DANA POINT HARBOR REVITALIZATION

PRELIMINARY SHORELINE MANAGEMENT PLAN

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Preliminary Shoreline Management Plan

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Shoreline Management Plan

Purpose and Scope

The purpose of the Dana Point Harbor Shoreline Management Plan is to carry out the policies as set forth in the Dana Point Harbor Revitalization Plan & District Regulations to implement the key policy provisions as required by the California Coastal Commission and provide recommendations for protecting Harbor facilities and Harbor users from the effects of coastal flooding by:

- Setting clear goals and objectives for managing sea level rise and potential impacts of flooding resulting from significant storm events and other acts of nature.
- Identifying benchmarks and milestones to routinely measure and monitor changes over time.
- Establishing recognized pathways of communications to help avert negative events associated with flooding to the greatest extent practicable.
- Continue to work with federal, state and local agencies to develop guidelines for structures to resist both wave runup and tsunami wave impacts.
- Include engineering recommendations for managing drainage in landside areas of the Harbor consistent with currently adopted standards and regulations and require the use of appropriately sized detention basins wherever applicable to reduce the risks from flooding.
- Support pubic education programs for emergency preparedness and disaster response. Distribute awareness pamphlets illustrating storm evacuation routes, areas susceptible to shoreline wave runup to boater groups, merchants and other user groups. Hold emergency drills in various areas of the Harbor to test the effectiveness of emergency preparedness plans.

The scope of this plan is to focus on the implementation of the required monitoring components in the absence of established regulatory standards for the design and protection of Harbor structures and coastal resources subject to damage resulting from sea level rise and episodic storm events that may have impacts to the operations of Dana Point Harbor and impact public safety.

Background

Dana Point Harbor is fully sheltered from the open ocean by almost 8,000 lineal feet of federal breakwater; the interior East and West basins providing berthing for approximately 2,400 small craft. Landside areas of the Harbor have been established by approximately 5,100 linear feet of cast in place concrete gravity quay wall and 230-foot boat ramp section; sloped concrete panels protect approximately 2,300 linear feet of the bulkhead and the remaining 2,570 linear feet is stabilized with riprap. The design elevation at the top of the quay wall varies between approximately +9.5 to +10.0 feet Mean Lower Low Water (MLLW). The toe of the panel protection system consists of a concrete triangular thrust footing with a design depth of 2 feet below finished grade and founded in natural bedrock (Noble, 2003). Engineering assessments of the existing quay wall system indicate that the shoreline protection in place presently has a remaining design life of approximately 35 to 50 years with normal maintenance and requires some repair or replacement of sections experiencing more severe deterioration. The overall structural condition of the exposed portions of the quay wall and concrete revetment were visually surveyed in 2003 by BlueWater Design Group and reported in a Bulkhead Structural Evaluation Report summarized the wall system as appearing to be in relatively good condition for the age of the structure and continual exposure to salt water, the elements and tides.

The floating structures are constructed from modular concrete encased foam pontoons. Each pontoon ranges in width from 3 to 4 feet for the fingers; 6 to 8 feet for the end ties and main walks, varying in length from 8 to 10 feet. The typical main wall is an 8 by 8 foot pontoon float. The finger floats vary throughout the Harbor based on the length of the individual slips, with timber walers to hold the float units together. These timbers run along the edges of the float and are bolted to the concrete floats. Generally, the pontoon decks cantilever out over the pontoons approximately 3 inches throughout the marinas. The docks are anchored with concrete piles or concrete filled steel pipe piles that are approximately 14 inches in diameter. Many of the existing piles are corroded and in need of replacement or repair that is contemplated as part of the Dana Point Harbor Marina Improvement Project.

Sea Level Rise

For many centuries, atmospheric concentrations of global greenhouse gases (GHG) were considered to be relatively stable. As the advent of the industrial age has intensified, the combustion of fossil fuels from activities associated with industrial growth and transportation expanded, thereby increasing concentrations of carbon dioxide in the atmosphere. The result has been an observed increase in average global temperature. The current consensus among scientists is that continued increases in atmospheric greenhouse gases will likely raise ambient global temperatures and also lead to changes in regional climate and historic weather patterns. As air temperatures rise over most areas, temperatures in others may become more variable and potentially more volatile. Rainfall distribution and storm patterns will likely also be affected. Some atmospheric modeling suggests that as polar ice melts, sea levels will rise and thereby have an impact on the frequency of inundation events in coastal areas.

Sea level is not uniform everywhere and is continually changing. Numerous natural processes affect sea level at any given place and time; from tides that produce hourly changes in sea level, to tectonic forces that take place over millions of years. In coastal areas, sea level is measured relative to the elevation of the land. Thus, factors that affect both ocean levels and land elevations must be equally considered when calculating projections of regional sea level rise (SLR). Macro atmospheric trends having an influence on tidal levels include climate patterns such as El Niño, changes in sea water temperatures, the gravitational effects of shifts in the large mass glaciers and ice sheets, the geologic and seismic movement of land and subsurface geology, the coastal area erosion process as well as a number of different types of direct and indirect human influences.

Ocean water levels, in part also determine the process of shaping the beaches along the Orange County coast. The primary local factors that affect ocean water levels in Orange County are: (1) astronomical tides; (2) sea level rise; (3) storms; and (4) global climatic oscillations. Astronomical tides in Orange County are of the mixed semidiurnal type, with two highs and two lows of unequal heights occurring each lunar day. Because tides occur at a large spatial scale, the tidal characteristics are similar at coastal locations throughout Orange County, including Dana Point Harbor. Tidal characteristics computed for the tidal epoch from 1983 to 2001 for the Newport Bay entrance are shown on the following table provide tidal characteristic measures for the Newport Bay Entrance (NOAA, 2003) in relation to the Mean Lower Low Water (MLLW) vertical datum. Each of these represent either extreme recorded events or defined vertical means as calculated by NOAA over the tidal epoch and given relative to a constant fixed vertical survey datum. The North American Vertical Datum of 1988 is the most recent vertical survey datum available. Mean Lower Low Water (MLLW) is the common low tide datum used for describing tidal characteristics.

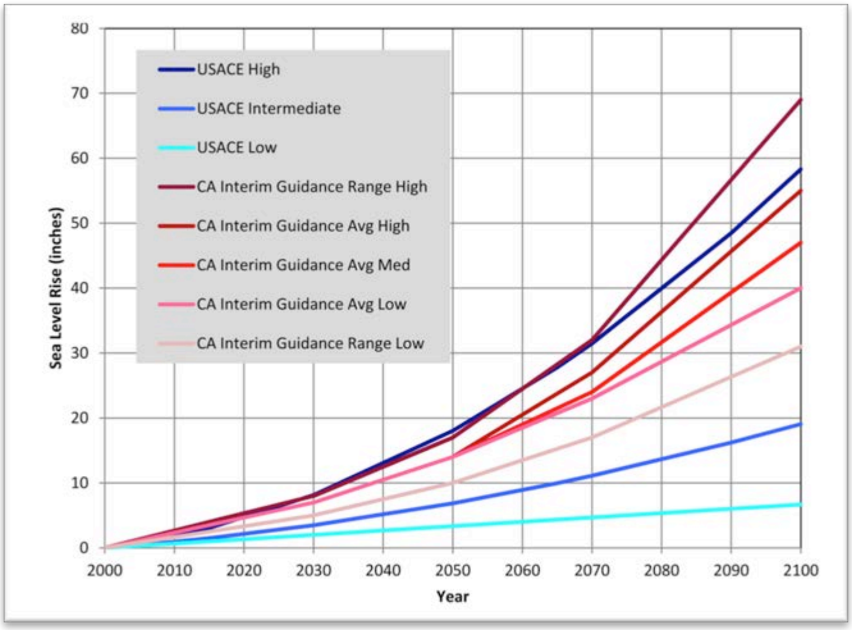
Tidal Characteristics at Newport Bay Entrance

Datum or Level	Elevation (Feet, MLLW)
Maximum Measured Water Level (1-28-1983)	7.67
Mean Higher High Water (MHHW)	5.41
Mean High Water (MHW)	4.67
Mean Tide Level (MTL)	2.80
Mean Sea Level (MSL)	2.77
Mean Low Water (MLW)	0.92
North American Vertical Datum of 1988	0.18
Mean Lower Low Water (MLLW)	0.00
Lowest Measured Water Level (1-20-1988)	-2.35

Source: NOAA (National Oceanic and Atmospheric Administration), 2003

USACE and many California State agencies have issued general guidance provisions for incorporating sea level rise into the designs of federal or state agency coastal projects. USACE guidance states that potential sea level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence and recommends a multiple scenario approach to address modeling uncertainties and help develop better risk-informed alternatives (USACE, 2011a). These scenarios cover a broad range of sea level changes termed low, intermediate and high as shown on the following Sea Level Rise Projections Table for the current century.

Sea Level Rise Projections

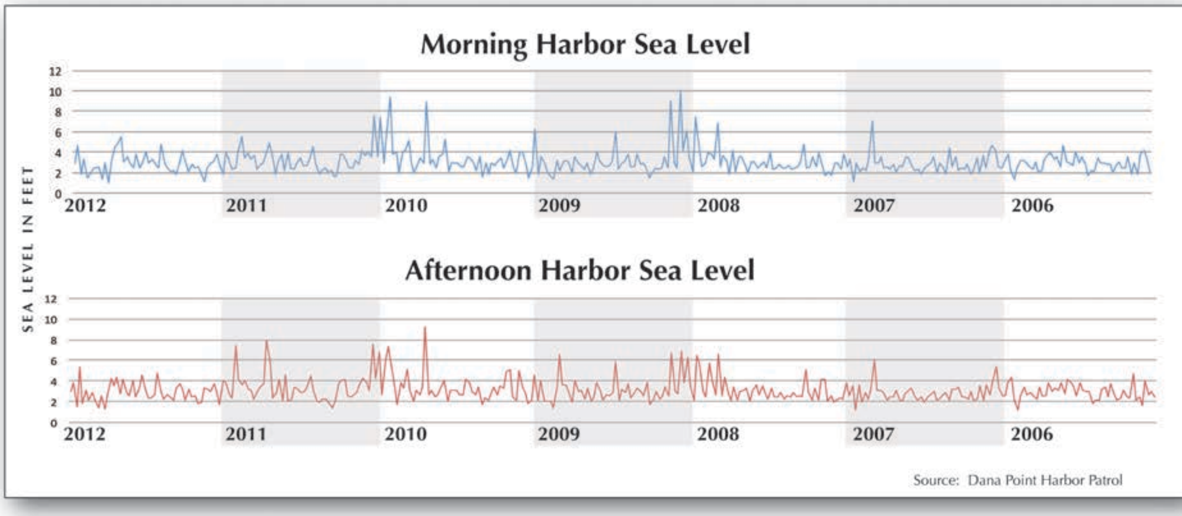


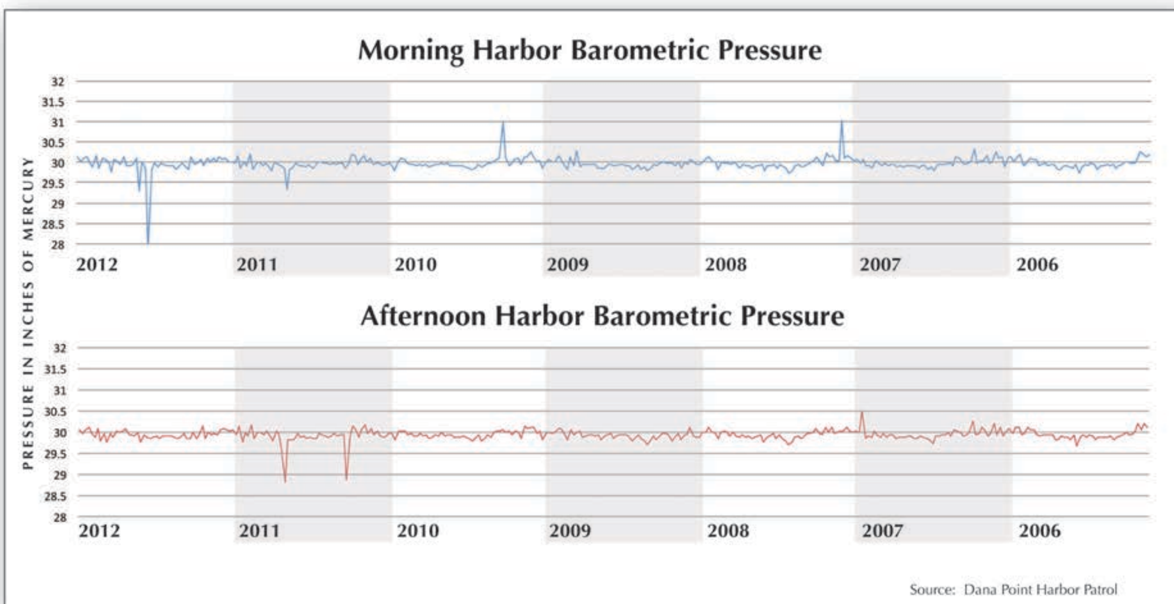
Source: Orange County Coastal Regional Sediment Management Plan, Everst International Consultants, Inc., April 2012

