15	Y	enlarge existing	1.2
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	2	2	2	3	15	Y		1.1
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	3	3	2	2	3	17	Y		1.1/1.4
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 23 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	3	3	2	2	3	17	N	SEE APPENDIX E3	1.2/2.2
CHANNEL (CONCRETE)	2	2	2	2	2	2	3	15	Y		2.3
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY	2	2	3	3	2	2	3	17	Y		1.1
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	2	2	2	2	3	15	Y		2.1
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 24 Solution: Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE									N	NAS-Safety, cost, not a solution	
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM	3	3	3	3	3	3	3	21	Y		1.1
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN									N	NAS-No positive drainage	
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 25 Solution-Madera Basin	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	3	2	2	2	15	Y		1.2/2.2/3.1/4.1/5.2
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM	3	3	3	3	3	3	3	21	Y		1.1
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS	2	2	3	3	3	3	3	19	Y	regrade lots	2.1
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	3	2	3	3	2	3	3	19	Y		1.3/5.1
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 26: Existing Basin Maintenance	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE									N	NAS-Safety, cost, not a solution	
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY									N	NAS-maintain surface runoff in roadway	
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM									N	NAS-No positive grade	
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	NAS-Depth to groundwater	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM	3	3	3	3	3	3	3	21	Y		1.1
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS									N	NAS-Cost	
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN									N	NAS-No positive drainage	
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Area 27 Solution-Flooding	Aesthetics	Cost	Disruption	Environmental & Regulatory	Flexibility	Land Area	Technical Aspects	POINTS	PROCEED W/ EVALUATION	Comments	Items
BASIN-DETENTION									N	NAS-depth to gw	
BASIN-SUBSURFACE									N	NAS-depth to gw	
BASIN-TERMINAL/RECHARGE	2	2	2	3	2	2	2	15	N	SEE APPENDIX E3	2.4/3.1
CHANNEL (CONCRETE)									N	NAS-Safety	
CHANNEL-ACROSS PRIVATE PROPERTY	2	3	3	2	3	2	3	18	Y		1.1/1.3/2.1/2.2/2.5/3.4
CURB AND GUTTER									N	NAS-Would not solve problem	
DIVERSION-BERM	2	2	2	2	3	2	3	16	N	SEE APPENDIX E3	1.2/3.2
DIVERSION-PUMP									N	NAS-Cost	
DIVERSION-STORM DRAIN									N	NAS-Against natural grade	
DRAIN TO NEW SEWER SYSTEM									N	NAS-Legal issues	
EROSION CONTROL									N	NAS-Would not solve problem	
FRENCH DRAIN									N	SEE APPENDIX E3	
FRENCH DRAIN WITH UTILITY									N	NAS-quantity of water	
FRENCH DRAIN-DIVERSION									N	NAS-quantity of water	
FRENCH DRAIN-OVER FAULT									N	NAS-distance	
LINEAR PARK									N	NAS-Landarea & cost	
MAINTENANCE PROGRAM									N	NAS-Would not solve problem	
POROUS PAVEMENT									N	NAS-Cost & lifespan	
PUMP TO AGRICULTURE									N	NAS-Cost	
PUMP TO ALTERNATE AQUIFER									N	NAS_Cost	
PUMP TO BAY									N	NAS-Cost	
PUMP TO CREEK									N	NAS-Cost	
PUMP TO FAULT									N	NAS-Cost	
PUMP-OTHER									N	NAS-Cost	
PURCHASE PROPERTY									N	NAS-Cost	
RAISE FOUNDATIONS	2	1	3	3	1	3	2	15	N	SEE APPENDIX E3	2.3/3.3
RECONSTRUCT ROADWAY									N	NAS-Would not solve problem	
ROAD CLOSURE									N	NAS-Would not solve problem	
STORM DRAIN W/ PIPE JACKING									N	NAS-Cost	
STORM DRAIN	2	2	2	2	3	2	2	15	Y		1.4
STORM DRAIN-ACROSS PRIVATE PROPERTY									N	NAS-Cost & tech aspects	
STORM DRAIN-CONCURRENT W/ SEWER									N	NAS-Proximity to new sewer	
STORM DRAIN-OVER FAULT									N	NAS-No positive drainage	
SWALE- ACROSS PRIVATE PROPERTY									N	NAS-Safety, would not solve problem	
VEGETATED SWALE									N	NAS-Would not solve problem	
PRODUCTION LOWER TO UPPER AQUIFER									N	NAS-Regulatory requirements	
WETLAND CONSTRUCTION									N	NAS-Location and cost	
EVALUATION CUTOFF: 14											
LEGEND: Y-YES, N-NO, NAS-Not a Solution, (refer to Appendix E1 for more definitions)											

Appendix E3
SECONDARY SCREENING OF ALTERNATIVES

REFINEMENT OF PRELIMINARY SCREENING ALTERNATIVE PROJECTS

Initially, the alternative projects presented in Appendix E2 were derived using the screening process, as described therein. These screening criteria, which included: *Aesthetics; Cost; Disruption; Environmental & Regulatory; Flexibility; Land Area*; and *Technical Aspects*, were applied to each drainage areas proposed project, and took into consideration the physical characteristics and limitations (surface and subsurface conditions).

In general, most alternatives presented in Section III were further analyzed in this paper. However, certain alternatives were omitted for the reasons outline below and by applying the same screening criteria:

Area 1 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Channel/Swale across Private Property	*Technical Aspects:* All alternatives were used as discussed in Section III. Lot flooding was an assumed problem and not a documented problem. Existing cross lot drainage is contained, no additional improvements required.
Curb & Gutter	*Technical Aspects:* Low lying area, curb & gutter will not be beneficial
Diversion Berm	*Technical Aspects:* Low lying area, no secondary outlet for diversion berm

Area 2 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Concrete Channel	Revised to overside drain, included in this report.
Erosion Control	*Disruption*: Would require erosion control adjacent to roadway, disrupting traffic and off street parking
Storm Drain to Bay	*Cost*: Surface improvements would be sufficient to provide drainage.

Area 3 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Erosion Control	*Disruption*: Would require erosion control adjacent to roadway, disrupting traffic and off street parking

Area 4 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Curb & Gutter	*Cost*: Surface improvements would be sufficient to provide drainage.
Diversion Pump	*Cost/Maintenance:* Surface (channel) or subsurface (storm drain) improvements would provide a better and less expensive long term solution.
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
French Drain	*Technical Aspects*: Surface water problem. Long term maintenance and failure.
Purchase Property	*Cost*: Would require purchase of approximately eight developed lots.
Subsurface Basin	*Cost*: Approximately $250 per linear foot and the required storage exceeds the derived benefit

Area 6 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Channel/Swale Across Private Property	*Technical Aspects:* Quantity of expected flow may exceed available land area to construct surface conveyance system. Safety issue having major conveyance system running above ground and between homes.
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
French Drain	*Technical Aspects*: Requires a long term solution. French drains subject to maintenance and limited life.
Pump to Agriculture	*Cost*: Long distance to agriculture would require expensive pump stations and support infrastructure. Water quality problems may limit agricultural crop usage.
Use Upper Aquifer	*Environmental & Regulatory*: May not be suitable for human contact or for landscaping vegetation.

Area 7 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
French Drain	*Technical Aspects*: Requires a long term solution. French drains subject to maintenance and limited life.
Pumping (Diversion to Agriculture, over fault)	*Cost*: Long distance to agriculture would require expensive pump stations and support infrastructure. Water quality problems may limit agricultural crop usage.
Swale Across Private Property	*Disruption:* Alternative surface improvements would be sufficient to provide drainage.
Use Upper Aquifer	*Environmental & Regulatory*: May not be suitable for human contact or for landscaping vegetation.

Area 8 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Basins	*Land Area*: Limited open space available to construct basin.
Channel/Swale Across Private Property	*Technical Aspects:* Quantity of expected flow may exceed available land area to construct surface conveyance system. Safety issue having major conveyance system running above ground and between homes.
Diversion Storm Drain	*Technical Aspects:* Low lying area, no secondary outlet for diversion storm drain that would adequately remove water from depressed areas.
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
French Drain over Fault	*Technical Aspects:* Topography. Surface water problem. Long term maintenance and failure.
Linear Park	*Technical Aspects & Land Area*: Limited open space available to utilize, would require summer irrigation, severe slopes, road closure or engineered culverts.
Purchase Property	*Cost*: Would require purchase of approximately twelve developed lots.

Area 9 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Curb & Gutter	*Cost*: Other surface improvements would be sufficient to provide drainage at less cost.
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
Pump Across Fault	*Cost*: Long distance to discharge would require expensive pump stations and support infrastructure. Other alternatives provide better cost/benefit ratios.

Area 10 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Curb & Gutter	*Cost*: Other surface improvements would be sufficient to provide drainage at less cost.
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
Subsurface Basin	*Cost*: Approximately $250 per linear foot and the required storage exceeds the derived benefit

Area 11 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Curb & Gutter	*Cost*: Other surface improvements would be sufficient to provide drainage at less cost.
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
Subsurface Basin	*Cost*: Approximately $250 per linear foot and the required storage exceeds the derived benefit

Area 13 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Basin	*Cost*: Not necessary since originally designed facilities need repair.

Area 14 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
French Drain	*Technical Aspects*: Bay influence groundwater will not drain.
Pump	*Technical Aspects*: Pumping of Bay influenced groundwater would require a well field of full time pump stations, and may induce saltwater intrusion.
Raise Foundations	*Cost*: Should be on a case by case basis and paid for by landowner.
Storm Drain (Diversion)	*Technical Aspects*: Bay influence, shallow depth to groundwater and flat slopes would cause construction and operational problems.
Swale	*Technical Aspects*: Bay influence, shallow depth to groundwater and flat slopes would cause operational problems.

Area 15 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
French Drain	*Technical Aspects*: Bay influence groundwater will not drain.
Storm Drain (Diversion)	*Technical Aspects*: Bay influence, shallow depth to groundwater and flat slopes would cause construction and operational problems.

