

Insurance Claim of Infinite Horizons, Inc.

Avila Beach Resort Flooding
Investigations

Storms of January and March 1995

for

AIG Technical Services
3 Embarcadero Center, Suite 1720
San Francisco, CA 94111

Attn: Fred Fredericks, CPCU

by

Church Water Consultants
2938 Shasta Road
Berkeley, California 94708
(510) 848-4862

August 8, 1995

~~805-781-4469~~
~~GIBSON'S~~
~~COPY~~
~~RETURN TO~~
~~COURTY~~
~~EX-106~~

April 10, 1997

File: 77000

George Gibson, District Engineer
San Luis Obispo County Engineering Dept.
Room 207, County Government Center
San Luis Obispo, CA 93408

Re: 1995 Lower San Luis Obispo Creek Flooding

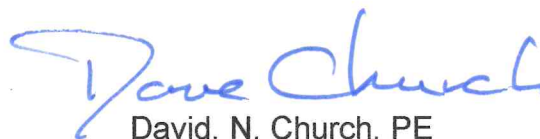
Dear Mr. ^{George}Gibson:

This is a belated thank you for your and your staff assistance two years ago when I was investigating the January and March 1995 flooding on lower San Luis Obispo Creek. Your knowledge, photos and insight were of great help.

I am finally able to send you a copy of the Church Water Consultants report: Avila Beach Resort Flooding Investigations, Storms of January and March 1995, August 8, 1995. I hope it may be of some value to the county in evaluating future floods in the area. Susan Litteral recently called me concerning the county's interest at the Ontario Bridge; she may be interested in this report.

I have appreciated working with Susan on the San Luis Obispo Creek Flood Management Plan, and look forward to your involvement as we move into Phase II and the county's part of the watershed.

Sincerely,
CHURCH WATER CONSULTANTS



David. N. Church, PE
Principal

Enclosure:

Avila Beach Resort Flooding Investigations, Storms of January and March 1995, 8/8/95

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APR 17 1997

COUNTY ENGINEERING
DEPARTMENT

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Appendices

APPENDIX A: INTERVIEWS

1. Rob Rossi, Owner, Avila Beach Resort Golf Course
2. Jake Miller, General Mgr., Avila Resort Investments
3. Dan Erdman, Civil Engineer, San Luis Obispo County Engineering Dept.
4. Russell Kiessig, President, Sycamore Mineral Springs
Steve Gregory, Vice President
5. Colleen Snyder, employee, Sycamore Mineral Springs
6. Robert Gorham, Avila Beach Fire Dept. 805-595-2009
7. Tom Kirschner, Wharfinger, Port San Luis Harbor District
8. Pat Farris, Commissioner, Port San Luis Harbor District
Janice Farris
9. Deanna Lauenroth, Resort General Mgr., San Luis Bay Inn

APPENDIX B: FEMA FLOOD INSURANCE STUDY

Flood Insurance Rate Map, Federal Emergency Management Agency,
July 18, 1985

APPENDIX C: CONTACTS

AVILA BEACH RESORT FLOOD INVESTIGATIONS

SECTION 1 - INTRODUCTION

PURPOSE

The Avila Beach Resort Flood Investigations were undertaken to describe and define the probable cause of property losses at the Avila Beach Resort Golf Course related to the storm of March 9 and 10, 1995, and the previous storms of 1995. Specifically, to provide a basis for judging whether the loss of four golf cart bridges and extensive bank erosion was caused by floods and their associated processes, high water levels, high velocity, debris, scour, fill, et cetera, or by other events not necessarily associated with flooding such as high winds, collision or diversion by man-made structures.

AUTHORIZATION

Work was undertaken by written agreement between American International Group Technical Services and Church Water Consultants signed May 1, 1995.

SECTION 2 - SITE DESCRIPTION

Avila Beach Resort is located along San Luis Obispo Creek and its tributary immediately north of the town of Avila Beach, California. It is 9 miles south of the City of San Luis Obispo, as shown on the Vicinity Map, Figure 1. San Luis Bay Harbor and the entrance to Pacific Gas & Electric's Diablo Canyon Power Plant facilities are a mile to the west. San Luis Obispo Creek drains approximately 84 square miles in a basin that rises to the 2500 foot elevation along the crest of the Santa Lucia Mountains. The Avila Beach Resort property extends from the mouth of San Luis Obispo Creek approximately 1.2 miles upstream to a tidal control weir. This reach is within the tidal influence of San Luis Bay. The adjacent flood plain contains the back nine holes of the Golf Course and four golf cart bridges (No. 10, 18, 16, 12; downstream to upstream order) numbered for the associated fairways. The front nine holes are located in Harford Canyon, a tributary that joins San Luis Obispo Creek near its mouth. Bridge 8 and the Event Bridge are on the Harford Canyon stream. Most of the resort buildings are located at the confluence of the two streams. Figures 3, 4, 5 and 8 are air photo enlargements of the site.

Holes 13 through 16 are located in an old stream meander scar in the southeast portion of the property. They are normally protected from creek flooding by a 2000 foot long levee constructed along the left (south) bank. Drainage water collecting behind the levee is

pumped to the creek near Bridge 16. Golf Course irrigation water is pumped from the creek on the left bank upstream of the weir.

Other developments immediately upstream of the Golf Course include Mallard Green Estates, San Luis Bay Tennis Club and Mr. Rossi's office building at the lower San Luis Bay Drive bridge. Two independent resorts, Sycamore Mineral Springs and Avila Resort, are located 0.3 and 0.9 of a mile respectively above the San Luis Bay Drive bridge. As all flood flows passing these resorts also passed the subject property, their experience provides a valuable insight into the flooding at Avila Beach Resort.

SECTION 3 - EVENT DESCRIPTIONS

COMPOSITE CHRONOLOGY

The following is a chronology of the three storms of 1995 that produced significant flooding in the lower San Luis Obispo Creek basin. Information was compiled from numerous sources (shown in parentheses) at various locations as indicated.

AVILA BEACH RESORT STORMS OF 1995 COMPOSITE CHRONOLOGY

January 10

- 4:00 Sycamore Mineral Springs (SMS): Water raising at rate of 1 foot/12 minutes. (Call to Steve Gregory, vice president, Sycamore Mineral Springs)
- 5:55 Sycamore Mineral Springs: Flood peak, water over road, high water mark (HWM) at bath house and Kiessig residence at elevation 26.0 feet. Survey indicated water 1.8 feet lower in West Meadow on opposite side of valley. (Russell Kiessig, president, Sycamore Mineral Springs)
- Avila Beach Resort Golf Course: High water mark 18 inches above floor of restroom near Bridge 16. (Rob Rossi, owner, ABR Golf Course)
- 7:00 Rain Gage: Cal Poly- 3.80 inches previous 24 hours, 9.21 inches previous 8 days
- 8:30 Sycamore Mineral Springs: Others observed large rafts of debris moving downstream including 1000 board-foot lifts of lumber from Ontario bridge construction. (Russell Kiessig)

9:30 Sycamore Mineral Springs: Water off road, 2-3 feet drop in 20 minutes. (Steve Gregory)