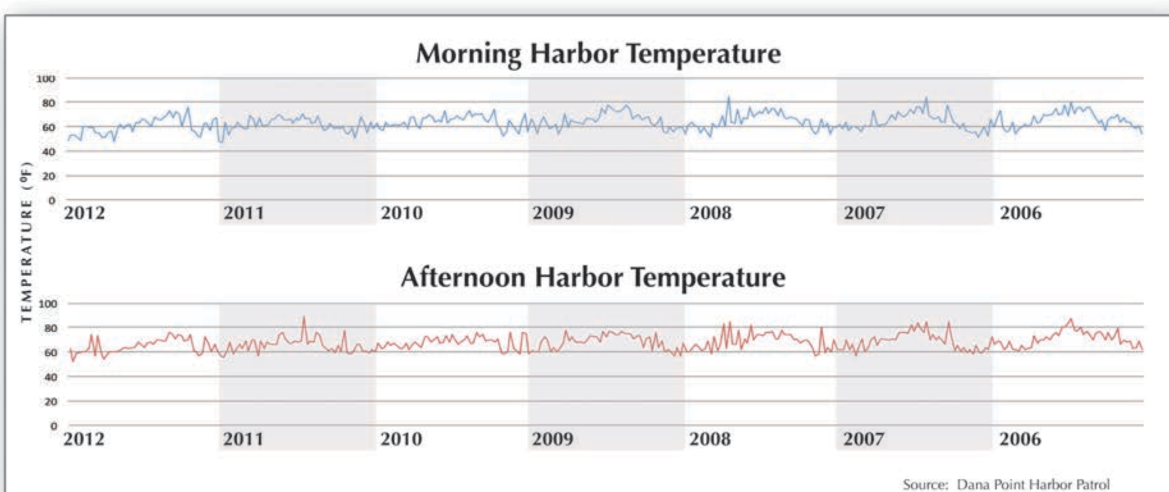
As shown, the low scenario is an extension of historical global rates (1.7 millimeters per year), since the local Newport Beach tide gage did not record a sufficient duration of data to provide a high confidence level of extrapolation. This global rate is between other, nearby local rates observed at La Jolla and Los Angeles (2.1 and 0.8 millimeters per year, respectively). The intermediate and high scenarios are based on equations provided by USACE. The State of California also has provided ranges to consider as interim sea level rise guidance (CO-CAT, 2010) until a final report from the National Academy of Sciences is published. These interim guidance assumptions are also provided. The selection of a projection for use in determining design considerations is presently based on the agency's context-specific considerations of risk tolerance and adaptive capacity in the application of regulations and design standards.

Storm-induced changes in nearshore water levels arise from storm surges (lowered barometric pressures, wind shear and wave set up) and fresh water runoff. For example, the lowest locally recorded barometric pressure occurred during a storm on January 18, 1988. The combined storm induced changes resulted in water levels that are historically approximately 0.7 feet above predicted astronomical levels at the Los Angeles Outer Harbor tide gage (USACE, 2002b). The fresh water component includes rainfall runoff and dam release and is particularly important for inland beaches such as those within Newport Bay and Huntington Harbour.

The OC Sheriff - Harbor Patrol maintains statistical records for conditions in the Harbor, including tidal height, wave intervals, air temperature and barometric pressure. Measurements are recorded twice daily (morning and afternoon) and although the interval of information available is not sufficient to establish tidal statistics (a full epoch of 19 years is typically


Morning Harbor Sea Level
Afternoon Harbor Sea Level
SEA LEVEL IN FEET
2012
2011
2010
2009
2008
2007
2006
Source: Dana Point Harbor Patrol


Morning Harbor Barometric Pressure
Afternoon Harbor Barometric Pressure
PRESSURE IN INCHES OF MERCURY
2012
2011
2010
2009
2008
2007
2006
Source: Dana Point Harbor Patrol


Morning Harbor Temperature
Afternoon Harbor Temperature
TEMPERATURE (ºF)
2012
2011
2010
2009
2008
2007
2006
Source: Dana Point Harbor Patrol

required to provide statistically significant conclusions), it does demonstrate relevant trends creating current for the 7 year period between 2012 and 2006 for Dana Point Harbor.

A more detailed data set is also summarized on tables for each year in Appendices A with examples of the Data Logs provided in Appendices B. As indicated by each of the graphs, for the timeframe data has been provided, the Harbor has generally maintained a variation in tide levels of approximately 2 to 3 feet (with some periods of storm influence), barometric pressures generally ranging between 29.75 and 30.2 inches of mercury and air temperatures between 60 and 80 degrees Fahrenheit.

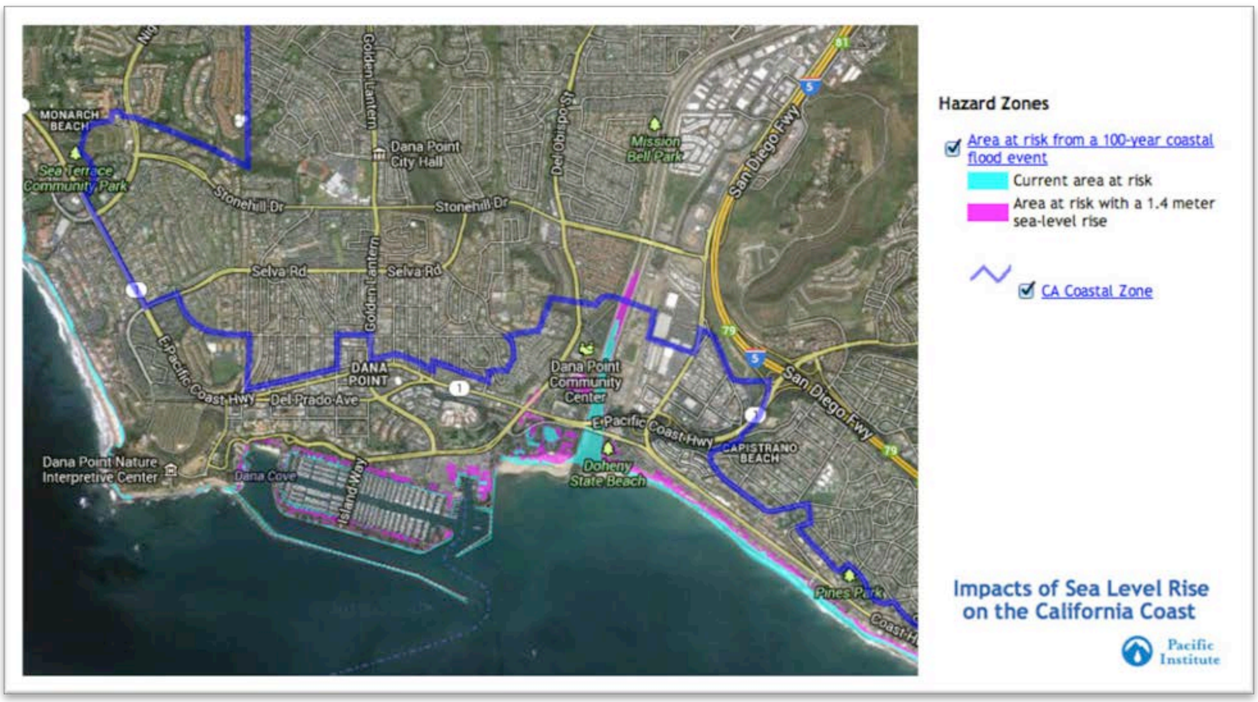
El Niño Southern Oscillations and Pacific Decadal Oscillations are global scale cyclic climatic variations that impact the local sea levels. El Niño has a frequency of every four to seven years and resulting in temporary increases in sea level on the west coast of North and South Americas. For example, during the major El Niño event of the 1997-1998 season, monthly mean sea levels in southern California were increased by up to approximately 1 foot (Flick, 1998 as reported in USACE, 2002b). On a longer time scale, the Pacific Decadal Oscillation was recently shown to be a likely cause of suppressed sea levels on the west coast of North America and may lead to a rapid increase in local sea levels in the near future (Bromirski et. al., 2010).

Waves are the driving force in generating long shore currents, sediment transport in the littoral zone and shoreline changes. Ocean waves impacting the Orange County coast are produced by four sources (USACOE, 2002b; Moffatt & Nichol, 2009a). The Northern hemisphere swell is derived from extra-tropical cyclones that occur in the northern Pacific Ocean and comprises the most severe waves reaching the Orange County coast. These tropical storm swells are derived from hurricanes off the west coast of Mexico during the summer and early fall. Most of these hurricanes take a westerly track, sending swells out to the Pacific Ocean. On occasion, a northwest track sends swell up to southern California, with the swell window ranging from 155 degrees to 200 degrees (USACOE, 2002b).

Southern hemisphere swell is derived from extra-tropical cyclones from the South Pacific Ocean with the majority occurring from spring through early fall. These swells approach from about 170 degrees to 215 degrees, decaying significantly as they traverse across the Pacific Ocean.

Local sea is the term applied to steep, short period waves that are typically generated by local winds and northwest winds in the outer coastal waters. The local winds can be further separated into pre-frontal winds from the southeast, gradient winds during the passage of a winter low-pressure system from the west and westerly sea breezes. With the predominance of wave energy reaching the Orange County coast from the northern hemisphere, wave driven currents typically run from northwest to southeast throughout the winter and spring. As this coast is also significantly exposed to southern swell, resulting in seasonal climatic cycles and a range of wave conditions.

Current scientific investigations by a number of investigators have concluded that it is highly likely that global mean sea level (MSL) is a phenomenon that has been increasing. This is the general conclusion of no fewer than 13 studies of MSL change over various periods during the last 100 years. The present assessments do not foresee a sea level rise of ≥1 meter during the next century. Nonetheless, the implied rate of rise for the best-estimate projection corresponding to the IPCC's "Business-As-Usual Scenario" is about 3 to 6 times faster than the rate experienced over the last century. The global estimates range from about 0.5mm (0.02 in.)/year to 3.0mm (0.12 in.)/year, with most estimations in the range of 1.0 to 2.0mm (0.039 to 0.078 in.)/year. For the southern California coastal areas (south of Cape Mendocino), sea level is anticipated to rise 4 to 30 cm (2 to 12 inches) by 2030, 12 to 61cm (5 to 24 inches) by 2050 and 42 to 167 cm (17 to 66 inches) by 2100[1] are consistent with to other typically referenced global SLR estimates. The following exhibit depicts areas of risk from a 100-year coastal flood event in the area of Dana Point Harbor as reported by the Pacific Institute.



For the planning process, most damage in coastal areas is attributable to storms, particularly in conditions where the confluence of large waves, storm surges and high tides during a strong El Niño period. Although to date there is no consensus about how climate change will affect the severity of storms, several longitudinal studies have reported trends indicating that the largest waves have been getting higher, storm event winds are getting stronger and sea level is increasing in height over the past few decades. These observational records are not of sufficient duration to be conclusive, but do provide an indication of potential trends.

[1] Sea Level Rise for the Coasts of California, Oregon and Washington: Past, Present and Future, National Academy of Sciences, 2012, National Academies Press, Washington, DC

The California Coastal Commission has prepared a Draft Sea-Level Rise Policy Guidance document to provide guidance on how to address sea-level rise in new Local Coastal Programs and Coastal Development Permits in accordance with currently established Coastal Act policies. Policy guidance in separated into the following principle groups:

Use of Science to Guide Decisions (Coastal Act Sections 30006.5 and 30335.5)

- Acknowledge and address sea-level rise as necessary in planning and permitting decisions.
- Use the best available science to determine locally relevant (context-specific) sea-level rise projections for all stages of planning, project design and permitting reviews.
- Recognize scientific uncertainty by using scenario planning and adaptive management techniques.

Minimize Coastal Hazards through Planning and Development Standards (Coastal Act Sections 30253, 30235, 30001 and 30001.5)

- Avoid significant coastal hazard risks where feasible.
- Minimize hazard risks to new development over the life of authorized structures.
- Avoid or minimize coastal resource impacts when addressing risks to existing development.
- Account for the social and economic needs of the people of the state; assure priority for coastal-dependent and coastal-related development over other development.
- Property owners should assume the risks associated with new development in hazardous areas.

Maximize Protection of Public Access, Recreation and Sensitive Coastal Resources (Coastal Act Chapter 3 and Section 30235)

- Provide for maximum protection of public beach and recreational resources in all coastal planning and regulatory decisions.
- Maximize natural shoreline values and processes and embrace green infrastructure and living shorelines; avoid the perpetuation of shoreline armoring.
- Address other potential coastal resource impacts (wetlands, habitat, scenic, etc.) from hazard minimization decisions, consistent with the Coastal Act.
- Address the cumulative impacts and regional contexts of planning and permitting decisions.
- Require mitigation of unavoidable pubic coastal resource impacts related to permitting and shoreline management decisions.
- Include best available information on resource valuation in mitigation of coastal resource impacts.

Maximize Agency Coordination and Public Participation (Coastal Act Chapter 5 and Sections 30006, 30320, 30339, 30500, 30503 and 30711)

- Coordinate planning and regulatory decisions making with other appropriate state, local and federal agencies; support research and monitoring efforts.
- Consider conducting vulnerability assessments and adaptation planning at the regional level.
- Provide for maximum public participation in planning and regulatory processes.