Area 16 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution.
French Drain	*Technical Aspects*: Bay influence groundwater will not drain.
Linear Park	*Technical Aspects & Land Area*: Limited open space available to utilize, would require summer irrigation, road closure or engineered culverts.
Pump Station	*Cost*: Existing pump station should be adequate provided that drainage from Los Osos Valley Road in captured and rerouted.
Reconstruct Roadway	*Technical Aspects:* Would create damming affect along Ramona Drive which may compound flooding problems.
Storm Drain (Diversion)	*Technical Aspects*: Bay influence, shallow depth to groundwater and flat slopes may cause construction and operational problems.

Area 17 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Channel/Swale Across Private Property	*Technical Aspects:* Curb & Gutter or roadside swales would better contain surface runoff from leaving streets.
Drain to Sewer	*Environmental & Regulatory*: Not a long term solution. Large quantity of surface flows would be introduced.
French Drain	*Technical Aspects*: Requires a long term solution. French drains subject to maintenance and limited life.
Subsurface Basin	*Cost*: Approximately $250 per linear foot and the required storage exceeds the derived benefit

Area 18 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Curb & Gutter	*Cost*: Other surface improvements would be sufficient to provide drainage at less cost.
Pump (Diversion)	*Cost*: Long distance to agriculture would require expensive pump stations and support infrastructure. Water quality problems may limit agricultural crop usage.

Area 19 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
	All alternatives were used as discussed in Section III. Lot flooding was an assumed problem and not a documented problem

Area 20 Alternatives Not Further Considered in Section IV. *Incorporated with Area 17B. All alternatives were used.*

Area 21 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
	All alternatives were used as discussed in Section III. Lot flooding was an assumed problem and not a documented problem

Area 22 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
	All alternatives were used as discussed in Section III. Lot flooding was an assumed problem and not a documented problem

Area 23 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Basin	*Cost*: Other minor modifications should significantly offset costs associated with basin construction

Area 25 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Basin	*Cost*: Enlargement of exist basins may not be necessary.
Linear Park	*Technical Aspects:* Existing storm drain facility adequate. Incorporation of linear park would require purchase of existing developed lot and provisions for safe outlet across Skyline Drive.
Purchase Property	*Cost:* Existing problems not considered significant enough to condemn existing properties.

Area 27 Alternatives Not Further Considered in Section IV.

Project	Reason for Removal
Basin	*Technical Aspects*: Shallow depth to groundwater.
Diversion Berm	*Technical Aspects:* Diversion to Los Osos Creek may require excessive land and would significantly impact existing properties.
French Drain	*Technical Aspects*: Requires a long term solution. French drains subject to maintenance and limited life.
Raise Foundations	*Cost*: Should be on a case by case basis and paid for by landowner.

Appendix E4

Recommended Alternatives Projects

This calculation sheet provides a screening of the Alternative Projects as presented in Section IV of the Draft Report. The results (shown as capitalized and highlighted) are the Recommended Alternative Projects as presented in Section V of the Draft Report.

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL		POSSIBLE PERMITS: SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 1: Santa Ysabel, Pasadena to 600 Block																				
1.2	1.2	No Project	-	- -	-	- -	-	-		Y										
1.2	1.2	Earth Swale	3	3	3	1	2	12		Y	Y		Y		Y				B	$2.5
1.3	**1.3**	**ROAD CLOSURE**	**2**	**3**	**3**	**2**	**3**	**13**		**Y**	**Y**				**Y**		**Y**		**B**	**$57.3**
1.4	1.4	Culvert	2	3	3	1	2	11		Y	Y	Y	Y	Y	Y	Y	Y		B	$8.2
Area 2: Santa Lucia																				
2.1	2.1	No Project	-	-	-	-	-	-												
2.2	**2.2**	**MAINTENANCE**	**3**	**3**	**3**	**1**	**2**	**12**												
2.3	2.3	Curb & Gutter	2	3	3	1	3	12		Y	Y	Y	Y	Y	Y	Y	Y		B	$44.1
2.4	2.4	Swale	2	3	2	1	3	11		Y	Y	Y	Y	Y	Y	Y	Y		B	$56.0

Y=Possible Requirement

Preferred projects in Bold

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL		POSSIBLE PERMITS: [redacted]	SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 3: Santa Ysabel 700 Block to 1200 Block																					
3.1	3.1	No Project	-	-	-	-	-	-													
3.2	3.2	Curb & Gutter	2	3	3	2	2	12			Y										$145.3
3.3	3.3	Roadside Swale	2	3	2	1	2	10			Y									B	$222.9
3.4a	3.4a	Storm Drain	1	2	3	1	3	10			Y	Y	Y	Y	Y	Y	Y	Y		B	$30.8
3.4b	3.4b	Storm Drain to Swale	1	2	2	1	2	8			Y	Y	Y	Y	Y	Y	Y	Y		B	$250.8
3.5	**3.5**	**MAINTENANCE**	**3**	**3**	**3**	**2**	**1**	**12**													
Area 4: Santa Ysabel, 1300 Block to 1600 Block																					
4.1	4.1	No Project	-	-	-	-	-	-													
4.2	**4.2**	**DIVERSION SWALE**	**3**	**3**	**3**	**2**	**2**	**13**			**Y**	**Y**		**Y**		**Y**	**Y**	**Y**		**B**	**$26.1**
4.3	**4.3**	**STORM DRAIN**	**2**	**2**	**3**	**1**	**3**	**11**			**Y**	**Y**		**Y**		**Y**	**Y**	**Y**		**B**	**$97.7**
4.4	4.4	Diversion Storm Drain	2	3	3	1	3	12			Y									D	$125.9
4.5	4.5	Alternative Combination	-	-	-	-	-	-			Y										
Area 6: El Moro Depression																					
6.1	6.1	No Project	-	-	-	-	-	-													
6.2	6.2	Pump to Bay	2	1	3	1	2	9		Y	Y	Y	Y	Y	Y	Y	Y	Y		B	$116.0
6.3	6.3	Pump to Los Osos Creek	1	2	3	1	2	9		Y	Y	Y	Y	Y	Y	Y	Y	Y		C	$170.0
6.4	6.4	Pump to Bay-Expanded	2	1	3	1	2	9		Y	Y	Y	Y	Y	Y	Y	Y	Y		B	$236.0
6.5	6.5	Pump to Los Osos Creek-Expanded	1	2	3	1	2	9		Y	Y	Y	Y	Y	Y	Y	Y	Y		C	$236.0
6.6a	**6.6a**	**EL MORO STORM DRAIN**	**3**	**2**	**2**	**1**	**3**	**11**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$385.5**
		SANTA MARIA STORM DRAIN	**2**	**2**	**2**	**1**	**3**	**10**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$220.4**
6.6b	**6.6b**	**EL MORO STORM DRAIN**	**3**	**2**	**2**	**1**	**3**	**11**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$419.1**
		SANTA MARIA STORM DRAIN	**2**	**2**	**2**	**1**	**3**	**10**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$281.9**
6.6c	6.6c	El Moro Storm Drain	-	-	-	-	-	-			Y	Y	Y	Y	Y	Y	Y	Y		B	

Y=Possible Requirement

Preferred projects in **Bold**

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL		POSSIBLE PERMITS:	SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 7: Paso Robles Depression																					
7.1	7.1	No Project	-	-	-	-	-	-													
7.2	7.2	Pump to Los Osos Creek	2	2	3	1	2	10		Y	Y	Y	Y	Y	Y	Y	Y	Y		C	$183.4
7.3	7.3	Pump to Los Osos Creek-Expanded	2	2	3	1	2	10		Y	Y	Y	Y	Y	Y	Y	Y	Y		C	$282.4
7.4	**7.4**	**PASO ROBLES BASIN**	**2**	**2**	**2**	**3**	**3**	**12**			**Y**									**D**	**$284.2**
Area 8: Ramona/Pismo Depression																					
8.1	8.1	No Project	-	-	-	-	-	-													
8.2	8.2	Pump to Bay	2	1	3	1	2	9		Y	Y		Y	Y	Y	Y	Y	Y		B	$126.3
8.3	8.3	Pump to Los Osos Creek	1	2	3	1	2	9		Y	Y	Y	Y	Y	Y	Y	Y	Y		C	$99.7
8.4	8.4	Pump to Bay-Expanded	2	1	3	1	2	9		Y	Y		Y	Y	Y	Y	Y	Y		B	$246.3
8.5	8.5	Pump to Los Osos Creek-Expanded	1	2	3	1	2	9		Y	Y	Y	Y	Y	Y	Y	Y	Y		C	$253.5
8.6	**8.6**	**RAMONA STORM DRAIN**	**2**	**2**	**2**	**1**	**3**	**10**			**Y**	**Y**		**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$232.3**
8.7	**8.7**	**CHANNEL**	**3**	**3**	**3**	**2**	**3**	**14**			**Y**										**$88.1**
8.8	**8.8**	**CURB & GUTTER**	**3**	**3**	**3**	**2**	**3**	**14**			**Y**										**$86.0**
Area 9: 14th to 17th Street Depression between Pismo & Ramona																					
9.1	9.1	No Project	-	-	-	-	-	-													
9.2	**9.2**	**STORM DRAIN**	**2**	**2**	**3**	**2**	**2**	**11**			**Y**										**$33.4**
9.3	9.3	Cross Lot Drainage	2	3	2	2	1	10			Y										$57.3
9.4	9.4	Porous Pavement	2	3	3	3	2	13			Y										$45.8

Y=Possible Requirement

Preferred projects in **Bold**

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL		POSSIBLE PERMITS:	SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 10: San Luis Avenue, 1300 Block to South Bay Boulevard																					
10.1	10.1	No Project	-	-	-	-	-	-													
10.2	**10.2**	**15th STREET BASIN**	**2**	**3**	**2**	**3**	**3**	**13**			**Y**									**D**	**$189.2**
10.3	**10.3**	**SAN LUIS AVENUE BASIN**	**2**	**3**	**2**	**3**	**3**	**13**			**Y**									**D**	**$390.8**
10.4	**10.4**	**SAN LUIS SWALE**	**3**	**3**	**3**	**1**	**2**	**12**			**Y**										**$13.0**
Area 11: Ramona, 1600 Block to South Bay Boulevard																					
11.1	11.1	No Project	-	-	-	-	-	-													
11.2a	11.2a	Retention Basin	2	2	2	3	3	12			Y									D	$87.7
11.2b	11.2b	Retention Basin	2	2	2	3	3	12			Y									D	$23.8
11.3	**11.3**	**SWALE**	**3**	**3**	**3**	**1**	**2**	**12**			**Y**										**$12.0**
Area 13: Monarch/Sea Pines																					
13.1	13.1	No Project	-	-	-	-	-	-													
13.2	**13.2**	**SWALE/TERMINAL TRENCH**	**3**	**3**	**3**	**3**	**3**	**15**			**Y**										**$18.9**
13.3	13.3	Curb & Gutter	2	3	3	2	3	13			Y										$90.5

