PROPOSED SWIMMING ENCLOSURE NET, ENTRANCE LAGOON, LAKE ILLAWARRA

REVIEW OF ENVIRONMENTAL FACTORS

JULY 2009

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1 INTRODUCTION

Lake Illawarra is a shallow coastal lagoon situated between Wollongong and Shellharbour on the NSW south coast. The lake is an important ecological and social asset for the Illawarra Region, being a popular recreational area, an important habitat for wildlife and a valuable commercial and recreational fishing ground.

The shoreline of Lake Illawarra has been degraded in the past from the clearing of vegetation and urban and industrial development around its edge.

In 1988 the then NSW Government established the Lake Illawarra Authority (LIA) for the purpose of improving the environment of Lake Illawarra, its foreshores and environs; and for related purposes under the Lake Illawarra Authority Act, 1987.

The functions of the Lake Illawarra Authority include:

(a) the removal of ooze, silt, sand, sediment, algae and weed growth;

(b) the deepening of channels and bays;

(c) the construction of silt traps and nutrient filters at entry points of streams and drains;

(d) the landscaping of foreshores including the planting and removal of trees and other vegetation;

(e) the provision of recreational facilities and amenities, including beaches, boat ramps, boat sheds, jetties, wharves, moorings and appropriately screened car parks; and

(f) the carrying out of land reclamation and works for the protection of the environment.

Since the establishment of the Authority a wide variety of works both within the lake and on its foreshores has been undertaken. Many of these works have achieved an increase in safe public accessibility to the lake and its foreshores.

In January 2009 a man was bitten by a 2m Dusky Whaler Shark whilst snorkelling in the entrance channel of Lake Illawarra near Windang Bridge. This incident raised concerns within the Lake Illawarra community as the Entrance Channel, in particular the Entrance Lagoon, is a popular swimming location for people of all ages.

Due to these concerns by the general public, the LIA proposes to install a swimming enclosure net across the downstream gap of the southern training wall to the Entrance Lagoon "Designated Swimming Area" (Figure 1.1).

Key

Location of proposed net

Figure 1.1. Location of the proposed net, Lake Illawarra Entrance Channel.

The works involve:

i) The creation of a sand pad near the gap to allow access for the pile driver.

ii) The installation of 2 timber piles.

iii) The removal of the sand pad.

iv) The installation of the "sea lion" netting.

v) The erection of appropriate navigation signage "channel blocked- no access" and public safety signage "do not climb on net or posts".

A detail description of the installation and function of the netting by Tebbutt and Ross Marine Service (accredited 'net' installers) is included in Appendix A. Design details of the net are included in Appendix B.

Under Schedule 2 of the LIA Act the carrying out of the work is defined as a 'Development Work'.

Under s26 of the LIA Act the carrying out of a 'Development Work' is an activity for the purposes of Part V of the *Environmental Planning and Assessment (EP&A) Act 1979*. Consent under Part IV of the EP&A Act is not required for the carrying out of a 'Development Work'.

This Review of Environmental Factors has been prepared pursuant to Part V of the *Environmental Planning and Assessment Act 1979* to assess the impacts of the construction and placement of the swimming enclosure net at the Lake Illawarra Entrance Lagoon.

2 OBJECTIVES OF THE PROPOSAL

The objective of this proposal is to:

i) *Protect bathers (and other users) of the designated swimming area at the entrance to Lake Illawarra from sharks and other large marine predators entering the swimming lagoon.*

ii) *Provide a safe recreational swimming area for the general public.*

3 OUTLINE OF THE PROPOSAL

The proposal involves the construction of a swimming enclosure net structure at the entrance lagoon, Lake Illawarra.

The net will consist of a polypropylene netting material which is braided with a fine stainless steel and copper wire. The netting is then attached to timber piles through the use of a stainless steel cable and is anchored to the seabed through the use of 10mm chain (Appendix A and B).

The estimated cost of the project is $19,000, as detailed below:

Item	Description	Amount $
1	**Site Safety and Management Plans**	200.00
2	**Preliminary Earthworks to Create Sand Pad for Piling Operations**	1,000 .00
3	**Supply and Place 2 Timber Piles**	6,800.00
4	**Remove Sand Pad**	1,000.00
5	**Supply and Install Swimming Enclosure Net**	8,000.00
6	**Supply and Install Signage**	2,000.00
7	**TOTAL**	**19,000.00**

Works aim to be completed by 31 August 2009.

Following completion of the installation of the net, the net will be inspected every month during the swimming months of October to April and repairs carried out as required.

Work will be carried out Monday to Friday from 7.00am to 5.00pm. No work will be carried out on weekends or public holidays.

4 ALTERNATIVE TO THE PROPOSAL

4.1 Do Nothing

Although the risk of a shark attack in Lake Illawarra is remote, the LIA believes it has a duty of care to protect bathers in the "designated swimming area" at the entrance to the lake. The net will provide users of the Swimming Lagoon with peace of mind given the recent shark attack.

The entrance lagoon, Lake Illawarra is a popular swimming location for families and young children. Doing nothing will maintain the current risk of sharks entering the entrance lagoon and potentially harming members of the public. From a risk management view, although the risk is low the consequences of a shark attack could be life threatening. This is unacceptable to the public.

5 DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 General

The Entrance Lagoon is an isolated section of the Entrance Channel, divided from the channel by a rock training wall which was constructed in 2000 as part of the Stage 1 Lake Illawarra Entrance works. Since Stage 2 entrance works were completed in 2007, the Lagoon experiences frequent flushing by tidal seawater. These works also resulted in the Entrance Channel being predominantly open to the sea allowing for easy fish passage into and out of the lake.

