

ENFORCEABLE UNDERTAKING

Environment Protection Act 1970 (Vic)

Section 67D

The commitments in this undertaking are offered to the Environment Protection Authority (EPA) by:

Boskalis Australia Pty Ltd (the Company)

A DEFINITIONS

In addition to terms defined elsewhere in this Undertaking, the following definitions are used:

EPA means the Environment Protection Authority

the Act means the *Environment Protection Act 1970 (Vic)*

the Company means Boskalis Australia Pty Ltd, ACN 099 738 333

the Queen means the *Queen of the Netherlands*, a dredger owned by the Boskalis Group

POWBONS means the *Pollution of Water by Oil and Noxious Substances Act 1986 (Vic)*

Undertaking means Enforceable Undertaking made pursuant to section 67D of the *Environment Protection Act 1970 (Vic)*

B BACKGROUND

1 EPA's role

EPA is a statutory body created by the Act, which has primary responsibility for the administration and enforcement of that Act.

2 Details of conduct / incident

- 2.1 On or about 1450 hours on 30 August 2008 the *Queen* was conducting dredging operations at Port Phillip Bay near Point Lonsdale.
- 2.2 At 1540 hours an oily substance was observed in the water by a member of the public aboard a fishing charter vessel. The report made by that person to the Point Lonsdale Lighthouse was that it appeared to be coming from the *Queen*.
- 2.3 Approximately 800 to 900 litres of oil was discharged from the *Queen*, caused by a defective valve below the waterline, before the *Queen* was able to locate and repair the defective valve.

3 Alleged Contraventions

EPA alleges that, as operator of and representative of the owner of the *Queen*, the Company is liable under section 63 of the Act for:

- an offence against subsection 39(1) of the Act in that on 30 August 2008 a discharge of oil from that ship polluted the waters at the entrance to Port Phillip Bay in the State of Victoria, so that the condition of the waters was so changed as to make those waters detrimental to any beneficial use made of those waters; and
- an offence against subsection 27A(1)(c) of the Act in that on 30 August 2008 a state of danger to the environment resulted from a discharge from the ship into the waters at the entrance to Port Phillip Bay in the State of Victoria, of a quantity of oil having toxic or otherwise dangerous characteristics.

C KEY OBJECTIVES OF THIS UNDERTAKING

This Undertaking is a binding agreement that aims to:

- Deliver benefits beyond compliance;
- Deliver tangible benefits to the environment and to local communities;
- Improve the Company's environmental performance by implementing systemic changes that will reduce the likelihood of a similar incident occurring in the future.

D UNDERTAKINGS

Under section 67D of the Act, the Company has offered, and EPA has agreed to accept as an alternative to taking Court proceedings, the following undertakings.

- 1 The Company has provided and undertakes to continue to provide environmental training of the Master and crew on all Company ships and equipment working in Victoria. That training will include:
 - *induction into the Environmental Management Plan (EMP) prepared for any project in Victoria, setting out the environmental drivers and concerns of the project and the management actions to control and mitigate potential environmental impacts including responsibilities to record and report all spills without delay;*
 - *marine fauna observation training to enable assigned personnel to recognise and record marine mammals and respond appropriately during encounters;*
 - *Shipboard Oil Pollution Emergency Program (SOPEP) equipment familiarisation and environmental awareness training relevant to vessel operations;*

- *SOPEP drills conducted every 6 months on spill events, spill equipment and spill reporting; and*
- *training and inspection requirements in relation to the hydraulic systems on board the relevant vessels (the Queen and any other vessels operated by the Company in Victorian waters), including visual inspections on each shift of the relevant hydraulic systems (including the green valve system) to monitor for wear and tear and other leakage risk factors.*

This undertaking will be completed within 24 months of the date this Undertaking comes into effect or when Company ships or equipment currently working in Victoria complete that work, whichever is earlier.

Intended outcome: To prevent future similar events by providing increased training to the Company's personnel in Victoria.

2 The Company undertakes to fund a course on dredging and its environmental impacts at Swinburne University. Swinburne University was selected as an independent institute within Victoria with a focus on marine-related engineering and environmental issues. Details of the course are provided below.