Y=Possible Requirement

Preferred projects in **Bold**

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL			POSSIBLE PERMITS: SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 14: Cuesta by the Sea, West																					
Binscarth Drive																					
14.1a	14A.1	No Project	-	- -	-	- -	-	-													
14.1b	**14A.2**	**CURB & GUTTER**	**2**	**2**	**3**	**1**	**2**	**10**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$179.8**
14.1c	**14A.3**	**STORM DRAIN**	**3**	**3**	**3**	**1**	**2**	**12**			**Y**										**$5.0**
Pine Avenue																					
14.2a	14B.1	No Project	-	-	-	-	-	-													
14.2b	**14B.2**	**CURB & GUTTER**	**2**	**3**	**3**	**2**	**2**	**12**			**Y**										**$21.8**
14.2c	14B.3	Swale	3	3	2	2	2	12			Y										$6.0
14.2d	14B4	Storm Drain	2	3	3	2	3	13			Y										$14.6
Area 15: Cuesta by the Sea, East																					
15.1	15.1	No Project	-	-	-	-	-	-													
15.2	**15.2**	**CURB & GUTTER-BINSCARTH**	**2**	**2**	**3**	**1**	**2**	**10**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$79.0**
15.3	**15.3**	**CURB & GUTTER-FEARN**	**2**	**2**	**3**	**1**	**2**	**10**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$12.3**

Y=Possible Requirement

Preferred projects in Bold

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL		POSSIBLE PERMITS: EIR	SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 16: Broderson, Skyline & Pine (see Area 25)																					
Sedimentation on Highland Drive																					
16.1a	16.A1	NO PROJECT	-	-	-	-	-	-													
16.1b	16.A2	Basin, Spill to Street	1	1	1	3	2	8		Y*	Y			Y			Y			D	$650.3
16.1c	16.A3	Basin, Spill to Storm Drain	1	1	1	3	2	8		Y*	Y			Y			Y			D	$824.7
16.1d	16.A4	Rock Berm	3	2	3	1	1	10			Y										$140.5
16.1e	16.A5	Intercept Channel	2	2	2	2	2	10			Y	Y	Y	Y	Y	Y	Y	Y		B	$219.4
																					* EIR/EIS due to endangered species
Los Osos Valley Road																					
16.2a	16.B1	No Project	-	-	-	-	-	-													
16.2b	**16.B2**	**STORM DRAIN TO FERRELL BASIN**	**1**	**2**	**2**	**3**	**3**	**11**			**Y**									**D**	**$881.0**
		Basin per 17.2a)																			**$304.0**
16.2c	16.B3	Storm Drain to Morro Shores	1	2	2	3	3	11			Y									D	$625.3
Minor Local Problems																					
16.3	**16.C1**	**CURB & GUTTER-BINSCARTH**	**2**	**3**	**3**	**1**	**2**	**11**			**Y**	**Y**		**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$160.1**
16.4a	**16.C2**	**CURB & GUTTER-PINE**	**2**	**3**	**3**	**1**	**2**	**11**			**Y**	**Y**		**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$166.1**
16.4b	16.C3	Storm Drain-Pine Street	2	1	3	1	3	10			Y	Y		Y	Y	Y	Y	Y		B	$331.0
16.5	**16.C4**	**CROSS GUTTER-RAMONA**	**3**	**2**	**3**	**1**	**4**	**13**			**Y**	**Y**		**Y**	**Y**	**Y**	**Y**	**Y**		**B**	**$6.5**
Area 17: Los Osos Valley Road																					
17.1	17.1	No Project	-	-	-	-	-	-													
17.2a	**17.2a**	**FERRELL RECHARGE BASIN**	**2**	**2**	**1**	**3**	**2**	**10**			**Y**									**D**	**$304.0**
17.2b	**17.2b**	**SANTA YNEZ STORM DRAIN**	**3**	**3**	**2**	**3**	**2**	**13**			**Y**									**D**	**$175.2**
17.3a	**17.3a**	**SAN LUIS STORM DRAIN**	**2**	**3**	**3**	**2**	**2**	**12**			**Y**									**D**	**$152.5**
17.3b	17.3b	Ferrell/Nipomo Storm Drain	1	3	3	2	2	11			Y	Y		Y	Y	Y	Y	Y		B	$392.6
17.4	17.4	Curb & Gutter	2	3	3	1	2	11			Y										$46.2

Y=Possible Requirement

Preferred projects in Bold

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL			POSSIBLE PERMITS: SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 18: Nipomo, 1200 Block to Mountain View																					
18.1	18.1	No Project	-	-	-	-	-	-													
18.2	**18.2**	**STORM DRAIN**	**1**	**2**	**3**	**2**	**2**	**10**			**Y**									**D**	**$392.6**
18.3	18.3	Retention Basin	2	2	2	3	2	11			Y									D	$94.1
Area 19: Santa Ynez at Mountain View																					
19.1	19.1	No Project	-	-	-	-	-	-													
19.2	19.2	Retention Basin	2	2	1	3	3	11			Y						Y*			D	$22.4
19.3	19.3	Storm Drain	2	2	3	2	2	11			Y										$9.7
19.4	**19.4**	**SWALE**	**3**	**3**	**2**	**3**	**2**	**13**			**Y**										**$8.1**
																					*Possible endangered snail habitat
Area 21: Vons Basin																					
21.1	**21.1**	**NO PROJECT**	-	-	-	-	-	-													
21.2	21.2	Retention Basin	2	2	1	3	3	11			Y									D	$44.6
21.3	21.3	Storm Drain	1	3	3	2	3	12			Y										$392.6
Area 22: Fairchild Basin																					
22.1	22.1	No Project	-	-	-	-	-	-													$44.6
22.2	**22.2**	**RETENTION BASIN**	**2**	**2**	**1**	**3**	**3**	**11**			**Y**										**$392.6**
22.3	22.3	Storm Drain	1	3	3	2	3	12			Y										

Y=Possible Requirement

Preferred projects in Bold

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL		POSSIBLE PERMITS:	SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 23: South Bay Boulevard & Los Osos Valley Road to Los Osos Creek																					
23.1	23.1	No Project	-	-	-	-	-	-													
23.2	23.2	Storm Drain	2	2	2	1	2	9			Y	Y	Y				Y	Y		C	$7.9
23.3	**23.3**	**CROSS GUTTER**	**3**	**2**	**3**	**1**	**2**	**11**			**Y**	**Y**	**Y**				**Y**	**Y**		**C**	**$6.1**
Area 25: Cabrillo Estates																					
Cabrillo Estates																					
25.1a	25.A1	No Project	-	-	-	-	-	-													
25.1b	**25.A2**	**MAINTENANCE**	**3**	**3**	**3**	**3**	**2**	**14**													**$2.5**
25.1c	25.A3	Grading	2	3	3	2	2	12			Y										$11.3
Vista de Oro																					
25.2a	**25.B1**	**NO PROJECT**	-	-	-	-	-	-													
Redfield Woods (see Area 16)																					
25.3a	**25.C1**	**NO PROJECT**	-	-	-	-	-	-													
25.3b	25.C2	Rock Berm	3	2	3	1	1	10			Y										$90.0
25.3c	25.C3	Intercept Channel	2	2	2	2	2	10			Y										$222.0
Los Osos Valley Road at Pecho Valley Road																					
25.4a	25.D1	No Project	-	-	-	-	-	-													
25.4b	**25.D2**	**MAINTENANCE**	**3**	**3**	**3**	**1**	**1**	**11**													

Y=Possible Requirement

Preferred projects in Bold

ITEM (WP No. 2)	ITEM (Draft Report)	DESCRIPTION	SCREENING CRITERIA: COST	ENVIRONMENTAL & REGULATORY	LAND AREA	WATER CONSERVATION	FLOOD RISK	TOTAL		POSSIBLE PERMITS:	SLO CO	RWQCB	DFG	DHS	DPR	CCC (Appeal Zone)	USFWS	ACOE		DISCHARGE POINT	COST (In thousands)
Area 27: Los Osos Valley Road at Cimmaron																					
27.1	27.1	No Project	-	-	-	-	-	-													
27.2	27.2	Maintenance	3	3	3	1	1	11													$7.6
27.3	27.3	Swale	3	3	3	2	2	13												C	$25.0
27.4	27.4	STORM DRAIN	2	2	3	2	3	12												C	

Y=Possible Requirement

Preferred projects in **Bold**

APPENDIX F

BENEFIT ANALYSIS

F1: Discussion
F2: Understand Proposition 218

Appendix F1
DISCUSSION

1. COMMUNITY BENEFIT METHOD

- The Community Benefit area would consist of all 5127 properties within the geographically defined Community Service Area 9J. Each of the property owners within CSA 9J would equally contribute to drainage improvements throughout the Service Area.
- Precedence has been set to pursue this methodology with the introduction of the existing $16 per year drainage fee. This may be overturned in court with the passage of Proposition 218.
- Benefits derived from the improvements within the Community may be considered unequally shared. Those residences at or near the improvement would receive a larger portion of the benefit by experiencing reduced flooding. The further away from the improvement the less perceived benefit. However, the entire community would benefit from reduced roadway flooding and exposure to pathogens from failed septic systems.

