# User's Guide

Welcome to the Location File for San Diego Bay, located in the southwestern corner of the U.S. San Diego Bay has an excellent natural harbor, which has made it a busy commercial port. San Diego Bay is also headquarters for the 11th U.S. Naval District, with major naval and marine training bases also located there.


NOAA created Location Files for different U.S. coastal regions to help you use the General NOAA Oil Modeling Environment, GNOME. Each Location File contains information about local oceanographic conditions that GNOME uses to model oil spills in the area covered by that Location File. Each Location File also contains references (both print publications and Internet sites) to help you learn more about the location you are simulating.

As you work with the Location File for San Diego Bay, GNOME will prompt you to:

1. Choose the model settings (start date and time, and run duration).
2. Input the wind conditions.

GNOME will guide you through choosing the model settings and entering the wind conditions. Click the Help button anytime you need help setting up the model. Check the “Finding Wind Data” Help topic to see a list of web sites that publish wind data for this region.

More information about GNOME and Location Files is available at http://response.restoration.noaa.gov/software/gnome/gnome.html .

# Technical Documentation

## *Background*

San Diego Bay is a long, narrow crescent-shaped bay (25 km long, 1-3 km wide). The bay can be divided into two regions: a deeper outer bay and a shallower inner bay. The tidal range is on the order of 1.7 m with a maximum of 3 m. The tidal phase lag from the mouth to the back portion of the bay is only 10 minutes. San Diego Bay is a "low-inflow estuary" (Largier et al. 1996). With a mean rainfall of 26 cm/year, which occurs mostly in winter, San Diego Bay has very low freshwater input. The low inflow of fresh water creates very little buoyancy forcing, so the density-driven circulation is driven by seasonal heating and evaporation.

The mouth of San Diego Bay has been modified by the construction of the Zuniga jetty, which extends approximately 1 mile offshore of Zuniga Point. The Coastal Pilot states that approximately "two-thirds of the jetty has only small sections that are visible at high water."

Kelp forests extend approximately 2 km southward from Point Loma and along its western side. These thick kelp forests create seasonal damping of currents to about one-third their values outside (Jackson and Winant 1983).

Offshore of San Diego Bay, the long-term averages of the currents are equatorward in all seasons, with velocities as high as 10 cm/s (Winant and Bratkovich 1981). Ninety-eight percent of current measurements are between 1 and 25 cm/s (Winant 1983).

## *Current Patterns*

The currents in the San Diego Bay area are simulated with four current patterns. The two most significant circulations are the tides and the offshore current. Although the tides in San Diego Bay are asymmetrical (Chadwick and Largier 1999), they have been simulated as symmetrical in the Location File because, at this time, GNOME does not support separate tidal current patterns for flood and ebb. The Location File tides within the bay are controlled by the San Diego Bay Entrance Tide Station. Offshore currents are scaled to always flow southward in the Location File. These current patterns also simulate the diminished currents in the kelp forests off Point Loma.

To simulate wind-driven currents in the Location File, two current patterns were developed, one with NNW winds and the other with orthogonal (WSW) winds. These current patterns are scaled with the relative component of the user's wind data. The approximately 3% ratio of currents to winds from Gaul and Stewart (1960) is used to scale the wind-driven currents to the wind.

## *References*

You can get more information about San Diego Bay from these publications and web sites.

### Oceanographic

Bray, N. A., A. Keyes, and W. M. L. Morawitz (1999). The California Current System in the Southern California Bight and the Santa Barbara Channel. Journal of Geophysical Research, Vol. 104 (C4), pp. 7695-7714.

Chadwick, D. B. and J. L. Largier (1999). Tidal Exchange at the Bay-Ocean Boundary. Manuscript in preparation.

Coastal Pilot 7: Pacific Coast: California, Oregon and Washington. 30th edition. US Dept. of Commerce, NOAA, National Ocean Service.

Gaul, R. D. and H. B. Steward (1960). Nearshore Currents off San Diego, California. Journal of Geophysical Research 65(5): 1543-1556.

Hickey, B. M. (1979). The California Current System: Hypotheses and Facts. Progress in Oceanography, Vol. 8, pp. 191-279.

Jackson, J. A. and C. D. Winant (1983). Effect of a Kelp Forest on Coastal Currents. Continental Shelf Research 2(1): 75-80.

Largier, J. L., C. J. Hearn, and D. B. Chadwick (1996). Density Structures in "Low Inflow Estuaries," in *Buoyancy Effects on Coastal Esturine Dynamics Coastal Esturine Stud.*, vol. 53, edited by D. G. Aubrey and C. T. Friedrichs, pp 227-242, American Geophysical Union, Washington, D.C.

Lynn, R. J. and J. J. Simpson (1987). The California Current System: The Seasonal Variation of its Physical Characteristics. Journal of Geophysical Research. 92 (C3), pp. 12947-12966.

San Diego Bay Interagency Water Quality Panel
http://sdbay.sdsc.edu/
Water quality information for San Diego Bay. For information about the TRIM2D 2-D hydrodynamic model of San Diego circulation, click the link "Modeling home page."

Scripps Institution of Oceanography Library
http://scilib.ucsd.edu/sio
A reference page courtesy of the Scripps Institution of Oceanography (SIO) Library, University of California, San Diego.
(1) Under the section, *Other UCSD Sites*, click the link "San Diego's Ocean." Offers links to real-time conditions at Scripps Pier and other offshore information.
(2) On the "San Diego's Ocean" page, scroll to the section "San Diego Bay," then click the link "San Diego Bay." Offers tide and tidal current predictions, a searchable bibliography, and an environmental data repository.

Winant, C. D. and A. W. Bratkovich (1981). Temperature and Currents of the Southern California Shelf: A Description of the Variability. Journal of Physical Oceanography, vol. 11, pp. 71-86.

Winant, C. D. (1983). Longshore Coherence of Currents on the Southern California Shelf During the Summer. Journal of Physical Oceanography, vol. 13, pp. 54-64.

## Wind and Weather

Marine Weather Information
http://nimbo.wrh.noaa.gov/Sandiego/marine.html
A compendium of online weather and tide sources for the San Diego area. Compiled by the NOAA National Weather Service (NWS).

Oceanographic and Earth Science Data Services Directory
http://scilib.ucsd.edu/sio/dataserv/
A service of the Scripps Institution of Oceanography (SIO) Library, University of California, San Diego (UCSD). Click the link "San Diego's Ocean" for local surf snapshots, and wind and wave information.

National Data Buoy Center
http://www.ndbc.noaa.gov/
(1) Real-time weather and wave information: Click the link, "Real-Time Data," then the link, "NDBC Station locator map," to access a clickable map of buoy locations. Click the station ID number to obtain real-time data.
(2) Historical information: Click the link, "NDBC Data Index," to get historical data.

Decoded Offshore Weather Data
http://www.ems.psu.edu/wx/regions/pac-east.html
A section of the Penn State University Weather Pages. Provides current and near real-time data that includes winds every 15 minutes.

National Weather Service (NWS), San Diego, Coastal Marine Forecast
http://www.wrh.noaa.gov/sandiego/cwfsgx.html
Current conditions and weather forecast.

## Oil Spill Response

NOAA Hazardous Materials Response Division (HAZMAT)
http://response.restoration.noaa.gov
Tools and information for emergency responders and planners, and others concerned about the effects of oil and hazardous chemicals in our waters and along our coasts.