Port Phillip Bay: Channel Deepening.

Submission to the

Victorian Government Standing Committee on Finance & Public Administration relating to examining the business case for the Port Phillip Bay channel deepening project as presented by the Port of Melbourne Corporation (PMC) and the Victorian Government.

Submitted by
Captain Frank Hart.
Retired Harbour Master ports of Western Port and Hastings.

27 April 2008.
Concerns relating to the Business Case presented by the Port of Melbourne Corporation (PMC) and the Victorian Government (the Proponents) with reference to the Port Phillip Bay Channel Deepening Project

Introduction.

The Channel Deepening is a very high risk Project that increases the dangers and reduces the safety margins at Port Phillip Heads for large near 14 metre draught ships transiting the Entrance to Port Phillip Bay.

The risk of these near 14 metre draught ships grounding outside the Great Ship Channel in the Entrance is considerably higher than the risk for the current maximum draught ships using the existing Entrance Channels.

If a 14 metre draught ship grounds in the Entrance the consequences could be a disaster for the Environmental, Financial and Social well being of the State of Victoria.

1. Requirement to include cost of risk in Public Organisation Business Case.

Any business case advanced by the Proponents in relation to the Port Phillip Bay - Channel Deepening Project must include the potential cost to the Organisation and to the State of the critical shipping risks for near 14 metre draught ships grounding in Port Phillip Heads when transiting the entrance to Port Phillip Bay. (See Parts 1, 2, 3, & 4 of the attached submission)

In 2002 the Victorian Auditor- General’s Office (VAGO) reported on Risk Management in Victorian Public Sector Organizations. Over 60 Victorian public sector organizations were examined for their risk management activities.

The VAGO Report clearly defines what the Appropriate Risk Management Strategies should be, including an expectation that the public sector organization should have deliberate and evident risk management strategies and processes commensurate with the nature, scope, frequency and magnitude of risk to which they and the State may be exposed.

This can only occur if the risks have been properly evaluated. The Proponents have not met these criteria with respect to the safety of near 14 metre draught ships transiting Port Phillip Heads with the significantly increased risks relating to the channel design and the proposed operating parameters after Channel Deepening.

2. In September 2005 the Australian Institute of Company Directors in conjunction with the Institute of Internal Auditors Australia conducted a Public Sector Governance and Risk Forum titled ‘Risk and Risk Management in the Public Sector’.

The Concluding Remarks from this forum state that risk management should be part of an organization’s strategy and planning process, and an integral component of corporate governance. Importantly risk management must provide reasonable assurance that the organization will achieve it’s objectives with an acceptable degree of residual risk.
It is clear that in relation to the safety of near 14 metre draught ships transiting Port Phillip Heads these objectives have not been met.


Dr. Noakes suggested that Environmental Impact Assessments should be integrated with conventional cost benefit analysis for the specification of project parameters as normally required in developing the public sector business case, and that safety and consequential loss issues should be incorporated within the mainstream economic cost benefit appraisal.

Dr. Noakes stated that if a large ship were to be stuck in Port Phillip Heads for some months, the economic consequences could be similar to the Longford Gas Explosion.

These economic strategies are reinforced by renowned U.S. economist R.H. Frank, who recommends that in cost benefit analysis, monetary values be assigned to risks which could contribute to partial or total project failure, loss of reputation, market penetration, long term enterprise strategy alignments, human life and the environment. (R.H. Frank 2000)

The grounding of the oil tanker ‘Exxon Valdez’ in Prince William Sound in 1989 and the loss of 35,000 ton of oil cargo resulted in clean-up, loss to business and damages costs on Exxon of over US $10 billion.

The Environmental, Social and Financial and Economic costs to the State resulting from a near 14 metre draught ship grounding in Port Phillip Heads have not been Assessed and/or made public by the Proponents.
4. ‘Economists at Large’ is a Melbourne based group of consulting economists with expertise in the fields of economics, environmental, tourism and energy economics, as well as financial analysis and international trade.

In their Submission to the SEES in July 2008 and again in a forum on 23 August 2008, at Parliament House, convened by Sue Pennicuik MP. to consider the Channel Deepening Proposal, the Economists at Large Group were critical that significant costs, including costs associated with identified risk have been omitted from the business case advanced by the PMC.

Unless the costs of the High Risks associated with this project are evaluated and incorporated into the Business Case, any Business Case will fail to meet the recommendations of Government Auditors, Professional Associations and Economists and will have little or no integrity.

5. Notwithstanding some dubious and partial denials, made by the PMC in their ‘Responses in Reply’ on the last day of the 2007 SEES hearings (which could not, due to their timing in the hearings, be challenged) the facts are that PMC have failed to design a channel through Port Phillip Heads for 14 metre draught ships that reflects the recommended standards outlined in the Permanent International Association of Navigation Congresses (PIANC), ‘A Guide for the Design of Approach Channels to Ports’, and they have failed to satisfactorily undertake or complete a Risk Analysis relating to the risk of 14 metre draught ships grounding at Port Phillip Heads, that reflects the criteria and standards of the PIANC Guide and the Australian Standard 4360, ‘Risk Management’.

Specifically these deficiencies relate to the failure to assess both the likelihood of an occurrence (the grounding of a near 14 metre draught vessel in the Heads whilst transiting the Entrance to Port Phillip Bay) and evaluating the potential consequences of such an occurrence.
Without the inherent risks of the Channel Deepening and a near 14 metre draught ship grounding in the entrance being determined and evaluated, any Business Case has little integrity and no value. These omissions and deficiencies are outlined in the following Parts.

PART 1. Identifying the risks of a near 14 metre draught ship grounding in Port Phillip Heads when transiting the Entrance.

PART 2. Investigating the risks of a near 14 metre draught ship grounding in Port Phillip Heads when transiting the Entrance.

PART 3. Further Investigation of the risks of a near 14 metre draught ship grounding in Port Phillip Heads when transiting the Entrance – including supporting submissions from 3 former Port Phillip Pilots and the views of a 4th former Port Phillip Pilot.

PART 4. Failure of the design of the Great Ship Channel at the Entrance to Port Phillip Bay to reflect the standards and recommendations of the Permanent International Association of Navigation Congresses (PIANC) ‘A Guide for the Design of Entrance Channels’ (required for 14 metre draft ships) and failure of the Proponents to conduct a risk Assessment that reflects the recommendations and standards of the PIANC Guide for undertaking a Risk Assessment and the Australian Standard 4360 ‘Risk Management’.

Signed

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Retired Harbour Master Ports of Western Port and Hastings
27 April 2008.
PART 1.

Identifying the Risks

of a near 14 metre draught ship grounding in

Port Phillip Heads

When transiting the Entrance
PART 1 INDEX

Introduction

Primary Concerns.
Assessment Guidelines.

Environment Effects Statement.

Increased Dangers and Reduced Safety Margins, resulting from Large Deep Draught Vessels using Port Phillip Bay, following Channel Deepening.

Evidence Relating to Groundings and Collisions and Associated Risks in Port Phillip Bay.

Impact of a Large Deep Draft Oil Tanker or Container Ship, involved in a Powered Hard Grounding, at Port Phillip Heads.

Public Accountability.

Summary.
INTRODUCTION

Submission by Captain Frank Hart relating to increased navigational dangers, reduced safety margins, likely accidents with significant environmental and socio-economic impacts and public accountability resulting from the Channel Deepening Project are evidenced.

This submission relies on my experience as a master mariner having traded at sea for sixteen years, six of those years on a regular basis trading into and out of Port Phillip Bay to and from Tasmania.

I subsequently served as Harbour Master of the Port of Western Port & Hastings from 1966-1988, having overall responsibility for the safe, day to day, operations in the port including the safety of navigation.

The above experience is supplemented with my association with the Australian Port and Marine Authorities in prescribing, publishing and implementing rules for the safe transport and handling of dangerous goods and oils in Australian Ports and combating port emergencies, including those of oil pollution.

Throughout this Part references from the 2004 Environment Effects Statement are shown in italics, with comments in plain text.

Primary Concerns

As a consequence of the Channel Deepening Project large, deep draught, oil tankers and container ships, drawing up to 14 metres of water, are the vessels most at risk when navigating the entrance of Port Phillip Bay. The primary consideration of this submission is the safe navigation of these vessels through the Heads.
These large deep draught vessels are in the greatest danger of grounding alongside the boundaries of the Great Ship Channel at Port Phillip Heads. Such a grounding would likely result in catastrophic consequences, including blocking the Heads to all but small vessels, virtually closing the Ports of Melbourne and Geelong and causing major oil pollution with extensive long term environmental and socio economic damage.

**Assessment Guidelines**

The following parts of the Assessment Guidelines, dated October 2002, for the Port Phillip Bay Channel Deepening Environment Effects Statement, dated July 2004 are addressed in this submission:

*Part 2.6*  “Modify channels within existing alignments to accommodate vessels with draughts up to 14 metre at any stage of the tide”.

*Part 2.7*  “Potential changes in risks to the Bay’s environment and users from larger ships and changes to shipping movement patterns”.

*Part 4.5*  “Application of the Precautionary Principle”.

*Part 4.7*  “Assess potential environmental effects, as a result of the construction and maintenance of the channels, any spoil grounds, or any changes in shipping operations and patterns”.

“Assessment of environmental effects to be based on scientifically supported studies”.

“The scientific reliability of investigations to be indicated, including estimated degree of uncertainty or statistical confidence wherever appropriate”.

“Where impacts are not quantifiable they need to be described qualitatively, in as much detail as possible”.

“Further assessment of all environmental effects needs to encompass both potential impacts on and uncertain risks to the environment. Consequently, the systems based approach needs to incorporate:

...An environmental risk management approach based on assessing potential
hazards to environmental assets, values and uses, and the likelihood of their occurrence to guide effective risk management measures…..

Since environmental risks may span a range of probabilities, it is important that the level of rigour of investigation of particular risks is proportionate to both the potential consequences and the likelihood of their occurrence. While it will be appropriate to assess ‘worst case’ scenarios with respect to some issues, the effort directed to such investigations should be proportionate to both the potential consequences and likelihood of the worst case eventuating”.

The channel deepening project increases the risks and dangers, and reduces the safety margins of the navigation of deep draught vessels, particularly at Port Phillip Heads. The Assessment Guidelines for the Environment Effects Statement require the study and assessment of these risks and the likely significant impacts.

The assessments in the EES that relate to likely shipping incidents lack credibility, (see PART 2 below). The studies are based on inadequate data taken over too short a time frame. The data is limited in scope and comprises a narrow, quantitative list of numbers. The model is based on a UK study which cannot be assumed to apply to other regions. The study fails to take into account particular factors such as physical features, tides, currents, swell, weather and human error.

Environmental risk management, based on assessing potential hazards to environmental assets, values and uses, and the likelihood of their occurrence to guide effective risk management measures, as required above has not been carried out.

The Environment Effects Statement, fails to meet the test of due diligence and rigorous examination, proportionate to the potential consequences and to the likelihood of the worst case eventuating, as required under Assessment Guidelines part 4.7 above. The EES trivializes potential dangers, risks and impacts.
Environment Effects Statement

EES Volume 3 Biological and Physical Workstream – Marine Ecology.

Part 6. Port of Melbourne Ship Incident Model.

6.1 Purpose of Model
A probabilistic shipping incident model was required to calculate the likelihood of grounding incidents in various parts of the bay, as groundings would disturb benthic habitats. A shipping incident model was also required to calculate the likelihood of oil spills. In both cases, the model was required to provide information on the change in probability of incidents relative to the existing situation for scenarios in 2030, with and without a deepened channel.

6.2 Model Description

6.2.1 Model Overview
The Det Norske Veritas probabilities of incidents and oil spills were duplicated here in.

Tables 6.1 to 6.5. It should be noted that the models and these probabilities have numerous assumptions and caveats. These include:

- collision frequencies are assumed to be in proportion to the number of ship hours in an area without reference to density and pattern of vessel movements at specific locations;
- incident frequencies for collision, striking, grounding and impact are a factor of 10 less than those for UK port accident experience prior to 1976;
- other port-specific and ship specific factors are not incorporated, including:
  - tidal range, current speed;
  - extreme wind and sea conditions;
  - specific navigational hazards such as submerged rocks;
  - other restrictions on use of port according to time of day, weather, vessel operations, vessel dimensions;
6.3 Model verification

The predicted incident and oil spill frequencies were compared with existing data for Port Phillip Bay. A shipping incident log was provided by Port of Melbourne Corporation for the period 27/07/1998 and 30/05/2003. An oil spill log was provided by Marine Safety Victoria. These data, along with discussions with the Harbour Master, indicated that the model overestimated the probability of an incident occurring, but the data were only for a short period. An assessment of the validity, accuracy and robustness of the model is required. Regardless of this requirement, the model is considered exceptionally useful for providing a preliminary indication of relative changes in likelihoods of hazards occurring in association with channel deepening.

Validity, Accuracy and Robustness of Port of Melbourne Ship Incident Model.

The PMC Ship Incident Model (which the EES relies on to claim, ‘channel deepening will have no significant effect on the number of ship incidents and the number of oil spills’) is seriously flawed.

The assessment of the validity, accuracy and robustness of the model referred to in part 6.3 ‘Model Verification’, has not been carried out. Until this verification is provided, the model is of dubious credibility and has no substance.

When will the verification of the model be undertaken and by whom? For the verification to have credibility, the work must be independently carried out and be at arms length to all involved in the PMC model and involved in all other aspects of the Project. (see National Research Council - Peer Review below).

The incident data used in the model is from 27/07/1998 to 30/05/2003. Notwithstanding the brevity of the data period and the numerous assumptions,
caveats and exclusions, the assertion is made in the EES (see 6.3 above) that the model ‘overestimated the probability of an incident occurring’. This assessment is wrong.

The data analysed should have been for a 20 year period or longer. Only with this period length of data, can a clear picture be gained, and important questions be investigated fully and answered more confidently.

The data, derived from the time period chosen, shows no groundings at Port Phillip Heads. However, 3 vessels have grounded in Port Phillip Heads during the last 20 years, and one pilot launch overwhelmed by rough seas, with the pilot and two crew members being drowned.

Had the data used in the model, been taken over a 20 year period or longer and been more location specific, and included causal data, the conclusions drawn would have been very different and had greater validity. The conclusions would have shown the risks at the Heads to be significantly greater and not “manageable”.

The conclusions in the EES drawn from this model are dangerous. The model is certainly not ‘exceptionally useful’ as described in part 6.3 above. No ‘probabilistic shipping incident model’ would be less dangerous than the one provided. The model is a quantitative model based on deficient and doubtful data and gives a false sense of completeness. This model underestimates and overlooks the true risks.

Predictions of groundings and oil spills need to be derived from a more scientific and broader based model, with location specific data covering a much longer time period. Physical modelling at the Heads is required to study the transit of ships along the Great Ship Channel in the changed circumstances, and to determine the new risks and dangers and to support and verify the computer modelling already carried out. Together, both models will facilitate far better decision making than can reasonably be expected with the doubtful computer modelling information
presently available. The modelling needs to be totally independent from and at arms length to the stake holders.

**Grounding at Port Phillip Heads.**

‘Incident frequencies for collision, striking, grounding and impact are a factor of 10 less than those for UK port accident experience prior to 1976’.

Where is the information supporting this statement? What relevance have ‘collision, striking and impact incidents’ with ‘grounding incidents’ in various parts of the bay when considered in the context of the purpose of the model? (see 6.1 above). What relevance has UK port experience prior to 1976, to dangers and risks in Port Phillip Heads before and after the channel deepening i.e. in 2004 and 2006 and up to 2030?

*The following port and ship specific factors are not incorporated, including: ....... (as per 6.2.1 above).*

The shipping incident model, used by the consultants to estimate the likelihood of grounding incidents at the Heads, lacks any credibility when the many exclusions, caveats, qualifications and deficiencies described in 6.2.1 are not incorporated?

The shipping incident model, designed to estimate the likelihood of grounding incidents in various parts of the bay, has no value when the model fails to incorporate local specific detail such as tidal range and extreme current speed (with currents up to 8 knots crossing the Great Ship Channel in two different directions on each tide); wind, sea and swell conditions; specific navigational hazards such as submerged rocks and vessel dimensions?

How can the changed depths in the channels and increased ship draught, particularly at the Heads and effective reduction in channel widths, be ignored and
excluded from the data used in the model to determine probabilities, when projecting and assessing future risks and dangers?

The validity of the model is seriously flawed and inherently prejudiced. Information derived from this model may produce indicators related to some average somewhere in the UK, prior to 1976. However, unless all the factors detailed above are included and considered, the model will not provide substantive information on likely changes in probability of incidents to those existing in Port Phillip, for scenarios to 2030, either with or without a deepened channel. The existing model fails to provide any reliable information or predictions for Port Phillip Heads.

**Port of Melbourne/Parsons Brinkerhoff state in the EES that:**

‘The entrance to Port Phillip Bay is one of the most dangerous in the world’.....‘the entrance was a focus of the navigation simulation work. An outcome of the design process has been that in limited extreme conditions (waves, tidal levels and currents) the design vessel will not be able to use the Great Ship Channel because of insufficient under-keel clearance and width of channel exist in the current design’.

Where are the details of this ‘navigation simulation work’ and how have the results been represented? A computer model with input of limited data will produce limited and possibly misleading information. In the Channel Deepening Project, computer modelling must be checked and measured against physical modelling to provide reliable output. (see Part 3 no. 7 below).

Where is evidence from the Port Phillip Pilots in relation to the safe navigation of the large deep draught oil tankers and container ships (length up to 330 metre beam 45 metre and draught 14 metre) through the port channels with the new proposed depth and width parameters. Evidence from the pilots is critical in analysing navigation risks, dangers and safety margins (as required by the Assessment
Guidelines including parts 2.7 and 4.7 above, and for the EES Impact Analysis, including part 6. Port of Melbourne Ship Incident Model.) Were questionnaires on the safety parameters of the new channels submitted to individual pilots, or has the opinion of the pilots been contained in a Company response? As pointed out in the ‘NRC Peer Review’ below, the close involvement of the stakeholders undermines the independence of the study and could compromise the scientific validity of the study.

The ‘Environment Effects Statement’, fails to comply with the Assessment Guidelines unless a credible, independent risk assessment of navigational safety is completed. This assessment should adopt the findings of the ‘National Research Council Peer Review Executive Summary’ and apply the methods of the ‘Prince William Sound, Risk Assessment Study’. (see below).

Although the Channel Deepening Proposal indicates the Great Ship Channel is to be widened on its western side, at the north eastern part, to increase safer access to the Channel for outward bound deep draft vessels, there are other safety concerns relating to insufficient channel width that have not been properly resolved. (see Part 3 and NRC Peer Review Executive Summary below).

**Oil Spills at Port Phillip Heads**

How does the probabilistic shipping incident model predict the likelihood of oil spills at Port Phillip Heads, and what reliance can be placed on the accuracy of the prediction?

Oil spills at Port Phillip Heads follow vessel groundings. They are an extension of the same causes and are conditional on the groundings. The same observations and questions asked above relating to groundings at the Heads, are relevant to the likely occurrence of oil spills in the same location. It is almost certain that an oil spill will follow a ‘powered hard grounding’ of either a deep draught oil tanker or a deep draught container ship in the shallower waters alongside the Great Ship Channel.
The Port of Melbourne Ship Incident Model (6.2.1 above) was based on previous ship incident and oil spill modelling in and near Australian Ports by Det Norske Veritas. This modelling was for a large-scale assessment of oil spill risks around Australia.

What consideration has been given to the extent to which the Port Phillip Bay situation is similar or dissimilar to the DNV coastal oil spill modelling, from the broad features of the operating environment to the handling of individual variables, in particular at the Heads? (See ‘National Research Council - Peer Review’, below).

Collision frequencies are assumed to be in proportion to the number of ship hours in an area without reference to density and pattern of vessel movements at specific locations.

This statement is seriously flawed and misleading. If it were correct then there would be little difference between the open area of the Bay and the Channel north of the Fawkner Beacon for collision frequencies and oil spills. The dangers in the various channels are related to many clear and distinct factors and variables specific to those parts, rather than ship hours in an area. (see list of Groundings and collisions for Port Phillip Bay and NRC Peer Review below).

In assessing the validity, accuracy and robustness of the Port of Melbourne Ship Incident Model the following extracts from the identified statements and papers below are relevant to the PMC Model and are considered:

“A Physical Risk Analysis of Ship Grounding”, by S. Lin, H.L. Kite-Powell and N.M. Patrikalakis, published under the auspices of the Massachusetts Institute of Technology, in December 1998, carried out over a three year period using data taken from five U.S. ports, between 1981 to 1995 i.e. 15 years, concluded that:
'Groundings of commercial ships entering or leaving port contribute to one third of all commercial maritime accidents, including some of the worst in the United States history'.

A study of “Human Error and Marine Safety”, conducted by A. M. Rothblum of the U.S. Coastguard Research & Development Center 1998, states:
‘research indicates that human error contributes to between 75-96% of marine casualties’.

In a Dutch report, Accidents at Sea: Multiple Causes and Impossible Consequences” Wagenaar W. A. and Groeneweg J. (1987),
‘human error was found to contribute to 96 out of 100 marine accidents studied’.


‘A quantitative model alone is limited in its ability to assess risks and uncertainties. Quantitative models require very specific data that enable the description of the phenomena and relationships of interest. The risk analysis is used to predict the potential for accidents due to human error, but a knowledge of the linkages between human error and accidents is essential to building risk models. Estimates of the conditional probabilities that link the stages in the causal chain must be made to predict the risk of accidents due to human and organizational error. Most studies of transportation related accidents have concluded that human errors cause approximately 80% of all accidents. Three modelling techniques were used in the Prince William Sound Risk Assessment Study, two of these techniques were used to capture both the impacts of human error and the potential effects of human and organizational error related risk reduction interventions. Det Norske Veritas analysts used a fault tree approach and the George Washington University team developed a system simulation/expert judgment based modelling technique’.
Maritime incidents are unlikely to lessen. Human error must be identified and considered as part of any maritime risk analysis. Human error may be modified through various behavioural programmes, but it cannot be eliminated. Human error is taking place at this time in the EES where broad assumptions, purporting to be facts, are being made based on inadequate and flawed data.


After the 1989 ‘Exxon Valdez’ grounding in Prince William Sound (PWS), Alaska, a study team in 1995 from Rensselaer Polytechnic Institute, George Washington University and Det Norske Veritas developed 3 models to examine current levels of risk and evaluate proposed risk mitigation measures to reduce the amount of oil spilled in the Sound. The initiators of the study asked the ‘National Research Council’ to provide a Peer Review of the Prince William Sound Risk Assessment.

The National Research Council Peer Review of the Risk Assessment states:

‘The most significant weaknesses of the PWS Risk Assessment are (1) the lack of an overarching framework to ensure the consistency and logic of the analysis; (2) the lack of clear description of how the models were implemented, the probabilities calculated, and the results reached; (3) the inaccessibility of the proprietary data on which the results are based; (4) the treatment of human and organizational error; and (5) the appearance that conclusions are precise and logical, when in fact they are neither.

‘The Assessment involved close and continuous interaction with the stakeholders. Thus the Assessment is less an independent analysis of risk than a mutually agreed upon description of issues and recommendations for mitigating risk’. ‘The data were very limited, the analytic results and the resulting conclusions are not robust and are necessarily uncertain’.

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‘The PWS Assessment used three modelling approaches: marine accident assessment system, fault trees and simulation. A fourth model for estimating the volume of oil spills was used in conjunction with each. The potential weaknesses of the MARCS approach are listed below:

- the lack of dynamic modelling
- the assumption that all ships travelled at an average speed
- the assumption that all ships adhered to collision avoidance rules
- the exclusion of human factors
- the exclusion from the powered grounding model of accidents caused by failures to make required course changes’.

‘The fault tree model was incomplete, as no logical analyses relating basic events to accidents were included, and should have labelled the estimates ‘expert judgments’ instead of implying that the analysis was based on actual fault trees. In addition the estimates do not include uncertainty ranges; thus they give a false sense of completeness. This approach could result in risks being underestimated and risk reduction measures being overlooked’.

‘In the simulation model most parameters in the conditional probabilities were based on expert judgments encoded through relatively long (up to two hours) given to 162 people including pilots and tanker officers. The National Research Council committee has many concerns about the use of these questionnaires’.

‘The PWS Assessment asserts that the relative closeness of the numerical results of the three models indicates the correctness of the results and the validity of the analytic methods. However the methods as implemented were all based on the same input data and modelling assumptions. Therefore a reasonable case can be made that the results were bound to be comparable.
The National Research Council does not find the report’s argument compelling’.

‘Sensitive analyses and discussions of uncertainty were not included in the PWS Assessment. No analysis presented in the Assessment enables the reader to understand the effect of uncertainties and assumptions on results’.

‘Large scale models are critically dependent on the proper treatment of all relevant and available information, including accident statistics, weather data, operational data, and carefully encoded expert opinion, when necessary. In spite of the PWS study team’s diligent efforts to collect applicable data, the available environmental data were sparse; operational data also had to be supplemented with worldwide data. The National Research Council committee questions the applicability of some supplemental data’.

Human Factors.

‘Human factors must be a critical part of risk assessments, especially for crew-oriented marine systems. The National Review Council committee has concerns about how human factors were treated in the PWS study, particularly with regard to expert judgments. The committee appreciates that insufficient data were available, but is concerned with the way expert judgment was used to infer the probabilities of incidents and accidents attributable to structural, mechanical, or human errors’.

‘Because of the lack of essential and objective data, the PWS assessment team found it necessary to elicit and analyze expert judgments to complete their models. The assessment team appears to have tried to take into consideration and make adjustments for experts’ fatigue, levels of understanding, individual scale bias, and variability in response to the questionnaires, but the NRC committee has fundamental questions about
expert community bias or viewpoint, as well as residual questions about the
consistency of the responses and their application. The application of
sophisticated statistical techniques to the responses to the questionnaires tends
to mask these problems. Further complications arise from the use of a
subjective worst case approach. Mixing worst cases with probabilities makes
interpreting results extremely difficult’.

Applicability of the Assessment to Other Locations.
‘The conclusions and recommendations of the PWS assessment are location-
dependent and cannot be assumed to apply to other regions. Careful
consideration should be given to the extent to which the situations under
examination are similar to the ones analyzed in the PWS assessment, from the
broad features of the operating environment to the handling of individual
variables that appear to influence the result. Because relatively little
sensitivity analysis was done on the models used in the PWS assessment, the
effects of individual variables on assessment results are not easy to discern or
to apply elsewhere’.

‘Replication of the modelling approach also depends on collecting and
analyzing similar types of location – specific data. Some of the data in the
PWS study are proprietary and depend on the co-operation of the firms that
own it, and some depend on high level access to local experts. Other data,
such as information on vessel tracks derived from the vessel identification
capabilities of the PWS Traffic System, may be relatively difficult, if not
impossible, to obtain for other ports’.

‘In short, other regions of the Country should not try to replicate the PWS
assessment. The approach used in the PWS assessment has three elements:
the analytical methods (George Washington University dynamic modeling,
MARCS, and fault trees), the manner of implementing the methods, and the
results. The methods are clearly and obviously applicable to other areas, with
varying degrees of effectiveness and difficulty. The manner of implementation may be applicable depending on the circumstances; but the details are clearly not applicable. The results are not applicable except as a list of topics for consideration. A determination of unacceptable risks and acceptable risk reduction measures are always greatly influenced by local considerations, and local communities should participate actively in the early stages of a study to identify the objectives. The analysis should identify the factors and situations that tend to increase or decrease the risk, and the effectiveness of particular measures in reducing risk, when system-wide effects are taken into account’.

Summary of Findings.

‘The PWS Risk Assessment is an important step forward in the use of probabilistic risk assessment methods for assessing the safety of transporting oil in large tankers in PWS. Strengths of the assessment include: attempts to use probabilistic methods at the basic modelling level; searches for data from available databases and well designed questionnaires; the presentation of results in a variety of forms; and stakeholder involvement. However, the PWS assessment fails to measure up to the review criteria adopted by the NRC committee, which incorporate and expand upon criteria used for all NRC reviews. In particular, as applied in the PWS assessment, the weakness of the analytic methods raises questions about whether the results represent a scientifically-based assessment of risk. Close involvement of the stakeholders throughout the assessment process also undermines the independence of the assessment and could compromise the scientific validity of the assessment. Although the PWS assessment provides valuable information to those in decision making roles, it does not have the scientific rigour necessary to compare alternative measures’.

‘Taking into account stakeholder involvement, the limited data used for the analysing, and the lack of transparency in the analysing, the NRC committee
concludes that the PWS assessment is a first step in the right direction but applying it directly to other areas will require major changes in methods and procedures.

Changes that would make it more generally applicable include the following:

- providing an overarching study framework
- expanding the consideration of human factors
- disclosing the underlying data
- analysing sensitivities and uncertainties.