The Dana Point Harbor Revitalization Plan & District Regulations included several policies related to sea level rise, including:

> *Siting and design of new shoreline development anywhere in Dana Point Harbor and the siting and design of new or replacement shoreline protective devise shall take into account anticipated future changes in sea level, based on the best available scientific information and projections or range or projections of future sea level*. (LUP Policy I-8.6.5-1)

> *Due to the uncertainties about future sea level rise, a range of likely and extreme rises in sea level shall be used in the planning phase to assess project sensitivity to future water levels, identify possible consequences to the development and the surrounding area if the anticipated sea level is exceeded and determine the minimum acceptable amount of future seal level rise that can be used for design purposes*. (LUP Policy I-8.6.5-2)

> *OC Dana Point Harbor shall study the potential impacts of sea level rise and flooding of San Juan Creek on the existing or proposed structures along the seawall*. (LUP Policy I-8.6.5-3)

In acknowledgement of the Coastal Act policies and resulting from the issuance of an executive order in 2008 by Governor Arnold Schwarzenegger that directed California state agencies to plan for sea-level rise and coastal impacts, the California Coastal Commission included a Special Provision in the Dana Point Harbor Revitalization Plan and District Regulations (Chapter II-3, Special Provision 11) stating the following:

> *A Shoreline Management Plan for Dana Point Harbor shall be submitted to the City of Dana Point for review prior to or concurrent with the first Coastal Development Permit for development of the Commercial Core area and shall be periodically updated (every 5 years) to include an assessment of seasonal and long-term shoreline changes and the potential for flooding or damage from sea-level rise, waves, storm surge or seiches and provide recommendations for protection of existing and proposed development, pubic improvements, coastal access, public opportunities for coastal recreation and coastal resources. The Shoreline Management Plan shall also evaluate evacuation routes (including Marine Commercial Planning Area 4 in the event of incapacitation of the Island Bridge) and the feasibility of hazard avoidance, retrofitting existing or proposing*

new protection devices and restoration of the sand supply in appropriate areas of the Harbor as required.

Assessments of sea level rise at state and regional levels are challenging because data on the geophysical process involved are relatively sparse and there are no agreed-upon models or approaches for projecting future sea level rise.

Potential Impacts Associated With Sea-Level Rise in Dana Point Harbor

- Low lying roads, water/wastewater, stormwater infrastructure, utility infrastructure are at risk of impaired function due to flooding and/or inundation.
- Damage to piers, docks and marina facilities from increased wave action and higher water levels.
- Decreased bridge clearances due to increased and prolonged increases in tidal heights and increase probability of a bridge failure due to water-related damage to the bridge structure.
- Decreased Baby Beach area.
- Limit effectiveness of stormwater management practices by increased groundwater levels and effects of saltwater intrusion.
- Vertical accessways and boat launch areas could become inaccessible due to flooding.
- Damage to recreational areas and facilities due to increased wave damage (particularly on the Island – PA 4).

Additional Programs and Studies Related to Sea Level Rise and Shoreline Protection The Orange County Coastal Regional Sediment Management Plan (Draft Report) makes recommendations for future programs and studies in support of protecting coastal resources. The Sea Level Rise Beach Sustainability Study is summarized as entailing preparation of an engineering and economics study to determine the nourishment requirements necessary to offset projected sea level rise impacts throughout the Orange County coastline. The primary purpose of this study would be to determine whether, where and how much beach and nearshore nourishment would be necessary to offset sea level rise impacts on the Orange County coast. The study would include a calculation of the recreational and shore protection costs of unmitigated shoreline erosion resulting from sea level rise. In addition, it would include development of conceptual solutions and associated costs to mitigate the sea level rise scenarios recommended by government agencies. Results from this study would be used in long-term planning for the County of Orange and coastal cities affected by the potential impacts associated with sea level rise.

U.S. Army Corps of Engineers

At the federal level, the USACE and USEPA have recognized that SLR considerations need to be incorporated into the design life of all federally funded projects. However, with no adopted mandates or policies in place to evaluate the effect of SLR on new projects (other than internal memoranda in response to Hurricane Katrina and Hurricane Rita), the standard of reference has remained a 1987 National Research Council report that assumed three hypothetical SLR scenarios for the year 2100: 0.5 meter, 1 meter and 1.5 meters in SLR. This assumption framework was updated in July 2009 by the USACE's, using a multiple scenario approach where levels of risk were assigned to the National Research Councils criteria to evaluate impacts.

Federal Emergency Management Agency

The National Flood Insurance Program administered by FEMA is the primary mechanism for communities receiving flood protection does not include SLR as an evaluation tool for mapping potential flood insurance hazards. With the recent disasters from major storm events on a national level, FEMA has embarked upon a mapping modernization effort that involves updating flood insurance rate maps, many dating from the 1970 and 1980 period. With SLR and settlement of levees, many flood program facilities nationwide no longer meet CFR 65.10 requirements that were responsible for establishment of "preliminary" flood maps to be issued that show communities in the flood plain. In addition, many of the cities and counties that FEMA mapped as flood prone were required by 2010 to demonstrate that their levees were adequate to protect against a 1% annual chance flood event to obtain certification.

FEMA has also update its mapping approach for areas vulnerable to coastal flooding to a risk-based methodology. This approach includes the reevaluation of present sea levels, estimating extreme high water elevations due to tides, surges, tsunamis and determining a plan based on local SLR trends in the development of Special Flood Hazard Area designations and design considerations to remove such determinations when no longer applicable.

The current Flood Insurance Study (FIS) published by FEMA indicates that Dana Point Harbor is located within Zones AE, VE and X (see FIRM Map No. 06059C0504J, dated December 3, 2009 on the following page). The land portions of the Harbor (except a portion of Dana Wharf and the southeastern portion of PA 1) are in Zone X, which is outside the 500 year flood zone. The southeastern portion of PA 1 is within a subsection of Zone X, which indicates it is within the 500 year flood zone and within the 100 year flood zone with an average depth of less than 1 foot. Zone AE is considered to have a base flood elevation of 9 feet and Zone VE, which includes the seawalls has a base flood elevation of 23 feet.

City of Dana Point

The City's Emergency Plan designates procedures that will be followed in responding to anticipated emergencies within the City of Dana Point. The Plan describes how the City will prepare for, respond to and recover from an emergency or disaster. The Plan is consistent with State and Federal guidelines regarding disaster planning. Additionally, the City maintains an Emergency Operations Center and communications equipment to coordinate City services during local emergencies.

Evacuation routes are shown on the Designated Emergency Evacuation Routes and Emergency Facilities Exhibit of the City's General Plan. As indicated, Pacific Coast Highway, Dana Point Harbor Drive and Street of the Golden Lantern are designated as evacuation routes in the City.

Designated Emergency Evacuation Routes

Source: City of Dana Point General Plan, Public Safety Element

<u>County of Orange</u>

The County's Emergency Response Plan provides a detailed summary of the County organization and identifies the responsibilities of each component agency in the event of a disaster. The Orange County and Operational Area Emergency Operations Center is used for managing disaster response and recovery for County agencies and departments and constituents served by the County. The center also coordinates disaster response and recovery for its operational area and coordinates operations resource requirements and availability with the State Regional Operations Center. The County acts as a central point for coordination and operational, administrative and support needs of the emergency responders. The center is staffed with personnel from all agencies within the County and various operational area jurisdictions and agencies.

In the event of failure of the Island Bridge, evacuations of the Island area of the Harbor (PA 4) would be coordinated by OC Sheriff – Harbor Patrol and OC Dana Point Harbor staff, utilizing County and/or sport fishing vessels to ferry individuals to landside areas of the Harbor.

Tsunamis

Tsunamis, as defined by the City of Dana Point Public Safety Element (July 9, 1991) are seismically induced sea waves generated by offshore earthquake, submarine landslide or volcanic activity. Great magnitude waves have not historically been recorded in Orange County because the coastline is somewhat protected from the north by the coastal configuration (Palos Verdes Peninsula and Point Conception) and the offshore islands (Santa Catalina and San Clemente Islands). Locally the Headlands also protects most of the Dana Point coastline from tsunamis which might originate from the north. The city's coast is more exposed to damage from a more rare tsunami or other storm waves that originate from the south.

California is at risk from both local and distant tsunamis. Eighty-two possible or confirmed tsunamis have been observed or recorded in California during historic times. Most of these events were small and only detected by tide gages. Eleven were large enough to cause damage and four events caused deaths. Two tsunami events caused major damage. The 1960 Chilean earthquake produced a great tsunami that impacted the entire Pacific basin. Damage was reported in California ports and harbors from San Diego to Crescent City and losses exceeded one million dollars. The worst event was the 1964 tsunami generated by the M 9.2 Alaska earthquake that killed 12 in Northern California and caused over $15 million in damages. The peak wave height was 21 feet in Crescent City and 29 city blocks were inundated. Wave oscillations in San Francisco Bay lasted more than 12 hours causing nearly $200,000 in damages to boats and harbor structures.

The Cascadia subduction zone will produce the State's largest tsunami. The Cascadia subduction zone is similar to the Alaska- Aleutian trench that generated the magnitude 9.2 1964 Alaska earthquake and the Sunda trench in Indonesia that produced the magnitude 9.3 December 2004 Sumatra earthquake. Native American accounts of past Cascadia earthquakes suggest tsunami wave heights on the order of 60 feet, comparable to water levels in Aceh Province Indonesia. Water heights in Japan produced by the 1700 Cascadia earthquake were over 15 feet, comparable to tsunami heights observed on the African coast after the Sumatra earthquake. The Cascadia subduction zone last ruptured January 26, 1700, creating a tsunami that left markers in the geologic record from Humboldt County, California to Vancouver Island, Canada and is noted in written records in Japan. At least seven ruptures of the Cascadia subduction zone are observed in the geologic record.

The National Oceanic and Atmospheric Administration (NOAA) has statutory responsibility to provide tsunami warnings, which are disseminated in California through the Governor's Office of Emergency Services. Local jurisdictions have the responsibility for ordering and canceling evacuations. The California Geological Survey has statutory authority to conduct tsunami inundation mapping, contingent on State program funding. The Governor's Office of Emergency Services (OES) has contracted with the University of Southern California for preliminary tsunami inundation mapping with funding from NOAA through the National Tsunami Hazard Mitigation Program (Program). This Program supports tsunami hazard mitigation in the states of California, Oregon, Washington, Alaska and Hawaii. As shown on the following page, the Tsunami Inundation Map for Emergency Planning for the Dana Point Quadrangle/San Juan Capistrano Quadrangle, prepared by the California Emergency Management Agency (March 2009), all of Dana Point Harbor is subject to tsunami inundation.

Tsunamis cause damage to man-made structures in several ways, primarily from water currents and the impact of waterborne debris. The incoming waves cause flooding and push vessels into land-based structures. The withdrawing waves causes vessels and boats to hit bottom and damages power plants and other facilities that use sea water for cooling. The strong currents scour foundation material from under structures and carry debris. Debris carried by the water batters people and property, and is responsible for much of the damage from tsunamis. Secondary effects, such as fire and the release of hazardous materials, can escalate the disaster to a greater catastrophe. These effects are difficult to predict. The exposure of our built environment to possible tsunami damage varies dramatically along the California coast. The flooding produced by the tsunamis depends strongly on local topography. The historical tsunami record suggests that the tsunami hazard in the Southern California region, from the Palos Verdes Peninsula, south to San Diego has a moderate likelihood of occurrence.