II. AREA BENEFIT METHOD

- The Area Benefit would consist of only those properties within a physically defined watershed (Areas 1 through 27) that contribute storm water runoff to the problem areas. Properties within the defined surface drainage areas in which the improvements are proposed would pay their fair share cost of constructing the improvements.
- If the drainage area also experiences flooding associated with high groundwater, the defined subsurface drainage region in which the improvements are proposed will also contribute to the fair share cost of constructing the improvements within the area.
- Costs would be equally distributed to each property owner within the surface and/or subsurface area.
- Benefits derived from the improvements within the area may be considered unequally shared. Those residences at or near the improvement would receive a larger portion of the benefit by experiencing reduced flooding. However, the entire community would benefit from reduced roadway flooding and exposure to pathogens from failed septic systems with no contributed cost of the improvement.

ALTERNATIVE METHODS

As an alternative to equal project cost distribution as presented above, costs could be distributed based on the following methodologies. These methodologies would apply to both the *Community Benefit Method* and the *Area Benefit Method*.

A. VOLUME OF FLOOD

- Estimate the flood surface elevation and area of inundation for the 100 year storm event.
- Estimate the total volume of water which drains to the problem areas
- Determine the drainage areas which drain to the problem area
- Calculate the fair share cost of each area equal to:
  1. Overall improvement cost multiplied by the (volume generated per area/total volume of water);
  2. Areas outside of the flood prone area do not contribute financially to the improvements; or,
  3. Other areas pay proportional share based on need by the community as a whole. A mechanism to establish the weight of a community area will need to be determined.

B. DISTANCE FROM PROBLEM

- Determine a problem area and the area in which the problem occurs
- Calculate the fair share cost for the improvement costs within the problem area based on:
  1. Areas outside of the area in which the problem occurs do not contribute financially to the improvements; or,
  2. Areas further away from the flooding area pay a progressively smaller percentage of the cost to construct the improvements within the area. The mechanism for determining the percentage could be inversely proportional to the distance from the problem.

C. AREA WEIGHTING

- Determine the problem areas - i.e., an area which experiences significant flooding.
- Determine the impact of the flooding area on the ability of the community to access homes, commercial area and recreational areas.
- Rank the areas in terms of how much benefit they derive from a particular area within the community
- Rank the flood prone areas in terms of the impact on the community.
- Determine the fair share cost of each area based on the percentage of impact the area has on the flood prone area - could be based on traffic generation rates into the area, volumes of flood water generated by the area, distance from the flood area
- Multiply the fair share cost of the improvements by the weighted rank of the flood area
- Areas which do not generate a benefit from the flood prone area or are below the ranking threshold of the flood area do not contribute to the cost of improvement within the flood prone area.
- Areas outside of the problem drainage area do not contribute financially in the cost to construct the improvements.

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Understanding Proposition 218

Elizabeth G. Hill, Legislative Analyst • December 1996

This report was prepared by Marianne O'Malley under the supervision of Mac Taylor.

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UNDERSTANDING PROPOSITION 218

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Legislative Analyst's Office

APPENDIX II

Text of Proposition 218

This initiative measure adds Articles XIII C and D to the California Constitution

RIGHT TO VOTE ON TAXES ACT

SECTION 1. TITLE. This act shall be known and may be cited as the "Right to Vote on Taxes Act."

SECTION 2. FINDINGS AND DECLARATIONS. The people of the State of California hereby find and declare that Proposition 13 was intended to provide effective tax relief and to require voter approval of tax increases. However, local governments have subjected taxpayers to excessive tax, assessment, fee and charge increases that not only frustrate the purposes of voter approval for tax increases, but also threaten the economic security of all Californians and the California economy itself. This measure protects taxpayers by limiting the methods by which local governments exact revenue from taxpayers without their consent.

SECTION 3. VOTER APPROVAL FOR LOCAL TAX LEVIES. Article XIII C is added to the California Constitution to read:

ARTICLE XIII C

SECTION 1. Definitions. As used in this article:

(a) "General tax" means any tax imposed for general governmental purposes.

(b) "Local government" means any county, city, city and county, including a charter city or county, any special district, or any other local or regional governmental entity.

(c) "Special district" means an agency of the state, formed pursuant to general law or a special act, for the local performance of governmental or proprietary functions with limited geographic boundaries including, but not limited to, school districts and redevelopment agencies.

(d) "Special tax" means any tax imposed for specific purposes, including a tax imposed for specific purposes, which is placed into a general fund.

SEC. 2. Local Government Tax Limitation. Notwithstanding any other provision of this Constitution:

(a) All taxes imposed by any local government shall be deemed to be either general taxes or special taxes. Special purpose districts or agencies, including school districts, shall have no power to levy general taxes.

(b) No local government may impose, extend, or increase any general tax unless and until that tax is submitted to the electorate and approved by a majority vote. A general tax shall not be deemed to have been increased if it is imposed at a rate not higher than the maximum rate so approved. The election required by this subdivision shall be consolidated with a regularly scheduled general election for members of the governing body of the local government, except in cases of emergency declared by a unanimous vote of the governing body.

(c) Any general tax imposed, extended, or increased, without voter approval, by any local government on or after January 1, 1995, and prior to the effective date of this article, shall continue to be imposed only if approved by a majority vote of the voters voting in an election on the issue of the imposition, which election shall be held within two years of the effective date of this article and in compliance with subdivision (b).

(d) No local government may impose, extend, or increase any special tax unless and until that tax is submitted to the electorate and approved by a two-thirds vote. A special tax shall not be deemed to have been increased if it is imposed at a rate not higher than the maximum rate so approved.

SEC. 3. Initiative Power for Local Taxes, Assessments, Fees and Charges. Notwithstanding any other provision of this Constitution, including, but not limited to, Sections 8 and 9 of Article II, the initiative power shall not be prohibited or otherwise limited in matters of reducing or repealing any local tax, assessment, fee or charge. The power of initiative to affect local taxes, assessments, fees and charges shall be applicable to all local governments and neither the Legislature

nor any local government charter shall impose a signature requirement higher than that applicable to statewide statutory initiatives.

SECTION 4. ASSESSMENT AND PROPERTY RELATED FEE REFORM

Article XIII D is added to the California Constitution to read:

ARTICLE XIII D

SECTION 1. Application. Notwithstanding any other provision of law, the provisions of this article shall apply to all assessments, fees and charges, whether imposed pursuant to state statute or local government charter authority. Nothing in this article or Article XIII C shall be construed to:

(a) Provide any new authority to any agency to impose a tax, assessment, fee, or charge.

(b) Affect existing laws relating to the imposition of fees or charges as a condition of property development.

(c) Affect existing laws relating to the imposition of timber yield taxes.

SEC. 2. Definitions. As used in this article:

(a) "Agency" means any local government as defined in subdivision (b) of Section 1 of Article XIII C.

(b) "Assessment" means any levy or charge upon real property by an agency for a special benefit conferred upon the real property. "Assessment" includes, but is not limited to, "special assessment," "benefit assessment," "maintenance assessment" and "special assessment tax."

(c) "Capital cost" means the cost of acquisition, installation, construction, reconstruction, or replacement of a permanent public improvement by an agency.

(d) "District" means an area determined by an agency to contain all parcels which will receive a special benefit from a proposed public improvement or property-related service.

(e) "Fee" or "charge" means any levy other than an ad valorem tax, a special tax, or an assessment, imposed by an agency upon a parcel or upon a person as an incident of property ownership, including a user fee or charge for a property related service.

(f) "Maintenance and operation expenses" means the cost of rent, repair, replacement, rehabilitation, fuel, power, electrical current, care, and supervision necessary to properly operate and maintain a permanent public improvement.

(g) "Property ownership" shall be deemed to include tenancies of real property where tenants are directly liable to pay the assessment, fee, or charge in question.

(h) "Property-related service" means a public service having a direct relationship to property ownership.

(i) "Special benefit" means a particular and distinct benefit over and above general benefits conferred on real property located in the district or to the public at large. General enhancement of property value does not constitute "special benefit."

SEC. 3. Property Taxes, Assessments, Fees and Charges Limited. (a) No tax, assessment, fee, or charge shall be assessed by any agency upon any parcel of property or upon any person as an incident of property ownership except:

(1) The ad valorem property tax imposed pursuant to Article XIII and Article XIII A.

(2) Any special tax receiving a two-thirds vote pursuant to Section 4 of Article XIII A.

(3) Assessments as provided by this article.

(4) Fees or charges for property related services as provided by this article.

(b) For purposes of this article, fees for the provision of electrical or gas service shall not be deemed charges or fees imposed as an incident of property ownership.

SEC. 4. Procedures and Requirements for All Assessments. (a) An agency which proposes to levy an assessment shall identify all parcels which will have a special benefit conferred upon them and upon which an assessment will be imposed. The proportionate special benefit derived by each identified parcel shall be determined in relationship to the entirety of the capital cost of a public improvement, the maintenance and operation expenses of a public improvement, or the cost of the property related service being provided. No assessment shall be imposed on any parcel which exceeds the reasonable cost of the proportional special benefit conferred on that parcel. Only special benefits are assessable,

and an agency shall separate the general benefits from the special benefits conferred on a parcel. Parcels within a district that are owned or used by any agency, the State of California or the United States shall not be exempt from assessment unless the agency can demonstrate by clear and convincing evidence that those publicly owned parcels in fact receive no special benefit.

(b) All assessments shall be supported by a detailed engineer's report prepared by a registered professional engineer certified by the State of California.

(c) The amount of the proposed assessment for each identified parcel shall be calculated and the record owner of each parcel shall be given written notice by mail of the proposed assessment, the total amount thereof chargeable to the entire district, the amount chargeable to the owner's particular parcel, the duration of the payments, the reason for the assessment and the basis upon which the amount of the proposed assessment was calculated, together with the date, time, and location of a public hearing on the proposed assessment. Each notice shall also include, in a conspicuous place thereon, a summary of the procedures applicable to the completion, return, and tabulation of the ballots required pursuant to subdivision (d), including a disclosure statement that the existence of a majority protest, as defined in subdivision (e), will result in the assessment not being imposed.

(d) Each notice mailed to owners of identified parcels within the district pursuant to subdivision (c) shall contain a ballot which includes the agency's address for receipt of the ballot once completed by any owner receiving the notice whereby the owner may indicate his or her name, reasonable identification of the parcel, and his or her support or opposition to the proposed assessment.