A major improvement would be to insure the assessment team’s independence of the steering committee, which should only be involved establishing and monitoring specific goals and objectives and facilitating the collection of information’.

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Although the PMC Ship Incident Model cannot be compared to the Prince William Sound risk analyses models in size or detail it still purports to assess quantitative risk for no less an important environmental and socio-economic area. The findings of the NRC Executive Summary of the ‘Peer Review’ of the Prince William Sound risk analyses models, equally apply to and reflect on the PMC ship incident model.

The purpose of the Port of Melbourne Ship Incident Model as set out in 6.1 was to calculate the likelihood of grounding incidents in various parts of the bay, and to calculate the likelihood of oil spills. In both cases the model was required to provide information on the change in probability of incidents relative to the existing situation for scenarios in 2030, with and without a deepened channel.

Extrapolating from the NRC Peer Review and the other related papers, clearly identifies the flaws of the Port of Melbourne Ship Incident Model.

The PMC Ship Incident Model has not satisfactorily fulfilled the tasks specified in 6.1. The predictions drawn from the model that, ‘the channel deepening will have
no significant effect on marine incidents and oil spills’, are misleading and dangerous and a major error.

Meyrick – Price Waterhouse Coopers Economic Impact Study

Volume 4 Socioeconomic Workstream - Economics

Volume 2 Economic Impact Report.

Executive Summary

Part 5 Direct Benefits of Channel Deepening.

5.2.2 Crude Oil Imports

The Deepening of the channel would permit significant savings in the cost of importing crude oil through higher utilization of current “Aframax” vessels. These vessels will be able to load to their marks, reducing the number of voyages required to transport crude oil imports. This stream of benefits was identified by Drewry (2002) and included in the original economic evaluation.

Mobil is considering using “Suezmax” or “LR2” sized vessels with a parcel size of approximately 120,000 tonnes of crude oil each voyage*. The effect of using “Suezmax” tankers would be a 44% reduction in the number of voyages that are currently required. Based on Drewry and Meyrick Data sources, the cost of running the larger size vessel is estimated at approximately US$1.017 million per trip compared to US$0.943 million per trip for an Aframax sized vessel.

In total, the potential savings from using Suezmax are estimated to be $9 million per year. The present value of this benefit stream over 25 years at 6% per annum is $100 million.

5.2.3 Refined Product Trade

The annual benefits to the product carriers of the channel Deepening Project are based on work undertaken by Drewry, and are estimated to be $0.43 million. The present value of this benefit stream over 25 years at 6% per annum is approximately $4.68 million.
Throughout the public consultative phase at the public meetings held earlier this year, the Consultants advised the channel deepening was intended for deep draught container ships.

Not until publication of the EES on 05/07/2004, the proposal for deep draught oil tankers with draughts up to 14 metre to transit Port Phillip Heads was withheld from the community, effectively avoiding full and proper public examination, consideration and debate with this part of the proposal.

Tankers generally have less power to weight ratio, have less length and greater beam and have a greater block coefficient making them slower and far less manoeuvrable than similar size container ships. **When oil tankers, drawing up to 14 metres, use the 17 metre Great Ship Channel at Port Phillip Heads, and when these same oil tankers are in the Bay, risks are raised to a far higher level than the level of risks for the container ships previously considered, with potential for far greater adverse consequences.** (See “Exxon Valdez” references below).

The community is not impressed by oil companies saving millions of dollars annually in exchange for jeopardizing the health of the environment in the Bays and along the coast, and placing the national and local economies at risk.

*Meyrik – Risk Report*

*Volume 4. Socioeconomic Workstream/economics (Economic Specialist Study)*

*Volume 3 Economic Risk Assessment.*

8. **MANAGEMENT (p.32)**
8.2 Management Objective – Collision Minimization

“The overarching objective is to prevent collisions between the dredging vessels and other vessels”.

The actual period of time taken to dredge the Heads will probably be much longer than the two months estimated. This will put pressures on masters and pilots to transit the Heads at times when the dredge may partly block the channel and in less than ideal weather and tidal conditions. What measures will be put in place to minimize dangerous situations during dredging operations?

On 20/06/84 the hopper barge “Charles H McKay” sank off Gellibrand light after being in collision with a freighter.

On 31/01/94 the dredge “AM Vella” was in collision with a freighter in the South Channel while dredging.

8.3 Threshold levels.

“The current annual threshold level for vessel collision rate in Port Phillip Bay is zero – a rate which is expected to be maintained”.

This statement and implied safety record and forecast is wrong and conflicts with the statistics which list not less than 11 collisions in Port Phillip in the last 20 years, five are shown as vessels under way and 6 between the vessel under way and either the wharf or a ship at the wharf. This number of collisions, which include a dredge and a freighter on 31/01/1994 and a dredge hopper barge and a freighter on 20/06/1984 when the hopper barge sank, is not insignificant. (see attached list of groundings and collisions).

10. RESIDUAL RISK ASSESSMENT

10.6 Impact of an oil or chemical spill.
Initial Risk

The impact of an oil or chemical spill has not been evaluated due to a number of factors which would make a generalized assessment of limited value.

The factors that determine the economic impact of an oil spill are heavily dependent on:

- The location of the oil spill
- The type of material that is spilt (Crude oil has a very different impact to that of refined products such as diesel fuel.)
- The volume of material spilt.
- The prevailing weather conditions, in particular wind direction, wind speed and sea state.

It is impossible even in a limited area such as the Heads to make a single impact assessment without specific information.

These assertions are misleading. The required impact of an oil or chemical spill assessment was not intended to relate to a particular event. It was intended to be an assessment of a possible event. (see Part 3 and Part 5 below).

An economic impact assessment should have been carried out. The model should have been for an oil spill in the most likely location, that is, at the Heads, for Crude oil (as a crude oil tanker is larger and less manoeuvrable than most other vessels and more likely to ground in that location). The modelling should have been for a volume of oil of 10,000 and 60,000 tonnes, with a south-westerly wind of some 25 knots and in a moderate southerly sea and swell.

In the event of either a deep draught oil tanker or container ship grounding at the Heads, the likelihood is for a major oil spill occurring with half the oil spreading into Port Phillip Bay, into the southern part of the Bay including Swan Bay and stretching along the eastern shore from Portsea through to Frankston and half the
oil spreading outside the Bay, down to Cape Schanck and further towards Westernport.

**Residual Risk**

*However, compliance with performance criteria developed clearly state that there will be no oil or chemical spills as a result of channel deepening. Therefore this risk is no longer considered to pose a threat.*

This assertion is wrong. A powered hard grounding at Port Phillip Heads alongside the Great Ship Channel by a large, deep draught oil tanker or container vessel will likely result in a major spillage of oil. The risks will increase significantly if the Channel Deepening Proposal proceeds as proposed.

What are the ‘performance criteria developed’, that will prevent such a grounding and where are the uncertainty factors that should have been studied? (Assessment Guidelines 4.7 above)

**m.t. Exxon Valdez.**

* A full report of the findings of the m.t. ‘Exxon Valdez’ grounding, in Prince William Sound, Alaska in 1989 and the consequential oil spill and damage to the environment, as defined, should be compiled and used as a guide as to what may occur at Port Phillip Heads.

During the night of 24th March 1989, the 1,100 ft. oil tanker Exxon Valdez, loaded with 200,000 ton of crude oil, grounded on a charted reef in Prince William Sound, Alaska. As a result of the grounding, approximately 37,000 tons of oil was spilled into the Sound, causing major environmental and socio-economic damage.

Notwithstanding extensive clean-up operations that continued for many years, 15 years later, the environment has still not recovered. Costs estimates to the community and to the ship owner vary between $US 6 and 10 billion.
Cases are still before the courts including the third legal challenge by “Exxon Mobil” against orders to pay punitive damages. In January 2004, a court order was made against the company to pay $US 6.75 billion in punitive damages plus interest, to fishermen, Alaska natives and others whose land or trade suffered damage following the disaster. In this latest decision, the Judge wrote: that following the spill “the social fabric of Prince William Sound and Lower Cook Inlet was torn apart”. He added that it “disrupted the lives and livelihood of thousands of claimants and their families for years”.

The company has paid $US 3.2 billion following the spill to cover environmental clean-up and compensation to Alaska residents and businesses. According to the “Exxon Valdez Oil Spill Trustee Council” more than $US 2.8 billion in tourism and recreation-related dollars were lost following the spill.

**Assessment Guidelines and the Precautionary Principle**

*The Assessment Guidelines, Part 4.3 “Matters to be Addressed” include, “The shipping access, economic, environmental and other implications of different depths of channel deepening”.*

*The Assessment Guidelines, Part 4.5 “Evaluation Objectives and Criteria” requires that, “Criteria” should address the, “Application of the Precautionary Principle”.*

The lack of a substantive and credible risk analysis and economic impact assessment as a consequence of a likely significant event, namely, a large deep draught oil tanker or container ship grounding in the Heads with significant loss of oil, fails to comply with and meet the standards of the “Application of the Precautionary Principle” set out under the 1992, “Inter-Governmental Agreement on the Environment” which states:
“Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk weighted consequences of various options”.

The Assessment Guidelines Part 4.6, defines ‘existing environment’ as including:

(i) Health, safety or amenity of people living, working or engaging in other activities;

(ii) Demography, attitudes, behaviour and well being of social communities and groups;

(iii) Physical and social infrastructure, and

(iv) Economic activity and output.

The Assessment Guidelines state that the “existing environments” should:

“include a detailed description of environments potentially effected by the proposal; and combine published information with sufficient new field data to provide a firm and suitably reliable basis for impact prediction, especially with respect to environmental issue identified”.

The failure to carry out a credible risk analysis and impact assessment of a likely oil or chemical spill at Port Phillip Heads, fails to comply with the requirements of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. This Act requires a full impact assessment of activities taken outside a Commonwealth marine area, where those activities are likely to have significant impact on the marine area’s environment.
10. RESIDUAL RISK ASSESSMENT

10.7 Channel Blocking Caused by Vessel Grounding. (p.38)

Initial Risk

A channel blockage will have an immediate effect on large and small shipping operators as their ability to load and/or unload cargo will be impaired. The impact of this occurrence is likely to be significant economic loss due to missed cargo calls and disruptions to vessels schedules. For smaller shipping operators, such as those plying the coastal trades and Bass Strait, the impact will be critical in the summer period when extra services are run.

The consequences of a vessel grounding, although noted by the “Proponents”, appear to have been disregarded in the EES - Port of Melbourne Corporation/Parsons Brinkerhoff - “Conclusions”. The statement is made that, “In summary, it is concluded that the Project poses minimal risk to the Bay as a whole, providing the environmental performance criteria are implemented”.

On what basis can the “Proponents” state the risks of such an event and then draw these conclusions? Where are the environmental performance criteria? Where are the uncertainty factors, have they been ignored? This conclusion is based on a risk assessment of doubtful credibility.

Volume 4 Socio Economic Workstream.
Vol. 2 Tourism and Recreation Risk Assessment.

6.18 Vessel Grounding

Vessel grounding as part of the long term operation of larger container ships, as well as those associated with capital dredging and maintenance dredging could have an impact in some sections of the Bay but the impact would not be anticipated to be long term. The impact however would be locationally specific and not be anticipated to be long term.

The impacts for each part of the Bay are discussed below.
6.18.3 North of the Bay

‘The presence of a large vessel ‘aground in the Bay’ could however have an unexpected positive impact on tourism in the sense that it could become a short term attraction and thus have a positive impact on accommodation and hospitality industries. It could also be a positive for charter boat tours in the Bay’.

The statements in relation to “locationally specific” and “would not be anticipated to be long term” show an ignorance relating to the movement and persistence of spilt oil. The statements in respect to tourism attraction and accommodation and tourism industries show no respect for the emotional health of the community and dismiss of all that is valued and good in the community.

Port of Melbourne Corporation Environment Effects Statement
Volume 1Main Report
Volume 1 EES/ Part E. Conclusions
Chapter 50 Regional Analysis
50.1.2 Conclusions
The general conclusions from the analysis of potential Baywide effects of channel deepening are:………..

Oil and chemical spills from shipping incidents could cause substantial impacts on the ecosystem structure and function of the Bay.

- channel deepening would not increase the likelihood of general incidents.

In summary, it is concluded that the Project poses minimal risk to the Bay as a whole, providing the environmental performance criteria are implemented. The threats of oil spills and translocation of marine pests represent the principal threats to the overall structure and function of the Bay’s ecosystem.

50.2 South of the Bay
As indicated above, it was concluded that the Project would pose minimal risk to the key processes that operate at a Baywide scale, provided the environmental performance criteria are implemented.

Where are and what are the ‘environmental performance criteria’ that are going to minimize the risks and remove the likelihood of general incidents? What are general incidents? Where are the uncertainty factors?

The statement, ‘posing minimal risk to the Bay and to the key processes that operate at a Baywide scale, provided the environmental performance criteria are implemented’, also shows an ignorance of the movement and persistence of spilt oil, and with a grounding of a large deep draft tanker or container ship at the Heads shows little appreciation of the consequences. It also shows scant respect for the emotional health of the community and is a dismissal of all that is valued and good in the community.

**Increased Dangers and Reduced Safety Margins resulting from Large Deep Draught Vessels Using Port Phillip Bay following Channel Deepening.**

The safe navigation of large vessels (being length up to 330 metres, beam up to 45 metres and draught up to 14 metres) into and out of Port Phillip Bay at any stage of the tide and in all weathers along the alignment of existing channels deepened to 17 metres, is jeopardized by the channel deepening proposal and is of major concern.

The impact of one of these large, deep draught vessels grounding at Port Phillip Heads could shade into insignificance any other major maritime disaster that has occurred previously. This assessment is based on the following points:

1. **Existing channel depths and draught limitations as described in the “Port Operating Handbook”**.
The Great Ship Channel is 245 metres wide and has a declared depth of 14.0 metre.

The Eastern Ship Channel, abutting the eastern edge of the Great Ship Channel is between 140 metres wide at its north-eastern or inshore end and 200 metres wide at its south-western or seaward end. This channel has a declared depth of 11.9 metres.

The Western Ship Channel, abutting the western edge of the Great Ship Channel is 95 metres wide and has a declared depth of water of 11.4 metres. Without tide, the existing permitted maximum draught of a vessel allowed to transit through Port Phillip Heads, along the Great Ship Channel is 11.6 metres.

Examination of the Eastern and Western Ship Channels as shown on the large scale sounding plan of Port Phillip Heads (1 : 2,500) with soundings plotted 25 metres apart, provides detailed information about the depths of water in these channels.

In the Eastern Ship Channel, there is one area, (approx. 20 x 8 metres), where the depth of water is between 11.9 and 13 metre. In the Western Ship Channel along the outer north-western edge of the channel, there are four small areas with depths of less than 13 metres but more than 11.4 metres. The depths of water in the remaining areas of the Eastern channels and Western channels are over 13 metres.


Statistical and anecdotal evidence indicates that deep draught ships transiting the Great Ship Channel are at times set outside the limits of this Channel into the adjacent Eastern and Western Channels.

Vessels drawing up to 11.6 metre draught, with no tide, are likely to avoid grounding if they stray into Eastern Channel which has depths of water over 13 metres and only one less depth, of 11.9 metres.

Vessels drawing up to 11.6 metre draught, with no tide are likely to avoid grounding if they stray out of the Great Ship Channel into the Western Channel...
unless they stray into the four areas found along the outer edges of the channel where there are depths of water of 11.4 metres. The remainder of this channel has depths of water over 13 metres.

Within the current parameters, there is a safety margin for 11.6 metre draught vessels if they are set or stray outside the edges of the Great Ship Channel.

**Changed Parameters**

Changed conditions, channel depths and draught limitations for vessels drawing up to 14 metres in the Great Ship Channel following channel deepening to 17 metres.

The channel deepening proposal at the Heads is to dredge the Great Ship Channel to a depth of 17 metres and to permit vessels with draughts of 14 metres to transit the Great Ship Channel, at any stage of the tide.

The safety margins that currently exist in the Eastern and Western Ship Channels for vessels with 11.6 metre draught, will disappear with post dredging parameters, i.e. for vessels with 14 metre draught permitted to transit the Heads at any stage of the tide. The depths of water in the Eastern (11.9 metre) and Western (11.4 metre) Ship Channels abutting the Great Ship Channels will not change.

**If a 14 metre draught vessel is set outside the edges of the Great Ship Channel the chances of that vessel NOT GROUNDING in the Eastern or Western Channels under the new proposal are SLIGHT!**

3. **Restricted Visibility.**

The leading lights and beacons, marking the edges of the entrance channels through the Heads are situated on Shortland Bluff at Queenscliff, a distance of approximately 2.5 nautical miles from the south-western entrance to the Great Ship Channel.
In the event of restricted visibility, including rain, fog or mist obscuring the leading lights or beacons, the pilot and ships’ officers have difficulty monitoring and conning the vessel along the track of the Great Ship Channel and may have to rely on available electronic aids. (see below)

4. Tides and Currents.

The Australia Pilot volume II states that, ‘the tidal streams in the Heads depend on the relative water levels inside and outside Port Phillip, the greatest difference in levels occurs at about the time of high and low water in the entrance, and the tidal stream therefore runs at its strongest, 5 to 8 knots, at these times; slack water occurs at about 3 hours before and after high water in the entrance when there is no difference in the levels’.

‘The in-going stream from southward and eastward increases in strength as it nears the Heads; it sets right into the entrance, across through the reefs with great force, and spreads towards Shortland Bluff and Point King’.

‘The out-going stream sets towards Victory bight between Point Lonsdale and Shortland Bluff, and thence out through the entrance at a great rate; the body of this stream sets athwart the entrance towards Point Nepean, and away south-eastward along the land and into the shore between Point Nepean and Cape Schanck’.

‘During rough seas a vessel may scend or dip below the ordinary water level, and great caution should be used by a vessel of deep draught outward bound…’,

From these extracts, it is apparent that both the flood and ebb tidal currents each flow strongly into and out of Victory bight between Point Lonsdale and Shortland Bluff, and each crosses the line of the main leads, in two ‘reverse’ directions.
The ingoing and outgoing currents do not always change at the predicted times. Atmospheric pressure and prevailing winds may effect the direction of the currents and the times of change may be up to one hour different to that predicted.

5. Courses steered to counter cross currents
A 330 metre long ship with draught of 14 metres, transiting the Great Ship Channel inward bound will have to steer an adjusted course away from the ‘course to make good’ in order to counter the effects of the cross current (5-8 knot and sometimes stronger). This deviation from the, ‘course to make good’ to the, ‘course steered’, is known as ‘set’.

The amount of ‘set’ (or course deviation) that has to be allowed, depends on the speed of the vessel through the water and the direction and strength of the cross current. In an ebb tide, with a vessel at the south-west end of the Great Ship Channel inward bound the adjusted course could be as much as 15 degrees to the left of the course to make good; meaning the ship’s course could be 027 degrees to make good a course of 042.5 degrees.

The larger deep draft vessels having up to 2.4 metres more draft than currently permitted through the Heads, could have an increased underwater profile of over 3,000 sq. metres. The effect of cross currents of 8 knots or more on these vessels with increased underwater profile in the Heads needs to be fully studied using a physical hydraulic model. This Physical modelling has not been carried out.

When a 330 metre length, 45 metre beam and 14 metre draught ship, steaming at 14 knots in a cross current of 8 knots, steers 15 degrees to the left of her true course to make good a course of 042.5 degrees, the bow of the ship is approximately 80 metres to the left of the stern of the ship, increasing the ‘apparent’ beam of the ship by 80 metres to 125 metres. Steering such a course is referred to as ‘crabbing’.
In the 245 metre wide channel this large, deep draft vessel has little margin between the ends of the ship and the sides of the Great Ship Channel. This margin, if the mid length of the ship is in the centre of the channel, may only be 65 metres at each end. If the mid length is not in the centre of the channel, the margin will be more than 65 metres at one end and less at the other. At times, when visibility is lost or reduced because of rain, fog or mist, (sometimes slowly and unexpectedly) in daylight or at night time, there is obvious concern that a deep draught vessel proceeding along the course of the Great Ship Channel may be set towards the edges of the channel. With the vessel travelling at a speed of over 7 metres per second, there is little time to take remedial action to correct the set.

(See attached extract, Exxon Valdez: Baker v. Hazelwood – 2001 – testimony referring to turning oil tankers; and

“The Human Element in Shipping Casualties”, Bryant, D. De Biev, et al 1998 states: “The control of ships does pose a very peculiar set of problems. The ship is a ‘slow system’ in which feed-back is not available in a direct and immediate form due to the enormous inertia of the vessel and the fluid nature of its physical environment. The navigator must thus take action in anticipation of what the situation will be at some time in the future”.

6. The Use and Reliability of Electronic Navigational Aids.

Electronic navigation systems are an aid to navigation only. While they assist in determining a vessel’s course that has been made good and its current position, they are limited in predicting the track of the vessel and take no account of the large dynamic and inertial forces at play.

‘Radar’ and ‘Differential GPS’ may be used as aids to navigation but should not be implicitly relied upon. In fact, these aids may create a false sense of security and over confidence which may lead to a casualty. Radar and the GPS are not free from
error. Course notes on electronic navigational aids, from the Australian Maritime College state that, “Because satellites transmit radio waves the information contained in those waves and therefore GPS derived positions can be affected by equipment characteristics and various geometric and atmospheric factors. While many of these errors are compensated for in the satellite and in the receiver, some cannot be corrected because of their variable nature. GPS should be used as a backup to visual and other electronic aids to navigation.

The accuracy of the GPS position fix can only be expected to be +/-25 metre under the best of circumstances. The use of GPS for channel and port navigation is not recommended due to the inherent inaccuracy of the system.”

“It is important that navigators do not lose the ability to use transit lines, and visual bearings as it is the visual navigation techniques which are the key to pilotage of vessels in confined waters and harbours. Manoeuvring of ships is done visually and an over reliance on electronic aids will handicap a navigator when it comes to pilotage situations”.

“GPS is subject to many unpredictable errors. It must never be relied upon as the sole means of navigation of a ship. It should only be used as a back up to traditional means of visual and radar navigation. An understanding of the errors in GPS is vital to the knowledge of the limitation of the system. There have already been some GPS operator assisted groundings”.

The Radar Observer’s Handbook for Merchant Navy Officers, 9th Edition 1998, by W. Burger, published by Brown Son & Ferguson, compares radar positions obtained by ranging and by bearings. Obtaining a position by means of two range circles at a mean range of 5 miles from the objects using a 6 mile range scale; then compare it with a similar position obtained by two bearings. If in both cases the angle of intersection is 90 degrees, then it can be shown that in the case of range
circles the Most Probable Position (MPP, 95% probability) will lie within a circle radius of 0.14 nautical mile, while in the second case using bearings only, the circle of error would lie within 0.12 nautical mile. That is within a circle of radius between 255 metres and 222 metres. note: The width of the Great Ship Channel is 245 metre.

The report of the Marine Board investigation into the grounding in the Heads of the bulk carrier m.v. “Matru Kripa” when returning to sea after abandoning attempts to enter Port Phillip Heads, on 10 September 1994 the Board noted that, “the position at 2050 hours (of the “Matru Kripa”) depends on single radar bearing and believes the accuracy should be treated with some caution”. (Summary of Report available).

The final report, of the Marine Board investigation in relation to an incident involving the tanker m.v. “Eburna”, when the vessel grounded leaving Port Phillip Heads on 16 March 1997, contains a submission from the Port Phillip Pilots stating: “No reliance can be placed on either the 1210 or 1220 radar positions placed on the chart, or the vessels assumed track”. (Summary of Report available)

These references indicate that the reliability and accuracy of radar positions is not absolute and may be affected by various factors including human and inherent error.

Electronic Navigation Charts.
The electronic chart is used as an aid to navigation, they provide the mariner with chart and navigation information on a computer screen. The computer is interfaced to an electronic positioning system, usually GPS which allows the screen to display the users position on a chart image. The graphical display shows the ships position relative to routes and charted dangers. Other instruments can be interfaced to display, course, speed, heading, depth and other navigational information.
The Australian Maritime College course notes state that, “An electronic chart system can only plot positions relative to charted information. **It is not a substitute for visual or radar navigation and is not a substitute for an adequate lookout.**”

Potential errors of the displayed data, can be introduced by inaccurate input from the electronic position fixing system (DGPS), inaccurate input of radar data and different deodetic co-ordinate systems. In addition to these the reference position of sensors on board may result in errors of display of own ship’s position.

Potential errors of interpretation may occur because of different modes of vector stabilization, over scale of the display, neglecting the 95% probability of the accuracy standard of the fixing sensor, failure of the automatic track keeping features such as the continuous display of own ship’s position on the preplanned track; and difference between true north and gyro north.

7. **Channel Design and Vessel Manoeuvrability.**

In May 2001 an International Workshop on Channel Design and Vessel Manoeuvrability, held in Norfolk, Virginia brought together channel designers, naval architects, pilots and ship operators to review and share design approaches and standards that affect safety of operations. The desire was to develop policy recommendations that can be implemented in the way channels are laid out and enlarged, and how various types of ships should be designed and handled.

The points made below are supported and contained in papers presented at the workshop by W.O. Gray, Gray Maritime Company, Darien, Connecticut; J. Waters, Associate Professor, U.S. Naval Academy, Annapolis, MD; A. Blume, Office of Vessel Traffic Management, U.S. Coast Guard, Washington, DC. and A.C. Landsburg, Acting Coordinator of Research and Development, Maritime Administration, Washington, D.C.
The following issues are critical in considering the proper design of the entrance channels through Port Phillip Heads to set safe parameters and standards for large deep draught vessels transiting the Great Ship Channel and the port entrance.

The International Maritime Organization (IMO) provides guidance criteria for the manoeuvrability of ships operating at sea speed in open water, but these are only guidelines with which many ships do not comply. These guidelines may not help ensure that a ship is manoeuvrable at slow speed in narrow channels where bank effects and squat, which increases at approximately the square of the ship’s speed, are crucial.

The Permanent International Association of Navigation Congresses (PIANC) and U.S. Army Corps of Engineers (USACE) have documented approach to channel design. In both cases, the recommendations of these groups refer mainly to channels within ports that are in reasonably sheltered waters.

PIANC is the internationally recognized authority for navigation channel design guidance, maintenance and operations; and USACE is the principle organization in the US responsible for these matters.

The USACE navigation mission statement is “to provide safe, reliable, efficient, and environmentally sustainable channels, harbors and waterways, for movement of commerce, national security needs and recreation.” There are some fundamental difficulties in achieving this mission. Most notably, there are no recognized standards for safety, reliability, efficiency or environmental sustainability relative to channel design promulgated by either PIANC or USACE.

The entrance to Port Phillip is unique, the entrance channel is subject to very significant swells, particularly during or after south-westerly gales, at times of
strong ebb tides. The Channel is also subject to extremely strong cross currents up to 8 knots or more.

These conditions are not usually associated with channels in ports, where swells are often non existent and currents can be expected to flow more or less along the line of the channel.

To identify and assess safety concerns, channel designers usually depend on ship simulation to provide information regarding problematic areas of a proposed channel.

Ship simulation was formerly used primarily as a training tool for mariners seeking to gain experience and to exercise manoeuvres in a controlled ‘virtual’ environment. While simulation continues to be used as a training tool for operators, ship simulation is now widely used as a navigation channel design tool. Both PIANC and USACE recommend using ship simulation to perform detailed or final channel design and ship simulation is used to verify a conceptual design, that ships can safely navigate the proposed channel. The results of simulation are typically used as a “pass-fail” check and to suggest incremental improvements through such modification as altering the proposed channel width or altering the proposed turn configuration.

7a. Modelling
There are two basic types of ship simulators; physical scale models and computer based models.

Physical scale modelling.
A scale model of a particular channel or harbour bathymetry is constructed. Scaled ship models are then piloted through the model scale channels. Physical simulators advantages are they provide ‘realistic representation’ of complicated hydrodynamic effects, including bank suction effects and shallow water manoeuvring. Most ship
operators have a very high level of confidence in the feedback obtained from physical simulation, particularly with a manned model simulator.

Computer modelling.
State of the art computers used for channel design have considerable limitations and can only model hydrodynamic phenomena that the programmer has been able to model and code into the simulator. Many workshop participants, underscore the need for more full-scale physical data to help calibrate, validate and improve numerical models.

Simulation and modelling.
The outcomes of simulation are helpful to channel designers but are subjective in nature. It is easy to identify problem areas if for example five or six ‘operators’ run aground in a particular area during the simulations. It is not so easy to ensure that because all five or six operators satisfactorily transited a channel during simulation, that the channel is deemed safe.

The number of ‘runs’ should be large enough for the results to perform a meaningful statistical analysis as well as a risk and uncertainty analysis. While the time and expense associated with simulation studies may reduce this number, to be of statistical benefit, a large number is required.