5.2 Physical Environment

5.2.1 Climate and Rainfall

The Lake Illawarra area has a temperate climate typical of the NSW south coast region. Yearly variations in temperature are not very significant, and rainfall peaks during autumn (Figure 5.1). The average annual rainfall for the area from Wollongong Post Office is 1136mm.

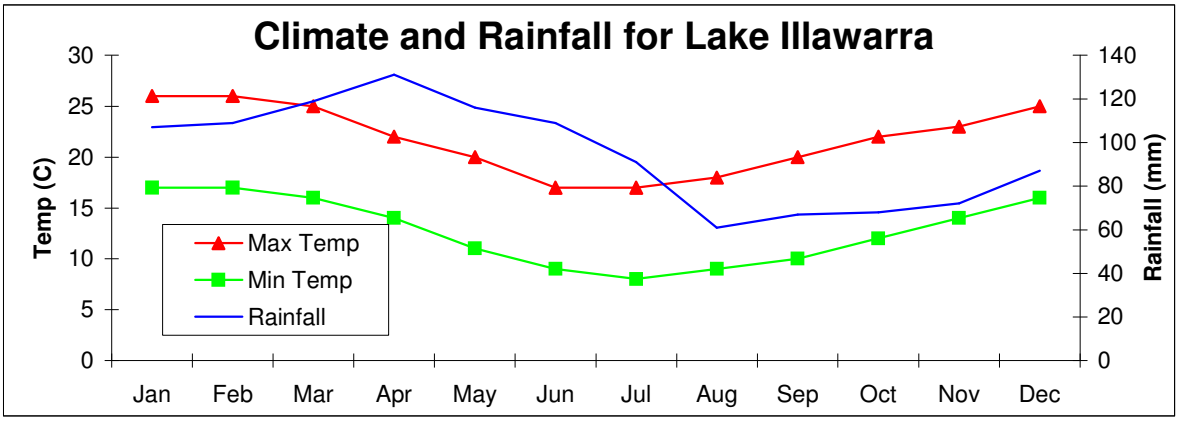

Figure 5.1. The monthly average min/max temperatures and rainfall for the Lake Illawarra Region.

5.2.2 Climate Change

The weight of scientific evidence available predicts accelerated Sea Level Rise (SLR) over the course of this century. The extent of SLR is not definitive and predictions rely on a range of global atmospheric models driven by various greenhouse gas emission scenarios.

Studies undertaken on the impact of sea level rise on Lake Illawarra indicate that within a 100 year period lake levels are expected to rise from current 0.15m AHD to a predicted 0.9m AHD (Cardno 2007). The models used in this study are based on predictions consistent with the NSW State Governments policy on sea level rise which states that based on the best national and international projections, sea levels along the NSW coast are expected to rise by up to 90cm over 100 years.

5.2.3 Flooding

The estimated 1% AEP flood level at the site is 2.0m AHD, during a major flood flow velocities in the channel would be of the order of 2 - 3m/s (Cardno 2001). During major ocean storms, swell waves up to 1m could penetrate through the mouth of the lake and up the channel.

5.2.4 Soils, Landscapes and Geology

The bed of the lake near the entrance consists of clean marine sands.

5.2.5 Vegetation

Lake Illawarra is characterised by both aquatic and terrestrial vegetation. Variations in these communities occur around the lake depending on the physical and chemical characteristic of the area.

5.2.5.1 Aquatic

Lake Illawarra is known to support a variety of diverse seagrass beds containing species such as *Zostera capricorni, Ruppia megacarpa* and *Halophila ovalis* (Gray, 2007). Seagrass beds are however limited to the western section of the entrance channel and so no beds are found within the Entrance Lagoon area (Figure 5.2).

Figure 5.2. Seagrass distribution in the Entrance Channel, Lake Illawarra

5.2.5.2 Terrestrial

As the Entrance Lagoon consist largely of marine sand, this area supports very little terrestrial vegetation. Vegetation occurring on the nearby dune system was planted by the LIA during the completion of the Stage 1 works in 2000 and consists of Marram Grass, Spinifex and Coastal Wattles.

5.2.6 Fauna Habitats and Species

An EIS statement undertaken prior to the commencement of the Stage 2 Entrance Works indicated that terrestrial faunal habitats within this area are limited to the vegetated areas surrounding the Entrance Channel (PBP 2005). The Entrance Lagoon more specifically contains no vegetation and thus provides minimal habitat for terrestrial fauna.

The EIS identified that the Entrance Channel contained a variety of aquatic fauna, namely fish. A total of 56 fish species have been identified in Lake Illawarra. These include fish of both recreational and commercial value. There are 31 listed threatened fish in the locality of the proposed works. Of these no protected sharks were known to inhabit Lake Illawarra or its channel. Sea horses, sea dragons and pipes fish were also included in this list as protected species, though none have been identified in the channel it is expected that they may use the channel for passage in and out of the lake (PBP 2005).

According to Dr Vic Peddemors of the Department of Primary Industries, a 2m Dusky Whaler Shark was responsible for the shark attack which occurred in the Entrance Channel in 2009 (Appendix C). Prior to this the last shark attack in this area was in 1951. Though no direct studies have been undertaken on the presence of sharks in the Entrance Channel, the lack of sightings by frequent visitors to the area suggest that the presence of sharks in the Entrance Channel is a rare occurrence.