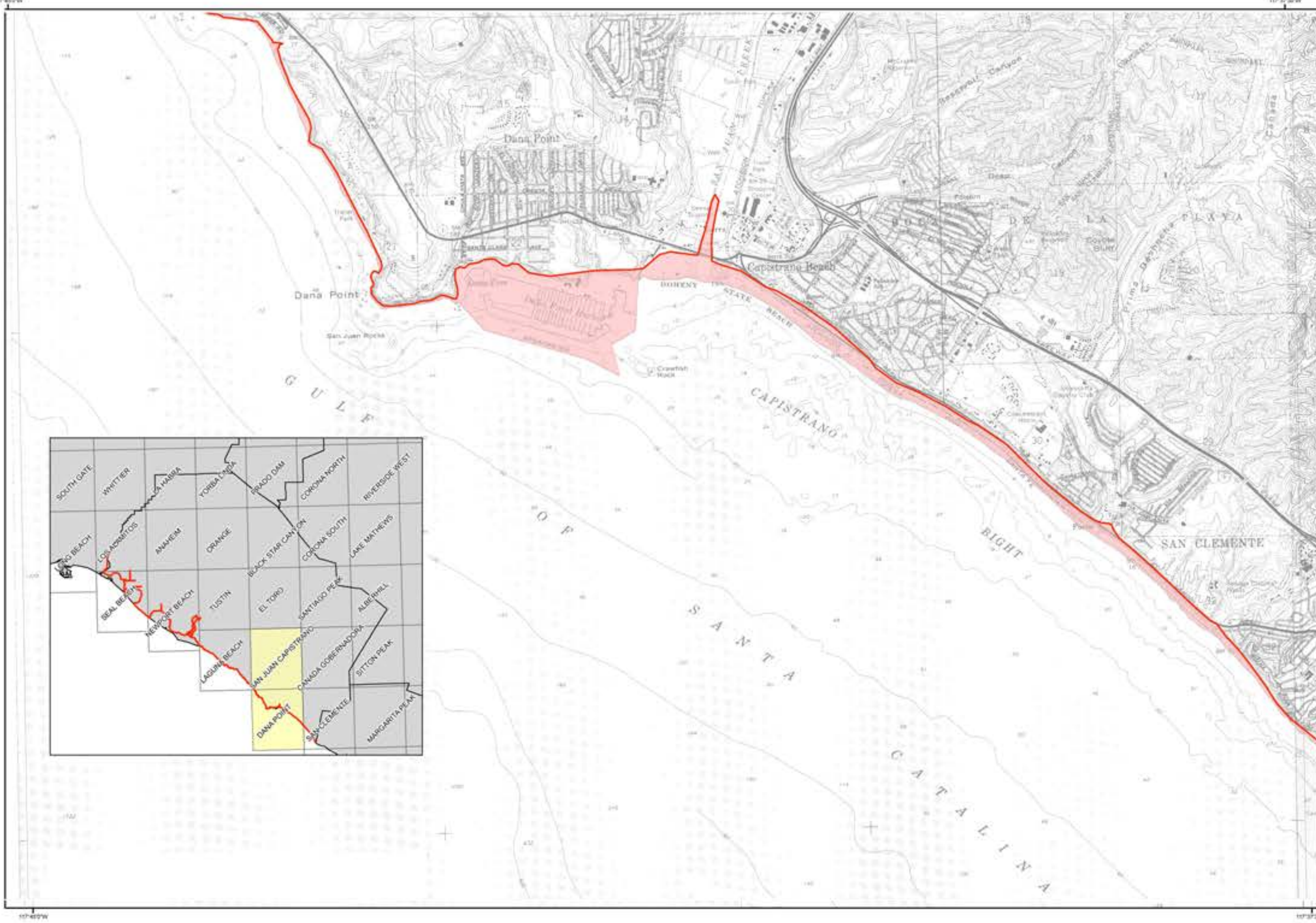
The current building codes are primarily focused on constructing buildings resistant to earthquakes do not, in general, address the forces likely to arise from tsunamis. FEMA's Coastal Construction Manual (FEMA 55), developed to provide design and construction guidance for structures built in coastal areas, addresses seismic loads for coastal structures and provides information on tsunami and associated loads. However, the authors of the Coastal Construction Manual concluded that tsunami loads are far too great and that, in general, it is not feasible or practical to design "normal" structures to withstand these loads. Many structures, including those throughout Dana Point Harbor are designed to resist forces directed towards the structure; however, once water enters the structure and draw-down occurs outside of the structure, walls may be compromised, resulting in serious damage.

The topography of Dana Point provides significant protection for the majority of the City. Unlike other coastal communities where much of the developed area is at, or very near sea level, the Dana Point Coast is backed by very high bluffs. The low-lying area between these bluffs and the ocean is the local Tsunami Hazard Zone. The projected worst-case scenario for a tsunami in Southern California is a 10-12m run-up, or approximately 40 foot change in mean sea level. In the unlikely event of an emergency, federal regulations require that an alert and notification system be in place to help protect the health and safety of the public. The Community Alert Siren System is a network of sirens strategically located within the plant's Emergency Planning Zone (EPZ) to provide that service. The sirens are activated by local government officials in the event of an emergency. Community Alert Sirens may be used to alert the public to a wide variety of emergencies, including tsunamis, earthquakes and San Onofre Nuclear Generating Stations-related events, although the facility is no longer in service and currently being decommissioned. A valid siren alarm is a long, steady tone that lasts for approximately three minutes. This long, steady tone is the only siren sound we will use during a real emergency or during periodic testing of the system. One siren is located in Dana Point Harbor adjacent to Embarcadero Place and is planned for relocation as part of the Commercial Core Project.

California Emergency Management Agency
California Geological Survey
University of Southern California

Tsunami Inundation Map for Emergency Planning
Dana Point Quadrangle/San Juan Capistrano Quadrangle

State of California
County of Orange



TSUNAMI INUNDATION MAP FOR EMERGENCY PLANNING

State of California ~ County of Orange
DANA POINT QUADRANGLE
SAN JUAN CAPISTRANO QUADRANGLE

March 15, 2009

SCALE 1:24,000

METHOD OF PREPARATION

Initial tsunami modeling was performed by the University of Southern California (USC) Tsunami Research Center funded through the California Emergency Management Agency (CalEMA) by the National Tsunami Hazard Mitigation Program. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping (Titov and Gonzalez, 1997; Titov and Synolakis, 1998).

The bathymetric/topographic data that were used in the tsunami models consist of a series of nested grids. Near-shore grids with a 3 arc-second (75- to 90-meters) resolution or higher, were adjusted to "Mean High Water" sea-level conditions, representing a conservative sea level for the intended use of the tsunami modeling and mapping.

A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides (Table 1). Local tsunami sources that were considered include offshore reverse-thrust faults, restraining bends on strike-slip fault zones and large submarine landslides capable of significant seafloor displacement and tsunami generation. Distant tsunami sources that were considered include great subduction zone events that are known to have occurred historically (1960 Chile and 1964 Alaska earthquakes) and others which can occur around the Pacific Ocean "Ring of Fire."

In order to enhance the result from the 75- to 90-meter inundation grid data, a method was developed utilizing higher-resolution digital topographic data (3- to 10-meters resolution) that better defines the location of the maximum inundation line (U.S. Geological Survey, 1993; Intermap, 2003; NOAA, 2004). The location of the enhanced inundation line was determined by using digital imagery and terrain data on a GIS platform with consideration given to historic inundation information (Lander, et al., 1993). This information was verified, where possible, by field work coordinated with local county personnel.

The accuracy of the inundation line shown on these maps is subject to limitations in the accuracy and completeness of available terrain and tsunami source information, and the current understanding of tsunami generation and propagation phenomena as expressed in the models. Thus, although an attempt has been made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event.

This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region (Table 1). For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event.

References:

Intermap Technologies, Inc., 2003, Intermap product handbook and quick start guide: Intermap NEXTmap document on 5-meter resolution data, 112 p.

Lander, J.F., Lockridge, P.A., and Kozuch, M.J., 1993, Tsunamis Affecting the West Coast of the United States 1806-1992: National Geophysical Data Center Key to Geophysical Record Documentation No. 29, NOAA, NESDIS, NGDC, 242 p.

National Atmospheric and Oceanic Administration (NOAA), 2004, Interferometric Synthetic Aperture Radar (IfSAR) Digital Elevation Models from GeoSAR platform (EarthData): 3-meter resolution data.

Titov, V.V., and Gonzalez, F.I., 1997, Implementation and Testing of the Method of Tsunami Splitting (MOST): NOAA Technical Memorandum ERL PMEL – 112, 11 p.

Titov, V.V., and Synolakis, C.E., 1998, Numerical modeling of tidal wave runup: Journal of Waterways, Port, Coastal and Ocean Engineering, ASCE, 124 (4), pp 157-171.

U.S. Geological Survey, 1993, Digital Elevation Models: National Mapping Program, Technical Instructions, Data Users Guide 5, 48 p.

Table 1: Tsunami sources modeled for the Orange County coastline.

Sources (M = moment magnitude used in modeled event)		Areas of Inundation Map Coverage and Sources Used		
		Long Beach Harbor	Newport Harbor	Dana Point
Local Sources	Catalina Fault	X	X	X
	Channel Island Thrust Fault			X
	Newport-Inglewood Fault	X	X	X
	San Mateo Thrust Fault			X
	Palos Verdes Submarine Landslide #1	X	X	
	Palos Verdes Submarine Landslide #2	X	X	
Distant Sources	Cascadia Subduction Zone #3 (M9.2)	X		X
	Central Aleutians Subduction Zone#1 (M8.9)	X		X
	Central Aleutians Subduction Zone#2 (M8.9)	X		X
	Central Aleutians Subduction Zone#3 (M9.2)	X	X	X
	Chile North Subduction Zone (M9.4)	X	X	X
	1960 Chile Earthquake (M9.3)	X	X	X
	1952 Kamchatka Earthquake (M9.0)			X
	1964 Alaska Earthquake (M9.2)	X	X	X
	Japan Subduction Zone #2 (M8.8)	X		X
	Kuril Islands Subduction Zone #2 (M8.8)	X		X
	Kuril Islands Subduction Zone #3 (M8.8)	X		X
	Kuril Islands Subduction Zone #4 (M8.8)	X		X

MAP EXPLANATION

Tsunami Inundation Line

Tsunami Inundation Area

PURPOSE OF THIS MAP

This tsunami inundation map was prepared to assist cities and counties in identifying their tsunami hazard. It is intended for local jurisdictional, coastal evacuation planning uses only. This map, and the information presented herein, is not a legal document and does not meet disclosure requirements for real estate transactions nor for any other regulatory purpose.

The inundation map has been compiled with best currently available scientific information. The inundation line represents the maximum considered tsunami runup from a number of extreme, yet realistic, tsunami sources. Tsunamis are rare events; due to a lack of known occurrences in the historical record, this map includes no information about the probability of any tsunami affecting any area within a specific period of time.

Please refer to the following websites for additional information on the construction and/or intended use of the tsunami inundation map:

State of California Emergency Management Agency, Earthquake and Tsunami Program:
http://www.oes.ca.gov/WebPage/oeswebsite.nsf/Content/B1EC
51BA215931768825741F005E8D80?OpenDocument

University of Southern California – Tsunami Research Center:
http://www.usc.edu/dept/tsunamis/2005/index.php

State of California Geological Survey Tsunami Information:
http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/index.htm

National Oceanic and Atmospheric Agency Center for Tsunami Research (MOST model):
http://nctr.pmel.noaa.gov/time/background/models.html

MAP BASE

Topographic base maps prepared by U.S. Geological Survey as part of the 7.5-minute Quadrangle Map Series (originally 1:24,000 scale). Tsunami inundation line boundaries may reflect updated digital orthophotographic and topographic data that can differ significantly from contours shown on the base map.

DISCLAIMER

The California Emergency Management Agency (CalEMA), the University of Southern California (USC), and the California Geological Survey (CGS) make no representation or warranties regarding the accuracy of this inundation map nor the data from which the map was derived. Neither the State of California nor USC shall be liable under any circumstances for any direct, indirect, special, incidental or consequential damages with respect to any claim by any user or any third party on account of or arising from the use of this map.

Emergency Response Plan

The City's Emergency Plan designates procedures that will be followed in responding to anticipated emergencies within the City of Dana Point. The plan describes how the City will prepare for, respond to and recover from an emergency or disaster. It is consistent with state and federal guidelines regarding disaster planning. This includes consistency with the State Administrative Manual (SAM) policies for disasters as well as Federal Emergency Management Agency (FEMA) guidelines. Additionally, the City maintains an Emergency Operations Center (EOC) and communications equipment to coordinate City services during local emergencies such as fires and power outages. Orange County's Emergency Response Plan provides a detailed summary of the countywide organization and identifies the responsibilities of each component agency in the event of a disaster. The Orange County and Operational Area Emergency Operations Center (OC OA/EOC) is used for managing disaster response and recovery for County agencies, departments and constituents served by the County. The OC OA/EOC coordinates disaster response and recovery for its operational area (including all political subdivisions of Orange County) and coordinates operations resource requirements and availability with the State Regional Operations Center. The OC OA/EOC acts as a central point for coordination, and operational, administrative and support needs of the emergency workers.

The OC OA/EOC is staffed with personnel from agencies within the County and various operational area jurisdictions and agencies (this may include but not limited to County personnel from law enforcement, public works, transportation, fire services, etc.) depending on the nature of the emergency. According to the City's General Plan, Pacific Coast Highway, Dana Point Harbor Drive and Street of the Golden Lantern are designated as evacuation routes. Cove Road is also designated as a secondary evacuation route.

Conclusion

It is clear that the science of climate change and Sea Level Rise is evolving and is presently proceeding with little guidance from state or federal agencies. As of this writing, there are no regional or local action plans or general or specific plan provisions to reduce the effects of sea level rise. Additionally, the County of Orange and the City of Dana Point have each not adopted any quantitative thresholds of significance for sea level rise as it relates to the placement of structures within areas potentially susceptible to the effects of sea level rise and/or wave run up.

Presently there are wide deviations in the reliability of data interpretation conclusions. Possible reasons likely have to do with durations used to acquire data, number of monitoring stations, reliability of the measurement devices, standardized protocols data gathering, technological advances in measurement devices and methods of data aggregation and analysis. Nonetheless, it is significant that, despite the differences, both the recent and earlier studies all find a positive trend in global MSL, although systematic bias can be attributed to any such investigations.

Continued efforts to incorporate adaptive design solutions as architectural, engineering and technological solutions are developed, supplemented with on-going monitoring should negate the effects of the various estimates of SLR over the life of the proposed Dana Point Harbor Revitalization Plan facilities and ensure public safety to the greatest extent practicable.