(e) The agency shall conduct a public hearing upon the proposed assessment not less than 45 days after mailing the notice of the proposed assessment to record owners of each identified parcel. At the public hearing, the agency shall consider all protests against the proposed assessment and tabulate the ballots. The agency shall not impose an assessment if there is a majority protest. A majority protest exists if, upon the conclusion of the hearing, ballots submitted in opposition to the assessment exceed the ballots submitted in favor of the assessment. In tabulating the ballots, the ballots shall be weighted according to the proportional financial obligation of the affected property.

(f) In any legal action contesting the validity of any assessment, the burden shall be on the agency to demonstrate that the property or properties in question receive a special benefit over and above the benefits conferred on the public at large and that the amount of any contested assessment is proportional to, and no greater than, the benefits conferred on the property or properties in question.

(g) Because only special benefits are assessable, electors residing within the district who do not own property within the district shall not be deemed under this Constitution to have been deprived of the right to vote for any assessment. If a court determines that the Constitution of the United States or other federal law requires otherwise, the assessment shall not be imposed unless approved by a two-thirds vote of the electorate in the district in addition to being approved by the property owners as required by subdivision (e).

SEC. 5. Effective Date. Pursuant to subdivision (a) of Section 10 of Article II, the provisions of this article shall become effective the day after the election unless otherwise provided. Beginning July 1, 1997, all existing, new, or increased assessments shall comply with this article. Notwithstanding the foregoing, the following assessments existing on the effective date of this article shall be exempt from the procedures and approval process set forth in Section 4:

(a) Any assessment imposed exclusively to finance the capital costs or maintenance and operation expenses for sidewalks, streets, sewers, water, flood control, drainage systems or vector control. Subsequent increases in such assessments shall be subject to the procedures and approval process set forth in Section 4.

(b) Any assessment imposed pursuant to a petition signed by the persons owning all of the parcels subject to the assessment at the time the assessment is initially imposed. Subsequent increases in such assessments shall be subject to the procedures and approval process set forth in Section 4.

(c) Any assessment the proceeds of which are exclusively used to repay bonded indebtedness of which the failure to pay would violate the Contract Impairment Clause of the Constitution of the United States.

(d) Any assessment which previously received majority voter approval from the voters voting in an election on the issue of the assessment. Subsequent

increases in those assessments shall be subject to the procedures and approval process set forth in Section 4.

SEC. 6. Property Related Fees and Charges. (a) Procedures for New or Increased Fees and Charges. An agency shall follow the procedures pursuant to this section in imposing or increasing any fee or charge as defined pursuant to this article, including, but not limited to, the following:

(1) The parcels upon which a fee or charge is proposed for imposition shall be identified. The amount of the fee or charge proposed to be imposed upon each parcel shall be calculated. The agency shall provide written notice by mail of the proposed fee or charge to the record owner of each identified parcel upon which the fee or charge is proposed for imposition, the amount of the fee or charge proposed to be imposed upon each, the basis upon which the amount of the proposed fee or charge was calculated, the reason for the fee or charge, together with the date, time, and location of a public hearing on the proposed fee or charge.

(2) The agency shall conduct a public hearing upon the proposed fee or charge not less than 45 days after mailing the notice of the proposed fee or charge to the record owners of each identified parcel upon which the fee or charge is proposed for imposition. At the public hearing, the agency shall consider all protests against the proposed fee or charge. If written protests against the proposed fee or charge are presented by a majority of owners of the identified parcels, the agency shall not impose the fee or charge.

(b) Requirements for Existing, New or Increased Fees and Charges. A fee or charge shall not be extended, imposed, or increased by any agency unless it meets all of the following requirements:

(1) Revenues derived from the fee or charge shall not exceed the funds required to provide the property related service.

(2) Revenues derived from the fee or charge shall not be used for any purpose other than that for which the fee or charge was imposed.

(3) The amount of a fee or charge imposed upon any parcel or person as an incident of property ownership shall not exceed the proportional cost of the service attributable to the parcel.

(4) No fee or charge may be imposed for a service unless that service is actually used by, or immediately available to, the owner of the property in question. Fees or charges based on potential or future use of a service are not permitted. Standby charges, whether characterized as charges or assessments, shall be classified as assessments and shall not be imposed without compliance with Section 4.

(5) No fee or charge may be imposed for general governmental services including, but not limited to, police, fire, ambulance or library services, where the service is available to the public at large in substantially the same manner as it is to property owners. Reliance by an agency on any parcel map, including, but not limited to, an assessor's parcel map, may be considered a significant factor in determining whether a fee or charge is imposed as an incident of property ownership for purposes of this article. In any legal action contesting the validity of a fee or charge, the burden shall be on the agency to demonstrate compliance with this article.

(c) Voter Approval for New or Increased Fees and Charges. Except for fees or charges for sewer, water, and refuse collection services, no property related fee or charge shall be imposed or increased unless and until that fee or charge is submitted and approved by a majority vote of the property owners of the property subject to the fee or charge or, at the option of the agency, by a two-thirds vote of the electorate residing in the affected area. The election shall be conducted not less than 45 days after the public hearing. An agency may adopt procedures similar to those for increases in assessments in the conduct of elections under this subdivision.

(d) Beginning July 1, 1997, all fees or charges shall comply with this section.

SECTION 5. LIBERAL CONSTRUCTION. The provisions of this act shall be liberally construed to effectuate its purposes of limiting local government revenue and enhancing taxpayer consent.

SECTION 6. SEVERABILITY. If any provision of this act, or part thereof, is for any reason held to be invalid or unconstitutional, the remaining sections shall not be affected, but shall remain in full force and effect, and to this end the provisions of this act are severable.

APPENDIX G

SUPPORT DOCUMENTATION

G1: County of San Luis Obispo Contract
G2: Short Term Solutions

AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES FOR PRELIMINARY ENGINEERING EVALUATION, LOS OSOS / BAYWOOD PARK COMMUNITY DRAINAGE PROJECT FOR SAN LUIS OBISPO COUNTY

THIS AGREEMENT is made by and between the COUNTY OF SAN LUIS OBISPO ("COUNTY") on behalf of San Luis Obispo County Service Area No. 9J ("CSA 9J"), and Engineering Development Associates ("ENGINEER"), at San Luis Obispo, California, on May 28, 1996.

In consideration of the mutual promises contained herein, it is hereby mutually agreed as follows:

ARTICLE I. DESCRIPTION OF PROJECT

The project shall be known as the "Preliminary Engineering Evaluation, Los Osos / Baywood Park Community Drainage Project for San Luis Obispo County Service Area No. 9J", ("PROJECT").

The PROJECT will consist of the preparation of a report investigating drainage problems and solutions to eliminate flooding within CSA 9J. The report will be based upon research, meeting with community representatives and members of the public, engineering calculations and judgement, and regulatory and environmental requirements.

ARTICLE II. ENGINEER'S SERVICES

A. Performance and Control

ENGINEER agrees that all of ENGINEER'S work hereunder shall be performed to the satisfaction of COUNTY, in strict accordance with all applicable statutory provisions, and with the provisions of this AGREEMENT, as all such rules, regulations, laws and/or other applicable provisions are extant during the life of this AGREEMENT.

In the event of conflict between any of such requirements, the order of priority shall be:

1. Applicable Statutory Provisions.

2. This AGREEMENT.

B. Scope of Services

The ENGINEER will perform the services which are described in the tasks which follow:

1. Phase I: Project Initiation and Alternatives Selection

a. Task 1: Attend Initial Meetings and Gather Information

Attend an initial meeting at the County Engineering office to discuss the project and expectations regarding the project. Submit a rough outline of Working Papers(Task 3 and 9) and Report(Task 11 and 13). Submit a timeline for the completion of all Tasks in the PROJECT.

Review and tabulate flooding problems within the community, beginning with the list of flood-related damage in Los Osos during 1995 (CSA-9 Advisory Group Water/Drainage Committee) and including those set forth in Task 2.

Attend initial meeting in the Community of Los Osos to meet the Water/Drainage Subcommittee of the CSA-9 Advisory Group ("Water/Drainage Subcommittee") and gather information on community concerns and areas of interest.

Review existing County files documenting community drainage problems and those efforts made in implementing drainage solutions within the community. ENGINEER shall identify the need for any additional information or data. Review timeline and adjust if necessary.

The ENGINEER will identify, quantify and evaluate all existing storm drain facilities in CSA 9J and the tributary area of the identified problem zones including inlets, pipes, pumps, channels, basins and discharges for current hydraulic capacity.

Deliverables for Task 1:	Presentation materials, Agendas, and Minutes for Task 1 meetings
Meetings for Task 1:	Initial meeting w/County (1) Community Meeting (1)

b. Task 2: Problem Identification

The ENGINEER will identify and describe the source, cause, impact, and outlet of flooding/high ground water problems in the areas on the following list:

1) El Moro Corridor from 11th Street west to 3rd Street
2) The Ramona Avenue/Pismo Avenue swale from 11th Street west to 3rd Street
3) Paso Robles Avenue between 14th and 18th Street
4) Santa Ynez at Fairchild westerly to 11th Street
5) The Pine/Ash/Broderson area
6) Pecho Road and Grove Street
7) Los Osos Valley Road from 10th Street to the area west of Palisades Avenue
8) Los Osos Valley Road at Cimmaron and the northerly drainage
9) Other sites as identified through initial investigations and discussions with the Water/Drainage Subcommittee and the community.

The analysis of these localized flooding problems in CSA 9J may require analysis of the entire drainage basin.

All work performed for Task 2 to Task 13 will utilize one foot topographic mapping. This mapping will be provided by the COUNTY to the ENGINEER on June 3, 1996. However, the ENGINEER should be prepared if the mapping is delayed. The TIME OF PERFORMANCE will be extended one and a half days for every day of delay. No additional compensation will be provided for any delay in providing one foot contour topographic mapping.

Prepare exhibits of each area that will serve as a basis for future discussion and depiction of projects to solve the flooding problems.

Prepare a map of shallow groundwater elevations for the Spring of 1995.

Prepare a map of depth to groundwater contours.

Submit summary of problems identified with exhibits and maps to the COUNTY and address comments received.

Deliverables for Task 2: Summary of problem areas including exhibits of each area.

