

CALIFORNIA COASTAL COMMISSION

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TO: Coastal Commissioners and Interested Parties

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SUBJECT: Coastal Impacts of the 1997-98 El Niño and Predictions for La Niña

1997-98 EL NINO: A BRIEF BIOGRAPHY

The greatly anticipated and closely monitored '97-'98 El Niño surprised the scientific community with the speed at which the waters of the equatorial Pacific warmed above normal. When compared to the evolution of the previous significant El Niño in 1982-83, this year's El Niño appeared to be heading for record levels of precipitation and coastal storm activity. Encouraged by extensive media coverage, the public feared that it would also surpass the severe coastal damages that characterized the '82-83 El Niño.

While coastal damage from the 1997-98 event was significant, it was far less than anticipated. The Governor's Office of Emergency Services (OES) estimates damages statewide to be over \$550 million. This damage estimate has not yet been broken down by region, but the coastal damages are expected to be less than the coastal damages caused by the 1982-83 El Niño, valued at \$100 million in 1982 dollars. The widespread erosion, flooding, and wave damage in '82-'83 occurred due to the coincidence of storms and extremely high tides, increasing wave heights and the landward extent of the storms' impact. This year's storms most damaging component was rainfall, effecting the entire state, not just the coastal areas. By February 1998, rain had saturated soils and began triggering debris flows, landslides and bluff collapses statewide. FEMA and USGS staff estimate that there were thousands of debris flows and landslides across the state this winter, several of the most significant occurred in or near the coastal zone: Rio Nido, Pacifica, Laguna Beach and Laguna Nigel. Despite record levels of precipitation and numerous landslides, the damages over this past winter fell far below the economic impact of the 1995-6 and 1996-7 winter storm seasons which each caused \$1.8 billion in damages.

HIGHLIGHTS OF COMMISSION RESPONSE TO EL NINO

The improvements in predicting and monitoring El Niño events have enabled regulatory and planning agencies to incorporate the effects of these events into their regulatory and planning programs. Over the past winter, Commission staff has joined with the scientific community to

educate the public on El Niño, help communities and individuals prepare for the impacts of these weather anomalies, and distribute information on methods of mitigating the impacts of erosion and storm damages. The following are actions that the Commission and its staff undertook in response to the '97-'98 El Niño and in anticipation of future events:

- Provided the public with information about El Niño and ways to prepare property for winter weather conditions.
- Participated with other groups, including Scripps Institution of Oceanography, CA Dept. of Boating and Waterways, and CA Shore and Beach Preservation Association, in sponsoring a conference on the potential impacts of an El Niño winter.
- Held public workshops on shoreline protection and erosion issues.
- Prepared written procedural guidance to assist coastal analysts in assessing shore protection projects and to better understand the dynamic nature of the coastline.
- Recruited a NOAA Coastal Services Center Fellow who will work with the staff of the Commission and the Dept. of Boating and Waterways on beach nourishment opportunities statewide.
- Held staff meetings with homeowners on cleanup and response as follow up to emergency permits.
- Prepared summaries of significant coastal damage and emergency permitting response (a final summary is attached).
- Issued 143 emergency permits.
- Documented pre- and post-El Niño beach conditions with photographs and video footage at various locations in the state.
- Applied for a grant to hire additional staff to process emergency permits.
- Applied for a grant from NASA to acquire pre- and post-El Niño aerial photography and beach topographic data to complete shoreline change analysis.

EL NINO IMPACTS ON PUBLIC ACCESS

The short-term El Niño impacts included loss of sandy beaches and loss of use of public beach facilities due to direct storm damages or temporary road closures. Many of these access impacts have now been mitigated as the sand has returned and almost all public facilities (roads, beach parks, etc.) have been repaired and re-opened.

