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Nepean River - Penrith Lakes Pipeline: Additional Aquatic Impact Assessment

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Natural & Cultural Heritage Consultants 15-17 Henrietta St Chippendale NSW 2008

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Report for Maunsell Australia Pty Ltd

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ABBREVIATIONS

ASFB	Australian Society of Fish Biology
CAAB	Census of Australian Aquatic Biota
DEC	NSW Department of Environment and Conservation
DEH	Commonwealth Department of the Environment and Heritage
DNR	Department of Natural Resources)
DPI	Department of Primary Industries
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act* 1979
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
FM Act	*Fisheries Management Act* 1994
KTP	Key Threatening Process
LGA	Local Government Area
LWD	Large Woody Debris
MNES	Matter of National Environmental Significance
NPWS	NSW National Parks and Wildlife Service (now DEC)
PLDC	Penrith Lakes Development Corporation
RFI Act	Rivers and Foreshores Improvement Act 1948
SEPP	State Environmental Planning Policy
STP	Sewage Treatment Plant
SIS	Species Impact Statement
sp.	species (singular)
spp.	species (plural)

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1.0 SUMMARY

Biosis Research Pty. Ltd. was commissioned by Maunsell Australia Pty Ltd to undertake an additional aquatic ecology assessment of the intake pipelines for the proposed Nepean River to Penrith Lakes pipeline. A previous report by Biosis Research examines the impact of potential pipeline routes from the Penrith Weir to Penrith Lakes. This study assesses the proposed twin 70 m long intake pipelines into the Penrith Weir pool. Therefore study area comprises the only Nepean River at the Penrith Weir

This report assesses the conservation significance of the study area in terms of threatened species, populations (and their habitats) or ecological communities that occur, or have the potential to occur, in the study area in accordance with the requirements of the *Environmental Planning and Assessment Act* 1979 (EP&A Act), *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and *Fisheries Management Act* 1994 (FM Act).

An aquatic ecologist and research assistant from Biosis Research surveyed the proposed pipeline intake on 12 April 2006. The area is dominated by extremely dense growth of submergent macrophytes, predominantly native *Valiseneria americana* and the exotic weed *Egeria densa*. The riparian vegetation adjoining the Nepean River is highly degraded and generally restricted to a strip of trees adjoining the river with an understorey dominated by exotic species. The proposed intake pipelines will remove approximately 1000 m^2 of macrophytes, partially block the Nepean River and may cause temporary increase in turbidity and sedimentation during construction and rehabilitation.

One threatened aquatic species, Macquarie Perch *Macquaria australasica*, listed under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and the *Fisheries Management Act* 1994 (FM Act), is known to occur in large creeks upstream of the Penrith Weir. An Assessment of Significance under the EPBC and FM Acts concluded that there would be no significant impact to this species and therefore a Species Impact Statement and/or Referral is not required.

Mitigation Measures

To reduce the potential impact of the proposal on aquatic flora and fauna, the following mitigation measures are recommended:

- The area disturbed during the excavation of the Nepean River should be rehabilitated by replacing the original the soil profile, sedimentation controls such as silt curtains and revegetation with *V. americana*.

- Large Woody Debris partially within the construction area should be lopped or realigned to minimise damage to the habitat. Snags or other LWD completely within the cofferdams should be relocated adjacent to the pipeline route.

- Fish or freshwater mussels trapped within the cofferdam, should be released back into the weir pool, with any pest species euthanasied.

- Minimise the impact to the Nepean River and its tributaries through sedimentation control, channel maintenance and rehabilitation. Control measures should be implemented to prevent erosion or sedimentation under high flow and/or flood conditions during construction and rehabilitation.

- Regularly monitor water quality and flows at the Penrith weir and outlet to monitor impacts of sedimentation and water quality during construction and operation.

- Should drawdown prevent either entry or passage through the fish ladder or the attractant flow within the Nepean River, measures should be implemented to correct this.

- Prevent the transport of aquatic weeds (e.g. *Egeria densa, Salvinia molesta, Elodea canadensis)* through inlet and outlet design and wash down of Plant and Equipment.

- Permits for dredging and clearing will be required under the FM Act and the RFI Act.

- Organisations which should be consulted regarding the abstraction of water from the Nepean River include DPI Fisheries, Hawkesbury-Nepean CMA and Sydney Catchment Authority and DNR.

2.0 INTRODUCTION

2.1 Background

Biosis Research Pty. Ltd. was commissioned by Maunsell Australia Pty Ltd to undertake an additional aquatic ecology assessment for the proposed Nepean pump intake for the Nepean River to Penrith Lakes pipeline. The original study assessed the proposed pipeline routes from Penrith Weir to the Penrith Lakes and the impacts of extraction on the downstream aquatic ecology (Beitzel *et al.* 2005). This additional report assesses the intake pipeline, conservation significance of the Penrith Weir Pool in terms of threatened species, populations (and their habitats) or ecological communities that occur, or have the potential to occur, in the study area in accordance with the requirements of the *Environmental Planning and Assessment Act* 1979 (EP&A Act), *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and the *Fisheries Management Act* 1994 (FM Act).

2.1.1 Description and Features of the Study Area

The study site comprises the northern section and the eastern bank of the Penrith Weir Pool on the Nepean River (Figure 1). The study area lies within the Penrith Local Government Area (LGA). The area to the east of the Nepean River is a public reserve managed by the Penrith City Council with some associated infrastructure (BBQ areas parking, rowing club).

The majority of native vegetation within the study area has been historically cleared. Remaining remnants of native vegetation are mainly restricted to the banks of the Nepean River.

2.1.2 Proposed Development Activity

Penrith Lakes Development Corporation propose to construct a pipeline to pump water from Penrith Weir on the Nepean River into existing quarry pits or impoundments within the Penrith Lakes Scheme, with the aim of extending existing lakes and filling new lakes. Twin, 630 millimetre diameter, intake pipelines will be laid under the riverbed of the Nepean River to the intake structure. The pipeline will extend 70 m to the midpoint of the Nepean River, 110 m upstream of the weir (Figure 1). The pipelines will provide a flow of up to 1.0 m^3/s, when the flow in the Nepean River exceeds 350 ML/day (low flow pumping limit). Temporary cofferdams, 15 m wide will be utilised to provide access for construction and pipe laying equipment along the bed of the weir pool.

This study assesses the proposal to extend the intake of the pipeline 70 m into the Penrith Weir pool. Assessment of the proposed pipeline from the Penrith Weir to Penrith Lakes has been covered in (Beitzel *et al.* 2005)

2.2 Aims

The general aim of this report is to undertake an aquatic flora and fauna assessment of the study area and to determine the impact of the proposal on relevant matters of conservation significance.

The specific aims are to:

1. provide a brief assessment of the aquatic habitat values, particularly macrophytes and freshwater mussels of the study site;

2. undertake targeted field surveys for threatened aquatic species, populations (and their habitats) or ecological communities listed under the schedules of the *Fisheries Management Act* 1994 (FM Act) and/or *Environment Protection and Biodiversity Conservation Ac*t 1999 (EPBC Act) that are known or likely to occur within the study area;

3. undertake Section 5A assessments for threatened aquatic species, populations and ecological communities (listed on the FM Act) and/or Assessment of Significance for threatened and migratory species listed on the EPBC Act that are either directly or indirectly impacted by the proposal;

4. provide recommendations to minimise the environmental impacts of the proposed development;

3.0 METHODS

The study area was surveyed on the 12 April 2006. The general condition of the site was assessed and observations made of extant plant and animal species and vegetation communities (as detailed below). During the site visit the weather was sunny with moderate winds.