- *the course is organised by Professor Alex Babanin, with Mr Frans Uelman (MsC) of the Boskalis Group available as a guest lecturer;*
- *the course outline has been developed by Gary Carter, Gladstone Ports Corporation;*
- *the course will be offered to students at Swinburne University and will also be open to interested persons from or working for Australian Port Corporations and similar government authorities; and*
- *the Company will fund the reading material for the course.*

Annexure A to this undertaking is the proposed course outline.

This undertaking will be completed within 18 months of the date this Undertaking comes into effect.

Intended outcome: To implement an education program, available through Swinburne University, on dredging and its environmental aspects within Victoria.

3 The Company undertakes to provide Swinburne University with \$75,000 to sponsor a PhD project at Swinburne University on the "Investigation and Monitoring of Turbidity in Port Phillip and Coastal Area of Victoria by means of Satellite Observations and Numerical Modelling". Details of the project are provided below:

- *The project is a three year project;*

- *The project will be undertaken by a PhD candidate and will be supervised by Professor Alex Babanin and Professor Ian Young, both of Swinburne University;*
- *The project includes observing, modelling and predicting turbidity and sediment suspension for Victorian coastal regions and Port Phillip;*
- *As changes of turbidity levels indicate alteration of irradiation through the water column and relate to the intensity of mixing in the upper ocean and shallow areas (a vital environmental process in terms of oceanographic, ecological and marine-biology aspects), and as changes of turbidity are usually connected with the suspension of bottom particulate matter, this project will have environmental benefits important for coastal engineering applications, including transport of both natural and industrial deposits.*
- *The project will result in the publication of a paper that will be publicly available.*

Annexure B to this undertaking is the project proposal.

This undertaking will be completed within 42 months of the date this Undertaking comes into effect.

Intended outcome: To sponsor a research project to enable better environmental information to be generally available for future coastal engineering applications.

- 4 The Company undertakes that it will pay the costs of its compliance with this Undertaking.
- 5 The Company undertakes to provide six monthly progress reports to the EPA on the implementation of undertakings 1-3 of Section D of this Undertaking from the date this Undertaking comes into effect and until this Undertaking is terminated. In addition, the Company will supply all documents and information reasonably requested by EPA from time to time for the purpose of assessing the Company's compliance with the terms of this Undertaking.
- 6 The Company undertakes to engage, at its own cost, an independent EPA appointed auditor. The auditor will review the content of this Undertaking and provide written assurance to EPA that the implementation of undertakings 1-3 of Section D of this Undertaking have been satisfactorily completed so as to deliver the intended outcomes of each undertaking.
- 7 The Company undertakes that any public reference to the actions contained within this Undertaking shall also make reference to this Undertaking.
- 8 The Company has estimated the cost of compliance with this Undertaking to be approximately \$95,000 (not including the cost of undertakings 1 and 6 above). The Company undertakes to provide the EPA with detailed costing of compliance at the completion of the Undertaking.

E. ACKNOWLEDGMENTS

- 1 The Company acknowledges that EPA has alleged that, as a result of the incident on 30 August 2008, the Company has contravened provisions of the Act. The incident and these allegations are considered very serious and the Company has conducted its own investigation into both the incident itself and the necessary remedial measures required to minimise the likelihood of repetition of the incident.

As a result of that investigation, the Company, of its own volition, designed and constructed an alternative to the valve that was defective and which caused the incident. That alternative valve has been replaced on the *Queen* to ensure that a similar incident does not occur in the future. The relevant parts of the hydraulic system on the *Queen*, including that alternative green valve, were reviewed by a representative of EPA in June 2009 to confirm its appropriateness and effectiveness at overcoming the defects of the valve that caused the incident.

