IMPACTS ON NSW COMMERCIAL FISHING VIABILITY AND SUSTAINABILITY.
THE HAWKESBURY PRAWN TRAWL FISHERY

SUBMISSION
To
THE PARLIAMENTARY ENQUIRY

LEGISLATIVE ASSEMBLY STANDING COMMITTEE ON NATURAL RESOURCE MANAGEMENT (CLIMATE CHANGE)

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INDEX

THE ENQUIRY TERMS OF REFERENCE:

That:

(1) A standing committee be appointed to enquire into issues of sustainable natural resource management with particular reference to climate change impacts and, in particular, to report on the following terms of reference:

(a) The likely consequences of human-induced climate change on land(including salinity),water and other natural resources;

(b) Options for ensuring ecologically sustainable natural resource use, taking into account the impacts of climate change;

(c) Approaches to land and water use management practices on farms and other natural resource management practices, having regarded in particular to the role of such practices in contributing to climate change or as a tool in helping tackle climate change.

(d) The effectiveness of management systems for ensuring that sustainability measures for management of natural resources in NSW are achieved , having particular regard to climate change; and

(e) The likely consequences of national and international policies on climate change on natural resource management in New South Wales.

Climate Change Affects NSW Commercial Fisheries

1. INTRODUCTION:

Overview:

Land and water management in NSW for population growth , critical infrastructure, industry, housing, agriculture, and adequate guidelines for that development, are crucial to the productivity, survival and health of the aquatic ecosystems and commercial fisheries viability and sustainability in estuaries and the ocean.

Sustainable development principles are based on the recognition of the relationship between the health of the economy and the health of the environment. The environment provides benefits to humans through providing natural capital (good soils, clean water etc) on which productive activities such as agriculture, forestry and commercial fisheries depend. *(Valuing Fisheries Tor Hundloe 2002)*

AQUATIC ECOSYSTEMS FOOD CHAINS:

Climate Change can influence the aquatic ecosystems food chains. It affects currents, channel morphology, hydrology, water volume, temperature, ph, oxygen, salinity, chemicals, nutrients, phosphorus, nitrogen, acids, phytoplankton and micro pollutants. These changes can be the difference between a healthy or unhealthy aquatic environment and a productive estuarine and ocean community and subsequently affects the viability and sustainability of commercial fisheries.

FISH BREEDING AND MIGRATION:

Climatic events and developments that result in increased water temperatures, decreasing freshwater flows, increased disposal of concentrated effluent, diffuse water and storm water to drains, population growth and chemical pollution can all potentially affect the survival, migration and breeding of fish species and the harvest of commercial fisheries.

NATIONAL, STATE AND LOCAL GOVERMENT POLICY:

Existing environmental guidelines established for development and environmental assessments for infrastructure involving the extraction and disposal of effluent water into the environment has the potential to compromise the health of waterways and the ocean due to rising temperatures, population growth, increased water demand, decreasing freshwater events and the inadequacies within the guidelines to address the changing environmental needs for in stream aquaculture and migratory fish, including zooplankton.

Clear evidence of this can be found in inland river systems and coastal rivers in NSW such as the inland Murray Darling River and the coastal Hawkesbury Nepean River system.

- The Hawkesbury Prawn Trawl Fishery already experiences affects from high nutrients, increased weed growth, blue green algae alerts.
- Commercial fishers of the Murray Darling were the first commercial fishers to be bought out or offered entry into Carp fishing or yabbies harvesting, due to ‘claims’ of over harvesting native species.
- Survival of Zooplankton in the Murray Darling River threatens Murray Cod survival.

- Sydney Harbour was closed to commercial fishing due to Dioxin levels exceeding the world health guidelines. Note: recreational fishing still remains in Sydney Harbour.
- The Hawkesbury River Oyster industry is slowly recovering from a QX virus attack by introducing pacific oyster spat into the Hawkesbury River. The Hawkesbury River was the one of the highest Sydney Rock oyster producers in NSW.

2. BACKGROUND:

The NSW Governments commercial fisheries sustainability management regime:

The NSW Government under NSW Fisheries legislation and Regulations have, for decades, addressed what they believe to be a strategy of appropriate industry natural resource management by reducing, restricting, removing and closing areas of access to prime commercial fishing grounds across NSW.

Sustainability objectives and extensive consultation are always words included in the objectives, often to the dismay of many fishers working in the commercial fishing industry who in the main consider that they are not consulted adequately. A further restructure review is currently due to be released in 2008.

Recorded Statistics 1940-1992

Fisheries statistics show that in 1940/41 there were 3000 fishers and 2000 boats in all sectors.

1940/41 there were 2500 fishers (boats not listed) for inshore ocean and estuary.

With the change from steam boats to diesel power and the ability to fish further a field in the ocean and harvest different species (*fisheries statistics 1940 to 1992*) the numbers had increased to

1980/83 there was 4000 fishers in all sectors.
1980/83 there was 3500 boats in all sectors.

Today there are around 1200 commercial fishing businesses, and this figure changes down daily as industry receives further closures as a result of Marine Parks, area closures and creating recreational only havens.

Twenty nine recreational only havens were established in NSW in 2002 on the basis of sustainability of fish stocks. These closures have subsequently impacted on the ability of the commercial fishers to sustainably harvest their product and remain viable in many areas.