3.1 Taxonomy

Names of fish follow the Census of Australian Aquatic Biota (CAAB) maintained by DEH with the exception of *Gambusia holbrooki* which is referred to by its common name Plague Minnow. This common name is deemed by Department of Environment and Conservation (DEC), Department of Primary Industries (DPI)fisheries and the Australian Society of Fish Biology (ASFB) to be a more appropriate name for this pest species which is considered to have contributed to the decline of over 40 species of fish and frogs world wide. In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices. Plants, aquatic and terrestrial are referred to in the body of the report by scientific name only, with taxonomy following (Harden 1990, 1991, 1992, 1993, 2000, 2002) and (Sainty and Jacobs 1994).

3.2 Statutory Regulations

Federal and State Acts and Policies that apply to the study area with regard to aquatic flora and fauna are listed below, further information on these regulations is provided in Appendix 1.

- *Environmental Protection and Biodiversity Conservation Act* 1999 (Commonwealth) (EPBC Act)
- *Environmental Planning and Assessment Act* 1979 (NSW) (EP&A Act)
- *Fisheries Management Act* 1994 (FM Act)
- *Water Management Act* 2000 and *Rivers and Foreshores Improvement* Act 1948 (RFI Act)
- NSW DPI Fisheries Habitat Protection Plan 3 Hawkesbury Nepean Catchment
- Sydney Regional Environmental Plan (SREP) 11 Penrith Lakes Scheme

- Sydney Regional Environmental Plan (SREP) 20 – Hawkesbury-Nepean River

3.3 Literature and Database Review

A list of documents used to prepare this report is located in *References*. Database searches were conducted in April 2006. Records of threatened fish species were obtained from Department of Primary Industries (DPI) Fisheries BioNET for the Hawkesbury-Nepean River system. Records for threatened species, populations and communities listed under the EPBC Act were obtained from the Department of Environment and Heritage (DEH) EPBC Online Database within a 10 km radius of the study area. In addition DPI Fishfiles for the Hawkesbury-Nepean River were checked for potential species of significance occurring within the study area.

3.4 Aquatic Fauna Survey

Aquatic habitats were surveyed by undertaking visual assessment and by recording incidental observations. An assessment of the waterway and riparian condition and habitat was undertaken following a modified AUSRIVAS protocol

3.4.1 Aquatic Habitat Assessment

The aquatic habitats were classified according to the DPI (Fisheries) Fish Habitat Scheme, which assesses the waterway on their potential for fish habitat. The habitat classes are defined as:

- *Class 1 - Major Fish Habitat* Large named permanently flowing stream, creek or river. Threatened species habitat or area of declared "critical habitat" under the threatened species provisions of the FM Act. Aquatic vegetation is present. Known fish habitat and/or fish observed inhabiting the area;

- *Class 2 - Moderate Fish Habitat* Smaller named permanent or intermittent stream, creek or watercourse. Clearly defined drainage channels with semi-permanent to permanent waters in pools or connected wetland areas. Marine or freshwater aquatic vegetation present. Known fish habitat and/or fish observed inhabiting the area;

- *Class 3 - Minimal Fish Habitat* Named or unnamed watercourse with intermittent flow, with potential refuge, breeding or feeding areas for some aquatic fauna (e.g. fish, yabbies). No to minimal defined drainage channel. Semi-permanent pools, ponds, farm dams or wetlands nearby, or form in the

watercourse after a rain event. Watercourse interconnects wetlands or stream habitat; and

- *Class 4 - Unlikely Fish Habitat* Named or unnamed watercourse with intermittent flow during rain events only, little or no defined drainage channel, little or no free standing water or pools after rain (e.g. dry gully, shallow floodplain depression with no permanent wetland aquatic flora present). No aquatic or wetland vegetation present.

The waterways class is used to determine the appropriate type of bridge required and whether inclusion of a fishway is required within a development (NSW Fisheries 1999).

3.5 Fish Survey

A survey for fish was undertaken at the Penrith Weir

Bait Traps

Four bait traps baited with a 12 hour yellow glow stick were set at each site. The concertina traps measure 250 mm x 250 mm x 400 mm with two 40mm entrance funnels. Traps were set close to the bank or aquatic vegetation at 17:00 and retrieved at 21:00.

Fyke nets

Four single wing fyke nets (two constructed of 6 mm and two of 10 mm mesh), with single 10 m long wing were set at each site. Nets were set at17:00 and retrieved at 21:00.

Spotlighting

Spotlights were used to attract fish to the surface which were then netting in small aquarium dip nets. A total of 20 person minutes of spotlighting was undertaken.

Fish captured by these techniques were identified to species level following (McDowall 1996). Fish were measured to total length and an assessment made of external abnormalities before being released on site. Large numbers of schooling fish, encountered during surveying, such as Plague Minnow *Gambusia holbrooki* or Australian Smelt *Retropinna semoni* are recorded as observed and not measured or counted. If large numbers of one species are captured (>50 individuals), 20 individuals are randomly sub-sampled and the total number recorded to prevent over handling. Eels are also listed as observed, with species identified and numbers counted but no individuals measured. Pest species such as Carp *Cyprinus carpio* and Plague Minnow were not returned to the waterway.

3.6 Limitations

This study is part of a larger study on the proposed pipeline and pumping from the Nepean River to Penrith lakes and as such should be considered with the initial survey and hydrological modelling. It was conducted in accordance with methodology that would be employed for an assessment in accordance with Section 5A of the EP&A Act.

The study area was surveyed in autumn and it is possible that some animals and plants were not observed during the survey. However, as the assessment of impact is based on the presence or absence of suitable habitat for threatened flora and fauna (which is adequate to satisfy the requirements of the EP&A Act), such species are taken into account during the assessment even though they may not be conspicuous during the survey. Such an assessment is considered conservative, in that the presence of habitat for a threatened species, population or ecological community is sufficient to warrant further consideration in the impact assessment process. The assessment does not need to rely on actual records of threatened species.

4.0 RESULTS

4.1 Aquatic Habitats

At the proposed pumping point the Nepean River is a disturbed lowland floodplain river which had low flow at the time of the survey. The river forms a very large weir pool, backed up behind the Penrith Weir and at the proposed pumping location is 130 m wide and 1.5 m deep. The Penrith Weir is approximately 2.5 m in height and approximately 80 m wide. On the eastern side of the weir a covered vertical slot fish ladder with an attractant overflow has been constructed (Plate 2). Fish passage through the fish ladder is hindered though its design and detached aquatic vegetation and debris blocking the upstream entrance. The Nepean River above Penrith Weir is fairly clear, wide and deep behind the weir with a narrow riparian zone on the eastern side and wider zone consisting mainly of *Casuarina* sp. on the western bank. The edges were well held with grass, trees and rock armouring with the substrate being composed of cobbles silt gravel and concrete. Stepped banks, approximately 10 m high, border the river on both sides (Plate 1).

