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Submission on the
Supplementary Environment Effects Statement for
the proposed Channel Deepening Project in Port Phillip Bay

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SUMMARY

The VNPA strongly opposes this project because the Bay's assets are too precious and the risks too high. The very many risks are cumulative so the chances of something going seriously wrong are great. The multiple possible impacts on a large number of areas and environments, and the unpredictable interactions in the system, make for many uncertainties and a strong possibility that unforeseen (or even foreseen) disasters will occur. The risk is not worth it to allow a relative minority of larger ships into the Bay with limited economical benefits to the general public. Alternatives such as use of other ports for larger ships, encouragement of use of the Melbourne Port by medium sized ships and improvement of the National rail network are far preferable to taking this risk.

LIMITATIONS OF OUR SUBMISSION AND OF THE PROCESS

The provision of only 6 weeks to digest and analyse 15,000 pages of documents containing complex technical information suggests that the government does not seriously wish to have the project scrutinised. With the level of resources available to us, and the multiple demands on our staff and volunteers, we have been unable to examine the documents to anywhere near the extent that that we feel is necessary to respond to such a significant proposal. If there are errors or omissions in our submission because we have missed some aspect in the documents we make no apologies because of the sheer size of the material. Instead we reserve the right to add to our submission at the panel hearing on any relevant matter.

The proposal to have the Panel Hearing very shortly after the submission deadline further exacerbates this situation. Even more alarming is the proposal to limit the questioning of witnesses and to limit the length of the panel hearings to only 4-7 weeks. As the Panel is itself only given a few weeks to produce a report then this will make the situation even worse. All this makes it impossible to examine this complex proposal to the depth required. In addition, unfortunately none of the Panel members have had the benefit of sitting through the details of the previous EES, making their task even more difficult.

Compounding the situation are the limitations placed on the panel preventing them from considering any alternatives to the proposal (such as other ports or transport options) or the cumulative effect of the maintenance dredging that will follow indefinately.

Proper analysis by the public, independent experts, and the Panel cannot be done quickly. The long-term impact of all aspects of the proposal and whether there are other means to achieve the same end are vital considerations. Our Bay is a vital asset to our State and deserves better.

WHY THIS PROJECT SHOULD NOT GO AHEAD

The Bay is too precious

As outlined in the EES and the SEES, the Bay has a vast array of important values including high biological diversity, complex ecosystems, Marine National Parks and Sanctuaries, internationally listed wetlands and sites of archeological and geomorphological significance. A large number of species in the bay are endemic to the region and most of the Bay's species are found in the southern half of the bay where extensive dredging and dumping of the material is to take place. There are threatened species such as sea-horses, snapping shrimp, ghost shrimp, giant seaweeds and unique 'sponge gardens' in the Rip. Thirty-three species are known to be 'of conservation concern' with much still unknown about the vast majority of species in the Bay. There are seals, dolphins, penguins and occasionally whales. There are also important uses including a wide range of recreational and tourism activities, fishing industries, aquaculture and other marine-based industries.

The Bay also acts to help de-nitrify the runoff and treated sewage that is discharged into the Bay in large quantities. The sensitive benthic ecosystem is critical in this respect and irreversible damage of its ecosystems has been suggested as a possible outcome. It is also possible that seagrass losses will be irreversible with long-term impacts on fisheries and the overall ecology of the Bay. *No matter how remote this possibility, it is a chance we should not be taking*

The Bay is also of great economic importance for a wide range of reasons including ecological services (such as de-nitrification), fish resources, tourism, recreational and so-on. The economic value of these, if put at risk, would far exceed claimed economic benefits of the proposal, and are also enjoyed far a far wider range of the general public.

Many impacts are certain or likely

The proposed dredging program is massive on a world scale and long in duration. As outlined during the 2004 EES hearings it is four times the size of the next largest dredging operation anywhere. It will affect large areas in the north and south of the Bay. Port Phillip is the largest enclosed bay in the world, with complex and unique marine ecology. It is no wonder that assessment of the proposal is complex and the project controversial.

The sheer volume of material to be removed (about 25 million m^3 initially and 17 million m^3 for maintenance in the next 30 years), and the multiple and difficult to control problems associated with moving it, mean some impact is inevitable. The SEES admits this but claims such impacts will be 'short-term' or 'limited' with most impacts lasting only 1-2 years. Where, after 100 years of dredging in the Bay (at a much lesser scale), are the comprehensive studies of the impacts of past dredging that provide the basis for these risk assessments? The physical change to the Bay will also mean some permanent changes in the Bay's physical environment which again are described as 'limited'.

Impacts which particularly concern the VNPA include:

- Impacts on shorter-lived fish, especially those living near or passing through the mouth of the Yarra and/or with migration patterns in and out of the bay
- Impacts on penguins at St Kilda

- Impacts in the wider bay on penguins, seabirds, dolphins and seals due to turbidity affecting their feeding because of poor visibility and/or reduction in prey numbers.Risk of toxic algal blooms in the north of the Bay
- Permanent loss of sea-grass in the south east of the Bay
- Rockfalls in the Entrance resulting in loss of slow growing biota and damage in the Marine National Park
- Turbidity and sedimentation and their myriad and wide reaching effects
- Disturbance and mobilisation of contaminated material in the north of the Bay.
- Accumulation of contaminants in top-order carnivores such as larger fish, seals and penguins
- Mobilisation of nutrients and algal cysts - including the possibility of upsetting denitrification processes when combined with turbidity and sedimentation
- Changed currents, - effects on transport of larval fish
- Underwater noise and vibration and its effects on migrating fish and penguins
- Changed tidal ranges, currents and wave patterns - potential impacts on salt marshes and areas such as Mud Island
- Risk of larger oil spills- with potential wide ranging impacts.

These impacts are outlined below. To match the layout of the SEES, issues are largely dealt with area by area except where some issues overlap.