- **Affects of Reducing Commercial Fishing Fleet:**

The Sydney Fish markets are the largest markets in our hemisphere and are now experiencing a significant decline in fish product harvested from NSW. Co Ops across the state are having difficulties due to the reduction in local product. Many have just closed their doors.

- **Social Impacts**

This has subsequently led to significant impacts to families, marriage breakdowns and depression.

- **Looking For Water, and Fisheries implications 2006-07**

In 2006 – 07 across the country, state, and national governments were looking for the next river that could be diverted to alleviate the condition of another.
The Clarence River was proposed as a source of water for the Murray Darling River and South East Queensland. The Clarence River is the largest prawn trawl fishery in the state. The Shoalhaven River provides drinking water for Sydney propping up water extractions from the Hawkesbury River the Hawkesbury River is the second highest producer of prawns in the state there are only three estuaries left that prawn trawlers harvest prawns. The South coast prawn fishery has already been decimated by changes to the Shoalhaven river system.
Cross species contamination of ecosystems occurs. There are new species of algae being discovered in the Hawkesbury River (*D. Channon 2007).*
There are 130 main estuaries in NSW.

2. BACKGROUND CONT:

Value of school prawn stocks in 2003:

According to NSW Fisheries Environmental Impact Statement for Estuary Prawn trawl 2003, the prawn stocks are ranked first in value amongst wild caught seafood resources managed solely by the NSW State Government. Over the period from 1997/98 to 2000/2001 the Estuary Prawn Trawl Fishery contributed on average around 23% (501 tonnes) by weight and 19% (five million) by value to the production from prawns. (*Valued using Sydney fish markets value and NSW fisheries statistics. Fishers do not agree with the use of Sydney Fish markets as the guide to the average price of prawns due to other methods of marketing bringing higher prices.*
(NSW *Fisheries management strategy; Estuary Prawn Trawl 2003*).

Since this time Botany Bay and Lake Macquarie were declared recreational only havens. Sydney harbour has been closed due to exceeding world health dioxin levels, these three areas were significant prawn fishing grounds.

- **CHANGES IN NSW TOTAL PRAWN WILD HARVEST:**

Total School prawn harvest has dropped in NSW as follows:
2003-04 635 tonnes; 2004 – 05 547 tonnes; 2005-06 483 tonnes.

- **CHANGES IN NSW AQUCULTURE PRAWN HARVEST:**

Total Aquaculture prawn harvest has dropped as follows:
2003-04 363 tonnes; 2004- 05 294 tonnes 2005 – 06 241 tonnes.

- **CHANGES IN GENERAL IN THE 2006 FISHERIES STATISTICS:**

In Australia the total volume of Australian Fisheries production fell by 37,300 tonnes or 13%.

In NSW the gross value of fisheries production fell by 12.3 million to just under $120 million in 2005-06.

The gross value in the wild catch sector fell by from 83.6 million in 2004-05 to $74.6 million in 2005 -06.

The fall in figure identified as a result of a fall in production of several key species including king prawns, abalone, (Total allowable catch reduction), and sea mullet.
(Abalone are also under threat from disease).
(Abare, Australian Fisheries statistics 2006)

3. THE HAWKESBURY PRAWN TRAWL FISHERY:

- **Hawkesbury River Fishery Endorsements:**

The Hawkesbury river trawl fishery has approximately 50 endorsed fishing businesses, managed under the Department of Primary Industries and the various Fisheries Legislative Acts and regulations. It is a share managed fishery and a single method fishery. Within these endorsements, there is 'latent' effort and also fishers who only work a few weeks of the year in the fishery.

- **Area of operation:**

The area of fishery operation is from a line drawn across the river at Barrenjoey Headland. It includes the main river upstream to Lower Portland Ferry. Harvesting occurs five days a week, however, public holidays were recently removed to appease recreational fishers without consideration of the viability of the industry and climatic conditions.
It is estimated that less than 4% of the river is accessed by the industry on any one day. Only 46% of the river is accessible to fishers. This means that 56% of the river area is permanently closed to commercial fishing. The areas that are closed are there to protect the biodiversity, fish habitat and nursery areas. The fishery primarily targets school prawns *Metapenaeus macleayi* , Broad squid, *Photololigo etheridgei,* Bottle Squid, *Lolious noctiluca* and is allowed to keep a selection of by products such as Silver Biddy, Trumpeter Whiting and Blue swimmer crabs. *(a full list is available in the Fishery Management strategy 2003)*

- **Environmental Management Strategies:**

Environmental impact assessments, management strategies and management plans are in place for the fishery. Although environmental external impacts are included,

departmental managers have prioritised and clearly concentrated on the industries environmental impacts. This means, boat size restrictions, net size and net mesh size restrictions are in place. By-catch exclusion devices are mandatory.
By product permitted to be retained is itemised and monitored and assessed against recreational fishing activities. *(See Appendix B of the Estuary Prawn Trawl Fishery EIS*)

- **Quality of the Product:**

The Hawkesbury River prawn and squid fishery commands top prices for the quality product harvested. Most fishers sell direct to wholesalers or the retail sector. Both target products (prawns or squid) are well sought after and are sold as a food product or as a bait product for recreational fishing.
The fishery is the only estuarine squid fishery and the second highest producer of estuarine school prawns in the state. The Clarence River and Hunter Rivers also have prawn trawl fisheries.