Long-term impacts are primarily associated with the installation of shoreline protection devices. Rock was added to existing walls or entirely new seawalls were constructed. This rock almost always covers up sandy beach that was used for public recreational use. It also often prohibits lateral movement along the beach as the rocks are inundated during high tides. The majority of the rip rap was added in the South Central Coast district. Caltrans installed rip rap along 11 miles of coast. State Parks installed 700 feet of rock to repair a seawall. Private homeowners added rock on 55 parcels, totaling an estimated 2 miles of shoreline. All of this rock potentially impacts public access to and along the shoreline. Follow-up processing of regular coastal development permits will include an analysis of the impacts, identification of feasible alternatives and implementation of necessary mitigation measures.

EL NINO REVERSALS: LA NINA

Scientists are now predicting the onset of mild La Niña conditions this fall, continuing through winter. During La Niña conditions, the mirror image of El Niño, the trade winds strengthen, upwelling increases off the west coast of North and South America, and sea surface temperatures can fall below normal by as much as 7°F. Weather conditions associated with La Niña are generally the opposite of an El Niño. The cold water in the equatorial Pacific inhibits the formation of storms that under El Niño conditions form in the central Pacific and travel eastward toward the coast of California. Air temperatures are expected to be cooler than normal, and, more importantly, Central and Southern California are expected to receive below average amounts of precipitation. The effect of La Niña tends to be stronger in the winter months and closer to the equator, decreasing in effect and predictability the greater distance north or south of the equator. Currently, the National Weather Service is predicting the following precipitation levels for next winter:

- Los Angeles: 78% of average precipitation
- San Francisco: 87% of average precipitation
- Eureka: 111% of average precipitation (The Pacific Northwest receives greater rainfall during La Niña conditions, influencing northern California.)

Weather effects from La Niña are variable; there have been years with above average precipitation and years with below average precipitation. Considering the above average precipitation over the past two winters, meteorologists are hesitant to suggest a drought for the coming winter; they expect only slightly below average rainfall for Southern and Central California and above average for Northern California.

One important implication of lower precipitation levels and intensified winds is increased risk of wildfires. Due to the record precipitation last winter, vegetation has grown vigorously. Overgrown vegetation, less winter rain and strengthened winds all increase the potential for fire. The following are some of FEMA's wildfire preparation tips:

- Create a safety zone around homes¹: clear flammable vegetation in lawn, thin between tree crowns and remove limbs close to the ground.
- Plan water needs: maintain an adequate outside water source and garden hose that is long enough to reach any area of the home or other structures on the property.
- Prepare a family disaster plan.
- Prepare emergency supplies including food and water for 3 days and battery operated radio and flashlight.

FUTURE ENSO EVENTS

The El Niño phenomenon is expected to reoccur every 3 to 7 years. In the past 20 years, there have been 7 El Niños and 3 La Niñas. Due to improved monitoring and modeling techniques, scientists have vastly improved their ability to detect and predict the effects of El Niño and La

¹ Check local fire standards for specific size of safety zone.

Niña events. Commission staff has compiled a notebook of all information prepared for the 1997-98 event by staff as well as important related news and journal articles and will keep it up to date for use in future El Niño events. Staff has collected a number of slides, photographs and video footage showing pre- and post-El Niño conditions. Staff is also working with NOAA, NASA and the Resources Agency to obtain pre- and post-El Niño measurements of beach topography and aerial photography. These records of shoreline change are valuable for both emergency response and future planning. Continued use and examination of the data acquired during this year's El Niño will help the Commission identify critical needs for future El Niño events. These efforts, and others, will allow the Commission to repeat its proactive response for future El Niño or La Niña events.

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**1997-1998 EL NINO:
FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY
PERMIT RESPONSE**

NORTH COAST

As of August 14, a total of 12 El Niño related emergency permits granted.