Some of these impacts and risks on their own may seem 'minor' or 'medium' (but see comment on risk analysis below). However, taken in total, and especially if all does not go as predicted, there is a cumulative risk of some serious losses in the medium or long-term, especially if the system is periodically re-disturbed with not-so-small maintenance dredging.

In addition, some possible scenarios such as oil spills and widespread denitrification and algal blooms could result in catastrophic outcomes. While these may be unlikely, they nonetheless represent a real gamble.

Bias In The Risk Analysis

The risk analysis employed, and the SEES in general, play down the risk to the environment. Different standards and criteria are applied to economic considerations than to the environment and social considerations. If the shipping industry suffers more than one month's stoppage this is rated as an 'extreme' consequence (p5-54) and as 'moderate' when it is for only one week.

In contrast, for the various aspects of the environment and tourism permanent loss is required to get an extreme rating and effects that last for years are only rated as 'moderate'. Over 10 fatalities or major health impacts on over 1000 individuals are required to be assessed as 'extreme' while 1 fatality and/or 100 persons suffering major illnesses or injuries is considered 'moderate'.

YARRA RIVER/HOBSONS BAY

Ninety percent of the river bed in the Yarra for 6 km from the mouth, up to (and including) Appleton Dock, will be removed (3.37 million m3) together with 5% of the seabed in Hobsons Bay (2 million m^3). Impacts will include gross removal of habitat, increased turbidity, re-suspension of contaminants, noise and vibration and possible stimulation of algal blooms.

Recovery of various invertebrate and microscopic biota in the river and seabed will take up to one year, if the SEES is correct in its predictions. Fish and other fauna dependant on these such as Black Bream will be affected for at least this period.

Seahorses and pipefish

The SEES notes that a number of EPBC protected seahorses, seadragons and pipefish (syngnathids) are found in seagrass and reef algal habitat in Hobsons Bay and some are in the Yarra River estuary (p12-30 – 12-35). Twenty-four species are found on the wider Bay, however the SEES main report is vague about numbers of species in each area. Impacts from turbidity and high noise percussion are dismissed as 'minor' on the grounds that the various species are found elsewhere in the Bay or Australia. Australia has about a third of the world's syngnathid species with this group being sparse or absent in many other parts of the world. Protection of our exceptionally diverse fauna is important even if individual species are found elsewhere.

Fish in the Yarra

Estuaries are usually more diverse than rivers. In addition to the above syngnathids, the lower Yarra has records of 32 native species between East Melbourne and the mouth (see table below) including at least 10 species of freshwater fish from further up the Yarra that are diandromous, (species that pass between freshwater to marine/estuarine systems and back, in either direction, as part of their lifecycle). They include 4 species of gallaxids, one of which is the Mudfish. There are also five mainly freshwater species that frequent lower stretches, 3 species that frequent both freshwater and estuaries, 8 species confined largely to estuaries, and 6 largely marine species. These were detailed in one of our earlier submission to the 2004 EES. But, in spite of our provision of this information, the SEES ignores the overall fish diversity and only considers those fish that are listed as threatened, or are of commercial value.

In spite of this diversity, there has never been a fish survey between Melbourne and the sea save for one day with gill nets (at Spencer St Bridge, Victoria dock, Westgate Bridge, Newport power station) plus one dip net near Newport power station. In contrast Dights Falls in Kew has been intensely surveyed. Most lower Yarra fish records are either opportunistic or are very old, dating back to the 19th century. For those fish with only old records, it should not be concluded they are no longer there, especially smaller non-commercial/recreational fishing species. For instance, the single dip net survey at Newport in 1989 revealed the only record for the Bridled Goby and only the second record for the Blue-Spot Goby (previously recorded in 1935).

We are disappointed that the SEES has still not conducted base-line surveys for the smaller fish such as the gobies, gudgeons, hardyheads and smelt in the lower Yarra, although at least the invertebrates have now undergone some limited sampling.

Native Fish in the lower Yarra*

DIANDROMOUS SPECIES
#*Grayling, Tupong, Spotted Gallaxid, Broad-finned Gallaxid, Common Gallaxid, #Mud fish, Short-finned Eel, Short-headed Lamprey, Pouched Lamprey, Australian Bass.

PRIMARILY FRESHWATER SPECIES
#Macquarie Perch, #Trout Cod, #Murray Cod, Golden Perch, River Blackfish.

ESTUARINE/ FRESHWATER SPECIES
#Yarra Pigmy Perch, Australian Smelt, Flat-headed Gudgeon.

ESTUARINE SPECIES
Blue spot goby, Bridled goby, Tamar River Goby, Small-mouthed Hardyhead, Black Bream, Estuary Perch, Yellow-eyed Mullet, Mulloway.

PRIMARILY MARINE SPECIES
Sea Mullet, Sand Flathead, Australian Salmon, Green-back Flounder, White Trevally, Southern Anchovy.

Most impact would be on species that are entirely estuarine or spawn in or migrate through the estuary - especially as sensitive larval forms. Bottom dwelling and burrowing fish are also highly vulnerable as their habitat is to be removed in large quantities. At least half of the 32 species are likely to be affected in this way. Less affected species would be those that can live for their whole life cycle in a range of habitats or are mainly marine or freshwater. Some species have a degree of tolerance to turbidity and low dissolved oxygen (perhaps a prerequisite to living in the Yarra!). But whether they could survive the greatly increased turbidity of intensive dredging and, in the case of burrowing fish, the gross disturbance and removal of the substrate, is another question.

It is important to note that a significant part of the fish fauna in the upper Yarra, including in the National Parks surrounding Melbourne, depend on the young and/or spawning adults of the diandromous species surviving in this lower river section. We strongly suggest that, should dredging proceed, that monitoring be undertaken of the more common diandromous species in the middle and upper Yarra and at Dight's Falls. perhaps as part of Melbourne Water's on-going programs .