January 24/25

16:00+ Sycamore Mineral Springs: Light rain, water raising. Initial high water occurred 700 feet upstream of normal flooding point in lower meadow. Kiessig believes it was caused by debris collecting on heavily constructed orchard fence opposite his residence. Maximum depth 1 foot+/- over road. (Russell Kiessig)

7:00 Rain Gage: Cal Poly- 1.36 inch previous 24 hours, 2.97 previous 3 days

March 9

7:00 Rain Gage: Cal Poly- 0.04 inch previous 24 hours

22:43 San Luis Obispo (SLO): Dispatchers Log: Higuera St. partially flooded, barricades placed. (*Telegraph-Tribune* newspaper)

March 10

12:45 AM Sycamore Mineral Springs: Office called Colleen Snyder; told her water was 2 feet below road. (Colleen Snyder)

1:30 Sycamore Mineral Springs: Colleen Snyder arrives; Water on the road was up to her waist (3.5 feet., elev 24 feet; a 5.5 foot +/- raise in 45 minutes) on road. (Colleen Snyder)

1:45 San Luis Obispo Police Department: Received a county wide flash flood warning from the Office of Emergency Services. Two to four inches of rain expected in the next four hours. (*Telegraph-Tribune*)

4:00 +/- Sycamore Mineral Springs: **Maximum water level** (el <25) (Colleen Snyder)

4:47 High Tide of 4.1 feet MLLW

5:30/6,+ Avila Beach Resort Golf Course: (Rob Rossi)
Water to edge of Golf Course road 300 feet downstream of weir (CWC-3, Figure 4, elevation 12.8 ft.);

Weir overflow of 5 feet, but weir drop still evident;
 Water at base of oaks (Ground @Oak elev 9.6 ft., 300 feet downstream of
 CWC-3)

March 10 (cont.)

- 5:30/6,+ Water about 6 inches over edge of sand trap near Hole 12 (CWC-5,
 elev 10.8 ft.)
 Water at deck of Bridge#12 (cap beam elev 8.5 ft.), 6" higher in January storm
 Water at edge of Tee 12 (CWC-6, elev 8.7 ft.)
 Water on side of swale on left bank below Bridge #18 (CWC-2, elev 6.7 ft.),
 Water below chord of Bridge #10 (CWC-1, elev 5.2 ft.)
- 6:16 Sunrise
- 7:00 Sycamore Mineral Springs: Garage flooded 6" deep (el 25)
 (Russell Kiessig)
- Rain Gages: Cal Poly, 3.95 inches previous 24 hours
 SLO County, 2.84"/24 hrs
 2.00 inch between 20:00 and 5:00
 Diablo Canyon, 6.02"/24 hrs
 5.97 inches between 15:00 and 6:00
 Avila Terminal, 3.76"/24 hours
- Wind: San Luis Obispo Airport Tower Log: Gusts in 35 to 48 knot range
 between 7:00 and 14:00
- 7:30 Golf Course: Water across fairways both upstream and downstream of Bridge
 16. (Janis Farris, Avila Beach resident; see photos)
- 8:00 Avila Resort at Ontario Bridge (AR): Water started to recede, did not reach
 fence. (Jake Miller, manager)
- 8:30 Golf Course: Bridge 10 gone when Deanna Lauenroth (manager,
 San Luis Bay Inn) arrived.
- 9:00 Avila Beach Resort Golf Course: (Rob Rossi)
 Bridge #10 lost first (CWC right bank pile cap elev 12.5 ft.)
 Bridge #12 lost (CWC right bank pile cap elev 8.5 ft.)
 Bridge #16 piles lost (CWC right bank pile cap elev 9.6 ft.)

March 10 (cont.)

- 9:30 Golf Course: No grass visible at Holes 11, 12, 16, 17. Water level dropping. (Pat Farris, Avila Beach resident, San Luis Bay Harbor District Commissioner)
(See photos)
- Avila Resort at Ontario Bridge: Water across floodplain from abutment to abutment, elev. 24.0 ft.+/. (Dan Erdman, SLO County Engineering)
- 10/11:00 Sycamore Mineral Springs: High winds, big tree (*Telegraph-Tribune* photo) blew down, gusts estimated to 60 mph from NW, wind from south at golf course (Russell Kiessig)
- 11:00 Avila Resort: Rain started (Jake Miller)
- 12:36 Low Tide of 0.3 feet, MLLW
- 13:00 Avila Resort : Downpour
Sycamore Mineral Springs: 0.5 feet on road, could drive out (Colleen Snyder)
- 13:15 Avila Beach Road is flooding. (*Telegraph-Tribune*)
- 14:10 California Highway Patrol calls to report flooding on See Canyon and Monte Roads with trees down and cars trapped between them near Avila Beach. (*Telegraph-Tribune*)
- 14/15:00 Avila Beach Road: Water on road 1/4 mile downstream of Sycamore Mineral Springs. (Robert Gorham, Avila Bay Fire Department Log)
- 15:00 Sycamore Mineral Springs: >1.0 foot on road, no access again to Sycamore Mineral Springs: Oak blew down (Colleen Snyder)
Avila Resort : Sharp stream rise in 20 minutes. (Jake Miller)
- 15:10 Highway 101: Caltrans closed freeway north and south of SL Bay Drive interchange. (Robert Gorham)
- 15/18:00 Sycamore Mineral Springs: Wind abated (Colleen Snyder)
- 16:30 Golf Course: Water over entire lower golf Course at Bridge 10. (Dave Berger, Inn Engineer)

March 10 (cont.)

- 16:45 San Luis Obispo: George Gibson, SLO County Flood Control Engineer (Start of intense rainfall) "It was a monsoon event. And all that water fell on a watershed that was already saturated." (*Telegraph-Tribune*)
- Ken Shaw, Higuera Street, SLO: 4 to 6 foot raise in SLO Creek in 20 minutes. (*Telegraph-Tribune*)
- 17:00 Avila Beach Resort Golf Course: Bridge #18 failure observed by passing contractor, Tom McGonagill, SLO. (Rob Rossi)
- Avila Resort : Avila Resort almost totally flooded (Jake Miller)
- 17:30 San Luis Obispo: Water had (started to) subside (*Telegraph-Tribune*)
- 18:00 Diablo Canyon Power Plant Rain Gage: 8.54 inches in past 24+ hours
- 18:00+/- San Luis Bay Drive Bridges
- At Tennis Club: Flow across north bridge approach, but not to low chord of bridge
- At Monte Road west of Highway 101: Flow extended west almost to Monte intersection, more overflow than morning (Rob Rossi)
- 18/19:00 Sycamore Mineral Springs: **Maximum water level** (elev 29 ft., near top of speed limit sign). (Colleen Snyder) *E₂end*
- 19:00 Sycamore Mineral Springs: Maximum water level, receded 1 inch by 19:30. (Carol Kiessig)
- San Luis Bay Drive at club: Water to line (1.7 feet) on fire truck. (Robert Gorham)
- 19:26 High Tide of 3.2 feet, MLLW
- 20:30 Avila Beach Road: Avila Fire Dept. requested closure. (Robert Gorham)
- 21:00 Sycamore Mineral Springs: noticed water dropping (Colleen Snyder)
- 23:57 Low Tide of 2.5 feet, MLLW