- **Developments within the Catchment:**

Water management and effluent disposal in conjunction with population growth and climatic conditions within the Hawkesbury Nepean catchment, all affect the fishery.

4. **THE HAWKESBURY NEPEAN RIVER CATCHMENT**

Issues: Climatic affects and population growth impacts on the productivity of the estuary and ocean

BACKGROUND:
There are 21 significant dams and 13 weirs in the Hawkesbury Nepean catchment of 22,000 square kilometres. Drinking Water is extracted for the city of Sydney and towns within the catchment.
Water is extracted for Industry, agriculture and riparian access use. Water supplies are managed by Sydney Water Corporation and several Local Water utilities such as local government as well as private operators who have pumping rights. A multitude of ground water bores exist, all of these extractions are interrelated to estuarine condition and the productivity of the estuary and the ocean.

2005 -2007 Droughts continues:
Due to climatic conditions, and an extenuating drought, in 2005-06 and 2006-07, Warragamba Dam dropped below 42% capacity, the city was placed on full water restrictions, what environmental flow releases existed, ceased. Human water requirements were prioritised over the environments water needs.

Water for Richmond's and Windsor's water supply initially continued to be released from Warragamba dam to be extracted from the river via the drinking water treatment plant located downstream of the Winmallee STP outfall. Irrigation demand increased for agriculture and local turf farms from Penrith to Windsor.

The 2004 Hawkesbury Nepean River Management Forums (HNRMF) recommendations were re evaluated and some were being introduced. The HNRMF was required to evaluate environmental flow objectives to be released from eight of the dams in the upper catchment. To provide environmental flows to the various rivers, an evaluation of the capacity of the catchments dams for security of drinking water supplies was required.

The continuing drought conditions meant that critical water management strategies needed to be implemented and decisions to transfer water from the Shoalhaven River needed to be used as the backup for Sydney's drinking water supply, from Warragamba Dam. Pumping from the Shoalhaven River commenced, subsequently keeping Warragamba Dam at inflated levels.

During low flow (drought conditions), ninety percent of the flow in the Hawkesbury Nepean River is from tertiary treated effluent in the vicinity of Penrith, Windsor and Sackville. This area is the nursery area for migratory fish species including the school prawns harvested by commercial fisheries.

Gosford and Wyong's water supply was also critical, both the Mooney Mooney Dam and the Mangrove creek dams dropped to critical levels. No environmental flows are provided from these dams to the rivers. Goulburn's water supply likewise became critical.

Note: Due to low flows in the Murray Darling River, dairy farmers could not access water from Lake Albert. This resulted in Dairy herds being sold from farms that have been in existences for over 100 years.

5. DISCUSSION:

- **Sydney and Greater Sydney Metropolitan Growth Planned 2005-06-07**

There are new management plans for the growth of Sydney. Water sharing plans are now underway for the Hawkesbury Catchment, Sydney and the rest of the coastal NSW catchments. These processes and subsequent management decisions will be critical for the productivity of estuaries, rivers and bays across NSW. The management of environmental water and the prospect that water will go to the highest bidder offers little comfort to the commercial fishing industry that relies so heavily on fresh water flows but has absolutely no control over them.

Hornsby Shire for example: As a result of the Metropolitan Strategy, Hornsby and Ku-ring-gai areas are grouped together to form one of ten subregions. Hornsby and Ku-ring-gai form the North Sub region and are required by the State Government to provide additional 21,000 dwellings over the next 25 years.

For each of these dwellings water and effluent will need to be managed in an area that does not lend itself to recycling due to the topography of the land.
The New Brooklyn, Mooney Mooney Sewerage Treatment plant that will be releasing its treated effluent into the Hawkesbury River at Brooklyn Bridge is an example of the issues in this area. Sydney water claimed that this outfall will not affect industry. Insufficient research has been completed, the precautionary principle is ignored, and the Commercial fishing industry will contend with an exclusion zone for cooking prawns in the area. There is insufficient evaluation of impacts in a neap tide, changes to salinity and acceptance to migration of zooplankton and fish in the channel.

Sydney North and South West Sectors: Major releases of land are planned for the North and South West Sectors of Sydney these developments will encompass 160,000 homes by 2030.

- **Recycling Water and environmental water to allow development:**

With water levels critical, the Sydney Growth Commission forges on with studies and plans completed and a new set of strategies to be implemented. The North and South West sector developments are in the Hawkesbury catchment and will impact the Hawkesbury River environs.
Private property partnerships agreements are legislated to enable tapping into Sydney's tertiary treated effluent mains. Little debate is occurring with the disposal of brine that may be disposed of as a result of these agreements.

- **The Western Sydney Recycle scheme**:

The Western Sydney Recycle scheme is another example of the impacts to the Aquatic environment from critical Infrastructure development that Sydney Water claims will not impact the commercial fishing Industry.*(See M. Howard submission attached.)* There needs to be good science and appropriate guidelines and management practices with the disposal of bio-solids and brine into catchments. The issues are not sufficiently discussed or highlighted in relation to direct impacts on the aquatic environment in the 2006 Metro Water Plan or the proposed Western Sydney Recycle scheme.