The avoidance of dredging in the Yarra in spring, that is proposed to lessen the impact on grayling and mudfish, should also be of some benefit to most of the other diandromous species as the migration time of young fish up the river is similar for most of these species. However unfortunately the dredging in autumn-winter in Hobsons Bay could well affect fish larvae (of both endangered and more common species) coming down at this time as relatively high turbidity will result near the mouth of the Yarra (see Fig 10-16 p 10-75). Young fish larvae may be sensitive to such pollution, as is acknowledged in the SEES (p12-36, 12-37).

For grayling and mudfish (and hence the other small migratory fish) the SEES admits that population of juveniles reaching breeding age may be reduced for one year (p12-35). But the

* This does not include syngnathids which are additional. About another 7 strictly freshwater native fish species are further up the Yarra and are unlikely to be affected and there are also at least 8 exotic species (some of which occur near the mouth).
# = species listed under EPBC and/or F&F Guarantee Acts

SEES then claims that for grayling '*given the 2-3 year breeding span of the species, recovery is therefore expected within 1 to 2 years*' (p12-36). However this statement is misleading and incorrect as is the information about grayling on p 12-29 which incorrectly implies all grayling '*can breed from one year*'. In fact, while some grayling males can breed at one year, females do not do breed until the second year and 88% of breeding grayling then die (Koehn and O'Conner 1990[1], Cadawaller and Backhouse 1983[2]). Most survivors do not last beyond the third year. Thus most females have only <u>one</u> chance to breed. Therefore the failure of one, or worse two years in a row, breeding season will have a serious effect on populations.

Mudfish and other gallaxids in the Yarra are even more short-lived. These generally only live up to two years and have only one or more rarely two chances of breeding and are therefore susceptible to the dredging which spans just over year.

All these species could also be affected by turbidity affecting their migration within the Bay (p12-37). This can also be affected by changed currents. Permanent changes in the currents in the Bay resulting from the deepened channels could result in the larvae of fish being unable to return to the very north of the Bay and the mouth of the Yarra. At the 2004 panel hearing it was reported by Greg Jenkins that changes in the currents from the deepened channels could result in the larvae of King George Whiting being unable to reach the very north of the bay. While this may be insignificant for the whiting which settle over a wide area, it may be far more significant other young fish such as those that enter the mouth of the Yarra as part of their life cycle.

This particular effect is important as it represents a permanent change to the Bay environment as opposed to the more temporary effects of turbidity etc. As stated by Mr. Jenkins "*in terms of larval transport, if channel deepening results in marked changes to transport patterns that result in larvae not reaching important juvenile habitat then there would be significant long-term impact.*" (Witness statement p5). In the Heads, turbidity and impacts from noise could also be an additional problem for those Yarra River species that migrate right out to sea and back.

As admitted in the SEES (p12-38) one year of poor recruitment could affect population viability of already endangered species. It would also impact severely on other more common species as the dredging spans over two autumns and in the longer term, permanent current changes could have unforeseen lasting impacts on populations.

<u>Other Fish</u>

The SEES admits that the sensitivity of local Bay fish species to various levels of suspended sediments has not been determined (p12-36). A 'medium risk' of damage to fish larvae and juvenile fish is then predicted. It is far more truthful to say the risk is unknown.

Dredging in Hobsons Bay could affect a significant proportion part of the anchovy spawning there. Research by Primary Industry Research Victoria (p1 Annexure C2 – Anchovy, Part C POMC submission to 2004 panel hearing) indicated that spawning of this species is highest in Hobsons Bay. Fish larvae including anchovy and Black Bream are likely to be affected in at least the short-term with flow on implications for species dependant on them. In drawing the

[1] Koehn and O,Conner 1990: Biological Information for Management of Native Fish in Victoria. Freshwater Fish Management Branch, Arthur Rylah Institute for Environmental Research, Department of Conservation and Environment

[2] Cadwallader and Backhouse 1983: A Guide to the Freshwater Fish of Victoria. Fisheries and Wildlife Division, Ministry for Conservation

conclusion of a 'medium risk', the SEES has undertaken only a literature review. There has been no experimental work to look at the effects of turbidity on these and other fish eggs and larvae, and its conclusions could well underestimate the impact.

The SEES notes that Commercial Fishing may be affected for 1-2 years after the completion of the project (P 12-88). Considering the duration of the project, this could be a total of at least 2-3 years (or longer if its speculations are incorrect).

Penguins

Effects on penguins of possible reduction of anchovy and other fish due to dredging are portrayed as 'minor'. We dispute this and believe that combined with other factors such as toxic algal blooms the risk, especially to the St Kilda Penguins, is far more substantial.

Dredging in the Yarra River, Williamstown and Port Melbourne Channel occurs during the penguin breeding season and also during the spawning period of anchovies which comprise over 90% of the penguins' diet. Increased turbidity is also admitted by the SEES to possibly affect the penguins' ability to see and catch their prey. In addition, dredging in the warmer months is when algal blooms resulting from the stirred up sediments are most likely.

The SEES dismisses possible effects of the toxic blooms and food shortages in the area because '*most penguins are feeding in other parts of the Bay*'. However we understand that recent research, which will be outlined in the Earthcare submission, has found St Kilda penguins foraging in areas that differ from those identified in the SEES. Distribution data for penguins underpins the entire SEES assessment, therefore the SEES assessment of a "minor" effect on penguins is incorrect and must be reviewed.

In addition, even if the penguins do forage elsewhere, they must swim back to their colony and cross any algal blooms in the vicinity. In attempting to counter this possibility, the SEES states that "*since algal blooms occur naturally from time to time, any effect could be considered within the tolerance levels of the penguin*" (p13-107) and that "*given the uncertainties surrounding the occurrence, extent, duration and toxicity of algal blooms, the potential effects on penguins have been assessed as low risk*". These are assertions that cannot be made. If the intensity and frequency of blooms resulting from dredging exceed the 'natural' levels experienced to date, the impact on the penguins may not be within their 'tolerance levels'. In fact the level of risk, specifically to the St Kilda penguins, is largely unknown.