Computer modelling of the navigation of vessels at Port Phillip Heads must be complemented and confirmed by physical modelling. Unless physical modelling of the handling of the large deep draught vessels transiting inward and outward bound through the Heads, is carried out, there is little confidence on stand alone computer modelling.

7b. Channel Width.
Historically, channel depth has secured the most attention of channel designers and mariners. Both PIANC and USACE have detailed guidance for determining
channel depth and although channel width is treated somewhat similarly, the detail and attention to channel width is not as great as channel depth.

The quote “depth is for productivity, width is for safety”, illustrates a belief that width is a more fluid channel characteristic. Recently, the width of some navigation channel projects has been reduced to cut costs. Impacts occur due to one-way and two-way limitations, as well as reduced vessel speed. All caused by reduced manoeuvrability.

Risk and uncertainty analysis of channel design and usage is desperately needed to incorporate vessel transit data, as well as other factors into assessment of channel safety. The role of simulation technology needs to be supplemented with other tools for assessing total risk and uncertainty.

7c. Ship Manoeuvrability in Dredged Channels.
The capabilities of ships vary. Some have very poor manoeuvrability characteristics for the channels they must transit. Ship manoeuvrability and controllability characteristics vary from ship to ship.

A pilot has to assume control of the ship, soon after boarding, often with little knowledge of the controllability of that ship. Controllability depends on the design of the ship, engines, on length/beam/draught and trim ratios, rudder size, reserve rudder angle, power/tonnage ratio, minimum bare steerage speed and windage and on the prevailing weather and sea/current/swell conditions at the time.

Rudder efficiency and reserve rudder angle in narrow channels is important, as it has been observed that loaded tankers in dredged channels may require 10 degrees of rudder to initiate a turn, but at least 20 degrees of rudder is needed to check a turn.
Channel width should receive as much attention in the design process as channel depth.

In addition to beam, the design width of a channel, must account for windage so that ships encountering cross winds can crab as necessary to avoid being set out of the channel. This is particularly important for ports frequented by ships with large windage areas such as container ships.

Large deep draft container vessels have large windage that can complicate the vessel’s manoeuvrability in narrow channels as well as during slow speed manoeuvring. A large container ship with 45 metres beam when heeled 3.5 degrees, due to strong wind, increases its draught by 1.5 metres.

Some large vessels may have a minimum steerage speed of about 8 knots. Some new single screw tankers being built at minimum cost with low power/tonnage ratios and small rudders pose significant manoeuvring challenges. These vessels pose handling problems, especially when the ships are in ballast when the windage area of these types of vessels is greatest. Strong cross currents are more important with deep draught vessels. The width of the channel must account for the set of the current, so that ships can crab as necessary. This applies particularly at Port Phillip Heads where current ‘set’ is most influential on deep draught oil tankers.

PIANC (the Permanent International Association of Navigation Congresses) publication PTC II-30 of June 1997 ‘Approach Channels – A Guide for Design’ considers cross currents > 1.5 – 2.0 knots as strong. The Canadian Coastguard Guidelines for the Safe Design of Commercial Shipping Channels consider cross currents > 1.5 knots as severe. At Port Phillip Heads the currents cross the Great Ship Channel in two directions. The ebb tide, for example, flows westward crossing the channel from east to west into Lonsdale Bight, where it is reflected and flows out of the bight crossing the Great Ship
Channel from west to east at speeds of up to 8 knots or more! The direction of the flood tide is the reverse of the above.

At the closing session of the workshop a statement was made that, “Some of the fundamental rules of thumb for channel design are often violated in practice – both in the US and abroad. For example the general rule that the width of one-way channels should be between 4 – 5 times the maximum beam of ships expected to use it, is seldom followed. This rule of thumb is for channels in ‘sheltered ports’ and not for an open entrance channel such as at Port Phillip Heads, with some of the strongest cross currents experienced at any port entrance in the world, and where significant swells are notorious. (See Australian Pilot Volume II).

Existing Dangers
There are many concerns relating to the navigation of large deep draft vessels in the Great Ship Channel including under-keel clearance; squat; inexperienced crews; shortage of crew; language problems and possible failure of propulsion, steering gear and navigation systems. These problems will be exacerbated in the Port Phillip Heads Channels because of the proposal. However, these problems are not a direct consequence of the Channel Deepening Project, rather they are existing risks and dangers.

Summary of increased dangers and reduced safety margins in relation to the navigation of 14 metre draught vessels at Port Phillip Heads and in the Bay.

The channel deepening proposal will produce a channel with half the effective width of the existing channel at Port Phillip Heads for the use of larger and deeper draught oil tankers and container ships. The largest vessels will have increased deadweight tonnage by up to 100%, with increased length and beam, and increasing draught by up to 2.4 metres.
The risks and impacts of a vessel grounding at the Heads will dramatically increase as a result of the Channel Deepening Project leading to a likely, powered hard grounding of a large deep draft vessel alongside the Great Ship Channel.

Such a catastrophic event will likely result in a major oil spill with major environmental damage and the likely blockage of the ports of Melbourne and Geelong, to all but relatively small vessels, and lead to socio-economic destruction of parts of the local and State economy. (See PART 5 below).

PART 4
Evidence Relating to Groundings and Collisions, and Associated Risks in Port Phillip Bay.

There is both statistical and anecdotal evidence to indicate clearly that deep draft vessels are at times set or stray outside the boundaries of the Great Ship Channel.

Attached is a list of known groundings in the Heads since the grounding of the s.s. ‘Time’ on Corsair rock on 22/08/1949; and known collisions since the pilot vessel ‘Wyuna’ and the freighter ‘Bass Trader’ collided in the Heads on 15/06/1972.

The sources for this list are various. Marine Safety Victoria declined to acknowledge a written request for information, dated 08/06/2004 and an oral request one week later. There are probably a number of groundings and collisions not on the list, due to the difficulty in obtaining complete, detailed information.

In total, 27 groundings and 13 collisions are shown on this list. For the last 20 years, there are shown 11 groundings and 11 collisions. Port Phillip Heads is notorious for vessels stranding. Historically there are some 65 recorded wrecks in the area.
Recent Groundings in Port Phillip Heads.

The ‘investigation reports’ of the last three groundings in the Heads are examined. All three vessels were being piloted by a licensed pilot at the time of the incidents.

1. The oil tanker MT ‘Eburna’ was outward bound from Geelong on 16/03/1997 drawing 10.5 metre fore and aft under the pilotage of a licensed pilot. Tide was at full ebb. The vessel is reported as set to the eastward of the shipping channel when passing through the Heads and grounded, putting a hole in her fore-peak tank.

   The report states, “It is probable that the damage occurred as a result of the vessel coming down onto a pinnacle of rock or loose rock protruding above the seabed whilst the vessel was pitching during her passage through Port Phillip Heads”.

2. The bulk carrier MV ‘Matru Kripa’, was inward bound from sea for Geelong on 10/09/1994, under the pilotage of a licensed pilot. When proceeding along the Great Ship Channel the pilot of the vessel abandoned his attempt to navigate the Rip Entrance, due to an inability to make sufficient headway against a strong ebb tide, and decided to return to sea.

   During the return passage to sea, the vessel which was drawing 10.4 metre fore and aft, made contact with the sea bed to the south of the Rip Entrance and to the eastward of the shipping channel, putting a hole in the fore peak tank. When the ebb tide eased off, the vessel entered the port and diverted from Geelong to Melbourne.

3. The oil tanker, MT ‘Golden Gate Sun’ entered Port Phillip Heads under the pilotage of a licensed pilot at 0414 hours on 29/08/1984. The vessel was on the leads, failed to alter course to starboard and shape a course for the South
Channel. The ship grounded on the rocks at Shortland Bluff. The pilot advised he had taken anti-histamine medication and alcohol earlier that night.

4. A disaster occurred at about 0130 hours on 16/08/91 when the pilot launch “George Tobin” was overwhelmed by large seas in the vicinity of Lonsdale Reef. The vessel was returning to Queenscliff with two crew and a pilot who had just been taken off an outward bound vessel. All three men on board the launch were drowned.

**Groundings in the South Channel.**

The investigation reports of three groundings in the South Channel are examined.

1. On the evening of 23/09/2003 the 47,500 GRT car carrier MT ‘Global Spirit’, entered Port Phillip Bay under the pilotage of a licensed pilot. Weather conditions were good with 5-6 nautical mile visibility, reducing to about 2 nautical miles in showers. The wind was from the north at about 25 knots.

On approaching the eastern end of the South Channel, when the Hovell Pile was abeam to port, the ‘Global Spirit’ altered course to port and described an arc through north, then west, that resulted in the vessel running aground on the eastern end of the middle bank when the turn to port was not checked. The pilot advised he had nodded off.

2. On 28/06/2001 the multi purpose cargo vessel MV ‘Mirande’, outward bound from Geelong, under pilotage of a licensed pilot, as the vessel passed south of beacon no 12 in the south channel, the ship’s steering gear suffered a telemotor system failure. None of the bridge team attempted to change to the other system or attempted to use the non-follow-up steering controls. The ship’s momentum and the proximity of the edge of the channel resulted in the ship grounding within a few minutes.

The reports conclusions state:
- Two fuses blew
- The mate and third mate had inadequate knowledge of the bridge equipment.
- The helmsman had received no training in emergency steering procedures.
- Intoxication of the master resulted in his absence from the bridge at the time of the steering failure.

3. On 02/05/1993 the container vessel, MV ‘Berlin Express’ inward bound in the South Channel under pilotage of a licensed pilot. The vessel was in automatic steering through the dredged cut and took a rapid sheer to starboard and grounded adjacent to the South Channel Pile beacon. The most likely cause of the sheer to starboard was considered to be the speed that the vessel was travelling (about 18.5 knots), the effect of squat and the reduction of the under keel clearance and the response of the auto pilot to these factors.

The purpose of examining these reports is to provide some indication of the cause of the various incidents. In all cases, a degree of human element is involved.

In the case of the MV ‘Mirande’, even though the cause was largely attributed to the fuses blowing, the ‘investigation’ was critical of the Master not being present on the bridge, the mate and third mate having inadequate knowledge of the bridge equipment and the helmsman not trained in emergency steering procedures.

In the case of the MV ‘Berlin Express’, the statement was made that if the vessel had been proceeding at a much slower speed for the passage through the dredged cut, the lateral movement to starboard would have not been so great, and therefore the grounding would have been less likely to happen.
The human element error in the causes of the other incidents is apparent.

In the paper, ‘Human error and Marine Safety’ 1998, Dr. A. Rothblum of the U.S. Coast Guard Research Centre, states, ‘Notwithstanding improvements in hull design, stability systems, propulsion systems, and navigational equipment and technological advancement with a high degree of reliability, the maritime casualty rate is still high’.

‘Accidents are not usually caused by a single failure or mistake, but by the confluence of a whole series or chain of errors. In looking at how accidents happen, it is usually possible to trace the development of an accident through a number of discreet events’.

It is not intended to investigate the circumstances of the accidents other than to establish that, any claim stating, ‘the risks are manageable’ is very optimistic and could be seen more accurately as misguided.

**Impact of a Large Deep Draught Oil Tanker or Container Ship involved in a Powered Hard Grounding in Port Phillip Heads.**

**Potential environmental and socio-economic consequences of the grounding and stranding of a 14 metre vessel alongside the Great Ship Channel.**

Why is reference made throughout the EES to the impact of container ships grounding and no reference is made to the impact of large deep draught oil tankers grounding? Large deep draught oil tankers generally have less power to weight ratio, have a greater block co-efficient and are usually described as sluggish with respect to their manoeuvring capability.

Although the increased dangers and reduced safety margins will impact significantly on the safe navigation through Port Phillip Heads of large deep
draught container ships, the vessels most at risk are the large oil tankers that Mobil intend using in the Port. (see PriceWaterhouse Coopers Economic Impact Study, Vol. 4 Socioeconomic Workstream – Economics. Vol. 2 Economic Impact Report).

As discussed earlier, there is a likelihood of a large vessel straddling the Great Ship Channel, loosing large quantities of oil and blocking the entrance to all but the smaller ships for some considerable time. If a vessel grounds adjacent to the Great Ship Channel, there is a likelihood that the vessel will break up. Because of the strong currents in this area, there is little chance of mooring another vessel near-by to lighten the stranded vessel, and the salvage would in itself be extremely difficult, dangerous and costly.

There is no shortage of similar events that have occurred elsewhere, on which to model and study the likely impact. A study should be conducted and published by the proponents, and considered by the Government, before any decision to proceed with this proposal is reached.

The recommended study should include some of the following, larger oil spills that were consequential to vessel groundings:

‘Tasman Spirit’ 27/07/2003 at Karachi approx. 40,000 tonnes;
‘Sea Empress’ February 1996 at Milford Haven. approx.72,000 tonnes crude oil;
‘Cercal’ October 1994 at Leixoes Hbr. Portugal. approx. 2,000 tonnes crude oil;
‘Brear’ January 1993 Shetland Islands, Scotland. approx. 85,000 tonnes;
‘Aegean Sea’ December 1992. La Corunna, Spain approx 80,000 ton;
‘Exxon Valdez’ March 1989. Prince William Sound, Alaska approx. 37,000 tonnes;
‘Amoco Cadiz’ March 1978. Portsall, France. approx. 220,000 tonnes of Crude Oil;
‘Argo Merchant’ December 1976 off Nantucket Isl. Massachusetts approx 30,000 tonne;
Urquiola 1976 La Corunna, Spain approx. 108,000 tonnes crude oil;
‘Metula’ 1974 Magellan Straits. approx 53,000 tonnes crude oil.
The ‘Exxon Valdez’ incident gives the most detailed information to use as a base model.

A study of Worldwide Marine Oil Spill Cleanup Costs presented in a paper to the ‘Arctic and Marine Oil Spill Programme Technical Seminar (June 2000) by Dagmar Schmidt Etkin discusses the differences in costs of cleaning up oil spills in different countries. Costs vary considerably between countries and regions, probably due to differences in cultural values, socio-economic factors, and labour costs. Location, oil type, and spill size also factor heavily in determining cleanup costs. Near shore spills and in-port spills are 4-5 times as expensive to clean up as offshore spills, small spills cleanup costs are shown as higher per tonne than the cost of large spill cleanups.

This paper describes a cleanup cost estimation technique that can be applied to marine spills of different type. The model was developed from updated cost data collected from case studies of over 300 spills in 40 nations. The model takes into account oil type, location, spill size, cleanup methodology and shoreline oiling to deduce a per unit cleanup cost figure.

This model could have provided the structure for a similar model for the PMC had the PMC undertaken an impact assessment as required by the Assessment Guidelines part 4.7.

Costs for cleanup in the US are shown at approximately 3-4 times higher than the cost of cleanup in Australia.

**Costs by locality.**

An analysis of US oil spills in 1994 showed the cost of cleaning up spills of more than 50 tonne as being $12,000 per tonne. In 1999, port cleanup costs in US were estimated as $34,000 per tonne and off shore as $7,000 per tonne.
Costs by type.
Costs of cleaning up crude oil in the US (1999) varied between $14,500 and $21,000 per tonne and diesel fuel as $3,000 per tonne.

Oil that lands on exposed beaches, will weather over several years; whereas oil which reaches protected beaches, will have to be physically removed, as the use of dispersants is generally not approved in Australian waters.

The length of time that oil is released from a stranded vessel, and the direction and speed of the currents and winds, at Port Phillip Heads will determine what parts of the foreshore and bay and coastal areas will be affected. For the purpose of modelling, 50% of the oil could be assumed to enter Port Phillip Bay and 50% move along the ocean beaches between Point Nepean and round Cape Schanck towards Flinders.

Public Accountability

Government, the Port of Melbourne Corporation, the Harbour Master, Port Phillip Pilots and the Consultants have a joint and several responsibility to ensure that the Channel Deepening Project in no way compromises the safe navigation of large deep draught vessels in the Port Phillip Bay Shipping Channels.

The Environment Effects Statement fails to show proper investigation of the increased dangers and reduced safety margins that will exist as a result of the proposal. The studies relating to safe navigation, particularly in Port Phillip Heads, overlook the dangers and under estimate the consequences of a large deep draught tanker or container ship grounding in this location, that will put at risk the environment and the socio-economic wellbeing of the State of Victoria.
With minimal margin of safety and increased dangers at the Heads as a consequence of the proposal, and with the potential catastrophic consequences of a powered hard grounding of a large deep draught oil tanker or container vessel alongside the Great Ship Channel, brings into question the accountability of the Government, the Port of Melbourne Corporation, the Harbour Master, the Pilots and the Consultants for providing a channel of inadequate dimensions for the safe navigation of these vessels.

The Master has ultimate responsibility for the safety of his vessel, but when the vessel is under the pilotage of a licensed pilot advising on navigation in the port, the question arises as to who will bear responsibility and be held accountable if a grounding occurs in the circumstances described in this submission.

Safeguarding the Public Interest must be of prime importance. The Assessment Guidelines, Part 4.5 require the 1992 Inter-Governmental Agreement on the Environment - ‘Application of the Precautionary Principle’ be addressed. The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 is also relevant. The relevant parts of the Agreement and the Act have not been properly responded to in the Environment Effects Statement. Tokenism is unacceptable.

Consequences have to be uppermost in the minds of the decision makers.

When steam replaced sail there were going to be no more groundings, when the Titanic was built she was unsinkable, when the Exxon Valdez was built she was fitted with all the latest navigation aids to avoid a grounding. Accidents will happen, man made accidents of such dimensions are inexcusable.
Summary.

Since writing the above I have had the opportunity to read the Proponents’ Witness Statements from Maunsell Australia Pty. Ltd. in relation to Channel Design and from Australian Marine Ecology in relation to Marine Ecology and regional analysis.

Having read both documents, I conclude that the views expressed above in my submission relating to increased dangers and reduced safety margins are reinforced and that the following points from the Witness Statements are relevant:

1. Maunsell’s Report states, ‘The recommended Great Channel width from PIANC, of 260 metre for the large tanker is wider than the proposed width of 245 metre. The 245 metre channel alignment was endorsed by the Harbour Master and the Port Phillip Sea Pilots as being Satisfactory’.

‘The PIANC guidelines provides planners with a set of procedures to be used when determining parameters required to provide efficient maneuverability with no less than minimum safety margins and allowances. Procedures are set forth for the determination of channel width, depth, side slope and curvature, as well as the alignment of channels’.

‘The guidelines have been developed for waterways utilized primarily by large traffic, such as tankers, general cargo and bulk carriers, and are not meant to replace more extensive analyses for the final channel design’.

It is noted that the PIANC Guidelines are to ‘provide efficient maneuverability with no less than minimum safety margins and allowances’.

It is also noted that PIANC consider cross currents in excess of 1.5 knots as being strong, the Canadian Coastguard in their channel design recommendations consider cross currents over 1.5 knot as severe, yet at Port Phillip Heads cross currents of 8 knots are regularly experienced throughout the tidal cycle.
Notwithstanding this information the Harbour Master and the ‘Port Phillip Sea Pilots’ consider a width of less than the PIANC recommended width in the Great Ship Channel as ‘satisfactory’.

I consider this attitude is wanton foolhardiness and brings into question whether stakeholder interests are being given undue consideration at the expense of safety.

In my opinion a channel width of 260 metre which is the minimum recommended by PIANC for large tankers, is far too small for the safe navigation of large deep draught oil tankers and container ships in the extreme conditions regularly experienced at Port Phillip Heads.

PIANC – IAPH state in their 1997 Report on Approach Channels – A Guide for Design (vol. 2) ‘For deep water ports which must receive large ships, in excess of 50,000 dwt say, an important problem to be faced is the fact that the actual track of these ships may deviate considerably from the ideal. This is a consequence of the slow response of large ships to rudder action... This characteristic may require the introduction of different operational limits for such ships in port approaches... and as a result, the provisions to be made for safe navigation may have to be more extensive than for those ports catering only for small vessel’s.

2. Assessment of the results derived from computer model, using the SimFlex Simulator, leave a clear impression that the criticisms and shortcomings of simulation techniques, outlined in the paper, ‘Channel Design and Maneuverability’, by Gray, presented before the New York Metropolitan Section of the Society of Naval Architects and Marine Engineers on January9, 2002 (refer to PART 3. 7 above) apply here. The Maunsell Report, (set out below) gives a clear impression that the programming of the simulator has progressively been reworked and modified, to achieve an output that resembles the answers expected, and not answers that produce unexpected difficulties.
After studying the Simulation Report (set out below) there is doubt that the modeling of
the navigation of large deep draught oil tankers and container ships through Port Phillip
Heads has been scientifically and thoroughly assessed. To treat the results as anything
other than a simple guide for channel design at the Heads, with a high degree of
uncertainty, would be dangerous. There is a question mark over the experience of those
undertaking the model programming and their independence from the stake holders.

**The Report states:**

6.4.4 The Rip

*The key issue arising from the first simulation were:*

- The flood currents as modeled in the entrance to the Great Ship Channel and
  over the entrance deep caused very difficult ship movements. For some
  departures the high currents resulted in the ship being uncontrollable, even at
  sea speed, and grounding occurred on the west side of the channel because the
  ship had moved outside the channel. It was noted that the ship was crabbing
  some 20 – 25 degrees along the channel, which gave an effective ship width of
  about 100 metre in the 245 metre wide channel. It was noted that the flood
  current field modeled may not be a realistic condition.

- The pilots commented that the lack of leads and marks in the simulator rendered
  the simulation unrealistic, and that in the real life situation visual cues would
  enable better handling of the vessel. It was also noted that the simulations were
  being undertaken on an ad-hoc basis of reacting to the changes induced in the
  vessel direction as they occurred, rather than by following a predetermined plan
  and course, which would be normal practice when navigating through the
  entrance.

- There was an issue in relation to ship motions under waves north of Point
  Nepean on arrivals, where wave motion at full ahead could cause grounding in
the simulation model with the ship turning to starboard. This was controlled by adopting a slower ship speed. The wave height in the model was 1.5 metre, which some pilots regarded as unrealistic.

As a result, further attention in the second simulation to investigating the wave and current parameters used in the model, pilot familiarity with the simulation and consideration of a predetermined course, and the addition of navigation aids to the simulation. The modifications to the simulation model, the second simulation study and the findings were as follows:

- Simulated navigation techniques were improved by introducing a constant radius turn based on the predictor tool available on the electronic chart display, and by the addition of lines on the electronic chart display to represent marks currently used by the pilots.

- A number of check runs were performed with a 295 metre Panamax vessel at 13 metre draught to simulate existing operations through the entrance and to test whether the simulator gave similar results expected by the pilots.

- A more realistic current field was applied, developed from the current field studies undertaken for the environment impact studies.

- A more realistic wave field was applied, based on the additional wave studies undertaken by Lawson and Treloar.

The outcomes of the second simulation study with these modifications were:

- In the pilot’s opinion, the check runs for existing operations produced realistic though conservative ship handling performance.
• Arrivals and departures could be safely completed using the marks currently used by the pilots and while also being able to keep south of the Goorangai wreck.

• Departures could be satisfactorily completed using the constant radius turn and by using ship revolutions at a speed consistent with approximately 15 knots through the water when approaching the turn from the South Channel into the Great Ship Channel. In all runs, the ship veered to the western side of the channel near Point Lonsdale and it was recommended that the channel should be flared in this area to improve navigation.

• Arrivals and departures for the tanker were satisfactory, with the same issues as occur at present when navigating large tankers in a strong current.


4.1 Channel width

The Maunsell Report states, ‘Aids to navigation have been categorized as excellent in all sections of the channel’.

This statement needs amplification. The main leads at Port Phillip Heads are situated at Shortland Bluff, Queenscliffe, approximately 2.5 nautical miles from the seaward end of the Great Ship Channel. As described in my submission these leads may be obscured from seaward at any time when rain passes between the bridge of the ship and the leads, obliterating the leads from the view of those navigating the vessel on the bridge of the ship. At night time, banks of rain or showers may be passing through this area and not be observed. The leads may be visible one minute and gone the next.

This feature is one of the reasons why a 245 metre wide 17 metre deep Great Ship Channel with 11.4 and 11.9 metre declared depths on each side of the Great Ship
Channel, for large deep draft oil tankers and container ships with draught up to 14 metre, is totally inadequate. **Increasing the proposed width of the Great Ship Channel by a few metre is totally inadequate and will not make the difference between a safe and an unsafe entrance.**

4. Reviewing the Expert Witness Statement of Dr. J. Edmunds, Australian Marine Ecology with respect to references to the Port of Melbourne Ship Incident Model, he again makes the statement that, ‘I consider that the risk of oil and chemical spills from changes to shipping will reduce with the project. This is because there would be more ship passings without the project, which would substantially increase the risk of an incident leading to a spill’.

This forecast is a distortion of the facts. As shown above, the proposal will increase the dangers and decrease the safety margins. The risk analyses in the EES lack credibility and the claim that, ‘the project will reduce the number of ship passings’, is based on subjective information. The maritime shipping industry is in a state of development and realignment at this time, with routes and hub ports and ship number forecasts subject to constant change.

The above opinions are based on my experience set out in the Introduction of this Submission and in accordance with the best information available to me at this time.

# Groundings and Collisions in Port Phillip Bay


<table>
<thead>
<tr>
<th>name of vessel.</th>
<th>date and time</th>
<th>type of incident</th>
<th>pilot on board</th>
<th>comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Global Spirit”</td>
<td>23/09/03 2100 hr.</td>
<td>grounding</td>
<td>yes</td>
<td>vessel rounding Hovell pile, pilot advised that he nodded off.</td>
</tr>
<tr>
<td>“Sapphire”</td>
<td>18/01/03</td>
<td>grounding</td>
<td>?</td>
<td>Webb Dock. incident listed – public report not yet released.</td>
</tr>
<tr>
<td>“Mirande”</td>
<td>28/06/01</td>
<td>grounding</td>
<td>yes</td>
<td>Steering gear failure, grounded in south channel. Inquiry found first and third mates had inadequate knowledge of bridge equipment specifically emergency steering gear.</td>
</tr>
<tr>
<td>“Eburna”</td>
<td>16/03/97 1215 hr.</td>
<td>grounding</td>
<td>yes</td>
<td>comment: Shell tanker. Investigation found vessel hit bottom passing out of Port Phillip Heads holing fore peak tank.</td>
</tr>
<tr>
<td>“Matru Kripa”</td>
<td>10/09/94 2050 hr.</td>
<td>grounding</td>
<td>yes</td>
<td>comment: When entering through Port Phillip Heads vessel found to be making little headway against strong ebb tide. Entry aborted, whilst returning to sea, vessel grounded putting hole in fore peak tank.</td>
</tr>
<tr>
<td>“Berlin Express”</td>
<td>02/05/93</td>
<td>grounding</td>
<td>yes</td>
<td>comment: Vessel inward bound grounded in south channel as a result of ship taking a rapid sheer to starboard. At time vessel in automatic pilot.</td>
</tr>
<tr>
<td>“Novikov Priboy”</td>
<td>07/06/92</td>
<td>grounding</td>
<td>yes</td>
<td></td>
</tr>
</tbody>
</table>
comment: Vessel grounded off Gellibrand shoal.

“Ampol TVA”  11/09/91  grounding  yes
comment: Vessel grounded off the Hovell light.

“George Tobin”  15/08/91  founded  yes
comment: Pilot launch founded on reef off Point Lonsdale.

“Premier”  30/04/91  grounding  yes
comment: Vessel grounded in South Channel.

“Golden Gate Sun”  30/08/84  grounding  yes
comment: Oil tanker failed to turn off leads entering through Heads and vessel grounded on Shortland Bluff. Pilot claimed he had been taking anti-histamine medication for a cold, causing him to fall asleep.

“Africa”  1969  grounding  yes
comment: Bulk carrier grounded while negotiating Point Richards Channel.

“Nagaosan Maru:  02/10/64  grounding  yes
comment: grounded near Queenscliffe.

“Millers Canopus”  30/08/64  grounding  yes
comment: Oil tanker grounded in Hobsons Bay.

“Kissavos”  20/08/64  grounding  yes
comment: Oil tanker grounded in Hobsons Bay.

“Beltana”  16/09/63  grounding  no
comment: Grounded Point Nepean Reef in strong ebb tide.

“Karoon”  08/09/63  grounding  no
comment: Grounded Point Nepean Reef in strong ebb tide.

“Wangara”  18/11/61  grounding  no
comment: Freighter grounded near Point Lonsdale, outward bound, forced to the west giving sea room to inward bound vessel

“River Glenelg”  21/07/60  grounding  ?
comment: Bulk carrier grounded Hobsons Bay.