- Humboldt County: Big Lagoon
 - * rapid bluff retreat (up to 60 feet at one location) endangered blufftop homes: 1 home partly destroyed, 2 red-tagged, 3 yellow-tagged.
- Sonoma County: Gleason's Beach
 - * bluff retreat caused 4 homes to be red-tagged and 2 yellow tagged. Emergency permit issued in August for replacement and repair of seawalls fronting 5 homes.
- San Francisco County: Great Highway, San Francisco
 - * rapid bluff retreat destroyed the parking areas south of Sloat Avenue.
- San Mateo County: Pacifica
 - * extensive bluff retreat (up to 30 feet in some locations) along Esplanade Drive threatened many homes. Two emergency coastal permits were issued for the construction of a seawall in front of 3 bluff top lots. In June, 8 homes were demolished and another emergency permit was issued to construct a rock revetment to protect Esplanade Drive and utilities.
 - * bluff retreat along Shoreline Avenue threatened a number of homes: 1 home red-tagged. Four emergency permits issued for repair and expansion of revetments.
 - * undermined a parking lot, street end, and walkway adjacent to Rockaway Beach. Three emergency permits for placement of riprap at the end of Rockaway Beach Avenue.

FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY RESPONSE

- * Sharp Park had extensive flooding, some undermining of seawall and landscaping damage.
- San Mateo County: Princeton
 - * emergency permit issued in June to place rip rap along bluff face at Princeton Avenue.

CENTRAL COAST

As of August 14, a total of 21 El Niño related emergency permits granted. Most emergency actions and problems are located within local government's area of responsibility.

- Santa Cruz County: Wadell Bluffs, Highway 1
 - * landslide briefly closed highway. Landslide debris cleared under terms of existing permit.
- Santa Cruz County: Santa Cruz and Aptos areas
 - * significant erosion along West and East Cliff Drives damaged road and pedestrian access.
 - * shoreline erosion at Pleasure Point; complete loss of an access stairway.
 - * shoreline and riverbank erosion threatened homes on San Andreas Road and the San Lorenzo River levee. Emergency permit issued for rock slope protection for San Andreas Road.
 - * six emergency permits for riprap and seawall repair.
- Santa Cruz and Monterey Counties: Pajaro River levee
 - * flooding associated with levee breaks.
- Monterey County: Moss Landing
 - * emergency permit issued for dredging and disposal of 22,000 cubic yards of spoils from north Moss Landing Harbor.

FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY RESPONSE

- **Monterey County: Salinas River**
 - * flooding from levee overtopping. Emergency permit for riprap to repair levee.

- **Monterey County: Seaside and Monterey**
 - * overflow from coastal lagoons at El Estero, Del Monte Lake and Laguna Grande/Roberts Lake caused flooding, loss of public beach accessways and damage to dune restoration projects; 3 emergency permits granted for emergency channelization, outfall reconstruction and dune reconstruction.
 - * two emergency permits issued for repairs to Wharf #2.

- **Monterey County: Carmel Area**
 - * most sand missing from south end of municipal beach; bedrock exposed; public access stairs damaged.
 - * flooding at mouth of Carmel River; 2 emergency permits granted for breaching at river mouth and for temporary access road to wastewater treatment plant.
 - * Highway 1 and County road culverts washed out; brief closures resulted.
 - * substantial damage to Carmel Riviera Mutual Water Company facilities.

- **Monterey County: Big Sur Coast, Highway 1**
 - * flooding and landslide damages closed the highway at 16 locations. Highway 1 will have to be realigned at Hurricane Point.

- **Monterey County: Palo Colorado Road**
 - * severe flood damage closed this county road for several weeks.

- **San Luis Obispo County: Piedras Blancas**
 - * significant erosion washed two cleaned old gas station tanks into the ocean. Emergency permit issued to remove remaining tanks.

FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY RESPONSE

- **San Luis Obispo County: Avila Beach**
 - * substantial damage to wharf and parking lot at Port San Luis. Emergency permit for 6,000 tons of riprap and wharf repairs.
- **San Luis Obispo County: Guadalupe Oil Fields**
 - * high flow in Santa Maria River threatened to expose underground petroleum plumes and oilfield sumps. Emergency permit issued for sump and plume excavation.

SOUTH CENTRAL COAST

As of August 14, a total of 59 El Niño related emergency permits granted. Most of the permits were for riprap or vertical seawalls to protect single family residences in the Malibu area.