References

1. California Coastal Commission Draft Sea-Level Rise Policy Guidance – Public Review Draft, October 14, 2013

2. Sea-Level Rise for the Coasts of California, Oregon and Washington – Past, Present and Future, 2012, National Academies Press, Washington, D.C.

3. Pachauri, R.K., July 2008
Intergovernmental Panel on Climate Change, Climate Change 2007: Synthesis Report, Geneva

4. Intergovernmental Panel on Climate Change 2007a
IPCC (2001) The Scientific Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change
Cambridge University Press, Cambridge, U.K.

5. Intergovernmental Panel on Climate Change 2007b
IPCC (2001) IPCC Fourth Assessment Report Annex 1: Glossary in Climate Change 2007: The Physical Science Basis, Contribution of working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change
Cambridge University Press, Cambridge, U.K.

6. Noble Consultants, 2003
Dana Point Harbor Revitalization Plan – Master Plan Physical Conditions Assessment

7. BlueWater Design Group, December 2003
Bulkhead Structural Evaluation – Dana Point Marina Redevelopment

8. BlueWater Design Group, January 2005
Orange County Dana Point Harbor Marina Condition Evaluation

9. US Army Corps of Engineers, October 2011
Sea Level Change Considerations for Civil Works Programs

APPENDICES

2012 DATA SUMMARY

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
01/01/12	0930	2.9	13.3	49	30.12
01/01/12	1535	3	13.3	63	30.05
01/07/12	0930	4.7	15.4	53	30.01
01/07/12	1530	3.8	15.4	52	29.95
01/15/12	0815	1.8	13.3	53	30.10
01/15/12	1635	1.5	13.3	59	30.04
01/22/12	0800	3.3	13.3	51	30.12
01/22/12	1625	5.3	15.4	59	30.10
01/30/12	0808	1.5	13.3	49	29.99
01/30/12	1530	1.8	13.3	60	29.95
02/07/12	0830	1.8	14.3	60	29.88
02/07/12	1500	3.1	14.4	60	29.87
02/17/12	1000	2.5	13.3	60	30.15
02/17/12	1530	2.1	12.5	63	30.07
02/23/12	0950	2.4	9.1	59	29.85
02/23/12	1540	2.9	9.1	74	29.78
2/25/12	0900	2.6	12.5	59	30.09
2/25/12	1700	2.2	11.8	57	29.97
03/04/12	0730	1.3	16.7	55	30.07
03/04/12	1430	1.4	16.7	73	29.74
03/11/12	0800	3	14.3	55	30.01
03/11/12	1630	2.6	14.3	59	29.97
03/18/12	0750	10.0	8.3	51	29.76
03/18/12	1545	10.3	7.7	54	29.86
03/27/12	0825	3	15.4	51	30.08
03/27/12	1635	2.8	13.3	58	30.01
03/31/12	0745	4.5	18.2	55	30.01
03/31/12	1530	4.3	18.2	60	29.98
04/11/12	0900	4.8	5.0	57	24.96
04/11/12	1630	3.5	14.3	60	30.03
04/15/12	0730	5.5	9.1	48	30.13
04/15/12	1535	4.4	11.8	60	30.09
04/22/12	0730	3.1	10.0	58	29.92
04/22/12	1545	2.8	15.4	61	29.93
04/30/12	0730	3.5	14.3	62	29.91
04/30/12	1600	4.2	15.4	63	29.94
05/07/12	0730	3.0	14.3	58	29.95
05/07/12	1530	2.9	14.3	64	29.89
05/13/12	0805	2.4	14.3	61	30.09
05/13/12	1530	2.6	20.0	63	29.98
05/25/12	0730	3.8	8.3	62	29.31
05/25/12	1620	4.0	8.3	64	29.74
05/27/12	0725	2.5	7.1	56	30.02
05/27/12	1700	2.5	5.9	64	29.92
06/03/12	0715	3.0	8.3	64	29.84
06/03/12	1525	3.3	7.1	68	29.87
06/10/12	0930	4.0	11.1	63	24.88
06/10/12	1630	4.6	10.5	66	29.85
06/22/12	1615	2.9	15.4	66	29.81
06/22/12	0930	3.1	7.1	64	29.88
06/25/12	0930	3.3	13.3	65	29.98
06/25/12	1630	2.4	13.3	67	29.89

2012 DATA SUMMARY (continued)

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
07/03/12	0930	3.0	7.7	63	29.87
07/03/12	1600	2.4	12.5	68	29.85
07/08/12	0930	2.5	14.3	60	29.98
07/08/12	1700	2.7	14.3	66	29.90
07/17/12	0930	4.8	10	68	29.96
07/17/12	1700	4.8	10	70	29.91
07/23/12	0730	3.0	16.7	66	29.93
07/23/12	1530	3.0	16.7	70	29.90
07/30/12	0730	2.4	15.4	65	29.92
07/30/12	1615	2.3	15.4	69	29.91
08/05/12	0730	2.1	22.2	67	29.93
08/05/12	1715	2.7	20.0	69	29.88
08/12/12	no data	no data	no data	no data	no data
08/12/12	no data	no data	no data	no data	no data
08/21/12	0930	2.2	17.8	70	29.83
08/21/12	1530	2.5	18.2	76	29.84
08/27/12	1030	1.9	5.9	73	29.93
08/27/12	1600	2.1	13.3	75	29.86
09/02/12	no data	no data	no data	no data	no data
09/02/12	no data	no data	no data	no data	no data
09/09/12	no data	no data	no data	no data	no data
09/09/12	no data	no data	no data	no data	no data
09/15/12	0830	3.0	15.4	67	29.98
09/15/12	1530	3.3	15.4	71	29.96
09/20/12	1030	4.2	11.3	72	29.89
09/20/12	1530	3.7	14.3	74	29.83
09/30/12	no data	no data	no data	no data	no data
09/30/12	no data	no data	no data	no data	no data
10/07/12	0830	3.0	13.3	70	29.83
10/07/12	1600	3.2	15.4	73	29.83
10/13/12	0900	2.1	12.5	60	30.14
10/13/12	1600	2.1	12.5	69	30.00
10/19/12	1030	2.8	13.3	70	29.94
10/19/12	1630	3.2	14.3	70	29.84
10/28/12	no data	no data	no data	no data	no data
10/28/12	no data	no data	no data	no data	no data
11/05/12	1100	2.5	11.8	76	29.98
11/05/12	1600	2.5	9.1	74	29.93
11/11/12	0900	2.6	14.3?	57	30.06
11/11/12	1530	2.6	14.3	61	30.14
11/18/12	no data	no data	no data	no data	no data
11/18/12	no data	no data	no data	no data	no data
11/25/12	0930	2.0	13.3	57	29.93
11/25/12	1630	1.8	13.3	60	29.85
12/02/12	no data	no data	no data	no data	no data
12/02/12	no data	no data	no data	no data	no data
12/09/12	no data	no data	no data	no data	no data
12/09/12	no data	no data	no data	no data	no data
12/16/12	no data	no data	no data	no data	no data
12/16/12	no data	no data	no data	no data	no data
12/23/12	no data	no data	no data	no data	no data
12/23/12	no data	no data	no data	no data	no data
12/30/12	no data	no data	no data	no data	no data
12/30/12	no data	no data	no data	no data	no data

2011 DATA SUMMARY

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
01/02/11	0900	1.1	11.8	52	30.10
01/02/11	1500	1.9	16.7	57	29.99
01/08/11	0900	2.4	15.4	51	30.00
01/08/11	1530	3.3	14.3	59	29.94
01/16/11	0900	3.0	15.4	63	30.11
01/16/11	1500	3.2	15.4	72	29.95
01/25/11	0900	3.1	15.4	63	30.02
01/25/11	1500	3.0	15.4	66	29.94
01/30/11	0900	3.8	11.8	57	30.12
01/30/11	1530	3.7	12.5	60	30.04
02/06/11	0830	2.8	14.3	65	30.08
02/06/11	1550	2.9	14.3	66	30.07
02/13/11	0830	1.9	14.3	67	30.10
02/13/11	1550	1.7	14.3	61	30.06
02/20/11	0850	4.0	6.7	48	30.01
02/20/11	1530	4.0	7.1	57	30.02
02/27/11	0830	3.1	7.7	47	30.00
02/27/11	1530	3.8	9.1	56	30.06
03/06/11	1120	2.3	14.3	64	29.98
03/06/11	1530	2.7	5.9	61	29.94
03/13/11	0930	2.5	13.3	53	30.15
03/13/11	1530	2.4	13.5	68	30.15
03/20/11	0920	4.1	13.3	58	29.84
03/20/11	1530	7.4	5.6	58	29.74
03/26/11	0900	5.5	15.4	59	30.00
03/26/11	1500	4.1	14.3	62	29.98
04/02/11	0900	3.4	16.7	64	29.90
04/02/11	1530	3.6	15.4	66	29.90
04/10/11	0930	3.9	14.3	60	30.20
04/10/11	1530	4.0	14.3	63	30.18
04/17/11	0800	3.3	7.7	58	29.83
04/17/11	1530	3.2	8.3	69	29.85
04/24/11	0815	3.7	16.7	58	29.98
04/24/11	1540	3.1	15.4	61	29.98
05/01/11	0930	2.3	15.4	69	30.01
05/01/11	1615	2.3	14.3	70	30.00
05/08/11	0955	2.7	6.3	66	29.92
05/08/11	1445	3.0	15.4	70	29.92
05/15/11	0840	3.0	13.3	59	29.98
05/15/11	1500	3.4	4.8	57	30.02
05/22/11	0930	3.7	7.7	67	29.92
05/22/11	1530	3.7	13.3	69	29.90
05/29/11	0930	4.9	7.1	61	29.78
05/29/11	1530	7.9	8.3	63	29.78
06/05/11	0930	3.9	9.1	61	30.02
06/05/11	1530	5.8	11.1	68	30.02
06/13/11	0930	1.9	14.3	62	29.96
06/13/11	1530	2.4	13.3	66	29.93
06/18/11	0930	3.1	12.5	66	29.92
06/18/11	1600	2.9	14.3	66	29.57
06/26/11	0930	3.8	16.7	66	29.84
06/26/11	1530	4.1	16.7	66	24.80

2011 DATA SUMMARY (continued)

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
07/04/11	1045	2.2	13.3	70	29.32
07/04/11	1630	2.1	10.5	74	29.8
07/10/11	0900	3.9	20	69	29.83
07/10/11	1530	4.6	18.2	76	29.82
07/18/11	0900	2.5	5.9	65	29.87
07/18/11	1630	2.0	6.3	71	29.82
07/24/11	0930	2.3	11.8	65	29.98
07/24/11	1530	2.3	13.3	67	29.97
07/30/11	0930	2.9	14.3	66	29.91
07/30/11	1530	3.4	4.2	67	no data
08/08/11	0845	3.4	16.7	63	29.93
08/08/11	1530	3.2	16.7	69	29.89
08/14/11	0750	2.7	15.4	67	29.87
08/14/11	1630	2.9	15.4	68	29.84
08/22/11	0745	2.7	11.8	65	29.94
08/22/11	1530	3.0	10.0	69	29.88
08/27/11	0930	3.2	7.7	71	29.84
08/27/11	1600	3.4	18.2	89	29.86
09/02/11	0900	4.5	18.2	66	29.87
09/02/11	1700	4.5	18.2	66	29.83
09/12/11	0800	2.9	10	67	30.01
09/12/11	1640	3.1	16.7	69	29.95
09/18/11	0930	1.9	12.5	63	30.01
09/18/11	1640	2.0	13.3	68	29.94
09/24/11	0710	2.2	13.3	64	29.97
09/24/11	1500	1.9	15.4	67	29.91
10/02/11	0915	2.4	8.3	69	29.97
10/02/11	1500	2.3	8.1	73	29.88
10/04/11	0930	2.1	10	61	29.94
10/04/11	1630	2.3	11.8	65	29.91
10/17/11	0730	2.2	12.5	57	29.99
10/17/11	1530	1.9	10.0	63	29.97
10/23/11	0800	1.6	10.5	58	29.94
10/23/11	1530	1.4	12.5	61	29.91
10/30/11	0900	1.7	15.4	63	29.99
10/30/11	1500	1.9	15.4	63	29.94
11/06/11	1015	3.8	15.4	58	29.98
11/06/11	1530	3.7	15.4	59	29.93
11/13/11	0830	3.8	7.1	59	29.84
11/13/11	1700	4.0	6.7	65	24.88
11/20/11	1030	3.1	3.9	58	29.97
11/20/11	1530	4.1	5.0	60	29.90
11/27/11	0740	2.5	12.5	60	30.20
11/27/11	1545	2.6	13.3	78	30.13
12/04/11	0945	2.5	13.3	55	30.16
12/04/11	1530	2.5	12.5	59	30.08
12/11/11	0930	3.2	16.7	54	29.96
12/11/11	1545	2.7	16.7	58	29.88
12/18/11	1000	2.8	13.3	59	30.10
12/18/11	1530	2.9	16.7	60	30.05
12/27/11	0930	4.1	14.3	50	30.16
12/27/11	1530	3.8	14	66	30.16

