Tweed Shire Council

Banora Point and Tweed Heads West WRPs Reclaimed Water Management Strategy EIS

Representations Report

November 2005

Contents

Table Index

Appendices

1. Introduction

1.1 Outline of Project

Tweed Shire Council (Council) are assessing options to upgrade two of its existing Water Reclamation Plants (WRPs) at Banora Point and Tweed Heads West. The Tweed Heads West Plant was constructed in the 1960's and has expanded over the years to a capacity of 10,000 equivalent persons (EP). The Banora Point WRP has been in operation since 1978 and has a capacity of 50,000 EP, with a present loading of 42,000 EP.

Both plants discharge reclaimed water into Terranora Creek downstream of the Dry Dock on the ebb tides.

The need for a new reclaimed water management strategy may be summarised as follows:

1. To improve reclaimed water quality in order to meet the DEC effluent quality criteria, and hence comply with the conditions of the DEC Catchment Licence.
2. To provide sewerage services for the predicted increases in population in the WRP catchment area.
3. To meet community expectations.

In 1999, a technical, environmental and financial analysis of effluent disposal options was undertaken (Egis, 1999) for an effluent disposal strategy for the catchment based on the outcomes of a community consultation process undertaken in 1998.

The study identified two viable effluent disposal strategies:

- Improve effluent quality at both plants and continue to discharge to Terranora Creek at the current discharge points on ebb tides; or
- Move the discharge point to the Tweed River and discharge effluent on ebb tides (with or without improved effluent quality).

From a consideration of environmental and social issues and costs Council's preferred strategy involved retaining the existing discharge points and upgrading the effluent quality.

In 2003, Council engaged community consultation consultants, 4Site Co Pty Ltd to present the results of the Effluent Disposal Options Report (Egis, 1999) and to facilitate community and stakeholder endorsement of the preferred disposal strategy. A Community Reference Group (CRG) was established during this phase comprising representatives of Council, environmental organisations, surfing organisations, fishing organisations, Tweed Byron Local Aboriginal Land Council and the broader community.

In summary, the consultation program drew a poor response to numerous and diverse strategies to engage the community. The response from the CRG meetings was generally as follows:

- Objection to effluent disposal to Terranora Creek; and
- Maximise reuse.

In 2004, Council commissioned GHD to re-engage the community and seek community input on new strategy options and to seek community endorsement of a preferred strategy. A series of two options evaluation workshops were undertaken with the CRG to seek their input in determining a preferred strategy.

A total of 9 new reclaimed water management strategy options were presented, each considered by the CRG using a qualitative evaluation process where each option was assessed against twelve assessment criteria that were agreed upon by the CRG.

Based on the findings of the Community workshops, Council decided to proceed with the implementation of Option 6 in the short term and Option 9 as a future strategy to investigate, as a short and longer term strategy will go some considerable way to address many of the issues raised by the CRG.

This EIS therefore investigates the environmental impacts of implementing Option 6, which comprises:

- Enhancement of effluent quality to reuse standard;
- Promotion of beneficial reuse for domestic non-potable uses in new developments;
- Capital investment in catchment rehabilitation; and
- Discharge of unused water to Terranora Creek.

1.2 The Proposal (description – construction and operation)

The scope and description of the major components of the proposed works are as follows:

- Upgrade Banora Point WRP to 75,000 EP and enhancement of Banora Point and Tweed Heads West WRPs effluent quality to reuse standard for domestic non-potable reuse (section 9.2);
- Implement an Effluent Reuse Strategy including the encouragement of beneficial reuse for domestic non-potable uses in new developments (section 9.3);
- Implement the Integrated Water Cycle Management Plan (section 9.4);
- Capital investment in a Terranora and Cobaki catchment rehabilitation program (section 9.5); and
- Discharge of excess water to Terranora Creek on the ebb tide (section 9.6).

It is proposed that whilst Tweed Heads West WRP is being demolished and rebuilt, sewage will be pumped to Banora Point WRP for treatment.

Both plants are expected to be commissioned in early 2008.

1.3 Statutory Approval Process

In New South Wales, environmental assessment of proposed development is prescribed by the *EP&A Act 1979* and *EP&A Regulation.* Environmental assessment is undertaken under one, or both of parts 4 and 5 of the *EP&A Act*:

- **Part 4 -** where development consent is required from a consent authority; or
- **Part 5 -** where development consent is not required and a determination to approve the activity is made by a determining authority.

1.3.1 Assessment under Part 5 of the *EP&A Act 1979*

SEPP No 4, (Clause 11 (1)), allows public authorities to undertake certain developments, that would otherwise require development consent, without that development consent. Further information on SEPP 4 is provided in Section 1.5.

As TSC, a "public authority", is undertaking the proposed works and the proposed works can be appropriately described as "*sewerage treatment works*", then the provisions of *SEPP 4* are applicable.

The proposed project does not require development consent and has therefore been assessed under Part 5 of the *EP&A Act, 1979.*

Nominated Determining Authority

Under Part 5 of the *EP&A Act 1979* there are two potential determining authorities with respect of this proposal, namely the following:

- DEC; and
- DIPNR.

Section 110A of the *EP&A Act 1979* provides for the Minister for Infrastructure, Planning and Natural Resources to select one "nominated" determining authority, where there is more than one.

Gazetted on 21 May 1999, the Minister in pursuance of Section 110A of the *EP&A Act 1979* nominated the determining authority that is the proponent of the activity, within the meaning of Part 5 of the *EP&A Act, 1979* to be the nominated determining authority for that activity.

Therefore, the proponent of this project, Council, is the nominated determining authority. The nominated determining authority is able to exhibit the EIS and receive submissions from the community on behalf of all determining authorities.

Need to Consider an EIS?

Under Section 111 and 112 of the *EP&A Act 1979* respectively:

- a determining authority is required to "examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the proposed development"; and

- "shall not carry out a development or grant an approval to that activity if it is likely to significantly affect the environment, unless the determining authority has examined and considered an EIS".

This EIS has been prepared because the proposed development has already been determined to have the potential to significantly affect the environment.

1.3.2 Assessment under Part 4 of the *EP&A Act 1979*

On consultation with DIPNR, reclaimed water re-use cannot be appropriately described as "*sewerage treatment works*" under *SEPP 4*. Therefore the provisions of *SEPP 4* are not applicable and any future effluent re-use proposed as part of the Banora Point and Tweed Heads West WRPs Reclaimed Water Management Strategy will require assessment under Part 4 of the *EP&A Act, 1979* requiring a development application to be submitted.

At this stage, reclaimed water opportunities have not yet been confirmed so a development application has not been submitted. It is envisaged that the Minister would make the approval of this EIS conditional upon Council confirming the opportunities for reuse and submitting a development application at that stage.

1.4 Commonwealth Matters

Commonwealth matters include the requirements under the *EPBC Act 1999*, for the protection of 'matters of NES', which include:

- World heritage properties;
- RAMSAR wetlands of international importance;
- Nationally threatened animal and plant species and ecological communities;
- Internationally protected migratory species;
- Commonwealth marine areas; and
- Nuclear Actions.

Under the *EPBC Act*, approval of the Commonwealth Minister for the Environment is required for actions that may have a significant impact on matters of NES.

No matters of NES have been identified in this EIS that will be impacted by the proposed development and therefore the approval of the Commonwealth Minister for the Environment is not required.

1.5 State Environmental Planning Policies

SEPP (State Significant Development) 2005

SEPP (State Significant Development) 2005, which was gazetted on 25 May 2005, prescribes that development that is development of a kind:

a. described in Schedule 1 or 2, or

b. described in Schedule 3 as State significant development,

is State significant development.

Under section 76A(9) of the *EP&A Act*, the Minister for Infrastructure and Planning is the consent authority for State significant development, where that development requires development consent.

This policy only applies to proposed developments that are assessable under Part 4 of the *EP& A Act* where development consent is required from a consent authority. The proposed development does not require development consent and therefore the provisions of this policy do not apply.

SEPP No.4 – Development Without Consent

SEPP 4 (Clause 11 (1), allows public authorities to undertake certain developments, that would otherwise require development consent, to be undertaken without that development consent, The Clause states as follows:-

- *Clause 11: Certain development by public authorities*

(1) Where, in the absence of this clause, development, being the construction of water storage dams, ***sewerage treatment works*** *or electricity transmission lines by or on behalf of a* ***public authority*** *may be carried out only with development consent being obtained therefore, that development may be carried out without that consent.*

As Council, a public authority, is undertaking the works and the proposed works can be appropriately described as "sewerage treatment works", then the provisions of Clause 11 of *SEPP 4* are applicable.

However, the effluent re-use component of the proposal cannot be described as sewerage treatment works, and therefore the provisions of Clause 11 of *SEPP 4* are not applicable. Therefore, this component of the proposal may only be carried out with development consent and a development application will need to be submitted.

SEPP 14 – Coastal Wetlands

The aim of this policy is to ensure that the coastal wetlands are preserved and protected for environmental and economic reasons. The policy applies to local government areas outside the Sydney metropolitan area that front the Pacific Ocean. The policy identifies over 1300 wetlands of high natural value from Tweed Heads to Broken Bay and from Wollongong to Cape Howe. Land clearing, levee construction, drainage work or filling may only be carried out within these wetlands with the consent of the local council and the agreement of the Director-General of Planning NSW. Such development also requires an environmental impact statement to be lodged with a development application.

A search of planning maps held by the Council found a number of *SEPP 14* wetlands in the vicinity of the proposal. This *SEPP* therefore does apply and has been addressed in the EIS.

SEPP No. 26 – Littoral Rainforests

This *SEPP* provides for the protection of littoral rainforests, a distinct type of rainforest well suited to harsh salt-laden and drying coastal winds. The policy requires that the likely effects of proposed development be thoroughly considered in an environmental impact statement. The policy applies to 'core' areas of littoral rainforest as well as a 100 metre wide 'buffer' area surrounding these core areas, except for residential land and areas to which *SEPP No. 14* - Coastal Wetlands applies. This *SEPP* does apply to the Tweed LGA.

A search of planning maps held by the Council found no *SEPP 26* littoral rainforests in the vicinity of the proposal. This *SEPP* therefore does not apply.

SEPP No. 33 – Hazardous and Offensive Development

This Policy provides for the control and proper consideration of development that is either 'hazardous' or 'offensive' and without adequate mitigation measures would pose a significant risk to, or have a significant impact on, the locality in relation to human health, life or property or the biophysical environment.

While this *SEPP* does not apply to proposals considered under Part V of the *EP&A Act*, it is demonstrated in the EIS that all chemicals will be stored in small quantities below the threshold for a potential hazard and meet the NSW DEC requirements for licensing.

SEPP No. 44 – Koala Habitat Protection

This Policy aims to 'encourage the proper conservation and management of areas of areas of natural vegetation that provide habitat for koalas, to ensure permanent, free living populations over their present range, and to reverse the current tend of population decline.'