March 11

- Golf Course: Levee overtops at upstream end adjacent to Avila Beach Road flooding Holes 13 through 16.
- 4:00 Sycamore Mineral Springs: Water still deep (Colleen Snyder)
- 5:00 Sycamore Mineral Springs: Down to 0.5 feet on road, could drive out (Colleen Snyder)
- 5:56 High Tide of 4.4 feet, MLLW
- 7:00 Rain Gages: Cal Poly, 4.05" previous 24 hours, 8.00" previous 2 days
SLO County (Broad and Industrial Sts). 2.79"/ 24 hrs
2.44 inches between 12:00 and 20:00
1.12 inches between 16:00 and 19:00
Avila Terminal, 3.17"/24 hrs
Diablo Canyon, 2.5"/24 hrs
- 10:30 Avila Beach Road: Road reopens (Deanna Lauenroth)

HIGH WATER MARKS

Method

On May 16, 1995, Mr. Church made a tour of the golf course with the owner, Mr. Rob Rossi, to mark the high water that Mr. Rossi observed between 5:30 and 9:00 A.M. on March 10, 1995. Stakes labeled CWC- 1 to 6 (C-1 to 6, Figure 4) were set for subsequent level survey. Mr. Rossi also pointed out high water levels reported to him at a Mallard Green residence (Resid, Figure 4) and at the Tennis Club (C-23).

Subsequently Mr. Church made a detailed reconnaissance of the area between Bridge 10 and San Luis Bay Drive, identifying and staking 20 apparent high water marks. The selected high water marks were typically flotsam deposits or soil wash lines located in protected areas away from the main channel current and wave action. The high water mark may have been left by any of the 1995 floods, but are believed to primarily represent the high water of the evening of March 10th. On May 23rd Mr. Church directed a Central Coast Engineering, Inc. survey crew during their level survey of the high water marks. The bench mark for the survey was Reference Mark 56 as described on the FEMA Flood Insurance

Rate Map (Appendix B). Several elevation marks on a topography map (2-foot contour, dated 6/13/89) of the Golf Course provided by Mr. Rossi were verified.

The results of the level survey are plotted on the High Water Mark Profile, Figure 6. The profile elevations were projected on the topography map to obtain an estimate of the extent of flood inundation for both Mr. Rossi's morning observations and the high water marks. The results of these projections are shown on the Inundation Map, Figure 5.

Areas Flooded

The extent of March 10 flood inundation was estimated based on interviews with Mr. Rob Rossi (Appendix A-1), the high water mark survey and various reports of water on Avila Beach Road. The results of investigation along San Luis Obispo Creek are shown on Figure 5. Note that portions of the levee and various other areas within the flood plain were not apparently inundated. Other areas, such as Mallard Green, are poorly interpreted due to land modifications subsequent to the 1989 topographic map.

As to Harford Canyon, photographs and comments from Meserve Engineering indicate that overbank flooding did occur adjacent to the creek.

The estimated extent of flooding in the vicinity of Bridges 18 and 16 was latter confirmed by interview (Appendix A-8) and photographs (Photo Set No. 1) of Mr. and Mrs. Pat Farris, Avila Beach residents.

Flooding also occurred on January 10 and 24, 1995. Mr. Rossi said that the Golf Course inundation depth near Bridge 16 during January 10 was greater than the March 10 event.

Damages

Damages on the Golf Course that are associated with the storm of March 10, 1995 are as follows:

- Loss of 4 golf cart bridges No. 10, 18, 16 and 12 on San Luis Obispo Creek
- Loss of the Event Bridge and adjacent culverts on Hanford Canyon near club house
- Severe bank erosion and land loses of up to 8 feet at :
 - Left (southeast) bank adjacent to levee from Bridge 12 past Bridge 16
 - Right (north) bank adjacent to Fairway 17

Left bank in vicinity of Bridge 18
Abutments of Bridge 8, Hanford Canyon

- Submergence of irrigation pump facility at Tidal Weir
- Submergence of drainage pump sump near Bridge 16

The flood of January 10, 1995, reportedly damaged the right (northwest) abutment and walkway to Bridge 12.

Relation of Morning Observations to Maximum High Water

Mr. Rossi's morning observations of March 10, as indicated on Figure 6, are approximately 3 feet below the high water mark in the vicinity of Bridges 18, 16 and 12. High flows were apparently impinging on the bridge deck support beams only at Bridge 12 when he observed them. However, the high water mark survey indicates that the high velocity channel current impinged on and submerged Bridges 18, 16 and 12 at some time during the flood. The deck of Bridge 10 remained well above (7 feet +/-) the high water throughout the flood.

METEOROLOGY

Rain Gages and Weather Radar

Rainfall records were obtained from the following gage sites:

- California Polytechnical University, San Luis Obispo
- SoCal Gas (Broad and Industrial Streets), San Luis Obispo
- Avila Terminal (Union 76), Avila Beach
- Diablo Canyon Power Plant (PG&E)
- Pismo Beach

The hourly rainfall from the SoCal Gas recording rain gage is shown of Figure 6, Precipitation & Tides, Storm of March 9-10, 1995. This gage, located in the open valley, records less rainfall than the Cal Poly, Avila Terminal and Diablo Canyon daily gages that are located at the base of major ridges. In addition, Santa Maria weather radar (NEXRAD) mapping of momentary and total storm accumulation were reviewed. The following table provides selected data from those gages.

SAN LUIS OBISPO BASIN RAINFALL

Station	January 1995		March 1995			
	10*	25*	10*	11*	Maximum	
					8 Hour	24 Hour
Cal Poly	3.80	1.36	3.95	4.05		
SoCal Gas	—	1.30	2.96	2.92	2.44	4.58
Diablo Canyon	—	3.06	6.02	2.53	3.36	8.54
Avila Terminal	2.24	1.57	3.76	3.17		
Pismo Beach	—	1.30	2.54	0.88		

* For prior 24 hours ending 7:00 AM +/- on date

Depth-Duration-Frequency Estimate

A review of long duration recorded rainfalls during the months of January and March, and the estimated annual probability of recurrence helps to put the flooding and duration of high flows in context. Both the January and March totals at the Cal Poly rain gage in San Luis Obispo exceed 16 inches. In the 111 years of record reviewed only one other year, 1963, had two months exceeding 16 inches and only two other years with one month exceeding 16 inches.

For the shorter duration 6 and 24 hour precipitation (which directly effects the peak flows in the San Luis Obispo Creek basin) the annual probability of recurrence is in the range of 10 to 20 percent—not that uncommon. The two-day total of 8.00 inches at Cal Poly has approximately a 4 percent annual probability.

Wind

High winds were experienced at Avila Beach Resort and throughout the San Luis Obispo basin during both the January 10 and March 10 storms. The San Luis Obispo Airport tower logged gusts between 35 and 48 knots (40 and 52 mph) between 7 AM and 2 PM on March

10th. Diablo Canyon reported winds in the 35 to 45 mph range from midnight through noon on the 10th with peak gusts to 60 mph after dawn.

Tides

Predicted tides at San Luis Bay Harbor (adjusted to mean sea level datum) are shown on Figure 7. The significant swell in the 12.6 to 14.6 foot range from the SSW may have increased the effective tide at the mouth of San Luis Obispo Creek. As shown, the high tides of 5 AM and 7:30 PM roughly correspond with the reported times of peak stage at Sycamore Mineral Springs. Thus, the tides may have further increased the water levels in the Golf Course.