Aquatic vegetation within the weir pool consisted of beds *Typha* sp., with isolated *Juncus* sp. and *Persicaria* sp. on the banks under a canopy of mature *Casuarina* sp. There was almost a total cover of submerged aquatic vegetation dominated by *Valiseneria americana* (native) and *Egeria densa* (exotic). Other macrophytes recorded in the area include *Creratophyllum demersum* (native), *Hydrilla verticillata* with the algae *Chara sp*. and a small amount of filamentous algae also present. Some sections of gravel and cobble substrate were encounter in shallow edge areas. Macrophyte harvesting was being undertaken upstream of the weir and had removed the submergent vegetation within approximately 1 m of the surface in some areas. A brief examination of the aquatic harvester showed that the removed vegetation consisted primary of *E. densa* and *V americana*. The floating aquatic weed *Salvinia molesta* (exotic) was common and native *Lemna sp*. was present.

Downstream of the weir the river shallows, flowing over bolder and cobble riffles and runs into a meandering section of shallow pools and backwaters (Plate 5.) The river is 15 – 7 m wide through the riffles with a depth of approximately 0.3 m. The riparian vegetation is denser than above the weir with patches of *Salix* sp. which appear to have been poisoned as part of a control programs.

Downstream of the riffles, two tributaries enter from the eastern bank (see previous report). The banks are high and held by native and exotic trees, grasses and vines. The channel is shallow, braided with vegetated islands and the backwaters infested with *E. densa*, *V. americana, S. molesta* and *Sagittaria platyphylla*.

The Nepean River is classified by the DPI Fish Habitat Scheme as Class 1 Major Fish Habitat, although impacts from the sand extraction and Penrith Sewage Treatment Plant (STP), urban and agricultural development, upstream dams and weirs have severely affected the flow and habitat quality of this river.

4.2 Aquatic Fauna

There are thirty-nine species of fish that have been recorded in the mid Hawkesbury-Nepean Catchment. Seven species of fish including one alien species were recorded during sampling. Sampling was dominated by the alien fish species Plague Minnow and the native species Flat-headed Gudgeon *Philypnodon grandiceps*. A small number of fish predominantly Flat-headed Gudgeon (<10 %), were infected with fungus on the dorsal surface which can indicates stress and/or poor water quality.

4.2.1 Significant Aquatic Fauna

There are two threatened species of fish listed under the FM Act (Table 1) which have potential to inhabit the local area; Macquarie Perch *Macquaria australasica* listed as Vulnerable and Trout Cod *Maccullochella macquariensis* listed as Endangered. Both species are also listed as Endangered under the EPBC Act. In addition one species, the Australian Grayling *Prototroctes maraena*, is listed as Vulnerable under the EPBC Act and Protected under the FM Act. However, of these species potential habitat is only thought to occur within the study area for the Macquarie Perch.

There are a number of important recreational and migratory aquatic species which are known to occur in the mid Hawkesbury Nepean Catchment. These include the Australian Bass *Macquaria novemaculeata* and the Freshwater Catfish *Tandanus tandanus* both of which are protected from commercial fishing under the FM Act. The Australian Bass is catadroganous (migrates to estuaries to breed) is stocked in the Nepean River at Penrith and was introduced into the Penrith Lakes system (SKM 2004).

Two threatened species of dragonfly (Odonata) are also listed as potentially occurring within the study area. However, field investigations revealed a lack of suitable habitat for these species within the study area.

Table 1 Aquatic fauna listed on the TSC Act or EPBC Act that have the potential to occur in the local area.

Common Name	Scientific Name	FM Act	EPBC Act	Habitat and Distribution	Potential habitat within study area
Invertebrates					
Archaeophya adamsi	Adams emerald dragonfly	V		Cool clear streams with gravely riffles and extensive riparian vegetation	No
Austrocordulia leonardi	Sydney Hawk Dragonfly	E		Deep cool pools on slow flowing rocky rivers with steep sides	No
Fish					
Maccullochella macquariensis	Trout Cod	E	E	Inhabits large rivers and streams in the upper Murray Darling Basin often associated with cover such as LWD rock outcrops, boulders and deep holes	No Known from translocated stocks within Cordeaux Dam
Macquaria australasica	Macquarie Perch	V	E	Cool clean water preferring deep slow flowing pools and lakes. Eastern populations are genetically distinct from western populations. Known from Glenbrook Creek and Colo River	Yes Potential habitat within the Nepean weir and river
Prototroctes maraena	Australian Grayling	P	V	Clear gravely coastal streams and rivers from the sea to the first barrier, up to 1000 m	No Generally found in coastal streams or rivers further south

Key: V = Vulnerable E = Endangered P= Protected

Concern has also been shown for the freshwater mussels *Hyridella depressa* which are the subject of a current study into their habitat and ability to provide biological filtration of contaminants. Freshwater mussels are known to inhabit gravel and silt substrate generally with some instream cover such as logs, tree roots or boulders through the Nepean system, however only recently has any research been conducted ecology in the Nepean River.

5.0 IMPACT ASSESSMENT

The construction of the intake pipelines will result in the temporary loss of macrophytes from a 15 x 70 m corridor or approximately 1000 m^2, given the dense cover in this area. The dominant species are the exotic pest *E. densa* and native *V. americana* with beds of *Typha* sp. and *Phragmities australis* along the bank. It is likely, given the invasive nature of the exotic aquatic weeds in the weir, that the area would quickly be colonised and covered by *E. densa* following the completion of works. Construction of the pump house and the terrestrial sections the pipeline may impact the riparian vegetation. This area is dominated by exotic mown grass with large *Casuarina cunninghamiana* ssp. *cunninghamiana* and occasional shrubs along the bank. Construction of the pump house will involve the clearing of at least 42 m^2 of predominantly exotic grass.

The use of cofferdams and trenching of the pipeline below the substrate has the potential to result in a temporary increase in sedimentation during construction and on the removal dams as well as impacting upon benthic animals within the opened areas.

5.1 Aquatic Fauna

No threatened aquatic fauna were observed during this survey. Where there is potential habitat (foraging or breeding resources) for threatened species in the study area then further consideration of the potential impact of the proposed development on these species is required. The mid Nepean River and Penrith Weir provides very limited potential habitat for Macquarie Perch which is known to occur in Glenbrook Creek to the south west and the Colo River to the North West. Assessments of Significance under the EPBC and FM Act have been prepared in relation to the proposed intake pipeline (see Appendix 5). The assessment concluded that the proposal would not have a significant impact on this species.

Habitat for freshwater mussels is found over much of the impacted area however the dense cover of macrophytes reduces the availability of habitat. Mussels are generally found in areas of sand gravel or silt substrate with some cover, large woody debris, boulders, or overhanging banks (Byrne 1998). Some habitat exists close to the bank among boulders placed for bank stabilisation and between macrophyte beds or in cobble silt patches, although the area is not known to support a large population. The construction of the pipelines may encounter a small number of freshwater mussels which would die if left exposed for any length of time.

Recreational Activities

The Penrith Weir provides a number of recreation opportunities including rowing boating and fishing Recreational fishing for native and exotic fish such as Bass is conducted from the eastern bank and from small boats in the weir pool. The construction of the pipeline will result in a temporary restriction to anglers' access to the lower 100 m of the Penrith Weir Pool and may restrict boating and fishing activities near the weir.

5.2 Key Threatening Processes

A Key Threatening Process (KTP) is an impact listed under the FM, or EPBC Acts that could cause a species, population or ecological community to become threatened or is identified as an impact for two or more listed threatened species, population or EECs. KTPs relevant to the proposal are detailed below.