The St Kilda colony of penguins is already under stress from the drought. The lack of good flows of fresh water from the Yarra has meant no anchovy spawning and poor breeding success over the last year. We understand that the population has dropped by an estimated 20%. This is without channel deepening, which will compound the problem if it closely follows drought.

Lastly, the penguins in this area and elsewhere in the Bay would be especially susceptible to any oil spills. The allowing of larger ships potentially increases the size of any disaster with catastrophic effects (see also below).

THE MAIN PART OF THE BAY

Here 2.4 million m^3 of mostly clay is to be removed from the north of the Bay plus 14.6 million m^3 from the South Channel - mostly sand but with some fine content that will cause turbidity.

Seagrass

Seagrass is important for fish breeding and for crustacea. It is also vital for many seahorses and pipefish (syngnathids). Flow-on effects are likely for various fish including King-George Whiting and to other fauna dependant on them in turn (penguins, seals, dolphins etc)

The SEES claims that less than 5% of seagrass in the bay will be significantly affected. Zostera rather than Amphibolobus will be impacted and 24% of this may be affected by turbidity (p13-3). Most of this is in the south of the Bay where 15-20% will experience reduced leaf density or total loss of leaves. The proportion of seagrass affected between Dromana and Portsea – the area where the impact is predicted - is not given. The SEES states that seagrass 'may' recover although the recovery rate is admitted to be 'uncertain'.

The SEES discusses the main seagrass areas (listed with sizes on p13-52) as to whether they will be affected by light attenuation depending on depth of the beds and predicted turbidity. Most of its conclusions are vague and/or are downplayed:

- Mud Island = 95% Zostera unaffected (therefore presumably 5% may be affected)
- Sorrento Bank = 'some' Zostera affected
- Rye to Rosebud = less than 10% Zostera affected
- Dromana = all affected! But the Zostera seagrass beds are 'sparse' therefore affect is 'minor'. (How important is this area which is well separated from others? Will it recover or will it be eliminated as the beds are already sparse?)
- Portsea = 'small areas' of Zostera
- Nepean Bay = some Amphibolobus may be affected but 'should recover'.

In the conclusions (13-62) it rates the 15-20% impact in the south of the Bay as 'moderate'. It also makes a statement that Mud island seagrass is not expected to be affected (p13-62) which contradicts the statements on p 13-57 that imply 5% may be affected

From the information on the size of the various seagrass beds (p13, Technical Appendix 50), and the proportion of the Bay's seagrass that is projected to be impacted, it is apparent that a total of about 3 sq km of seagrass will be affected. By using the individual seagrass bed sizes and the statements about which beds will be affected or unaffected (p13-62) it would appear that about 53% of all the seagrass between Dromana and Portsea will be impacted. The only area within this that is estimated not to be potentially affected by the dredging turbidity is at Cameron's Bight where the seagrass is already sparse and degraded (Tech App 53 p70)

This is potentially a very significant impact on a large area of the Bay. It will affect an area that is particularly popular for recreation including fishing. The seagrass beds here are noted by the SEES to be the most important for the settling of King George Whiting larvae. There will also be many other fish species affected.

Seagrass is stated to be 'naturally variable' with Blairgowrie used as an example (p13-54 – 13-55). But is this variability 'natural' or are there man-made disturbances influencing it, e.g. sewerage outfalls?

It is claimed in the SEES main report that attenuation of light to 15% of surface light will be sufficient to sustain the seagrass generally (p13-55) and that this is a conservative estimate. In fact Technical Appendix 53 reports that the Zostera seagrass appears to have a minimum light requirement of 12.5-25.6% (p59). Therefore a conservative estimate is 26% not 15%. A 15% level may suit the more restricted Amphibolis seagrass and the Ecklonia kelp but is likely to be insufficient for at least some of the Zostera which constitutes the majority of seagrass in the Bay. Therefore the area of seagrass affected is likely to be considerably underestimated by the SEES.

The experiments with shading seagrass as part of the SEES assessment (Tech App 53) found that the Zostera continued to decline for 6 weeks after removal of shading that was applied for 10 weeks. The seagrass then stabilized with some new shoots - but presumably with other parts dying as it did not increase over the next 5 weeks when the experiment ended. Earlier longer experiments in 1995 (reported in Tech App 36, p36) found that shoot numbers remained low 11 months after shade removal, thus indicating that recovery could be very slow indeed. Claims in the SEES that the seagrass 'is expected to recover in the following spring' are pure speculation as are recovery rates of all fauna dependant on it.

It must also be remembered that such experimental patches are usually surrounded by healthy seagrass which allow recolonisation by shoots and rhizomes from the adjacent area. Will extensive areas of seagrass that become sparse because of turbidity recover the same as a small patch surrounded by more healthy seagrass? Further hindering the recovery of seagrass, is the possibility of repeated turbidity from maintenance dredging. This is a factor that must be considered.

The possibility that recovery of sea-grass will be periodically set back has been refuted on the grounds that maintenance dredging already occurs. But there have already been observed declines in seagrass in some areas of the Bay. Indeed it was admitted at the 2004 panel hearing by POMC that the loss of the seagrass bank at Sorrento from the dredging in 2000 'was a distinct possibility'. The maintenance dredging will be over 5 times the volume that occurs now and could eventually have extremely serious long-term impacts. Repeated maintenance dredging, say every 5 years, could well prevent this recovery in affected areas in the south and east of the Bay. Permanent loss is a real possibility and on this basis alone, we believe this project should not go ahead.

We are most concerned that dredging will not necessarily stop if the prescribed turbidity/light diminution is exceeded. There are various loops in the Environmental Management Plan that will change dredging sequences etc (Attachment 4, pA4-85) but suspension of activities does not occur for at least 2 $^{1}/_{2}$ days. Three reports to the 'relevant government agency' are made before suspension of activities is required with the government agency then able to approve the recommencement of activities. If the rise on turbidity is gradual and the change in methods successful the system might work. But what if the rise is rapid, with perhaps unforeseen weather conditions causing problems?