2010 DATA SUMMARY

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
01/02/10	0930	3.7	11.8	60	30.02
01/02/10	1530	4.3	11.1	66	29.96
01/12/10	0930	4.0	13.3	68	30.10
01/12/10	1530	3.8	13.3	60	30.08
01/17/10	0930	3.5	12.5	62	29.96
01/17/10	1530	3.1	13.3	61	29.92
01/23/10	0930	7.6	14.3	55	29.99
01/23/10	1530	7.5	15.4	59	30.01
01/30/10	0930	3.6	14.3	64	29.97
01/30/10	1530	4.3	14.3	62	29.90
02/07/10	0930	7.4	14.3	58	29.90
02/07/10	1530	6.8	14.3	60	29.88
02/17/10	0930	3.0	13.3	63	29.95
02/17/10	1530	2.7	13.3	67	29.90
02/21/10	0900	5.8	11.8	58	29.99
02/21/10	1500	6.0	12.5	63	29.98
02/28/10	0900	9.4	16.7	57	29.90
02/28/10	1600	7.3	14.3	64	29.93
03/07/10	0900	3.8	14.3	64	29.79
03/07/10	1600	5.8	14.3	68	29.80
03/14/10	0930	4.0	13.3	60	30.01
03/14/10	1530	3.5	13.3	65	30.01
03/21/10	0930	2.0	13.3	61	30.10
03/21/10	1600	1.7	14.3	67	30.02
03/26/10	0930	4.0	15.4	62	30.06
03/26/10	1530	3.8	13.3	65	30.02
04/03/10	0930	4.2	14.3	61	29.98
04/03/10	1530	3.3	15.4	63	29.92
04/12/10	0930	5.1	14.3	62	29.94
04/12/10	1530	5.1	10.0	63	29.95
04/17/10	0930	3.0	16.7	64	29.94
04/17/10	1530	3.1	15.4	67	29.90
04/26/10	0930	2.0	15.4	58	29.93
04/26/10	1530	2.0	15.4	62	29.90
05/02/10	1200	2.8	7.7	67	29.95
05/02/10	1550	3.1	10.5	66	29.95
05/08/10	0930	3.4	13.3	68	29.91
05/08/10	1530	2.7	13.3	68	29.90
05/15/10	0930	2.9	16.7	61	29.95
05/15/10	1530	3.4	16.7	65	29.94
05/23/10	0930	8.9	8.3	58	29.87
05/23/10	1530	9.2	18.2	64	29.85
05/30/10	0930	2.8	9.1	67	29.90
05/30/10	1530	2.7	9.1	72	29.88
06/06/10	0900	3.3	11.1	67	29.94
06/06/10	1530	3.1	11.8	72	29.94
06/14/10	0930	2.4	18.2	70	29.95
06/14/10	1530	2.5	16.7	68	29.90
06/19/10	0930	3.6	7.7	68	29.99
06/19/10	1530	2.7	15.4	70	29.98
06/26/10	0930	3.8	16.7	64	29.94
06/26/10	1530	3.5	18.2	72	29.91

2010 DATA SUMMARY (continue)

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
07/05/10	0900	5.2	16.7	65	29.97
07/05/10	1530	4.0	16.7	67	29.94
07/11/10	0930	2.1	15.4	64	29.92
07/11/10	1530	2.0	15.4	68	29.92
07/17/10	0930	2.9	6.7	73	29.91
07/17/10	1530	3.1	15.4	73	29.88
07/25/10	0930	3.0	15.4	63	29.90
07/25/10	1530	3.1	15.4	68	29.88
08/01/10	0930	3.0	16.7	66	29.93
08/01/10	1530	3.1	16.7	74	29.88
08/08/10	0930	2.6	15.4	66	29.90
08/08/10	1530	2.7	14.3	69	29.89
08/14/10	0930	2.6	6.3	69	29.88
08/14/10	1530	2.7	61.6	66	29.86
08/21/10	0930	3.6	16.7	67	29.84
08/21/10	1530	4.1	16.7	69	29.83
08/28/10	0930	3.4	16.7	65	29.82
08/28/10	1530	3.8	15.4	70	29.79
09/07/10	0945	2.9	10	69	29.85
09/07/10	1600	3.0	9.1	73	29.83
09/11/10	0945	2.2	13.3	73	29.96
09/11/10	1530	2.7	15.4	67	29.92
09/19/10	0930	3.6	15.5	68	29.88
09/19/10	1700	3.4	14.3	67	29.78
09/25/10	0930	1.6	14.3	71	29.90
09/25/10	1530	1.7	10.0	76	29.84
10/03/10	0930	2.9	15.4	70	29.97
10/03/10	1530	2.4	15.4	72	29.92
10/10/10	0930	1.9	10.0	71	29.98
10/10/10	1530	2.2	10.0	74	29.86
10/17/10	0930	3.0	14.3	66	30.02
10/17/10	1540	2.8	14.3	69	30.00
10/23/10	0930	2.7	16.7	64	30.07
10/23/10	1530	3.4	16.7	70	30.03
10/31/10	0930	3.1	12.5	67	30.10
10/31/10	1530	2.7	10.5	70	30.03
11/07/10	0930	3.4	11.1	74	31.00
11/07/10	1530	3.5	12.5	68	30.06
11/13/10	0900	2.5	15.4	62	30.10
11/13/10	1530	3.3	7.1	71	29.98
11/21/10	0930	3.3	15.4	58	29.92
11/21/10	1600	4.9	6.3	59	30.02
11/28/10	0930	4.2	7.1	52	29.97
11/28/10	1530	5.1	6.7	58	29.94
12/05/10	0900	2.4	16.7	56	30.06
12/05/10	1530	2.5	15.4	60	30.02
12/12/10	0930	2.0	10.0	65	30.11
12/12/10	1530	2.1	8.3	76	29.99
12/19/10	0930	4.0	4.8	61	29.94
12/19/10	1500	5.0	4.8	63	29.85
12/26/10	0940	4.0	8.3	58	30.14
12/26/10	1500	3.3	13.3	61	30.14

2009 DATA SUMMARY

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
01/06/09	0930	2.8	14.3	54	30.12
01/06/09	1530	2.9	15.4	58	30.08
01/11/09	0930	1.5	13.3	63	30.24
01/11/09	1530	1.8	16.7	76	30.10
01/18/09	0930	2.4	16.7	71	30.12
01/18/09	1530	2.2	13.3	75	30.10
01/26/09	0930	6.2	7.1	56	30.00
01/26/09	1530	4.6	6.7	58	29.96
02/01/09	0930	1.9	12.5	66	30.04
02/01/09	1530	2.1	7.1	61	30.02
02/07/09	0930	3.5	11.8	63	29.84
02/07/09	1530	4.0	12.5	60	29.82
02/15/09	0930	2.9	10.0	54	30.02
02/15/09	1530	2.0	8.3	60	29.95
02/22/09	1000	2.1	11.8	62	30.06
02/22/09	1530	2.0	16.7	68	30.00
03/01/09	0930	1.6	15.4	68	30.00
03/01/09	1530	2.0	14.3	72	29.95
03/08/09	0930	1.3	11.8	64	30.00
03/08/09	1600	1.4	11.8	70	30.00
03/16/09	0930	3.2	14.3	58	30.15
03/16/09	1530	3.4	15.4	60	30.09
03/22/09	0930	2.2	11.1	59	30.06
03/22/09	1530	6.6	6.3	64	30.08
03/30/09	0930	3.1	14.3	62	29.96
03/30/09	1830	3.6	14.3	60	29.94
04/03/09	0900	3.2	7.1	54	29.82
04/03/09	1530	3.6	8.3	63	29.80
04/12/09	0930	3.1	6.7	60	30.12
04/12/09	1530	3.0	16.7	67	30.04
04/19/09	0930	2.0	14.3	71	29.90
04/19/09	1530	1.9	14.3	78	29.92
04/26/09	0930	3.5	14.3	59	30.00
04/26/09	1530	4.0	8.3	69	30.00
05/03/09	0930	2.9	14.3	65	30.00
05/03/09	1530	3.0	15.4	72	30.02
05/11/09	0930	2.7	9.1	64	29.89
05/11/09	1530	3.1	9.1	68	29.88
05/17/09	0930	2.3	7.7	64	29.94
05/17/09	1530	2.3	7.7	68	29.90
05/24/09	0930	3.0	14.3	63	29.96
05/24/09	1530	3.3	14.3	68	29.94
05/31/09	0930	1.8	15.4	62	29.96
05/31/09	1530	2.0	13.3	67	29.92
06/07/09	0930	2.5	15.4	67	29.95
06/07/09	1530	2.5	14.3	71	29.90
06/15/09	0930	4.0	16.7	66	29.95
06/15/09	1530	3.8	15.4	73	29.94
06/21/09	0930	3.2	7.1	66	29.86
06/21/09	1530	3.1	9.1	72	29.82
06/29/09	0930	2.7	16.7	64	29.84
06/29/09	1530	2.2	16.7	72	29.90

2009 DATA SUMMARY (continued)

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
07/05/09	0930	2.6	14.3	67	29.96
07/05/09	1530	2.7	16.7	68	29.92
07/12/09	0930	2.7	14.3	75	29.96
07/12/09	1530	2.6	13.3	77	29.97
07/18/09	0930	3.1	14.3	71	29.91
07/18/09	1530	2.9	13.3	72	29.84
07/25/09	0930	6.0	16.7	78	29.91
07/25/09	1530	5.8	15.4	77	29.91
08/01/09	0930	2.3	9.1	75	29.94
08/01/09	1530	2.2	13.3	76	29.94
08/08/09	0930	2.9	11.8	73	29.96
08/08/09	1530	3.2	14.3	74	29.93
08/15/09	0930	3.1	10.0	72	29.92
08/15/09	1530	2.9	9.1	74	29.92
08/22/09	0930	3.8	18.2	72	29.90
08/22/09	1530	3.7	16.7	77	29.89
08/31/09	0930	2.6	8.3	75	29.81
08/31/09	1530	2.4	10.0	75	29.78
09/05/09	0930	2.6	8.3	78	29.87
09/05/09	1530	2.9	7.7	75	29.83
09/14/09	0930	3.8	14.3	74	29.96
09/14/09	1530	3.3	13.3	74	29.94
09/22/09	0945	2.8	15.4	66	29.82
09/22/09	1500	3.0	15.4	71	29.85
09/27/09	0930	3.0	16.7	69	29.88
09/27/09	1530	2.6	13.3	73	29.78
10/03/09	0930	2.6	20.0	70	29.78
10/03/09	1530	3.8	10.5	73	29.70
10/11/09	0900	1.5	11.8	65	29.86
10/11/09	1530	1.7	12.5	64	29.82
10/18/09	0930	2.0	13.3	67	29.95
10/18/09	1600	2.3	14.3	71	29.90
10/24/09	0930	2.5	13.3	68	29.92
10/24/09	1530	3.0	10.0	72	29.82
11/03/09	0930	2.3	16.7	63	29.98
11/03/09	1530	2.3	10.5	61	29.91
11/09/09	0930	2.5	15.4	61	30.01
11/09/09	1530	2.6	15.4	67	29.96
11/14/09	0930	3.5	7.1	63	29.99
11/14/09	1530	3.4	8.3	64	29.96
11/25/09	0930	2.5	15.4	68	29.99
11/25/09	1530	2.6	14.3	69	29.94
11/28/09	0930	9.0	8.3	56	29.80
11/28/09	1530	6.7	8.3	60	29.77
12/06/09	0930	2.9	2.0	55	29.91
12/06/09	1530	3.0	18.2	62	29.88
12/12/09	0930	2.5	14.3	60	30.01
12/12/09	1530	2.8	3.7	60	29.96
12/22/09	0930	10.0	8.3	56	29.85
12/22/09	1530	6.9	8.3	57	29.80
12/28/09	0930	4.1	14.3	58	30.02
12/28/09	1530	3.8	15.4	64	29.94