5.3 Water Quality

Recent water quality analysis of Lake Illawarra shows a general compliance with the ANZECC guidelines. Exceptions to the guidelines include nutrient parameters such as total nitrogen, total phosphorus, ammonia, oxidised nitrogen and filterable reactive phosphorous. Turbidity, pH and chlorophyll-a are found to comply most of the time. Further details on the water quality characteristics of this area can be found in the draft report ‘Condition Assessment of Lake Illawarra’ (LIA 2009).

5.4 Social Environment

The Entrance Lagoon is a popular site for recreational fishing, swimming, canoeing, picnicking and walking, especially in the summer months of October through to April. The Entrance Channel is also popular for snorkelling, surfing, recreational and commercial fishing, canoeing and recreational boating.

5.5 Cultural Environment

The Entrance Lagoon consists of marine sands which are impacted by tidal circulation. Due to the dynamic nature of sediment transport in the area the occurrence of Aboriginal objects of significance is highly unlikely. To date no items of cultural significance have been identified in this area.

6 ENVIRONMENTAL IMPACT OF THE PROPOSAL

6.1 Physical Environment

6.1.1 Climate and Rainfall

The proposed activities would have no impact upon the current local and general climate and rainfall.

6.1.2 Climate Change

A change in the Mean Sea level (MSL) and hence a change in the average lake level (by up to 60cm) could have an impact on the site. The height of the net will be adjusted to account for any changes to sea level.

6.1.3 Flooding

The net and associated piles will have no effects on flood levels to the surrounding area.

6.1.4 Soils, Landscapes and Geology

Prior to the installation of the piles a sandy pad needs to be constructed using sand from the Swimming Lagoon area to allow access for the pile driver. This sandy material will be removed after the installation of the piles and placed back along the swimming lagoon beach. There will be minimal long term effects on the sedimentary environment.

6.1.5 Vegetation

As no vegetation occurs in the immediate area of the proposed netting system, there will be no impacts on local vegetation. A slight electrical current running through the mesh of the netting will limit the growth of any algal or aquatic flora species on the net. Occasionally the net will need to be cleaned of algal accumulations.

6.1.6 Fauna Habitats and Species

During the piling phase of the construction of the net noise and disturbance within the Entrance lagoon will limit the number of fish inhabiting this area. These works will however, only take two days and once complete will provide no further threats to aquatic species.

The netting used for the enclosure is designed to only prevent larger aquatic organisms such as sharks and rays and so has a stretched diameter of 200mm to allow passage of smaller animals. The chosen netting structure is endorsed by the Department of Primary Industries (DPI) NSW. The slight electrical current running through the netting limits algal and vegetative growth and thus limits the number of organisms drawn to the net.

As part of the contract with the designers and installers of the net, the net will be checked monthly to ensure no marine fauna are caught within the net and arrangements are made to remove and dispose of any organisms entangled in the net. The chosen contractors have developed methodologies inline with the NSW Department of Primary Industries guidelines for the identification and removal of marine organisms such as seahorses (Appendix D). This involves a series of underwater inspections of the net and the careful removal of any organisms to nearby seagrass beds or to a similar habitat. When replacing the netting, the netting is carefully removed in sections to the beach where it is checked again before removal of the net out of the water. DPI is to be notified prior to the undertaking of these works and will be provided with a report after the work is complete. If excessive accumulation of aquatic fauna occurs then the LIA has the option of limiting the use of the net to between the months of September to April.

6.2 Water Quality

During the instillation of the piles and the temporary movement of sedimentary material, some sediment material may be entrained into the water column. These works will however only occur for a small period of time, after which the sediment will be able to re-settle. A floating boom will be used to retain the suspended sediments to a reduced area.

6.3 Social Environment

Whilst during these works the public will be restricted from these areas, the construction of the swimming enclosure net will result in increased public safety for people using the Entrance Lagoon for recreational activities.

6.4 Cultural Environment

No sites of cultural significance have been identified in the proposed area. If any potential sites of significance are uncovered during the commencement of the works, then no further works in that location will be undertaken until the site is identified and the appropriate consent is sought.

6.5 Noise

The proposed activity will result in the generation of noise, particularly during piling operations. Noise levels are likely to exceed ambient noise concentrations close to the work site. The nearest residence is located some 300m away along Reddall Parade. It is unlikely that noise levels will be a problem to residents.

To minimise the impact on local residents and users of the surrounding area the following measures will be employed by the contractor prior to works commencing on site:
- All equipment will be in good working order to minimise noise outputs. Residential silencers will be fitted to plant equipment where these are available.
- No work will be permitted outside normal daylight working hours or on Sunday or Public Holidays

Under the NSWDECC Interim Construction Noise Guideline:

Time of Day	**Management Level** ($L_{Aeq(15min)}$)	**How to apply**
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction. • Where the predicted or measured $L_{Aeq(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB (A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority may require respite periods by restricting the hours that the very noisy activities can occur.

L_{Aeq} – The equivalent continuous sound level is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and traffic noise.

RBL – The Rating Background Level for each period is the median value of the Assessment Background Level (ABL) values for the period over all of the days measured. There is therefore an RBL value for each period- daytime, evening and night time.

Based on similar project areas an RBL of 50-60 dB is estimated, i.e. say an RBL of 55dB.