Environmental assessments for approvals of effluent and disposal into the ocean and river have been based on set dilution levels. Changes to the levels and concentrations by new methods using reverse osmosis treatments has the potential to increase the disposal of salt, pharmaceuticals, hormones and fragrances (PPCPS) into existing outfalls as water is extracted for recycling objectives and moved from one outfall to another and per head of population increases.

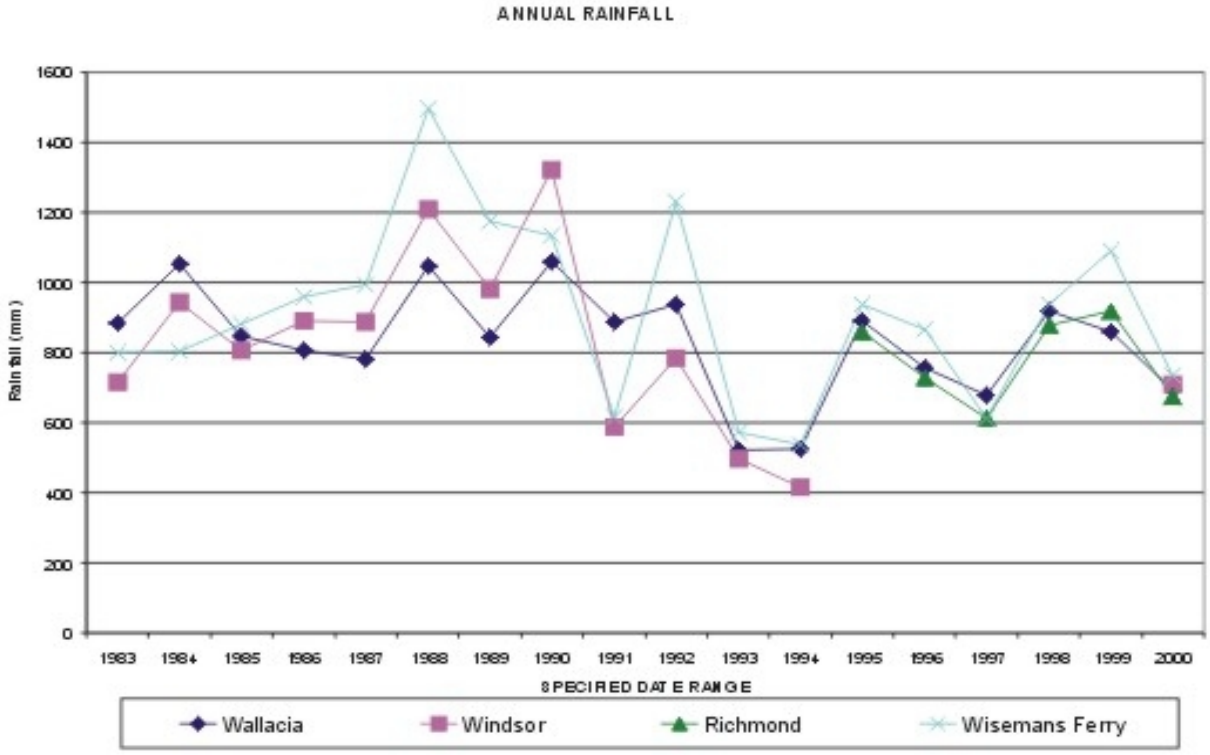
Existing Guidelines have allowed approved effluent disposals to occur, the Western Sydney recycle scheme is expected to discontinue disposing 100 tonnes of nutrients a year into the Hawkesbury River. Where will these nutrients end up?

- **Cumulative impacts to river and estuarine condition:**

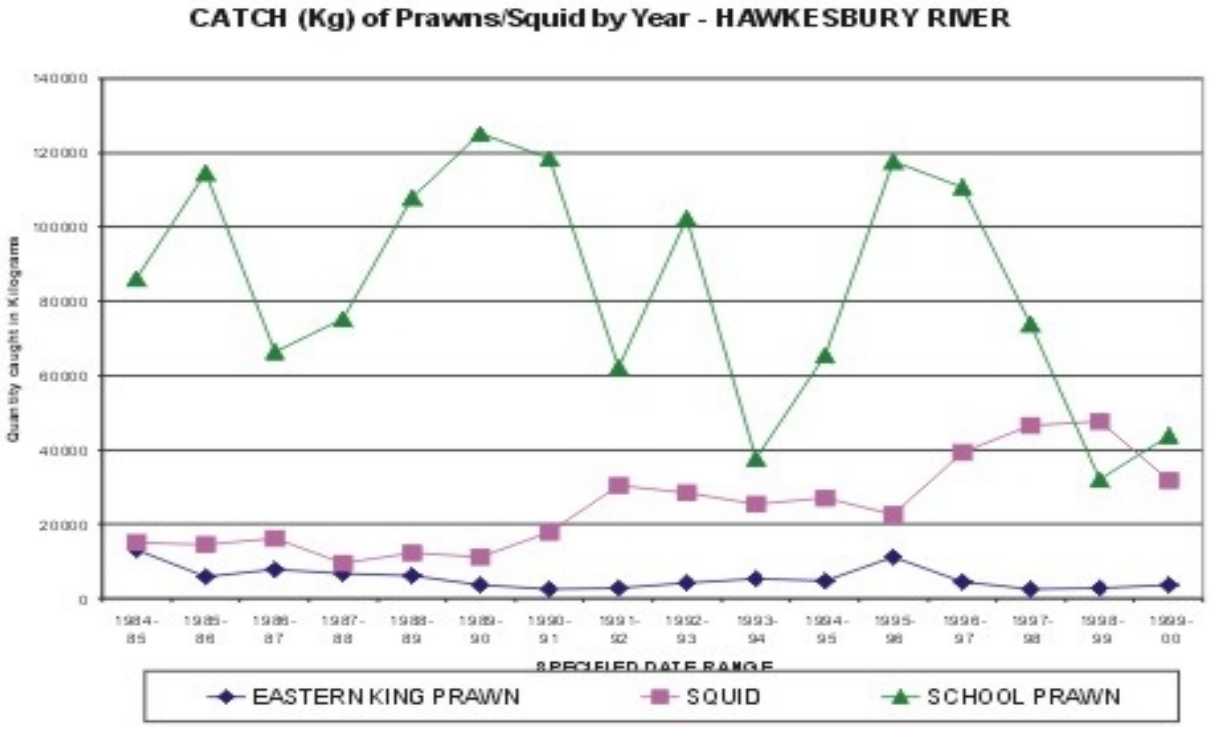
It is essential that there is a maintained environmental flow in the Hawkesbury Nepean River to compensate for the disposal of all tertiary treated effluent that will continue to be disposed of into the river above and below the weirs.
Human Pharmaceuticals, Hormones and Fragrances can be toxic to fish and their larvae; numerous studies are available on these (see *attached M.Howard Submission to Sydney Water*)