- **Santa Barbara County: Gaviota, Refugio and El Capitan State Beaches**
 - * access roads, campgrounds and parking lots extensively damaged by flooding and storm waves. Closed to the public.
 - * emergency permit issued for road repair over Gaviota Creek.
- **Santa Barbara County: Stearns Wharf**
 - * damage to pilings, decking, sewer and water lines from storm waves.
- **Santa Barbara County: Goleta Slough and Carpinteria Marsh Area**
 - * emergency permits issued for the dredging of these creek channels to address flood damages.
- **Ventura County: Faria Beach**
 - * seventeen residences damaged by storm waves and high tides.
 - * one home "red tagged."
- **Ventura County: Pacific Coast Highway at old Rincon Highway.**
 - * damage to highway and concrete seawall at various locations due to storm waves, high tides, and landslides.
 - * about one mile of new riprap to protect highway.

FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY RESPONSE

- **Ventura County: Union Pacific Railroad**
 - * emergency permit issued to repair bridge over Ventura River after it washed out due to flooding and debris flows.
- **Ventura County: Emma Woods State Beach**
 - * damage to access road and campgrounds.
- **Ventura County: Ventura State Beach at San Jon Road**
 - * emergency permit for clean up of an oil spill resulting from an oil pipeline break in Hall Canyon contained at San Jon Barranca.
- **Ventura County: McGrath State Beach**
 - * emergency permit issued to breach McGrath Lake to prevent flooding of Harbor Blvd. and nearby properties.
- **Ventura County: Port Hueneme Pier**
 - * portion of pier collapsed and other sections damaged by storm waves.
- **Ventura County: Pacific Coast Highway: Point Mugu to Sequit Point**
 - * extensive amount of riprap to protect highway.
- **Los Angeles County: Leo Carrillo State Beach**
 - * approximately 700 feet of the parking lot fronting the beach damaged by storm waves.
 - * emergency permit issued for 700 feet of riprap to repair and expand a revetment to protect a parking lot and two State Park residences.
- **Los Angeles County: Broad Beach, Malibu**
 - * four front beach homes suffered severe damage (1 completely destroyed).
 - * seventeen emergency permits issued for the placement of riprap to protect residential structures.
- **Los Angeles County: Malibu Road Beach Area**
 - * beach scour threatened to undermine a number of residences on Malibu Road.
 - * eighteen emergency permits issued for either bulkhead repairs and/or placement of riprap.

FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY RESPONSE

- * landslides threatened a number of homes on Malibu Road from the inland side.
- Los Angeles County: Pacific Coast Highway (beach front homes)
 - * twelve emergency permits for placement of riprap to protect residences.
- Los Angeles County: Malibu Creek
 - * bank erosion and placement of 400 feet of riprap to protect shopping center.
- Los Angeles County: Rambla Orienta
 - * landslide threatened 17 residences.
- Los Angeles County: Pacific Coast Highway south of Topanga Canyon
 - * approximately 2,000 feet of riprap to protect highway.

SOUTH COAST

As of August 14, 8 El Niño related emergency permits granted.

- Los Angeles County: Santa Monica Beaches closed temporarily due to sewage outflows
- Los Angeles County: Palisades Park Bluffs, Santa Monica
 - * twenty-five tons of material fell onto California Incline and Pacific Coast Highway.
- Los Angeles County: Redondo Beach breakwater
 - * loss of rock in two areas.
 - * emergency permit issued for the placement of 50,000 cubic yards of sand on Redondo Beach.
- Los Angeles County: King Harbor Marina
 - * wave damage to seawall in front of Portofino Hotel.
- Orange County: Huntington Beach
 - * two emergency permits issued for seawall repair.
- Orange County: Newport Beach
 - * emergency permit issued for creek outlet structure at Buck Gully.

FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY RESPONSE

- * extensive beach loss at Corona Del Mar.
- * landsliding in upper Newport Bay.
- * emergency permit issued for hillside repair along Galaxy Drive.
- Orange County: Laguna Beach
 - * major slope failures, mudflows and slope erosion caused major damage to residential structures and roads at Laguna Canyon Road, Canyon Acres, Aliso Creek and Pacific Coast Highway.
- Orange County: Dana Point
 - * large sections of beach walkway in Salt Point damaged, approximately \$30,000 in damages.
 - * storm drain collapsed at Monarch Bay and Capistrano Beach.
 - * emergency permit issued for erosion control of Dana Point Headlands bluffs.
- Orange County: San Clemente
 - * damage to Marine Headquarters foundation and major sand loss. Emergency permit issued for sheetpile wall in front of and along the sides of the building.
 - * San Mateo Creek railroad bridge damaged.
 - * mobile home trailer park threatened by waves.
 - * slope failure along coastal bluff in Paseo de Cristobal blocked railroad line; threatened 4 or 5 private homes; some bluff top patios lost.
 - * emergency permit for seawall repair along N. El Camino Real

SAN DIEGO COAST

As of August 14, a total of 23 El Niño related emergency permits granted.

- Oceanside Harbor
 - * closed twice due to high surf, approximately \$700,000 in storm related damage.
- Encinitas
 - * two emergency permits issued for bluff retention systems along Neptune Avenue.
- Cardiff

FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY RESPONSE

- * North Cardiff State Beach parking lot damaged.
- * South Cardiff State Beach parking lot, walkways, railings, landscaping and restrooms destroyed or significantly damaged. Emergency permit issued to relocate restroom.
- * frequent closure of Highway 101 due to wave run-up and flying cobbles. City has funded study to address protection of highway.
- Solana Beach
 - * temporary placement of riprap on 15 coastal properties (approved through regular permit process). Riprap has been removed.
 - * emergency permits for construction of erodable walls to fill undercutting and sea caves. Two follow-up permits have been submitted.
 - * Tide Park Beach access has been repaired and reopened.
- Del Mar
 - * three homes damaged beyond repair.
 - * five emergency permits issued by City of Del Mar for riprap adjacent to destroyed homes. Two homeowners have requested emergency permits from Coastal Commission. No emergency permits issued. Regular permit approved to construct a seawall.
 - * approximately \$1.6 million in damages.
- Pacific and Mission Beach
 - * damage to boardwalk with portions closed to public use.

OIL SPILL INCIDENTS

- Piedras Blancas, 2 cleaned old gas station tanks washed out to sea. Remaining tank being removed under emergency permit (San Luis Obispo County).
- Guadalupe (emergency response to prevent marine release) (San Luis Obispo County).
- San Jon Barranca Creek Oil spill (Ventura County).
- Madranio Creek, Vintage Petroleum Pipeline spill (Ventura County).

FINAL SUMMARY OF SIGNIFICANT COASTAL DAMAGE AND EMERGENCY RESPONSE

- East Fork of Hall Canyon, AERA Energy Pipeline spill (Ventura County).
- Canada del Diablo, Vintage Petroleum Pipeline spill (Ventura County).

FEDERAL CONSISTENCY ACTIONS

- "No Effects" Determination for Caltrans dewatering and slope protection on Highway 1, Big Sur (just south of Monterey/SLO County line).
- Highway 1, near Gaviota Tunnel (Santa Barbara County).
- Mission Trails Vineyard, west side of Highway 101 near the town of Los Alamos (Santa Barbara).
- "No Effects" Determination for Caltrans maintenance of Highway 1, Point Mugu (Ventura County).
- "No Effects" Determination for Army Corps Dredging Modification, Morro Bay (San Luis Obispo County).
- "No Effects" Determination for Army Corps Dredging time extension, Morro Bay (San Luis Obispo).
- Emergency work at waste water treatment facility and Equestrian Center in City of Fillmore (Ventura County).
- Repair work to Gaviota Beach Road (Santa Barbara County).
- Riverbank restoration to San Antonio Creek in Ojai (Ventura County).
- Slope stabilization in Hopper Creek (Ventura County).
- Repair Santa Rosa Creek bridge (Santa Barbara County).
- Repair to Santa Rosa Creek Road, near Cambria (San Luis Obispo County).
- Road repair on Santa Rita Road (San Luis Obispo County).
- Caltrans had over 200 Storm Damage Projects in the Coastal Zone.