Installation and operation of in-stream structures and other mechanisms that alter natural flow regimes of rivers and streams

In-stream structures such as dams and water extraction devices can impact upon the riverine environment causing a wide variety of changes to the habitat, water quality and flow conditions and often creating barriers to fish passage. The Nepean River is already impacted by historical changes to its water regime. During construction of the proposed intake pipelines cofferdams will be installed to provide machinery access to lay the pipelines under the bed of the Nepean River. This will effectively produce a temporary barrier, half the width of the river (see Figure 2). This may temporarily increase the flow velocity in the channel to the west of the cofferdam. However the impact of this temporary dam this is not considered to be significant due to amount of the channel remaining (> 50 m unblocked) and the low velocity of flow (no perceptible flow recorded) during most flow levels.

The proposed works will result in the operation of a pumping facility which has the capacity to reduce flows and potentially cause minor drawdown effect upon the Nepean River. Under an existing licence, pumping of 1.7 m^3/sec (147 ML/day) from the Penrith Weir can be undertaken at flows exceeding 170 ML/day. This has been highlighted as having potential for significant impact upon the riverine environment downstream of the Penrith Weir and cause restrictions and barriers to fish passage (Beitzel *et al.* 2005, Water Research Laboratory 2005). The current revised scheme (when fully operational) proposes pumping of 1 m^3/sec when flows exceed 350 ML/day. This pumping regime will reduce the impact upon the habitats within the lower Nepean River.

It has been estimated that flow of >300 ML/day is required to provide adequate

fish passage in the Nepean River downstream of the Penrith Weir (Bishop 2004). This would reduce the effects of cyanobacteria and provide improved habitat and fish passage for the lower Nepean River.

Management of the pumping should be undertaken to reduce the effects of the abstraction and preserve the natural shape of the flow and not impact downstream communities and fish passage. Pumped volumes should be not impact on any environmental flows released for the river.

Removal of Large Woody Debris

The removal of Large Woody Debris (LWD) is listed on the FM Act as a KTP. Large Woody Debris such as fallen trees, logs, branch piles and root masses provide important shelter and breeding habitats for fish (including a number of threatened species), benthic habitat diversity and erosion protection. The construction of the cofferdam and the area within may encounter some LWD although little LWD was observed in the study site.

DPI Fisheries recommend the retention of LWD and provide guidelines on the management of LWD for instream works. Under the guidelines it is preferred that LWD be retained during instream work and DPI will not support some types of proposal for removal of LWD such as aesthetic reason. However if impact is unavoidable on approved works then the following options (in order of desirability) are recommended:

- impeding sections of the LWD should be lopped
- LWD realigned outside the construction
- LWD relocated to a similar channel area and direction within the waterway adjacent to the work

Removal of LWD from the waterway should be considered only as a last resort.

Degradation of native riparian vegetation along New South Wales water courses

The removal of riparian vegetation is listed on the FM Act as a KTP, including the removal of vegetation in catchment zones. Riparian vegetation contributes to the River ecosystem by providing: shade; a source of LWD; food for fish; bank stabilisation; and protection from sedimentation and runoff.

A section of riparian vegetation will be removed for the construction of the pipeline, pump house and associated infrastructure along the bank of the Nepean River. Rehabilitation of cleared areas, including revegetation and emergency

measures to protect the area from high volume flow events, should be implemented to reduce the potential for erosion and sedimentation.

5.3 General Impacts

5.3.1 Dredging and reclamation

Dredging and reclamation can produce significant impacts to aquatic ecosystems through direct removal of habitat, disruption to breeding sites, increases in sediment and changes in water chemistry and flow patterns. The construction of intake pipes into the Nepean River will require a dredging and reclamation permit under Part 7 of the FM Act for the excavation and laying of the pipeline. Although the pipelines are only 630 mm diameter each, a 15 m wide corridor of will be required for machinery access and will be provided through the use of cofferdams. Construction of the cofferdam and excavation of the pipeline into the weir pool will result in the removal or death through exposure of approximately 1000 m^2 of aquatic macrophytes and potentially impact LWD (see above).

Aquatic vegetation and substrate is utilised by a number of species of fish as breeding sites. The damage to the substrate may impact upon a small area of breeding habitat for gudgeons and galaxids within the weir. Freshwater mussels may also inhabit the sediment within the area of the cofferdams.

5.3.2 Weed Management

A number of aquatic weeds are known within the Penrith Weir including the submerged *Egeria densa* and *Elodea canadensis* and floating *Salvinia molesta*. Penrith Lakes Development Corporation actively controls macrophyte growth and *Salvinia molesta,* however *E. densa* and *E. canadensis* are not currently known within the Penrith Lakes area. Clearing of a 15 m wide x 70 m long corridor along the bed of the Nepean River will result in the removal of 1000 m^2 of macrophytes, predominantly *E. densa* and *V. americana*. Impacted areas should be replanted with *V. americana* to help prevent recolonisation of the impacted area by *E. densa*.

Measures should be put in place to prevent the transportation of exotic weeds via the pipeline through the design of the intake structures at the Nepean River and quarantine measures at the output.

5.3.3 Erosion Run Off and Sediment Control

Sedimentation and runoff can cause significant degradation in water quality aquatic habitats, creek bank stability and riparian vegetation. It can also affect fish breeding by smothering eggs and nests and by causing fish kills (McDowell 1996). Historical sand extraction and associated changes in flow regime have caused significant sedimentation in the Nepean River bordering PLDC. Further changes in the flow regime for the Nepean River through the pumping from the Penrith Weir may result in further sedimentation of the Nepean River and impact water quality. Sedimentation and reduction in water quality are both listed as threatening processes by the Australian Society of Fish Biology (ASFB). Erosion and sedimentation is of greatest concern in areas where proposed works are in the vicinity of the Nepean River, such as the intake pipeline under the bed of the weir pool, pump house excavation, the proposed pipeline route within the banks of the Nepean River. During construction and rehabilitation appropriate sedimentation and erosion controls should be implemented and maintained, particularly to protect against high volume flows. An Erosion and Sedimentation Control Plan should be developed and implemented in consultation with the DEC and DPI (Fisheries). Aquatic sedimentation controls such as silt curtains or booms should be used to surround the cofferdam construction area.

6.0 RECOMMENDATIONS

To reduce the potential impact of the proposal on terrestrial and aquatic flora and fauna, the following mitigation measures are recommended.

- The area disturbed during the excavation of the Nepean River should be rehabilitated by replacing the original the soil profile, sedimentation controls such as silt curtains and revegetation with *V. americana*;
- Large Woody Debris partially within the construction area should be lopped or realigned to minimise damage to the habitat. Snags or other LWD completely within the cofferdams should be relocated adjacent to the pipeline route;
- Fish trapped within the cofferdam when the construction area is pumped dry, should be released back into the weir pool, with any pest species euthanasied;
- Any freshwater mussels located within the construction area or disturbed during excavation of the substrate should be immediately relocated to similar habitat upstream of the pipeline;
- Minimise the impact to the Nepean River and its tributaries through sedimentation control, channel maintenance and rehabilitation. Control measures should be implemented to prevent erosion or sedimentation under high flow and/or flood conditions during construction and rehabilitation;
- Regularly monitor water quality and flows at the Penrith Weir and outlet;
- Should drawdown prevent either entry or passage through the fish ladder or the attractant flow within the Nepean River, measures should be implemented to correct this;
- Where possible, the route of the pipeline should follow existing roads and not impact riparian vegetation; and
- Prevent the transport of aquatic weeds (e.g. *Egeria densa, Salvinia molesta, Elodea canadensis)* through inlet and outlet design and wash down of Plant and Equipment.