“Pattawilya”  26/07/59  grounding  yes
comment: freighter grounded Hobsons Bay.
<table>
<thead>
<tr>
<th>Ship Name</th>
<th>Date</th>
<th>Event</th>
<th>Status</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Patricia”</td>
<td>26/01/57</td>
<td>grounding</td>
<td>yes</td>
<td>oil tanker grounded Hobsons Bay.</td>
</tr>
<tr>
<td>“Iron Master”</td>
<td>03/10/57</td>
<td>grounding</td>
<td>?</td>
<td>grounded in South Channel.</td>
</tr>
<tr>
<td>“Tasmania Star”</td>
<td>09/05/56</td>
<td>grounding</td>
<td>yes</td>
<td>freighter grounded Point Richards Channel.</td>
</tr>
<tr>
<td>“Orsova”</td>
<td>24/05/56</td>
<td>grounding</td>
<td>yes</td>
<td>Passenger vessel grounded in South Channel.</td>
</tr>
<tr>
<td>“River Burnett”</td>
<td>17/07/55</td>
<td>grounding</td>
<td>no</td>
<td>Bulk carrier grounded on Corsair Rock.</td>
</tr>
<tr>
<td>“Orcades”</td>
<td>07/05/52</td>
<td>grounding</td>
<td>yes</td>
<td>grounded South Channel.</td>
</tr>
<tr>
<td>“Time”</td>
<td>22/08/49</td>
<td>grounding</td>
<td>no</td>
<td>freighter grounded Corsair Rock, unable to be refloated and remained on rock for 10 years until it disappeared in a storm.</td>
</tr>
</tbody>
</table>

**COLLISIONS.**

<table>
<thead>
<tr>
<th>Ship Name</th>
<th>Date</th>
<th>Event</th>
<th>Status</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Tamesis”</td>
<td>02/12/02</td>
<td>collision with wharf</td>
<td>yes</td>
<td>collided with wharf whilst berthing, primary cause squall of wind.</td>
</tr>
<tr>
<td>“Cape York”</td>
<td>05/08/02 2048 hr.</td>
<td>collision with wharf</td>
<td>yes</td>
<td>Departed B Berth, Appleton Dock without tugs. Engine failure. Vessel blown across river and struck 32 South Wharf.</td>
</tr>
<tr>
<td>“Santa Lucia”</td>
<td>31/10/01 0245 hr.</td>
<td>collision with wharf</td>
<td>yes</td>
<td>Vessel departing F Appleton Dock struck 29 south wharf.</td>
</tr>
<tr>
<td>“Bunga Orkid Dua”</td>
<td>23/05/01 2336 hr.</td>
<td>collision with marina pier</td>
<td>yes</td>
<td>After departure vessel proceeding down river struck pier 35 marina structure.</td>
</tr>
<tr>
<td>“Western Tiger”</td>
<td>April 1997</td>
<td>collision with wharf</td>
<td>yes</td>
<td>Collided with Lascelles wharf Geelong during berthing operations.</td>
</tr>
<tr>
<td>“Columbus Victoria”</td>
<td>17/11/96 2232 hr.</td>
<td>collision</td>
<td>no</td>
<td></td>
</tr>
</tbody>
</table>
comment: Both vessels at anchor off Williamstown. “Columbus Victoria” dragged anchor in strong winds and collided with “Sampet Hope”.

“Searoad Mersey” 31/01/94 2151 collision no
“AM Vella”
comment: “Searoad Mersey” using ARPA set course to pass dredge “AM Vella” working in South Channel. Struck No. 15 beacon and proceeded on to collide with dredge.

Pacprince” and 09/08/93 collision ?
HMAS “Castlemaine”
comment: collision at North Wharf.

“Reliance Trader” 12/09/90 collision with ship at berth. yes
“Anangel Apollo”
comment: “Reliance Trader” berthing at Corio Quay North No.1 collided with “Anangel Apollo” berthed at Corio Quay North No. 3, Geelong.

“Ace Chem” 18/04/89 collision yes
“Tolema”
comment: Collision in River Yarra.

“Yue Man” 20/06/84 collision yes
“Charles H McKay”
comment: In collision off Gellibrand, Williamstown, hopper barge “Charles H. McKay” sank.

“Nieuw Holland” 09/08/72 collision yes
tug “Melbourne”
comment: Passenger ship “Nieuw Holland” collided with tug “Melbourne” when picking up headline and tug “Melbourne” sank as a result.

“Wyuna” 15/06/72 collision yes on “Wyuna”
“Bass Trader” no on “Bass Trader”
comment: Pilot vessel “Wyuna” collided with cargo ship “Bass Trader” at Port Phillip Heads in fog.

Signed.
Frank Hart.
21/09/2004
PART 2.

Investigating the risks of a near

14 metre draught ship

grounding in Port Phillip Heads

when transiting the Entrance.
This presentation to the Panel relates to the primary concerns set out in the Expert Witness Statement, dated 24 September 2004, submitted by Captain Frank Hart.

These concerns refer to the safe navigation of large deep draught oil tankers and container ships transiting the Great Ship Channel at Port Phillip Heads, should the channel deepening proposal proceed in its present form. The Witness Statement examines:

1. Description of existing physical features of the entrance channels.
2. Description of proposed changes to physical features of entrance channels.
3. Existing parameters for vessels transiting the Great Ship Channel.
4. Proposed parameters for vessels transiting the Great Ship Channel.
5. Comparing existing entry channel parameters with future parameters.
6. Increased risks and dangers associated with reduced safety margins.
7. The Port of Melbourne Ship Incident Model.
8. Oil Spillages.
9. Channel Design.
10. Size of vessels to use deepened channels.
11. Crabbing.
12. Physical hydraulic model to help calibrate and validate numerical model.
13. Restricted visibility and navigation aids.
14 Use of other references, information and papers.
15 Other Port of Melbourne Corporation comments in Annexure E 4.
16 Public Accountability.
17 Conclusions.

Attachment. I Under-keel Clearance in Eastern & Western Ship Channels
Attachment. II Under-keel Clearance in Great Ship Channel.
Attachment. III Great Ship Channel. Ebb Tide.

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1. **Description of existing physical features of the entrance channel**

The Great Ship Channel crossing the Rip Bank is 1500 metre long, has a width of 245 metre, with a declared depth of -14.0 metre CD.

Abutting the eastern side of the Great Ship Channel crossing the Rip Bank is the Eastern Ship Channel with a width at it’s seaward end of 200 metre and 130 metre at its north-eastern end, with a declared depth of -11.9 metre CD.

The Western Ship Channel abuts the western side of the Great Ship Channel, is 95 metre wide and has a declared depth of -11.4 metre CD.

Examination of the depths of water in the Eastern and Western Ship Channels crossing the Rip Bank, show one small area in the Eastern Channel and four areas on the western boundary of the Western Channel with depths of less than -13 metre CD.

The total width of the ship channel crossing the Rip Bank, having a depth of at least -13 metre CD, is more than 370 metre.
The “Port of Melbourne Operating Handbook 2002”, part 2.1, Anchorages, Channels and Berths, states, “Over the Nepean Bank, depths of at least -14 metre CD exist between 150 metre west and 200 metre east of the main leading line” ie. A total width of 350 metre, with 14 metre depth of water, exists over the Nepean Bank.

2. **Description of proposed changes to the physical features of the entrance channels.**

The proposed deepening to the channels crossing the Rip and Nepean Banks are described in some detail in the witness statement presented by Mr. Peter Burton of Maunsell partners.

The proposal is to deepen the Great Ship Channel to a declared depth of water of -17 metre CD, compared to the present declared depth of water in this channel of -14 metre CD.

The proposed changes include, deepening the Western Ship Channel on the western side of the Nepean Bank and the north western corner of the Western Ship Channel crossing the Rip Bank to a depth of -17 metre CD.

The Eastern Ship Channel crossing the Rib and Nepean Banks and most of the Western Ship Channel crossing the Rip Bank remain untouched, except for sections which have been referenced as being deepened to -14 metre CD for purposes associated with a construction channel..

3. **Existing parameters for vessels transiting the Great Ship Channel.**

Existing parameters for vessels transiting the Great Ship Channel are maximum allowable draught of 11.6 metre “without tide” and 12.1 metre “with tide”.


The “with tide” amount is equal to 1.5 metre plus allowances. The allowances include squat, wave and uncertainty allowance.

The PoMC state in their Submission dated 29 October 2004, Annexure E.4 part 9, page 9, “the West Channel has a natural depth in excess of -17 metre CD over most of its area”.

This statement is not correct, most of the Western Ship Channel across both the Rip and Nepean Banks has depths appreciably less than -17 metre CD with a least depth of 11.4 metre.

4. **Proposed parameters for vessels transiting the Great Ship Channel.**

The Port of Melbourne Corporation make the following two statements as to the rise of tide required, before 14 m. draught vessels will be allowed to transit the Great Ship Channel, following channel deepening in the Heads. There are inconsistencies in these two statements.

i. “Response to Specific Submissions and Issues. Annexure Part E”, dated 29/10/2004. “Response to requests by panel for further information”, clause 4.5 (b), page 7, asking, would vessels with a draught of 14.5 metre be able to access Port Phillip Bay under the current proposed channel design? the PoMC state:

   “Under favourable tidal and weather conditions, it would be possible for vessels with a draught of 14.5 metres to enter Port Phillip Heads. The window of opportunity would be narrow and vessels could not rely on gaining access. The design was based on allowing safe and near constant access through Port Phillip Heads for a 14 metre vessel”.

ii. In a separate, paper to the Panel dated 01/11/2004 the PoMC advise:
The current proposal by PoMC is to deepen the shipping channels to provide access for 14m draught vessels to the Port of Melbourne:

- At all stages of the tide within Port Phillip Bay and the Yarra River; and
- With a 95% probability of transiting the entrance to Port Phillip Bay (over the Rip Bank and Nepean Bank) when the rise of tide is 1.5m.

Note: A rise of tide of 1.5 metre on the Rip Bank and Nepean Bank is approximately half tide (approximately the time of slack water)

5. **Comparing existing entrance channel parameters with future parameters.**

At present 11.6 metre draught ships transit the Great Ship Channel through the Heads with no tide and 12.1 metre draught ships transit with 1.5 metre rise of tide (plus allowances) on the Rip Bank.

After deepening, 14 metre draught ships will be allowed to transit the Great Ship Channel through the Heads when there is a minimum of 1.5 metre rise of tide, (plus allowances for squat, wave and uncertainty). This is a total increase in draught over the allowable 11.6 metre draught base case of 2.4 metre.

The Proponent intends to cater for this increase in draught, by deepening the Great Ship Channel from -14 metre CD, to -17 metre CD.

The existing depths of water in the Eastern Ship Channel and Western Ship Channel remain unchanged, except for some sections which will be deepened to -14 metre CD for construction purposes. These areas are not identified in the Proponents submission.
These proposed changes contain the reduction in safety margins in the Eastern and Western Ship Channels. (see attachments 1 & 2).

The under-keel clearance for proposed 14 metre draught vessels, if they deviate into the areas of the Eastern and Western Ship Channels where there is 13 metre of water, will be:

0.9 metre less clearance for the proposed 14 metre draught vessels with 1.5 metre rise of tide, compared to existing 11.6 metre draught vessels with no rise of tide, and

1.9 metre less clearance for the proposed 14 metre draught vessels with 1.5 metre rise of tide, compared to existing 12.1 metre draught vessels with 1.5 metre rise of tide. (See attachments 1 & 2).

The statement from the Proponents that, “they propose deepening sections of the Eastern and Western Ship Channels to -14 metre CD, for construction purposes” is equivocal.

The proposal fails to properly define these channels, that have less under-keel clearance for 14 metre draught vessels than that recommended by PIANC.

The Proponent appears to be offering the Eastern and Western Ship Channels as defacto navigation channels for 14 metre draught tankers and container ships if they deviate outside the boundaries of the Great Ship Channel. (Refer Annexure 4 E, part 9, page 9 third paragraph).

PIANC recommends minimum entry channel depths, for particular size vessels.
Due to the probability of 14 metre draft vessels deviating out of the Great Ship Channel into the Eastern and Western Ship Channels when transiting the entrance to the port, the same recommended channel depths prescribed by PIANC, should be provided in both the Eastern and Western Channels as will be provided in the Great Ship Channel. The same weather and sea conditions, will prevail across the three channels at any one time.

This recommended amendment is a significant deviation from the existing design.

Increased construction costs and additional environmental studies associated with the extra dredging for the wider 17 metre channel must be carried out and placed on exhibition and be submitted for public comment and assessment before the “amended proposal incorporating the extra dredging” is approved.

Such additional dredging is likely to incur significant extra costs over a considerably longer time frame to complete the work and is likely to cause major changes to tidal flow and water levels inside the Bay.

Proposed dredging methods using a hydro hammer and trailer cutter suction dredge are unproven in the strong cross currents experienced at the entrance to Port Phillip and there is doubt as to whether or not they will be successful.

No fall back alternative dredging options have been submitted by the Proponent for assessment and consideration should the proposed methods prove unsatisfactory.

6. **Increased risks and dangers associated with reduced safety margins.**

The dangers for deep draft ships transiting the Great Ship Channel and grounding in the Heads do not lie in the Great Ship Channel, they lie within the shallower waters in the Eastern and Western Ship Channels, adjacent to the Great Ship Channel.
Ships do not ground where there is water, ships ground where there is insufficient water.

The strong and severe cross-currents at the entrance to Port Phillip Bay are generated by the near 3 metre rise and fall of the tide in Bass Strait, combined with the comparatively small size and irregular shape of the entrance to Port Phillip Bay, the shape of the seabed and the large area of water inside the Bay.

These currents, which cross the entrance channels in two different directions, together with the cyclonic weather systems and associated winds in southern Victoria, generate significant seas and swells and help create the navigational dangers that put ships at risk.

The Port of Westernport in comparison has a wider entrance than does Port Phillip, has a similar rise of tide to Bass Strait of some 3 metre and in the main shipping channels and in the open areas of the bay a tidal current flows at approximately 1.5 knots, running in line with the channels and the berths.

If Port Phillip Bay was situated at the eastern end of the Baltic Sea, where there are no tides, the strong troublesome cross currents and dangers would not exist.

There is statistical evidence that ships navigating along the Great Ship Channel, due to the strong cross currents or for other reasons, deviate outside the boundaries of this channel. In the last twenty years, three such ships have grounded at the entrance to Port Phillip Bay. See Marine Inquiry Reports for “Golden Gate Sun”, “Matru Kripa” and “Eburna”.

The Marine Inquiry into the grounding of the oil tanker “Eburna” departing Port Phillip on 16/03/1997, concluded that, “the vessel was set eastward of the line of the leads through the Great Ship Channel. It is further concluded that the vessel was in the Eastern Channel when the damage was sustained”.

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“It is concluded that the fore peak tank was holed at 1217 hours at which time the Bosun heard the sound of rushing air emanating from the fore-peak ventilators.

Draught of Eburna on departure from Geelong was 10.5 metre fore and aft.

Mr. Burton of Maunsell Partners stated, before the Panel that “there is anecdotal evidence indicating that ships navigating along the Great Ship Channel, deviate outside the boundaries of the Great Ship Channel”. I support this statement based on my professional experience in this matter.

The Proponent has chosen not to comment on this evidence, nor to produce expert witnesses to give evidence to the panel with respect to such events.

Under present circumstances at low tide if a ship with a draught of 11.6 metre; or when there is 1.5 metre rise of tide on the Rip Bank a ship with a draught of 12.1 metre; is set outside the boundaries of the Great Ship Channel there is a probability that such ship will not ground in the Eastern and Western Ship Channels provided the ship remains within the 370 metre wide, 13 metre deep part of the channel.

It is clear that with the proposed increase in the length, beam and draught of the larger oil tankers and container ships there is every likelihood that some of these vessels while traveling at speeds of approximately 14 knots will find themselves outside the eastern and western boundaries of the Great Ship Channel.

With the reduced safety margins described above the probability of these ships grounding in the Eastern and Western Ship Channels increases.

The Proponent has not demonstrated to the Panel, to the Government or to the community, with any conviction, that after deepening, there is any certainty that 14 metre draft oil tankers and container ships, can be expected to navigate along the
course of the deepened Great Ship Channel without deviating outside the boundaries of the Great Ship Channel into the East and West Ship Channels.

Once committed to the navigation of a deep draught vessel along the Great Ship Channel, particularly when the ship is outward bound, there is no turning back, the pilots and masters of these large vessels are unable to abort their decision.

The momentum and the inertia of a large deep draft ship traveling at approximately 14 knot, and the time and intricacy needed to adjust or correct externally enforced changes in direction, is referred to in the Witness Statement. see pages 36, 58 & 59 and attached paper Exxon Valdez. Baker v Hazelwood – 2001 testimony.

Notwithstanding unequivocal information as to the singular dangers of navigation that exist in the entrance to the Port, due to the strong cross currents, a vessel’s propensity to either remain in or to deviate outside the boundaries of the Great Ship Channel has been evaluated by computer modeling and simulation. Statistical and anecdotal evidence indicating a tendency under the influence of the cross currents to deviate outside the boundaries of the Great Ship Channel appears to have been given little weight. Acceptance of numerical modeling with little account taken of actual contrary information is dangerous. (ref. Witness Statement, page 42, Simulation and Modeling and part 7 below).

Reference EES Vol. 1\Part A Introduction Chapter 4 part 4.4.2 states:

“The Heads – From a vessel operations perspective, the Heads area is one of most dangerous in the world, and consequently was a focus of the navigation simulation work. An outcome of the design process has been that in limited 'extreme' sea conditions (waves, tidal levels and currents) the design vessel (the larger vessel) will not be able to use the Great Ship Channel because of insufficient underkeel clearance and width of channel exist in the current design. In these extreme conditions, to provide the required
under-keel clearance would have required the provision of additional depth in the channel, while increased channel width would also be required under some conditions. This has meant an optimization of the channel design, where safety requirements are not compromised, but 100 per cent access in all conditions has been reduced slightly in order to minimize the volume of dredging required. The reduced dredging also decreases the potential environmental impacts and the cost of dredging”.

The claims contained in this paragraph are ambiguous and fail to convince that safety is not being compromised.

7. **The Port of Melbourne Ship Incident Model.**

The Proponent has submitted a ship incident model that has not been reviewed by suitably qualified peers, experienced in risk management and maritime operations. The model focuses on probabilities, it fails to properly address uncertainties and sensitivities, and consequences and is deficient on detailed, accurate local specific data.

The expert witness Dr. Edmunds advised that he had endeavoured to simplify the model. In trying to simplify the model, old data from a remote location has been used and relevant, local specific data over a sufficient time period has been omitted. The result is that both risk and uncertainty findings lack credibility. The robustness and rigour of the model have not been assessed and verified, and the results are questionable.

The value and use of the model results, by other expert witnesses, to accurately assess economic and environmental risks, uncertainties and impacts is dependent on the reliability of the model. There is concern that these witnesses have accepted the results without question and with little regard to the consequent accuracy of their own studies and recommendations.
When examined against relevant standards and literature, the model lacks credibility, yet it is advanced to meet the criteria set out in the Assessment Guidelines parts 4.5, 4.6 and 4.7. The investigation study has not been pursued with rigour proportionate to either the potential consequences or to the likelihood of the worst case eventuating, as required by the Assessment Guidelines, part 4.7.

The results of the model are dangerous in that they suggest the likelihood of a grounding of a deep draught vessel and/or a major oil spill is low and that little needs to be done. Consequently, the model conveys a false sense of security and encourages complacency with respect to investigating a channel design adequate to avoid the ingredients for a major incident occurring alongside the Great Ship Channel at Port Phillip Heads.

Compliance with the Precautionary Principle and with the Environment Protection and Biodiversity Conservation Act, as required by the Assessment Guidelines, cannot be achieved until a broadly based and credible scientific risk management study of vessel incidents, in the most vulnerable areas of the Port, is properly completed.


8. **Oil Spillage.**

Evaluation of the impact of an oil spill as required by the Assessment Guidelines parts 4.5, 4.6 and 4.7. has not been carried out. (See Meyrick & Associates Clause 10.6 of Vol. 3 Economics Risk Assessment of Vol. 4 Socioeconomic Workstream.

The Proponent has not fully examined the potential consequences and impacts of a 14 metre draught ship deviating out of the Great Ship Channel resulting in a powered hard grounding in the Eastern or Western Ship Channels.
The Assessment Guidelines part 4.7 require an impact assessment of the worst case eventuating. The proponent relies on the Environmental Management Plan to mitigate the consequences of an oil spillage. The proponent fails to recognize the limited effectiveness of available oil pollution clean up equipment and facilities. The proponent fails to recognize that oil booms are ineffective where there is a current in excess of half a knot passing across the boom. The proponent fails to recognize that the use of oil dispersants are unlikely to be recommended or approved, due the inherent toxicity of the dispersants. Clean-up of a significant oil spillage will resolve into physical removal of coagulated oil which fetches up on the shore. Clean-up of oil from the water is considered to be extremely ineffective and is unlikely to result in the recovery of any quantity of oil.

To suggest that an Environmental Management Plan can mitigate the impact of a significant oil spill after the event is disingenuous. Ref. “Exxon Valdez”, Witness Statement pages 25 and 26. There is no doubt that every effort in managing both planning and operations is critical in trying to prevent the occurrence of an oil spill, at all costs and should take preference over post event management plans.

There are numerous published reports of types and sizes of marine oil spills, world wide, that may be referenced and used with local wind and weather data and tidal information and local geographic features and socio-economic factors, to facilitate a study of the impacts, consequences and effects of different types and sizes of oil spills as required by Assessment Guidelines part 4.7. (eg. Witness Statement page 53. and paper titled “A Study of Marine Oil Spill Cleanup Costs” presented by Dagmar Schmit Etkin to the ‘Arctic and Marine Oil Spill Programme Technical Seminar June 2000.)

9. **Channel Design.**
Explicit and implicit warnings that refer to strong cross currents and width of entrance channels are contained in PIANC, and in other guides such as the Canadian Coastguard Guide for Entrance Channels.

These warnings and the advice and concerns of other reputable sources addressing related maritime accidents have been largely disregarded by the Proponent. (see paper “A Physical Risk Analysis of Ship Grounding” by S. Lin, H.L. Kite-Powell and N.M. Patrikalakis, M.I.T. December 1998 – Witness Statement page 12).

PIANC recommendations refer to prevailing cross currents as “strong”, if they are > than 1.5 – 2.0 knot. The Canadian Coast Guard refer to cross currents > 1.5 knots as “severe”.

The Proponent has ignored the following PIANC Guide statement in relation to cross currents and failed to comment on them in their Submission:

“Although cross current magnitudes of up to 2.0 knots are shown in the Table, it is best to align the channel, if at all possible, to avoid such high cross-current velocities. On occasions high cross currents over a short section of the channel may be unavoidable, and in such circumstances the ship may have to pass through them as rapidly as possible to avoid deviating from it’s course. However as a simple rule, cross currents greater than 1.5 knots across significant lengths of the channel should be avoided by re-alignment if possible”.

Note: The strong currents crossing the Great Ship Channel do so along it’s whole length, in contrary directions.

At the entrance to Port Phillip, cross currents up to 8 knots are regularly experienced throughout the tidal cycle and these currents cross the Great Ship Channel over the Rip and Nepean Banks in two contrary directions. See expert witness statement, pages 43, 44, 45 & 46.
As realignment of the channel is not possible through Port Phillip Heads, adequate alternative compensation should be built into the design.

Notwithstanding these factors the Proponent has accepted a channel width of 245 metre, for vessels up to 52 metre beam with cross currents up to 8 knots, where PIANC recommendations are for a channel width of 260 metre, with cross current speed > 1.5 -2.0 knots. (ref. Burton Witness Statement page 20)

PMC Annexure E4. Channel Design Details part 9 Page 9 second paragraph that states, “the West Channel has a natural depth in excess of -17 metre CD over most of it’s area”, is not accurate. As stated earlier in this paper the West Channel does not have a natural depth of -17 metre CD over most of its area.

The statement that “Sections of the East and West Channels adjacent to the Great Ship Channel are proposed to be dredged to a minimum of -14 metre CD for construction purposes”, is dangerously misleading. For the Proponent to suggest that 14 metre draught tankers and container ships can cross into these channels and remain safe is irresponsible and imprudent.

As indicated above, with the inevitability of 14 metre ships moving into the Eastern and Western Ship Channels, the Eastern and Western Ship Channels have to be regarded as navigation channels and need to be dredged, for navigation purposes, to not less than the depth recommended by PIANC for 14 metre draft vessels using the Great Ship Channel.

The Proponent in their submission, dated 29 October 2004 in “Response to Specific Submissions and Issues”, Annexure E 4, part 9 on page 9 second part, appear to be confused when referring to existing and proposed widths of the Great Ship Channel. They claim that proposed widths of between 300 and 375 metre at the turn into and from the South Channel will be a significant improvement over existing channel width in this location which is 245 metre.
The Port Operating Handbook 2002, page 11, states, “there are depths over the Nepean Bank of at least 14 metre between 150 metre west and 200 metre east of the main leads” ie. a total of 350 metre

Therefore the new width parameters over the Nepean Bank after dredging to 17 metre for 14 metre vessels, will be no different to those that exist at present over the Nepean Bank for 11.6 metre vessels without tide and 12.1 metre vessels with tide.

10. **Size of Vessels to Use Deepened Channel**

The PoMC Annexure E 4 part 9 page 9 states, “it is important to note that 14 metre vessels are not predicted to begin visiting the port of Melbourne in low numbers until mid to late in the project time span”.

Are the PoMC suggesting that dredging should be staged out until such vessels begin to use the port? The PoMC appear to be considering only 14 metre draught container ships and seem to have overlooked the stated requirement for 14 metre draught oil tankers to use the port. These tankers are likely to want to use the deeper channel depths as soon as they are available.

Mr. Burton advises in his submission clause 3.3: “Port Phillip Sea Pilots have recommended that, apart from deep draft container ships, large tankers should also be modeled in the design process, as these tend to be deep, underpowered vessels and difficult to manoeuvre. Port Phillip Sea Pilots recommend that tankers with a beam of 52 metre should be considered as these could be expected to operate into the Geelong and Gelibrand berths at some time in the future”.

Larger tankers than those with a maximum loaded draught of 15 metre may use Port Phillip, in a part loaded condition, provided their actual draught does not exceed the maximum allowable limit ie. 14 metre. Many crude oil vessels currently using the Port
are unable to load to their maximum draft and use the port part loaded. The beam of the larger tankers part loaded is still greater than the beam of the smaller tankers that load to their maximum draft.

The PoMC submission states part 9 page 9 that, “oil tankers infrequently use the shipping channels”.

There is a significant trade in crude oil and refined products in and out of Melbourne and Geelong amounting to several million tons of cargo per year. The tonnage of the crude oil varies according to the level of production from Bass Strait.

The safe navigation of deep draft Suezmax and similar tankers through Port Phillip Heads, when the oil companies have stated their intentions to use these vessels, cannot be ignored.

11. Crabbing.

The PoMC, Annexure E 4 part 9 page 9, have expressed concern with the assessment of the degree of crabbing that has been calculated and expressed in the Witness Statement. Their concern is based on the grounds that the length of the vessel used for the calculation, was 330 metre long and 45 metre beam and that the calculations indicated that the effective beam of vessel is increased to 125 metre.

PoMC suggest that a more accurate portrayal is a length of 320 metre and beam of 42 metre, as used by Mr. Burton in his modeling.

If the ship size used to calculate the “effective beam” is the same as that used by Mr Burton, the amount of set as determined by Mr. Burton from the ‘Simflex’ numerical model should also be used ie., 25 degrees of set instead of the 15 degrees used in the Witness statement calculation. Using the Burton figures, the effective beam is considerably more than the beam calculated using the parameters in the Witness
The effective beam due to crabbing is increased from 80 metre plus 45 metre (beam of vessel) to 125 metre, to 135 metre plus 42 metre (beam of vessel) to 177 metre.

This effective beam leaves only 68 metre total clearance across the 245 metre wide channel, this is 34 metre at each end of the ship, provided the mid length of the ship is in the centre of the Great Ship Channel.

If the “effective beam of the 14 metre draft ship”, is somewhere between that determined by the Witness and that determined by Burton, obtained from the simulator study, the safety margins within the boundaries of the 245 metre wide Great Ship Channel are insufficient. There is little confidence that such ships in the strong cross currents will not cross-over from the Great Ship Channel into the Eastern or Western Ship Channels. (see attachment. 3).

When considering the available under keel clearances for a 14 metre draught vessel in the Eastern and Western Ship Channels, the risk of such a vessel grounding in these channels is significant.

In the event of such a grounding the “channel design” could become the source of serious and contentious litigation.

The examples make the reduced safety margins and increased dangers more obvious, even to the uninitiated. (See attachments. 1, 2 & 3).

12. Physical hydraulic modeling to help calibrate and validate a numerical model.

The Burton Report describes the ‘SimFlex’ real time PC based simulation work, undertaken to determine the navigation behaviour of the selected vessel in the port channels and to determine whether or not the sample ships could be safely controlled.
and perform necessary maneuvering functions and requirements in the channels. The proposal was to modify the channels as best possible along the existing alignments to accommodate the larger, deeper draft vessels in the Port.