Map of shallow groundwater elevations for the Spring of 1995. (based upon previous studies)

Map of depth to groundwater contours.

c. Task 3: Develop Solutions

Identify and discuss solutions to each drainage problem identified including but not limited to the solutions in the following list:

Traditional Solutions
Pipes, outlets and basins.
Place drainage pipe concurrently with sewer pipe.
Place sewer immediately for use short-term for drainage.
Drain over fault line to low groundwater.
Curb and gutter, swales, and regrading.
Drainage diversion around community.

Non-Traditional Solutions
Wetlands construction.
Parks/retention basin property acquisition including homes.
Enhanced recharge and retention.
Minimize flows with low flush toilets, non-tile roofs, more pervious surfaces.
Localized pumping of groundwater into sewer system.
Creek management.
    Property owner maintained program.
    Property Acquisition.
Utility trenches as French drains.
Storm drain easements as pedestrian corridors.
Change water use from ower acquifer to upper acquifer.

There may be other solutions which may resolve problems or the ones above may not be viable. The ENGINEER is responsible for conceiving and evaluating potential solutions. Solutions must address current need and that needed to meet anticipated build out of the CSA 9J.

Meet with COUNTY and consultant for Los Osos sewer project to discuss the status of the sewer project and to coordinate sharing of information.

Establish criteria for evaluating and prioritizing solutions. This criteria should include consideration of financial affordability. Use criteria to qualitatively screen potential solutions to analyze further. Document screening process.

Prepare Working Paper No. 1, Problem Identification and Solutions Development, compiling the work completed in Tasks 1, 2, and 3.

Submit Working Paper No. 1 and discuss comments with COUNTY.

Deliverables for Task 3:	Working Paper No.1 (9 bound originals, one unbound, and on 3.5" disk in approved format), Minutes for meetings
Meetings for Task 3:	Coordinate with Sewer Project (1). Discuss comments on Working Paper No.1 with COUNTY (1).

2. Phase II : Preliminary Analysis

a. Task 4: Determine Impacts on Flooding

Analyze the solutions identified for further analysis in Task 3 to determine the impact on flooding. Each project site will be addressed independently and then with respect to a community wide solution. Determine potential solution requirements and the apparent best routing locations for projects. Prepare a list with supporting exhibits of potential solutions for each of the problem areas. Recommended solutions may be different then those determined for analysis in Phase I.

b. Task 5: Determine Groundwater and Water Quality Impacts

Evaluate each solution's impact in terms of groundwater recharge and quality, potential discharges to Morro Bay, water quality of discharges, and overall water use strategies involving domestic and agricultural water use, high ground water problems, reclamation and recharge and direct bay discharge. Consider the impact of normal, wet, and dry year climatic conditions on each solution.

Estimate the relative contributions to shallow groundwater problems from increased urban run-off from property development and septic tank discharge. Estimate the degree to which existing shallow groundwater conditions will continue to be problems with implementation of the sewer project, or contribute to problems resulting from increased urban run-off.

c. Task 6: Determine Environmental and Regulatory Impacts and Requirements

Prepare a preliminary analysis to determine the probable environmental impacts of recommended solutions and probable mitigation measures. Environmental impacts for each solution will be identified and discussed. A matrix, checklist, or table will summarize environmental information. The preliminary analysis shall include potential regulatory impacts, water quality impacts, and a review of County development policies and standards.

Identify all regulatory agencies that have authority to regulate permitting for applicable aspect of solutions including construction improvements. Determine applicable requirements of permitting agencies and local, state, and federal law including but not limited to NPDES and Best Management Practices. In addition, determine mitigation measures for potential impacts of solutions.

Determine the potential need for solutions which address first flush treatment and/or recharge permits. The analysis will include and estimation of surface runoff water quality and recharge water quality.

Review and evaluate County development policies and standards with regard to drainage conditions based on their performance in actual flood events. Provide independent evaluations and recommendations regarding said standards.

d. Task 7: Determine Other Impacts

Determine other impacts including social and political which are relevant to each project. These might include the *impact on* community character or whether the project is growth inducing.

e. Task 8: Calculate Costs

Develop preliminary cost estimates for alternatives and identify the area of direct and indirect benefit for each alternative. These estimates should include requirements for land acquisition, rights-of-way, and any probable mitigation of environmental impacts.

f. Task 9: Prepare Working Paper No. 2

Refine the screening criteria for the selection of solutions. Apply the screening criteria utilizing the information and analysis prepared in Task 1 through Task 8. Prepare and submit Working Paper No. 2, Alternatives Analysis, compiling the material completed in Task 1 through Task 9. Discuss comments on Working Paper No. 2 with COUNTY.

Deliverables for Task 9:	Working Paper No.2 (9 bound originals, one unbound, and on 3.5" disk in approved format), Minutes for meeting
Meetings for Task 9:	Discuss comments on Working Paper No.2 with COUNTY (1).

3. Phase III: Draft Report

b. Task 10: Refine Preferred Project

Develop a schedule and estimated costs for annual operation and maintenance of preferred project.

Prioritize all improvements of the preferred solution in terms of implementation schedules and costs to include: a) individual, stand alone improvements; b) phased improvements, requiring integration with other identified improvements; c) regional or sub-basin improvements, as compared to, d) a communitywide total drainage improvement project. Cost estimates shall be developed for individual improvements, combined and phased improvements, regionally and as one total communitywide project.

Benefit assessment areas shall be determined for each improvement in terms of property: a) direct benefit; b) indirect benefit and c) overall communitywide benefit. Said determination shall be limited to

property identifications by area only. Cost spread per individual parcel shall not be included.

For each improvement, the ENGINEER will identify any applicable regulations/requirements of other agencies including but not limited to: San Luis Obispo County Flood Control and Water Conservation District, California Water Code, California Environmental Quality Act, California Health Department, California Department of Fish and Game, Caltrans, CAL OSHA, US Army Corps of Engineers, US Bureau of Reclamation, US Fish and Wildlife Service, EPA, USDA, Natural Resources Conservation Service, California Coastal Commission.

c. Task 11: Prepare a Draft Report

Prepare a Draft Report, Preliminary Engineering Evaluation, of findings and conclusions to include all of the above determinations, supporting data and the preliminary environmental analysis. The Draft Report will include Working Paper No. 1, Working Paper No. 2, and discussion and presentation of work completed in Task 10 and 11.

The Draft Report will address groundwater issues and the influence of the proposed sewer collection system on groundwater level, and issues related to water quality discharge. It will also discuss the influence of surface water runoff in relation to high groundwater levels throughout the watershed. Water use strategies for agricultural runoff, reclamation, bay discharge and water quality will be addressed. Infrastructure capacities and efficiencies will be described in the report and recommendations for implementing projects to rectify current flooding problems will be given.

Submit Draft Report to the CSA 9 Advisory Group and the County Board of Supervisors. Submit Draft Report for comment by various regulatory agencies.

Deliverables for Task 11: Draft Report (9 bound originals, one unbound, and on 3.5" disk in approved format)

4. Phase IV : Final Report

a. Task 12: Meeting with COUNTY

Meet with COUNTY to discuss comments on the Draft Report and provide guidance for any changes to the Draft Report.

Deliverables for Task 12: Minutes for meeting

Meetings for Task 12: Discussion with COUNTY (1)

b. Task 13: Prepare Final Report

Assist the COUNTY in the preparation of a project description to be used as part of a public material information, and to be used to solicit a design consultant for the purpose of financing and constructing the preferred project.

Prepare Final Report, "Preliminary Engineering Evaluation of Flooding Problems in CSA 9J", including revisions based upon comments and discussion regarding the Draft Report.

Deliverables for Task 13: Final Report (9 bound originals, one unbound, and on 3.5" disk in approved format)

Meetings for Task 13: Presentation to CSA 9 Advisory Group and County Board of Supervisors(2)

D. Special Services

Tasks which may be required of ENGINEER as Special Services have not been defined as of the date of this AGREEMENT. If required by COUNTY, such special services will be defined by written Amendment(s) to this AGREEMENT.

ARTICLE III. TIME OF PERFORMANCE

A. Schedule. All work called for shall be completed by ENGINEER within one hundred twenty (120) calendar days after being notified by COUNTY, in writiing, to proceed under this AGREEMENT. The schedule may be extended pursuant to Task 2.

B. Time of Performance for any Special Services will be negotiated by the COUNTY with ENGINEER as appropriate and will be designated with any written amendment(s) to this AGREEMENT.

ARTICLE IV. TERM

The term of this AGREEMENT shall be one year from the date first above written.

ARTICLE V. COMPENSATION

The COUNTY shall pay ENGINEER in accordance with this AGREEMENT an amount not to exceed the lesser of: (a) the total costs for all time and materials expended by ENGINEER on the tasks described in the Scope of Services in accordance with the rate schedule included in Exhibit B, "Rate Schedule", or (b) the sum of fifty one thousand dollars (**$51,000.00**). No payments shall be made unless a Notice to Proceed is issued by the COUNTY to the ENGINEER for this AGREEMENT.

The COUNTY shall pay ENGINEER for any Special Services called for under ARTICLE II an amount not to exceed the lesser of: (a) the total of all time and materials expended by ENGINEER on the Special Services in accordance with the rate schedule included in Exhibit B, "Rate Schedule", or in accordance with the terms of those Special Services as described in any Amendment(s) to this AGREEMENT. No payments shall be made unless a Notice to Proceed is issued by the COUNTY to the ENGINEER for the Special Services.

No additional compensation will be provided for any delay by County in providing one foot topographic mapping to ENGINEER. Other delays in completion of ENGINEER's services beyond the schedule in ARTICLE III for completion of these tasks, which delays are beyond ENGINEER's control, may result in an increase in cost to the ENGINEER. In this event, ENGINEER may request COUNTY for additional compensation in the amounts provided for in Exhibit B, but COUNTY shall not be required to pay any such requested additional compensation if the County Engineer determines, in the sole discretion of the County Engineer, that such additional compensation is not justified or appropriate.