(Human Pharmaceuticals', Hormones and Fragrances; T Ternes, A.Joss)
Inadequate fresh water occurrences, cumulative impacts of dams, bores, and direct river irrigation pumping and the proposed increase per head of population in Western Sydney may well compound the toxic impact from years of effluent disposal in this region and the ongoing disposal from existing tertiary treatment plants and the priority sewerage program implementation.

Prawn Trawl catches are affected by Rainfall events:
Hawkesbury catchment:



Catch graph comparison to rainfall 1984 to 2000



5. DISCUSSION CONT:

- **Aquatic Productivity**

Productivity of the whole aquatic ecosystem is linked to moon phases, the movement of the sun (seasons) and fresh water events. As the world spins, one doesn't go without the other in the tidal movement. Changes to salinity and temperature linked to freshwater events are triggers to why fish, crabs and prawns move down stream or breeding occurs. In floods the systems are cleansed and replenished with food and oxygen so necessary for survival and reproduction. Many fish including prawns have lots of eggs (high fecundity) for the survival of the species. Survival in an aquatic environment of larvae and zooplankton are essential components for multiplying the food chain and increasing the productivity of water ways. Fish eat fish and migrate through whole estuarine and ocean systems.

Phytoplankton likewise is essential for survival of the zooplankton for example. Healthy Water, salinity and water temperatures and oxygen are crucial components to the health of all aquatic species which in turn is affected by climatic conditions.

- **Water Temperature in the Hawkesbury River.**

The Hawkesbury Rivers water temperature on average has been reported as recording 2 degrees warmer during 2006-2007. *(Derek Channon 2007*).
Temperature changes and low flows influence impacts to the aquatic environments, such as the frequency of Blue Green Algae outbreaks, increased weed growth in nutrient enriched water, changed chemical reactions, an increase to nitrate and nitrite impacts, reduced availability of oxygen and stratification can occur, subsequently there is reduced productivity.

- **Dam influences to productivity:**

Commercial fishers claim that the construction of Warragamba Dam changed the productivity and historic catches of the Hawkesbury prawn fishery. The construction of Tallowa Dam and changes to the mouth of the Shoalhaven River resulted in the decline of the prawn trawl fishery that worked off the mouth of that River.
Recent Studies just completed on the Clarence River clearly show the connectivity between prawn trawl catches and freshwater events. (NSW Fisheries research 2007).

In New Zealand studies have shown that freshwater flow alone can affect estuarine communities, independently of nutrients, contaminants, or suspended solids. (*Hayward, B.W., H.R. Grenfell, A.T. Sabaa, M.S. Morley and M. Horrick*s.)

Care is required to address the needs of the Aquatic environments across all sub catchments, rivers estuaries and the ocean. More and More water will be retained by humans as population growth continues.
The existing infrastructure and impacts from existing developments are based on ANZECC or World Health guidelines how accurate these are in the face of warmer water temperatures is of concern.

5. DISCUSSION CONT:

- **Greater Metropolitan Areas Effluent Disposal:**

There are 17 inland sewerage treatment plants (STPs) depositing in excess of 200 mega litres of effluent a day into the Hawkesbury Nepean River system, and 10 coastal STPs depositing over 50,000 tonnes of suspended solids and between 350,000 to 400,000 mega litres of effluent to the ocean outfalls.
(Sydney Water Annual Report 2005)

Sydney Water is investing millions of dollars in completing its Priority Sewerage program across Sydney.
The recent Brooklyn, Mooney Mooney Sewerage Treatment Plant is a source of concern as its outfall is located under the Brooklyn Road Bridge. The river is some 500 metres wide at this point and is the channel that migratory species must go through as they make their way up and down the river. Sydney Water did not evaluate sufficiently the affects of this outfall and it's Plume on the fishing Industry. Climatic changes, temperature changes, zooplankton survival and tidal effects are all unanswered issues. Environmental Assessments and legislative criteria are not sufficient to protect the industries interests. The Precautionary Principle appears to apply only when it suits.