Mr. Burton advised before the Panel that the simulator was not used to assess levels of risk and the simulation work was not intended to imply that risk had been eliminated.

Mr. Burton’s report includes the following statements:

6.1 Navigation control of the ship in the simulations was undertaken by Port Phillip Sea Pilots to ensure results were in accord with current practice and operational experience in the channels.

In the simulation exercise the electronic chart system (ECS), bridge control, tug control and radar modules were used. Combining the ECS and the radar display provides a realistic bridge environment, including full zoom in/out capabilities, speed, speed made good, course, course made good and rate of turn indicators. However it should be noted that ECS does not replace the advantage the pilot has when standing on an actual ship bridge and immediately assimilating all this information with a 360 degree view from the bridge and bridge wings. In general the simulation pilot will take longer to respond. As the simulation series proceeds it is to be expected that pilots will become more accustomed to the new environment and therefore simulation in the new environment will become easier.

6.4.4 The Rip

“The key issues arising from the first simulation were:

The flood currents as modeled in the entrance to the Great Ship Channel and over the Entrance Deep caused very difficult ship movements. For some departures the high currents resulted in the ship being uncontrollable, even at sea speed, and grounding occurred on the west side of the channel because the ship had moved outside the
channel. It was noted that the ship was “crabbing” some 20 to 25 degrees along the channel, which gave an effective ship width of about 100 metre in the 245 metre wide channel. It was noted that the flood current field modeled may not be a realistic condition.

The pilots commented that the lack of leads and marks in the simulator rendered the simulation unrealistic, and that in real life situation visual clues would enable better handling of the vessel. It was also noted that the simulations were being undertaken on an ad-hoc basis of reacting to the changes induced in the vessel direction as they occurred, rather than by following a predetermined plan and course, which would be normal practice when navigating through the entrance.

There was an issue in relation to ship motions under waves north of Pt. Nepean on arrivals, where wave motion at full ahead could cause grounding in the simulation model with the ship turning to starboard. This was controlled by adopting a slower ship speed. The wave height in the model was 1.5 metre, which some pilots regarded as unrealistic.

As a result, further attention was given in the second simulation to investigating the wave and current parameters used in the model, pilot familiarity with the simulation and consideration of a predetermined course, and the addition of navigation aids to the simulation. The modifications to the simulation model the second simulation study and the findings were as follows:

Simulated navigation techniques were improved by introducing a constant radius turn based on the predictor tool available on the electronic chart display, and by the addition of lines on the electronic chart display to represent marks currently used by pilots.

A number of check runs were performed with a 295 metre Panamax vessel at 13 metre draft to simulate existing operations through the entrance and to test whether the simulator gave similar results to those expected by the pilots.
A more realistic current field was applied, developed from the current field studies undertaken for the environmental impact assessment studies.

A more realistic wave field was applied, based on the additional wave studies undertaken by Lawson and Treloar.

The outcomes of the second simulation study with these modifications were:

In the pilot's opinion, the check runs for existing operations produced realistic though conservative ship handling performance.

Arrivals and departures could be safely completed using the marks currently used by the pilots, and while also being able to keep south of Goorangai wreck.

Departures could be satisfactorily completed using the constant radius turn and by using ship revolutions at a speed consistent with approximately 15 knots through the water when approaching the turn from the South Channel into the Great Ship Channel. In all runs, the ship veered to the western side of the channel near Point Lonsdale, and it was recommended that the channel should be flared in this area to improve navigation.

Arrivals and departures for the tanker were satisfactory, with the same issues as occur at present when navigating large tankers in a strong current”.

The statement is often made that the one thing a hydraulic model will reveal is the unexpected. It is possible to predict the expected, but to be able to observe the unexpected is one of the benefits associated with hydraulic model studies.

This comment, referring to predicting the expected, reflects the second simulation reported on by Mr. Burton. It was not until the expected was achieved that the modeling was considered satisfactory.

Foundation for Safety of Navigation and Environment Protection Ship Handling Research and Training Centre. Ilawa, Poland. "WHY MANNED MODELS". Electronic bridge simulators are controlled by mathematical equations describing in more or less approximate way ship’s behaviour in different manoeuvring situations. There are a lot of situations, which cannot be properly numerically simulated because of too complex hydrodynamic phenomena affecting ship maneuverability, however bridge simulators are excellent tools to practice bridge work. Manned models although they are small, are ships by the very nature and physical laws govern their behaviour when manoeuvring. In other words manned models represent realistically all hydrodynamic phenomena.

There is a degree of healthy skepticism as to the accuracy and reliability of numerical modeling, which in this case is related to the completeness and accuracy of the hydrodynamic phenomena that the programmer has been able to model and code into the simulator. There is often a general reluctance to accept the unexpected and attribute an unexpected result as faulty, possibly due to the programming of a model.

The cost and time required to construct a physical model may be significant but particularly where the site is exposed, with difficult hydrodynamics, the cost will normally be recouped many times over by virtue of the production of the best design to facilitate safe navigation.

13. **Restricted visibility and navigation aids.**
Annexure E 4 part 5 page 5 Limitation of visual navigation aids in restricted visibility.

The PoMC question the veracity of the concerns raised in the witness statement, “Restricted Visibility” on page 33 and “The Use and Reliability of Electronic Navigational Aids”, on pages 36, 37, and 38 and “Electronic Navigation Charts” on pages 38 and 39. These statements are self explanatory and supported by references.

The PoMC in Annexure E 4 part 5, page 5, suggest that electronic navigation aids are an acceptable reliable alternative navigation tool, when normal navigation lead lights and beacons cease to be visible because of poor visibility.

All aids to navigation should be used by the professional navigator, however the information derived must be used with caution and within it’s limitations and not be implicitly relied upon.

The interpretation by the navigator, of displayed electronic information, is not always instantaneous. Generally normal visual navigation aids in close quarters situation, are recommended and preferred. See Burton’s report on use of the ‘Simflex’ simulator and pilots comments in that report. “the lack of leads and marks in the simulator rendered the simulation unrealistic and that in the real life situation visual cues would enable better handling of the vessel”.

Clause 6.1 of the Burton Statement says, “It should be noted that ECS does not replace the advantage the pilot has when standing on an actual ship bridge and immediately assimilating all this information with a 360 degree view from the bridge and bridge wings”.

When using electronic navigation, with the Simflex simulator, the pilots were unable to control the model until marks were put in to replicate the normal visual aids.

Annexure E 4 Part 5, page 5, Difference between GPS and DGPS.

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Where the words “GPS” and “DGPS” are quoted in the witness statement from “references”, they are quoted as written in the particular “reference”.

14. **Use of References, Information and Papers.**

The PoMC, Annexure E 4 part 5, page 5, question the use of Australian Maritime College course notes quoted in the witness statement.

An expert witness statement has limited value and carries little weight unless supported by relevant independent expert opinions, information and technical references, hence the references quoted throughout the Witness statement.

15. **Other PoMC comments contained in Annexure E 4.**

The comments raised by the PoMC in Annexure E 4 part 3, regarding the Harbour Master and the pilots and part 6 regarding integrity of shipping channel users and pilots are not of a technical nature.

16. **Public Accountability.**

The matters raised in the witness statement remain relevant.

17. **Conclusions**

The reduced safety margins and increased dangers for 14 metre tankers and container ships to safely transit the entrance channels as described above, puts at risk the environment and the socio-economic well being of the local community, the State and the extended area.

A grounding of a 14 metre draught oil tanker or container ship alongside the Great Ship Channel has the potential for catastrophic consequences.
The Proponent has failed to show with any certainty that such a vessel will remain within the boundaries of the Great Ship Channel and will not be set into the Eastern and Western Ship Channels which have not been dredged to the PIANC prescribed depths for such vessels.

The Environment Effects Statement fails to meet the requirements of the Assessment Guidelines in the areas that I have considered and detailed in my submission dated 24/09/2004 (PART 1 of this document).

Frank Hart
16/11/2004

Further Investigation of the risks

of a near 14 metre draught ship grounding in

Port Phillip Heads when transiting the Entrance

including supporting submissions from 3 former

Port Phillip Pilots and the views of a

4th former Port Phillip Pilot.
PART 3

Executive Summary

Conclusions.

PART A

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PART B

The Increased Risks and Reduced Safety Margins for Ships Transiting the Great Ship Channel at Port Phillip Heads.

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B.19 RESPONSIBILITY FOR FLAWED DESIGN


List of Attached Appendices
1a Statement from Captain Geoffrey Beever. Retired Port Phillip Pilot
1b Statement from Captain Maurie Cobal. Retired Port Phillip Pilot.
1c Statement from Captain Brian Tod Retired Port Phillip Pilot.
2 Copy of Communication relating to briefing from proponent.
3 Copy of Communication with Marine Safety Victoria
4 Use of PIANC Guide for Design of Approach Channels and Exxon Valdez Risk Assessment and Peer Review.
Executive Summary of Expert Witness Statement from Frank Hart on proposed Port Phillip Bay Channel Deepening.

The Port of Melbourne Corporation propose to deepen the shipping Channels in Port Phillip Bay to allow 14 metre draft ships to transit the channels at all states of the tide. Ships with drafts less than 11.6 metre are presently permitted to transit the Great Ship Channel without tidal assistance. This Statement further reviews the proposed design of the Great Ship Channel at the entrance to the Port.

The depth of water in the Great Ship Channel has a declared depth of 14 metre with lesser depths in the Eastern and Western side channels.

Port Phillip Heads at the entrance to the Bay has earned the reputation of being one of the most dangerous and difficult port entrances world wide. The greatest difficulties at Port Phillip Heads are caused by the very strong tidal currents that cross the Great Ship Channel in contrary directions, simultaneously at velocities up to 8 knots or more. These currents exert huge pressures on the sides of ships transiting the Heads, and together with inclement weather, at times make the pilotage of vessels along the 245 metre wide channel difficult, dangerous and precarious.

There is both material and anecdotal evidence that shows the 11.6 metre draft ships deviate at times from the Great Shipping Channel into the side channels. Ships with draft less than 11.6 metre that deviate from the Great Ship Channel may not ground in the Eastern and Western Side Channels. This situation will change with the maximum draft of ships increasing to 14 metre.

With clear evidence that the smaller, shallower vessels deviate into the Eastern and Western Ship Channels and knowing the huge increase in sideways forces on the larger, deeper ships and the increased likelihood of such ships deviating out of the Great Ship Channel, there is an obvious need for the side channels to be deepened to the same depth as that of the Great Ship Channel.
If 14 metre draft ships require 17 metre depth of water to safely navigate through the Great Ship Channel, they also require 17 metre depth of water in the Eastern and Western side Channels.

The proposed design of the Great Ship Channel reduces the margin of safety by failing to provide adequate width of channel with 17 metre depth of water for the larger, deeper ships, so increasing the likelihood of the deeper ships grounding in the shallower side channels and putting at risk the environment, and financial and social wellbeing of the State of Victoria and beyond.

Both the Channel Design and the Marine Risk Analysis are examined and the conclusion is reached that the design of the Great Ship Channel fails to meet international standards and the marine risk analysis is based on incomplete, inadequate and flawed information and makes predictions that are clearly wrong. The proposed design may be determined as the cause of future accidents if not revoked.

It is clear that restrictive operating parameters determined by the PMC to compensate for the flawed channel design and designed to provide a modicum of safety, will need to be so restrictive that lengthy delays will be incurred by ships that will flow on to services in the Port. Consequently operating costs will escalate preventing financial objectives from being achieved.

Unless the safe operation of ships with drafts up to 14 metre is assured, the project must be abandoned.

**Conclusions.**

The following conclusions are submitted to the Panel:
i. The project parameters to design a channel through Port Phillip Heads to allow the safe transit of 14 metre draft ships at all stages of the tide, have not been achieved.

ii. Evidence indicates that the Great Ship Channel design and the proposed operating parameters have reduced existing safety margins to the extent that a deep draft ship will inevitably ground and or strand outside the boundaries of the Great Ship Channel.

iii. There is a conflict between producing a design at a feasible financial and environmental cost with no safety margins and producing a design that has the essential safety margins that will be prohibitive in cost. This conflict has not been resolved.

iv. The reduced safety margins and the increased dangers that will eventuate from the navigation of near 14 metre draft vessels through Port Phillip Heads at all stages of the tide, cannot be mitigated without significantly widening the Great Ship Channel.

v. Widening the Great Ship Channel from 245 metre to approximately 500 metre will mitigate but not eliminate the increased dangers for ships with drafts up to 14 metre.

vi. Limiting the access times to the Great Ship Channel for vessels with drafts to 14 metre to times of slack water will significantly mitigate the dangers, however such restrictions will stop the financial objectives being achieved.

vii. In order to provide a greater margin of safety, a requirement to widen the 17 metre Great Ship Channel to the outside edges of the Eastern and Western Channels is likely.
viii. If the Great Ship Channel is widened beyond the current design to increase the safety margins, then the recommendations contained in the 2005 EES Panel Report part 11.5 hydrodynamics would need to be revisited.

If this work is approved by Government the environmental consequences and the costs of the increased dredging will dramatically increase, without eliminating navigation dangers.

ix. In order that Task 3(1) of the Terms of Reference can be completed, the Port of Melbourne Corporation and the Port Phillip Pilots Association must supply in writing to the Inquiry full details of the advice tendered by the Port Phillip Pilots Association to the PMC and any other relevant advice covering all aspects of the proposed design and proposed operating parameters for 12.1 to 14 metre draft ships transiting the Great Ship Channel.
PART A

INCREASED RISKS and REDUCED SAFETY MARGINS for SHIPS TRANSITING the GREAT SHIP CHANNEL at PORT PHILLIP HEADS.

A.1. INTRODUCTION

The Port of Melbourne Corporation propose to deepen the appropriate sections of the existing shipping channels in Port Phillip Bay leading to the Port of Melbourne to accommodate vessels of 14 metre draft at all states of the tide.

The object of this expert witness statement is to consider and address the proposed design for the Channel Deepening Project at Port Phillip Heads. Attention is focused on the safety and design of the Great Ship Channel for vessels up to 14 metre draft to transit the Great Ship Channel at all states of the tide. (see part B.)

Port Phillip Heads at the entrance to Port Phillip Bay may rightly lay claim to being one of the most dangerous and difficult stretches of water and harbour entrances world wide.

All vessels 35 metre in length or greater are required to engage a Port Phillip Pilot, duly licensed by Marine Safety Victoria, to navigate within port waters, unless the master of the vessel holds a certificate of exemption from pilotage issued by Marine Safety Victoria. (Port Waters of Melbourne – Operations Handbook).

The Port of Melbourne Corporation, (proponents) have declined to introduce any Port Phillip Pilots as expert witnesses to give supporting evidence as to the safety of both the proposed design and the proposed operating parameters, of the Great Ship Channel at Port Phillip Heads, in respect to 12.1 to 14 metre draft ships transiting this channel.
To allow Task 3(1) of the Terms of Reference for this Inquiry to be completed, the Port of Melbourne Corporation and the Port Phillip Pilots Association must supply in writing to the Inquiry full details of the advice tendered by the Port Phillip Pilots Association to the PMC covering all aspects of the proposed design and the proposed operating parameters for 12.1 to 14 metre draft ships to transit the Great Ship Channel.

The Port Phillip Pilots were involved in the ship simulation exercises relating to the design of the Great Ship Channel. The results of the simulation exercises, although not fully disclosed, have raised more doubts about the safety and design of the Great Ship Channel than they have resolved.

The pilots must be required to personally present evidence to this Inquiry, relating to both the design and the proposed operating parameters. Vital evidence from the Pilots relayed by the proponent and implied evidence from the pilots given by others lacks the necessary credibility needed for this Inquiry to base its recommendations.

It is interesting to conjecture as to the reasons for the absence of the Port Phillip Pilots from this Inquiry. Every other type of expert has been presented by the proponent including accountants, economists, civil engineers, geomorphologists, environmental scientists, mathematicians, experts on flora and fauna and public relations specialists; but experts in the discipline that the success or failure of the proposal hinges on, the safety of navigation, have been conspicuously absent.

The financial benefits claimed by the proponent may be seen as unattainable, when it is shown that the Great Ship Channel will have to be widened significantly beyond the proposed 245 metre.
A.2. **FOCUS OF STATEMENT.**

This statement is focused towards eliminating shipping accidents at Port Phillip Heads.

This statement finds that the proposed Design and Operating Parameters of the Great Ship Channel, as described in the EES and SEES, are so dangerous and safety so prejudiced that it is impossible to believe that the proponents will not apply to widen the Great Ship Channel further at great additional financial and environmental cost, once the Government has sanctioned the dredging to proceed.

In order to compensate for the flawed design the proponents are likely to announce severe limitations on the proposed operating parameters of the deeper vessels prior to commissioning the 17 metre Great Ship Channel.

A.3 **DESCRIPTION OF PHYSICAL FEATURES OF ENTRANCE CHANNEL.**

The Great Ship Channel through Port Phillip Heads is over 2,000 metre long and has a width of 245 metre, with a declared depth of -14 metre below chart datum.

Abutting the eastern side of the Great Ship Channel, is the Eastern Ship Channel with a width at its seaward end of 200 metre and 130 metre at its north-eastern end, with a declared depth of -11.9 metre.

The Western Ship Channel abuts the western side of the Great Ship Channel is 95 metre wide and has a declared depth of 11.4 metre.

Examination of a large scale chart of the depths of water in the Eastern and Western Ship Channels crossing the Rip Bank shows one small area in the Eastern Channel and four small areas on the western boundary of the Western Channel with depths of less than 13 metre.
A.4. **PROPOSED DESIGN AND OPERATING PARAMETERS.**

The maximum draft for ships transiting the entrance to Port Phillip Bay, through the Great Ship Channel, is presently restricted to 11.6 metre without tidal assistance, and 12.1 metre draft with the assistance of 1.5 metre of tide.

This Expert Witness Statement examines:

i. the proposal to increase the depth of water in the 245 metre wide Great Ship Channel at the Heads from 14 metre to > 17 metre and to extend a small wedge shaped area at the north-western corner of the Rip Bank to > 17 metre. The width of the navigable Great Ship Channel (other than this small wedged shaped area) is to remain at 245 metre, and

ii. the proposed operating parameters set out in the 2007 Supplementary Environment Effects Statement (SEES) and in the 2004 Environment Effects Statement (EES), and

iii. the likelihood and consequences of a 12.1 to 14 metre draft ship grounding and/or stranding outside the boundaries of the proposed 245 metre wide x 17 metre deep Great Ship Channel.

The proponent advises that the proposed design of the Great Ship Channel is for vessels with drafts up to 14 metre to transit the channel at all states of the tide.

The proponent advises that the desired financial objectives will not be achieved if the channel is only operational for 12.1 to 14 metre draft ships to transit at near slack water, when the tide is almost stationary. (i.e. for approximately four hours per day). See Appendix 8 Maunsell Channel Design Report part 4.3.
The proponent advises that the proposed design and operating parameters, set out in the 2007 Supplementary Environment Effects Statement (SEES), have not changed from the design and the operating parameters set out in the 2004 Environment Effects Statement (EES).

Examination of the proposed design and operating parameters provides little assurance that the safe navigation of 12.1 to 14 metre draft ships, along the Great Ship Channel at all states of the tide is possible.

A.5. **INDISPUTABLE FACTS.**

**Fact 1.**
Entering or leaving Port Phillip Bay, deep draft ships with drafts between 12.1 and 14 metre will not ground and/or strand if the whole of the ship is navigated within the boundaries of the proposed 17 metre deep Great Ship Channel.

**Fact 2.**
Deep draft ships with drafts between 12.1 and 14 metre transiting the Great Ship Channel at any state of the tide, will inevitably ground and/or strand if the ship or part of it, deviates outside the boundaries of the Great Ship Channel into the side channels.

**Fact 3.**
In all instances, the grounding of ships in Port Phillip Heads has occurred outside the boundaries of the Great Ship Channel.

**Fact 4.**
The greatest danger to the safe navigation of ships at Port Phillip Heads is due to the effect of very strong tidal currents of 7 or 8 knot, that cross the Great Ship Channel simultaneously in contrary directions.
A.6. **PROPRIETORS ADVICE re COMMISSIONING OF GREAT SHIP CHANNEL.**

Concerns were put to the proponent relating to the potential grounding of 12.1 to 14 metre draft ships in the Eastern and Western Ship Channels that run alongside the Great Ship Channel, and the need to restrict transit times to slack water. These concerns were dismissed by the proponent, who advised that this size container vessel will not be seen in the Port for many years.

The proponent’s answer circumvents addressing the most dangerous situations of all, by failing to acknowledge the proposed transit through Port Phillip Heads of the deeper 12.1 to 14 metre draft, oil tankers (after deepening the terminal at Gellibrand Pier) and bulk carriers.

Note: Mobil Oil has advised that they wish to use oil tankers with drafts between 12.1 metre and 14 metre in the Port of Melbourne. (Meyrick-Price Waterhouse Coopers - Economic Impact Study Vol. 4 EES). Discussion - Meyrick Associates & Mobil November 2003.

The proponent’s answer indirectly accepts that when 12.1 to 14 metre draft ships start to use the Great Ship Channel the danger of grounding in the side channels will be present, and suggests that the proponent recognizes that the Great Ship Channel needs to be widened further.

In the event of the grounding or stranding of an oil tanker carrying over 100,000 ton of oil, at Port Phillip Heads, with the subsequent loss of large quantities of oil, disastrous environmental, financial and social consequences will affect the waters of Port Phillip Bay, Western Port Bay and Bass Strait.

Vessels other than oil tankers may carry over 10,000 ton of oil in their double bottom fuel tanks.
A.7. **LIMITATION ON TRANSIT TIMES TO SLACK WATER.**

The proponent has received advice from the Port Phillip Pilots, stating that ships with drafts between 12.1 and 14 metre, will be restricted to transiting the Great Ship Channel to the times of slack water; as ships between 12.1 and 14 metre draft are uncontrollable in the Great Ship Channel when the tides are running.

The claim from the proponent that 12.1 to 14 metre draft ships will transit the channels at all states of the tide, is a clear misrepresentation of the facts.

There are suggestions that restrictions may be imposed by the Harbour Master on 12.1 to 14 metre draft ships transiting the Great Ship Channel, to times when the speed (velocity) of the tidal current is less than 3 knots, that is when the magnitude of the currents crossing the Great Ship Channel is less than 2 knots.

An appraisal of the 2007 tide tables shows that the total number of tides during the year, number 1,411 and the number of tides where the current velocity remains below 3 knots are 279, that is 19.8% of the total number of tides. The 2007 predicted maximum flood tide through the Heads has a velocity of 8.1 knots and the ebb tide has a velocity of 6.8 knots.

This suggestion also conflicts with the statement that the design of the Great Ship Channel is to enable 14 metre draft ships to transit at all states of the tide and is another variation to those previously presented to the 2004 EES Panel and to the statements contained in the 2007 SEES.

**Statements from the pilots and the proponent are clearly incompatible. There will always be pressures placed on the Pilots to meet commercial exigencies and this appears to be happening even at the design stage of this proposal, almost before a lump of rock has been removed!**
The periods of time for the 12.1 to 14 metre draft ships to transit the Heads, limited to the times of slack water, that is for approximately four hours per day, will stop the desired financial outcomes, as claimed by the proponent, from being achieved. (See Part B).

A.8. **RECENT SHIPPING INCIDENTS.**

In 2006 four known vessels with drafts less than 11.6 metre, deviated outside the Great Ship Channel. One and possibly two of these vessels grounded in the entrance to Port Phillip Bay. (See Part B)

A.9. **MARINE RISK ASSESSMENT.**

Royal Haskoning, the risk consultants commissioned by the proponent, were required in part to assess the likely occurrence of a 12.1 to 14 metre draft ship grounding and/or stranding in the Heads. (SEES Appendix 16, Summary Document).

A Risk Assessment of the **magnitude of the likely consequences** of such a grounding and/or stranding, was specifically excluded from the Royal Haskoning brief.

The concept of ‘Risk’ in the marine world is linked to the internationally accepted definition of ‘Risk’. The definition defines ‘Risk’ as a function of the likely frequency of an incident and the magnitude of the potential consequences.

**Has the assessment of the likely consequences of an accident been excluded from both the EES and the SEES as the potential consequences are too dreadful to contemplate?**

One such accident could put an end to all concerns about the ‘bottom line’.

The PIANC Guide was produced by an international Working Group (No.30) convened by the Permanent Technical Committee II.

The objective of the PIANC Report is to provide information and recommendations on good practice. The PIANC Working Group (No.30) included participants from the International Maritime Pilots Association, and the International Association of Lighthouse Authorities to assess and if necessary update existing Reports, to provide practical guidelines for the design of approach channels and fairways. Its intention is to provide practising engineers with guidelines and data which will allow them to design a channel for a given ship or mix of ship types.

The PIANC Guide parts 2.3, 2.4, 3.8, and part 7, relate to aspects and requirements for Marine Risk and Safety Operations and part 8 relates to aspects and requirements for a Marine Impact Assessment to be carried out.

The Marine Risk and Impact Assessments are an integral part of the PIANC Guide for designing a safe shipping channel and determining safe operating parameters.

The failure to include an assessment of the magnitude of the consequences of a grounding and/or stranding of a vessel in Port Phillip Heads, in the Marine Risk Analysis undertaken on behalf of the proponents, prevents the design of the Approach Channel from complying with the recommendations of the PIANC - Guide for the Design of Approach Channels. (See Part B.)

The Risk Assessment study for the Great Ship Channel in Port Phillip Heads is flawed for the following reasons:

i. The study lacks overarching principles to robustly study the outcomes and consequences.

ii. The study is based on inadequate and incomplete data provided to the Assessors.

iii. The historic data used in the Risk Assessment is derived from a physical environment at Port Phillip Heads which will be changed following the channel
deepening. The changed environment has not been adequately studied and incorporated in an assessment of the likely frequency of incidents.

iv. The Assessors have had inadequate inter-relationship with the pilots and other operators and technocrats and appear to have been quarantined by the proponent.

v. Failure to examine the magnitude of the potential consequences of a grounding and/or stranding at Port Phillip Heads of a near 14 metre draft vessel is a major deficiency and precludes the assessment meeting PIANC standards.

A.10. CHANNEL DESIGN.
The channel design was undertaken for the proponents by Maunsell Partners Australia Pty Ltd.

Maunsell Appendix 8. Part 3.1:
This part states that the design of the channel system for navigation was undertaken in accordance with the design process set out in the PIANC publication “Approach Channels – A Guide for Design 1997”.

Comment.
Examination of the Design Process – SEES Appendix 8; the Marine Risk Assessment – SEES Appendices 15 and 16; and the Marine Impact Assessment – SEES Appendix 16, show that these studies fail to reflect the recommendations, standards and intent of the PIANC Guide for Approach Channels in a number of significant areas. These omissions and deviations are examined in this report.

Failure to observe the PIANC Recommendations for both the Marine Risk Assessment and the Channel Design in relation to the design of the Great Ship Channel has resulted in the recommendation of a design that has significantly reduced safety margins and increased dangers and will likely lead to a 12.1 to 14 metre draft ship grounding and/or stranding in the Heads.

The proponent’s objectives stated in the EES and the SEES will not be achieved.
PART B

The Increased Risks and Reduced Safety Margins for Ships Transiting the Great Ship Channel at Port Phillip Heads.

B1. OVERVIEW.

The proposed design is to deepen the existing 14 metre deep, 245 metre wide, Great Ship Channel to >17 metre deep and leave the existing width at 245 metre, for 14 metre draft ships to transit at all stages of the tide.

The Eastern and Western Ship Channels running parallel to and alongside the Great Ship Channel, apart from the north west corner of the Western channel crossing the Rip Bank, will basically remain at the current depths.

The primary concern is that these parameters will result in reduced safety margins and increased dangers with vessels up to 14 metre draft deviating into the side channels.

There is material and anecdotal evidence that ships with <11.6 metre draft, regularly deviate from the Great Ship Channel into the Eastern and Western ship channels.

After channel deepening, the 14 metre draft ships will more likely deviate from the Great Ship Channel into the Eastern and Western Ship Channels and because of their increased draft are likely to ground and/or strand in the side channels.

Simple logic shows that the Eastern and Western Ship Channels must therefore, also be deepened to 17 metre depth.
The proposed 245 metre wide 17 metre deep Great Ship Channel for the use of 14 metre draft ships at all stages of the tide, provides less width than that currently available for many vessels with less than 11.6 metre draft. (see A.3. above)

Such a reduction in the effective width of the entrance channel across the Rip Bank, for the heavier, longer, wider and deeper ships, from the present available width for the smaller and shallower vessels is of concern and must set alarm bells ringing.

B.2 CONCERNS AND CONSEQUENCES.