Penrith Lakes Development Corporation has a permit to obtain a licence to divert water from Nepean River within 500 m upstream of Penrith Weir (Deed of Agreement 1987, 1989). Prior to project approval, DPI (Fisheries) should be consulted regarding the proposed works including blocking of tributaries for the construction, partial blocking of the Nepean River with cofferdams, dredging

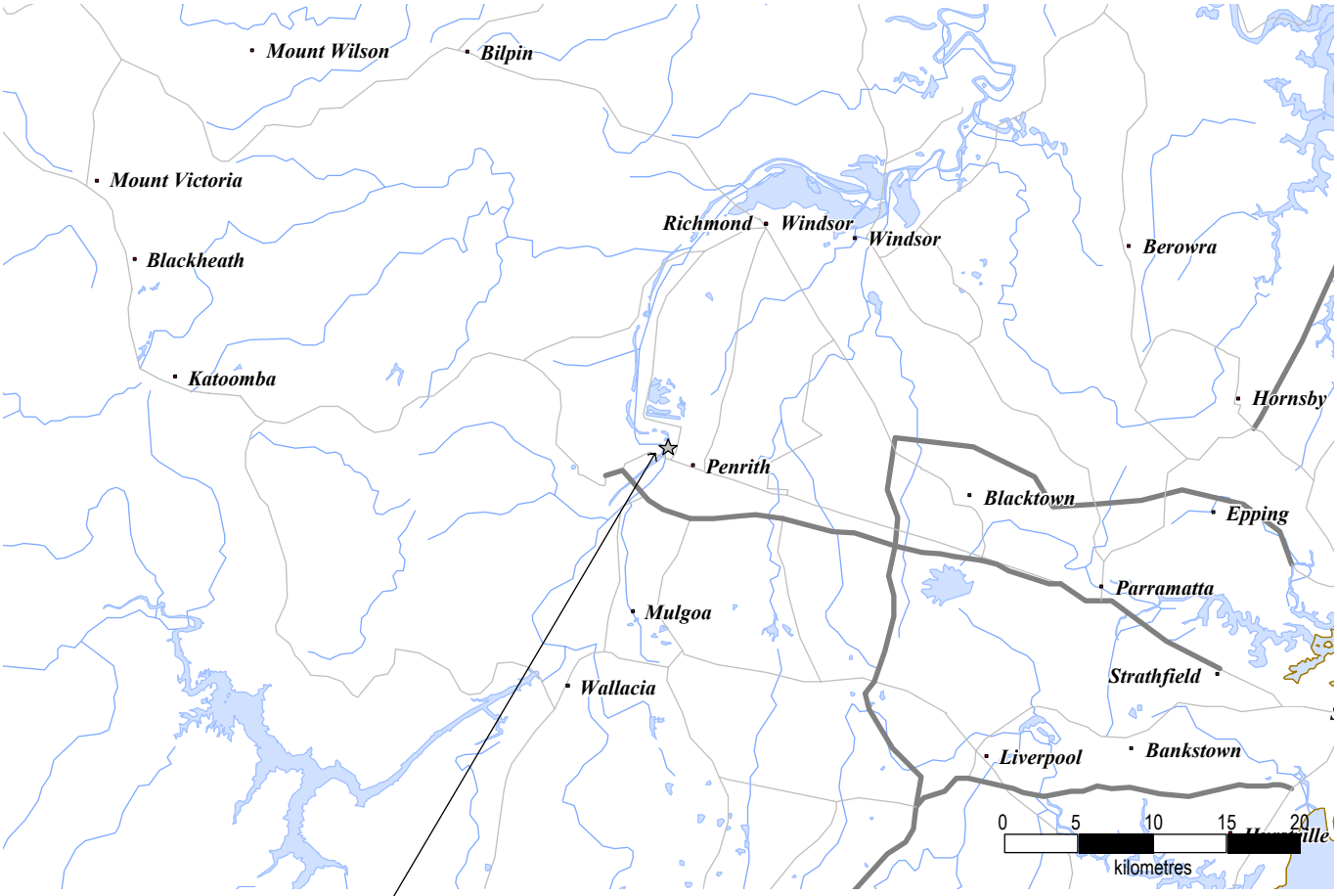
and excavation and drawdown effects on fish passage. A permit for development within 40 m of the River under the RFI Act may also be required. Other organisations which should be consulted regarding the abstraction of water from the Nepean River include the Department of Natural Resorces, Hawkesbury-Nepean CMA and Sydney Catchment Authority under whose operating licence must provide a minimum of 50 ML/d over the Penrith Weir.

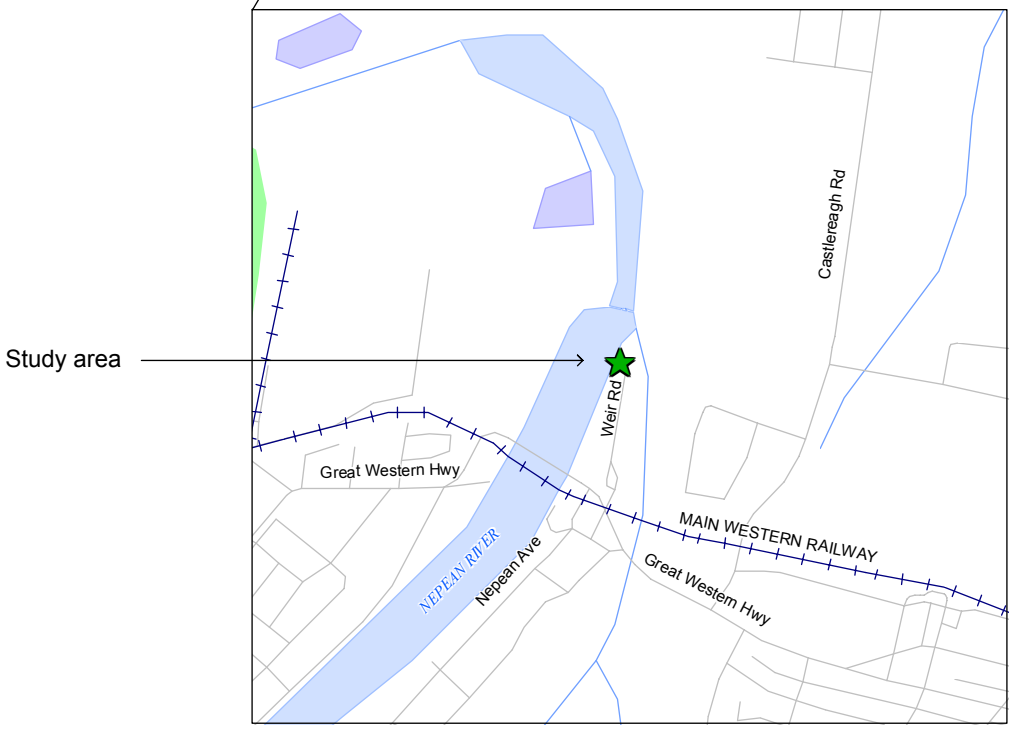
7.0 CONCLUSION

The proposed intake pipeline will result in the removal of 1000 m^2 of aquatic vegetation.