The Western Sydney recycle Scheme proposes to replace the planned environmental Flows from Warragamba Dam (*Hawkesbury Nepean River Forum recommendations 2004*) with recycled effluent.
Sydney Water claimed in the environmental assessment of the proposal that the proposal would not affect the fishing Industry. The EIS was inadequate in its assessment of the impacts to migratory species, water allocation balance and subsequent changes to South Creek which is planned to continue as a drain.

Any changes in management of water in the river system can and does impact the Aquatic ecosystem especially migratory species and zooplankton. Chemicals and pharmaceuticals in the environment are not adequately addressed. (*see submission Howard to Sydney Water) and (State of the Science in Australia - Chemicals of concern in Wastewater Treatment Plant Effluent).*

There are significant Hydrological issues with the changes of flows in the South Creek, Windsor area.
The Salinity wedge primarily functions around Sackville. Effluent discharges from South creek and Cattai Creek influence the condition of water quality at the interface of the 'wedge' Fishermen expressing concern that eels when caught in the region do not survive well and appear to be distressed before being caught. Eels are generally kept live and placed in live tanks.

- **Tertiary effluent flow impacts 2004 -05- 06 – 07.**

Effluent discharge has become the primary flow in the upper reaches of the Hawkesbury River in these years. While Sydney water is required to comply with guidelines, these guidelines are clearly not adequate in times of low flows and low rainfall events.
High Nutrients loads are of concern, (Sydney Catchment Authority report 2005) so too are chemicals and pharmaceuticals that are claimed to be low but have been cited as exceeding recommended guidelines in some instances.

Sydney Catchment Authorities records clearly demonstrate that below Sydney Water outfalls nutrient readings are exceeding guidelines in many instances. *(SCA annual report 2005*)

Commercial fishers now have an exclusion zone to contend with when harvesting and cooking prawns in the vicinity of the new Brooklyn sewerage treatment outfall to satisfy Safe food requirements.

DISCUSSION CONT:

- **Climate and Weed Growth:**

Warm water, low flows, and high nutrients result in excessive growth of Salvinia on the surface of the Hawkesbury Nepean River and Egeria densa in the water column. Other weeds such as alligator weed also spread in the upper reaches. Over a Million dollars was required to clean up the growth of Salvinia that spread down the Nepean and Hawkesbury Rivers. NSW Government agencies were complacent in recognising the issue, many agencies ignoring their responsibilities. Commercial fishermen had taken samples of *Egeria densa* to the NSW Fisheries office, at least 8 years prior and were directed to the Department of Agriculture all to no avail it appeared as though no one had responsibility for Aquatic weeds in fresh water.

Egeria densa is a significant weed that affects fishing operations and can out grow native grasses. It is prolific in warm water and low flow conditions; it will spread across the river bed.

Salvinia likewise is a prolific weed that spreads rapidly through the river system with warm weather and low flow conditions.

These weeds spread downstream and become entangled in nets in large quantities. This affects the viability of the fishery requiring fishers to move downstream from local and peak trawl grounds. Labour is increased, travelling and trawl hours are affected.
Egeria densa is also instrumental in slowing the current and subsequently silting increases will occur.

With the change of climatic conditions in December 2007, intense storm activity has moved
Egeria densa further downstream, it can be located in the tidal channel from Lower Portland to Laughtondale following intense storm events. Fishermen working generally in the Lower Portland reaches are now travelling to below Wisemans Ferry to be able to harvest prawns without major weed loads in their nets.
Egeria densa is an exotic aquarium weed introduced into Australia. It also is prolific in the Clarence River.

- **School Prawns migration pattern:**

School prawns migrate through the whole system spending most of their juvenile time in the upper reaches of the river then travelling down to the ocean for breeding and

releasing larvae, this larvae after completing its Metamorphosis stage, in turn, makes its way back up the river.
The river is closed above Lower Portland Ferry to trawlers. This allows the migrating prawns to grow. The prawns are caught in spring, summer and autumn as they migrate upstream and downstream. There is inadequate appreciation of the value of the species in the areas closed to access by fishermen. This is the resource the industry catches as it grows and migrates through the system

Oyster production loss:
The QX virus decimated the Sydney Rock Oyster Industry in the Lower Hawkesbury River and Broken Bay
Studies have revealed that the virus inhabits a worm found in the River; however it is still not known just how this event, the climate and the general overall conditions of the river interrelate.

There have been no environmental flows from either Mangrove or Mooney Mooney Dams which are upstream from the oyster farm beds. With the Drought continuing the likelihood of flushes of fresh water down these river systems is reduced as water demand increases.

DISCUSSION CONT:

- **Fire:**

With increasing temperatures there are increasing fire risks. There are several major National parks in the Hawkesbury catchment. Major Fires occur and subsequently the ash washes into the Hawkesbury- Nepean River. Ash can severely impact water quality. There were major fires in the Brooklyn area prior to the Oyster virus outbreak.