Concerns exist that relate to:

i. reports that lack substance yet allege to analyse the dangers,
ii. deficiencies of the design process and the proposed design,
iii. ship statistics that have not been produced,
iv. analyses that have not been carried out,
v. reliance placed on irrelevant empirical rules relating to the width of channels,
vi. apparent lack of consideration for potential disastrous consequences, and
vii. dubious claims that the design is for 14 metre draft ships at all states of the tide.

The proposed design parameters as set out in the EES and SEES are for larger and deeper vessels (with length up to 340 metre, beam to 45 metre and draft up to 14 metre) to transit, the deeper Great Ship Channel (depth 17 metre, width 245 metre) at all states of the tide, in cross tidal currents, which regularly flow at velocities up to 8 or 9 knots or more.

Evidence clearly shows that these larger ships whilst transiting the dangerous Great Ship Channel will have no margin for human or physical error. They will inevitably deviate from the 245 metre wide Great Ship Channel and ground and/or strand in the Eastern and Western Ship Channels that run alongside the Great Ship Channel.
B.3. APPOINTMENT OF RISK ASSESSORS.

Royal Haskoning were commissioned on 18th November 2005 to establish acceptable marine safety criteria for the project; and undertake a Marine Impact Assessment to establish the overall marine risk, comprising risk of collision, grounding, stranding, impact and striking; etc.

Royal Haskoning made a visit to Melbourne between 5th and 16th December 2005 to be briefed and to collect the available data relevant to the assignment.

The requirement was to carry out a Marine Risk Assessment to assess the consequences of the channel deepening on navigational risk in the channel. The scope of the assessment was to examine the probability of events occurring but not to include examination of societal impact. (Appendix 16 ‘Summary’ document).

Appendix 16 part 1.4.1 Scope states:

“It is important to note that risk is usually the product of the likelihood of an event and the impact that the event will have on its surroundings. The scope of this assessment is to examine the likelihood of events occurring but does not include examination of societal impact. When reference is made to risk in this report, this therefore refers to the likelihood of the event occurring”.

Comment.

The limitation of the Risk Assessment to examining the likelihood of events occurring and excluding examination of ‘societal impact’, i.e., excluding examination of the magnitude of the consequences of those events, disqualifies both the Marine Risk Assessment and the Marine Impact Assessment from meeting the recommendations, standards and methodology of the PIANC Guide and violates international acceptance of ‘risk’. (see B6. below).

The failure to carry out a full impact assessment of activities taken outside a Commonwealth marine area, where those activities are likely to have significant impact on the marine area’s environment, contravenes the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

**B.4. FAILURE TO MAKE KNOWN ACCIDENT AND INCIDENT DATA.**


Long term historical accident data was provided to the Assessors was from 1949 to 2001. The review of accident data for Port Phillip made available by Marine Safety Victoria, to the Assessors, was for the period from January 2002 until March 2006. This data relates to groundings, collisions and strikings. More detailed data relating to ship deviations has not been made available to the assessors. (See SEES Appendix 16, Appendix B in Assessors Report).

The use of the data from January 2002 to March 2006 has been projected forward to assess future risks that relate to larger ships grounding in the Heads. This methodology is inappropriate and false. The changed relationship of the deeper ships, having 12.1 to 14 metre draft, with the unchanged depths of water outside the Great Ship Channel, has been ignored.

The historical incident figures relating to groundings in Port Phillip Heads, are only a small proportion of the total number of ships that have deviated from the Great Ship Channel. The actual figures required to enable a reliable estimate of the future level of risk are the total number of deviations from the Great Ship Channel, i.e., the number of ships that grounded outside the channel plus the number of ships that deviated from the Great Ship Channel which did not ground.
Electronic monitoring and recording vessels’ tracks passing through Port Phillip Heads was commenced sometime after the 2004 EES. The Risk Assessors make no reference to having received any electronic data or information relating to deviations of vessels from their tracks and courses, or from the Great Ship Channel or elsewhere in Port Phillip Heads. Such data is available as shown by inquiries into ship incidents in 2006.

**PIANC 7.3 Collection of Data** states: Data for the determination of marine risk will generally come from a number of sources.

In order for risk assessments to have any degree of reliability, information has to be as extensive and as accurate as possible. Important sources that have not been provided include radar surveillance and video recordings from port radar, and data collected from pilots, and traffic operators and technocrats.

The Risk Assessors appear to have ignored this recommendation. Had the data provided to the Marine Risk Assessors included data obtained from monitoring and recording the tracks of ships through Port Phillip Heads and questionnaires to all pilots and technocrats, the conclusions reached forecasting the safe transit of 12.1 to 14 metre draft ships through the Great Ship Channel, at all stages of the tide, would likely have been very different and started alarm bells ringing. (See SEES Appendix 16 part 2.4)

**In the context of the comparatively recent start of monitoring and recording ships’ tracks through Port Phillip Heads, all records of deviations, particularly those disclosed by monitoring together with anecdotal evidence taken from the Pilots and the VTS operators** (see SEES Appendix 15 parts 10.3 and 10.4) **are vital in regard to carrying out the risk assessment.** (See Exxon Valdez Risk Analysis and Peer Review. APPENDIX 4 below).

The proponent together with Marine Safety Victoria and any other entity that has information obtained from the monitoring and recording programme of ships’
tracks through Port Phillip Heads need to make that information available to this Inquiry.

Without that information a realistic Marine Risk Assessment cannot be achieved. Great caution, by imposing the most severe time and tidal height restrictions on the transit of the 12.1 to 14 metre draft ships, must be implemented.

Regrettably no apparent effort has been made to supply, or assist in helping the Risk Assessors obtain all available information and advice, relating to ship deviations at Port Phillip Heads.

B.5. RECENT SHIP DEVIATIONS FROM THE GREAT SHIP CHANNEL.

Three of the four following incidents; that occurred in 2006 relating to ships that failed to navigate within the boundaries of the Great Ship Channel; were not included in information passed to the Risk Assessors.

The following details are accurate to the best of my knowledge:

i. 06/12/06. 0400 hr. Passenger ship “Statendam”. Inward bound. Tidal prediction slack water flood 0438 hr. Point Lonsdale signal station reported the vessel entered the Heads off the navigation leads and so close to Lonsdale Reef that the vessel was suspected of hitting Lonsdale Reef. The pilot had boarded the vessel only 8 minutes before the vessel passed Point Lonsdale Light House.

The vessel’s port stabilizer fin was unable to be retracted when the vessel was inside Port Phillip Bay and steaming towards her berth. The vessel was subsequently berthed starboard side to the wharf so the port stabilizer fin and the hull could be inspected by divers.
ii. 19/05/06. early a.m. The container ship “APL Kobe”. Outward Bound. Vessel was alerted by Point Lonsdale signal station that she was navigating off the navigation leads and outside the boundaries of the Great Ship Channel.

iii. 05/05/2006 The container ship “Champion”, outward bound. Vessel strayed outside the Great Ship Channel, to the western side. The Pilot took remedial action by altering course to port, passing through and across the Great Ship Channel and deviated outside the eastern side of the Great Ship Channel.

iv. 04/01/06. 0830 hr. Oil tanker. “Desh Rakshak”, inward bound. Draft 11.4 metre. Vessel grounded whilst entering Port Phillip Bay, through Port Phillip Heads, outside the western side boundary of the Great Ship Channel. The tidal prediction was for 4.1 knot of ebb tide. The bottom of the vessel was holed and indented in a number of places.

A transcript from the Australian Transport Safety Bureau of the investigation into the grounding of the Desh Rakshak is available on their website.

Comment.

It appears that full details of these incidents were not conveyed to the risk assessors.

If these four ships had drafts between 12.1 and 14 metre, rather than <11.6 metre as they did, they would have all grounded and/or stranded in the Heads, outside the boundaries of the Great Ship Channel, in Port Phillip Heads.

If ships with drafts <11.6 metre regularly deviate from the Great Ship Channel, how many more larger vessels of 12.1 to 14 metre draft ships are likely to deviate.

SEES Appendix 15. part 7 Stochastic Analysis states: “In addition to the assessments made with respect to the channel geometry based on the PIANC design guide and the real time navigation simulation, an important part of the Project to receive detailed
consideration is the dredged depth required in the Great Ship Channel through the Entrance. Whilst this is outside the direct scope of the Marine Safety Report it is briefly reviewed here for completeness”.

“The work has been based around the determination of the dredged depth required for the transit of a 14 metre draught vessel without incident. The aim has been to balance the volume of dredging against the failure of a vessel making the transit given the wave and tidal conditions encountered at the Entrance. In this case failure was defined as the vessel touching the seabed…………..”

Comment.
This work was restricted to the Great Ship Channel and no thought given to the side channels.
Although the depth of the Great Ship Channel is recognised as an essential part of providing a safe entrance channel, it is disconcerting that this work was requested of the Risk Assessor and the risk of a vessel deviating outside the boundaries of the Great Ship Channel and grounding and/or stranding in the shallow side channels has not received similar detailed analysis. No scientific and analytical work has been done to determine the adequacy of the width of the Great Ship Channel. Reliance has been on the ship simulation trials that have suggested major problems in meeting design objectives.

SEES Appendix 16 part 2.4 Incident Data for existing PoM Channel states:
“The derivation of safety criteria using the locally available incident and vessel transit data is generally preferred as it allows the unique characteristics of the Port to be readily considered”.

“A review of the incident data for Port Phillip, made available by Marine Safety Victoria for the period January 2002 until March 2006 (51 months) ………..Grounding”
The one grounding for this period on which the risk assessment at the entrance to Port Phillip is based is – “one grounding at the entrance (touch bottom)”.
It is surprising that the proponent has not drawn the attention of the Risk Assessor to the obvious weakness and fallacy in the unrealistic limited data base to determine the risks at Port Phillip Heads of a deep draft vessel deviating outside the Great Ship Channel.

B.6 PREVIOUS GROUNDINGS.
Notwithstanding the historic nature of the following three groundings in the Heads, the causes of these groundings and others referred to in the historic data, are important in understanding the problems at the Heads and in assessing the risks, namely:

i. “Eburna” 16/03/1997, draft 10.5 metre. Oil tanker, grounded in Heads, outward bound from Geelong reported to have strayed to the east of the main leads. Vessel holed in fore peak tank.

ii. “Matru Kripa” 10/09/1994, draft 10.4 metre. Bulk cargo vessel, grounded in the Heads. Strong ebb tide and vessel making little headway, entering on the main leads through the Heads. The pilot decided to abort entry. The vessel was turned about in the Heads. The vessel grounded and holed the fore peak tank.

iii. “Golden Gate Sun” 30/08/1984. Oil tanker inward bound in ballast, grounded at Shortland Bluff, Queenscliff, Vessel failed to turn to starboard off the leads towards the South Channel.

Comment.
The causes and analysis of these groundings and similar accidents are more important, than simply using each accident to add to a statistical data base. Analytical evidence (PIANC 3.1) must be combined with evidence obtained from surveying the pilots and other technocrats and to the data obtained from monitoring and recording of vessels tracks carried out at the Vessel Traffic Services centre. An analysis of the causes and potential causes relating to the changed environment following the deepening must be undertaken. Without doing these surveys and studies false projections relating to ships deviating and grounding out of the Great Ship Channel will be obtained, which will
further undermine decision making and Port safety. The Risk Assessor appears to have neglected undertaking any analytical study as required above.

Reports of investigations into accidents analysing the causes must be released by the Authorities to enable the community and in particular professional mariners and channel designers to learn from the information.

**Regrettably there is a growing tendency for authorities to hide reports of Accidents and Incidents from the public, eliminating much vital and valuable information that was historically available for practicing mariners and for training new entrants in the industry.**

**B.7. PIANC REQUIREMENTS FOR RISK ASSESSMENT TO INCLUDE BOTH FREQUENCY OF EVENTS AND MAGNITUDE OF CONSEQUENCES.**

In all international definitions “Risk is the product and measure of the prospect of an event occurring and the magnitude of its consequences”. Failure to assess the potential consequences, disqualifies the study being referred to as a ‘risk assessment’, and prevents the Channel Design from meeting the recommendations of the Permanent International Association of Navigation Congresses (PIANC) Recommendations ‘Approach Channels – A Guide for Design’.

(See Parts 2.3, 2.4, 3.8, 7 and 8 of the PIANC Guide).

Reliance on incomplete data of ships deviating from channels and applying historic data obtained from smaller ships grounding outside the channel to project forward numbers and thereby estimate the risk of deeper 12.1 to 14 metre draft ships grounding and/or stranding outside the boundaries of the Great Ship Channel in Port Phillip Heads is flawed methodology.
Comparing the effects of a physical environment in a particular location with the effects of an altered physical environment in the same location at a later time will provide inaccurate and misleading forecasts.

The Risk Assessment is required to assist in the design of the channel and to determine safe operating parameters. It is further required to determine likely accidents and consequences and provide information on which to make informed decisions in a situation where safety margins are being drastically reduced and safety is being prejudiced.

Unless accurate information is used in the Risk Analysis false predictions that are dangerous to use will result.

The ‘Summary’ of the Royal Haskoning ‘Marine Risk Assessment’ Appendix 16 states:

*“the assessment was based on backward estimates, using data supplied by Marine Safety Victoria; the forward estimates have not been used”.*

This data relates not to what is being proposed, but to what presently and previously existed.

The ‘Summary’ statement above, contradicts the following statement made in part 2.6.1 of the Royal Haskoning ‘Marine Risk Assessment’ Appendix 16:

*“That making use of historical records to determine frequency of incidents can be misleading, historical incident data cannot be directly used to identify the level of navigational risk that will apply to the current or proposed changes…….”*

**Comment.**

Historical data may be used to demonstrate how many ships grounded and what caused <11.6 metre draft ships to ground outside the Great Ship Channel. **It does not provide any indication of the number of ships that deviated outside the channel and did not**
ground and is misleading if used to indicate how many larger, deeper ships will deviate outside the channel if the proposal proceeds.

Where historical data is derived from different conditions it must not be mathematically extended to indicate the number of larger, deeper 12.1 to 14 metre draft ships that will deviate from the deepened Great Ship Channel, nor can it be used as a base for determining how many of the deeper draft ships will ground and/or strand outside the Great Ship Channel. Regrettably this method has inappropriately been used.

All groundings in Port Phillip Heads have taken place outside the Great Ship Channel, at times when ships have either strayed off course or where ships have failed to navigate on the leads to transit the Great Ship Channel.

It is clear that ships with less than 11.6 metre draft will be at less risk of grounding outside the channel, than those ships with the 12.1 to 14 metre deeper draft, when they deviate off course or stray outside the boundaries of the Great Ship Channel. It is also clear that the strong cross currents in the Heads are influential as a major cause of ships deviating off course.

B.8. **INCREASE IN SIDEWAY FORCES ON LARGER SHIPS IN GREAT SHIP CHANNEL.**

The Australian Maritime College has provided information of the estimated change in sideway forces, on different size ships, from an 8 knot tidal stream crossing from 45 degrees on the bow, in different depths of water, for a stationary vessel.

(i) Ship 170 metre in length, draft 11 metre, depth of water 14.6 metre = 1,900 tonne
(ii) Ship 320 metre in length, draft 14 metre, depth of water 14.6 metre = 7,000 tonne
(iii) Ship 320 metre in length, draft 14 metre, depth of water 17.6 metre = 5,700 tonne
When the Great Ship Channel is deepened the 14 metre draft ship will be floating in a 17 metre deep narrow trench, with some 13 metre depth of water in each side channel.

No matter how the above parameters may differ from actuality, the huge difference in the sideway forces on the larger, deeper draft vessels will be significant and has to be taken into account.

The reasons for this huge increase in sideways forces are beyond this text, but relate both to the increase in area of the ship and the reduced space around the larger vessel for the cross currents to dissipate, including less under-keel clearance.

The actual sideways forces exerted by the cross currents on both sides of the vessels as it transits through the Great Ship Channel must be calculated by the channel designer and/or the risk assessor. These forces should be calculated for both existing size vessels, up to 11.6 metre draft, and the design vessels, up to 14 metre draft. These calculations will permit an understanding and evaluation of the different forces. The calculations should be for various tide heights and current velocities.

There is no evidence this work has been done. Why has it been ignored and/or not reported on?

B.9. ESTIMATION OF NEW RISK.

The PIANC Recommendations part 3.1.3 ‘Risk Alleviation Methods’ state that, “Once the marine risk has been estimated for the new situation (i.e. for the new channel operation) it must be compared with either the existing situation or agreed international standards”.

Comment.
It is clear that the marine risk for the proposed new situation at Port Phillip Heads, (i.e. for the new channel operation) has not been fully examined and estimated. Only the existing risk for the existing ships and existing environment has been assessed -
by using incomplete data and information. (See 2005 EES Panel Report page 103 ‘Safe Navigation’).

The relationship of the proposed larger deeper draft ships to the waters outside the Great Ship Channel is very different to the relationship of the existing smaller and shallower draft ships to the same waters outside the Great Ship Channel.

B.10. MARINE IMPACT ASSESSMENT.

SEES Appendix 16. part 3
Royal Haskoning has utilized a computer model MARTRAM to carry out a Marine Impact Assessment to help determine the risk of a vessel grounding. Their Report part 3.3 and part 3.10 states:

“Groundings are assessed as a function of the distance travelled where there is a potential risk of grounding due to either tidal constraints or shallow water on either side of the channel. In the case of PMC, grounding is only likely in the entrance, the south Channel, and the channels north of the Fawkner Beacon; the Port Melbourne Channel, the Williamstown Channel and the Yarra River”.

Comment.
This principle of assessing groundings in Port Phillip Heads as a function of the distance travelled in Port Phillip Bay is seriously flawed, it is inappropriate where different channels in a port have little uniformity or similarity about them. For example the currents in the Great Ship Channel flow diagonally across the channel at velocities up to 8 knots or more, and the currents in the South Channel have a velocity of less than 2 knots, and flow more or less in line with the direction of the Channel. They cannot be compared. The study and statement has little credibility in the waters of Port Phillip Bay.

The methodology also assumes that the number of future total groundings has been reliably estimated. This work has not been carried out, either in the Marine Risk Assessment, the Marine Impact Assessment or in the channel design process.
SEES Appendix 16 part 3.5 Channel Operating Parameters.

Part 3.5.1 states: “The Marine Impact Assessment has been carried out using the following operational parameters.

3.5.1(b) The Entrance: The Great Ship Channel will continue to be operated as a one-way channel; the only significant change being an increase in the declared depth to 17 metre. The channel width remains unchanged at 245 metre wide although the channel will be locally widened at the “Wedge” on the western side at the inner end, to provide increased manoeuvring room. There will be no changes to the Western and Eastern Ship Channels………..”

“Metoocean conditions make transiting the Entrance a complex operation, and as part of the studies carried out for the Channel Deepening Project conditions have been stochastically analysed by others to determine the minimum dredged depth for the main channel, the outer channels will not be dredged”.

“The stochastic analysis has determined, for a variety of vessels up to 14metre draft, the conditions of tide and wave height where grounding will not occur for the declared depth. It is understood that the results of the analysis will be formulated for inclusion in the Port Operations Handbook/Harbour Master’s Directions”.

Comments.
Nowhere in the ‘summary’ or ‘conclusions’ to the Marine Impact Assessment is any mention made of the 12.1 to 14 metre draft vessels deviating outside the boundaries of the Great Ship Channel and grounding in the entrance at Port Phillip Heads. The only reference to these ships possibly grounding in the entrance is to the adequacy or otherwise of the depth of water within the Great Ship Channel.

The lack of a robust study to ascertain the risks of 12.1 to 14 metre draft ships deviating from the Great Ship Channel and grounding in the Eastern or Western Channels or elsewhere in the Heads, conveys a misleading impression that such an
incident/accident is unlikely to happen, and gives to the uninitiated, a false sense of security.

Evidence clearly shows that many ships deviate outside the boundaries of the Great Ship Channel. Some of these ships ground outside the Great Ship Channel and others, more fortunate, avoid grounding.

There has been no apparent understanding or consideration shown in the design or in the Risk Analysis to the changed relationship of the greater draft of the larger 14 metre vessels to the unchanged depths of water outside the Great Ship Channel.

The Marine Impact Assessment has little value in predicting groundings in the Heads. The published results give rise to misleading projections in relation to the real risks of the large vessels in this area.

**B.11 WIDTH OF PROPOSED GREAT SHIP CHANNEL.**

Why is the 245 metre width of the south-western part of the Great Ship Channel across the Rip Bank, (where there is a dangerous and difficult entrance to Port Phillip Bay, where there are extremes of weather, sea, swell, tidal and cross current conditions), considered adequate; when the same 245 metre width is required in Hastings/Western Port (in the benign and sheltered waters at the northern end of the port), for the same size vessels?

In Hastings in 1970, when extending the 14.7 metre deep, 183 metre wide ship channel some three miles to a new refinery at the northern end of the Hastings channel, for the use of 100,000 ton oil tankers accessing the newly built ESSO oil terminal, the Port Phillip Pilots requested that the width of the new channel extension be widened from 183 metre (600 ft.) to 245 metre (800 ft.) as they considered the existing 183 metre wide channel to the BP oil terminal, too narrow.
The tidal current in Hastings flows along the course of the channel, at a maximum rate of 1.5 knot. There are no cross currents, no waves more than 1.0 metre high and no swell. The channel is safe and benign for all ships and could be considered a mill pond compared to the cauldron that exists in certain conditions at Port Phillip Heads.

B.12. UNCERTAINTIES.

Many of the dangers at Port Phillip Heads are the result of ‘Uncertainties’. The weather, tides and currents are unpredictable and variable. Swell and waves can be subject to spikes that significantly increase their size unexpectedly. Currents circulate as large eddies and the times of high and low water may vary beyond predictions. The speed and directions of the surface current may differ to the speed and direction of current flowing over the ground. Rain and fog can unexpectedly and suddenly restrict the visibility of navigation lights and beacons.

These types of problems are Uncertainties. Risks can be managed - Uncertainties Cannot.

B.13. STATEMENTS MADE BY PORT PHILLIP PILOTS RELATING TO NAVIGATING SHIPS IN GREAT SHIP CHANNEL.

Many Port Phillip pilots have commented on the difficulties of keeping ships within the boundaries of the Great Ship Channel. Some of their statements include the following:

“There is not a pilot in the Service who has not been swept outside the Great Ship Channel”, and

“Plenty of pilots have been swept outside the Great Ship Channel”, and

“We were swept 100 metre off the leads”, and

“I don’t like the idea of entering between two rock walls”, and

“The proposed channel design at Port Phillip Heads is an accident waiting to happen”.

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The history and causes of accidents and incidents of ships transiting Port Phillip Heads, serve to reinforce and substantiate these statements made by Port Phillip Pilots.

B.14. STATEMENT MADE BY PORT PHILLIP PILOT AFTER ATTENDING A BRIEFING PROVIDED BY THE PROPOSER.

On the 28th June 2006, the proponent provided a briefing to a recently retired Port Phillip Pilot and to myself, relating to the proposed design and the proposed operating parameters of the Great Ship Channel, for vessels with drafts up to 14 metre.

Following this briefing, I wrote to the proponent on 2nd July 2006 setting out our continuing concerns relating to the channel deepening proposal, and to the safety of 12.1 to 14 metre draft ships transiting the Great Ship Channel.

The Port Phillip Pilot in his correspondence with me, following the briefing, stated:

“*The most optimistic scenario would be that after operating the port under the new development, and having had a few scares, the operating parameters will be reduced. The worst case scenario is that a disaster will occur*”.

Are we destined to try and see if this can be achieved?

B.15. EXPERIENCE OF OTHERS.

Royal Haskoning in Appendix 16. part 2.7 of their report state: “In the absence of extensive incident data, the opinions of experienced vessel masters who use the port on a regular basis can be a useful gauge of navigational safety in that port channel. Comments from a master of a BP tanker master who has visited Port Phillip regularly over the past four years are given in Appendix I”.

Comment.
The inclusion of a statement from the master of a foreign ship in (Royal Haskoning) Appendix I of the Risk Assessment suggests that the Risk Assessor considered the risk assessment for the Great Ship Channel was undertaken in the absence of extensive incident data.

Reading Appendix I of the Royal Haskoning Risk Assessment, it is apparent that this master’s total visits to Port Phillip Bay were insignificant over a four year period and certainly insufficient for him to have a detailed and intimate knowledge of Port Phillip Heads and the operational problems associated with the very strong tides that simultaneously cross the Great Ship Channel in two different directions.

However, even with his slight knowledge of the area, the master’s statement underlines the deficiencies of the Risk Assessment and the inadequacy of the design. Rather than endorsing views that the risks are minimal and manageable the master refers to the problems of heavy seas/swell, tide rips across the Heads, the need to transit the Heads at full manoeuvring speed to reduce risk of drift/set or leeway and the vessel experiencing strong currents.

Many of these problems referred to in the masters statement appear to have been recklessly dismissed in the marine risk assessment and design process.

Rather than quote the ship’s master, the risk assessor should have requested the Port Phillip Pilots, who navigate ships through the Heads on a daily basis to provide written evidence, and have their views supplemented by interviews and written evidence from the masters of Australian vessels who also navigate their ships through Port Phillip Heads on a ‘frequent basis’, rather than just a ‘regular basis.

As part of this Witness Statement, I attach two documents from two Port Phillip Pilots, where they describe their experiences and express their concerns relating to the transit of large deep draft vessels through the Great Ship Channel. (See Appendix 1 below).
It appears that the risk assessors have spent insufficient time working on site, to establish any close relationship with either the pilots or masters of ships transiting the Heads and barely had time to familiarize themselves with the area, let alone understand the dangers and the problems.

B.16. EVALUATION OF MARINE RISK.

The Marine Risk Assessment, in relation to the design and proposed operating parameters for 12.1 to 14 metre draft ships transiting the Great Ship Channel at Port Phillip Heads, is based on historic, incomplete and largely irrelevant information and data, and therefore is likely to provide misleading predictions.

The study is flawed from the beginning and the PIANC recommendations have been misinterpreted and ignored.

The Marine Risk Assessment appears to support the project by suggesting that the risk will be little different in the future than what it is today, and that it can be managed and even reduced with more efficient navigation aids. Such assessment is incorrect and dangerous.

Regrettably the risks are based on flawed data, they have not been clearly identified and assessed, the causes and consequences of a grounding and/or stranding have not been analysed and taken into account, and it appears that the limitations of even the most modern navigation aids in the prevailing weather and tidal conditions at Port Phillip Heads have not been properly assessed and understood.

All visible navigation aids including the PEL lights, on which assertions of safer navigation have been based, are useless in heavy rain, hail and fog.
Electronic aids, no matter how accurate, provide current and historic navigation information, i.e. where the ship is and where it has been, they cannot determine where the ship will be under the influence of the contrary cross currents in future time.

The pilot, watching the transits and the leading lights and beacons, constantly adjusts the course to maintain the ship’s track and to counter the strong variable currents crossing in different directions the narrow Great Ship Channel. Electronic aids cannot accurately predict the required changes to the ship’s future course.

PEL lights have serious limitations and are normally only used when transit marks or transit lights are unable to be used. Transits show clearly to the pilot the rate of change as the ship moves across a track. With PEL lights this rate of change is not apparent.

The Risk Assessment shows little appreciation and understanding of the relationship between the 11.6 metre draft ships and the waters in the Eastern and Western Ship Channels, and the relationship between the 12.1 to 14 metre draft ships and the same waters. Similarly the Risk Assessor has shown little understanding of the difficulties that the 12.1 to 14 metre draft ships will have keeping on track within the boundaries of the Great Ship Channel, in all weathers, in all visibilities and at all times of the day and night when transiting the Great Ship Channel.

Rather than taking a cautious and realistic approach the risk assessment incorrectly and dangerously portrays the risk of a 12.1 to 14 metre draft ship grounding and/or stranding at the Heads outside the Great Ship Channel, as little different to existing risks and is manageable and therefore acceptable.

The Royal Haskoning assessment of the increased ‘risk’ is stated in Appendix 16.

Summary:

“The assessment has determined that there will be a small increase in risk up to 2035 but, that there is no area within the port channel that is responsible for or attracts additional risk, based on the following assumptions”;

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(i). “That there is no change to the current vessel traffic management, aids to navigation, etc.”

(ii). “The Port maintains its original commitment to adopting international best practice as set out by IALA, to meet the demands of the increased levels of traffic over the coming years”.

Comment.

These statements make little sense and have no real bearing on determining the natural causes of ships grounding in the Heads. It is hard to take this Risk Assessment for Port Phillip Heads seriously, it looks as though the assessment is being padded for the uninitiated with incidentals, and the real problems have been neglected and glossed over.

The reduced safety margins and increased risks at Port Phillip Heads are the direct result of the design of the Great Ship Channel, together with the proposed operating parameters for the 12.1 to 14 metre draft ships.

PIANC 3.1 defines the channel design tools as being: Analytical, Numerical and Physical and states that the design tools must be supplemented by experience and must include the practical experience of the mariners who use the results of the designer’s efforts.