It is hard to imagine that with the pressures of millions of dollars tied up in the continued use of the machinery that government and bureaucracy will stop the dredging for long periods if real problems arise and not cave into continuation of dredging in some form to the ultimate detriment to the Bay, its seagrass and biodiversity. Clear criteria for stopping dredging must be instigated that are legally enforceable (including by third parties).

If the seagrass is impacted and does not recover, the ecology and diversity of the Bay will permanently suffer.

Fish

Recovery of fish populations is predicted within 2 years provided the seagrass recovers within 1-2 years (e.g. p 13-74). On p 13-73 this optimism is reduced to 'some recovery of seagrasses within 1-2 years'. Thus the SEES is somewhat inconsistent and bases it statements on fish recovery on assumptions about seagrass recovery. It also only discusses five species of fish in any detail.

Seagrass is critical for King George Whiting larvae. Importance of sites around the bay varies – with shallow seagrass beds between Sorrento and Dromana consistently with the highest abundances of settled larvae (p13-66). This is the very area where seagrass will be most affected (see above).

The Bay "is thought to be particularly important for spawning and/or nursery ground for juveniles, resident adults and migratory snapper" (p13-69). This is an understatement of the importance of Port Phillip Bay for this species which is described in a "Fisheries Note" published last year by the Department of Primary Industries:

Extract from Fisheries Note 593 - October 2006:
For the past 6 years fisheries scientists from Primary Industries Research Victoria (PIRVic) have been investigating Victoria's snapper stocks (see Fisheries Notes 538, 544 and 585) to determine the significance of Port Phillip Bay to Victoria's important recreational and commercial snapper fisheries.

The results of these studies, involving natural chemical markers or 'tags' in fish earbones (otoliths), show that for the period surveyed Port Phillip Bay was crucial to the snapper fisheries in western and central Victoria. PIRVic's Paul Hamer and Greg Jenkins found the majority of juvenile and young adult or 'pinkie' snapper in western and central Victorian waters spent time as small juveniles in nursery areas in Port Phillip Bay. Young snapper (see photo over page) that spent their early life in Port Phillip Bay moved from the nursery areas in the Bay to populate coastal waters and Western Port bay.

"Snapper as young as 1 year of age moved distances of up to 200km from Port Phillip Bay. By the age of 4 years, snapper populations in western and central Victorian coastal waters and Western Port bay were dominated by fish that actually started life in Port Phillip Bay"

Underlining = our emphasis

Thus clearly Port Philip Bay is extremely important for this species. However impacts on snapper and some other fish species are dismissed on the basis of 'limited' plumes from the south-east DMG. And yet during the hearing of the earlier EES the use of the south-east DMG area was questioned by Greg Jenkins, a departmental biologist, on the basis of the likely importance of this site for snapper.

In the north of the Bay impacts are dismissed as 'minor' as the plume in north of bay is predicted to be limited. Indeed, for a whole series of ecological elements including seabed habitat, nutrient cycling, seagrass, any impact in the north of the Bay is totally dismissed and not discussed at all because "such a small area will be impacted" and "effects will be negligible". With the finer sediments in this area, this limitation of the plume is hard to understand and we question what will happen if severe weather events or flooding of the Yarra occur? Indeed the turbidity modeling used the weather data from 2003 and did not, as far as we have yet been able to determine, include more extreme weather.

For anchovies it is stated that their food (phytoplankton) will recover quickly, but dredging in north of bay may interfere with their schooling for spawning. Both snapper and anchovy spawning, coincides with dredging in the Port Melbourne Channel. No diagram showing key fish spawning, migration events within the bay and the dredging timetable is given. Indeed, the location of spawning grounds for most species of fish other than King George Whiting, snapper and anchovies are not known.

The turbidity in the south of the Bay could affect migration of fish in and out of the Bay (and within the Bay) which is ranked as a 'Medium Risk' as 'there are great uncertainties around how fish species will change their migration patterns as a result of the plume form dredging' (p 13-78).

As was acknowledged by Greg Jenkins during the 2004 EES, '*the impacts of dredging on migrating fish are totally unknown and is an area that carries significant risk'*. (witness statement p 14). *'The migration routes and seasons or movement are not well understood and the behavioral responses of migrating fish to elevated turbidity, suspended sediments, noise and light at night are virtually unknown'* (witness statement p 10). Fish migration is likely to be also affected by the hydrohammer and other dredging vibrations in the entrance (see below).

Spider Crabs

The protection of aggregations of Spider Crabs *Leptomithrax gaimardii* was an issue dealt with in the 2004 EES. It was proposed that video camera surveillance take place of channels about to be dredged in the south of the Bay to ensure that these aggregations, which can consist of many hundreds of individuals, are not impacted. The current SEES main report mentions their presence but does not appear to have any proposals to protect them. We are puzzled by this omission and hope this does not mean that this species is not now to be looked after.

Seapens

Seapens are found in two very limited areas in the Bay. One of these sites will be subjected to relatively high levels of suspended sediments for 6 months at 14.4mg/L for 80% of the time and over 50mg/ml at times (p13-37). Although it is stated that they have tolerated past nearby dredging activities, there is no indication of how high the raised turbity/sedimentation was in the past or how long the episodes lasted. A 'moderate' impact is predicted. Again this prediction is speculative and a poor outcome is quite possible for this very restricted taxa.

Dolphins

The highest concentration of dolphins is in the north of the Bay, according to Figure 13-29 (p13-84) and yet the SEES main report then says the highest dolphin numbers were seen in the south. We do not understand this discrepancy. Dolphins are only discussed in the south of the Bay. As with fish, no details are given of dredging times in the north (including in Fig 13-11, p13-26). Dolphins will be affected by raised turbidity due to reduction in prey and, to a lesser extent, by underwater visibility. They are also likely to be upset by percussion style underwater noise, (which is quite different from boat noises to which they would be more accustomed) including pile-driving in the north of the Bay and Hydro-hammering in the south.