The Contractor shall provide to the Client a report on the results of noise testing of all major equipment to be used on the project, by an appropriately qualified and experienced acoustic consultant, prior to that equipment being used on site.

Noise monitoring will also be undertaken during the works to ensure that the appropriate measures are being taken into account considering the level of noise being produced.

7 STATUTORY REQUIREMENTS

7.1 *Lake Illawarra Authority Act 1987*

As noted in the declaration, the proposed works fall within the definition of "Development Works" as defined in Schedule 2 to *Lake Illawarra Authority Act (LIAA) 1987* (as amended). Development Works include:

a) the removal of ooze, silt, sand, sediment, algae and weed growth;

b) the deepening of channels and bays;

c) the construction of silt traps and nutrient filters at entry points to streams and drains;

d) the landscaping of foreshores including the planting and removal of trees and other vegetation;

e) the provision of recreational facilities and amenities, including beaches, boat ramps, boat sheds, jetties, wharves, moorings and appropriately screened car parks; and

f) The carrying out of land reclamation and works for the protection of the environment.

Under Clause 26 of the LIA Act the carrying out of any of these works is an activity for the purposes of Part 5 of the *Environmental Planning and Assessment Act 1979* (as amended) (EPAA) and the Authority is a determining authority for those purposes. As there is no statutory requirement for development consent from Council, the Authority must determine itself, "to the fullest extent possible", the environmental impact of the proposed works. This REF satisfies the Authority's statutory requirements.

7.2 *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act (EPAA) 1979* (as amended) institutes the principle system of environmental planning control and environmental assessment for development activities throughout NSW. The LIAA determines that the proposed improvement works require consideration under Part 5 of the EPAA.

Part 5 of EPAA provides that, in considering the merits of an application, a determining authority has a statutory duty to consider the environmental impacts of the proposed activity.

"Determining authority" means a Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out". (A public authority under the Act includes Local Councils).

Under **Section 111** of the EPAA, the LIA (being the determining Authority for this Activity) is required to "*examine and take into account, to the fullest extent possible, all matters affecting, or likely to affect, the environment by reason of that activity*". **Section 112** of the EPAA also requires the LIA to consider whether the proposed activity is "*likely to significantly affect the environment"*.

For the purpose of Part 5, the factors to be taken into account when considering the likely impact of an activity on the environment include those matters listed in **Clause 228** of the ***Environmental Planning and Assessment Regulation 2000*** (EPAR 2000). These various matters are addressed in the Checklist included in Section 8 of this REF.

7.3 Threatened Species Conservation Act 1995

The purpose of this act is:

(a) to conserve biological diversity and promote ecologically sustainable development, and
(b) to prevent the extinction and promote the recovery of threatened species, populations and ecological communities, and
(c) to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities, and
(d) to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and
(e) to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

It is determined that there will be no significant impact on threatened species as there is only a small likelihood of species being present in the locality of the proposed works. It was therefore concluded that the eight part test of significance is not required for threatened fish or shark species. The netting used will be too small to catch these larger species, but will also be taut with a mesh size large enough to allow smaller aquatic species to enter. The mesh size is consistent with DPI guidelines along with the methodology used in the removal of organisms from the netting to a suitable habitat nearby. Mortalities of aquatic organisms will be reported upon monthly inspections of the netting and if excessive the use of the netting will be limited.

7.4 Fisheries Management Act 1994

Part 7A of this act aims to:

(a) to conserve biological diversity of fish and marine vegetation and promote ecologically sustainable development and activities,

(b) to prevent the extinction and promote the recovery of threatened species, populations and ecological communities of fish and marine vegetation,

(c) to protect the critical habitat of those threatened species, populations and ecological communities that are endangered,

(d) to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities of fish and marine vegetation,

(e) to ensure that the impact of any action affecting threatened species, populations and ecological communities of fish and marine vegetation is properly assessed,

(f) to encourage the conservation of threatened species, populations and ecological communities of fish and marine vegetation by the adoption of measures involving co-operative management

As described previously, the netting selected for these works are designed to minimise the impact on marine flora and fauna. The mesh size and structure will limit the entrapment of marine species and the slight current running through the netting will deter the growth of organisms on the mesh. The netting will also be monitored monthly to ensure any fauna that are caught within the net are released in an appropriate manner. These methods of monitoring and releasing have been approved and are consistent with the Department of Primary Industries.

7.5 National Parks and Wildlife Act 1974

Section 90 of this act states:

(1) A person who, without first obtaining the consent of the Director-General knowingly destroys, defaces or damages, or knowingly causes or permits the destruction or defaces of or damage to, an Aboriginal object or Aboriginal place is guilty of an offence against this Act.

No Aboriginal archaeological sites have been located in the proposed area. If potential sites are unearthed during the undertaking of the works, work within that location will stop and the Department of Environment and Climate Change contacted for determination.

7.6 Environmental Planning Instruments

7.6.1 State Environmental Planning Policy (SEPP) No. 71 – Coastal Protection

State Environmental Planning Policy (SEPP) 71 – Coastal Protection gives statutory meaning to the Government's Coastal Policy. The policy was made under the *EPAA* to ensure that the coastal zone is protected in accordance with the principles of Ecological Sustainable Development (ESD) and that development is appropriate and suitably located and that there is a clear and consistent development assessment framework for the coastal zone. The aim of the policy is:

(a) To protect and manage the natural, cultural, recreational and economic attributes of the NSW coast.

(b) To protect and improve existing public access to and along coastal foreshores.