In the event that the proposed development will impact on 'potential' or 'core' Koala habitat then an approved plan of management must be prepared and assessed by Council in conjunction with a development application. This *SEPP* does apply to the Tweed LGA.

Due to the proposed strategy not causing additional vegetation disturbance, no 'potential' or 'core' Koala habitat will be disturbed and therefore this *SEPP* does not apply to the proposed development.

SEPP No.55 – Remediation of Land

This policy relates to the remediation of contaminated land. Contaminated lands are defined in accordance with Part 7A of the *EP&A Act 1979*, which states that:

"Contaminated land means land in, on or under which any substance is present at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment."

A consent authority cannot consent to development on land unless it has considered whether the land is contaminated, and if it is then whether the land is suitable for the purpose for which development is proposed.

The area of the grit stockpile at the Banora Point WRP site is likely to be contaminated. This land is likely to be suitable for redevelopment subject to a site contamination investigation to quantify the extent of contamination and preparation and implementation of a remediation strategy. This has been addressed in Section 10 of the EIS.

SEPP 71 Coastal Protection Policy

The Policy has been made under the *EPA&A Act 1979* to ensure development in the NSW coastal zone is appropriate and suitably located. The policy intends to ensure there is a consistent and strategic approach to coastal planning and management and there is a clear development assessment framework for the coastal zone.

The policy prohibits certain types of developments from taking place within the coastal zone. The policy also designates the Minister for Infrastructure and Planning as the consent authority for particular types of large-scale developments and requires that councils take certain criterion into account when determining development applications.

The policy applies only to 'significant coastal developments', which are developments in 'sensitive coastal locations'.

'Sensitive coastal locations' include:

- land within 100 metres above mean high water mark of the sea, a bay or an estuary;
- land listed in Schedule 3 to the policy (no land is currently listed);
- coastal lakes, Ramsar wetlands and World Heritage areas,
- marine parks and aquatic reserves under the *FM Act*;
- land within 100 metres of any of the above;
- land reserved under the *National Parks and Wildlife (NP&W) Act*;
- *SEPP 14* coastal wetlands; and

While the discharge outlet is located in a sensitive coastal location, the application of this policy is precluded as the discharge is not considered a significant coast development as defined by Schedules 2 and 3 of the policy.

1.6 Regional Environmental Plans and Policies

North Coast Regional Environment Plan 1998

The *North Coast REP 1998* (REP) was made under the *EP&A Act* and provides the framework for detailed local planning by councils.

The REP provides local government with state and regional policy guidelines for the preparation of local environmental plans and for certain types of development and sets

the basis for new urban and rural development. The emphasis is on progress coupled with careful management. Amendments to the policy deal with heritage items, the NSW Coastal Policy and concurrence and consultation requirements in the REP.

Clauses of particular relevance to this proposal are:

Clause 13. Objectives

The objectives of this plan in relation to fisheries and catchment management are to preserve and enhance fishery habitats and associated catchments, and to promote the sustainable use of natural resources.

Clause 15. Development control wetlands or fishery habitats

The council shall not consent to an application to carry out development for any purpose within, adjoining or upstream of a river or stream, coastal or inland wetland or fishery habitat area or within the drainage catchment of a river or stream, coastal or inland wetland or fishery habitat area unless it has considered the following matters:

(a) the need to maintain or improve the quality or quantity of flows of water to the wetland or habitat,

(b) the need to conserve the existing amateur and commercial fisheries,

(c) any loss of habitat which will or is likely to be caused by the carrying out of the development,

(d) whether an adequate public foreshore reserve is available and whether there is adequate public access to that reserve,

(e) whether the development would result in pollution of the wetland or estuary and any measures to eliminate pollution,

(f) the proximity of aquatic reserves dedicated under the FM Act 1994 and the effect the development will have on these reserves,

(g) whether the watercourse is an area of protected land as defined in section 21AB of the Soil Conservation Act 1938 and any measures to prevent soil erosion, and

(h) the need to ensure that native vegetation surrounding the wetland or fishery habitat area is conserved, and

(i) the recommendations of any environmental audit or water quality study prepared by the Department of Water Resources or the Environment Protection Authority and relating to the river, stream, wetland, area or catchment.

Clause 32B. Development control – coastal lands

(1) This clause applies to land within the region to which the NSW Coastal Policy 1997 applies.

(2) In determining an application for consent to carry out development on such land, the council must take into account:

(a) the NSW Coastal Policy 1997,

(b) the Coastline Management Manual, and

(c) the North Coast: Design Guidelines.

(3) The council must not consent to the carrying out of development, which would impede public access to the foreshore.

(4) The council must not consent to the carrying out of development:

(a) on urban land at Tweed Heads, Kingscliff, Byron Bay, Ballina, Coffs Harbour or Port Macquarie, if carrying out the development would result in beaches or adjacent open space being overshadowed before 3 pm midwinter (standard time) or 6.30 pm midsummer (daylight saving time), or

(b) *elsewhere in the region, if carrying out the development would result in beaches or waterfront open space being overshadowed before 3pm midwinter (standard time) or 7 pm midsummer (daylight saving time).*

Clause 33. Development control - coastal hazard areas

Before granting consent to development on land affected or likely to be affected by coastal processes, the council shall:

(a) take into account the Coastline Management Manual,

(b) require as a condition of development consent that disturbed foreshore areas be rehabilitated, and

(c) require as a condition of development consent that access across foredune areas be confined to specified points.

Clause 43. Development control—residential development

(1) The council shall not grant consent to development for residential purposes unless:

(a) it is satisfied that the density of the dwellings have been maximised without adversely affecting the environmental features of the land,

(b) it is satisfied that the proposed road widths are not excessive for the function of the road,

(c) it is satisfied that, where development involves the long term residential use of caravan parks, the normal criteria for the location of dwellings such as access to services and physical suitability of land have been met,

(d) it is satisfied that the road network has been designed so as to encourage the use of public transport and minimise the use of private motor vehicles, and

(e) it is satisfied that site erosion will be minimised in accordance with sedimentation and erosion management plans.

Clause 81. Development control—development adjacent to the ocean or a waterway

(1) The council shall not consent to a development application for development on land within 100 metres of the ocean or any substantial waterway unless it is satisfied that:

(a) there is a sufficient foreshore open space, which is accessible and open to the public within the vicinity of the proposed development,

(b) buildings to be erected as part of the development will not detract from the amenity of the waterway, and

(c) the development is consistent with the principles of any foreshore management plan applying to the area.

(2) Nothing in subclause (1) affects privately owned rural land where the development is for the purpose of agriculture.

NSW Coastal Policy 1997

The NSW *Coastal Policy 1997* is the Government's policy for the coordinated planning and management of the NSW coastal zone. It aims to guide coastal zone planning and management by coordinating the various policies, programs and standards, which apply at both State and Local Government level including the NSW Estuary Management Policy under which the Tweed Coast Estuary Management Plan has been developed.

The Policy covers an area one kilometre landward from the low water mark, and extends three nautical miles out to sea unless, for the purposes of ensuring the effectiveness of a specific policy initiative, the definition requires adjustments or qualification.

The Council has a role in implementing the Coastal Policy under the *EP&A Act 1979* through the requirement to consider the provisions of the policy when making decisions on development applications and to take the policy into account where rezonings are proposed.

Council has taken this policy into account in preparing the LEP for Tweed Heads (Tweed LEP 2000).

NSW State Groundwater Policy (1997)

The NSW Groundwater Policy, consisting of a Framework Document and a set of three Component Policies addressing groundwater quality protection, groundwater quantity management and groundwater dependent ecosystems, was produced in recognition of the need for a clear government policy direction and coordinated approach to the improved management of groundwater. Ultimately, the policy aims to manage the State's groundwater resources so that they can sustain environmental, social and economic uses for the people of NSW. To achieve this goal, the policy has promoted a partnership approach between the community, industry and government to allow all key stakeholders to participate in the decision making process with respect to the management of groundwater resources. In so far as the policy is relevant and applicable, the proposed development will have regard to the policy content and demonstrate compliance.

Northern Rivers Catchment Management Authority Draft Catchment Action Plan (May 2005)

This Northern Rivers Catchment Management Authority (NRCMA) is chartered with developing a draft Catchment Action Plan (CAP) for the region. The draft CAP for the region (catchments of Tweed, Brunswick and Richmond Rivers) will become the regional business plan for investment in natural resource management for the next 10 years, and will be targeting those issues and locations where significant change is needed.

It is anticipated that the refinement process will be complete by July/August 2005 at which point a broader program of consultation will occur to enable input from the wider Northern Rivers community.

Following this consultation process the draft CAP will be finalised and submitted to the Northern Rivers community for review and to the Minister for approval and Gazettal.

The Catchment and Management targets relevant to the proposed reclaimed water management strategy include:

Urban Water Cycle Management

The CAP will reinforce the need for Integrated Water Cycle Management (IWCM) plans to be developed and implemented. IWCM is currently a Best Management Practice and is funded by State Government subsidy.

Council is currently preparing their IWCM plan which is expected to be completed by the end of 2005.

The proposed strategy is considered to meet the draft CAP by embracing the principles of integrated water cycle planning (i.e. whole of catchment approach to water management) in its preparation.

DEC Interim Environmental Objectives for NSW Waters

As part of the NSW Government water reform program announced in 1995, up to 11 interim water quality objectives for each of the 31 NSW catchments were recommended by the NSW Government. The objectives recommended for each catchment vary, as the recommendations are based on providing the right water quality for the environment and the various human uses of water in a particular catchment. By allowing for the determination of the appropriate water quality and river flow necessary to satisfy the objectives, the objectives can guide the plans and actions of each catchment's river, groundwater or water management committee.

Environmental objectives for the Tweed River were produced in 1997 and assign uses at strategic points along the entire river catchment. Terranora Broadwater has been identified as a site where the protection of aquatic ecosystems, primary contact recreation, secondary contact recreation and visual amenity values are desired. The water quality objectives identified for the Tweed Estuary are identical with the exception that, in addition to the aforementioned objectives, the protection of aquatic foods and commercial shellfish production is also considered important. By improving the quality of effluent released by the WRPs, the proposed development will allow the above water quality objectives to be realised and maintained.

Water quality objectives for the Lower Tweed Estuary and Terranora Creek are outlined in Water Quality and River Flow Interim Environmental Objectives; Guidelines for River, Groundwater and Water Management Committees – Tweed River Catchment (1999) NSW EPA, Sydney NSW.

Also, objectives adopted specifically by the Tweed River Committee (TRC) are set out in Tweed River and Catchment Interim Water Quality Management Plan (WBM, 2000).