The Marine Risk Analysis fails by not having robustly analysed all the above constituents.

B.17 NON DISCLOSURE OF PILOT’S ADVICE.

Why has the proponent failed to disclose advice, provided to them by the Port Phillip Pilots, that the transit of the 12.1 to 14 metre draft ships through the Heads
will only be possible at times of slack water, as the 12.1 to 14 metre draft ships are uncontrollable in the Great Ship Channel, when the tide is running?

The advice, provided by the Port Phillip Pilots, contradicts the statements made by the proponents and their consultants in the EES and the SEES, that the design of the Great Ship Channel will allow ships up to 14 metre draft to transit the Great Ship Channel at all states of the tide.

The Pilots’ advice reflects the PIANC Recommendations Part 3.7 contained in their publication, ‘Approach Channels - A Guide for Design’

PIANC Part 3.7 states:
“Handling a ship in all conditions of tide and weather is not always possible in the confined waters and low speeds associated with port operations. If the underkeel clearance is too low, the waves too high, the current too strong or the wind speed too great, the ship may be endangered. The pilot may not be able to control the vessel safely…”.

“There are certain limits beyond which operations become unsafe and it is important that the designer be able to estimate these limits at the design stage……”

B.18. DESIGN OF GREAT SHIP CHANNEL.

Note: The comments below on the design and design process take the reader through those parts of the PIANC Guide for Approach Channels that have a bearing on the design and design process used to develop the proposed design for the Great Ship Channel at Port Phillip Heads. Repetition occurs in places as different parts of the PIANC Guide refer to the same subject matter.

The proposed design for the Great Ship Channel was undertaken by Maunsell Australia Pty. Ltd. and is dated 22nd February 2007.
Maunsell Appendix 8. Part 3.1 Channel Design Report states:
“the design of the channel system for navigation was undertaken in accordance with the design process set out in the Permanent International Association of Navigation Congresses (PIANC) Approach Channels – A Guide for Design PIANC – 1997”.

“The PIANC Guidelines recommend a two staged process:
i. The preparation of a concept design in which initial estimates of width, depth and alignment options are made to enable alternative options to be rapidly evaluated, and

ii. A detailed design based on experienced judgement and sophisticated computer based analysis and design to develop, validate and refine the concept design. The detailed design is then further checked for acceptability by means of vessel traffic analysis, risk analysis, and cost estimates”.

Maunsell Appendix 8. Part 3.3 states:
“A preliminary design was prepared by review and adjustment of the Concept Design against the PIANC Guidelines”.

“PIANC sets out empirical rules, developed from a world wide review of existing channels which enable the width and depth of the channel to be approximately and conservatively estimated”.

Comment.

PIANC Part 2.3 states ….the Concept Design Method should provide adequate navigational safety in accordance with good modern practice. It contains within it the implied safety margins used in many parts throughout the world. (See Appendix A).

PIANC Appendix A. Compares existing approach channel widths with channel widths determined using Concept Design Rules (CDR). Appendix A indicates that for outer
channels that are one way, a maximum of \(8.9B\) (\(B\) being the breadth of the vessel) may be calculated using the Concept Design Rules for the ‘most unfavourable’ design condition.

**Comment.**

Concept Design Rules for determining channel width, only apply where cross currents are \(<2.0\) knots. The maximum design width of \(8.9B\) (in PIANC Appendix A) obtained by using the PIANC formula with cross currents up to \(2.0\) knots, would increase significantly where cross currents increase from \(2.0\) knots to \(>4.0\) knots.

When the unfavourable physical conditions that prevail at Port Phillip Heads, (that grossly exceed the physical conditions covered by the Concept Design Rules), are taken into account it is apparent that the proposed Great Ship Channel design width of 245 metre, (approximately \(5.4B\), in cross currents often well in excess of the \(2.0\) knots in the table), is grossly inadequate for the larger 12.1 to 14 metre draft vessels.

PIANC part 3.3 states that: “the outputs of the Detailed Design may be subject to further checking for acceptability by means of marine traffic analysis, and risk analysis….,

**Comment.**

(i). The design width of the Great Ship Channel has to relate to the local conditions which include the very strong variable and unpredictable cross currents in Port Phillip Heads, exposure to heavy sea and swells and strong south-westerly weather.

In these conditions reliance on the PIANC empirical rules which apply where cross currents are \(<2.0\) knots, to determine and justify the width of the Great Ship Channel at 245 metre, in cross currents of velocity up to 7 and 8 knots and cross-current magnitude up to 4 or more knots, is inappropriate.

(ii). The currents that cross the great ship channel simultaneously in two different directions with
velocities up to 7-8 knots, will have cross-current magnitudes > than 4 knots, and even a velocity of 4-5 knots the cross currents will have a magnitude > 2 knots

The proposed design width of 245 metre for the Great Ship Channel fails to take into account these factors.

(iii). The Great Ship Channel is extremely complicated, difficult and dangerous and the techniques outlined in the more elaborate Detailed Design method, set out in the PIANC Recommendations Part 6 must be followed.

The studies carried out and the application of the information obtained by the Consultant has not produced a channel design that can be regarded as having the necessary margin of safety to avoid the grounding and stranding of a 12.1 to 14 metre draft ship outside the boundaries of the Great Ship Channel.

(iv). As shown above with reference to the flawed Risk Analysis, important information obtained from monitoring and recording the tracks of ships that have deviated outside the boundaries of the Great Ship Channel, together with the indicative number of deviations of vessels outside the boundaries of the Great Ship Channel obtained from sources such as the Port Phillip Pilots, has not been obtained and the relevance of such information has been ignored. This information is an important and necessary part of the Channel Design study. If all this information had been obtained and taken into account the channel width would have been seen to be inadequate to meet the design criteria.

PIANC Part 3.8 states that: ‘the object of approach-channel design is SAFETY and NAVIGABILITY for the shipping traffic that will use the port, a final stage, particularly in a busy port, will be to carry out a marine traffic analysis and risk analysis. Marine risk embraces the risk to life, damage to the marine environment and occasionally the potential commercial loss to a port in the event of an accident’.
‘Overall risk is determined from the frequency with which a particular type of accident may occur combined with some measure of its consequence. Consequence may be measured as the number of casualties, damage to the environment or potential loss of revenue’.

**Comment.**
The frequency of an accident and measure of its consequence has not been assessed for 14 metre draft vessels transiting the Great Ship Channel.

**PIANC part 5.2 Channel Design** states: ‘The Concept Design method given here, uses information gathered worldwide which is representative of good modern practice. It will be satisfactory for the preliminary design of most channels, but it is accepted that some occasions will arise when such a technique will be inappropriate and the more elaborate methods of Detailed Design will have to be employed, even for preliminary design’.

**Comment.**
This PIANC recommendation clearly indicates that the Concept Design Method and the use of empirical rules, relied on to determine and justify the 245 metre width of Great Ship Channel is inappropriate.

**PIANC part 5.2.2 Alignment** advises that: ‘It is preferable to have the prevailing currents aligned with the channel to minimise cross-currents’.

**Comment.**
The fact is that the alignment of the currents and the channel, as recommended by PIANC, cannot be achieved at Port Phillip Heads and is the Achilles Heel of the Great Ship Channel design.

**PIANC part 5.2.3.2 Currents**, advises: ‘Cross currents affect a ship’s ability to maintain a course ……….As will be shown, the manoeuvrability of a ship changes as its
depth/draft ratio approaches unity. As a result, its ability to cope with currents will also change as the water depth reduces. In some ports the currents may be too strong at certain states of the tide to allow certain ships to navigate with safety. This may cause their arrivals and sailings to be restricted to certain time periods in the tidal cycle. This implies times for which the channel will not be available for such ships and the decision regarding acceptable downtime levels will be based mainly on economic considerations”.

**Comment**
Has this recommendation been fully considered? Safety must be paramount at Port Phillip Heads and cannot be traded against “economic considerations”.

A grounding in a sheltered position on gently sloping hard sand may not have such disastrous consequences as a grounding in Port Phillip Heads on rocks in an exposed location with very strong currents and constant movement from seas and swell.

The dubious claim continues to be made by the proponent that the design is appropriate for 14 metre draft vessels to transit the Great Ship Channel at all states of the tide, with minor delays due to severe met ocean conditions. In the EES Panel Hearing the proponent put in writing that severe met ocean conditions would only occur on 4 or 5 days per year!

**PIANC part 5.3 Channel Concept Design Method.**

The ‘Concept Design Method’ uses empirical rules for channels with cross currents <2.0 knots. The Concept Design Method is inappropriate for the Great Ship Channel with cross-currents up to 4 knots or more. The ‘Concept Design Method’ has to be replaced with the ‘Detailed Design Method’ to determine the width of the Great Ship Channel.

**PIANC part 5.3.1 Introduction** states: “In this section a Concept Design method for approach channels is introduced. It is meant for use in early design and trade-off studies."
It represents good modern practice and channels designed to this method should result in an adequate level of navigational safety”.

“Although it can be applied to channels world wide, local conditions may require dimensions or alignment which differ, in part, from those derived from the information given below. Detailed Design, which would follow Concept Design, would address the particular features of a given site and is discussed in Chapter 6”.

**Comment.**

Concept Design is not appropriate for determining the width of the Great Ship Channel. The design process used for the width of the Great Ship Channel does not accord with the PIANC Recommendations:

i. The Risk Analysis which is required to form an integral part of the design process and the Marine Impact Assessment, are flawed and incomplete.

ii. The Concept Design process reflects the PIANC empirical rules. However the facts are that the PIANC empirical rules for cross currents do not apply where cross currents exceed 2.0 knot maximum. In Port Phillip Heads the cross currents flow in contrary directions well in excess of 2.0 knots and often at more than 4 knots.

iii. The design process for the Great Ship Channel has failed to follow the Detailed Design recommendations and has been inextricably bound to the Concept Design method, assiduously following the empirical rules which in relation to ‘channel width’ do not apply to the Great Ship Channel. The prevailing physical conditions that are found on a daily basis at Port Phillip Heads rule out the appropriateness of using the Concept Design method and the empirical rules for determining a safe width for the Great Ship Channel.

**PIANC part 7.6 SAFETY CRITERIA**

Part 7.6.1 states: “A thorough analysis of shipping accidents shows that only a small percentage of accidents in approach channels and ports has been ascribed to channel design, but it is essential that for future commercial and economic pressures placed on port operators, this percentage remains low”.
“The Concept Design method given in Chapter 5 is based on good modern practice and therefore contains in it the implied safety margins used in many ports throughout the world. In Detailed Design, where measurements of marine risk have been made, quantitative measures of safety are available and a judgement must be made as to whether such levels are adequate or not”.

Comment.
Where are these measurements of Marine Risk and the quantitative measures of safety? Where are the judgments regarding such levels and what are the judgments based on. The Marine Risk Assessment detailed in SEES Appendices 15 and 16 is flawed. Proposed safety margins around the Great Ship Channel for the near 14 metre draft vessels will be significantly less than existing safety margins and can hardly be judged to meet the standards prescribed in the PIANC Guide.

Maunsell Appendix 8. Channel Design Report

Part 8.1 SimFlex Navigation Simulations states:
“The Channel Widths selected through the concept design and preliminary (PIANC empirical) design process, were verified through a computer based navigation simulation process”.

The underlying acceptance criterion in the PIANC Guidelines is a “satisfactory level of navigational safety” as determined by suitably qualified and experienced mariners operating in the port.

“PIANC recommends that a consensus agreement on the safety and suitability be reached by the mariners who operate in the port as a “Panel of Experts”.”
The Panel of Experts for this project comprised:
The Harbour Master, the Managing Director of Port Phillip Sea Pilots (PPSP), various individual members of the PPSP on a day to day basis, supported by advice from the simulator operator, channel designer and CDP project team as required.

Part 8.5.1 Describes First 2D Simulations May 2003,
Part 8.5.2 Describes Second 2D Simulations October 2003 and
Part 8.5.3 Describes Third 2D Simulations March 2005

Part 8.5.4 Conclusions for the First Three Simulations
“It was concluded that the channel alignment and width proposed will provide a sound basis for the development of acceptable channel operating rules and guidelines”.

Comment:
Are we to assume that these ‘conclusions’ were the finite result of the deliberations of the ‘Panel of Experts’, or are we to assume that the panel of experts did not agree on a safe channel width and decided to turn to proposed ‘operating parameters’ to provide a measure of safety.
These facts have not been made clear and cause great concern that there is an unhealthy conflict of interest in providing an entrance channel for near 14 metre draft vessels at all states of the tide, which on the one hand is economically feasible but unsafe and on the other will provide the necessary safety margins for the large 12.1 to 14 metre draft ships but at an unaffordable price.

In the first two ship simulation trials, there were a total of 186 runs, from which 10 were familiarization runs, 126 were successful and 50 runs were reported as either going aground or experiencing adverse results.

In the third set of simulation trials the individual results were not detailed or disclosed.
The Conclusions as stated in Appendix 8 Part 8.5.4 do not suggest or identify what the operating rules and guidelines should be.

**The stated Conclusions of the first three sets of simulations trials, in 8.5.4 above, do little to assuage the fears of inadequate safety margins and increased dangers and cannot be regarded as a ringing endorsement for the design or for any operating parameters that will allow 12.1 to 14 metre draft ships to safely transit the Great Ship Channel at all stages of the tide.**

**The most glaring anomaly of the simulation trials is that whilst the trials were being classified as a success by the consultant and the proponent, four known vessels in 2006 deviated outside the Great Ship Channel whilst transiting Port Phillip Heads. One and possibly two of these ships grounded in the Heads.**

In light of the Pilots’ advice to the proponent that 12.1 to 14 metre draft ships can only transit the Great Ship Channel at the times of slack water, because they are uncontrollable when the tides are running, rather implies that the results of the simulations point to major problems with the Great Ship Channel design.

There are many experienced and knowledgeable mariners aware of the simulation trials, who for the following reason also call the trials a success. The trials have at last revealed how difficult and precarious will be the task of keeping the deep draft ships within the boundaries of the Great Ship Channel. The simulation trials have not demonstrated that the design of the Great Ship Channel is safe and satisfactory.

**The proposed Great Ship Channel design is clearly too narrow for the safety of 12.1 to 14 metre draft vessels, entering and leaving the port, and fails to meet the PIANC Standards and Recommendations.**
The proposed Great Ship Channel design of 245 metre width, for the larger 12.1 to 14 metre draft ships, is effectively half the present channel width, for <11.6 metre draft ships, across the Rip bank.

The financial constraints on providing adequate safety and the uncertain operating parameters for the entry of 14 metre draft ships into the port need to be resolved and not by trial and error. Determining resolution to these by trial and error makes a mockery of the process that has been under way for over five years.

This proposal is illogical and dangerous and the acceptance of this design is unsound.

**B.19 RESPONSIBILITY FOR FLAWED DESIGN.**

In the event of a deep draft ship grounding and/or stranding outside the boundaries of the Great Ship Channel in Port Phillip Heads, which results in major pollution, financial loss and social trauma; the failure to disclose all relevant information to interested parties during the design and assessment stages of the project, the failure to obtain and/or disclose written advice from the Port Phillip Pilot Service and the failure to conduct a risk assessment of the likely magnitude of the consequences of a 12.1 to 14 metre draft ship grounding or stranding in the Heads, may result in significant claims for damages.

**B.20 Frank Hart Submission to EES Panel dated 24th September 2004 and Presentation Paper dated 16th November 2004.**


The 2004 Panel Report suggests that the proponent’s method of responding to this material was unsatisfactory, and stated that it remains largely unaddressed and unanswered.
The proponent has again failed in the 2007 SEES to properly address large bodies of the original material.

**B.21. GENERAL COMMENTS.**

There is danger in allowing this proposal to be approved, knowing that the Great Ship Channel is too narrow and that the proponents will likely seek Government approval, after the dredging has commenced, to widen the entrance channel even further, on the grounds that they need to reduce the level of risk.

This could be seen as a way of not presenting the full proposal to the community, and avoid having the full proposal scrutinized and assessed for environmental and financial implications and outcomes.

The cost of deepening the Eastern and Western Ship Channels to 17 metre could significantly increase the total cost of the dredging project, yet without such work being completed the safety of the Great Ship Channel is not assured and a grounding at the Heads of a near 14 metre draft vessel could come at an even greater cost to Victoria and beyond.

The proponents may believe that once the work has commenced, the total critical mass and momentum will require the project to be properly finished, when otherwise it may not be assessed as likely to produce satisfactory outcomes.

Mr Lindsay Fox in an article in the Age newspaper on 21 August 2006 criticized the channel deepening proposal. He stated that, “The big ships of today carrying containers can’t get into Port Phillip Heads. Even when it is dredged, they will still not get in”. He further stated that the proposal will lead to inefficiencies and be a waste of money

Mr. Fox is correct, except that not only container ships will be very restricted in their transit times through the Great Ship Channel, oil tankers and bulk carriers will be even further restricted due to their inherent poor manoeuvrability and lower power to weight...
ratio. These latter vessels present an even greater risk than the container ships and Mr. Fox’s ‘inefficiencies’ may surface as ‘disasters’.

Widening the Great Ship Channel further will not eliminate the heightened risk of a 12.1 to 14 metre draft ship grounding outside the Great Ship Channel.

The PMC have failed to prove that this project will not cause irreparable damage. Their assertion that if we wait 20 years all visible damage will disappear is doubtful.

Those who believe that the benefits for Victorians to come out of this project will outweigh the disadvantages are living in a fools’ paradise.

The above criticism of the marine risk assessment, of the likely frequency of groundings and strandings, the lack of assessment of the potential magnitude of the consequences, the deficient design of the Great Ship Channel, the failure to produce complete data and information to all participants are matters of serious concern.

This Inquiry has to recognize the increased dangers and reduced safety margins that will eventuate with the proposed Great Ship Channel design and the navigation of 12.1 to 14 metre draft vessels through Port Phillip Heads. The inevitability of the grounding and/or stranding of a large vessel outside the Great Ship Channel at Port Phillip Heads, with the possibility of catastrophic consequences to follow, is not acceptable.

List of Attached Appendices,

Appendix 1b. Statement from Captain Maurie Cobal. Retired Port Phillip Pilot.
Appendix 1c. Statement from Captain Brian Todd. Retired Port Phillip Pilot and currently Harbour Master/Pilot Port of Wyndham – West Australia.
These three statements refer to the proposal to deepen the Great Ship Channel to permit 14 metre draft ships safe transit the channel at all states of the tide.

Appendix 2. Copy of communication between Frank Hart and officers from Port of Melbourne Corporation relating to briefing given to Captain Hart and to retired Port Phillip Pilot, Captain Keith Finnemore on 28 June 2006, relating to deepening the Great Ship Channel at entrance to Port Phillip Bay.

Appendix 3. Copy of communication between Captain Frank Hart and Marine Safety Victoria.


Appendix 5. Qualifications and Experience of Expert Witness Captain Frank Hart.


I, Frank Hart, have made all the inquiries that I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Frank Hart.
Retd. Harbour Master.
Ports of Western Port and Hastings. 07/06/2007.
APPENDIX 1. Statements from Retired Port Phillip Sea Pilots.

1a. **Statement from Captain Geoffrey Beevers. Retired Port Phillip Sea Pilot.**

Memorandum to Captain Frank Hart

4th June 2007

Dear Frank

**Re: Your Submission in relation to Harbour Deepening (Great Ship Channel).**

I was a Port Phillip Sea Pilot from 1982 until 2005 when I retired. During my career I piloted thousands of ships through the Heads in all states of the tide and in all weather conditions. It was common for pilots to swap tales of being swept out of the Great Ship Channel into the adjoining channels particularly on deep slow ships and having heart in mouth whilst correcting which often resulted in over correcting due to unfamiliarity with a ship just boarded and other causes well documented in your report. These incidents were not reported or documented and generally became successful transits after correction.

I have read your report and note that it clearly documents the dangers in limiting the deepening to a ‘canal’ from which a ship may easily stray due to simple errors, such as the helmsman putting the helm the wrong way, or distractions resulting from the activities of the Captain and Officers who may not appreciate the dangers faced in transiting ‘The Rip’. More subtle causes are the unexpected current variation in extremes of wave and wind influence, sometimes caused by weather conditions geographically remote from Port Phillip Heads and hence totally unpredictable.

The views of ALL serving Port Phillip Sea Pilots are very desirable for assessing the navigational needs but the culture of the serving pilots is such that they are unlikely individually to state their mind but will inevitably speak with one voice being that of their Management, steeped as it is in commercial and financial overlay and not reflecting safety considerations alone.

There is no evidence that ‘near misses’ have ever been recorded or published among pilots for their communal benefit nor has any risk management in relation to parameters for safe navigation of ships once the pilot is on board been implemented. Once the pilot is on board the ship it will enter if physically possible whether prudent or not, such is the pilots’ culture.

At present a deep draft ship may stray into the Inner Western (Gazetted 11.4m but being mostly in excess of 11.6m) or into the Inner Eastern Channel (Gazetted 11.9m), without
any certainty of running aground. In contrast once dredged for deeper ships, those ships will likely or certainly run aground if they deviate from the canal as they inevitably will. This was demonstrated in the simulation trials. You have addressed this in your report but it needs to be stressed that with deeper ships the frequency of deviating from the Great Ship Channel will be greater and the consequence dire.

Simulation trials should only be accepted as demonstrating the safe design of the proposed channel when all pilots participate and the results demonstrate 100% safe transits under the parameters determined to be commercially acceptable for port operations. Otherwise the design or the parameters must be changed.

It is important that the size of the new generation of deeper ships is not seen in terms only of their increased draft, which to a layman may not appear great, but recognise that the abandonment of the Panamax beam limitation means that the sheer bulk and manoeuvrability of the bigger ships in the tidal streams will increase exponentially.

In adverse conditions, current and leeway may be so great as to cause the bow of a ship 300+ metres long to track dangerously close to the channel bank in a channel of only 245 metres width. There will be no margin for error, but error there will be, by the nature of the fickle nature of the wind and currents and variable propulsion power for which the pilot must make constant but variable allowance.

All my comments relate to the time during which I was an active Port Phillip Sea Pilot and do not take account of any operational changes which may have taken place since 2005.

Yours faithfully

Geoffrey Beevers
APPENDIX 1b. Statement from Captain Maurie Cobal. Retired Port Phillip Sea Pilot.

TO WHOM IT MAY CONCERN
Re: GREAT SHIP CHANNEL DEEPENING

I am currently a retired Port Phillip Sea Pilot namely, from 1982 to 2006 and was previously an exempt Master from 1979 until 1982. During this time, I have encountered some unforeseen serious situations amongst the thousands of transits through Port Phillip Heads that could have resulted in environmental disasters, had the vessels been deeper, wider and longer.

I feel compelled to express my views regarding the consequences to the environment that may arise in case of an accident if the current proposed operating parameters of the Great Ships’ Channel at Port Phillip Heads are not adhered to when the allowable ship’s draft will be increased from 12.1 to 14 meters.

I believe that at present it is only proposed to deepen the Great Ships Channel to 17 meters at the Heads, not to widen it. To me that is fraught with danger.

Introducing a ‘canal’ by deepening the existing channel from 14m. to 17m. would limit the safe navigation of vessels over 12.1 m. to approximately 4 daily periods, namely at slack water. It is my opinion, that at times, it would become unmanageable to control a deep loaded vessel possibly on reduced speed with a beam in excess of 40m. and length in excess of 300m. in the confines of a 245m. wide channel when subjected to the influence of cross currents that may reach up to 8 knots in force, from a general, but at times unpredictable direction.

It is therefore my view that the Great Ships Channel be widened from the existing Eastern Leeds to the Western Leeds. This would at least increase the safe navigating parameters. Irrespective, I believe that the transiting of the new generation vessels through the Great Ship’s Channel should only be at slack water, not on a 24 hrs. basis as proposed.

The simulation trials that were held in 2003, 2005 and 2006 in order to test the current proposed design, operating parameters and navigation aids, could only be classed as a failure to the proposed project.

Furthermore, I am astounded that the current Government Committee has not issued a compulsory questionnaire to every serving pilot (since all are similarly qualified) so as to give all the players the opportunity to express their views and concerns. After all, it will ultimately be the younger Pilots (not the ones who will be retiring in the next few years) who will be guiding the new generation vessels through the well known treacherous entrance of Port Phillip.

I therefore urge the Government, not just as a retired Port Phillip Sea Pilot, but also as a concerned citizen, to scrutinize diligently every aspect of concern or criticism before
approving this project with its limitations, which could someday lead to an environmental disaster and negate its commercial advantages.

The Expert Witness Statement of Captain Frank Hart on behalf of Blue Wedges Coalition and Frankston Beach Association and Others, has my full support.

Yours faithfully,
Maurie Cobal
09 June 2007

APPENDIX 1c. Statement from Captain Brian Todd. Ex Port Phillip Sea Pilot & Currently Pilot & Harbour Master Wyndham Port.

Memorandum to Captain Frank Hart

Dear Captain Hart

Re: Your Submission in relation Harbour Deepening (Great Ship Channel)

I was a Port Phillip Sea Pilot from 1985 until 2002 and am currently the Harbour Master/Pilot at the Port of Wyndham, a port where we have a tidal range of 7.5 metres and tidal currents of up to 7 knots.

During my years as a Port Phillip Sea Pilot I would have transited the Great Ship Channel with deep draft vessels many times, at various stages of the tide and a great variety of weather conditions.

From 1995 onwards I habitually carried with me an Electronic Chart and GPS System which enabled me to view and record the ships position, course and speed over the ground. This system was highly accurate as I used a Differential GPS and was very confident in the accuracy of the results.

My experience is that the effect of the tide in the Port Phillip Heads could cause significant effects on the position of the vessel which necessitated course alterations to keep the centre of the ship on the middle course line through the Rip. It was not uncommon to be steering 30 degrees off course to maintain the 045/225 degree track on the main leads at Queenscliff.
Because I was aware of the ship’s position at all times by reference to the Main Leads and from the electronic chart I was able to see the actual position of the ship’s bow and stern relative to the edges of the Great Ship Channel.

I can recall two instances which are worthy of mention.

Mobil tanker mv Saucon – deep draft from Holden Dock to sea – Full flood tide at Port Phillip Heads – speed over the ground passing Pt Lonsdale 2 knots. Ship Speed 12 knots.

Deep draft ‘Contship’ container vessel from Swanson Dock to sea – strong ebb tide at Port Phillip Heads.

With the ship on or close to the centre of the channel the bow set to port and stern to starboard on our passage through the Heads. Even with Hard to Starboard helm could not control the port swing of the ship’s bow. By the time the swing to port was under control the ship’s head was approximately 170 degrees – that is 55 degrees off the alignment of the channel.

In the first instance I do not recall any steering problems but with a speed over the ground of 2 knots steering would have been very inefficient. In the second instance the ship was very powerful with excellent steering under normal circumstances but the combination of tidal effects and very deep draft of 11.9 metres approximately could have caused a serious grounding had we been in any other position when control became difficult.

On the basis of these incidents and many others over the 17 years I piloted at Port Phillip I can state unequivocally that to ignore the widening of the Great Ship Channel to include the Eastern and Western Channels will result in the grounding of a> 12 metre ship. There is no margin of safety in a 245 metre wide channel when large ships are routinely steering 20 to 25 degrees off course to maintain a course over the ground of 045/225 degrees.

The effect of the tide in this area is not sufficiently well understood or documented, on some occasions the effect on ship steering may be minimal and yet on other occasions can be extreme. What combination of factors bring about these changes is only a matter of conjecture and however vigilant the pilot there will always be the unforeseen distraction/helm order error/ or other factor which may delay the pilot’s response to a change in circumstances too late to regain control before the vessel has strayed beyond the bounds of the channel.

I have read your submission to the Panel with considerable interest and can only hope that your efforts will bring about the necessary changes to ensure that the navigation of vessels through the ‘Rip’ will not be on the basis that the ship will safely make this passage only if everything goes according to plan.

Regards  Brian Tod

Email: hmord@westnet.com.au
APPENDIX 2. Correspondence between Frank Hart and Port of Melbourne Corporation.

Letter from Frank Hart to Executive General Manager, Channel Deepening Project following Channel Deepening Briefing given to Captain Frank Hart and Captain Keith Finnemore by PMC on 28 June 2006:

Frank Hart,
02 July 2006.

Mr. Nick Easy,
Executive General Manager,
Channel Deepening Project,
Port of Melbourne Corporation.
GPO Box 261,
MELBOURNE. 3001

Dear Nick,

**Great Ship Channel - Design Briefing, Channel Deepening Project.**

On behalf of Captain Keith Finnemore (retired Port Phillip Pilot) and myself I would thank you and your colleagues for the briefing and discussion opportunity on the Channel Deepening Project design, provided to us both on 28 June. We are certain that only with open and frank discussion, amongst qualified and experienced personnel, will a safe and satisfactory design/operating outcome be achieved.