- **Blue green Algae:**

High Blue green Algae occurrences during the trawl season results in lost income for fishers who cook their product. It is essential that cooking is discontinued until the river receives the green light again.

The monitoring and graphing of Blue Green algae occurrences and river health should be evaluated for indications to how the river is responding to increased temperatures and nutrient loads.

The impacts from Blue green algae contamination go further than human health issues and needs to be viewed as a threat overall to the Aquatic ecosystem productivity.

- **River depths changes:**

The depths of the Hawkesbury River are changing. The river is silting up in many areas as a consequence of reduced flow activities. Verification of some of the changes can be found in the Geomorphology papers reported to the Hawkesbury Nepean River Management Forum.
There is a need to update and provide a detailed analysis of the present channel widths and depths of the Hawkesbury Nepean River system to verify claims of channel depths too low for navigation.

- **Environmental Flows:**

There are no environmental flows being released into the Hawkesbury Nepean River from Warragamba Dam due to the low levels of the dam.

It is essential that environmental flows are introduced into the Hawkesbury River; these flows should come from the Warragamba spillway as well as the Western Sydney Recycle scheme when completed. The Warragamba River needs environmental flows as well as the Nepean River before 2015.

Flows should at least commence in 2009 and be maintained as a constant flow and a variable flow consistent with rainfall events. Due to the level of weed growth and silting of the river bed it would seem sensible to allow a significant flush of water to continue down the river to reduce the invasive weed problem as soon as possible.

- **Catchment Management Authorities**

The development of catchment management authorities has assisted in focusing communities and governments from national, state, and local into developing a common objective to improving catchments.

Funding security and availability for the future is an issue and will remain an issue especially in the coastal catchments where catchment condition issues are diverse and constant.

The Hawkesbury Nepean catchment management authorities Healthy River strategy is linked to the Standards and targets that the catchment action plan complies with and is audited on.

All relevant state agencies should be linked to the same standards and targets so as to follow through to all developments on a catchment wide improvement target and recognition of the overall responsibilities.

- **NSW Fisheries Legislation:**

There is a need to review the implementation of the Fisheries management strategy and management committee's effectiveness in receiving, commenting on and dealing with environmental impacts external to and affecting the industries viability.
Environmental concerns for the health of the Hawkesbury Nepean River have been identified in numerous reports spanning several decades, yet the river condition especially from below the Dam wall to Lower Portland has continued to deteriorate and cost millions of dollars in remediation.
Fisheries managers at Management Committee level have previously seemed disinterested in discussing, evaluating, or actively pursuing external impacts to commercial fishing.

- **Gross Pollutant traps:**

There is an urgent need for financial assistance for local governments to resolve the design, funding and installation of gross pollutant traps and improving management of diffuse water.

- **Recreational fishing impacts:**

There is no comprehensive species by species value or catch data available for NSW

The changes to Fisheries management in NSW have affected the allocation of the fisheries resource without adequate assessment of the impacts from recreational fishing and proper correlation to community value for local caught fish products.
There is various ad hoc economic impact and regional expenditure reports for various species or regions.
(Australian Fisheries statistics 2006)

- **Adjusting and removing (adjusting) commercial fishers - fair value of fisheries importance.**

With the subsequent claims of the need for adjustment to commercial fisheries the commercial industry has and still is often valued with little regard for the complexities of and on the management of the resource.

Tor Hundloe in 2002 identified in his book 'Valuing Fisheries (an economic framework)' the need to give some fair valuation when valuing fisheries.

One of the most significant issues when valuing the commercial fleet is the number of inactive endorsements that
exist which subsequently distorts the actual income of working fishers.
also
NSW Fisheries are guided by the Sydney Fish market prices, and it is this price that is utilised in ABARE figures.
This results in a further devaluation of the Hawkesbury prawn trawl fishery. The Fish market price is usually based on Clarence River prawns not Hawkesbury River prawns this significantly under values the Hawkesbury River prawn and squid fishery.

Figures and methods such as this are used to evaluate the worth of the commercial fishery to the recreational fishery and also land based developments so subsequently the commercial fishery will not survive because it simply cannot compete on the same playing field.

Conclusion:
There is a failure of all governments to fully appreciate or understand the impacts to Commercial Fisheries from climate change which has been occurring for more than a decade. Climate change and accommodating economic growth on land will and is affecting the overall productivity of the ocean, estuaries, rivers creeks and the viability and sustainability of the Commercial Fishing Fleet. Government and the community will continue to blame a commercial fisher for the depletion of fish stocks and overfishing before recognising that the survival of zooplankton, fish larvae and the cycle of fish breeding and migration are affected by the availability of fresh water occurrences, oxygen, temperatures, human water consumption, effluent disposal and levels of chemical contamination.
Fish productivity and survival is lost in the water management debate, this denial devalues the commercial fishing industry by creating less productivity, lost income and viability then becomes an issue followed by restructure.

SUMMARY

a) The likely consequences of human – induced climate change on land (including salinity), water and other natural resources.

- Fresh water events to Aquatic ecosystems are reduced.
- Water extraction for humans increases and exasperates low flows to rivers estuaries and oceans.