1.7 Local Environmental Plans

1.7.1 Tweed Local Environmental Plan (LEP)

Clause 11 – The Zones

Both Banora Point WRP and Tweed West WRP sites are governed by the provisions of the Tweed LEP (LEP) 2000. Both sites are currently zoned 5a -Special Use. The provisions of 5a - Special Use are described in the LEP as being:

Zone Objectives:

Primary objective –

To identify land which is developed or is proposed to be developed, generally by public bodies for community facilities, services, roads, railways, utilities, and similar things.

Secondary objective –

To provide flexibility in the development of the land, particularly if it is not yet or is no longer required for the special use.

Development within the Zone:

Allowed without consent –

- Environmental facilities;
- Railways if on land indicated by red lettering as 'Railway' on the zone map;
- Roads, including road widening;
- Any use by or under the *Forestry Act 1916* for the purpose of State Forests if on land indicated by red lettering as 'Forestry' on the zone map

Allowed only with consent –

- Unless it is allowed without consent under Item 1, the particular use indicated by red lettering on the zone map and any development ordinarily incidental or ancillary to that use;
- Any use which is compatible with adjacent uses and with uses allowed (with or without consent) in adjacent zones;
- Public utility undertakings;
- Utility installations.

A sewage treatment plant is defined as an Environmental Facility.

The proposed project does not require development consent and has therefore been assessed under Part 5 of the *EP&A Act, 1979*.

Clause 34 Flooding

Objectives

- To minimise future potential flood damage by ensuring that only appropriate compatible development occurs on flood liable land; and
- To minimise the adverse effect of flooding on the community.

Where in the consent authority's opinion, land is likely to be subject to flooding, then it must not grant consent to development on that land unless it has considered:

(a) the extent and nature of the flooding hazard affecting the land, and

(b) whether or not the development would increase the risk or severity of flooding of other land in the vicinity, and

(c) whether the risk or severity of flooding affecting the development could be reasonably mitigated, and

(d) the provisions of *Tweed Development Control Plan No 5-Development of Flood Liable Land* and any other relevant development control plan.

1.8 Purpose of the Report

Under Section 113 (3) of the EP&A Act, *"A determining authority shall, as soon as practicable and not less than 21 days before carrying out an activity or granting an approval in relation to an activity, being an activity referred to in section 112 (1), furnish to the Director-General a copy of any representations made to it..."*

Under Section 113 (3A) of the EP&A Act, "The determining authority must, at that time, also forward copies of those representations to the Department of Environment and Conservation (DEC) if the activity is a scheduled activity under the *Protection of Environment Operations Act 1997*.

This report summarises all representations received during the EIS exhibition period, which should be furnished to the Director-General and the DEC in accordance with Sections 113 (3&3A) of the EP&A Act.

This report has been prepared in accordance with Sections 113 (3&3A) of the EP&A Act and will be taken into account during the determination of the EIS by Council in accordance with Clause 243 of the EP&A Regs.

1.9 Scope of the Report

In accordance with Section 243 (3) of the EP&A Regs, this Representations Report outlines the environmental impact statement process that has been completed (Chapter 2), highlights and addresses the key environmental impacts (Chapter 3) that may be experienced during construction and operational phases of the project and outlines the proposed mitigation measures that were outlined in the EIS. It also reports

on representations (Chapter 4) made by residents, businesses and government agencies.

2. Overview of EIS and Consultation

2.1 Scope of EIS

The primary objectives of the environmental impact assessment process may be summarised as:

- To identify and characterise the likely environmental, social and economic impacts associated with the construction and operational phases of the proposal;
- To determine the nature and extent of the likely impact;
- To identify mitigation measures to minimise the likely impact; and
- To seek and incorporate comments from all relevant Government Authorities, the community and stakeholders likely to be affected by, or have an interest in the proposal.

2.2 Consultation undertaken during the preparation of the EIS

2.2.1 Summary

Consultation undertaken during the preparation of the EIS with government authorities, stakeholders and the community included:

- Written consultation with the Director-General, Department of Infrastructure Planning and Natural Resources (DIPNR);
- A Planning Focus Meeting;
- Written consultation with selected government authorities;
- Distribution of 2 x Information Sheets to the community;
- A community information meeting; and
- Two Options Evaluation Workshops with the CRG;

Prior to the preparation of the EIS, relevant government departments and statutory agencies were consulted and requested to formally identify issues, which were considered in the EIS.

Table 1 identifies the government/statutory organisations, public organisations and local authorities consulted prior to the preparation of the EIS.

Table 1 Government /Statutory organisation, public organisations and local authorities consulted prior to the preparation of the EIS

Authority	Response
DIPNR, Assessments Branch	Responded with issues.
NSW DEC	Responded with issues.
Department of Lands	No response.
DEUS Far North Coast	No issues other than the requirement for approval under S. 60 *Local Government Act.*
DIPNR, Grafton Office	Responded with no issues.
RTA	Responded with no issues.
Department of Health	No formal comments.
Tweed Byron Local Aboriginal Land Council	No response.
Department of Primary Industries (NSW Fisheries)	Responded with issues.
Department of Primary Industries (NSW Agriculture)	Responded with issues.

Following preparation of the draft EIS, a draft copy was issued to the following agencies in Table 2 for comments. These comments were responded to and addressed during preparation of the Final EIS.

Table 2 Government /Statutory organisation, public organisations and local authorities consulted during the preparation of the EIS

Authority	Response
NSW DEC	No response.
Department of Primary Industries (NSW Fisheries)	Responded with no comments.
Department of Primary Industries (NSW Agriculture)	Responded with comments.
DIPNR, Grafton Office	Responded with comments.

2.2.2 Recent Consultation Part A

Council commissioned environmental and engineering consultants, GHD Pty Ltd (GHD) in 2004 to re-engage the community and seek community support on the preferred strategy option and to prepare an EIS process for the preferred strategy. In cognisance of the community's dissatisfaction with this option, Council asked GHD to present to the community an alteration to this option by the addition of funding to improve stormwater quality discharges into Terranora Creek.

Community Information Meeting No. 1

A Community Information Meeting was held on Wednesday 14th July at 7:00 pm to introduce the consultant team commissioned to prepare the EIS, provide background to the project, identify any new community interest in the project since the 2003 consultation phase, to introduce the revised strategy option and to seek preliminary comment from the community.

Invitations were sent to the CRG members of the previous consultation phase (refer Appendix C), a Community Information Sheet (refer Appendix C) was placed in letterboxes of residents of Banora Point and West Tweed Heads and an advertisement was placed in the *Tweed Link*, the weekly Council newsletter delivered to all ratepayers within the Tweed Shire.

Approximately 18 community members and three Council officers attended. The majority of community members that attended had been involved in the previous consultation phase and had a good background to the project. Participants stated that they were disappointed by the lack of interest demonstrated by the low attendance in this important issue.

Community members raised a number of issues during the meeting and these are summarised in Table 2-3 below.

Table 2-3: Summary of community issues raised during consultation

Issues Raised
Evaluation of options in the previous phase did not include options that were raised by the community
Both the 1995 and the 2003 consultation phases found that community want the discharge outlets moved
Council making no attempts to reuse water / options must consider land discharge
Algal blooms are occurring in Terranora Creek/ Reports have shown river is highly stressed
Concerned about the ability of the river to flush discharges from the plants
Concerned about the effects of flooding on the district and impacts on WRPs
EIS process being unduly rushed – should only continue following new studies of the health of the ecosystem

Issues Raised
Has stable isotope analysis (for sewage isotope) of fauna tissue been conducted previously or to be part of EIS?
ANZECC guidelines are not strict enough
Why is Council bringing stormwater into this project?
Can we still discharge on an ebb tide at 100 000 EP?
Shouldn't we be treating water to drinking water quality?
Terranora "E" development stormwater will be discharged into Trutes Bay
Concerned with cumulative impacts from project
Banora Point canal stinks
Remembers how you could sail in the canals, now only four metres deep from siltation
Total catchment management needs to be looked at

Overall, the key outcome of the meeting was the firm position taken by community representatives against the further discharge of reclaimed water into Terranora Creek and dissatisfaction with Council's process of identifying more sustainable solutions for reclaimed water management.

2.2.3 Recent Consultation Part B

Based on feedback and concerns voiced by the community at the Community Information Meeting summarised above, Council made a decision to place the EIS on hold and to revise the original consultation program to address the concerns of the community.

In response to this, GHD revised their scope to undertake the following additional studies prior to commencing the environmental impact statement:

- Re-examine opportunities for reclaimed water reuse in the catchment;
- Conduct an appraisal of the current health of the Terranora Estuary in terms of its current response to nutrient loadings to provide a pollutant load and concentration limit for future discharges into Terranora Estuary;
- Identify a series of new strategy options for the management of reclaimed water;
- Model the effectiveness of new strategy options in reducing pollutant loads in Terranora Estuary;
- Involve the CRG in evaluating the shortlist of viable options against a set of criteria to be determined by the participants in a series of two Options Evaluation Workshops; and
- Refer the results of the options evaluation process to Council.

Options Evaluation Workshops

Summary

Following the shortlist of viable options developed by GHD (Refer Section 8) and the completion of studies summarised above, the CRG was invited to participate in a series of two Options Evaluation Workshops to receive the results of the new studies being undertaken and to evaluate the new set of viable options against a set of criteria to be determined by the participants. The CRG was updated to include new participants (refer to Appendix C for the list of members).

The aim of the first workshop was to present the results of the effluent reuse study being carried out and to introduce to the CRG the options evaluation process. The aim of the second workshop was to present the results of catchment pollutant loads modelling and carry out the options evaluation.

The first workshop was held on the 4th November and the second was held on the 23rd November. Both workshops were held at the Tweed Civic and Cultural Centre, Tweed Heads between 5 pm and 7 pm.

Christopher Robinson, Sustainability Consultant, GHD, facilitated both workshops in conjunction with Jennifer McMahon, Project Manager, GHD. Dr. Riku Koskela, Principal Marine Biologist, GHD was also present at both workshops to present the findings of the appraisal of environmental responses in Terranora Creek, the catchment pollutant load modeling and to provide technical advice throughout the workshop.

Details of the Options Evaluation Workshops process are given in the Section titled 'Assessment of Reclaimed Water Management Options' located in the EIS.

Following the outcome of the Options Evaluation Workshops, a report summarising the findings of the workshops was submitted by GHD to Council (GHD, 2004c)(refer Appendix E). Subsequently, Council chose to adopt the findings of the options evaluation process and to select Option 6 (Refer Section 8) as the preferred option for the short-term and Option 9 (Refer Section 8) in the long-term.

A letter (refer Appendix C), along with a draft of GHD's Summary Report (GHD, 2004c) for their review and comment, was sent to all CRG members on the 20th January 2005 to communicate the findings of the options evaluation process and to advise of Council's decision to adopt these findings as the preferred strategy and proceed with the EIS.

No comments from the CRG have been received to date.

Community Information Meeting No. 2

A second community meeting will be held in July 2005 to present the preliminary findings of EIS and invite comments from the community. Community and CRG members will be invited to this meeting.