- 2 The Company acknowledges that EPA:
 - (a) may issue a media release on execution of this Undertaking referring to its terms and to the concerns of EPA which led to its execution;
 - (b) may from time to time publicly refer to this Undertaking; and
 - (c) will make this Undertaking available for public inspection on a register of undertakings, in accordance with section 67G of the Act and that this Undertaking will remain on the register upon completion of all undertakings contained within.
- 3 Further, the Company acknowledges that:
 - (a) as provided in section 67D(4) of the Act, EPA's acceptance of this Undertaking means that proceedings will not be brought by EPA against the Company for the offences constituted by the contravention alleged in Section B, clause 3 of this Undertaking;
 - (b) as provided in section 67D(5) of Act, if the Company withdraws this Undertaking before it has been fulfilled, proceedings may be brought for the offences constituted by the contravention alleged in Section B, clause 3 of this Undertaking;
 - (c) EPA's acceptance of this Undertaking does not affect EPA's power to investigate, conduct surveillance or pursue a criminal prosecution or its power to lay charges or seek a pecuniary civil order in relation to any contravention not the subject of this Undertaking or arising from future conduct;
 - (d) this Undertaking in no way derogates from the rights and remedies available to any other person or entity arising from any conduct described in this Undertaking or arising from future conduct.

- 4 The Company acknowledges that EPA had reason to be concerned as to the alleged facts and has offered an Undertaking in the terms set out above.
- 5 The Company acknowledges that this Undertaking has no operative force until accepted by EPA, and the Company and EPA acknowledge that the date of the Undertaking is the date on which it is accepted by EPA.

F. STATEMENT OF REGRET

The Company regrets the incident and any harm that did occur or might have occurred as a result of the incident.

The Company has taken steps to minimise the likelihood of any repetition of the incident, including by designing an alternative to the valve that was defective and by instituting additional environmental training for the crew of the *Queen* immediately following the incident.

G. ASSURANCE ABOUT FUTURE BEHAVIOUR

The Company assures EPA that the conduct that resulted in the alleged breach (namely, the use of the type of valve that was found to be defective) has ceased and will not be recommenced. The Company acknowledges that through the implementation of the actions outlined within this Undertaking and the remedial actions it has already undertaken, it will reduce the risk of future incidents.

H. EFFECT OF NON-COMPLIANCE

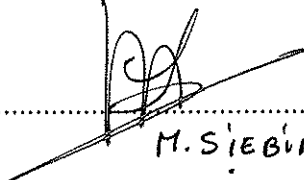
The Company acknowledges that failure to comply with this Undertaking may result in EPA seeking to enforce the Undertaking in the Magistrates' Court.

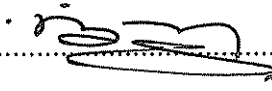
I. TERMINATION OF ENFORCEABLE UNDERTAKING

This Undertaking will terminate 48 months from the date that the Undertaking comes into effect. All undertakings contained within must be completed by this time. Failure to do so may result in EPA taking action to enforce the Undertaking.

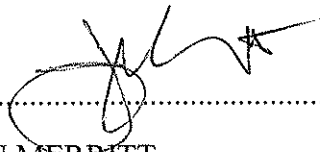
THE COMMON SEAL of THE)
COMPANY was affixed in accordance with)
the Corporations Act 2001 in the presence of:




..... Director
M. SIEBINGA


..... Director/Company Secretary
L. Slinger

**Accepted by the Environment Protection Authority under section 67D
of the Environment Protection Act 1970 by its Chairman / CEO and
Deputy Chairman:**


.....
JOHN MERRITT

CEO and Deputy Chairman of the Environment Protection Authority:

[date] 22 - 7 - 10

**Port and Harbour Engineering course
Dredging Engineering
HES6DRE**

2010

*Swinburne University of Technology
Alex Babanin (ababanin@swin.edu.au, (03) 9214-8033)*

Lecture Theatre (to be confirmed)

Subject is run in an intensive mode (36 hours of lectures in one week) during the spring semester break (20th to 24th of September). This subject will contribute 12.5 credit points towards graduate qualifications. In order to have the 12.5 credited, the students will have to submit an assignment.