Sea birds

The Mud Islands contain important breeding colonies of White-face Storm Petrel (EPBC listed) and Caspian Tern (FFG listed, 1 of 3 known colonies in Vic) according to p13-19. The SEES concludes that the White-face Storm Petrel is not likely to be affected as it is a wide ranging species. The SEES discusses impacts on the Crested Tern (EPBC listed) and concludes that the dredging "*may affect crested tern breeding for 2 consecutive seasons*" (p13-99) but does not say if the same impacts apply to the Caspian Tern. As with the fish, it seems that only federally listed or popular species are considered by the SEES. All rare species should be considered. Both tern species are found on Mud Islands.

Gannets and terns will be affected for at least 4 years. Use of the jumbo dredge in overflow mode overlaps with the breeding and fledgling period of gannets for 2 consecutive years and it is acknowleged that this will affect breeding during these periods (p13-94, 13-103). The turbidity affects a third or more of the gannet feeding habitat over 2 breeding seasons (p13-95 – 13-97). The SEES admits a "*possible worst case scenario*" of "*significantly depressed breeding success during the 2008 dredging period*" (p13-97) and that dredging "*is likely to affect the populations of gannets and crested terns for two seasons following the cessation of dredging. Subsequent recovery of populations to levels prior to CDP dredging is expected to take up to 2 years*" (p13-101). Thus the gannets/terns will be affected for a total of 4 years (or is it 6?). In Technical Appendix 55 it is stated that the impact is 'almost certain' and the consequence 'moderate' (p267).

The SEES uses the same turbidity level (5mg/l) as that sufficient to affect the feeding of both terns and gannets and yet the gannets dive far deeper (gannets up to 20m, terns up to 1metre - but usually a few cm) thus presumably, since both spy their prey from the air, gannets could be affected by a far lower level of turbidity than terns, with the deeper prey out of sight in turbid waters. Indeed, the surveys of seabirds done as part of the SEES found that clearer water in the Bay had the highest seabird biomass (p38, Tech App 56).

In addition, elsewhere in the SEES, 5mg/ml is predicted over a far larger area than that shown in Figures 13-33 and 13-34 (p 13-95, 13-96) when discussing effects on gannets. Figure 10-20 (p10-81) and also the diagrams showing surface turbidity (Fig 13-39, p13-109 – used to discuss impacts on penguins) appear to show a wider area being affected by 5mg/ml. Are Figures 13-33 and 13-34 of deeper underwater turbidity than Fig 13-39? Since gannets and terns hunt from the air, the surface turbidity is probably more important than that in deeper water. Thus it is possible that, specifically for the deeper hunting gannets, that a larger proportion of the feeding habitat will be affected than indicated in the SEES.

Mud Islands and other protected areas

Effects on marine life by the turbidity and sediments around Mud Islands and other marine protected areas are dismissed as 'negligible' even though reduced light may affect seaweed in Portsea Hole (p13-177) and possibly seagrass at Mud Islands (see seagrass section above where there are conflicting statements for Mud Islands). In the case of impacts on the shoreline environment it is concluded that there may be some increase in the area of saltmarsh due to increased tidal changes. This is portrayed as a plus as it may benefit the Orange-Bellied Parrot. [A cynic may think this statement is made to appeal to the federal environment Minister!].

Mud Islands are the surface expression of the Great Sand, the largest shoal in Port Phillip Bay. They consist of three shrubby sand islands enclosing a shallow tidal lagoon which is fringed by salt marsh. The island group is 1200 x 900 metres in size, has a total area of 86 hectares with a land area of 60 hectares, and reaches a height of 4 metres. Despite the name, the islands, including their outer beaches, are mainly composed of shelly sand. Resembling an atoll, Mud Islands form a unique feature in the southern Australian landscape.

Birds dominate the ecology of Mud Islands. A total of 87 species are recorded and 15 of these have been recorded nesting. The entire area above high water mark is used for nesting, with some species forming extensive colonies. The major species are Silver Gull, Straw-necked Ibis, Australian White Ibis and White-faced Storm-Petrel. Other colony forming birds are Australian Pelican, Crested Tern and Caspian Tern. The central lagoon is visited by thousands of intercontinental waders in the warmer months.

Formed by wind and wave action, Mud Islands are 'anchored' and protected by outcrops of phosphate rock at South Cape (facing Port Phillip Heads). This rare rock type forms below guano deposits as phosphate from guano (accumulations of bird droppings) leaches down and combines with shelly sand below to form hard calcium phosphate. Phosphate rock is resistant to marine erosion and keeps the entire system in place. Birds have thus played a fundamental role in the physical evolution of the system.

The survival of the entire Mud Islands system depends on this phosphate rock which is in the upper intertidal zone. Extreme high tides submerge the rock and expose the sand dunes to erosion, so this system is extremely vulnerable to even slightly increased high tides, especially if they happen to co-incide with storms. While it is true that global warming will also have this effect, nonetheless the change in tidal fluctuations will cause this process to happen sooner – surely not a desirable outcome.

The SEES notes that Mud Island "is continually changing shape due to storms and sand movement" (p13-114) and that due to limited data on the bathymetry of the Great Sands there was "*limited ability to undertake detailed investigations of water flow in the Great Sands especially as it applies to local sediment transport features*" (p10-12). Thus, although the SEES concludes that there will be few changes within the Great Sands and that Mud islands will 'continue to evolve in outline shape' (p10-45) there is some doubt here and we remain concerned about Mud Islands, especially when any changes due to the dredging, albeit small, are combined with sea-level rises due to climate change.

THE ENTRANCE

550,000m^3 of rock are to be removed from the entrance. This will take over 6 months and involve the largest dredger and a 'hydro-hammer' which will create loud underwater percussion noise.

Rockfalls

Rockfalls will fall across 18 ha of canyon wall and affect (at least) 13.5 ha of canyon habitat. It will partially or totally remove marine communities over 7.5ha and settle on and permanently affect 2.4 ha of the canyon floor. Only 100-120 ha of canyon exists. i.e. 12-13.5% of this type of habitat will be affected. These measurements do not include total surface area - only the horizontal projection. Thus the actual surface area affected is greater, considering the angle of

the majority of the slopes where outward facing slopes far exceed any sheltered caves and under-hanging slopes.