SECTION 4 - DISCUSSION

Riverine flood events generally encompass a number of interactive and inseparable characteristics, some of which are:

- Flows exceed the bankfull capacity of the channel
- Depth of flow increases
- Floodplain is partially or fully inundated
- Velocities may materially increase
- Channels and banks may erode/scour or fill
- Sediment entrainment and transport increases
- Debris entrainment and transport increases
- Debris and sediment accumulations may redistribute the flow and velocity
- Structures may be subject to increased loads due to depth, velocity and debris
- Structures may lose support due to foundation scour
- Duration of flooding in which the above characteristics may work

It should be recognized that floods are not simply a mass movement of pure water. They may entrain any material they come in contact with, either heavy (sediment) or light (debris). Thus sediment and debris are an inseparable part of a flood event. The loss of four golf cart bridges and extensive bank erosion on San Luis Obispo Creek as well as damage to bridges and culverts on Harford Canyon is directly related to one or more of the above flood characteristics.

The principal cause of the damages attributed to the March 10th event was the high flood flows that reportedly first crested at 4 AM that morning, aggravated by the accumulative effect of earlier floods and sustained high flows through March 11. The last bridge failed

during the second and higher crest stage of the evening of March 10. Three floods occurred in a three-month period of unusually high rainfall and stream flow. Channel banks, bottoms and structures were repeatedly attacked by high depths and velocities of flow. Banks were denuded and undercut, and remained saturated without adequate time to recover and stabilize, as would occur in a single flood event year. The channel bottom was subject to scour and fill with the passage of each peak flow. Subsequent floods could more easily reexcavate the unconsolidated fill, progressively increasing the total depth of scour and decreasing the foundation support of the piles. The pile structures themselves, materially aggravated by accumulations of debris, can increase the local velocities and scour potential immediately downstream of the restriction. Photos of Bridge No. 18 (Meserve Photo Set No. 6 -87; following Figures), where the upstream pile remains, but the downstream pile has shifted, broken or washed away, show a typical result of this type of scour failure.

While significant flooding did occur on San Luis Obispo Creek below Highway 101 on January 10, 25 and March 10-11, the rainfalls contributing to the flooding were not particularly rare events. What was unusual was the long duration of rainfall that resulted in long periods of sustained high flows and velocities. This led to a major channel scour and fill event in which there was ample time to erode the banks and undermine the bridge piles and abutments. The proximate cause of the major flood damages at Avila Beach Resort Golf Course was the unusually long duration of high velocity flow punctuated by three flooding events. This set up a condition in which the last flood caused materially greater damage than the prior floods of similar or higher observed maximum water levels or peak flows.

The erosion of alluvial channel banks, particularly on the outside of curves and adjacent to the deeper portions of the channel, is a normal phenomenon during high flows. The historic channel (Farris Photo No. 1.23) made broad meanders through the valley that is now occupied by the Golf Course. Much of the valley meanders have been reportedly filled in or leveed off from the active channel. Bank losses of January and March occurred primarily where fluvial geomorphic processes would predict the reestablishment of meanders. The Airphoto of August 22, 1991, Figure 8, is informative. The photo, taken at low tide and low stream flows, shows where the shallow (light) and deep (dark) portions of the active channel were 4 years prior to the flood. The deeper areas correspond quite well with the 1995 locations of bridge pile, abutment and bank failure. The shallow bar, visible downstream of Bridge 16 in the 1991 photo, shifts the flow from the left bank to the right bank where in 1995 extensive erosion occurred along Fairway 17. It has been suggested that the failed bridge decks deflected the flow and were a major contributor to downstream bank erosion. However, if such deflection did occur, the bridge deck area could, at best, deflect only a small fraction of the channel flow area, and the effect would be transitory as the bridge washed away.

No indications were found that wind was a direct contributor to the damages observed. High winds did occur during both the January 10 and March 10 storms. There are numerous reports of trees blown down throughout the San Luis Obispo basin. However, but for the flood providing the necessary floatation and transport, no significant wind-derived debris would have arrived at the damaged Golf Course facilities. Furthermore, field reconnaissance along the upstream floodplain indicated that recently-fallen trees were a small part of the total debris and that the larger debris capable of causing direct impact damage to the bridges were typically trunks of trees that had been dead for many years. (1)

Ongoing maintenance and grading work in the Golf Course and San Luis Bay Estates area may have contributed to the flood damage. Considerable debris from the January 10 flood was reportedly stockpiled in the floodplain between the weir and the levee. This debris was washed away in the March 10 flood and would have added to the debris impinging on the 4 main channel bridges. Loose piles of fill material had reportedly been placed in the flood plain adjacent to the Tennis Club and washed out during the March flood. A marked increase in the quantity of coarse gravel deposition in the vicinity of the two upstream golf cart bridges suggests that the loose fill was a contributor to both the fine and course deposition damage to the downstream fairways and greens .

SECTION 5 - CONCLUSIONS

1. The principal cause of claimed damages associated with the storm of March 10, 1995, was the high flood flows of San Luis Obispo Creek.
2. General conditions of flooding apparently persisted from midnight March 10 through 5: AM March 11. The flood stage crested twice on March 10; at approximately 4: AM, 1-1/2 hours before Mr. Rossi drove to the golf course, and at 6 to 7: PM. Crests corresponded generally with high tide in San Luis Bay.
3. Damages related to the loss of bridge piles, abutments and stream banks were aggravated by the accumulative effect of earlier floods and sustained high flows through March 11.
4. The erosion of alluvial channel banks and beds, particularly on the outside of curves and in the deeper portions of the channel, is a normal phenomenon during high flows.
5. Upstream flooding in and of itself provided the essential flotation and transport of all debris striking and/or collecting on the bridges.

6. No indications were found that wind was a direct contributor to the damages observed.
7. Flooding also occurred on January 10 and 24, 1995, with Golf Course depths during January 10 reportedly similar to or greater than the March 10 flood.