- In drought effluent disposals to estuaries and oceans are constant flow events and major percentage of receiving flows.
- Chemical imbalances will be increased.
- High nutrients in waterways and the ocean occur especially where main flow is from Sewerage treatment plants.
- Aquatic weeds invade river systems.
- Siltation and low flows disrupt normal estuarine functions and restricts navigation.
- Land erosion increases.
- Salinity levels rise.
- Ground water reduced.
- Foreshores of estuaries change resulting armouring of foreshores to stop the pace of the erosion.
- Fish breeding, migration and survival are affected.
- Zooplankton and phytoplankton survival is challenged from low flows, chemicals, salinity temperature etc.
- Algae become toxic especially with constant effluent flows.
- Population growth requires alternative water supply.
- Privatisation of effluent recycled water access occurs.
- Growth continues on the basis that water can be sourced from a multitude of areas by increasing
  the science, treatment and alternatives for water use and reuse.
- The total productivity of aquatic ecosystem is reduced due to the reduction in environmental water and fresh water events.

(b) ***Options for ensuring ecologically sustainable natural resource use, taking into account the impacts of climate change***

- Total Water cycle management remains a priority for the environment.
- Must recognise that fish productivity is affected with all water management.
- Population Growth: evaluations to recognise the impacts of chemicals and Pharmaceuticals in water and the subsequent increase in per head of population impacts to existing Sewerage treatment Plants disposals.
- Expand environmental education and labelling messages for Pharmaceuticals and fragrances.
- Ensure acceptable levels of chemical and Pharmaceutical in bio-solids and brine which can adversely affect fish breeding and fish health which subsequently is a food source for humans.
- Value commercial fisheries appropriately recognising the constraints that impact the industry.
- Conduct credible recreational fishing environmental impact assessments.
- Address cross contamination of rivers, that occurs with the diverting of water to different catchments and rivers.
- Protect environmental flows especially where the main flow in thr river becomes a constant tertiary sewerage treatment flow in drought.
- Assess the acceptable level of Tertiary Treated effluent to rivers and estuaries, how much is too much especially in drought conditions. Environmental assessment need to assess total impacts.
- Maintain standards and targets for improved land and water management.

(c) Approaches to land and water use management practices on farms and other natural resource management practices, having regarded in particular to the role of such practices in contributing to climate change or as a tool in helping climate change.

- Continue to support the national water initiative, however question that water should only go to the highest bidder. Will Industry out bid Agriculture, how do small farms survive.
- Continue Catchment Management Authorities and Catchment Action Plans, standards and targets and ensure all government agencies are committed to the same standards.
- Link Local environmental plans to Catchment Action Plans and standard s and targets.
- Ensure that National, State and Local governments cooperate and collaborate.
- Ensure effective guidelines for chemicals, Pharmaceuticals and fragrances in the environment.

(d) The effectiveness of management systems for ensuring that sustainability measures for management of natural resources in NSW are achieved, having particular regard to climate change.

- Ensure that legislation for Fisheries managers can address the concerns of fishermen with regard to impacts on the environment that influence fish survival, migration, foreshore erosion, chemical contamination, environmental flows, aquatic weeds, foreshore reeds protection etc. In whole systems.
- Ensure appropriate action is taken for reducing the mortalities and waste from recreational fishing by-catch.
- Review the practice of stocking fish in estuaries primarily for recreational fishing.
- Evaluate the impacts to fish stocks for commercial fishing and general human consumption.
- Ensure adequate chemical and pharmaceutical evaluations and guidelines for the environment are in place and are effective.
- Assess the present and acceptable ratio of effluent, chemical and pharmaceutical disposal levels to estuaries and the ocean for environmental health as well as human health having regard to the fact that humans eat fish.

(e) *The likely consequences of national and international policies on climate change on natural resource management in NSW.*

- Note the length of time that NSW has been managing its Commercial Fisheries and the major constraints and reduction of effort that has occurred over this time.
- There is more to the adjustment of commercial fishing than over-fishing of fish stocks or by-catch of the fleet. Human impacts in water and land management are significant.
- The reduction to the actual area of fishing ground each fishery can access. (compare this to the whole ocean area.)
- Australia considers it is leading the world in Fisheries management, yet its borders are being broached continually because of the fish that is in them.
- Change the fisheries legislation and the recreational fishing fund ability to raise funds to buy out commercial fishers. This is a bias management regime that gives one sector of the community a power over another sector of the community and creates bad blood within communities and on the water. There has to be another way to mange this process. Commercial fisher numbers cannot politically ever be the majority but their products is relied on for the majority of consumers.

- Commercial fisheries are being reduced, restricted, removed and constrained to expand and develop recreational fishing numbers with no environmental assessment for recreational fishing impacts who catch commercial quantities of fish.
- Recognise that the whole country and the world are relying on fish for food. Contamination of waterways from chemicals is a major issue that needs to be addressed, especially the importation of 'Old system Chemicals' that have not been assessed for acceptance to environmental and human health – climate change makes these impact worse.
- Recognise that climate change and land, water and chemical management can and does affect fish productivity and therefore affects commercial fisher's incomes.

REARCH:

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Chemicals of concern in Wastewater Treatment Plant Effluent. State of the science in Austrlaia.
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ATTACHMENTS: M. Howard Submission to Western Sydney Recucle Effluent Scheme
M. Howard powerpoint presentation re Fisheries and management.