ARTICLE V. BILLING AND PAYMENT

A. Billing:

The ENGINEER shall submit an invoice each month for services performed in accordance with this AGREEMENT in an amount not to exceed the lesser of: (a) the cost of time and materials expended by ENGINEER, or (b) the total of the estimated percentage of work completed for each task multiplied by the amount budgeted for each task. The amount budgeted for each task is shown in Exhibit A, "Fee Schedule", and in any Amendment(s). All invoices are subject to consideration of approval by the COUNTY based upon verification of time and materials expended by ENGINEER and percent of work completed for each task.

Invoices will show for each task billed, the budgeted amount, amount previously billed, current bill, and percent complete. Each invoice shall be accompanied with a brief description of the work associated with the invoice and a status report of the project to date.

Billing for any Special Services will be in accordance with the terms of the Amendment(s) to this AGREEMENT providing for any such Special Services.

B. Payment:

Payment shall be made to ENGINEER by COUNTY within thirty (30) days after approval of invoice by COUNTY ENGINEER, provided all work thereunder has been performed to COUNTY'S satisfaction and in strict accordance with this AGREEMENT and with all its attachments. The County Engineer will determine if an invoice is approved or unacceptable within 7 days of receipt.

In the event any such payment is not paid within thirty (30) days after approval by COUNTY of the invoice, it shall commence bearing interest on the date said invoice was approved by COUNTY, at the rate of six point five percent (6.5%) per annum (or such rate as may be the maximum interest rate permissible under applicable law) and COUNTY agrees to pay all accrued interest, together with the charges for approved services rendered.

ARTICLE VI. GENERAL

A. Authority

ENGINEER is not authorized to incur any debt, obligation or liability on behalf of COUNTY or to execute any agreement, contract or other commitment on behalf of COUNTY.

B. Indemnification

ENGINEER shall defend, indemnify and save harmless COUNTY, *its officers*, agents and employees, from any and all claims, demands, damages, costs, expenses, judgments, attorney fees or any liability arising out of this AGREEMENT or attempted performance of the provisions hereof, including but not limited to those predicated upon theories of violation of statute, ordinance, or regulation, professional malpractice, negligence, or recklessness including negligent or reckless operation of motor vehicles or other equipment, furnishing of defective or dangerous products or completed operations, premises liability, inverse condemnation, violation of civil rights and also including any adverse determination made by the Internal Revenue Service or the State Franchise Tax Board with respect to ENGINEER'S "independent contractor" status that would establish a liability for failure to make social security and income tax withholding payments, or any act or omission to act, whether or not it be willful, intentional or actively or passively negligent on the part of the ENGINEER or his agents, employees or other independent Consultants directly responsible to ENGINEER; providing further that the foregoing shall apply to any wrongful acts or any active or passively negligent acts or permissions to employees or other independent contractors and COUNTY, its agents, employees or independent profession contractors involved in this PROJECT. Nothing contained in the foregoing indemnity provision shall be construed to require indemnification for claims, demands, damages, costs, expenses, judgements, attorney fees resulting solely from the negligence or willful misconduct of the COUNTY. Nothing contained in the foregoing indemnity provisions shall be construed to require ENGINEER to indemnify COUNTY, against any responsibility or liability in contravention of Section 2782 of the Civil Code.

C. Arbitration Procedures

Arbitration shall only be used under this AGREEMENT in the event both parties consent in writing thereto in regard to any specific claim, counter-claim, dispute, other matter in question between COUNTY and ENGINEER arising out of or related to this AGREEMENT, or any breach of this AGREEMENT. Should arbitration be chosen by the parties hereto for the interpretation of this AGREEMENT, the parties shall arbitrate as follows:

1. COUNTY and ENGINEER shall each select an arbitrator of its own choosing, which arbitrators shall mutually select a third arbitrator.

2. The arbitrators may select the procedure for reviewing and determining the dispute.

3. The fees of the arbitrators shall be borne equally by COUNTY and ENGINEER.

4. The parties shall be bound by the decision of the arbitrators.

D. Responsibility of COUNTY

COUNTY will:

1. Assist ENGINEER in obtaining any information previously compiled in coherent form by COUNTY or others in connection with the Project, including but not necessarily limited to: pertinent maps, plans, studies, reports, computer files, record drawings, and right-of-way and easement information, which information is available to COUNTY and which is required in connection with ENGINEER'S services under this AGREEMENT. ENGINEER is entitled to rely on the accuracy of all such information furnished by COUNTY unless such information contains errors which should be apparent to an Engineer having ENGINEER's qualifications and experience.

2. Provide distribution for all Project documents, status and/or progress reports.

3. Provide front-end documents, and general and supplementary conditions for the Project. ENGINEER shall use COUNTY provided documents and conditions, or provide ENGINEER's own documents and conditions subject to COUNTY review and approval.

4. Attend appropriate Project meetings with representatives of the Drainage Subcommittee of the CSA 9 Advisory Group.

5. Provide site access and all necessary temporary rights of entry.

6. Pay all required permit fees, internal County Department fees and those fees not specifically identified within this AGREEMENT.

7. Review all of ENGINEER's submittals and provide written comments thereon on a timely basis on one copy.

E. Insurance

ENGINEER shall procure the following required insurance coverages at its sole cost and expense and maintain in full force and effect for the period covered by this AGREEMENT such insurance. All insurance coverages are to be placed with

insurers which (1) have a Best's rating of no less than B+VIII, and (2) are admitted insurance companies in the State of California.

1. Professional Liability Insurance: ENGINEER shall maintain in full force and effect during the entire term of this AGREEMENT, professional liability "errors and omission" insurance with limits of liability of not less than $500,000.00 per occurrence to cover all services rendered by ENGINEER pursuant to this AGREEMENT. Where claims made coverage is provided, a tail of two (2) years shall be provided or current policy maintained.

2. Comprehensive General Liability: ENGINEER shall maintain in full force and effect, for the period covered by this AGREEMENT, Comprehensive General Liability insurance with the following coverages.

   a. Personal Injury and Bodily Injury, including death resulting therefrom.
   b. Property damage.
   c. Automobile coverage which shall include owned and non-owned vehicles.

   The amount of insurance shall be not less than the following: single limit coverage applying to bodily and personal injury, including death resulting therefrom, and property damage, and automobile coverage in the total amount of $1,000,000.

   The following endorsements must be provided in the policy:

   a. If the insurance policy covers on an "accident" basis, it must be changed to "occurrence."

   b. The policy must cover personal injury as well as bodily injury.

   c. Blanket contractual liability must be afforded and the policy must contain a cross liability or severability of interest endorsement.

   d. The COUNTY, its officers, employees and agents shall be named included as additional insureds under the policy. The policy shall provide that the insurance will operate as primary insurance. No other insurance effected by COUNTY, whether commercial or self-insurance will be called upon to contribute to a loss hereunder.

3. Workers' Compensation Insurance: In accordance with the provisions of Labor Code Section 3700, ENGINEER, if ENGINEER has an employees, is required to be insured against liability for Workers' Compensation or to undertake self-insurance. ENGINEER agrees to comply with such provisions before commencing the performance of the work of this AGREEMENT, and during the terms of this AGREEMENT.

4. The following requirements apply to all insurance to be provided by ENGINEER:

   a. A certificate of insurance shall be furnished to COUNTY prior to commencement of work. Upon request by the COUNTY, ENGINEER shall provide a certified copy of any insurance policy to the COUNTY within ten (10) working days.

   b. Policies shall not be canceled or reduced in coverage or changed in any other material aspect without thirty (30) days prior written notice to COUNTY.

   c. Approval of the insurance by COUNTY shall not relieve or decrease the extent to which the ENGINEER may be held responsible for payment of damages resulting from ENGINEER'S services or operations pursuant to this AGREEMENT.

The parties expressly agree that the indemnification and insurance clauses in this AGREEMENT are an integral part of the performance exchanged in this AGREEMENT. The compensation stated in this AGREEMENT includes compensation for the risks transferred to ENGINEER by the indemnification and insurance clauses.

F. Termination of AGREEMENT

This AGREEMENT may be terminated by either party upon thirty (30) days written notice to the other party. Termination shall have no effect upon the rights and obligations of the parties arising out of any transaction occurring prior to the effective date of such termination. ENGINEER shall be paid for all work satisfactorily completed prior to the effective date of said termination.

G. Assignment

ENGINEER shall not assign or transfer this AGREEMENT or any interest herein.

H. Binding

This AGREEMENT and each and every provision hereof shall be binding on the heirs, administrators, trustees, transferees, and successors of the parties hereto, provided that this paragraph shall not be construed to authorize any assignment or transfer of this AGREEMENT or any interest therein by ENGINEER.

I. Waiver

No waiver by COUNTY of any failure by ENGINEER to comply with any term or condition hereof shall be or shall be construed to be a waiver by COUNTY of any similar or other failure by ENGINEER to comply with any term or condition hereof.

J. ENGINEER is Independent Contractor

At no time shall ENGINEER be or be construed to be an employee of COUNTY. On the contrary, ENGINEER at all times under this AGREEMENT shall be and shall be construed to be an independent contractor.

K. ENGINEER'S Endorsement

ENGINEER shall sign and seal all reports, maps, plans, specifications and/or other documents prepared by ENGINEER under this AGREEMENT in accordance with applicable provisions of the Professional Engineers Act of the State of California.

L. Documents, Information and Materials Ownership

All documents, information and materials of any and every type prepared by ENGINEER pursuant to this AGREEMENT shall be the property of COUNTY. Such documents shall include but not be limited to data, drawings, specifications, reports, estimates, summaries, and such other information and materials as may have been accumulated by ENGINEER in performing under this AGREEMENT, whether completed or in process. ENGINEER shall assume no responsibility for the use by others of any such documents, information, or materials except as these are applied to PROJECT.

M. Access to Records

1. ENGINEER shall keep complete and accurate records for the services performed pursuant to this CONTRACT and any records required by law or government regulation, and shall make such records available to COUNTY at all reasonable times. ENGINEER shall retain these records for a period of two (2) years following fulfillment of all of ENGINEER'S responsibilities hereunder, of for such longer time(s) as may be required by law.

2. ENGINEER shall assure the confidentiality of any records that are required by law to be so maintained.

N. Time is of the Essence

Time is hereby made the essence of this AGREEMENT.