FIGURES

Figure 1: Vicinity Map

Figure 2: Reference Map

Figure 3: San Luis Obispo Creek, Air Photo of April 19, 1995

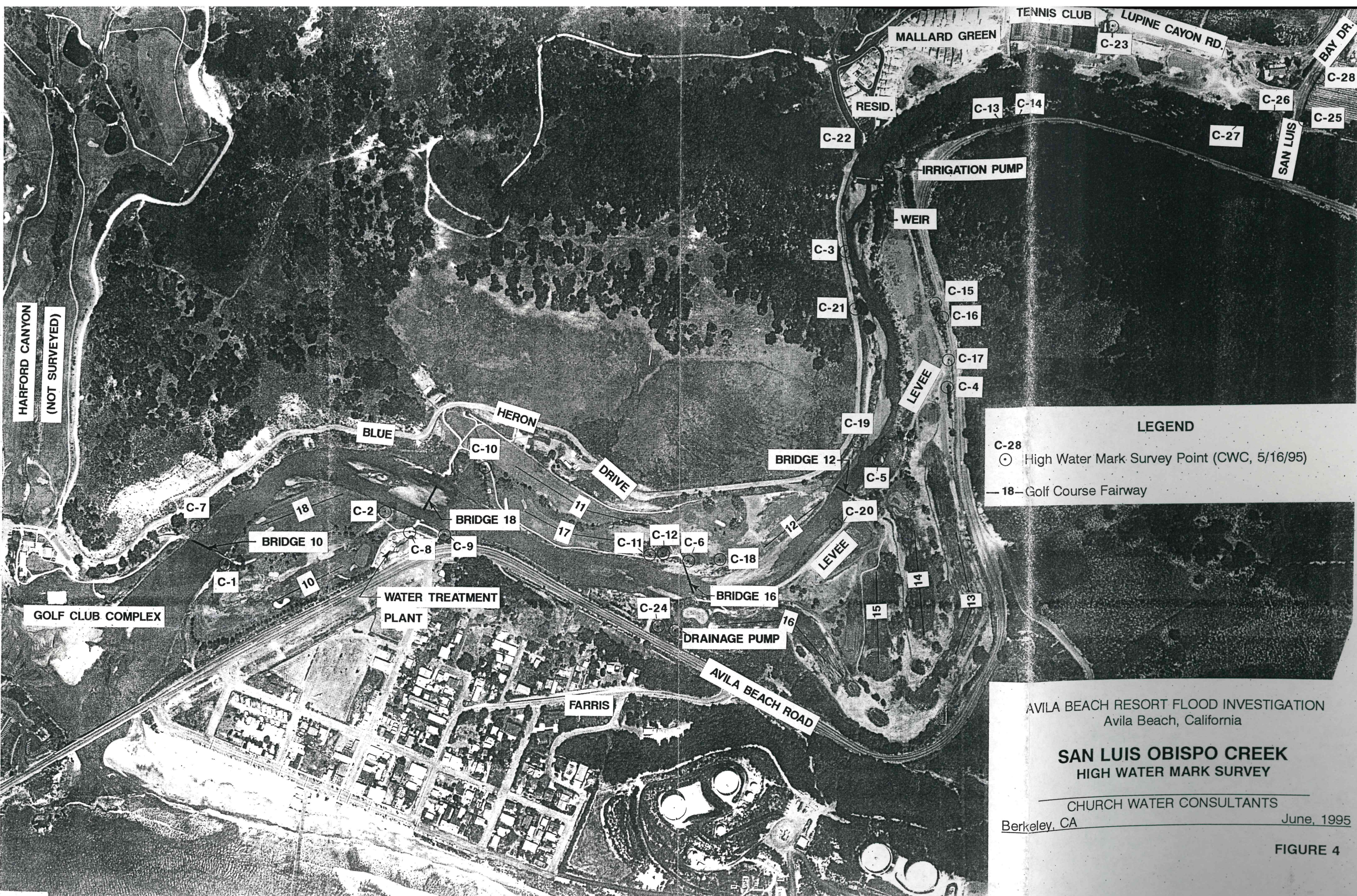
Figure 4: San Luis Obispo Creek, High Water Marks

Figure 5: San Luis Obispo Creek, Inundation Map

Figure 6: San Luis Obispo Creek, High Water Mark Profile

Figure 7: Precipitation & Tides, Storm of March 9-10, 1995

Figure 8: San Luis Obispo Creek, Air Photo of August 22, 1991



LEGEND

- C-28 High Water Mark Survey Point (CWC, 5/16/95)
- 18 — Golf Course Fairway

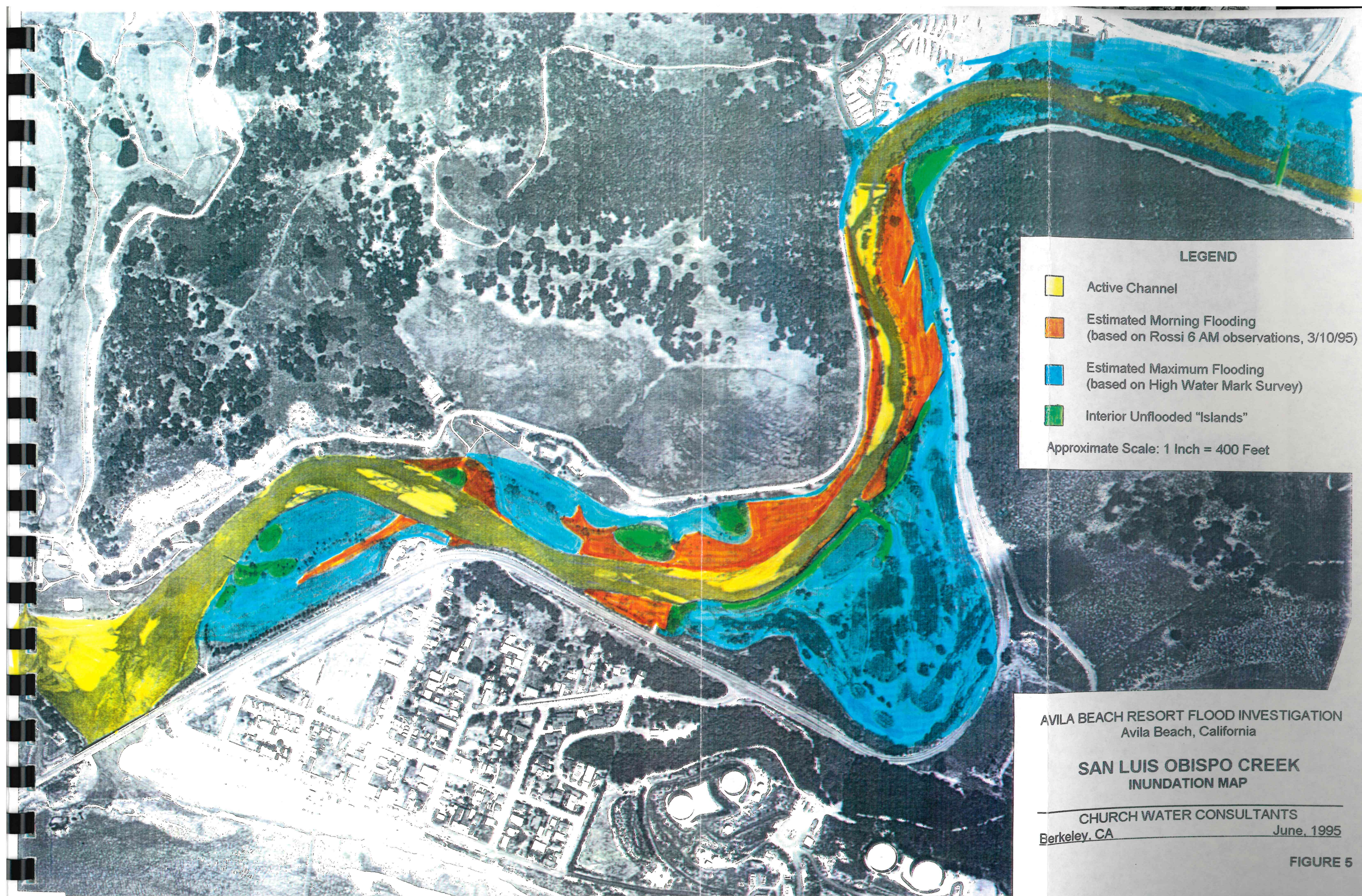
AVILA BEACH RESORT FLOOD INVESTIGATION
 Avila Beach, California

