



OIL & GAS

NOBLE DENTON MARINE SERVICES

Meteorological and oceanographic studies

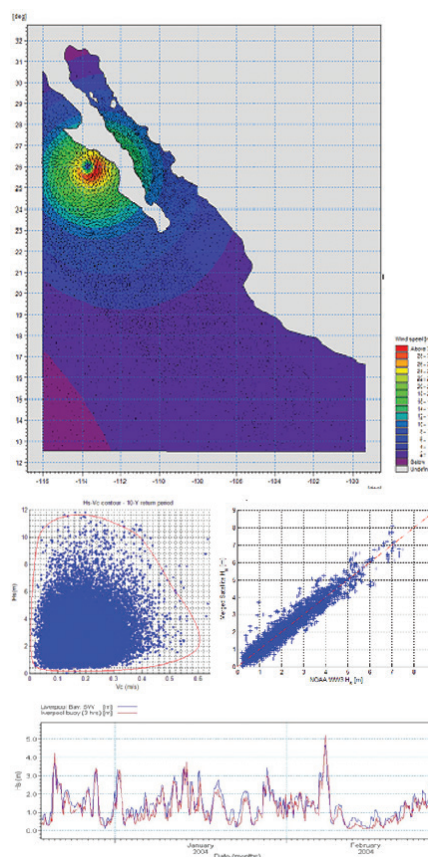
SUPPORTING SMOOTH OPERATIONS

From the drawing board to decommissioning, DNV GL supports customers in solving complex technical issues. Our work is enhanced by a broad service portfolio and a worldwide network of experts who are dedicated to helping achieve a safe and sustainable energy future.

Our Noble Denton marine services have supported the marine industry for over 50 years. Much of the sector follows our guidelines, standards and rules, and we have contributed significantly to developing global best practice in marine operations.

Based in London, DNV GL's Meteorological and Oceanographic (metocean) department has four decades of experience in supplying data to the global marine and offshore industries. Metocean information is a key requirement for location approvals, transportation design, structure design and weather-limited operations. Our thorough understanding of these covers all major seas and ocean basins.

Working in partnership with oil companies, drilling vessel owners, ship owners, shipyards and other stakeholders, we supply metocean data to international and national standards and guidance as well as to our internal technical guidance. Since the inception of the service in 1976, we have carried out more than 10,000 studies all over the world, and our work is supported by a global network of DNV GL mariners and engineers across the world.



COMPLEX MODELLING

Our numerical modellers interpret complex dynamics through the judicious application of the DHI Mike 21 hydrodynamic, spectral wave, Boussinesq wave and sediment transport modules. This ensures that the guidance we give is based on state-of-the-art understanding of the metocean environment.

Operating on a global basis, we provide advice on a variety of metocean conditions from tropical cyclones to ice cover. We ensure that our general approach, analytical procedures and tools are updated to incorporate changing trends in analytical processing and the guidelines given in International Standard ISO 19901-1.



Our services in detail

Through advanced analysis of measured, modelled and remotely-sensed data, our metocean specialists seek to quantify the effects of the physical environment on marine infrastructure and operations. In particular, we support our customers in solving complex issues related to:

- The design and operation of fixed and floating structures
- Coastal infrastructure, including ports, harbours, breakwaters and pipelines
- Operational planning and downtime assessment
- Marine transportation
- Jack-up approval.

Our services vary in water depth and complexity, from the beach to deep-ocean and from rapid, cost effective spot location reports for jack-up approval (more than 8,000 completed to date) to detailed design studies that may include extreme values, operating statistics, joint probability analysis and operability assessment.

Drawing on the experience of our engineering consultants, designers, marine warranty surveyors and metocean specialists, we offer a complete range of cost-effective and quick-response solutions, including:

- **Metocean criteria for first assessments and rig approvals:** A concise metocean report based on freely-available data and suitable for rapid assessment of offshore units at any single offshore site for any season, direction or return period.
- **Design studies for transportation routes:** Design criteria for marine transportation projects taking into account method of transportation, departure date, proposed route and vessel speed.
- **Design studies for offshore structures:** Using ISO-compliant methods to derive Hmax and crest, IFORM contours, associated extremes, and calibration of hindcast, with available measurements and numerical modelling as needed.
- **Tropical cyclone analysis:** Analysis of tropical revolving storms for the calculation of design, winds, waves and currents. Including numerical modelling of cyclones as required.
- **Metocean criteria for operation planning:** Waiting-on-weather and spells analysis, frequency tables and feasibility maps to help in planning offshore operations.
- **Numerical modelling:** Using Mike 21 FM and SW models, developed by the Danish Hydraulics Institute (DHI). These state-of-the-art numerical models simulate flows and waves in estuaries, coastal areas and seas, using a cell-centred finite volume method for spatial discretisation. Numerical modelling is used to produce high quality waves and flows across wind farms, along pipelines, in coastal areas or within harbours, and can also be applied to derive cyclonic waves, surges and currents.

Setting the standard

We have contributed significantly to developing guidelines, standards rules and global best practice in marine operations. But, with the oil and gas sector working on more complex projects in increasingly challenging environments, we believe that the benchmark can always be higher.

Every year, we invest 5% of our revenue back into research and development to keep us at the forefront of our customers' challenges. That results in more robust standards and, when you combine those with the deep technical expertise we bring to the complete asset lifecycle, you get true risk reduction.

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About DNV GL

DNV GL is the technical advisor to the oil and gas industry. From project initiation to decommissioning, we enhance safety, increase reliability and manage risks in projects and operations.

Our 4,000 oil and gas experts offer local access to global best practice in every hydrocarbon-producing country. Driven by a curiosity for technical progress, we provide a neutral ground for collaboration; creating competence, sharing knowledge and setting industry standards.

Our independent advice enables companies to make the right choices. Together with our customers, we drive the industry forward towards a safe and sustainable future.