(c) To ensure that new opportunities for public access to and along coastal foreshores are identified.

(d) To protect and preserve Aboriginal cultural heritage and Aboriginal places, values, customs, beliefs and traditional knowledge.

(e) To ensure that visual amenity of the coast is protected.

(f) To protect and preserve native coastal vegetation.

(g) To protect and preserve the marine environment of NSW.

(h) To protect and preserve rock platforms.

(i) To manage the coastal zone in accordance with the principles of ecologically sustainable development.

(j) To ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area.

(k) To encourage a strategic approach to coastal management.

The Minister for Natural Resources gazetted the 'coastal zone' maps for the Sydney greater Metropolitan Region including Wollongong on 18 November 2005. The maps and Section 92 of the *Environmental Planning and Assessment Regulations (EPAR) 2000* bring in to play the provisions of SEPP 71 and the ***1997 NSW Coastal Policy*** (Coastal Policy). The policies apply to the area defined as the 'coastal zone' which is created under section 4A of the *Coastal Protection Act 1979.* The 'coastal zone' is defined as *"generally one kilometre landward of the western boundary of the coastal waters of the State"*. The subject site is within this coastal zone as Lake Illawarra is identified as a coastal lake under SEPP 71.

For the purposes of this REF, Environmental Planning Instruments (EPI) is not a criterion for consideration under Clause 228 of the Environmental Planning and Assessment Regulation (EPAR) 2000. Accordingly, the activity does not require assessment against the relevant provisions of the SEPP or Coastal Policy.

Notwithstanding, a review of these policies was undertaken and it is considered that the activity complies with the intentions and provisions of both policies. This REF demonstrates that adoption of appropriate environmental safeguards will minimise the likelihood of any impact on the coastal environment.

Under Schedule 2 of the LIA Act carrying out of the work is defined as a 'Development Work'.

Section 26 of the LIA Act states that "the carrying out of a 'Development Work' is an activity for the purposes of Part V of the Environmental Planning and Assessment (EP&A) Act 1979". A consent from council under Part IV of the EP&A Act is not required for the carrying out of a 'Development Work'.

8 ENVIRONMENTAL IMPACT ASSESSMENT

For the purposes of Part V of the Environmental Planning and Assessment Act 1979, the following assessment is made pursuant to Clause 228 of the Environmental Planning and Assessment Regulation 2000.

As far as can be reasonably established, in relation to the proposal:

(a) Any environmental impact on a community

Comment: There will be a minor temporary impact on the community during the carrying out of the work. The community will be restricted from accessing the work site whilst works are in progress. The overall completion of these works will result in an increase in public safety.

(b) Any transformation of a locality

Comment: There will be minimal transformations of the locality as these works will result in the addition of a netting structure across the lagoon entrance.

(c) Any environmental impact on the ecosystems of the locality

Comment: There will be no adverse environmental impact on the ecosystems of the locality. Suitable safeguard measures will be put in place before and during the carrying out of the works to minimise impacts.

(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality

Comment: There will be no long-term reduction in the aesthetics, scientific or other environmental quality or value of the locality because of construction.

(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations

Comment: The work will not adversely affect the aesthetic, cultural or social significance of the locality or the values of the locality for present or future generations.

(f) Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974 (NPW Act))

Comment: There will be no adverse impact on the habitat of protected fauna in terms of the EPA Act and the NPW Act as no species protected under these acts occur in the proposed area.

(g) Any endangering of any species of animal, plant or other form of life whether living on land, in water or in the air

Comment: The carrying out of the work will not endanger any species of animal, plant or other form of life either on land or in water or the air. Measures are in place to manage any species which may be entangled in the net.

(h) Any long-term effects on the environment

Comment: There will be no negative long-term effects on the environment of the Entrance Lagoon or Lake Illawarra.

(i) Any degradation of the quality of the environment

Comment: There will be no degradation of the environment. Suitable safeguard measures will be put in place before and during the carrying out of works.

(j) Any risk to the safety of the environment

Comment: Suitable control measures will be put in place during the carrying out of works to reduce the risk to the safety of the environment. A floating boom will be used to limit increased turbidity spreading throughout the lake.

(k) Any reduction in the range of beneficial uses of the environment

Comment: There will be no reduction to the use of the environment. Following completion of the works it is expected there will be an increase in the recreational usage of the area as public safety, particularly for children will be increased.

(l) Any pollution of the environment

Comment: Suitable pollution control measures will be put into place to prevent turbidity, possible oil/fuel leakages, noise etc during the carrying out of the work.

(m) Any environmental problems associated with the disposal of waste

Comment: There will be minimal waste generated and any waste material will be disposed of to a suitable off site disposal area, following completion of the works.

(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become in short supply

Comment: There will be no increased demands on resources that are, or are likely to become in short supply because of the work.

(o) Any cumulative environmental effect with other existing or likely future activities

Comment: There will be no adverse cumulative environmental effects with other existing or likely future activities at the site.

9 SAFEGUARDS

The safeguard measures to be put in place to mitigate against any effects on the environment include:

(a) Suitable sediment and water control measures will be put in place prior to any works commencing to prevent turbidity in the Entrance Channel. Measures will include the construction of a floating boom.

(b) Vehicular access to the site will be via Reddall Parade.

(c) On site workers will be informed of the importance of protecting the environment and maintaining care and control at all times.

(d) Stockpiled material will be located at the southern carpark of Reddall Reserve or the Authority's compound off Northcliffe Drive, Warrawong.