SAN LUIS OBISPO CREEK
 HIGH WATER MARK SURVEY

CHURCH WATER CONSULTANTS
 Berkeley, CA

June, 1995

FIGURE 4



LEGEND

- Active Channel
- Estimated Morning Flooding
(based on Rossi 6 AM observations, 3/10/95)
- Estimated Maximum Flooding
(based on High Water Mark Survey)
- Interior Unflooded "Islands"

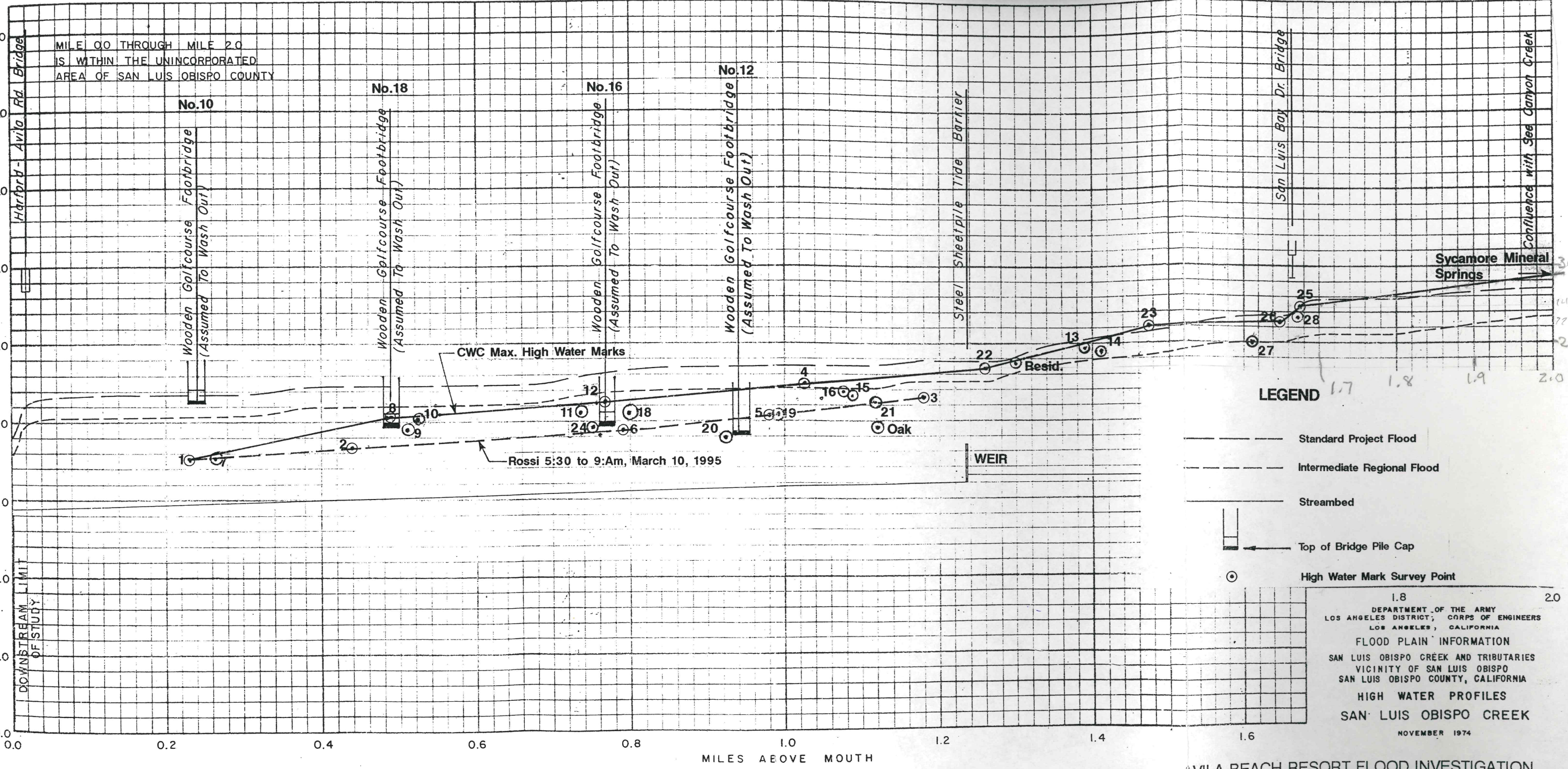
Approximate Scale: 1 Inch = 400 Feet

AVILA BEACH RESORT FLOOD INVESTIGATION
Avila Beach, California

**SAN LUIS OBISPO CREEK
INUNDATION MAP**

CHURCH WATER CONSULTANTS
Berkeley, CA June, 1995

FIGURE 5



AVILA BEACH RESORT FLOOD INVESTIGATION
Avila Beach, California

**SAN LUIS OBISPO CREEK
HIGH WATER MARK PROFILE**

CHURCH WATER CONSULTANTS
Berkeley, CA June, 1995

FIGURE 6

PHOTO SET NO. 2
SYCAMORE MINERAL SPRING
Russell Kiesigg

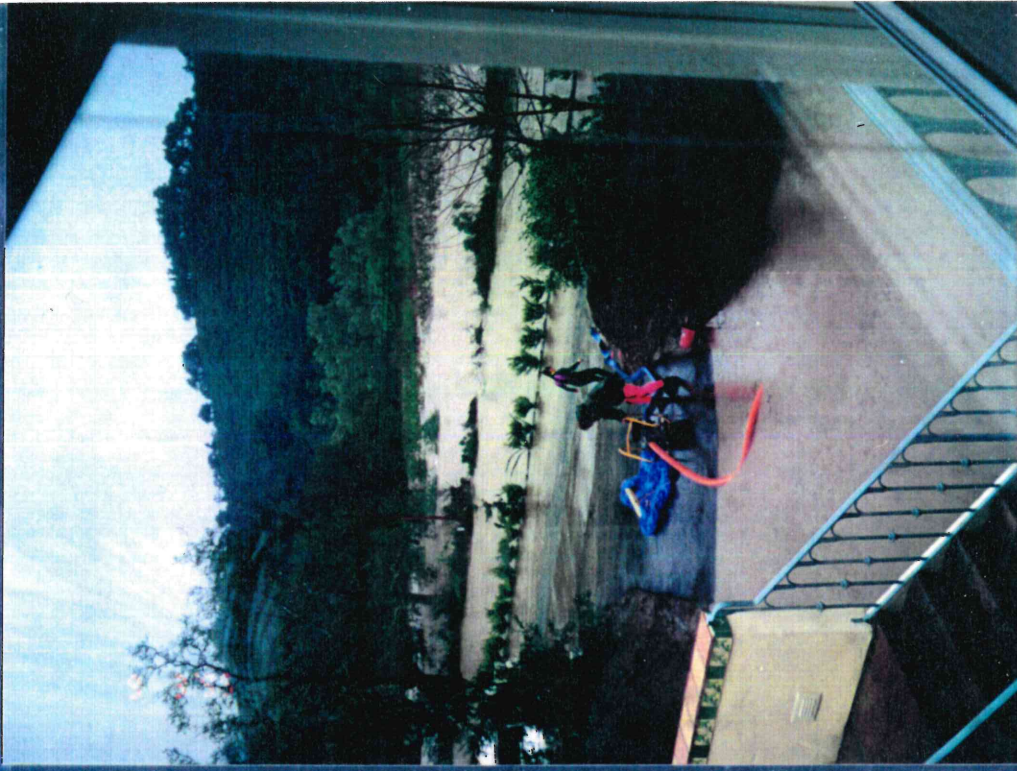


Photo 2.1
March 10, 1995
from Kiesigg residence

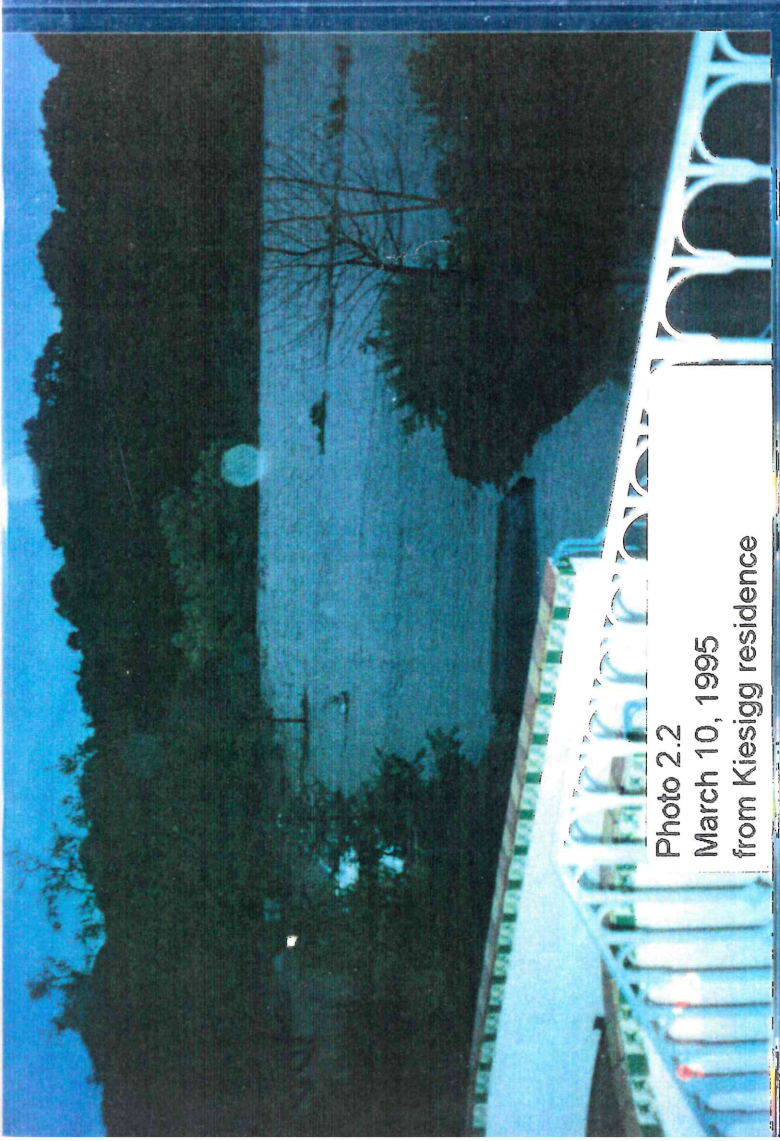


Photo 2.2
March 10, 1995
from Kiesigg residence

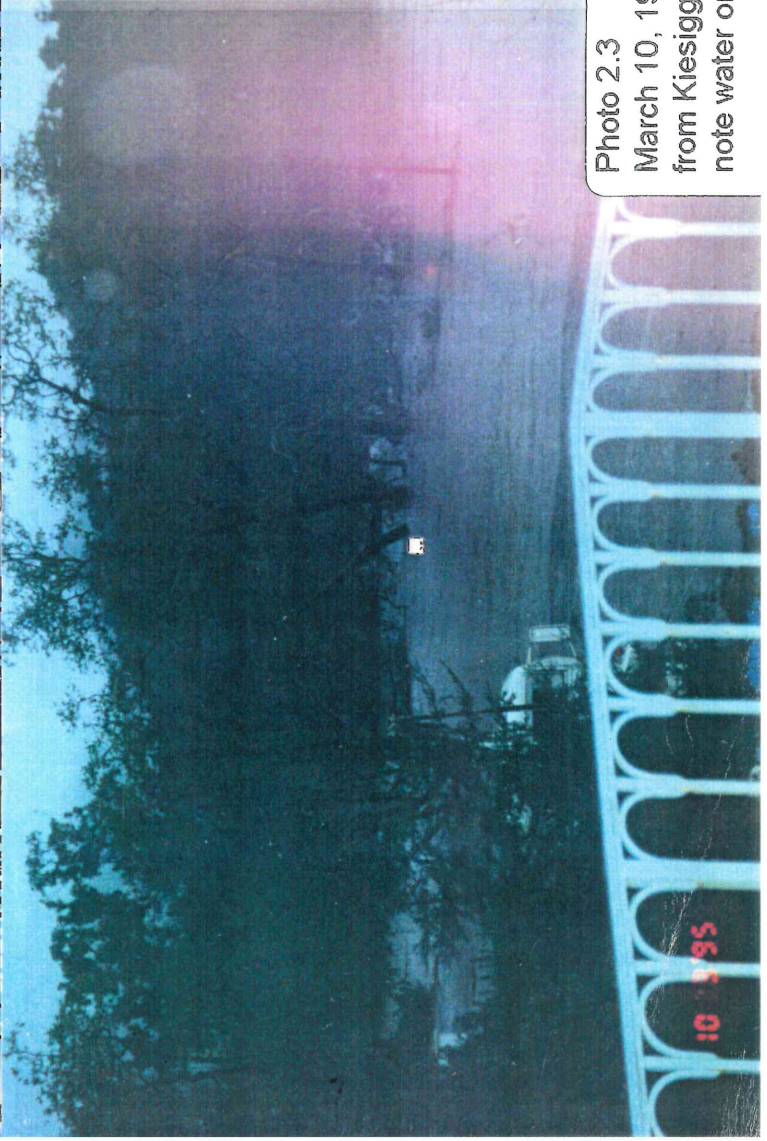


Photo 2.3
March 10, 1995
from Kiesigg residence
note water on Speed Limit sign

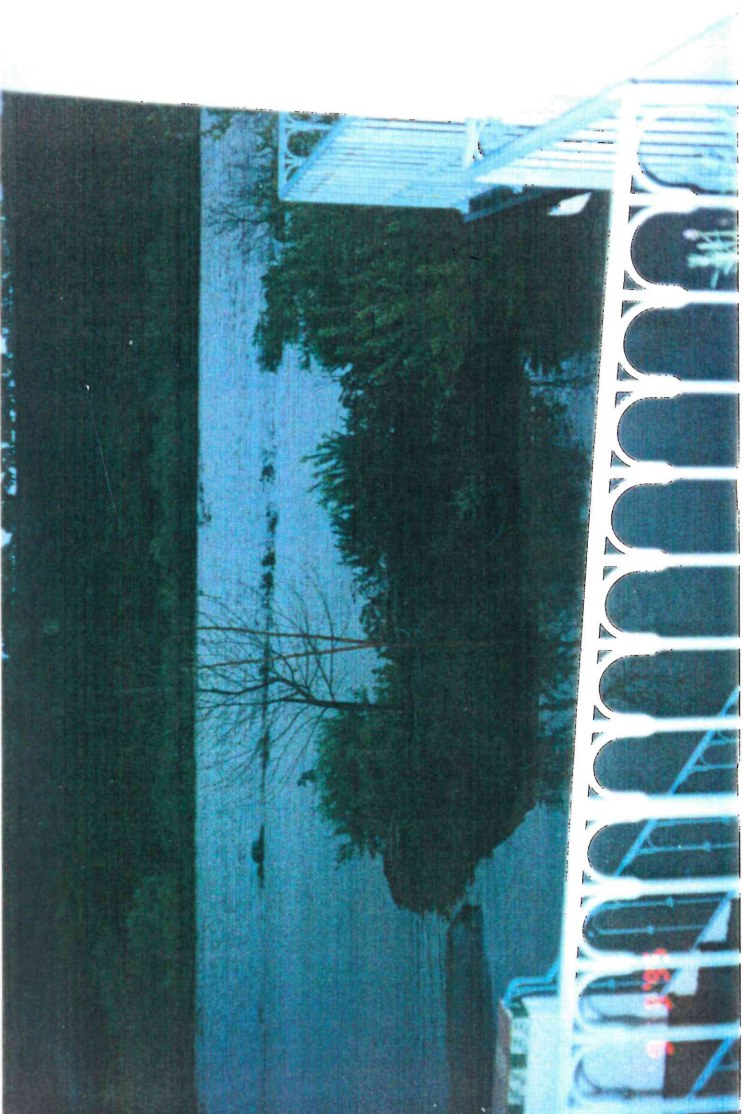




Photo 3.6
March 12, 1995
Ontario Bridge



Photo 3.8
March 12, 1995
Ontario Bridge



Photo 3.5
March 12, 1995
Ontario Bridge: Note debris/HWM
on right side of bridge deck



Photo 3.7
March 12, 1995
Ontario Bridge, left approach



Photo 4.1
January 10, 1995
Ontario Bridge and downstream
debris

APPENDIX A

INTERVIEWS

1. Rob Rossi, Owner, Avila Beach Resort Golf Course
2. Jake Miller, General Mgr., Avila Resort Investments
3. Dan Erdman, Civil Engineer , San Luis Obispo County Engineering Dept.
4. Russell Kiessig, President, Sycamore Mineral Springs
Steve Gregory, Vice President
5. Colleen Snyder, employee, Sycamore Mineral Springs
6. Robert Gorham, Avila Beach Fire Dept . 805-595-2009
7. Tom Kirschner, Wharfinger, Port San Luis Harbor District
8. Pat Farris, Commissioner, Port San Luis Harbor District
Janice Farris
9. Deanna Lauenroth , Resort General Mgr., San Luis Bay Inn

2. Jake Miller, General Mgr., Avila Resort Investments