Subject outline

Unit Outline was developed by Gary Carter, Gladstone Ports Corporation

Day One 20 Sep 2010

1. Introduction

(6 hours)

- Dredging industry and drivers
- Definition of dredging projects
- Effects of dredging projects
- International and national context
- Project development processes

2. Preliminary Surveys

(1 hours)

- Objectives and context of Preliminary Surveys
- Geometry and Quantities
- Environment (Ecological, Physical, Social)
- Debris & Wrecks

Day Two 21 Sep 2010

3. Environmental Studies & Approvals (Australia)

(2 hours)

- Baseline Studies
- Environmental Effects Studies
- Stakeholder communication
- State & Federal legislation
- State & Federal Approvals for Dredging
- Environmental Management Plan

4. Types of Dredgers

(5 hours)

- Dredging process

- Different types of dredgers
 - Excavation of soil and rock
 - Transport
 - Disposal
 - Tolerances
 - Environmental Aspects
 - Workability (metocean, shipping, geometry)
- Mobilisation aspects
 - Self Propelled Dredgers
 - Non-Propelled Dredgers
 - Dismountable Dredgers
- Contaminated Material
- Auxiliary Equipment
- Dredger Selection Criteria

Day Three 22 Sep 2010

5. Fluid Mechanics of Dredging

(2 hours)

- Pipeline Transport
- Pumps and drives
- Pump(s) + Pipeline

6. Survey Control for Dredging

(2 hours)

- Horizontal Positioning Systems
- Tide Measurement
- Calibration
- Hydrographic surveys
- Survey Vessels
- Information and control on Dredge Vessels

7. Subsurface Investigations

(3 hours)

- Objectives
- Soil & Rock parameters vs. dredging and reclamation aspects
- Classification of Soils & Rocks
- Site Investigation Methods
- Geophysical Methods
- Contaminated Material
- Cost aspects

Day Four 23 Sep 2010

8. Dredge Material Management

(8 hours)

- Environmental effects of dredging
 - Turbidity
 - Siltation

- Changes associated with Dredging
- Disposal options
 - Under water
 - On land
 - Contaminated Material
 - Environmental Control and mitigation
- Reclamation
 - Reclamation requirements
 - Specifications
 - Work methods
 - Soil improvement
 - Environmental control and mitigation
- Environmental Management Plan
- Lifecycle costing

Day Five 24 Sep 2010

9. Maintenance Dredging

(2 hours)

- Maintenance Dredging Requirement
- Dredging Methods
- Operational Problems
- Contaminated material

10. Cost

(2 hours)

- Cost types
- Cost breakdown
- Cost elements
- Other costs
- Tender Price

11. Dredging Contracts

(3 hours)

- Tender Process
- Types of contracts
- Relationship and communication
- Contract Documents
 - Drawings & Specifications
 - Conditions of Contract
 - Provision for Measurement
 - Clearance Surveys
 - Disputes & Resolution
- Award of Contract
- Site Supervision

Investigation and Monitoring of Turbidity in Port Phillip Bay and Coastal Area of Victoria by Means of Satellite Observations and Numerical Modelling

Alexander Babanin

Professor, Swinburne University of Technology

PO Box 218 Hawthorn, Victoria 3122 Australia

Tel.: +61-3-9214-8033, e-mail: ababanin@swin.edu.au

Proposal to the Royal Boscalis Westminster

Abstract

PhD project is proposed to investigate turbidity in Port Phillip Bay and coastal areas of Victoria due to suspended particulate matter (SPM). Satellite observations will be conducted by means of MOS (Modular Optoelectronic Scanner) and MERIS (MEdium-spectral Resolution Imaging Spectrometer) which will be used to derive surface concentrations of SPM and to parameterise turbidity levels. These will be linked to environmental forcing due to waves, winds and tides through analytical approaches and numerical modelling. Monitoring of the turbidity will be carried out over the duration of the project (three years), and hindcast and forecast of the turbidity levels will be conducted based on the satellite altimeter data base existing at Swinburne University

Monitoring, modelling and predicting turbidity in the coastal waters have essential environmental and practical significance. Changes of turbidity levels indicate alteration of irradiation through the water column and may have negative or positive consequences, and they also relate to intensity of mixing in the upper ocean and shallow areas which is a vital environmental process in terms of oceanographic, ecological and marine-biology aspects. Since changes of turbidity are usually connected with the suspension of bottom particulate matter, this question is also important for coastal engineering applications, including transport of both natural and industrial deposits.