Macquarie Perch, a threatened aquatic species listed on the EPBC and FM Act, has very limited potential habitat within the Nepean Weir. An Assessment of Significance concluded that there will be no significant impact to the Macquarie Perch as a result of the proposed pump and pipeline.

FIGURES





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Chippendale
NEW SOUTH WALES 2008

Figure 1: Location of the study area in a regional context.

DATE: 26 April 2006

Checked by:

File number: S4438

Location:-...\4000\4400s\4438\Mapping\S4438 Fig 1.WOR

Scale: 0 250 500 750 1000 metres

N W E S

Key

Waypoint recorded in field

Development footprint

Acknowledgements: Maunsell

Penrith Weir

Pipeline Route

Floating Boom

Intake Structure

Twin Inlet Pipes

Weir Reserve

Pumping Station

Nepean River

Control Building

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Figure 2: Proposed plan.

DATE: 26 April 2006

Checked by: MB | File number: S4438

Location:-curr_projects\4000\4400s\4438\Mapping\S4438 Fig 2.WOR

Scale: 0 10 20 30 40 50 metres

N W E S

PLATES

Plate 1: Penrith Weir Pool

Plate 2: Fish ladder (foreground) and overflow of the Penrith Weir

Plate 3: Nepean River downstream of the Penrith Weir

APPENDICES

APPENDIX 1

Statutory Regulations

A.1.1 *Environmental Protection and Biodiversity Conservation Act* 1999 (Commonwealth)

Under the provisions of the EPBC Act any action (activity or development) that requires Commonwealth approval is deemed a controlled action. This is usually the case when an action is likely to have a significant effect on the environment of Commonwealth land or any 'Matter of National Environmental Significance' (MNES) listed below:

- World Heritage areas;
- National Heritage places;
- Wetlands protected by international treaty (Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Internationally listed migratory species- Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) & Bonn Convention;
- All nuclear actions; and,
- The environment of Commonwealth marine areas.

Where an impact is of potential significance then those affected species or habitats must be referred (Referral) to Department of Environment and Heritage for assessment in accordance with specific criteria outlined in the Guidelines for Significance Assessment. These guidelines provide separate criteria for Extinct, Vulnerable, Endangered and Migratory species against which the significance of the impact can be assessed and whether a referral is required. The purpose of the referral stage is to determine whether a proposed action requires approval under the EPBC Act. If the Minister determines that an approval is required, the proposed action will proceed through the assessment and approval process.

A referral is a set of information that includes brief descriptions of the proposal, its location and potential impacts on matters of national environmental significance. The EPBC Regulations set out what information must be included in the referral.

If a proposed action has been referred to the Commonwealth Environment Minister and the Minister has decided that the action requires approval, an environmental assessment must be carried out.

The purpose of an environmental assessment is to bring together all the information on the impacts that a proposed action would have on matters protected by the EPBC Act, to ensure that the Minister makes an informed decision on whether or not to approve the action.

If the Commonwealth has signed a bilateral agreement with a State or Territory in which the action is to be carried out, the State or Territory will assess the action under the terms of that agreement. Similarly, the environmental assessment may be carried out by another Commonwealth agency if a ministerial Declaration has been signed with that agency. If no bilateral agreement or Ministerial declaration is in place, the assessment may nonetheless be carried out by a State or Territory under an accredited assessment process. The bilateral agreement between the Commonwealth and New South Wales has not been signed.

If none of these assessment processes is applicable, the Commonwealth will carry

out the assessment using one of the following assessment approaches:

- preliminary documentation;
- public environment report (PER);
- environmental impact statement (EIS); or
- public inquiry.

The proponent, or the person proposing to take the action, will be asked to supply preliminary information on the impacts of the proposed action in order to help the Minister select an appropriate assessment approach.

7.1 Environmental Planning and Assessment Act 1979 (NSW), Threatened Species Conservation Act 1995 (NSW) and Fisheries Management Act 1994 (NSW)

The *Environmental Planning and Assessment Act* 1979 (EP&A Act) is the principal legislative tool governing land use in NSW. One object of the EP&A Act is to encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats as listed under the *Threatened Species Conservation Act* 1995 or *Fisheries Management Act* 1994. A second object is to encourage the principles of ecologically sustainable development.

The *Threatened Species Conservation Act* 1995 protects all threatened plants and animals native to NSW (with the exception of fish and marine plants). It provides for the identification, conservation and recovery of threatened species and their populations and communities. It also aims to reduce the threats faced by those species. The *Fisheries Management Act* 1994 was amended by the *Fisheries Management Amendment Act* 1997, with respect to threatened species conservation and this Act now provides for the protection of all threatened fish and marine vegetation native to NSW waters.

If a planned development or activity is likely to impact threatened species, this must be taken into account in the development approval process. If the impact is likely to be significant, a Species Impact Statement must be prepared and the Director-General of Department of Environment and Conservation (DEC) and/or Department of Primary Industries (DPI) must agree to the development approval. In some cases, the Minister for the Environment will also need to be consulted.

In order to assess whether a development is likely to have a significant effect on threatened species, populations or ecological communities or their habitats, Section 5A of the EP&A Act , Section 94 of the TSC Act and Section 220ZZ of the FM Act outlines seven factors (Assessment of Significance)that must be taken into account in making the assessment (as amended by the *Threatened Species Conservation Amendment Act 2002*). *Assessment Guidelines* have been issued by DEC [2005] in accordance with Section 94A of the TSC Act to assist in the interpretation and application of the Assessment of Significance.

DEC (2005) *Assessment Guidelines*. Department of Environment and Conservation, Sydney.

The Assessment of Significance focuses consideration on likely impacts in the context of the local rather than the regional environment as the long-term loss of biodiversity at all levels arises primarily from the accumulation of losses and depletions of populations at a local level [DEC 2005]. It is intended that the Assessment of Significance will provide a system that allows the qualitative analysis of the likely impacts and, ultimately, whether further assessment needs to be undertaken in the form of a Species Impact Statement (SIS). In applying the Assessment of Significance, all factors must be considered and an overall conclusion drawn from all factors in combination. Where there is any doubt regarding the likely impacts, or where detailed information is not available, a SIS should be prepared unless the proposal can be modified such that a significant effect on threatened species, populations or ecological communities, or their habitats is unlikely.

Mitigating, ameliorative or compensatory measures proposed as part of the action, development or activity should not be considered in determining the degree of the effect on threatened species, populations or ecological communities, unless the measure has been proven successful for that species in a similar situation [DEC 2005]. In many cases where complex mitigating, ameliorative or compensatory measures are required, such as translocation, bush restoration, purchase of land, further assessment through the Species Impact Statement process is likely to be required.

In determining the nature and magnitude of an impact, it is important to consider matters such as:

- Pre-construction, construction and occupation/maintenance phases,
- All on-site and off-site impacts, including location, installation, operation and maintenance of auxiliary infrastructure and fire management zones,
- All direct and indirect impacts,
- The frequency and duration of each known or likely impact/action,
- The total impact which can be attributed to that action over the entire geographic area affected, and over time,
- The sensitivity of the receiving environment, and
- The degree of confidence with which the impacts of the action are known and understood.