7075 Ontario Road, San Luis Obispo, CA 93405; 805-595-7111
May 16 & 25, 1995; Present: David Church

- March 10, 1995, 8:00 AM, Avila Resort at Ontario Bridge : Floodplain full and water started to recede, did not reach fence surrounding resort. Flooding from tributary drainage (Gragg Canyon) coming in front gate.
- 11:00 : Rain started again
- 13:00: Rain poured
- 15:00: Sharp stream raise 20 minutes
- 17:00: Avila Resort almost totally flooded. Water level 5.5 feet above shuffleboard surface, 3 feet higher than January 10. Only center 50 feet of Ontario Bridge deck exposed.

3. Dan Erdman, Civil Engineer , San Luis Obispo County Engineering Dept.
Room 207, County Government Center, SLO, CA 93408; 805-781-5252
May 23, 1995; Present: David Church

- March 10, 1995, 9:30 AM at Ontario Bridge construction site(Avila Resort): Water across floodplain from abutment to abutment, elev. 24.0+/- ft.
- March 14: Inspected Ontario Bridge- Water had overtopped the approaches and abutments at both ends of the Ontario Bridge and reached an elevation of 32.4 feet on the bridge deck above pier #5 (from south)
- Obtained partial copies of:
 - Drainage Report for Commercial Area of San Luis Bay Estates (Mallard Green, et al), Westland Engineering, Inc., March 1986
 - Flood Plain Information, San Luis Obispo Creek and Tributaries, Los Angeles District, Corps of Engineers, November 1974
 - Flood Insurance Study, San Luis Obispo County, FEMA, September 1984
- Peak flow on south side of SLO near his home occurred between 5 and 6 PM on March 10

4. Russell Kiessig, President, Sycamore Mineral Springs
Steve Gregory, Vice President
1215 Avila Beach Drive, San Luis Obispo, CA 93405; 805-595-7302
May 25, 1995; Present: David Church

- January 10, 1995, 5:55 AM: Flood peak, water over road, high water mark (HWM) at bath house and Kiessig residence at elevation 26.0 feet. Maximum water level was equal to 1969, highest prior flood. Survey indicated water 1.8 ft lower in West Meadow on opposite side of valley.