(e) At the completion of the project the site will be tidied up and all waste material removed offsite to a suitable disposal location.

(f) To mitigate against the effects of noise pollution work hours will be limited and all necessary precautions will be put into place.

(g) Monthly inspections of the netting will identify any potential impacts on local marine organisms and to maintain the quality of the netting.

10 CONCLUSION

The conclusions of this report are:

The selection of netting used to create the swimming enclosure will minimise impacts on local marine fauna. Monthly inspections of the netting are proposed to manage algal growth and any species caught in the net. If capture rates become unacceptably high then seasonal usage of the net will be considered.

Design criteria and construction safeguard measures will ensure there are no long-term adverse impacts on the environment of the locality.

There will be some short-term social and environmental impacts at the locality but these will not be significant.

Due to the minimal impacts of these proposed works it is concluded that these works will not significantly affect the environment and therefore no Environmental Impact Statement (EIS) is required.

As the determining authority, the Lake Illawarra Authority approves the proposed works.

11 REFERENCES

Cardno Lawson Treloar (2001) Lake Illawarra Flood Study. Prepared for the Lake Illawarra Authority.

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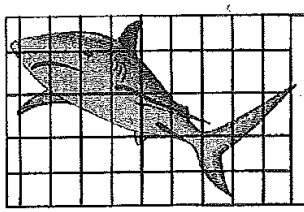
Appendices

Appendix A – Description of Proposed Net



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28th March, 2009

To whom it may Concern

Over the past 25 years, Tebbutt and Ross Marine Services have developed and refined material and assembly practices to produce the most reliable and sound swimming enclosures available. We employ a range of structural forms and materials to construct shark proof enclosures. The enclosures are constructed as site specific forms, following the exact contours of the seabed to provide the best possible protection while remaining environmentally sound.

The enclosures can be free standing or employ natural or manmade landscape features such as rock walls. The structural and aesthetic components of the enclosures can be varied to a degree to suit individual requirements while still maintaining effectiveness. Current functioning enclosures include both suspended and floating net systems, nylon and "Sea Lion" net as well as stainless steel ring designs.

A recent study carried out by Wollongong University compared the functionality of "Sea Lion" netting and nylon netting on location. The findings were very favorable to the more specialized "Sea Lion" net which was developed by Tebbutt and Ross Marine Services.

After inspecting the proposed site at Lake Illawarra, Tebbutt and Ross Marine Services recommend a suspended "Sea Lion" net system. The netting, in this case suspended on a stainless steel cable consists of a polypropylene material which has very fine stainless steel and copper wire braided into the net. This system emits a slight electric current which deters marine growth. This is essential in a location such as Lake Illawarra where the net is located close to the ocean. Limited marine growth will decrease the cost of maintenance and increase the lifespan of the enclosure.

We have found 10mm chain is the most effective way to secure the net to the seabed. This enables the net to exactly fit the contour of the ocean/lake floor and the even anchorage creates stability of the form. Our system of constructing these enclosures includes a 16mm polypropylene rope being threaded and fixed through the top section of net and a 10mm bottom rope of the same material coupling with a 10mm chain to secure the bottom section of the net.

Our nets are designed to impede large marine predators and not entangle or entrap smaller, less dangerous marine life. It is this feature that has led to our structures and

procedures have being evaluated and endorsed by the Department of Primary Industries NSW.

Tebbutt and Ross Marine Services recommend the use of stainless steel rings and timber pylons in situations where the net meets a rock barrier. This prevents the chaffing of the net against the rocks during tidal flows or large sea swells. This design is an advantage in a geographical location as exists at Lake Illawarra.

Council can elect to maintain the net with monthly inspections. This is highly recommended as small problems can reported to Council. They can then be repaired and rectified. These inspections include any small repairs and extend the overall life of the net. An approximate cost for inspections is $220.00.

The enclosure can remain in situ all year to cater for non seasonal swimmers, or removed in the winter months. If Council chooses to remove the enclosure there is a cost of approximately $1100.00. The net is removed, disassembled and stored at a location selected by Council. At the beginning of the following swimming season, the net is reassembled and installed at a cost of approximately $1100.00.