Website

A project website has been established at www.ghd.com.au for access by the community throughout the project's duration. It is proposed that the draft EIS be

displayed on both the project website and on Council's website www.tweed.nsw.gov.au.

Freecall number

A freecall number 1800 028 868 was established at the commencement of the project to answer any queries from the community.

2.3 Public Exhibition and Determination of the EIS

In accordance with Clauses 77 to 81 of the *EP&A Regulation 2000* the EIS was placed on public display at the following locations for the regulated period of 30 business days from Monday 12th September to Friday 21st October 2005:

- Department of Infrastructure, Planning and Natural Resources, 23-33 Bridge Street, Sydney
- Tweed Civic and Cultural Centre, corner Wharf and Brett Streets, Tweed Heads;
- Kingscliff Library, Turnock Street, Kingscliff;
- Murwillumbah Library, Tumbulgum Road, Murwillumbah;
- Tweed Shire Council offices, Tumbulgum Road, Murwillumbah;
- NSW Government Information Centre, Ground Floor, Cnr Hunter and Elizabeth Streets, Sydney; and
- Nature Conservation Council, Level 5, 362 Kent Street

The display period was advertised in both the local newspaper, the Council distributed newsletter, Tweed Link and the Sydney Morning Herald on two separate occasions, and by distribution of a second Community Information Sheet throughout Banora Point and Tweed Heads West. Community Information Sheet No.2 summarised the key issues identified in the EIS, the relevant proposed mitigation measures, provided details regarding the public display of the EIS and invited submissions on the EIS.

At each location a full copy of the EIS including all appendices.

Copies of the EIS were also distributed to all statutory authorities involved in the statutory consultation process.

The exhibition of the EIS invited comment by email, toll free telephone number, facsimile and mail.

2.4 Representations

The following individuals/organisations made submissions during (and after) the public exhibition period of the EIS. Representations were received through various forms including written (mail, fax, email) or verbal (telephone enquiries). These included the following:

Table 4 Summary of Representations Made

Response No:	Agency / Individual	Method of Response
Organisations		
1	Tweed Heads Environment Group	email
Government Agencies		
2	DEC	Fax
Individuals		
none		

3. Environmental Issues

3.1 Summary of Key Issues Identified

The following issues were identified as being key issues for assessment within the EIS as a result of the consultation and assessment of the area:

- Receiving waters, including water quality, aquatic ecology and downstream water use requirements;
- Groundwater and floodwaters management;
- Incident management, particularly effluent overflow;
- Noise, particularly during construction;
- Odour, from both general WRP operation and biosolids handling and management;
- Flora (including weeds) and fauna management;
- Heritage, both Aboriginal and European; and
- Visual Amenity.

3.2 Assessment of Impacts

3.2.1 Aquatic Environment

Pollutant Loads

As shown in Table 3-1, the proposed effluent quality for both WRPs is significantly improved in both Total Nitrogen and Total Phosphorus concentrations.

Table 3-1: Current and Proposed Enhanced Effluent Quality

Parameter	Existing Effluent Quality [1]				Proposed Effluent Quality at both WRPs	
	Banora Pt WRP		Tweed Heads West WRP			
	50 %ile	90 %ile	50 %ile	90 %ile	50 %ile	90 %ile
BOD (mg/L)	2.8	5.5	17	53		10
SS (mg/L)	5.6	16.0	34	70		10
Total Nitrogen (mgN/L)	5.8	7.1	10.2	18.6	3	5
Total Phosphorus (mgP/L)	5.1	6.5	6.9	9.4	1.2	2
pH	7.4	7.8	7.7	8.8		6.5 – 8.5
Faecal Coliforms (/100mL)	10	940	580	1980		< 150

Notes:
[1]2005 data, TSC.

Water Quality Objectives

Council has adopted a set of WQO's as determined by TRC (WBM, 2000) to provide the indicator criteria for receiving waters into which the treated effluent is discharged. For the purpose of the present assessment, the WQOs for receiving waters have been adopted to protect the following environmental values:

- Aquatic ecosystem protection;
- Production of edible raw shellfish;
- Primary body contact recreation (swimming and action sports);
- Secondary body contact recreation (boating).

WQO's have also been adopted by the DEC for the Tweed Estuary (EPA, DLWC, 1999). The DEC has set two criteria with respect to Faecal Coliform concentrations as shown:

1. Aquatic foods medial level of 14 MPN/100mL (NSW SQAP);
2. Primary contact recreation 150 MPN/100mL to be achieved in 10 years or more in waters affected by urban development.

3.2.2 Water Quality Impacts

Background and Existing Water Quality

As discussed in the EIS, current water quality conditions within in the Terranora Creek system are dependent upon the frequency and intensity of rainfall events. Surface run-off during rainfall events causes catchment-derived pollutants to flush into the system. This accounts for 70-90% of the variation in current water quality.

Recent monitoring conducted over 13 years at three sites (refer Section 5 of EIS) within the Terranora Inlet suggests that median nitrogen and phosphorous concentrations currently comply with TRC guidelines for all sites. However, on certain occasions these guidelines are exceeded for both nitrogen and phosphorous at all three sites.

Nutrient concentrations in the vicinity of the discharge point appear to be somewhat more elevated compared with the other sites. This is evidently the result of the discharge operation. Despite this, episodic elevations in nutrients at all sites are likely to be predominantly driven by catchment-derived stormwater runoff.

As effluent is discharged into Terranora Creek on the ebb tide, and is thus predominantly flushed from the system, it does not appear to significantly contribute to the nutrient regimes of either the Cobaki or Terranora Broadwaters and upstream of the discharge point.

Predicted Nutrient Loads

As shown in Table 3-2, calculations of total annual nutrient load predicted to enter the Terranora Creek system is expected to greatly reduce from current conditions despite an increase in flows from the WRPs. Over time, and assuming projected reuse of only 7.5%, nitrogen loads from the WRP are expected to decrease from 32.1 to 22.3 t/yr,

while phosphorous will decrease from 22.3 to 8.9 t/yr. Over this same period, the application of stormwater mitigation measures is expected to lead to a decrease in catchment derived total nitrogen loads from 88.1 to 70.5 t/yr and a decrease in phosphorus loads 15.3 to 11.3 t/yr respectively. In conclusion, this results in an expected net reduction in total nitrogen load to the Terranora system of 27.9 t/yr, and an expected reduction in total phosphorus load to the Terranora system of 17.4 t/yr.

Table 3-2: Nutrient loads derived from the Terranora catchment and WRP for existing and future conditions

Nutrient Source	Existing Load (t/yr)		Ultimate Stage 2 Load 85000 (t/yr) Reuse effluent quality Catchment mitigation	
	TN	TP	TN	TP
WRPs	32.1	22.3	22.3	8.9
Catchment	88.1	15.3	70.5	11.3
Total	**120.2**	**37.6**	**92.3**	**20.2**

Receiving Water Modelling Results

As part of this study receiving water modelling was undertaken to compare concentrations of nutrients in the Terranora system from the base case scenario (Scenario 1- upgrading plants to enhanced effluent quality and no catchment management program) with the preferred option (Scenario 4) . The following sections discuss the findings of this modelling in relation to the preferred option.

Modelling shows that nutrient concentrations within the Terranora system are expected to substantially decrease over the implementation period of the project. This reduction has been demonstrated to be attributed to the implementation of a catchment management program to deal with episodic stormwater–derived pollutant slugs that impact on the entire length of the system.

Modelling also indicates that discharge operations do not appear to appreciably impact on nutrient concentrations upstream of the discharge point. However, substantial reductions in nutrient concentrations in the upper estuary are expected to be gained from the catchment mitigation measures incorporated into the proposed option. Modelling predicts that these reductions will be greatest within the Terranora and Cobaki Broadwaters, with an approximate 0.06 - 0.15 mg/L reduction in median nitrogen concentrations and 0.01 - 0.03 mg/L reduction in median phosphorus concentrations.

Effluent discharge does contribute to the ambient nutrient concentrations of Terranora Creek downstream of Dry Dock. For the preferred option, the contribution of effluent discharge to the median ambient concentration of Terranora Creek was determined to be < 0.01 mg/L nitrogen and < 0.008 mg/L phosphorus. Given that catchment

mitigation is predicted to reduce median nutrient concentrations in Terranora Creek by 0.007 to 0.021 mg/L nitrogen and by 0.004 to 0.016 mg/L phosphorus, catchment mitigation efforts would appear to be sufficient to negate the potential impact of effluent discharge on ambient nutrient concentrations.

Compliance with Water Quality Guidelines

Protection of Aquatic Ecosystems

The TRC guidelines for water quality in the Tweed estuary have nominated guideline nutrient concentration values of 0.5 mg/L total nitrogen and 0.05 mg/l total phosphorus for the protection of aquatic ecosystems. Modelling of the preferred option (Scenario 4) has predicted that median concentrations of nitrogen will be compliant to TRC guideline values at all locations in the Terranora system. Guideline values for total phosphorus will only be met in the Terranora Inlet, and will be exceeded within the Cobaki and Terranora Broadwaters. The 80th percentile data for this modelling, which captures moderate rainfall events, indicates that all sites within the Terranora Inlet will remain compliant to the TRC guidelines for total nitrogen and only marginally exceed this guideline within the Terranora and Cobaki Broadwaters. The 80th percentile data for total phosphorus will exceed the guideline at all locations in the Terranora system. Non-compliance of nutrient concentrations at the 80th percentile reflects the impact of stormwater related pollutant loads.

In summary, the proposed option will represent a substantial improvement over current conditions for the system. This is most true for the Terranora and Cobaki Broadwaters, which are likely to receive substantial reductions in nutrient concentrations and the probable reduction in the rate of pollutant deposition within the sediment (derived from stormwater runoff). This alteration in water quality is likely to provide an enhanced level protection to the estuarine habitats, specifically those of the benthos.

Production of edible raw shellfish

Current conditions within the Terranora Inlet suggest that overall faecal coliform concentrations meet ANZECC water quality guidelines of 14 cfu/ 100ml for shellfish consumption recording a median of 1 cfu/100ml for 2001 –2002 (TSC, 2003). However, during rainfall events faecal colifom concentrations have been recorded to increase to several thousand per sample. Similarly to other pollution indicators, this is an indication of the significant influence of catchment-derived activities on the surface water quality of the Terranora Creek (KEC Science 1998).

As existing concentrations of faecal coliforms in the Terranora Inlet generally meet water quality objectives for the production of edible raw shellfish, although there are numerous occasions where they were not met in the lower estuary, it is expected that improved effluent quality would potentially increase capabilities for production of edible raw shellfish in accordance with the objectives.