2008 DATA SUMMARY

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
01/06/08	0930	6.1	14.3	59	29.96
01/06/08	1530	6.3	12.5	57	29.94
01/13/08	0930	3.4	15.4	60	30.07
01/13/08	1530	3.5	14.2	67	30.12
01/20/08	0930	2.1	16.7	54	30.00
01/20/08	1530	2.1	15.4	60	29.90
01/27/08	0930	7.5	7.7	61	29.96
01/27/08	1530	6.5	7.7	60	29.86
02/03/08	0930	4.4	14.3	64	29.95
02/03/08	1530	5.7	6.3	64	29.86
02/10/08	1000	2.6	16.7	61	30.02
02/10/08	1530	3.0	15.4	66	29.99
02/17/08	0900	2.9	15.4	60	30.10
02/17/08	1530	2.5	15.4	64	30.00
02/24/08	0930	3.9	4.8	55	30.12
02/24/08	1530	5.7	18.2	61	30.12
03/02/08	0930	3.8	16.7	59	30.00
03/02/08	1530	4.1	16.7	63	29.98
03/09/08	0930	3.3	7.7	56	30.00
03/09/08	1530	2.7	12.5	69	29.98
03/16/08	0930	6.8	7.7	51	29.83
03/16/08	1530	6.6	11.8	58	29.83
03/23/08	0930	2.6	15.4	63	30.02
03/23/08	1530	2.6	10.0	72	30.00
03/30/08	0930	3.7	6.7	59	29.98
03/30/08	1530	4.4	7.7	61	30.02
04/06/08	0930	3.2	14.3	61	29.98
04/06/08	1530	2.8	13.3	65	30.00
04/13/08	0930	1.9	13.3	69	29.94
04/13/08	1530	2.2	12.5	83	29.90
04/20/08	0930	4.2	18.2	60	30.00
04/20/08	1530	3.4	16.7	63	30.00
04/27/08	0930	2.1	13.3	85	29.94
04/27/08	1530	2.2	13.3	85	29.90
05/04/08	0930	3.5	7.1	64	29.86
05/04/08	1530	3.0	6.7	66	29.86
05/11/08	0945	3.6	14.3	63	29.94
05/11/08	1530	3.1	14.3	66	29.92
05/18/08	0930	2.7	12.5	74	29.90
05/18/08	1530	3.3	13.3	78	29.88
05/25/08	0945	2.0	13.3	62	29.92
05/25/08	1530	2.0	13.3	62	29.90
06/08/08	0930	3.1	11.1	67	29.84
06/08/08	1530	3.1	18.2	71	29.84
06/15/08	0930	3.1	14.3	66	29.90
06/15/08	1530	3.6	18.2	67	29.88
06/22/08	0930	2.5	15.4	76	29.92
06/22/08	1530	2.7	14.3	82	29.90
06/29/08	0930	2.7	16.7	68	29.96
06/29/08	1530	3.5	15.4	70	29/92
07/06/08	0930	3.1	8.3	70	29.80
07/06/08	1530	2.8	7.7	74	29.76

2008 DATA SUMMARY (continued)

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
07/14/08	0915	2.5	12.5	72	29.92
07/14/08	1520	2.3	12.5	74	29.88
07/21/08	0930	3.9	14.3	71	29.92
07/21/08	1530	3.3	14.3	73	29.90
07/27/08	0930	2.3	15.4	76	29.96
07/27/08	1530	2.5	15.4	76	29.96
08/03/08	0930	2.4	14.3	71	29.86
08/03/08	1530	2.5	9.1	76	29.83
08/10/08	0930	2.8	11.1	75	29.94
08/10/08	1430	2.9	10.5	77	29.92
08/17/08	0930	2.5	16.7	74	29.88
08/17/08	1530	2.3	13.3	71	29.84
08/24/08	0930	2.4	15.4	69	29.84
08/24/08	1530	2.6	15.4	71	29.78
08/30/08	0930	2.7	15.4	75	29.74
08/30/08	1530	2.5	14.3	78	29.70
09/07/08	0930	2.3	18.2	68	29.78
09/07/08	1530	2.9	18.2	74	29.75
09/14/08	0930	2.4	13.3	66	29.93
09/14/08	1530	2.5	15.4	74	29.88
09/21/08	0930	2.6	14.3	68	29.94
09/21/08	1530	2.6	11.1	74	29.90
09/29/08	0930	3.0	14.3	67	29.87
09/29/08	1530	2.5	13.3	70	29.83
10/05/08	0930	4.8	15.4	66	29.90
10/05/08	1530	5.1	14.3	71	29.88
10/12/08	0930	2.5	11.8	64	29.95
10/12/08	1530	2.9	3.2	67	29.95
10/19/08	0930	2.6	14.3	61	30.00
10/19/08	1530	2.2	20.0	69	29.96
10/26/08	0930	3.6	14.3	66	30.04
10/26/08	1530	3.3	14.3	70	29.98
11/02/08	no data	no data	no data	no data	no data
11/02/08	no data	no data	no data	no data	no data
11/09/08	no data	no data	no data	no data	no data
11/09/08	no data	no data	no data	no data	no data
11/16/08	no data	no data	no data	no data	no data
11/16/08	no data	no data	no data	no data	no data
11/23/08	no data	no data	no data	no data	no data
11/23/08	no data	no data	no data	no data	no data
11/30/08	no data	no data	no data	no data	no data
11/30/08	no data	no data	no data	no data	no data
12/06/08	0930	2.6	13.3	65	30.12
12/06/08	1530	2.1	13.3	68	30.07
12/14/08	0930	3.9	6.7	58	30.02
12/14/08	1530	4.1	6.3	63	29.97
12/22/08	0930	2.6	3.3	54	29.90
12/22/08	1530	4.2	5.3	57	29.94
12/28/08	0930	1.7	6.7	56	30.22
12/28/08	1530	2.0	11.8	58	30.12

2007 DATA SUMMARY

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
01/08/07	0930	2.1	9.1	66	30.12
01/08/07	1530	2.6	14.3	80	30.00
01/16/07	0930	1.7	15.4	59	30.16
01/16/07	1530	1.9	14.3	59	30.10
01/21/07	0930	2.9	14.3	63	30.04
01/21/07	1530	2.2	13.3	64	29.97
01/28/07	0930	2.9	15.4	54	30.05
01/28/07	1530	2.4	12.5	60	30.00
02/04/07	0930	2.3	11.1	60	31.04
02/04/07	1530	2.3	12.5	70	30.03
02/12/07	0930	3.8	13.3	59	30.09
02/12/07	1530	3.8	15.4	62	30.03
02/20/07	0940	2.6	12.5	62	30.16
02/20/07	1530	2.6	12.5	62	30.10
02/25/07	0930	3.3	5.9	58	30.09
02/25/07	1530	3.5	5.9	62	30.02
03/05/07	0930	1.1	15.4	64	30.04
03/05/07	1530	1.2	15.4	70	30.00
03/14/07	0930	3.0	15.4	57	30.07
03/14/07	1530	3.6	15.4	62	30.02
03/19/07	0930	2.1	12.5	60	29.99
03/19/07	1530	1.9	13.3	66	29.98
03/25/08	0930	2.4	13.3	60	30.06
03/25/08	1530	2.9	12.8	57	30.50
04/01/07	0930	2.2	18.2	58	29.90
04/01/07	1530	2.3	18.2	64	29.85
04/08/07	0930	3.4	15.4	56	29.91
04/08/07	1530	3.1	15.4	71	29.90
04/15/07	0930	7.1	9.1	61	29.86
04/15/07	1530	6.1	8.3	60	29.88
04/23/07	0930	3.0	18.2	60	30.03
04/23/07	1530	3.1	15.4	64	30.03
04/29/07	0930	3.0	13.3	61	29.98
04/29/07	1530	3.1	13.3	70	29.94
05/06/07	0930	3.6	10.0	73	29.90
05/06/07	1530	2,9	10.0	72	29.86
05/13/07	0930	2.4	7.1	62	29.98
05/13/07	1530	2.2	6.7	65	29.95
05/20/07	0930	2.6	9.1	61	29.90
05/20/07	1530	2.5	9.1	71	29.87
05/27/07	0930	2.3	15.4	62	29.94
05/27/07	1530	2.5	15.4	71	29.93
06/03/07	0930	2.8	14.3	62	29.94
06/03/07	1530	3.1	15.4	70	29.94
06/10/07	0930	2.1	13.3	66	29.87
06/10/07	1530	2.2	13.3	70	29.85
06/17/07	0930	2.7	15.4	70	29.90
06/17/07	1530	2.0	16.7	71	29.88
06/24/07	0930	2.6	9.1	65	29.87
06/24/07	1530	2.8	9.1	70	29.86
07/01/07	0930	3.6	7.7	72	29.90
07/01/07	1530	3.1	7.7	76	29.88
07/08/07	0930	3.4	14.3	69	29.90
07/08/07	1530	3.3	13.3	76	29.89

2007 DATA SUMMARY (continued)

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
07/16/07	0930	2.6	8.3	68	29.90
07/16/07	1530	2.5	7.1	76	29.89
07/23/07	0930	2.2	9.1	71	29.91
07/23/07	1530	2.2	9.1	75	29.85
07/29/07	0930	2.3	8.3	74	29.86
07/29/07	1530	2.5	6.3	82	29.84
08/05/07	0930	1.8	12.5	71	29.93
08/05/07	1530	1.9	12.5	77	29.91
08/13/07	0915	2.4	11.8	76	29.92
08/13/07	1530	2.5	10.5	84	29.88
08/19/07	0930	2.7	20.0	76	29.83
08/19/07	1530	2.7	20.0	79	29.84
08/26/07	0930	2.9	14.3	71	29.89
08/26/07	1530	3.0	14.3	76	29.80
09/03/07	0930	3.6	15.4	84	29.78
09/03/07	1530	2.2	16.7	85	29.72
09/10/07	0930	2.0	12.5	69	29.94
09/10/07	1530	2.3	13.3	70	29.90
09/16/07	0930	2.9	16.7	67	29.94
09/16/07	1530	2.7	16.7	74	29.91
09/23/07	0930	2.5	14.3	66	29.94
09/23/07	1530	2.9	14.3	70	29.92
09/30/07	0930	1.9	16.7	68	29.95
09/30/07	1530	2.2	7.1	72	29.94
10/06/07	0930	4.2	7.7	64	30.02
10/06/07	1530	3.2	9.1	69	29.98
10/14/07	0930	2.6	15.4	64	29.92
10/14/07	1530	3.2	14.3	66	29.89
10/22/07	0930	3.6	14.3	78	30.14
10/22/07	1530	3.4	15.4	85	30.06
10/28/07	0930	2.2	12.5	69	30.09
10/28/07	1530	2,5	11.1	73	30.02
11/04/07	0930	2.5	16.7	64	30.02
11/04/07	1530	2.5	16.7	61	29.98
11/11/07	0930	2.3	14.3	62	29.95
11/11/07	1530	2.3	13.3	65	29.89
11/18/07	0930	2.8	13.3	58	29.99
11/18/07	1530	3.0	13.3	60	29.94
11/25/07	0930	1.9	15.4	63	30.00
11/25/07	1530	2.2	15.4	64	29.98
12/02/07	0930	2.2	15.4	57	30.31
12/02/07	1530	2.3	14.3	59	30.26
12/09/07	0930	3.4	11.8	56	29.97
12/09/07	1530	3.5	9.1	62	29.92
12/16/07	0930	2.0	15.4	55	30.04
12/16/07	1530	2.1	14.3	58	29.97
12/25/07	0945	3.7	12.5	no data	30.04
12/25/07	1500	3.6	15.4	65	30.10
12/30/07	0930	2.4	7.1	51	30.16
12/30/07	1530	2.7	7.7	59	30.06

2006 DATA SUMMARY

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
01/01/06	0930	4.1	13.3	57	29.98
01/01/06	1530	3.9	11.8	59	29.91
01/07/06	0915	4.6	14.3	60	30.00
01/07/06	1520	5.4	14.3	64	29.97
01/16/06	0930	4.1	6.7	52	30.25
01/16/06	1530	3.3	9.1	62	30.20
01/23/06	0930	2.6	14.3	66	30.10
01/23/06	1530	2.6	8.3	72	29.92
01/29/06	0930	2.4	12.2	59	30.12
01/29/06	1530	2.6	11.8	66	30.10
02/05/06	0930	3.1	15.4	66	29.88
02/05/06	1545	3.8	15.4	69	29.90
02/12/06	0950	3.8	14.3	73	30.12
02/12/06	1600	4.4	13.3	68	30.02
02/20/06	0930	2.2	16.7	59	30.14
02/20/06	1530	2.3	13.3	62	30.09
02/26/06	0930	1.4	15.4	56	30.02
02/26/06	1630	1.2	14.3	64	29.96
03/06/06	0930	2.4	11.1	57	30.12
03/06/06	1530	2.6	16.7	69	30.10
03/13/06	0930	3.2	10.0	64	30.19
03/13/06	1530	3.4	10.0	62	30.12
03/20/06	0830	3.2	11.0	54	29.93
03/20/06	1530	2.7	7.7	62	29.93
03/26/06	0930	2.9	6.7	58	29.98
03/26/06	1530	2.9	7.7	61	29.97
04/01/06	0945	2.6	3.3	59	30.10
04/01/06	1530	2.6	16.7	65	30.10
04/08/06	0940	2.3	14.3	62	30.06
04/08/06	1530	2.3	15.4	62	30.05
04/17/06	0930	3.1	15.4	60	30.06
04/17/06	1530	3.4	6.3	63	30.05
04/22/06	0930	2.1	14.3	62	29.90
04/22/06	1530	2.6	5.0	64	29.92
04/30/06	1020	2.2	14.3	69	29.96
04/30/06	1645	2.6	14.3	73	29.90
05/06/06	0930	3.3	16.7	63	29.98
05/06/06	1530	3.8	15.4	67	29.94
05/15/06	0930	3.8	15.4	64	29.92
05/15/06	1530	3.0	14.3	70	29.94
05/20/06	0930	3.9	14.3	70	29.94
05/20/06	1530	3.3	14.3	70	29.92
05/29/06	0930	3.3	6.7	69	29.96
05/29/06	1530	3.1	7.7	72	29.94
06/04/06	0930	3.6	7.7	70	29.82
06/04/06	1530	3.8	8.3	70	29.82
06/11/06	0945	2.6	16.7	70	29.82
06/11/06	1600	2.8	16.7	73	29.82
06/20/06	1000	4.7	18.2	75	29.92
06/20/06	1530	4.1	16.7	76	29.91
06/25/06	0900	3.1	13.1	70	29.92
06/25/06	1500	3.8	15.4	73	29.86
07/02/06	0930	3.0	15.4	71	29.89
07/02/06	1530	3.4	14.3	80	29.88
07/09/06	1000	2.7	14.3	78	29.84
07/09/06	1530	2.6	15.4	80	29.80