Although 3000-6000m^3 of rock fell during the removal of 30,000m^3 during the trial dredging (i.e. 10-20%), it is predicted by the SEES that only 4,300m^3 will fall during the removal of over 18 times the amount of material (i.e. 0.78%) because of an 'improved draghead' and other procedures. This estimate of rockfall does not include loose rock that might fall subsequent to the dredging (p14-23). We are also somewhat skeptical that the rockfalls can be reduced to the extent claimed from that experienced in the trial. Thus it seems very likely that the areas affected will be greater than that predicted (see also the comments on the Marine Park below).

The SEES exaggerates that rate of recovery from that postulated in Technical Appendix 52. The SEES main report claims a functional community in 2 years and pre-existing diversity within 5 years (p14-27) whereas the Technical Appendix merely suggests that a functional community may establish in 5 years (p58). Even this is based on speculation and extrapolation from the initial colonisation observed at 15 months. Some species are slower growing and it would appear to be unknown how long it will take for the current mix and size of sponges etc. to reform. A possible flow-on problem is that, where the encrusting marine life is removed, it may open these areas, including in the Marine National Park, up for invasion by introduced seaweeds (e.g. Undaria) as the rate of colonisation by some of these species may be more rapid than the original species. The counter argument in the SEES, that these exotic species will invade anyway, is not necessarily true if the natural communities are intact - and in any case disturbance will accelerate their invasion.

But not all areas may be able to fully regenerate. Areas of relatively barren rubble may well be greater, especially if the prevention of rockfalls do not meet the ambitious targets claimed. Any loose rocks will mean scouring.

Rubble remaining in the shallower dredged areas will roll in the currents affecting recolonisation of kelp etc. It will also roll into adjacent areas of shallow rock reef and damage these during movement in turbulent water – a factor dismissed by the SEES since 'surrounding areas will not be affected' (p14-20). This ignores the point that the overall area is thus reduced.

The canyon in the adjacent Marine Nat Park is only 22ha (note: the SEES main report incorrectly states all the adjacent Park is this size) and the SEES estimates that only 0.34ha will be affected (1.5% of the canyon in the Park). But what real guarantee is there that the rock fall will be this limited? The modeling undertaken for this estimation (Appendix 54) makes two unlikely assumptions and one important omission. It makes the assumptions that less than 0.8% of the rock will fall during dredging (compared with 10-20% during the trial) and also that it will fall evenly from all the plateau edges, rather than more in some places than others (which will be the case in practice). It does not feed in the effects of the tidal currents which are strongest in the marine park section and could help sweep rocks sideways and around the 'Catacomb Ridge' which is the basis for the claimed limitation of damage to the Park.

Once rockfall has occurred there is no comeback or reparation possible. What punishment is available if limitation of the rockfall as claimed does not eventuate? What substantial bond is required of the company as is the case for mining? There seems little apparent reason for an operator to spend time and money in the entrance, at the extremely expensive rates involved, doing it as carefully as possible.

Impact on Fauna

The hydrohammer and other dredging noise can cause physiological damage to sygnogathids and other fish within tens of metres and affect the migration of a number of fish species in and out of the Bay including fish larvae (and a number of the diandrous fish species in the Yarra ignored by the SEES). The effects of the six months of dredging in the 3 km wide entrance (and of turbidity inside the Bay) on fish migration is "not comprehensively understood" i.e. it is a big unknown. It is claimed the hydrohammer will only be used for 5% of the time. Recovery of fish stocks within 1-2 years following completion of dredging is claimed (on what basis?).

Dolphins regularly pass in and out of the Entrance. The SEES (p14-42) only considers whether the noise will permanently damage these noise sensitive species, not whether it will affect their behaviour. Nonetheless, the EMP will direct that hydro-hammering cease when dolphins are within 600m. However there is no analysis of whether this will be sufficient to prevent serious disruption of their behaviour.

More than 500 penguins pass through the Entrance every tidal cycle i.e. 1000+/day. Most transit close to Port Nepean where noise will be less and it is assumed that therefore the noise won't affect them. However if this proves wrong it could seriously affect the Phillip Island population dependant on the Bay for food. The majority of Phillip Island penguins depend on Port Phillip Bay for winter feeding and any disruption of this would have serious implications for the over-winter survival of these birds. The Phillip Island population has already been drastically reduced, due to various reasons including the pilchard die-off, to a quarter or fifth of their original population (Simon Mustoe witness statement during the 2004 EES panel presentation).

BAY WIDE

Oil spills

The extent of devastation that could occur in the case of a fuel or oil spill can be seen in the maps at the back of Technical Appendix 55. However the SEES main report does little more than mention that oil spills could occur and that mitigation measures should be ready. It does not indicate the extent of possible damage, the main attributes at risk, or refer to the maps showing this. While oil spill are already a risk in the Bay, with the aim of the project to encourage more and larger ships, far larger oil spills will be possible than at present.

Denitrification

Sediment will settle and smother some areas to depths greater than 50mm covering some 28 km^2 west and north of Hovell Pile (4% of the south of the Bay). There may be considerable error in this estimate as the degree of uncertainty in the modeling of sedimentation was 'high' (p 10-16). This sedimentation is in an area that has the highest concentration of MPB (microphytobenthos, mainly diatoms) which are organisms important for nutrient cycling in the bay. Without this, toxic algal blooms may occur. Another 7.5 km^2 (at least) will be buried under sediments deposited by the dredge at the DMG. Adding to this is 21.6km of disturbed seabed within the dredged channel itself.