3.2.3 Estuarine Flora

Phytoplankton

Increased total nitrogen levels can lead to increases in phytoplankton production and / or to increases in epiphytic algal growth, both of which may lead to a reduction in light available to seagrass, negatively impacting and reducing their distribution. Increases in total nitrogen concentrations may also lead to eutrophication causing a detrimental impact to seagrass and mangrove populations, production of algal blooms, and nuisance odour. While there is evidence to suggest that the Terranora system is somewhat sensitive to this influence in the less well flushed upper reaches, this is unlikely to occur as a result of Option 6 given the predicted reduction in nutrient concentrations expected from their implementation.

Seagrass and Mangroves

The present condition of seagrass and mangroves within the Terranora system is rated as fair to excellent (University of Queensland, 2003). This condition is not expected to alter as a result of the implementation of Option 6. In fact, condition of seagrass communities may in fact improve given that stormwater-derived sediment mobilisation is expected to reduce.

The preferred option is likely to significantly reduce the ambient nutrient concentrations of the waterway. The impact of this change on marine flora should be regarded as beneficial in the long-term, given that nutrient concentrations are presently elevated from stormwater events.

3.2.4 Estuarine Fauna

Estuarine Fauna

Any negative impact to mangrove or seagrass communities would cause an adverse affect to the fish and fisheries of the area, including recreational and commercially important species, as these areas provide important habitat and nursery grounds for these species. Threatened species such as the seahorse and pipefish species highlighted in (Section 5.5.5) would be impacted upon through any change in seagrass abundance.

A search of the EPBC database identified a number of estuarine species within the search area that were listed as endangered or vulnerable. Two species of turtle were identified. One species was listed as endangered, *Caretta caretta* (loggerhead turtle) and one species was listed as vulnerable, *Chelonia mydas* (green turtle). Eight Part Tests for these species as required under the *Threatened Species Conservation Act 1995* were undertaken as part of the EIS. It was determined from the eight part tests that neither species is likely to be affected by the proposal.

Benthic Infauna

It is unlikely that the preferred option would measurably alter abundance or diversity of crustaceans or benthic infauna within the Terranora Creek. Substantial change in the rate of deposition of material to the lake beds of Cobaki and Terranora Broadwaters

may provide the impetus for long-term change in the distribution and abundance of benthic fauna in this area. This is not regarded as a deleterious change, given that such deposition rates are presently elevated due to inordinate catchment contributions.

Future Monitoring

To monitor the long-term impacts of the proposal on the Terranora ecosystem, the EIS outlined an ongoing monitoring program to be undertaken by Council to monitor any change or fluctuations in the health of the ecosystem.

3.2.5 Groundwater

Based on the limited knowledge that was provided on depths to groundwater resources on site, it should be assumed as a worst case scenario that groundwater levels on site are very shallow.

As a consequence, all non-structural infrastructure constructed as a result of the proposed works would be required to be adequately sealed against groundwater inflows in accordance with standard industry practice. This would include all new effluent and sludge storage ponds. This would also prevent the potential contamination of groundwater resources by effluent. The structural nature of all other infrastructure is expected to prevent groundwater inflow or contamination.

Continuation of groundwater monitoring at the Banora Point WRP site is recommended to monitor the potential for groundwater inflow or contamination.

Dewatering of the site may be necessary during construction. Any dewatering will require a Water Licence under the *Water Act 1912.* Raising the Tweed Heads West site to above 1 in 20 flood inundation level will increase the depth to groundwater, hence reducing the need to dewater the site and potentially expose acid sulfate soils.

Any new monitoring bores or wells that are constructed are required under Part V of the *Water Act 1912* to be licensed by DIPNR. All monitoring bores or wells are required to be drilled and installed by an appropriately licensed NSW or National Class driller.

With the development of the proposed effluent reuse scheme, the requirements of the NSW Groundwater Protection Policy (DLWC, 1998) shall be required to be implemented to protect groundwater quality.

3.3 Terrestrial Environment

3.3.1 Terrestrial Flora

The Banora Point WRP is surrounded by a buffer of remnant vegetation that forms habitat values to the north and south. There is little vegetation within the WRP site, comprising mainly of planted landscaping trees.

SEPP 14 wetlands are located to the north of site, however the proposed upgrade will not impact on this wetland. Remnant littoral rainforest is located to the south of the,

incorporated into the buffer vegetation, again this area will not be impacted by the proposed upgrade.

The Tweed Head West WRP has little vegetation on site, comprised mainly of planted landscaping trees. Regrowth vegetation surrounds the treatment ponds on the southern and western side of the site.

Searches of the DEH Online Database (DEH March 2005) and the DEC Atlas of New South Wales Wildlife database (DEC March 2005 (search area 10 x 10 kilometres centred on study area) for previous recordings of flora and fauna species of conservation significance within the district identified a total of 542 species within the vicinity of the study area. Of these, 47 are species of conservation significance[1]. Details of these species are provided in Appendix G of the EIS.

Since no vegetation is proposed to be removed as part of the upgrade works, none of the flora species of conservation significance that have been previously recorded in the general area are likely to be impacted on. Accordingly, an Eight Part Test[2] was not required for these species.

There were no noxious weeds as declared by Council in the State of the Environment 2003 Report identified on either site.

The planting of locally native shrubs and trees around the perimeter of the sites and the removal of weeds following construction activities at both Banora Point WRP and Tweed Heads West WRP will provide a range of beneficial impacts such as increasing the biodiversity of the site, promoting native fauna, and providing visual screening of the site.

3.3.2 Terrestrial Fauna

Both WRPs generally do not support any significant terrestrial fauna species or populations that will be impacted on by the proposal.

Banora Point WRP

In summary, the Banora Point WRP site contains little habitat for terrestrial fauna. A large treatment pond on site is providing some habitat for water birds including the pacific black duck, wood duck, dusky moorhen and cattle egret. The buffer vegetation surrounding the site is providing good habitat for terrestrial fauna and will not be impacted by the proposed works.

[1] Species listed under the schedules of either the Commonwealth *Environment Protection and Biodiversity Act 1999*, the *NSW Threatened Species Conservation Act 1995* or the ROTAP database (Rare or Threatened Australian Plant as defined by Briggs and Leigh (1988)).

[2] The NSW *Environmental Planning and Assessment Act 1979* requires that eight factors must be taken into account in deciding "whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats" listed on the Schedules to the NSW *Threatened Species Conservation Act 1995,* and consequently, whether a Species Impact Statement is required. This process is commonly called the "eight part test".

All species that were observed on site are locally common. The cattle egret is listed as a migratory species under the EPBC Act. This species is found regularly observed along the north and east coast of Australia in a wide range of habitats.

Tweed Heads West WRP

The Tweed Heads West WRP site contains little habitat for terrestrial fauna. The large treatment ponds located at the back of the site is providing habitat for numerous water birds including the pacific black duck, wood duck, dusky moorhen, ibis, spoonbill, cattle egret and cormorant.

All species observed on site are locally common. The Cattle egret is listed as a migratory species under the *EPBC Act.* This species is found regularly observed along the north and east coast of Australia in a wide range of habitats.

The site does not support any significant terrestrial fauna species or populations largely due to the history of land clearing of surrounding areas resulting in the creation of physical barriers to movement.

Conclusion

Results of searches of the DEH Online Database (DEH March 2005) and the DEC Atlas of New South Wales Wildlife database (DEC March 2005) (search area 10 x 10 kilometres centred on study area) identified 50 fauna species of conservation significance previously recorded within the surrounding area. The list of these species is contained in Appendix G. Of these 27 inhabit terrestrial habitat surrounding the WRP site. As the proposed upgrade works will not involve clearing or disturbance to any of the habitat on either WRP site or the buffer vegetation, only species that inhabit estuarine, mangrove and coastal areas (i.e. habitat within the vicinity of the two discharge outlets) have been addressed within the EIS.

3.3.3 Soils

Acid Sulfate Soils

Council Acid Sulfate Mapping indicates that both the Banora Point WRP and the Tweed Heads West WRP sites are located on Class 2 ASSs. This classification requires that under the Tweed LEP, planning instruments apply to any works below the ground surface or by which the ground watertable is likely to be lowered.

During construction there is the increased potential for exposure of these ASSs to air and to produce acid leachate. It is recommended that a comprehensive site assessment be undertaken to identify levels of ASS on both sites and that an ASS Management Plan be prepared in accordance with the ASSMAC to the satisfaction of the NSW DEC and Council and implemented prior to the commencement of construction on site.

Import of Fill

During the proposed construction works there will be significant earthworks associated with the construction of infrastructure and provision of flood protection

fill/embankments. The imported fill should be verified as being clean prior to delivery to the site.

Contaminated Land

The area of the grit stockpile at the Banora Point WRP site is likely to be contaminated. This land is likely to be suitable for redevelopment subject to a site contamination investigation to quantify the extent of contamination and preparation and implementation of a remediation strategy. It is recommended that a site contamination assessment of this area be undertaken prior to construction and a remediation strategy be prepared and implemented in conjunction with the redevelopment of the site.

Erosion and Sediment Control

Although the proposed sites are relatively flat and drainage is directed to on-site lagoons, it is recommended that erosion and sedimentation control plans (ESCPs) for both sites be prepared and implemented prior to the commencement of construction and maintained until all exposed surfaces are stabilised. The ESCPs should include as a minimum:

- Site plans showing the locations and types of all erosion protection measures (including sediment fences, straw bales etc);
- Erosion control structures should not cause undue flooding;
- All stockpiled fill material should be placed well away from drainage lines and adequately protected against erosion;
- Minimisation of disturbed areas through sound construction planning;
- All disturbed areas should be stabilised as soon as construction has finished in the immediate vicinity;
- All erosion control structures should be maintained until the area is stabilised;
- Re-use cleared vegetation where possible for landscaping and soil stabilisation;
- Works should cease during heavy rainfall events; and
- All erosion control structures should be inspected and replaced if necessary on a regular basis, and within 24 hours of a rainfall event that results in runoff.

3.4 Cultural and Socio-Economic Environment

3.4.1 Public Health and Safety

Perceived Benefits and Risks

To assess the possible impacts of the proposal on human health, a list of possible benefits and risks to public health were identified and considered.

Possible benefits to community health may be derived from:

- Sewering new households; and
- Improving quality of effluent discharges.

Possible risks to community health may be derived from:

- Impacts to ecosystem health from effluent discharges into Terranora Creek; and
- Impacts to edible seafoods and oyster leases from effluent discharges into Terranora Creek.

Sewering new households

The benefits of providing sewerage to new households in the Banora Point catchment will be significant as a formal sewerage system removes issues and impacts associated with on-site systems such as seepage and overflows.

Improving Quality of Effluent

With the Proposal, improvement of the effluent quality to reuse water quality will mean a higher rate of disinfection to that currently being achieved. After dilution the faecal coliform levels will be similar to the background levels in Terranora Creek.

Impacts to public health from effluent discharges into Terranora Creek

With the proposed option, continuation of discharges of unused reclaimed water into Terranora Creek at the existing discharge location is proposed. This location is in an area used for primary and secondary recreation and therefore could be perceived as a potential public health risk.