O. Subcontracts

1. Any subcontractors and outside associates or consultants required by ENGINEER in connection with service under this AGREEMENT will, unless a change is approved in writing by COUNTY, be limited to such individuals or firms as are specifically identified below:

The Morro Group
Philip Williams & Associates

P. Organization and Staffing for ENGINEER

The following identifies the general roles and responsibilities for key staff of the ENGINEER No changes shall be made therein without prior written approval of COUNTY.

Dan Lloyd will act as Project Manager for the ENGINEER, and will be responsible for maintaining the project schedule and production of all reports and exhibits. He will also provide analysis of regulatory agency review and permitting issues, drainage policy, and standards review, and benefit assessment analysis.

Keith Crowe will be responsible for analysis of all existing infrastructure and improvements. He will work with Don Asquith and Jeff Haltiner to develop solutions for each problem area.

Don Asquith will be specifically responsible for all issues related to groundwater, water quality, geologic conditions, groundwater recharge and appropriateness of proposed solutions. He will coordinate with Mary Reents in identifying potential environmental impacts relative to groundwater and bay discharge.

Mary Reents will have the responsibility of identifying all non-water related potential environmental impacts associated with proposed solutions for each problem area, and preparing initial studies that address environmental considerations.

Jeff Haltiner will assist in the development of solutions for drainage problems.

Q. Duty of ENGINEER

ENGINEER shall provide all labor, materials and equipment required for ENGINEER'S performance of this AGREEMENT, unless other provisions of this AGREEMENT specifically requires provision by COUNTY of any specific labor, material or equipment.

R. Designation of COUNTY'S Authorized Representative

Mr. Timothy P. Nanson, County Engineer, or other duly authorized representative as may be designated in writing by said County Engineer or by County's Board of Supervisors, is hereby designated to act as COUNTY'S authorized representative with respect to work to be performed under this AGREEMENT.

S. Notices

Notices hereunder to the parties hereto shall be sent by certified mail, return receipt requested, postage prepaid, addressed as follows:

1. To ENGINEER:

Engineering Development Associates
1320 Nipomo Street
San Luis Obispo, CA 93401

Attention: Mr. Dan Lloyd/Keith Crowe

2. To COUNTY:

County Engineering Department
County Government Center
San Luis Obispo, CA 93408

Attention Mr. George Gibson/Mr. Greg Martin

T. Entire AGREEMENT

This document, together with the attached Exhibit A, "Fee Schedule" and Exhibit B, "Rate Schedule" is the entire AGREEMENT between the parties, and supersedes any and all prior written or verbal agreements, representations and/or discussions between the parties. No changes, amendments or alterations to this AGREEMENT, or any term thereof, shall be effective unless in writing and signed by both parties hereto.

U. Venue

All performance under this AGREEMENT shall be in the State of California, and California shall be venue for any court proceedings.

IN WITNESS WHEREOF, this AGREEMENT has been executed by the parties hereto, upon the date first above written.

SAN LUIS OBISPO COUNTY

By: _____
Chairman of the Board of Supervisors
of the County of San Luis Obispo

ATTEST:

JULIE L. RODEWALD

County Clerk and Ex-officio Clerk
of the Board of Supervisors of
the County of San Luis Obispo

By: _____
DEPUTY CLERK

_____

By: _____
Dan Lloyd
Project Manager

APPROVED AS TO FORM AND LEGAL EFFECT:

JAMES B. LINDHOLM, JR.
County Counsel

By: _____
Deputy County Counsel

Dated: 17 MAY 96

"Exhibit A"

Fee Schedule

Phase	Task	Fee
Phase I:	1	$7,200
	2	$5,600
	3.	$7,495
Phase II:	4	$3,300
	5	$2,900
	6	$4,700
	7	$675
	8	$2,500
	9	$3,355
Phase III:	10	$4,600
	11	$5,000
Phase IV	12	$1,175
	13	$2,500
Total:		$51,000

"Exhibit B"

Rate Schedule

Name, Title	Rate/hour
Dan Lloyd, Project Manager	$95
Keith Crowe, Principal Engineer	$85
Glenn Marshall, Staff Engineer	$60
Jeffrey Haltiner, Water Resource Specialist	$125
Don Asquith, Hydrogeologist	$90
Mary Reents, Planner	$85

Appendix G2
SHORT TERM SOLUTIONS

The following tables summarize short term solutions initially presented in Working Paper Number 1 as temporary measures prior to the construction of permanent drainage infrastructure. Each table is specific to the individual drainage areas as presented in the draft report.

Area 1: Short Term Solutions

Item	Problem	Solution	Description
1.1	Pasadena Road	Temporary Road Closure	Continue temporary road closure during storm events.
1.2	Lot Flooding	Sandbagging	

Area 2: Short Term Solutions

Item	Problem	Solution	Description
2.1	3rd Street Sedimentation	Maintenance	Clean sand/silt deposition as required.

Area 3: Short Term Solutions

Item	Problem	Solution	Description
3.1	Lot Flooding	Sandbagging	
3.2	Sedimentation	Maintenance	Clean sand/silt as required.
		Erosion Control	Haybales or silt fences at identified sources of erosion.

Area 4: Short Term Solutions

Item	Problem	Solution	Description
4.1	14th Ponding	Sandbag & pump	Sandbag water to retain and use portable pump to pump water easterly towards Area 5 (eventual discharge to basin) or discharge to bay.
4.2	Cross lot drainage	Sand Bagging	

Area 5: Short Term Solutions

Item	Problem	Solution	Description
5.1	Sedimentation	Maintenance	Clean sand/silt as required.
		Erosion Control	Haybales or silt fences at identified sources of erosion.

Area 6: Short Term Solutions

Item	Problem	Solution	Description
6.1	Road Flooding	Continued pumping	
		Road Closure	
6.2	Residential Flooding	Sand Bagging	
6.3	Septic Tank Failure	Provide Portable Bathroom	Install portable bathrooms for residents have septic tank failure. Would not alleviate problems associated with cooking and cleaning.

Area 7: Short Term Solutions

Item	Problem	Solution	Description
7.1	Road Flooding	Continued pumping	
		Road Closure	
7.2	Residential Flooding	Sand Bagging	
7.3	Septic Tank Failure	Provide Portable Bathroom	Install portable bathrooms for residents have septic tank failure. Would not alleviate problems associated with cooking and cleaning.

Area 8: Short Term Solutions

Item	Problem	Solution	Description
8.1	Road Flooding	Road Closure	
8.2	Ramona Lake	Road Closure	
8.3	Residential Flooding	Sand Bagging	

Area 9: Short Term Solutions

None required.

Area 10: Short Term Solutions

Item	Problem	Solution	Description
10.1	Road Flooding	Road Closure	

Area 11: Short Term Solutions

Item	Problem	Solution	Description
11.1	Road Flooding	Road Closure	

Area 12: Short Term Solutions

None required.

Area 13: Short Term Solutions

Item	Problem	Solution	Description
13.1	Road Flooding	Road Closure	
13.2	Residential Flooding	Sand Bagging	

Area 14: Short Term Solutions

Item	Problem	Solution	Description
14.1	Road Flooding	Road Closure	
		Pump	Place portable pumps with discharge to bay
14.2	Residential Flooding	Sand Bagging	
14.3	Septic Tank Failure	Provide Portable Bathroom	Install portable bathrooms for residents having septic tank failure. Would not alleviate problems associated with cooking and cleaning.

Area 15: Short Term Solutions

Item	Problem	Solution	Description
15.1	Road Flooding	Road Closure	
15.2	Residential Flooding	Sand Bagging	

Area 16: Short Term Solutions

Item	Problem	Solution	Description
16.1	Road Flooding	Road Closure	
		Pump	Install temporary pumps at existing culverts.
16.2	Residential Flooding	Sand Bagging	
16.3	Silt Deposition	Erosion Control	Haybales or silt fences to retain slides off of Highland Drive

Area 17: Short Term Solutions

Item	Problem	Solution	Description
17.1	Road flooding	Road Closure	
17.2	Lot Flooding	Sand Bagging	

Area 18: Short Term Solutions

Item	Problem	Solution	Description
18.1	Road Flooding	Road Closure	Restrict access to residents of the area only.

Area 19: Short Term Solutions

Item	Problem	Solution	Description
19.1	Road Flooding, Mountain View	Road Closure	Restrict access to Mountain View to residents of the area only.
		Pump	Temporary pumps to culvert 23.3

Area 20: Short Term Solutions

None required.

Area 21: Short Term Solutions

None required.

Area 22: Short Term Solutions

Item	Problem	Solution	Description
22.1	Los Olivos Flooding	Road Closure	Close Los Olivos to through traffic
		Pump	Pump to basin 22.A, 21.A or 22.B if possible or pump to Mountain View

Area 23: Short Term Solutions

Item	Problem	Solution	Description
23.1	Nipomo at Eto Cr.	Road closure	Close road during severe storm events when Eto Creek may breach roadway.
23.2	Willow at DI 23.1	Road closure	Alternate route would be Andre Avenue to Nipomo
		Pump	Pump from Willow to Eto Creek.

Area 24: Short Term Solutions

None required.

Area 25: Short Term Solutions

	Problem	Solution	Description
25.1	Madera Basin	Redirect spill	Sandbag spill to redirect away from Monarch subdivision. May not be necessary because Monarch subdivision will install curb and gutter on Pecho Valley Road.
25.2	Madera St. erosion	Sand bagging	Protect residence with sandbags.
		Silt Fences	Install silt fences or haybales to limit amount of sediment from uphill undeveloped lots on Madera and San Ricardo Lane.
25.3	Vista at Los Arboles	Silt Fences	Install silt fences or haybales to limit amount of sediment from southerly hills.
25.4	Highland at Alexander	Silt Fences	Install silt fences or haybales to limit amount of sediment from southerly hills.
25.5	Pecho Valley at LOVR	Lane closure	

Area 26: Short Term Solutions

None required.

Area 27: Short Term Solutions

Item	Problem	Solution	Description
27.1	Flooding of LOVR	Road Closure	Close LOVR
		Temporary Pumping	Pump with discharge to Los Osos Creek
27.2	Residential Flooding	Sand bagging	