DHI SOLUTION

MANAGING SEDIMENT SPILL FROM DREDGING WORKS

Minimising environmental impact and securing environmental compliance

SEDIMENT SPILL

Sediment spill is unavoidable during dredging works and must be addressed. Dredging is a common part of numerous marine construction activities, such as port development, urban expansion, beach replenishment, coastal and flood protection, energy exploration, installation of energy production facilities such as Gravity Based Foundation wind turbines, mining and environmental remediation and improvement.

Dredging and earth handling in the aquatic environment always result in a certain sediment spill that must be managed. The sediment released during excavation, dredging, transport or disposal of sediment is visible as plumes or clouds of sediment in the water column and/or close to the seabed..

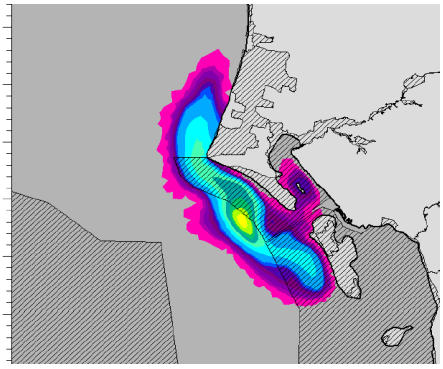
Assessing the influence of sediment spill is an important part of Environmental Impact Assessments (EIAs). Moreover, it is often required in order to comply with local or international environmental regulations, such as EU NATURA 2000 or Special Protective Areas (SPA) for fishery, birds or marine mammals.

The EIA often results in the definition of an Environmental Management Plan (EMP), which predefines the environmental compliance levels and controls and alleviates the predicted impact during the actual dredging operations.

Sediment spill from dredging is unavoidable but its impact can be controlled and minimised by the implementation of mitigation measures and a proper monitoring programme during and after dredging. In sensitive areas, DHI recommends the establishment of an EMP.

TAILOR-MADE SOLUTIONS

Site specific projects require site specific solutions. Each sediment spill must be mapped in order to establish its impact. Every dredging project and associated sediment spill has its own specific characteristics. Hence, mitigating measures to be established in the event of unforeseen and unacceptable impacts will be tailored to the site specific needs.



Exceedance plot of dredged material from a disposal site. The shaded areas indicate nature protection areas.

SUMMARY

CLIENT

Infrastructure companies, ports, marine contractors, environmental authorities

CHALLENGE

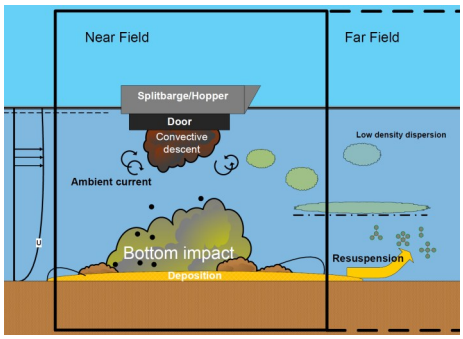
- Manage the environmental impact of sediment spill during marine construction works
- Define sediment spill levels
- Determine the actual impact levels
- Develop mitigation measures

SOLUTION

Sediment spill levels and impact areas are defined in an integrated system combining field data and sediment transport modelling.

VALUE

- Delineation of impact zone
- Environmental approval
- Reduced impact on environment through adequate planning and management
- Smooth project progress



Release of fines to the environment during disposal of dredged material from a barge or a hopper dredger. The material released becomes resuspended and will be transported by the current.

The complex behaviour of sediment spill and the difficulties in estimating spill rates call for a practical approach that integrates experience, high-tech and state-of-the-art simulation tools.

Two major sources of information serve as the basis to evaluate sediment spill:

- The spreading and behaviour of the sediment spill is determined from engineering information on geotechnics, sediment properties, dredging methodology, hydrodynamics and sediment transport
- The impact of the spill on ecology and water quality is determined from ecosystem information on marine receptors and their tolerance to shading, deposition and possibly toxicity from polluted sediments

ESTIMATION OF SEDIMENT SPILL RATES

Sediment spill occurs during dredging operations due to hopper overflow, disposals or filling of a barge or hopper. Moreover, excavation by grab or suction head results in localised sediment spills.

The estimation of spill rates is largely empirical. Over the past 25 years, DHI has established a large database of spill rates based on major projects all around the world and, in particular, in Denmark and Singapore.

EFFECTS OF SEDIMENT SPILL

Dredging in coastal areas often leads to spilled sediment being transported by current and waves. This may result in environmental impact, such as:

- Shading of seagrass and coral reefs
- Additional release of nutrients and risk of algal blooms
- Reduction of benthic vegetation and thereby food stock for water fowls
- Release of polluted sediment and pore water
- Risk for reduced water quality
- Return of disposed sediment into harbour basins or channels

MODELLING AND FIELDWORK

Numerical model simulations of sediment spill in the environment is made using DHI's software packages MIKE 21 or MIKE 3. Special software features allow you to simulate the activities of the dredger(s) during operation.

In addition, periodic habitat surveys ensure that the impacts predicted by numerical models are validated against the actual site measurements. The data collected will serve as a feedback into the overall environmental management and compliance of the project.

THE EMP

DHI has successfully implemented an Environmental Management Plan (EMP) based upon adaptive principles, which allow feedback from monitoring results into operative project planning. This way of environmental managing of dredging projects is today accepted as international best practice.

The feedback EMP produces a high level of credibility and reduces developers' and contractors' exposure to public complaints and liabilities associated with environmental impacts. It thus allows dredging activities to proceed in an efficient manner whilst ensuring protection of the environment.

Rainbowing causes considerable sediment spill, while grab dredging results in less spill.

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