As mentioned above, improvement of the effluent quality to reuse water quality for non-potable reuse in households will mean that recycled water quality will be treated to a very high standard to protect community health. The RWCC (1993) guidelines require that recycled water for residential reuse must be treated to effectively remove all pathogens (ie bacteria, viruses and parasites). Therefore public health risk is close to zero for reclaimed water discharges into Terranora Creek.

3.4.2 Visual Amenity

The Banora Point WRP site is well screened from surrounding land uses due to the retention of a substantial buffer of remnant vegetation around the site. This vegetation provides a complete visual screen from residential and industrial areas to the north, east and south. The proposed upgrade works to Banora Point WRP is hence unlikely to be a visual amenity concern to residents.

The Tweed West WRP site is partially screened from surrounding land uses to the south and west. There is no visual screen to passing motorists on Parkes Drive or employees in the 'Pink Bin' business adjacent to the site. In order to minimise any adverse impact on visual amenity of the area, strategic planting of native shrubs and trees around the perimeter of the site should be undertaken to screen the plant from Parkes Drive and nearby residential properties.

To further minimise the visual impact of the proposed works, it is recommended that the design and colour scheme of the facility be sympathetic to its surrounds.

3.4.3 Land Use

The current land use zoning of both sites is Special Uses 5(a). Under the Tweed LEP 2000, upgrades to the WRPs are allowed without consent.

DCP 16 prescribes a 400 metre buffer between any current or proposed primary and secondary process units of any Sewerage Treatment Plant and the nearest boundary of any allotment created for tourism, rural housing, urban housing (including caravan parks) and community facilities (e.g. halls, schools etc). No development is permitted within 200 m from any current or proposed primary and secondary process units of any sewerage treatment plant, except for uses of an open air nature (e.g. car parking, storage) or those uses not requiring permanent or prolonged work station occupation.

Between 200 and 400 metres from any current or proposed primary and secondary process units of any sewerage treatment plant, the DCP prescribes that buildings associated with industrial, commerce or trade must be designed with ventilation emanating from the side facing away from the sewerage treatment plant, and any office/retail components of the industrial building are to be air conditioned. A suitable vegetated area of 10 metres within the buffer is recommended to screen the Sewerage Treatment Plant from public view.

The closest residential house to Banora Point WRP is greater than 400 metres from the nearest treatment infrastructure and is consistent with the DCP. A commercial/industrial development is located within the 200 and 400 metre buffer but has ventilation facing the plant. This could be considered a breach if the facility was approved following the implementation of the DCP.

The closest house to Tweed Heads West WRP is located approximately 200 m southwest of the boundary of the site and also considered a breach of the DCP if the facility was approved following the implementation of the DCP.

Council should ensure that at least a 400 m buffer zone for residential houses is maintained surrounding the site throughout the operation of the plants, to ensure the amenity of existing land uses is maintained. The maintenance of a buffer zone should be seen as a reinforcement measure only and should not substitute other impact mitigation measures in the design and operation of the WRP.

3.4.4 Indigenous Heritage

Both WRP's are characterised by a history of extensive surface and subsurface disturbance, primarily for the construction of the existing plant on both sites. As a result, there is limited potential for indigenous and non-indigenous heritage significance.

A search of the DEC Aboriginal Cultural Heritage database returned no sites of significance within the surrounds of either WRP.

To ensure that sites or relics of Aboriginal heritage significance are not impacted by the proposed works it is recommended that TBLALC be consulted prior to the commencement of construction activities, and invited to be undertake a survey of the proposed areas for the works.

In the event that construction works uncover any sites or relics of Aboriginal heritage significance all works in the vicinity must cease immediately and Council's heritage adviser, TBLALC and DEC contacted as required. If human remains are uncovered during construction then NSW Police should also be contacted in addition to the above until the source of the remains are identified.

3.4.5 Non-Indigenous Heritage

Searches of the State Heritage Register and Inventory, the Australian Heritage Commission Register of National Estate, National Trust and *Tweed LEP 2000, Schedule 2 – Heritage Items* found no items of historical significance in the vicinity of the sites.

Should any items or relics of European heritage significance be discovered during the works then all works in the immediate vicinity must halt and Council heritage advisers, and if necessary, NSW Heritage Council consulted for further advice.

3.4.6 Noise and Vibration

Operational Noise Impacts

Introduction

To determine the likely noise impact from the proposed WRP upgrades on surrounding land uses, specialist sub consultants Air Noise Environment were commissioned to conduct a noise assessment study. The noise assessment study involved undertaking background noise monitoring at both WRP sites to determine the existing noise environment, and noise modelling to predict the future noise environment around the WRPs at their Stage 2 capacity (75 000 EP at Banora Point and 10 000 EP at Tweed Heads West).

Noise Assessment Guidelines

The NSW DEC (DEC) provide guidance on the assessment of noise impacts from industrial sources through the *NSW Industrial Noise Policy (2000)*. This policy defines the following two components for the assessment of industrial noise sources in NSW:

- controlling intrusive noise impacts in the short term for residences; and
- maintaining noise level amenity for particular land uses for residences and other land uses.

Modelling Methodology

The approach adopted for the noise assessment is in accordance with the NSW EPA Industrial Noise Policy. Source noise data for the existing operations were determined through measurements at the existing facilities. The expected future noise sources were identified through discussions with site personnel. Source noise levels for additional plant were determined by referencing the measurement data for the existing sites, or by specifying a maximum design noise level for individual plant items and adopting this in the noise modelling.

Modelling Results

For Banora Point WRP, based on the results of modelling under worse case conditions, provided the sludge press operations are shifted to start at 7 am to avoid night time period and enclosures of a minimum 20 dB mitigation are provided around the scum pumps and 317 return pump, the estimated noise levels are below the Industrial Noise Policy criteria for acceptable noise levels. Consequently there are expected to be no significant impacts as a result of the proposed WRP operation.

For Tweed Heads West WRP, based on the results of modelling under worse case conditions, the estimated noise levels are below the Industrial Noise Policy criteria for acceptable noise levels. Consequently there are expected to be no significant impacts as a result of the proposed WRP operation.

Construction Noise

The construction of the new works at both WRPs has the potential to create noise impacts on nearby residents due to the operation of construction equipment and increased traffic movements. Construction activities are expected to take approximately 12 months.

In order to minimise any potential noise impacts that may result from the proposed construction activities the following mitigation measures are recommended:

- Use of quiet plant and equipment where practical and cost effective;
- Ensure all plant and equipment complies and is operated in accordance with manufacturers specifications and relevant standards, including residential grade mufflers where available;
- Implementation of noise mufflers and shrouding / enclosure of high noise generating equipment where possible;
- Undertaking of activities in accordance with Australian Standard AS 2436;
- Planning of construction activities to ensure minimisation of length of activities associated with noise generation, and avoidance of undertaking high noise activities at sensitive times; and
- All construction activities should only be undertaken during the DEC approved construction hours, which are:
  - Monday to Friday – 7:00am to 6:00pm;
  - Saturdays – 8:00am to 5:00pm; and
  - Sundays and Public Holidays – no works.

Additionally an important part of minimising potential noise related complaints is an effective and comprehensive community consultation program. It is recommended that the community be advised of the type, nature and length of construction activities prior to the commencement of construction, and at regular intervals. As part of the community consultation program the community should be provided with a contact phone number for a person with the authority to take action to address the complaint if required.

Predicted peak construction traffic movements are expected to be in the range of 15 to 20 trucks and six to 10 light vehicles per day over a six month period, which represents a significant increase on the existing situation. Despite this the noise impacts associated with these increased movements are not expected to be significant due to the distance to the nearest residence. However, in order to minimise any potential impacts the following recommendations are made:

- all movements should be restricted to the DEC approved construction hours; and
- a Traffic Management Plan should be prepared that selects a designated route for all heavy vehicle movements that minimises the need for travel on quiet residential and rural roads.

Vibration

Based on distance to residences, no vibration impacts from the operation of the WRPs are expected.

With construction activities, there may be some localised vibration generation. In particular, activities associated with the compaction of clays for the lining of storage ponds and with demolition works may result in vibration generation. However, given the distances to nearest residences, no impacts at adjacent residences are expected.

3.4.7 Air Quality – Odour

Modelling Approach

The Ausplume model was used in this assessment. The Ausplume dispersion model is an approved model for regulatory assessment of odour emission impacts by the NSW DEC (previously Environmental Protection Authority). This model is a gaussian plume model widely used for regulatory impact assessment of air pollution sources. The Ausplume model assumes steady state meteorology during the time periods adopted for the model runs.

Emission Data Assumptions

Several assumptions were adopted for the purposes of estimating emissions from the sources at the sewage treatment facility. These assumptions provide for a worst case approach and are consistent with the requirements of the NSW DEC. The assumptions adopted are as follows:

- 24 hour operations (for all sources, including dewatering) at the maximum emission rate;
- constant emission flux across the area sources.

Results of Predictive Modelling

The results of the odour modelling for the proposed design case (without full enclosure of sludge processing and storage activities) indicated that there was a potential for exceedance of the odour assessment criteria under a worst case meteorological scenario for residential receptors for both the upgraded Banora Point WRP and the new Tweed Heads facility.

The key contributing factor to the predicted odour concentrations is the sludge processing activities. Therefore, additional mitigation modelling was completed that assumed full enclosure of the sludge processing and storage activities, with extraction and odour scrubbing of the emissions from these activities.

Results of the mitigation modelling demonstrated compliance in full with the seven ou criteria for commercial land uses, and no exceedance of the two ou criteria for residential land use for both Banora Point and tweed heads West facilities.

Conclusion

Assuming full enclosure of the sludge processing and storage activities, with extraction and odour scrubbing of the emissions from these activities at both WRP sites, odour emission levels from the proposed works comply with the two ou criteria for residential land use and the seven ou criteria for commercial land uses.

3.4.8 Air Quality – Dust

Another potential impact on air quality is through the generation of dust from exposed surfaces.

If not managed properly there is significant potential for dust generation from exposed surfaces during the construction phase of the project. In order to minimise dust generation it is recommended that the following safeguards be put in place during construction:

- Disturbed areas should be minimised by sound construction planning;
- Disturbed surfaces should be watered as necessary to minimise dust generation during dry and windy conditions; and
- Works should cease during periods of high winds when dust control by watering is ineffective.

Additionally incorrectly fitted, absent or in-operational exhaust systems on construction plant and equipment can impact on local air quality. It is recommended that all plant and equipment used on site should have properly fitted and maintained exhaust systems in accordance with the manufacturers specifications and relevant standards.

During operation of the WRPs, dust generation may result from the use of unsealed roads, and to a lesser extent from uncovered sludge stockpiles. In order to minimise this potential impact it is recommended that the volume of stockpiled sludge kept on site should be kept to a minimum, and the stockpiles lightly watered if necessary.