Recovery of all these areas by is claimed to occur within a year and the effect of removing/smothering a total of 47 km^2 of the Bay is considered 'minor'. It is claimed that if all MFB was totally removed for 15 months, the change in nitrogen would be 'within background levels" (p13-48). In contrast, the SEES main report notes there are great fluctuations in denitrification efficiency due to phytoplankton photosynthesis with quite large changes measured over months of measurements in the Great Sands (p13-49). However risk of serious denitrification is dismissed as 'minor' because of the 'likelihood of rapid recovery'.

The risk due to increased nitrogen load from the dredged sediments becomes greater when the mobilisation of nutrients and algal cysts is combined with turbidity and sedimentation. The statements that the additional nitrogen load entering the bay through the dredging disturbance will not have an effect because the load is small compared with that already arriving annually are fairly simplistic because these and other factors may compound it.

Toxic sediments

Disturbing toxic sediments in the mouth of the Yarra and then redepositing them within the Bay is an action that brings great unease about the extent to which these might be taken up by currents or marine life. Copper and zinc would seem the most likely contaminants to exceed the levels prescribed in the SEPP for the Bay while DDT and Dieldrin are already at very high levels on the existing spoil grounds. Other materials that could be mobilized include herbicides, insecticides, mercury, cadmium, lead, petroleum, chlorinated hydrocarbons and TBT (anti-fouling chemicals from ships with deadly effects on marine life).

With raised levels of contaminants such as heavy metals, dioxin and other industrial materials will fish in the bay be fit to eat - especially higher-order predators such as Snapper, and the products of aquaculture, especially filter feeders such as mussels? Even if fish are only affected in parts of the Bay, this will still be a health hazard to those that eat seafood from these areas.

The previous panel expressed great concern about the proposal to deposit this material uncapped in the Bay saying "*The proposed placement of large volumes of these toxic sediments in the Bay within an uncompacted bund or island of loose clay in shallow water, exposed to the overlying seawater, poses an unacceptable environmental risk. Transfer into the food chain is possible*".

At the 2004 panel hearing the dredging company Boskalis was adamant that capping was not technically feasible or practical because "*the muddy material dredged in the Yarra River will become thinner after dredging and its behaviour is more like a fluid than a clay. Putting a cap on top of this fluid cannot be done without instabilities causing the capping material to sink and disappear into the mud (inversed layer system). … To be able to cap low strength material either sand or mud are need to minimize the instability risk … a substantial layer of several meters would be required to cover all instabilities*" (Boskalis witness statement).

Now it seems that capping is considered feasible using sand only 0.5 metres thick (p7-69 – 7-71). Nearly 5 months settlement will be required before this can be attempted. Thus the toxic sediments will remain exposed for this time - or for longer if the degree of consolidation does not occur as predicted. What will happen if consolidation is slower or if the capping falls through, stirring up the toxic mix? It is far safer for the environment if the more highly toxic

sediments are removed from the Bay – or left undisturbed in the Yarra if they are currently stable.

Physical removal and burial of seabed

This is an unavoidable consequence if the project proceeds and will impact on a range of ecosystems and biota with varying recovery times. It will result in an increased risk of invasion of the physically disturbed sites by marine pests. For each of the main marine ecosystems involved there ought to be an analysis of the area and percentage of the ecosystem affected

For some areas, especially those that will undergo regular maintenance dredging, this loss will be permanent or result in a modified ecosystem. There is no estimation of the net loss or of what offsets are proposed in order to achieve a 'net gain'. The Victorian Native Vegetation Management Frame work gives no indication that this policy stops at the shoreline and it would be most inconsistent if the Government were not to apply similar principles to the marine as to terrestrial ecosystems.

CONCLUSIONS

The SEES may predict that various fauna will recover within a year or two, but in practice so little is known about many of the species that the long-term impact is a total unknown and the dredging is a gamble at best. If the recovery of seagrass is 'uncertain' then the recovery of species dependant on it is also uncertain.

The SEES and technical appendices contain a myriad of uncertainties. Each is a source of possible error in making predictions, modeling results and so-on. Each uncertainty adds to the possibility that there will be serious unpredicted (or predicted but discounted) results.

As noted in our earlier submission to the 2004 EES, there are multiple risks resulting from a number of processes impacting on a range of receiving environments. Complicating this are multiple possible interactions. Risks are additive and chain reactions are also possible. The one certainty about probabilities is that *they are additive*. What is the overall probability that at least one serious impact that affects a significant part of the Bay will occur?

The failure to consider whether there are alternative strategies to achieve at least some of the some purposes is a real flaw. This omission goes against the spirit of environmental effects assessment which is to look at possible alternatives including other methodologies and sites and the 'do nothing option' (status quo) and at the total effect of the development. It would also seem to be in breach of Commonwealth environmental legislation, which the proposal also has to satisfy, that requires that feasible alternatives are examined and that relevant impacts are adequately assessed.

The main financial beneficiaries of this project will be importers and exporters and the Port of Melbourne Corporation. Flow on to other Victorians and Australians will be slow and vastly diluted. The vast majority of the population will benefit only minutely but huge numbers would be affected if the Bay is seriously affected.

There is an assumption that the size of ships will totally drive the provision of port facilities regardless of the position of markets for the products they are carrying -rather than the physical characteristics of the important ports influencing decisions on what size of ships are chosen. Of course if you keep providing facilities for larger ships you will get more of them. It does not necessarily follow that without deeper channels the Port of Melbourne will be uneconomic or that costs will be that much more expensive when diluted amongst the many consumers. The number of ships visiting the Port is predicted to increase regardless of whether the channels are deepened. The Port will not become redundant, instead it needs to properly cater for medium sized ships and encourage these.

Any increase in cost that may result from the use of other ports should be compared with the costs that are known to be likely and also to those that would occur if the Bay ecology and dependant industries are seriously damaged. The loss of other industries, the environment and remedial works might well outweigh the temporary gain to shipping. The money not spent on the channel deepening and moving the road and markets at Footscray to expand the Port should instead be used to look at alternatives. In America, instead of deepening the Panama Canal, the rail network across the nation was improved.

The VNPA firmly believes that the risks are too great and that this proposal should not go ahead.