In assessing a proposed application, development or activity, all species that may be affected directly or indirectly should be considered. If adequate surveys/studies have been undertaken to categorically demonstrate the species does not occur in the study area, or if not resident, will not utilise habitats on site on occasion or be influenced by off-site impacts of the activity, that species does not have to be considered. Otherwise all species likely to occur in the study area (based on general species distribution information), and known to utilise that habitat type, should be assessed as if present. In addressing the limitations of the survey and assessment process, it is important to consider the precautionary principle[1] as defined under the *Protection of the Environment Administration Act* 1991, such that where adequate surveys have not been conducted within the study area, it is assumed that threatened species, populations and/or ecological communities are likely to occur based on the presence of suitable habitat and recent records in the area. (10 km radius of the study area).

In addition, any Final Determination to list a species, population or ecological community as Critically Endangered or Endangered made after lodgement of a development application or activity proposal needs to be included in the consideration of impacts and application of the Assessment of Significance. Vulnerable species listed after lodgement do not have to be subject to impact assessment as

[1] The precautionary principle states that "*if there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation*".

long as the development application is determined within 12 months of lodgement (Section 105A of the EP&A Act).

Under the *Assessment Guidelines* [DEC 2005], the following terms have been defined to assist in the application of the Assessment of Significance:

- *Subject site*: area directly affected by the proposal
- *Study area*: subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account
- *Local population*: population that occurs in the study area. In cases where multiple populations occur in the study area, each population should be assessed separately
- *Direct impacts*: those that directly affect habitat and individuals and include but are not limited to acute death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat; and,
- *Indirect impacts*: occur when project-related activities affect resources in a manner other than a direct loss of the resource. A broad range of impacts need to be considered, for example, killing the species through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious changes in the water table, increased soil salinity, promotion of erosion, inhibition of nitrogen fixation, provision of suitable seed bed for exotic weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas.

A.1.3 *Water Management Act* 2000 and *Rivers and Foreshores Improvement Act* 1948 (NSW)

The *Water Management Act* 2000 (WM Act) provides for the integrated and sustainable management of the State's waters, including those provisions previously included in the *Rivers and Foreshores Improvement Act* 1948 (RFI Act). Whilst proclamation commenced most of the provisions of the WM Act on 1 January 2001 (NSW Government Gazette No. 168, December 2000), matters relating to licences and approvals still continue to be dealt with by the RFI Act and the *Water Act* 1912. The Department of Natural Resources (DNR) is currently developing the administrative procedures to operate the approvals provisions (Chapter 3 Water management implementation, Part 3 Approvals) of the WM Act, however it is not known when these provisions will commence.

While the RFI Act allows the carrying out of works to remove obstructions from and improve rivers and foreshores and to prevent erosion of lands by tidal and non-tidal water, under Part 3A, Section 22B a person must not:

- make an excavation on, in or under protected land (land within 40m from top of bank);
- remove material from protected land;
- do anything which obstructs, or detrimentally affects, the flow of protected waters, or which is likely to do so unless the person is authorised to do so by a permit.

When assessing developments that require a Part 3A permit, the DNR considers whether the proposal is consistent with State Government policy including the NSW State Rivers and Estuaries Policy. Conditions of consent for a Part 3A permit, may as a result, include the establishment of a native vegetation riparian zone along a waterway. Given State Government policy, it is unlikely that a Part 3A permit would be issued for works that degrade watercourses and their environment, as it is DNR's aim that:

- an adequate native vegetation riparian zone (minimum 20m) be kept or established on either side of any waterway or wetland,
- on-line or instream water quality structures such as water quality ponds, trash racks and gross pollutant traps are strongly discouraged as they affect the continuity and corridor function of waterways and result in loss of riparian vegetation and habitat, and that
- channelisation, piping and/or relocation of streams and the construction of on-line or instream structures and culverts for waterway road crossing are discouraged.

A.1.4 *Fisheries Management Act* 1994

The *Fisheries Management Act* 1994 was amended by the *Fisheries Management Amendment Act* 1997, with respect to threatened species conservation, commercial fisheries management, recreational freshwater fishing, special fisheries trust funds, and charter fishing boats.

This Act provides for the protection of all threatened fish and marine vegetation native to NSW waters. Provisions in Part 7A cover the identification, assessment and proclamations of threatened species, populations and ecological communities and key threatening processes. They also provide for the identification of critical habitat, mandatory impact assessment in the land use planning process and active recovery management.

Under the Fisheries Management Act 1994, a person may be required to provide fish passage, generally through the installation of a fishway, when altering, modifying, or constructing a dam, weir or floodgate. Any proposal that requires construction, modification or alteration of a dam or weir, that requires some approval process by a public authority (including local government) must be referred to DPI Fisheries for determination.

A.1.5 *State Environmental Planning Policy 19 Urban Bushland*

The principal aims of the State Environmental Planning Policy (SEPP) 19 are to protect and preserve bushland within urban areas. The policy applies to Local Government Areas (LGAs) in the Sydney Region and Lake Macquarie areas but does not apply to areas administered by NSW National Parks and Wildlife Service or State Forests.

Under SEPP 19 the definition of bushland includes the characteristic species that make up the community and its structural form.

'Land on which there is vegetation which is either a remainder of the natural vegetation of the land or, if altered still representative of the structure and floristics of the natural vegetation'

A.1.6 *NSW DPI Fisheries Habitat Protection Plan 3 Hawkesbury Nepean Catchment*

The Fisheries management Act provides for the preparation of habitat protection plans to which the minister and public authorities must regard during the assessment of developments. The plan protects aquatic habitat in the Hawkesbury Nepean Catchment for aquatic fauna and flora. It aims to promote Total Catchment Management, mitigate habitat degradation and assist in the rehabilitation of Hawkesbury-Nepean catchment. It applies to all stages developments and events that may have an impact of fish habitat on all waters and associated habitats within the Hawkesbury-Nepean catchment. Any development should ensure fish habitat conservation through:

i) the maintenance of natural creek channels and wetlands;

ii) the preservation of native vegetation possible,

iii) avoidance of levees, flood gates and drains (except where allowed under SREP 11);

iv) the preservation of fish passage;

v) managing stormwater flows (offline gross pollutant traps, sedimentation ponds and artificial wetlands);

vi) minimise sedimentation and erosion;

vii) protect water quality

viii) appropriate monitoring of fish habitats liable to be affected.

A.1.7 Sydney Regional Planning Policy 11 Penrith Lakes Scheme

The following extract has been adapted from the NSW legislation website (www.legislation.nsw.gov.au).

The aims and objectives of SREP 11 are:

1. To permit the implementation of the Penrith Lakes Scheme.
2. To provide a development control process establishing environmental and technical matters which must be taken into account in implementing the Penrith Lakes Scheme in order to protect the environment,
3. To identify and protect items of the environmental heritage,
4. To identify land which may be rezoned for urban purposes, and
5. To permit interim development in order to prevent the sterilization of land to which this plan applies during implementation of the Penrith Lakes Scheme.

A.1.8 *Sydney Regional Environmental Plan 20 – Hawkesbury-Nepean River*

The following extract has been adapted from the NSW legislation website (www.legislation.nsw.gov.au).

This plan applies to certain land in the Greater Metropolitan Region (listed in Part 1 of the Plan), including the Penrith LGA.

This plan does not apply to the land to which *Sydney Regional Environmental*

Plan No 11—Penrith Lakes Scheme applies.

The aim of this plan is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.