Connection of the profiles of suspended particulate matter and the turbidity with environmental drivers such as those due to waves, winds and currents is acknowledged, but not well understood. While modelling SPM usually accounts for forcing due to currents and tides, mixing of the upper ocean by wind-generated waves is usually underestimated or not accounted for. In the meantime, such mixing can constitute a significant or even dominant contribution to the total mixing in the upper ocean (e.g. Babanin 2006, Babanin et al. 2009).

With respect to finite-depth areas, these effects have been recently studied by means of satellite observations and numerical modelling of the North Sea (Pleskachevsky et al. 2010). In a water column, SPM builds a vertical profile depending on settling velocities of the particles and on vertical mixing processes, thus on turbulence. Satellite observations in the North Sea show that surface SPM concentrations, in

locations where SPM bottom deposits are presented, grow rapidly and build plume-shaped structures during a storm. Also, satellites reveal that SPM rapidly sinks to the seabed after the wave height decreases, i.e. with absence of strong turbulence. To simulate this behaviour, the non-breaking wave-induced turbulence was parameterised and implemented into the General Ocean Turbulence Model (GOTM) as an additional source of turbulent kinetic energy. A number of numerical tests were carried out in order to reproduce experiments in a water tank and observations in the North Sea. Data from MOS and MERIS used to derive surface SPM concentrations showed the link between surface SPM concentrations and waves in the North Sea. The circulation model HAMSOM and the wave model WAM were applied to reconstruct circulation currents and surface waves. Erosion, resuspension and sedimentation processes taken from the Suspended Particulate Matter Transport model (SPMT) were combined with the extended GOTM model. The obtained results demonstrate the importance of waves for the vertical mixing processes in the Southern North Sea during storms.

In the coastal areas of Victoria, exposed to the Southern Ocean and South Pacific swells and storms, the waves are a most essential environmental-forcing factor and have to be taken into a proper account in the modelling of sediment suspension and turbidity. In Port Phillip Bay, tidal currents provide an additional strong component for turbulence generation and vertical mixing. In the course of the project, it is proposed to combine satellite observations of Victoria's waters by means of MOS and MERIS with analytical and numerical research based on the North Sea study, in order to produce an up to date model of sediment suspension for Victorian coastal region and Port Phillip Bay. Once the model is developed, it will use altimeter data base of Swinburne University (Zieger et al. 2010) to investigate past and predict future trends of turbidity changes.

The project will be conducted at the Swinburne University of Technology, Hawthorn, Victoria in collaboration with the German Aerospace Centre (DRL). It will have both innovative research and research training components, as the studies will be conducted by a PhD student under supervision of Prof. Alexander Babanin and Prof. Ian Young of Swinburne.

The proposed budget includes scholarship for the PhD student (A\$22K per year for three years), and travel budget for the student (A\$3K per year for three years). The University will contribute by waiving tuition fees (A\$20K per year), by providing computer and infrastructure facilities and the time of the academic staff. Total proposed cost for Boscalis is A\$75K over three years.

References

Babanin, A.V., 2006: On a wave-induced turbulence and a wave-mixed upper ocean layer. *Geophysical Research Letters*, 33, L20605, doi:10.1029/2006GL027308, 6p

Babanin, A.V., A. Ganopolski, and W.R.C. Phillips, 2009 : Wave-induced upper-ocean mixing in a climate modelling of intermediate complexity, *Ocean Modelling*, 29, 189-197

Zieger, S., J. Vinoth, and I.R. Young, 2009: Joint calibration of multiplatform altimeter measurements of wind speed and wave height over the past 20 years. *Journal of Atmospheric and Oceanic Technology*, 26, 2549-2564

Pleskachevsky, A., M. Dobrynin, A.V. Babanin, H. Gunther, and E. Stanev, 2010 : Turbulent diffusion due to ocean surface waves indicated by suspended particulate matter. Implementation of satellite data into numerical modelling. *Journal of Physical Oceanography*, under review