



# Drilling Muds and Produced Water Transport, Dispersion, and Seabed Deposition Model and Analysis

**MUDMAP** is a computer model and analysis system developed and used by ASA scientists and engineers that predicts the transport, dispersion, and seabed deposition of drilling muds and produced water derived from drill cuttings.

## MODEL DESCRIPTION

MUDMAP includes detailed models that account for the three stages of movement:

- the free fall of the consolidated mass of mud and cuttings (i.e., convective descent phase)
- the collapse of the consolidated mass as it hits the seafloor (i.e., dynamic collapse phase)
- the subsequent diffusion and deposition of the mud and individual cuttings

MUDMAP is controlled through an interactive Graphic User Interface (GUI) that integrates the model with a geographic information system (GIS), environmental data management tools, automatic grid generation tools, and associated input/output interfaces.

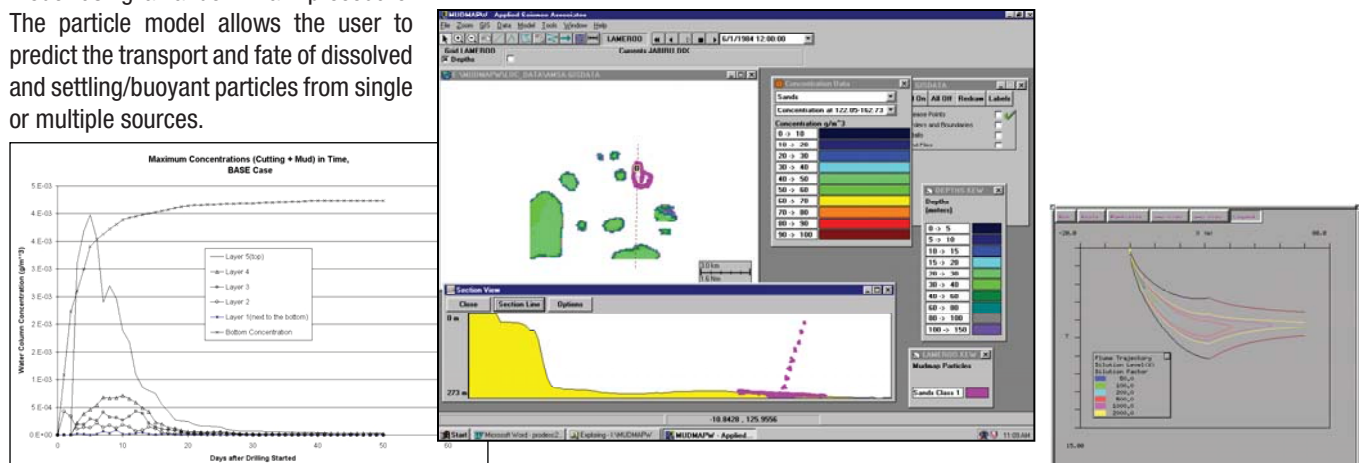
MUDMAP's near field model predicts the transport and dilution of drill fluid through convective jet and dynamic collapse phases. Model input includes a definition of drill fluid density and composition (settling velocity versus percent mass fraction); release location, rate, and duration; and the current and hydrographic fields. Model output (dilution, plume center location/width, trapping depths, contaminant concentration, thickness and deposition) can be displayed. These outputs are also used as inputs for the far field model. The far field transport and fate of the discharge is predicted by a particle-based model using a random walk procedure.

The particle model allows the user to predict the transport and fate of dissolved and settling/buoyant particles from single or multiple sources.



## Algorithms account for the major processes affecting the fate of discharges

- Initial dilution and dispersion of a material stream as it is discharged into receiving waters
- Growth and dilution of the discharge cloud as particles sink towards the seabed and entrain seawater
- Growth and dilution of the discharge cloud as material strikes the seabed
- The transport and dispersion of the discharge plume by local hydrodynamic conditions



## Geographic Information System (GIS)

The embedded GIS allows the user to input, store, manipulate, and analyze geographically referenced information. The simplified GIS has been designed to be user friendly, interactive and fast. GIS data is not required as input to MUDMAP, but is helpful in analyzing and interpreting model predictions.

The GIS allows an unlimited number of geographic databases to be created each with individual layers of data. Typical uses of the GIS include storing location names, biological resources (bird colonies, fish spawning areas), industrial facilities, environmental data.

Through the use of linking procedures additional information about geographically referenced data can be obtained. These link files might include charts, graphics, tables, tutorials, bibliographies, text, photographs, or animations. Examples of data which might be stored in the GIS for a typical problem include: Contaminant source strengths versus time for the discharge, details of outfall location and configuration, water column and sediment (core/grab sample) contaminant distributions, distribution and abundance of biota including shellfish, fish, birds, and marine mammals.

Data may be shared with commercial GIS applications such as ArcView® and MapInfo, and tools such as ArcView's 3d Analyst may be used to perform complete 3D analysis.

## ENVIRONMENTAL DATA PRODUCTS AND SERVICES

### Base Maps

MUDMAP can be set up for operation anywhere in the world. A geographic location for MUDMAP may be of any size and resolution. Please contact us for details. ASA can immediately prepare coastlines for anywhere in the world from the CIA, Digital Chart of the World (DCW), or World Vector Shoreline (WVS) databases. In addition, geo-referenced raster maps may also be used. Alternatively, base maps may be digitized from fine scale charts, or imported from existing GIS applications.

### GIS Data Layers

Locations of sensitive resources such as critical biological habitats, water intakes, industrial sites, archaeological sites, etc. may be supplied in a GIS database. This data may already be available in ASA archives, or we can readily gather and provide this data on an individual basis. The user may view, edit and update this database using MUDMAP's embedded GIS.

### Hydrodynamic Data

Models of water movement in oceans, estuaries, lakes, and rivers represent a fundamental component of many environmental assessment problems. Such models provide the basis for physical transport of drill muds in the water.

ASA maintains several hydrodynamic models:

- Open channel network flow
- 2-D finite difference
- 3-D boundary fitted
- 3-D finite difference (horizontal)
- vertically layered
- continuous vertical representation

MUDMAP may also integrate current meter data, seasonal atlas based current fields, or import data from hydrodynamic models. We work with a number of institutes and universities throughout the world to be able to provide the best possible data for any area.

ASA has built a wide range of computer modeling applications to solve various environmental problems. ASAMAP™, ASA's suite of environmental modeling tools, are available for licensed use and customization and include: AIRMAP, CHEMMAP, COASTMAP, HYDROMAP, OILMAP, SARMAP, SIMAP, MUDMAP and WQMAP. For more information visit our website at [www.asascience.com](http://www.asascience.com).



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