We had hoped that the information presented by the Port of Melbourne Corporation would enable us to examine and understand the process that has been undertaken to date, to determine the design and operating parameters that will allow near 14 metre draft vessels to safely enter and leave Port Phillip Bay at all stages of the tide, with necessary tidal assistance as required to compensate for ship motion and sea conditions. Our views on this information are expressed below.

**Definition of Design and Operating Parameters**

There are many aspects of the design process that we could have looked at more critically in seeking to clearly define the operating parameters of the **Great Ship Channel through Port Phillip Heads.** These include:

i. the actual design of the channel,

ii. the maximum length, beam and draft of vessels to use the channel, and
iii. the safe transit times of near 14 metre draft vessels.

Unless the operating parameters are clearly defined for all to understand, the process of robustly designing a safe channel for near 14 metre draft vessels is unlikely to be achieved.

If clear definition of the proposed operating parameters is clouded or obscured, ambiguity in design and operation will prevail and ship masters, pilots, the port operator, port service providers, shippers, and other port users will be confused. This will likely lead to inefficiencies, increased costs and decreased safety, with potentially disastrous financial and environmental consequences.

Adverse Consequences from Proposed Design and Operating Parameters.

We are concerned that the proposed design of the Great Ship Channel and proposed depths of water over the Eastern and Western Ship Channels together with the proposed operating parameters are unlikely to provide the outcomes expected by persons who have received the same briefing that we received on 28 June, when such persons are unaware of the technical flaws in the design. We believe the outcome is likely to be closer to the following scenario, than that suggested at the briefing:

i. In our assessment and the assessment of others qualified to know, the eventual operating parameters relating to the proposed design will lead to a very limited ‘transit time window’ at Port Phillip Heads for near 14 metre draft vessels to enter or leave the Port.

ii. Rather than being navigable at most stages of the tide, it is probable that after commissioning the deepened Great Ship Channel, the pilots and the Port Authority will restrict transit times of near 14 metre draft vessels to ‘slack water’ at the Heads, so as to minimize dangers from the strong cross currents and the inadequate channel width

Transit during the times of flood and ebb tides, will be assessed as being too difficult to keep the vessel within the boundaries of the channel and consequently too dangerous to attempt.

iii. If transit of near 14 metre draft vessels is restricted to times of slack water, lengthy delays to shipping movements will occur and involve all ships using the port. Port operating costs will escalate and the efficiency of the port will decrease significantly. Increased dangers will occur where and when ships congregate to wait or queue for slack water.
**Determination of Design and Operating Parameters.**

We note your advice that the opinion of the ‘Port Phillip Pilot Service’, and the assessment of those pilots involved in the ship navigation simulator trials that are taking place, are a major factor influencing your assessment and acceptance of the proposed channel design and operating parameters.

**In order to allow independent assessment of the proposed design, including assessment of the design tools and the design criteria and to facilitate a proper peer review, we respectfully request copies be provided to us of (i) all reports and submissions from the Port Phillip Pilot Service to the Port of Melbourne Corporation relating to the channel design and operating parameters; also (ii) the results and evaluation of the simulator trials now taking place; and (iii) the statistics and reports obtained from monitoring large deep draft vessels that have deviated from the Great Ship Channel, when entering or leaving the port.**

**Summary.**

Residual Concerns:

i. The proposed design of the Great Ship Channel fails to meet internationally accepted design standards for entrance channels where there are cross currents equivalent to those at Port Phillip Heads. The fine tolerances make little allowance for known navigational difficulties or recognize the causes of the many unfortunate incidents that have occurred at Port Phillip Heads over the last sixty years.

ii. For better outcomes, discussion and debate must involve more master mariners with local knowledge, who are experienced in port navigation and channel requirements, in strong tidal conditions and who are not directly employed by the Port of Melbourne Corporation or the Port Phillip Pilot Service.

iii. The views of the port pilot service have not been independently peer reviewed. They have been concealed from pilots, harbour masters, ship masters and maritime lecturers who have knowledge of the port and of ship handling characteristics and who are independent from the Port of Melbourne operations and management teams.

iv. In assessing dangers, ‘uncertainty’ has been confused with ‘risk’.

‘Risk can be managed, Uncertainty cannot’.

v. The proposed design and operating parameters, and restricting times of transit for near 14 metre draft vessels to near times of slack water at the Heads, fail to meet declared operating objectives or to eliminate unreasonably high levels of navigation difficulty and danger.
vi. The proposed depths of water in the Eastern and Western Ship Channels crossing the Rip Bank have not been shown to be adequate for the safety of vessels with drafts between 11.6 and 14 metre.

vii. After nearly 4 years of study and debate the design and operating parameters remain unclear. Unfortunately critical outcomes remain unresolved.

What are the specifications for this project? The specifications and operating parameters are obfuscated and clouded in uncertainty. All parties are entitled to know, clearly and unambiguously, what the design and operating parameters will be, what we will get and what price we will pay.

The evidence suggests that outcomes will fail to meet stated project specifications and will increase existing navigation difficulties and dangers.

Yours sincerely,

Frank Hart, Harbour Master, (retired). Ports of Western Port and Hastings.

Copy of Letter from Mr. Nick Easy to Captain Frank Hart dated 16 August 2006 in reply to letter from Frank Hart dated 02 July 2006 above.

Port of Melbourne Corporation.

16 August 2006.

Mr. Frank Hart,

Dear Frank,

Channel Deepening Project – Channel Design Briefing

Thank you for your recent correspondence and your attendance to the presentation on the Channel Deepening and the proposed Channel Deepening Project.

Port of Melbourne Corporation is currently compiling an extensive document known as the Supplementary Environment Effects Statement (SEES) in response to the Ministerial Guidelines released in October 2005.

An important chapter in this report will cover the design and operating parameters of the channel with regard to access by 14. metre draught vessels. This will provide sufficient information in regards to both navigation and construction. The design of the channel system for navigation has been undertaken in accordance with the process set out in the

It is considered that the work undertaken is of the highest standard and that a safe and functional design has been achieved.

I would be happy to discuss the matters you have raised in more detail prior to the formal exhibition process and will approach you closer to this time.

Once again, thank you for your time and interest in the channel Deepening Project.

Yours sincerely

Nick Easy
Executive General Manager
Channel Deepening Project

APPENDIX 3.

Correspondence with Marine Safety Victoria requesting information relating to Shipping Incident in Port Phillip Bay.

Copy of Email Sent on 15 April 2007 to Marine Safety Victoria requesting information relating to the grounding of the mt. Desh Rakshak. On 04 January 2006

To the Manager,
Marine Safety Victoria.

Dear Sir,
Please may I receive copy of the MSV Investigation Report into the grounding of the oil tanker, Desh Rakshak at Port Phillip Heads, on 04/01/2006.

Yours sincerely,
Frank Hart
15 April 2007.

Copy of return email from Marine Safety Victoria dated 17 April 2007 to email requesting information relating to MSV Inquiry into grounding of Desh Rakshak on 04 January 2006.
Frank,

Thank you for your enquiry.
The "Desh Rakshak" investigation has not yet been finalized & as such is not yet available for public distribution.
When investigations are available for public distribution, they are posted on the Marine Safety Victoria Website & may be downloaded by clicking on the appropriate link.

Kind Regards

Alan C Hollioake.

APPENDIX 4.


The 1989 grounding of the oil tanker ‘Exxon Valdez’ in Prince William Sound, Alaska, with the loss of 35,000 tonnes of crude oil, incurred clean up and compensation costs amounting to approximately US $3.5 billion, and punitive damages of approximately US $6.5 billion. Only now, 18 years after the accident, is the environment recovering to an acceptable degree.

Following the 1989 grounding of the Exxon Valdez in Prince William Sound, Alaska, a risk assessment was carried out in 1995 by Rensselaer Polytechnic Institute, George Washington University and Det Norske Veritas.

The initiators of this Assessment asked the National Research Council to provide a Peer Review of the Prince William Sound Risk Assessment, which was published in 1998.
Both these studies together with the PIANC recommendations are critically relevant to the work that should have been carried out in the Marine Risk Assessment and Marine Impact Assessment undertaken for this project. Regrettably in regard to the Great Ship Channel this has not eventuated.

Both the Prince William Sound - Assessment and the Peer Review of the Assessment are directed towards those persons with a technical background and whose daily business it is to think about, manage or regulate and need to know and understand the risks and hazards.

The standards and procedures established by these two studies constitute a standard of Risk Assessment that if followed and used as a model for the SEES Risk Assessment would have produced a more meaningful and informative outcome.

The information obtained together with more diligent following of content and intent of the PIANC Guide would have resulted in the design of a safer Great Ship Channel.

Signed

Frank Hart,
Harbour Master, (retired). Ports of Western Port and Hastings.
12 June 2007.
Failure of the design of the Great Ship Channel at the Entrance to Port Phillip Bay to reflect the standards and recommendations of the Permanent International Association of Navigation Congresses (PIANC) ‘A Guide for the Design of Entrance Channels’ (required for 14 metre draft ships)

and

failure by the Proponents to conduct a Risk Assessment that reflects the recommendations and standards of the PIANC Guide for undertaking a Risk Assessment and the Australian Standard 4306 ‘Risk Management’.
Planning Panels Victoria Guideline No. 1 part 2 states that:

2.1 An expert witness has a paramount duty to the Panel and not to the party retaining the expert.

2.2 An expert witness has an overriding duty to assist the Panel on matters relevant to the expert’s expertise.

2.3 An expert witness is not an advocate for a party to a proceeding.

This Submission addresses the Design Processes and the Actual Design of the proposed Shipping Channels, as they effect the safety of 14 metre draft ships transiting the Entrance to Port Phillip Bay.

Part 3 of the terms of reference of this inquiry relating to the Channel Design include the following:

Part 3. The Inquiry is to report to the Minister setting out information and advice as to:

(1) Whether amongst other matters the proposed design for the Channel Deepening Project (including for the channels …..and navigational aids) is safe……..

(2) The likely environmental effects of the subsequent operation of the deepened shipping channels.
Whether the proposed project design and approach to project implementation with or without modification are suitable to ensure the achievement of acceptable environmental outcomes…… having regard to ……costs…….

Introduction

As part of the Port Phillip Bay Channel Deepening project the Channel Design through Port Phillip Heads was carried out by Maunsell Partners, the Risk Assessment was carried out by Royal Haskoning Ltd. and the Peer Review carried out by SKM.

These three consultants claim that the Channel Design Process, the Channel Design and the required Risk Assessments were carried out in accordance with the recommendations of the Permanent International Association of Navigation Congresses – the ‘PIANC Approach Channels a Guide for Design’ and with Australian Standard 4360 ‘The Management of Risks’, and that the design met the recommendations of both standards.

Available evidence clearly demonstrates that these claims are invalid.

RISK ASSESSMENT

Technical Appendix 6 - Channel Deepening Project Risk Assessment for SEES.

1.1 - Introduction
URS Australia P/L. was appointed by the PMC to provide risk advisory services to the PMC and to develop a **Risk Management Framework**. URS advise that the risk assessment process was executed as a central part of the diverse SEES assessment components and not as a distinct assessment on its own. Each specific project team was required to assess the risk as their project evolved.

**1.3 - Report Objectives**

‘Detailed descriptions of specific risk issues are not provided in the URS report. These are described in the relevant technical reports for the SEES’.

**Section 2 - SEES Risk Management Framework**

URS advise that they have decided to follow the Australian/New Zealand Risk Management Standard AS/NZ 4360:2004 (AS4360) approach with respect to the Project risk management and to the required SEES risk assessment.

**2.1 - Overview of AS 4360 Risk Management Process**

AS 4360 state: The tasks set out in the risk management process are:

- **Establish the Context** – Establish the context in which the analysis will take place, establish evaluation criteria, and define the structure of the risk analysis.

- **Identify Risks** - identify when, where, why and how risk events could occur.

- **Analyse Risks** – identify existing controls, evaluate **likelihoods and consequences** to determine levels of risk.

- **Evaluate Risks** – Compare estimated levels of risk with evaluation criteria, consider benefits versus adverse outcomes.
**Treat Risks** – Develop and implement specific strategies for increasing benefits and reducing potential costs.

**Section 3. Risk Assessment – Overview, Concepts and Process**

**3.4.1 - What is Risk?**

**URS** state that, ‘risk is a condition resulting from the prospect of an event occurring and the magnitude of its consequences’.

**PIANC GUIDE – APPROACH CHANNELS A GUIDE FOR DESIGN**

**RISK ANALYSIS in the PIANC GUIDE.**

Parts 2.3, 3.1, 3.8, 6.1, all of part 7 and all of part 8 of the PIANC Guide, all refer to **RISK** as being an integral part of the Channel Design Process. See below:

**Part 2.3 COST/BENEFIT ANALYSIS.**

‘In the evaluation of proposed marginal adjustments or refinements to the channel design, as part of Detailed Design, cost/benefit analysis may be applied to justify the cost of design adjustments relative to the effect on the **RISK** of ship accidents. These costs include ship salvage and repair costs, loss of freight or hire, closure or obstruction of the channel, loss of port reputation, property and environmental damage’.

**Part 3.1 DATA COLLECTION DESIGN TOOLS AND EXPERIENCE.**

‘The design methodology in this report makes use of data collection methods and the design tools which may be classified broadly as: analytical, numerical and physical.
Analytical tools are models which allow for the analysis of wind, waves and currents as well as the probabilistic aspects of RISK.

**Part 3.8 MARINE TRAFFIC AND RISK ANALYSIS.**

3.8 states: ‘The object of approach channel design is safety and navigability, a final stage in the design will be to carry out a RISK ANALYSIS. **Overall RISK is determined from the frequency with which an accident may occur combined with a measure of its consequences.**

**Part 6.1 GENERAL METHODOLOGY.**

6.1 states: In this section the Detailed Design process is outlined. The basic methodology involves the use of computer models…. Consideration of marine Risk follows naturally from this and the incorporation of RISK into design is discussed in Chapter 7.

**Part 7. MARINE RISK AND SAFETY OPERATION.**

Part 7 states: ‘**RISK IN THE MARINE WORLD IS LINKED TO THE FREQUENCY OF ACCIDENTS AND THEIR CONSEQUENCES.**

‘The magnitude of the RISK in terms of costs depends on the RISK in terms of likelihood of accidents and the environmental consequences of each accident. The consequences of a grounding accident could be proportional to the size of vessel and the type of cargo. Certain cargoes will have greater potential consequences’.

**Part 8. METHODOLOGY OVERVIEW: THE MARINE IMPACT ASSESSMENT**

states: ‘This Report describes the techniques available for the design of approach channels. Emphasis has been placed on safety of operation and a major part of the report has been devoted to marine Risk. The design methods reflect the increasing need to consider RISK at all stages’.
ROYAL HASKONING MARINE RISK ASSESSMENT

Royal Haskoning were commissioned by the PMC to determine the impact of the channel deepening on navigational Risk in the channel.

Appendix 16. – Summary states:
A key requirement of the SEES has been to provide a Marine Risk Assessment. The assessment required is to focus on both the period of the dredging works and beyond to 2035.

‘The scope of this assessment has been to examine the probability of events occurring but does not include examination of societal impact’.

The Royal Haskoning Risk Assessment states on page 1 of the Summary that, ‘The closest guidance on safety criteria comes from the PIANC Guide that offers criteria for the measurement of Risk’.

Part 1.4 - Basis of this Risk Assessment
1.4.1 Scope

‘It is important to note that RISK is usually the product of the likelihood of an event and the impact that the event will have on its surroundings. The scope of this assessment is to examine the likelihood of events occurring but does not include examination of societal impact.'
When reference is made to Risk in this report, this therefore refers to the likelihood of the event occurring’.

Comment:

(1) A direct consequence of the Royal Haskoning Risk Assessment, omitting to include an assessment of the potential MAGNITUDE OF THE CONSEQUENCES of a 14 metre draft ship grounding in the Eastern or Western Ship Channels outside the boundaries of the GSC; immediately determines that the Royal Haskoning - Risk Assessment, fails to comply with either the standards or the recommendations of the PIANC Guide, or to the standards and the recommendations prescribed by the USR Risk Assessment. (See above).

(2) Failing to include an assessment of the potential magnitude of the consequences of a 14 metre draft ship grounding in the Eastern or Western Ship Channels outside the boundaries of the GSC, also prevents the terms of reference provided by the Minister being met, eg., The relevant parts of the terms of reference being part 4 – for the Inquiry to advise on, ‘the likely environmental effects of the subsequent operation of the deepened shipping channels’.

There are many other additional deficiencies and flaws in the Royal Haskoning Risk Assessment that clearly undermine any claim that their Risk Assessment complies with the PIANC Guide.

These deficiencies include the absence of adequate, accurate and relevant data, the use of irrelevant data including the inappropriate use of a Marine Traffic Model (MARTRAM) and using existing and historic environment and accident data to predict the likely frequency of future accidents in a changed environment in the Port Entrance.

These deficiencies are further described in my 12 June 2007 ‘Expert Witness Submission’ and in my ‘13 July 2007 Presentation Paper’.
The failure to include an assessment of the potential magnitude of the consequences of an accident is critical when claiming compliance with the PIANC Guide or compliance with the URS Risk Assessment or using the word risk in line with the scientific and universally accepted definition and meaning of the word ‘Risk’ i.e., to include both the likely frequency and magnitude of an event.

The Risk Assessment must include data of previous ship accidents and incidents. No data relating to ‘incidents’ has been included.

Recommendation 18 from the February 2005 EES Report states:

‘For the purpose of validating channel design safety at The Heads, the proponent should define the nature of a ‘near miss’ and an ‘incident’, in respect to vessels leaving the channels, grounding etc. Vessel tracking data should be collected. The data should inform a review of shipping incident risk as an input into channel design’.

Any data obtained by the PMC and/or Marine Safety Victoria has not been disclosed and was not provided to the risk assessor Royal Haskoning.

PIANC 3.1 Anecdotal Evidence from pilots. The lack of hard evidence of ship deviations from the Great Ship Channel needs to be supplemented by anecdotal evidence from the Port Phillip Pilots.

The lack of data provided by the PMC or Marine Safety Victoria to Royal Haskoning and the failure of Royal Haskoning to vigorously seek out the data precludes the Risk Assessment meeting the PIANC Guide standards and recommendations and meeting the overarching requirements of the URS stated requirements and parameters.
DESIGN OF GREAT SHIP CHANNEL

Maunsell Australia Pty. Ltd. were commissioned by the PMC to design for navigation and design for construction. The design for navigation was to determine the channel dimensions required for the vessel to travel between the Entrance and the berth.


This submission addresses the design of the Great Ship Channel (GSC) through Port Phillip Heads and the need to provide a safe channel to enable 14 metre draft ships to transit the entrance channel at all states of the tide.

The detail of the flawed Channel Design process and the Design and operating parameters of the GSC are clearly set out in my Submissions dated 7 May 2007 and the 12 June 2007 and in my 13 July 2007 Presentation Paper.

It is my intention to summarize the matters that invalidate the claim that, ‘the Channel Design process and/or the design of the Great Ship Channel meet the standards and recommendations of the PIANC Guide for the Design of Entrance Channels’.

Further that, ‘the proposed GSC design and operating parameters are unsafe for 14 metre draft ships and will likely lead to the grounding of 14 metre draught vessels in the side channels and that the claimed operating parameters cannot be achieved’.
Further that, ‘increasing the width of the proposed 245 metre wide GSC a nominal amount, say 20% to 30%, will not eliminate or mitigate the dangers to any noticeable degree and may instead increase the dangers at the Heads by leading to a false sense of security’.

Comment:

To provide a reasonable measure of safety, wherever 14 metre draft ships will deviate into the Eastern and Western Ship Channels running alongside the GSC these side channels have to be deepened to the same depth as the Great Ship Channel, that is from the western side of the Western Ship Channel to the Eastern side of the Eastern Ship Channel

Detailed information of ships deviating from the Great Ship Channel into the Western and Eastern Ship Channels is largely anecdotal as the electronic recording of ships tracks through the Heads has not been conducted for a long enough period of time. There is plenty of anecdotal evidence from the pilots and others to indicate that ships regularly deviate out of the Great Ship Channel into the Eastern and Western Ship Channels, alongside the GSC.

The extra force, from the prevailing currents that simultaneously cross the Entrance Channels in two contrary directions, exerted on the side of the proposed 14 metre draft ships over the existing 11.6 metre draft ships, has not been adequately studied and is not properly understood.

It is probable that the sideways forces on 14 metre draft ships will more than triple existing forces on the 11.6 metre draft ships and cause the 14 metre draft ships to be uncontrollable in Great Ship Channel at any time other than at slack water.
This is the reason that the Pilots have advised the PMC that 14 metre draft ships will only be able to transit the GSC at slack water, as they are uncontrollable in the GSC when the tide is running.

The following factors invalidate any claim that the Design process and the Design of the GSC comply with the PIANC Guide.

1. The empirical rules contained in Table 5.2 of the PIANC Guide have been inappropriately used to determine the width of the GSC at Port Phillip Heads.  
   Comment: These rules relating to cross currents do not apply where cross currents exceed 2.0 knots. These rules do not apply at Port Phillip Heads where the magnitude of the prevailing cross currents exceed 2.0 knots for approximately 70% of the time and these cross currents can exceed a magnitude of 6.0 knots.

2. The empirical rules that recommend increased basic manoeuvring lane channel width to allow for prevailing cross winds on large container ships have \textbf{not} been incorporated into the design width. (Table 5.1) 
   Comment: Strong cross winds are common at the entrance and pilots describe considerable problems with the ship’s heel and with controlling the ship when both cross winds and currents are present. A cautious approach in the design process would have made allowance for such conditions. 
   (Captain Beevers’ presentation on 17 July 2007 to the Inquiry emphasized the wind effect on container ships, as much as he emphasized the cross current effect.

3. Additional width for Bank Clearance (Table 5.4) has not been incorporated into the design width for 14 metre draft ships travelling along the deepened Great ship Channel. 
   Comment: It is likely that the bank effect will have considerable influence on 14 metre draft vessels transiting the GSC. A cautious approach would have included the Bank Clearance width factor. The pilots express concern in relation to 14 metre draft ships travelling along an apparent canal at the Entrance.
4. Risk is an integral and critical part of the PIANC Guide Channel Design process. The likely frequency of an event has been estimated using inadequate and inaccurate and irrelevant data and the likely magnitude of that event has been totally ignored in the Great Ship Channel Design process.

5. The use of PIANC Design Tools of Analysis, Numerical and Physical have been ignored. Comment: The basic design has been produced by using the Concept Design Method inappropriately.

The PIANC basic design tools have been largely ignored. No mathematical studies have been carried out to assess the increase in the forces that will be imposed on the sides of the 14 metre draft ships compared with the 11.6 metre draft ships. The risk data used has been incomplete, inaccurate and irrelevant. Assessment of future incidents and accidents is based on the frequency of 11.6 metre draft ships grounding outside the great Ship Channel and inappropriately projecting this figure to estimate the likely frequency of the larger, deeper 14 metre draft ships that may ground outside the Great Ship Channel.

The only tool used to validate the Design of the GSC has been the Ship Simulation Trials which produced uncertain results.

**Ship Simulation Trials.**

As stated previously the ship simulation trials had a very high failure rate. In the first two simulation trials there were a total of 186 runs, from which 10 were familiarization runs, 126 were classed as successful and 50 runs were reported as going aground or experiencing adverse results.

Results of simulations in the river Yarra were not separated from results of simulations at the Entrance, therefore failures and incidents at Port Phillip Heads
could not be reliably assessed. Results were not fully disclosed and only came to light when the PMC were compelled to disclose some details after disclosure in part by third parties.

Assessment of the results of the Ship Simulation Trials by the Panel of Experts is highly contentious. Following the first three simulation trials:

‘It was concluded that the channel alignment and width proposed will provide a sound basis for the development of acceptable channel operating rules and guidelines’,

after the fourth set of simulation trials this was changed to ……

‘Navigation of deep draught Post Panamax vessels through the proposed width and alignment of the deepened Entrance channel using the proposed PEL light arrangement will be safe and satisfactory’,

Justification for changing the doubtful assessment after the first three simulation trials to the confident assessment after the fourth set of simulation trials relies totally on the provision of PEL lights in three different locations.

Surely this assessment should have been tested in reality. Why were the PEL lights not installed after the fourth set of Simulation Trials in mid 2006 to test their efficacy?

May be it was feared that their claimed powers would be found to be illusionary and their limitations found to be as much of a problem as of a help.

This reassessment is based on unreal expectations of the help that will come from the provision of the PEL lights. It places a big question mark over the due diligence of the design process. The change to, ‘acceptance of the design’, on this basis is reckless and irresponsible.
It has to be noted that there is no mention of the likely restricted transit times of 14 metre draft ships, navigating the Great Ship Channel only at slack water, or whether transit will be possible at all states of the tide.

SKM Peer Review.

The deficiencies of the SKM Peer Review were outlined in my Expert Witness Statement of 12 June 2007 and Presentation Paper of 13 July last. The deficiencies are not repeated in this document.

Summary

There is significant concern amongst many mariners that the Channel Design Process has failed to produce a safe design and clear operating parameters for 14 metre draft ships to safely transit the Entrance to Port Phillip Bay after deepening the channel to 17 metre declared depth.

The main concern relates to the proposed width of the Entrance Channel being totally inadequate for future larger vessels with 14 metre draft, effectively being reduced by up to 50% from the width currently available for smaller vessels drawing up to 11.6 metre draft.

Concern relates to the veracity and competence of the studies and reports relating to the proposed design and operating parameters for the Great Ship Channel at Port Phillip Heads. The expertise and independence of the consultants and expert witnesses is in question.

Concern is for the safety of 14 metre draft ships transiting the proposed 245 metre wide Great Ship Channel when the tides are running and also extends to 14 metre
draft vessels transiting the Great Ship Channel at slack water, due to the often severe and uncertain tidal and environmental conditions at Port Phillip Heads.

Claims made by the PMC Consultants and Expert Witnesses that the Great Ship Channel Design and Design Process and the Marine Risk Assessment comply with the PIANC Guide recommendations and standards are in dispute. This claim appears to imply that the Great Ship Channel design has the stamp of approval of PIANC

This Inquiry is being asked to advise the Minister, on matters where the Inquiry has received contradictory evidence and is being asked to decide as to the veracity of both.

Doubt exists over the veracity of much of the evidence that has been presented.

I therefore request that the Maunsell Design Process and the proposed Design for the Great Ship Channel and the Royal Haskoning Marine Risk Assessment together with all supporting evidence, and all expert witness statements, presentation papers and transcripts, emanating from this Inquiry be referred to the PIANC Secretariat in Brussels for review.

I request that PIANC be asked to review and audit the Design Process and the final Design of the GSC and the Marine Risk Assessment and proposed Operating Parameters.

The safe transit of the Entrance to the Port is critical and must not be compromised. No flawed design or operating parameters should be countenanced where pilots are asked to pilot large deep draft oil tankers, bulk carriers and container ships through the Great Ship Channel when the design of the Great Ship Channel is clearly flawed and proposed operating parameters confused. (refer PIANC Guide part 2.3)
Only if this request is carried out with PIANC; or another fully independent and competent body, totally removed and at arms length from the proponent; assessing and approving the design and operating parameters, will the Inquiry be able to advise the Minister with confidence on the matters prescribed in the Terms of Reference.

Signed

Frank Hart
27 April 2008
The Chairman & Members,
Ministerial Inquiry into the Supplementary Environment Effects Statement,
Port Phillip Bay Channel Deepening Project,
Planning Panels Victoria.
1/8 Nicholson Street,
East Melbourne,
VICTORIA 3002.

Dear Sirs/Madam,

Re: Request for PIANC review of Design of Great Ship Channel and proposed Operating Parameters.

There is significant concern amongst many mariners that the Channel Design Process has failed to produce a safe design and clear operating parameters for 14 metre draft ships to safely transit the Entrance to Port Phillip Bay after deepening the channel to 17 metre declared depth.

The main concern relates to the proposed width of the Entrance Channel being totally inadequate for future larger vessels with 14 metre draft, effectively being reduced by up to 50% from the width currently available for smaller vessels drawing up to 11.6 metre draft.

Concern relates to the veracity and competence of the studies and reports relating to the proposed design and operating parameters for the Great Ship Channel at Port Phillip Heads. The expertise and independence of the consultants and expert witnesses is in question.

Concern is for the safety of 14 metre draft ships transiting the proposed 245 metre wide Great Ship Channel when the tides are running and also extends to 14 metre draft vessels transiting the Great Ship Channel at slack water, due to the often severe and uncertain tidal and environmental conditions at Port Phillip Heads.

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Only if this request is carried out with PIANC; or another fully independent and competent body, totally removed and at arms length from the proponent; assessing and approving the design and operating parameters, will the Inquiry be able to advise the Minister with confidence on the matters prescribed in the Terms of Reference.

Yours sincerely

Frank Hart.