APPENDIX 2

Fish Survey Results

Fish recorded during this survey

Scientific Name	Common Name	Alien Species	EPBC Act	FMA Act	No. Recorded
Gobiomorphus coxii	Cox Gudgeon				1
Hypseleotris compressa	Empire Gudgeon				1
Philypnodon grandiceps	Flathead Gudgeon				72
Philypnodon sp.	Dwarf Flathead Gudgeon				1
Macquaria novemaculeata	Australian Bass			#	1
Retropinna semoni	Australian Smelt				5
Gambusia holbrooki	Plague Minnow	Yes			74

- Listed as Protected from Commercial fishing under the FM Act

APPENDIX 2

Assessment of Significance (TSC Act)

Seven-part tests have been prepared for the Macquarie Perch based on their known or potential local distributions and the presence of limited potential habitat within the study area.

Macquaria australasica Macquarie Perch

Macquarie Perch *Macquaria australasica* is listed as Vulnerable on Schedule 5 of the FM Act. This species is also listed as Endangered on the EPBC Act. Macquarie Perch inhabit the upper reaches of catchments where there are deep pools and riffles with little sediment (McDowall 1996, Allen *et al.* 2002). They undertake an upstream breeding migration in late spring and deposit between 50,000 and 10,000 number small adhesive demersal eggs above riffles and at the tail of pools (Morris and Wooller 2001). The eastern population of Macquarie Perch are known in the upper reaches and dams of the Nepean River, Glenbrook Creek and the Colo River in the Hawkesbury Nepean Catchment and the upper Shoalhaven River and appear to be genetically distinct from the Murray darling basin population. (Bruce *et al.* 2001).

1. In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Macquarie Perch was not detected during this study. The species is known to occur in Glenbrook Creek approximately 6 km upstream. The Nepean Weir is poor quality potential habitat for the Macquarie Perch due to the existing impacts such as sedimentation, flow reduction and regulation, urban encroachment and exotic aquatic weeds. The proposed works will pump water from this weir which may cause drawdown effects which creates barriers to passage and causes some sedimentation. Given the poor quality of habitat directly downstream of the Nepean Weir it is unlikely that this area would support Macquarie Perch. While areas of habitat and potentially populations may occur in tributaries downstream it is unlikely that the proposed works will isolate potential breeding and refuge areas.

It is therefore considered that the lifecycle of this species will not be impacted such that any viable population of this species as is likely to be placed at risk of extinction.

2. In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

There are currently no endangered populations of this species listed under the FM Act.

3. In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

N/A Macquarie perch are listed as a Vulnerable Species under the TSC Act

4. In relation to the habitat of a threatened species, population or ecological community:

- **i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**

Approximately 1050m^2 of non-breeding habitat will be directly impacted by the construction of the pipeline. The impact to the habitat downstream of the Weir due to alteration to the flow regime from abstraction may include increases in sedimentation and extension of barrier to fish passage which may persist for some distance down stream. However, the Nepean River is currently highly impacted from dams, weirs and abstraction. With the current proposed pumping limits of 1m^3/sec when flow volumes exceed 350ML/day, it is unlikely that the abstraction of water for the PLDC would increase impact to any Macquarie Perch habitat in the Nepean River The Nepean River downstream of the weir is very unlikely to provide potential habitat for a population of Macquarie Perch. Populations of the Macquarie Perch are known upstream of the Penrith Weir and in the Colo River, a downstream tributary of the Nepean River. There are a number of natural and man-made barriers to fish passage within their range and it is unlikely that the proposed works would further isolate these known populations of Macquarie Perch within the Hawkesbury-Nepean River system. As such impacts to it habitat are not considered significant.

5. Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

Critical habitats are areas that are crucial to the survival of particular threatened species, populations and ecological communities. Under the FM Act, a register of critical habitats is maintained. No critical habitat has been declared for this species (DPI Fisheries Scientific Committee). No area impacted directly or indirectly by the proposed works is likely to be considered to be critical for the survival of this species.

6. Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

There is no current recovery plan for the Macquarie Perch.

7. Whether the action proposed is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

Key Threatening Processes (KTPs) are listed on Schedule 6 of the FM Act. The proposed development will involve the installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams which is a recognised KTP. It will also involve the removal of a small amount of riparian vegetation which is also listed as a KTP under the FM, Threatened Species Act 1994 and EPBC Acts ('Clearing of Native Vegetation'). The construction of the intake pipelines may include impact to a small amount of Large Woody Debris and the Removal of L W D is listed as a KTP on the FM Act.

Other threats to this species include sedimentation and habitat degradation, barriers to fish passage, thermal pollution from dams, competition by salmonids, overfishing and the Epizootic haematopoietic necrosis (EHN) Virus. (DPI Fisheries Scientific Committee 1998, Morris and Wooller 2001). The proposed works may increase the barrier to fish movement through the isolation of the fish ladder at Penrith Weir, though this ladder is already ineffective. The construction of the intake pipelines and may cause a temporary increase in sedimentation and turbidity in the immediate vicinity.

The majority of these processes and threats have already impacted upon the Nepean River at Penrith and as such the proposed works are unlikely to lead to a significant increase in these threats.

Conclusion:

The proposed development is unlikely to have a significant impact on this species. A Species Impact Statement is not recommended.

APPENDIX 3

EPBC Assessment of Significance

Endangered Species

Potential habitat occurs within the study site for Macquarie Perch *Macquaria australasica* listed as Endangered on the EPBC Act within the Nepean River upstream of the Penrith Weir*:*

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

Macquarie Perch are not known to occur in the Nepean River at Penrith Weir and no individuals were observed during this survey. It is unlikely that the proposed action will cause a decrease in the size of a known population.

Is the action likely to reduce the area of occupancy of the species?

Macquarie Perch are not known to occur in the Nepean River at Penrith Weir and therefore an area of known habitat will not be reduced by the proposed works.

Is the action likely to fragment an existing population into two or more populations?

The Macquarie Perch is known from several tributaries and in the upper catchment of the Hawkesbury Nepean River and the Colo River. It is unlikely that the proposed works will further fragment an existing population.

Is the action likely to adversely affect habitat critical to the survival of a species?

There is no critical habitat listed for the Macquarie Perch. The proposed development will not effect riffle or pool habitat within known habitat.

Is the action likely to disrupt the breeding cycle of a population?

There are no known breeding populations within or downstream of the weir and the proposed works are unlikely to reduce riffle habitat which is utilised for breeding, although riffle habitat downstream of the weir may be effected.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The status of the eastern populations of Macquarie Perch are considered less threatened than the Murray Darling Basin populations although they are still declining. The action may result in a reduction of fish passage in the Nepean River however it is highly unlikely that the Macquarie Perch would find suitably

habitat within the mid and lower Nepean River without significant improvements to the habitat, fish passage and flow regime.

Is the action likely to result in invasive species that are harmful to a critically endangered or endangered/vulnerable species becoming established in the endangered or critically endangered species/vulnerable habitat?

It is highly unlikely that the proposed action will cause an invasive aquatic species not currently established in the Nepean River to become established. Although a lack of flow may increase the distribution and abundance of aquatic weeds such as *Salvinia molesta* and *Egeria densa*.

Is the action likely to interfere with the recovery of the species?

An action plan has yet to be developed for Macquarie Perch and fish passage below the weir is highly impacted and however it is highly unlikely that the Macquarie Perch would find suitably habitat within the mid and lower Nepean River without significant improvement to the habitat, fish passage and flow regime

Conclusion

Based on the above assessment, Macquarie Perch are unlikely to be significantly impacted by the activities and as such a Referral under the provisions of the EPBC Act is not recommended for this species.

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