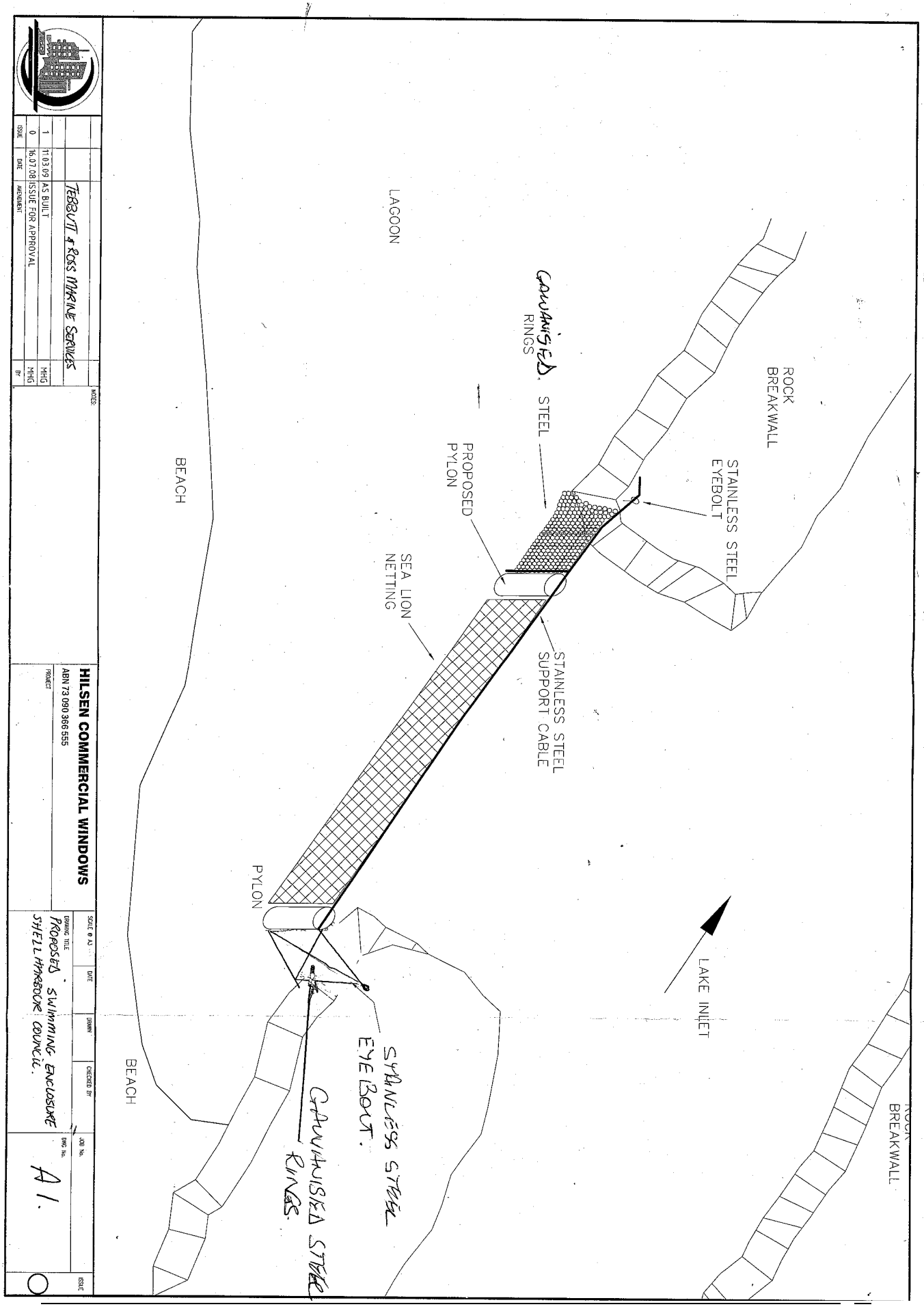
In closing, Tebbutt and Ross Marine Services strongly recommend the design illustrated in the previously supplied proposal drawing. The design consists of timber pylons suspending stainless steel cable which in turn supports a contoured "Sea Lion" net that attaches to stainless steel ring sections at the rock walls. This is the most effective barrier for your proposed site.

If you have any further questions regarding the enclosure, please do not hesitate to contact me.

Yours Sincerely,

Mark Tebbutt
Tebbutt and Ross Marine Services Pty Ltd

Appendix B – Proposed Swimming Enclosure Net Details


LAGOON
BEACH
BEACH
ROCK BREAKWALL
ROCK BREAKWALL
GALVANISED RINGS
STEEL
PROPOSED PYLON
STAINLESS STEEL EYEBOLT
SEA LION NETTING
STAINLESS STEEL SUPPORT CABLE
PYLON
LAKE INLET
STAINLESS STEEL EYE BOLT.
GALVANISED STEEL RINGS.
TEBBUTT & ROSS MARINE SERVICES
HILSEN COMMERCIAL WINDOWS
ABN 73 090 366 555
PROPOSED SWIMMING ENCLOSURE
STEEL HARBOUR COUNCIL.
A1.

Appendix C – Media Reports on Shark Attack at Lake Illawarra on 12/01/09

Dusky whaler shark the culprit: expert

By MICHELLE HOCTOR

WINDANG'S Steven Fogarty was the victim of a 2m dusky whaler shark that was most likely competing for access to a school of fish, a NSW Government expert has concluded.

Dr Vic Peddemors, who heads the shark research section of the Department of Primary Industries (DPI), visited Mr Fogarty's seaside home yesterday to investigate the attack.

Mr Fogarty, 24, was attacked while snorkelling under Windang Bridge on Monday morning, suffering 40 puncture wounds to his right calf and cuts to his fist from fighting off the predator.

"There's no doubt the attacker was a shark," Dr Peddemors said. "Its top jaw has had at least three goes at Steven's leg and left crescent shaped wounds."

He said based on the size and shape of the tooth marks, a dusky whaler was the culprit. The distance between the teeth and the width of the jaw indicated it was 2m to 2.2m long.

"We know from our research at the DPI that dusky whalers do go into large estuaries and would be quite comfortable swimming around here," he said.

Despite the findings, he said a dusky whaler usually wouldn't consider biting a human, especially one that was almost the same size as its prey, given Mr Fogarty stands 181cm tall.

"They're just not designed to bite humans and don't interact with them often enough to want to do it," he said.

Dr Peddemors said it was more likely the shark believed it was competing with Mr Fogarty for a school of fish.

"Steven was lying on the bottom looking at a school of bream and blackfish.

"It's possible the shark has mouthed him as if to say, 'This is my school of fish, get out of my way'.

"There's no chunk of flesh missing, and yet there has been three strikes on his leg."