3.4.9 Traffic

Construction Traffic

Construction of the proposed WRPs will run over a period of approximately 12 months, during which time there would be traffic generated mainly by the deliveries of fill, plant, equipment and materials to site, plus workers vehicles. The site is expected to accommodate up to 20 workers at any one time.

Predicted peak construction movements will result in an increase in traffic, mainly of trucks and light vehicles associated with bulk earthworks and the importation of clean fill.

No improvements to the access road leading to the site will be required.

In order to minimise the impacts of the predicted additional traffic movements generated by the construction phases it is recommended that the following safeguards be put in place as part of a Traffic Management Plan for the works:

- All vehicles, both light and heavy, movements to and from the site will be restricted to the DEC approved construction hours of:
  - Monday to Friday – 7.00am to 6.00pm'
  - Saturdays – 8.00am to 5.00pm; and
  - Sundays and Public Holidays – no movements.

Post Construction Traffic

Current traffic movements associated with the operation of the existing WRPs are approximately 2 light vehicles per day and 2 heavy vehicles per week, and these are expected to be similar following the completion of construction.

3.4.10 Services

The only underground services that exist are the Telstra cables and sewers on both sites. Overhead electricity powerlines currently provide power to both WRP sites.

The location of the above services as well as consultation with the service providers should be undertaken during detailed design to assess additional service requirements for the proposed works.

3.4.11 Greenhouse Gases

In considering the generation of greenhouse gases, a comparison of emissions was undertaken using estimates calculated for the proposed WRPs based on the following items:

- biological degradation of sewage;
- stabilisation of sludge;
- electricity usage.

The principal greenhouse gases (GHG) that may be emitted from water reclamation plants are:

- Carbon dioxide (CO_2) from oxidation of non-renewable fuel (energy) sources;
- Methane (CH_4) from anaerobic biological sewage treatment processes;
- Nitrous oxide (N_2O) from some anoxic biological treatment processes that incorporate nitrogen removal (denitrification).

In the case of Banora Point WRP, raw sewage is treated in a biological nutrient removal (BNR) activated sludge process that does incorporate nitrogen removal (denitrification). The waste activated sludge (biosolids) from this process is currently dewatered and disposed of off-site. The option exists in future of achieving further stabilisation of the waste activated sludge prior to dewatering and biosolids disposal. One option currently being investigated by TSC for sludge stabilisation is treatment in anaerobic lagoons. Similar to anaerobic digestion, lagoon treatment is expected to result in some methane production. Methane produced in this manner will typically escape to the atmosphere. Although technically possible, such lagoons are usually too large (and methane production relatively small) to economically cover and collect the biogas for energy recovery.

Tweed Heads West WRP currently uses trickling filters. To achieve proposed future effluent quality limits, the trickling filters will most likely be replaced by a more modern BNR process, similar to that at Banora Point (or the new Kingscliff WRP currently under design and construction). Therefore, Greenhouse Gas (GHG) emission estimates for West Tweed Heads (future) was estimated in the same manner as for Banora Point.

Method

Expected design (future) sewage loads for the two WRPs were estimated as shown in

Table 3-3.

Plant power consumption was estimated to be 1.7 kWh/kg biodegradable COD (raw influent), which is a conservative estimate for extended aeration BNR plants based on data collected by Hartley (2003). All plant power was assumed to be imported (no biogas generation or collection system with energy recovery in the plant flowsheet).

The GHG intensity factor for power generation (imported plant power) was assumed to be 1.05 tonnes CO_2-e/ MWh power consumed (NEMMCO, 2005)

Methane production was estimated based on rules of thumb for anaerobic stabilisation of waste activated sludge (viz. 20 % reduction of VSS, 0.8 m^3 biogas per kg VSS destroyed, 55% methane content of biogas). The global warming potential (GWP) of methane gas was taken as 21 times that of CO_2 (to derive CO_2-equivalents) (AGO, 1997). It was assumed that all methane produced in the lagoons eventually escapes (unoxidised) to the atmosphere, whether it be directly from gas emissions, or initially in dissolved form in the lagoon supernatant but later stripped out through recycles in the dewatering or mainstream processes.

Table 3-3 Estimated raw sewage flows and loads for Banora and West Tweed WRPs

Parameter	Unit	Banora	West Tweed
Flows			
Design EP	EP	75000	10000
Flow per EP	L/EP.d	240	240
Design ADWF	ML/d	18	2.4
	ML/annum	6570	876
Sewage characteristics (assumed)			
COD	g/ EP.d	120	120
BOD	g/ EP.d	65	65
TKN	g/ EP.d	12.5	12.5
COD	mg/L	500	500
BOD	mg/L	271	271
TKN	mg/L	52	52
Biodegradable COD/ COD	fraction	80%	80%

Major chemical consumption on the plants (in terms of tonnage per annum) is expected to be alum and lime (for supplementary chemical phosphorous removal). Indicative doses of 60 mg/L alum and 20 mg/L hydrated white lime were assumed, based on modelling undertaken for Banora Point WRP (GHD, 2004d). The greenhouse gas contributions for alum (expressed as pure dry alum) and hydrated dry lime respectively (including transport) were assumed to be: 0.31 and 1.07 tonnes CO_2-e/tonne chemical (BUWAL 250).

Nitrous oxide (N_2O) was estimated to represent 1% of the nitrogen denitrified on the WRP. There is considerable uncertainty in this estimate (typical range in estimates is <1 to 5%) (De Haas & Hartley, 2004). This estimate was used for indicative purposes due to the large GWP of N_2O (310 times relative to CO_2) (AGO 1997).

Results and Discussion

The results are summarised in Table 3-4 below.

Table 3-4 Results of Greenhouse Gas Emission estimates

GHG contributor	Unit	Banora Pt	West Tweed
Imported power only	t CO2-e/ annum	4691	625
Chemicals (alum and lime)	t CO2-e/ annum	275	37
Methane potential from sludge lagoons	t CO2-e/ annum	962	128
N2O potential from denitrification	t CO2-e/ annum	1200	160
Total GHG (from above)	**t CO2-e/ annum**	**7127**	**950**

From the results in Table 3-4, it is clear that the largest GHG contribution is expected to be due to power imported from a power generation facility. In Australia, most power generators use fossil fuel sources (non-renewable energy) and this is reflected in the GHG "intensity factor" assumed in the above calculations. If the plants designs were to include biogas generation and on-site energy recovery (electricity generation), this renewable energy source ("green energy") would partially off-set the GHG contributions from imported (predominantly "black") power. Unfortunately, designs that optimise energy recovery from sewage are usually not sub-optimal in terms of biological nutrient removal (BNR) performance. High levels of BNR are required to economically achieve low target effluent concentrations, particularly in terms of nitrogen (e.g. TN < 5 mgN/L), given the current electrical power cost structures in Australia.

The second most important GHG contribution (on a mass basis) is nitrous oxide emission from the BNR activated sludge process. However, the uncertainty in the extent of N_2O emission from BNR plants makes it difficult to quantify this fraction. If the influent TKN fraction that is nitrified and denitrified in the plant (approx. two-thirds of the influent TKN) exits the plant as N_2 gas, there is no GHG contribution. However, uncertainty in the range 1-5% of this gas being emitted as N_2O could potentially add 1200 to 6000 tonnes/ annum CO_2-e for Banora Point and 160 to 800 tonnes/ annum CO_2-e for West Tweed WRP respectively.

Similarly, if anaerobic sludge lagoons are used for stabilisation of biosolids, then potentially around 1000 (for Banora Point) and 130 tonnes/ annum CO_2-e (for West Tweed) respectively could be emitted in the form of unoxidised methane arising from anaerobic digestion processes in the lagoons.

GHG contributions from importation of major chemicals (alum and lime) are noted (Table 3-4) but relatively minor.

A cross-check using the Victorian EPA GHG model was used to verify the results using the methodology given above for GHG calculations. Banora Point WRP was used for comparative purposes. Although some differences were noted in terms of the contributions for power vs. chemicals and the question of inclusion or exclusion of methane from sludge lagoons, the overall prediction of GHG was closely similar (<1% different) between the approach used here and the Victorian EPA model.

3.4.12 Waste Management

Effluent

Approximately 18 ML/day of reclaimed water is expected to be produced from the proposed Banora Point (at its Stage 2 capacity of 75 000 EP) and 2.4 ML/day from Tweed Heads West WRP at its ultimate capacity of 10 000 EP. A number of opportunities for the beneficial reuse of this effluent have been described in the EIS. It has been recommended that more detailed studies be undertaken by Council to further develop these options during the detailed design stage. Due to the preliminary nature of the current study however, it has been assumed at this stage that 90 % of reclaimed water will be discharged to the Tweed River.

Biosolids

Biosolids refer to particulate matter produced at a WRP as a by-product of the treatment process. These solids have been suspended in raw sewage or generated by the natural biological processes used to treat the sewage. The solids are removed by settling, with the resultant solids commonly referred to as biosolids. Biosolids consist of inert solids and biomass cell residue as well as microbiological cultures. Biosolids are usually further processed and stabilised before dewatering to reduce volume and form a compost-like product..

Approximately 20 tonnes of biosolids has been estimated to be produced annually when the proposed WRP is operating at Stage 2 capacity. This will vary depending on the water content in the sludge.

Options for Beneficial Re-use

In NSW, the DEC (DEC) has produced Environmental Guidelines for the use of biosolids titled "*The Code of Practice for Use and Disposal of Biosolids Products*". The guidelines cover the DEC's policies and establishes requirements to meet environmental responsibility in placement of biosolids. The DEC encourages beneficial use of biosolids wherever possible. Provided the biosolids have been treated to an acceptable level and contaminants contained in the sludge product are acceptable, the sludge may be used in a variety of re-use applications.

The sludge from the proposed WRPs is expected to contain low contaminants (heavy metals and certain organic chemicals) since there is little industry in the catchment. It is expected that the stabilised sludge from the proposed WRPs would be suitable for land application following confirmation of its content by testing and identification of a suitable land application site.

Council has been active in the past in searching for opportunities to re-use biosolids products from its various wastewater treatment plants. Council's long term objective for sludge management at the proposed WRPs is to produce Grade B stabilisation sludge and to dispose 100% of it to land as a soil supplement/conditioner within the Shire.

The process configuration envisaged for Banora Point WRP will produce a Grade B stabilised sludge (aerobic digestion of thickened waste mixed liquor is proposed).

Other Wastes

Where possible wastes generated during both the construction and operational phases will be managed in accordance with the principles of (in decreasing order of priority) minimisation, re-use, recycling, reprocessing and disposal.

In meeting the above principles it is recommended that the following practices be put in place:

- inclusion of waste minimisation goals in contracts;
- encouragement of waste minimisation in purchasing including the return of packaging and palettes;
- maximise re-use of timber and concrete waste streams;
- recycle all recyclable waste streams; and
- minimise the volume of wastes requiring disposal to landfill.