2006 DATA SUMMARY (continued)

Date	Time	State of Sea		Air Temp	Pressure
		Height (feet)	Period (seconds)		
07/16/06	0930	4.0	14.3	69	29.96
07/16/06	1530	3.8	10.0	84	29.92
07/24/06	0930	2.9	10.0	80	29.74
07/24/06	1530	3.1	14.3	87	29.66
07/31/06	0930	3.6	16.7	71	29.88
07/31/06	1530	3.0	15.4	78	29.86
08/05/06	0930	2.8	14.3	75	29.94
08/05/06	1530	3.0	14.3	77	29.92
08/11/06	0930	1.7	12.5	76	29.91
08/11/06	1540	1.8	12.5	80	29.86
08/18/06	1020	2.2	10.0	72	29.98
08/18/06	1500	2.2	15.0	74	29.94
08/23/06	0930	2.1	16.7	76	29.95
08/23/06	1530	2.1	15.4	77	29.91
09/04/06	0930	3.4	7.7	76	29.82
09/04/06	1530	3.2	7.1	74	29.80
09/11/06	0930	2.9	15.4	71	29.92
09/11/06	1500	3.4	15.4	70	29.87
09/17/06	0915	3.0	14.3	67	29.90
09/17/06	1500	2.5	18.2	75	29.86
09/24/06	0900	2.8	13.3	63	29.94
09/24/06	1530	3.7	14.3	77	29.86
10/01/06	0930	2.8	14.3	65	29.92
10/01/06	1530	2.7	11.8	75	29.88
10/08/06	1000	2.0	14.3	57	29.94
10/08/06	1550	2.2	14.3	70	29.90
10/15/06	1010	2.6	14.3	65	29.86
10/15/06	1530	2.4	13.3	67	29.82
10/24/06	0930	3.1	14.3	68	29.90
10/24/06	1530	3.1	15.4	70	29.87
10/29/06	0930	2.4	14.3	67	29.95
10/29/06	1530	2.5	14.3	72	29.90
11/06/06	0930	2.5	15.4	70	30.00
11/06/06	1530	2.4	14.3	79	29.94
11/12/06	0945	3.6	9.1	64	30.02
11/12/06	1545	4.7	9.1	66	29.98
11/19/06	0930	1.9	13.3	67	29.98
11/19/06	1530	2.2	13.3	70	29.94
11/26/06	0930	2.9	8.3	64	29.98
11/26/06	1530	2.5	7.7	68	29.94
12/04/06	0930	1.8	14.3	64	30.10
12/04/06	1530	1.6	13.3	69	30.02
12/12/06	0930	3.8	15.4	60	30.26
12/12/06	1530	4.0	14.3	63	30.20
12/18/06	0900	4.2	9.1	58	30.19
12/18/06	1500	2.7	125	64	30.04
12/24/06	0930	3.6	13.1	61	30.12
12/24/06	1530	3.0	12.5	69	30.20
12/31/06	0930	2.1	15.4	54	30.20
12/31/06	1530	2.5	13.3	62	30.10

DATE (month and year): Jan 2006 | NOAA FORM 72-5A (5-73)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

FORM APPROVED
O.M.B. NO. 41-R2734

MARINE COASTAL WEATHER LOG —— COASTAL STATION

STATION NAME: DANA POINT | STATE: CA | STATION CALL: 9LØ | LOCATION: 33 27 N (Latitude) 117 41 W (Longitude)

(1) DATE	(2) TIME	(3) SKY COND.	(3) PRESENT WEATHER	(4) VISIBILITY (miles)	(5) WIND DIR	(5) WIND SPEED (knots)	(6) STATE OF SEA HEIGHT (feet)	(6) STATE OF SEA PERIOD (sec.)	(7) SEA WATER TEMP ☐C ■F	(8) AIR TEMP ☐C ■F	(9) PRESSURE	(10) REMARKS
1/28	9:50	P/C		20	SSE	3	2.4	12.5	57.0	59.5	30.22	L. 46.4°
1/28	3:30	P/C		15	SW	4	2.2	15.4	57.8°	64.2°	30.14	H. 64.8°
1/29	9:30	P/C		15	SE	4	2.4	12.2	57.4	58.9	30.12	
1/29	3:30	P/C		15	SW	5	2.6	11.8	57.6	65.8	30.10	
1/30	950	PC	HAZY	5	W	5	3.2	16.7	57.7	58.8	30.10	L: 45.5
1/30	350	PC		8	W	5	3.0	15.4	58.4	61.9	30.01	H: 65.7
1/31	9:45	P/C	Hazy	10	SE	5	3.1	6.3	57.8°	64.7°	30.02	L 54.1°
1/31	3:30	C	W/Haze	20	W	10	3.6	6.3	58.6°	65.7°	29.98	H. 66.4

NOAA FORM 72-5A (5-73) SUPERSEDES PREVIOUS EDITION

DATE (month and year): JAN 2006 | NOAA FORM 72-5A (5-73)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

FORM APPROVED
O.M.B. NO. 41-R2734

MARINE COASTAL WEATHER LOG —— COASTAL STATION

STATION NAME: DANA POINT | STATE: CA | STATION CALL: 9LØ | LOCATION: 33 27 N (Latitude) 117 41 W (Longitude)

(1) DATE	(2) TIME	(3) SKY COND.	(3) PRESENT WEATHER	(4) VISIBILITY (miles)	(5) WIND DIR	(5) WIND SPEED (knots)	(6) STATE OF SEA HEIGHT (feet)	(6) STATE OF SEA PERIOD (sec.)	(7) SEA WATER TEMP ☐C ■F	(8) AIR TEMP ☐C ■F	(9) PRESSURE	(10) REMARKS
1/19	1005	P/Cy		10	NNW	8-10	5.0	7.1	57.7	59.7	30.06	L 47.1
1/19	3:30	P/Cy		15	WNW	10-15	5.5	15.4	57.6	62.6	30.02	H- 65.5 Gusts to 20
1/20	9:15	Scattered clouds		20	ENE	2	4.3	14.3	57.0	56.8°	30.14	L 42.1°
1/20	3:30	C		25	WNW	10	4.3	13.3	57.5°	65.5°	30.18	H. 65.5°
1/21												L. 40.1°
1/21	3:30	C		20	WNW	[illegible]	3.0	9.1	57.9°	59.9°	30.02	H. 61.9
1/22												
1/22	330	C		25	WNW	10	3.1	6.7	57.7°	71°	29.98	
1/23	930	C		20	WNW	4	2.6	14.3	55.9	65.7	30.10	L: 52.3 / H- 72.9
1/23	1530	C		20	NNE	11	2.6	8.3	57.0	71.8	29.92	
1/24	930	C		15	NNE	8	2.6	15.4	56.8	70	29.91	L: 55.2
1/24	1530	PC		15	SE	15	2.6	14.3	57.0	62.4	29.93	H: 73.6
1/25	1000	P/C		25	SSE	7	2.5	13.3	56.7°	59°	30.08	L 46.8°
1/25	3:30	P/C		25	SSW	5	2.7	13.3	57.7°	61.5°	30.06	H 61.7°
1/26	9:30	P/C		20	N	3	1.9	12.5	57.3°	59.5°	30.16	L 48.6°
1/26	3:30	P/C		20	WSW	5	1.8	15.4	58.3°	62.2°	30.10	H 63.5°
1/27	4:35	P/C		15	S	3	3.1	14.3	57.7°	61.3°	30.16	L 48.7°
1/27	4:00	P/C		15	W	8	3.1	14.3	58.8°	62.1°	30.10	H. 65.5°

DATE (month and year): JAN 2006 | NOAA FORM 72-5A (5-73)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

FORM APPROVED
O.M.B. NO. 41-R2734

MARINE COASTAL WEATHER LOG —— COASTAL STATION

STATION NAME: DANA POINT | STATE: CA | STATION CALL: 9LØ | LOCATION: 33 27 N (Latitude) 117 41 W (Longitude)

(1) DATE	(2) TIME ( )	(3) SKY COND.	(3) PRESENT WEATHER	(4) VISIBILITY (miles)	(5) WIND DIR	(5) WIND SPEED (knots)	(6) STATE OF SEA HEIGHT (feet)	(6) STATE OF SEA PERIOD (sec.)	(7) SEA WATER TEMP °C ■F	(8) AIR TEMP °C ■F	(9) PRESSURE	(10) REMARKS
1/10	945	C/SY		30	SE	4	2.9	11.8	59.2	62.9	30.10	L- 45.4
1/10	245	C/SY		25	WSW	4	2.8	11.8	60.7	67.6°	30.02	H- 68°
1/11	1000	P/CY		20	WSW	4	3.1	10.5	60.4	60.4	30.02	L- 41.9°
1/11	350	CY		15	SSW	4	3.2	15.4	60.2	61°	29.96	H- 63.5
1/12	925	CY		15	NNE	3	3.0	14.3	59.3	58.5	30.00	L- 45.6
1/12	310	P/CY		10	WNW	8-10	2.9	13.3	60.2	62.4°	29.94	H- 68°
1/13	9:49	P/C		10	SSE	2	2.4	15.4	59.3°	56.7°	30.02	L. 46.2°
1/13	3:13	P/C		12	S	4	2.5	14.3	64.8°	59.8°	29.98	H-64.6°
1/14	9:40	P/C		15	S	5	2.3	13.3	59.2°	62.6°	30.02	L. 51.3°
1/14	3:48	CY		15	SW	4	3.7	15.4	59.3°	60.1°	30.00	H-66.7° Trace rain
1/15												
1/15	415	P/C		15	NW	14	6.2	12.5	58.9°	57°	30.06	
1/16	930	PC		15	CALM		4.1	6.7	58	52	30.25	L: 37°
1/16	330	PC		15	SW	2	3.3	9.1	58	62	30.20	H:62
1/17	930	PC		15	CALM		2.3	11.1	58	60.6	30.25	L:43°
1/17	1530	PC		15	SW	6	2.1	11.8	59.2	61.3	30.18	H:65.8
1/18	945	P/CY		25	ENE	4	2.0	10.5	58.2	59.7	30.16	L- 37°
1/18												H-66.7°

DATE (month and year): JAN 2006 | NOAA FORM 72-5A (5-73)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

FORM APPROVED
O.M.B. NO. 41-R2734

MARINE COASTAL WEATHER LOG —— COASTAL STATION

STATION NAME: DANA POINT | STATE: CA | STATION CALL: 9LØ | LOCATION: 33 27 N (Latitude) 117 41 W (Longitude)

(1) DATE	(2) TIME ( )	(3) SKY COND.	(3) PRESENT WEATHER	(4) VISIBILITY (miles)	(5) WIND DIR	(5) WIND SPEED (knots)	(6) STATE OF SEA HEIGHT (feet)	(6) STATE OF SEA PERIOD (sec.)	(7) SEA WATER TEMP °C ■F	(8) AIR TEMP °C ■F	(9) PRESSURE	(10) REMARKS
1/1	0930	CLDY		10	S	8	4.1	13.3	59.5	57	29.98	
1/1	1530	CLDY		8	ESE	6	3.9	11.8	59.8	59	29.91	
1/2	0950	CY	Ⓡ	1/2	SSE	20-22	5.9	5.3	59.3	59.9	29.92	L-57.4 R@ 0930 = .17, Gusts to 30
1/2	3:34	CY		5	WSW	8-10	7.9	7.1	59.1	60.3°	29.94	H- 60 R@ 1530 = .40 → .57
1/3	1008	P/CY		20	NE	6	4.9	15.4	59.5	57.4	30.20	L-46.6 R@ 0800 = .04
1/3	320	P/CY		15	WNW	10-12	5.9	15.4	59.7	58°	30.16	H- 61°
1/4	950	P/CY		20	WSW	4	3.8	14.3	59.5	60.6	30.19	L- 45.5°
1/4	300	PCY		10	WNW	8	4.1	14.3	71.1	60.1	30.12	H- 72.1°
1/5	930	P/CY		15	WSW	3	3.2	14.3	59.1°	68.2	30.18	L- 59.9
1/5	330	P/CY		25	ESE	3	3.3	10.0	61.2°	74.2	30.18	H- 81°
1/6	10:20	C		25	W	4	4.8	14.3	59.6°	81.2°	30.02	L-60.8°
1/6	3:50	C		25	WSW	2	4.1	11.8	61.8°	77°	29.94	H-81.9°
1/7	9:15	C →	Scattered clouds	20	WSW	4	4.6	14.3	59.3°	59.7°	30.00	L-52.3°
1/7	3:20	C	Hazy	15	W	4	5.4	14.3	60.4°	63.7°	29.97	H.63.7°
1/8												
1/8	330	C	HAZY	8	W	6	4.8	9.1	59.7	63	29.98	
1/9	940	P/CY		10	WSW	3	3.6	13.3	59°	62°	30.12	L- 45
1/9	330	C		10	WNW	8-10	3.1	12.5	59.8	70°	30.05	H-71