Mr Fogarty said Dr Peddemors' belief the shark had not set out to eat him might help him.

After five days, Mr Fogarty says he still has nightmares and wakes in cold sweats.

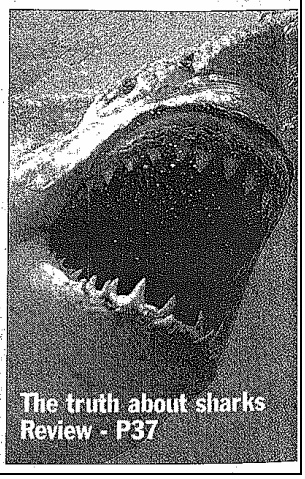
"But I've got a good group of friends who visit every day to keep me company and take my mind off things."

Bite-size: Shark attack victim Steven Fogarty with Dr Vic Peddemors, head of the shark research section of the Department of Primary Industries. They are examining the jaw of a 2m dusky whaler shark. Picture: ANDY ZAKELJ

Tips to avoid an attack

Simple rules to help swimmers avoid shark attack

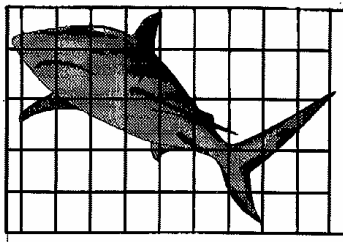
- Stay between the flags when you're swimming at the beach.
- Don't swim too far from shore - this will isolate you.
- Swim in groups as sharks are more likely to attack an individual.
- Avoid swimming when it's dark or during twilight hours when sharks are most active.
- Avoid waters with known effluents or sewage and areas that are used by recreational or commercial fishers.
- Avoid areas with signs of baitfish or fish feeding activity. Diving seabirds are a good indicator of such activity.
- Exercise caution when swimming in water between sandbars or near steep drop-offs.



The truth about sharks
Review - P37

Article from Illawarra Mercury, Saturday January 17, 2009

Appendix D – Method Regarding the Conservation of Hippocampus Abdominalis (Pot Bellied Seahorses)



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METHOD STATEMENT

CONSERVATION & RELOCATION OF HIPPOCAMPUS ABDOMINALIS (POT BELLED SEAHORSES)

Tebbutt and Ross Marine Services are a company specializing in the construction, installation and maintenance of shark proof swimming enclosures. Mark Tebbutt of Tebbutt and Ross Marine Services Pty Ltd has been working in this field for over 20 years. The company prides itself on its commitment to the preservation and conservation of all aquatic flora and fauna.

The following method statement describes the procedure followed to ensure the protection of the pot bellied seahorse during the removal of our swimming enclosures.

1. Notify a Fisheries conservation officer from the Department of Primary Industries of any impending enclosure removal at least 3-5 days prior to task. Ensure officer is given opportunity to attend.
2. A new enclosure is installed to maintain a shark proof environment as well as providing an alternative habitat for the seahorses.
3. Employee inspects the enclosure from the water to ascertain the presence and location of any seahorses.
4. Employee removes any visible seahorses by hand, relocating to adjoining sea grass beds.
5. Employee re inspects the enclosure from under the water to ensure all visible seahorses have been relocated.
6. The enclosure is carefully cut into sections no more than 10metres in length.
7. The sections are then slowly towed back to the foreshore. The gentle water pressure encourages remaining seahorses to relocate. The section then remains in the water while another inspection is performed. Any seahorses found at this stage are immediately returned to an appropriate habitat.
8. Each section of the enclosure is removed from the water and stretched so a clearer visual scan of the area is possible. Two employees walk the length of the section twice. Any seahorse found is immediately returned to a suitable environment.
9. At the completion of the task, a report will be furnished to the NSW Department of Primary Industries, outlining any seahorse mortality.

Mark Tebbutt
Tebbutt and Ross Marine Services Pty Ltd.

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STATEMENT REGARDING: CONSERVATION OF HIPPOCAMPUS ABDOMINALIS (POT BELLIED SEAHORSES)

Tebbutt and Ross Marine Services Pty Ltd are committed to the conservation and preservation of all aquatic flora and fauna, including the pot bellied seahorse.

Our work practice is governed by strict guidelines to enhance the protection of the pot bellied seahorse. These guidelines are consistent with the policies of NSW Fisheries (NSW Department of Primary Industries).

Our enclosures often become habitats for these seahorses due to the geographic location and the marine growth present on the structures. Routine maintenance inspections carried out on nets and additional specific inspections prior to the removal of any net aim to identify the presence of seahorses and asses any risks to them. On identification, Tebbutt and Ross Marine Services implement specific conservation procedures.

It is our policy, on removal of any existing enclosure, to ensure a new stainless steel cable and net is installed before the old is removed. This creates an alternative environment for the seahorses. The existing net is cut into manageable sections and towed to shore for disposal. The gentle water pressure encourages the relocation of the seahorses to the new structure or the sea grass bed. A thorough inspection of the removed net is carried out on the shore and any remaining seahorses are individually relocated to an appropriate habitat along the new net or an adjacent sea grass bed.

The said methods and procedures have been used successfully by Mark Tebbutt of Tebbutt and Ross Marine Services for habitat and species preservation for approximately 20 years.

The policy and procedures outlined in this document were developed under consultation with Mr. Paul Schuetrumpf, conservation officer, with NSW Fisheries (NSW Department of Primary Industries).

Mark Tebbutt
Tebbutt and Ross Marine Services Pty Ltd