- He had survey done of HWM of both January and March 10th floods (John Wallace & Assoc.); willing to exchange for our survey
- 8:30 AM: Others observed large rafts of debris moving downstream including 1000 board-foot lifts of lumber from Ontario bridge construction.
- 9:30 AM: Water off road, 2-3 foot drop in 20 minutes.
- January 24th, 16:00+: Light rain, water raising. Initial high water occurred 700 ft upstream of normal flooding point in lower meadow. Kiessig believes it was caused by debris collecting on heavily constructed orchard fence opposite his residence. Max. depth 1 ft +/- over road.
- March 10, 1995, 7:00 AM: Sycamore Mineral Springs: Garage flooded 6" deep (el 25).
- 10/11:00 AM: High winds. The big tree shown in Telegraph-Tribune photo blew down, gusts estimated to 60 mph from NW, wind from south at golf course.
- 19:00: Max water level, receded 1 inch by 19:30. (Carol Kiessig)
- 18 inches of water in Rossi's office at San Luis Bay bridge; in January the water was much lower- 1 inch in gate guard house which was a foot lower than office floor.
- Debris from March flood much less than January. Debris piles from January did not move in March flood.
- County objected to filling in the floodplain back in 1979
- Auto-dates on photos are unreliable.

5. Colleen Snyder, employee, Sycamore Mineral Springs; 805-595-7302
 1215 Avila Beach Drive, San Luis Obispo, CA 93405; 805-595-7302
 May 25, 1995; Present: Russell Kiessig, Steve Gregory, V.P., David Church

- March 10, 1995, 12:45 AM: Office called her to come in and help; told her water was 2 feet below road
- 1:30: Water on the road was up to her waist on road when she arrived.
- 4:00+/-: Maximum water level at Sycamore Mineral Springs
- 13:00: 0.5 ft on road, could drive out
- 15:00: >1.0 ft on road, no access again to Sycamore Mineral Spring.: Oak blew down.
- 18/19:00: Max water level (el 29 ft., near top of speed limit sign. See Kiessig photo 2.3).
- 21:00 : Noticed water dropping
- March 11, 4:00 AM: Water still deep
- 5:00: Water down to 0.5 ft on road, could drive out