Materials from the decommissioned trickling filter plant from the Tweed Heads West WRP will be re-used where possible. This may include the re-use of crushed concrete for road base. The stones from the decommissioned trickling filter plant will be cleaned and used for landscaping.

3.4.13 Operational Risks and Hazards

Operational risks and hazards of wastewater treatment plants are primarily associated with the release of untreated or partially treated effluent to the environment in extended wet weather events, by power failure or a major system failure through failure of a component of the process.

The primary risk of releasing untreated or partially treated effluent is the risk of causing harm to the receiver of water. In the case of the proposed upgrades, the source of risk is considered to be the human pathogens in the discharged effluent that have the potential to accumulate in oysters and subsequently affect consumers.

The proposed upgrades would include systems for management of flows of up to 7 x ADWF can be retained in a storm detention pond prior to any emergency overflow of the system. The new plants would also meet current standards of protection against flooding by ensuring treatment facilities are above the 1 in 20 AEP flood level and all electrical equipment would be constructed above the 1 in 100 AEP flood level. All key mechanical equipment would have standby capacity to enable normal plant operation. In the event of failure, a Programmable Logic Controller (PLC) system will enable switching to the standby unit. This includes main pumping systems (for transfer of sewage, treated effluent etc) and other key mechanical items such as aeration ability (to ensure continuation of biological treatment).

In the event of a power failure, mechanical items will cease operation so that no treatment can take place. Provision will be made for the plant to run on standby power provided by on-site power generators in the event of prolonged power outages.

3.4.14 Economic Evaluation

An evaluation of various reclaimed water management options was undertaken as part of the options evaluation and selection of the preferred option. This included capital cost comparisons and net present value analysis for the key options.

Based on this economic evaluation a preferred strategy was selected which has been the subject of further studies and investigations, and is the subject of this EIS.

3.4.15 Aquaculture

There are 10-12 current oyster leases in Terranora. All of these are located in the Terranora Broadwater, over two kilometres upstream of the existing discharge locations.

Discharge operations do not appear to appreciably impact on nutrient concentrations upstream of the discharge point. However, substantial reductions in nutrient concentrations in the upper estuary are expected to be gained from the implementation of a catchment rehabilitation program. Modelling predicts that these reductions will be greatest within the Terranora and Cobaki Broadwaters, with an approximate 0.06 - 0.15 mg/L reduction in median nitrogen concentrations and 0.01 - 0.03 mg/L reduction in median phosphorus concentrations. During higher flow events, as indicated by the 80^{th} percentile concentrations, total nitrogen concentrations will be reduced by as much 0.162 mg/L in the Cobaki Broadwater and 0.166 mg/L in the Terranora Broadwater.

A reduction in faecal coliform counts in the effluent quality is not likely to appreciably impact on oyster leases as effluent is predominantly flushed from the system through the current and proposed continued practice of ebb tide discharge. However, faecal coliforms counts are likely to significantly reduce in the upper catchment from the implementation of a catchment rehabilitation program, which will benefit the oyster leases.

3.4.16 Cumulative Benefits

In a whole of catchment sense, the key cumulative benefit from the proposal will be the reduction in nutrient and microbiological loads on the Terranora Creek system from implementing a reclaimed water management strategy that encompasses the principles of integrated water cycle management. Both WRPs and stormwater inputs contribute to pollutant levels within the Terranora system and the Broadwaters to which the proposed strategy is aimed at targeting both contributors.

Total annual nutrient loads predicted to enter the Terranora Creek system is expected to greatly reduce from current conditions despite an increase in flows from the WRPs. Nutrient load reduction will be realised from an improvement in effluent quality from both WRPs and from the implementation of a catchment rehabilitation program in the Terranora catchment. These initiatives will result in an expected net reduction in total nitrogen load to the Terranora system of 27.9 t/yr, and an expected reduction in total phosphorus load to the Terranora system of 17.4 t/yr.

Effluent quality is expected to be within both sets of the water quality objectives for the lower estuary, particularly nutrients, which have key potential downstream impacts on

algal blooms and water usage limitations respectively. Implementing an effluent reuse strategy will have a minor effect on reducing nutrient loads being discharged to the Tweed River, however will have a cumulative benefit of reducing water consumption through the encouragement of developers to implement dual reticulation in new developments in the Shire.

Receiving water modelling showed that nutrient concentrations within the Terranora system are expected to substantially decrease over the implementation period of the project. This reduction has been demonstrated to be attributed to the implementation of the catchment rehabilitation program to deal with episodic stormwater–derived pollutant slugs that impact on the entire length of the system. Discharge operations do not appear to appreciably impact on nutrient concentrations upstream of the discharge point, however, substantial reductions in nutrient concentrations in the upper estuary are expected to be gained from the catchment mitigation measures incorporated into the proposed option.

Also related to this issue is the improved capacity to manage wet weather flows, which will significantly decrease the risk of partially or untreated sewage discharging into Terranora Creek.

3.4.17 Cumulative Impacts

The main project-related cumulative impact is the impact to Terranora Creek and Tweed River estuary water quality from other processes or activities. These include stormwater run off, discharges from the Banora Point WRP and other WRPs, sources of nutrient runoff (golf courses, sporting fields, etc) and influence from land uses upstream of the WRP discharges. Improved effluent quality, implementation of a catchment rehabilitation program, implementing an effluent reuse strategy, implementing the IWCM Plan and increase in handling of flows will minimise the impacts of the WRPs on water quality however.

Effluent discharge does contribute to the ambient nutrient concentrations of Terranora Creek downstream of Dry Dock. For the preferred option, the contribution of effluent discharge to the median ambient concentration of Terranora Creek was determined to be < 0.01 mg/L nitrogen and < 0.008 mg/L phosphorus. Given that catchment mitigation is predicted to reduce median nutrient concentrations in Terranora Creek by 0.007 to 0.021 mg/L nitrogen and by 0.004 to 0.016 mg/L phosphorus, catchment mitigation efforts would appear to be sufficient to negate the potential impact of effluent discharge on ambient nutrient concentrations.

There is potential for disruption to local residents from construction noise, dust and the pollution of waterways through exposure of ASS during the construction period. Provided the recommended safeguards outlined in the EIS are adopted within the construction EMP, then the cumulative impact of these short term activities is expected to be minimal.

There is also the potential for disruption to local residents from odour discharges during operation of the WRPs. Provided the recommended odour mitigation measures

outlined in the EIS are adopted within the design of the WRPs, then the cumulative impact of operating the WRPs is expected to be minimal.

3.4.18 Summary

The key benefits may be summarised as improvements in downstream water quality by improved effluent quality, while the key impacts are largely associated with the construction phase of the project.

Based on the findings of the EIS it is considered that the cumulative benefits of the upgraded Banora Pont WRP will significantly exceed the cumulative impacts, provided the safeguards recommended in the EIS are adopted.

4. Consideration of Representations

4.1 Representations Overview

The following individuals/organisations made submissions during (and after) the public exhibition period of the EIS. Representations were received through various forms including written (mail, fax, email) or verbal (telephone enquiries). These included the following:

Table 5 Summary of Representations Made

Response No:	Agency / Individual	Method of Response
Organisations		
1	Tweed Heads Environment Group	email
Government Agencies		
2	DEC	fax
Individuals		
none		

4.2 Representation 1 – Tweed Heads Environment Group Inc. (email dated 16 October 2005)

Comment 1 *– Tweed Heads Environment Group contends that the continued discharge of sewage effluent to the Terranora Creek system is unacceptable to the Tweed Heads community.*

Main Points:

(i) The 2002 discharge of effluent to Terranora Creek for a population of 44,242 adds 77 kg N/day, which is 539 kg N/week or (one half tonne of Nitrogen per week) or about the nitrogen in three (3) bags of ammonium sulphate fertiliser per week.

(ii) With the population increase to 114335 in 2031 the discharge of effluent will add 143 kg N/day, which is 1001kg N/week (1 Tonne N/week) or about the nitrogen from 6 bags of ammonium sulphate fertiliser per week. That quantity is twice as much now.

Response 1 -

- The figures above refer to an outdated option presented during the 2003 consultation phase when Council was seeking approval for augmentation of both plants to an ultimate capacity of 114,335 persons and enhancement of effluent quality. The preferred option presented during the recent phase of consultation (2004) and the subject of the EIS is referring to augmentation of both plants to

85,000 EP and not for a 2031 projected population of 114,335. Council are aware that prior to increasing the capacity of the plants beyond a combined capacity of 85,000 EP, new options should be investigated, including the deep sea release option (Option 9) as was presented at the CRG Option Evaluation workshops and is also referred to in the EIS as a future option that requires further investigation.

- The above figures refer to an outdated option presented to the CRG in 2003 which involved upgrading both plants to an enhanced effluent quality and discharging 100% of effluent to Terranora Creek. The option which is the subject of the EIS involves the upgrade of both plants to enhanced effluent quality, plus implementation of a catchment mitigation program which was demonstrated to significantly reduce nutrient loads entering Terranora Creek. Please refer to Table 10-1 of the EIS that provides a more relevant estimate of nutrient loads relating to the proposed option.
- Table 10-1 of the EIS has demonstrated that the proposed option will result in a decrease in both TN and TP loads entering Terranora Creek, even before the
- Other reasons for the differences between Table 10-1 in the EIS to Comparisons Table 38 presented during the 2003 consultation phase that may account for the 477% discrepancy you mention in your email dated 6/10/05 include:
  - They refer to completely different options (see points above);
  - Table 10-1 is presented in tonnes/year and not kg/day;
  - Table 10-1 is calculated based on 50%ile data, and Table 38 is based on 90%ile data; and
  - Table 10-1 is based on 85,000 EP and Table 38 refers to a population of 83,310.

(iii) Throughout the Community Reference group consultation Tweed Shire Council preferred community group members have unanimously opposed strategy of dumping sewage wastewater.

At no time was Option 6 considered to be an option.

Response 1 (cont'd) -

The Options Evaluation Process to which Tweed Heads Environment Group participated in was selected so that all CRG members would have an equal opportunity to firstly select and weight criteria to be used in the options evaluation process, and secondly to assess each of the top 5 preferred options, against this mutually agreed criteria. This method was selected to remove any bias in opinions and pre-conceptions of options before the assessment was made.

As an outcome of this evaluation process, Option 6, despite it being opposed by certain members of the CRG before the process begun, was ranked the most preferred option at the final workshop held in November 2004 using a set of assessment criteria and weighting process as defined and agreed to by the CRG.

Comment 2 *-. There will be catastrophic consequences for the already sick ecosystem health of the 'Closed' Terranora System should Tweed Shire Council's preferred strategy proceed.*

Tweed Heads Environment Group Inc. and their scientific consultant team have analysed the statements in The University of Queensland report "TWEED RIVER ESTUARY ECOSYSTEM HEALTH MONITORING PROGRAM (2000 TO 2001) - FINAL REPORT JULY 2003" that support the case for the Tweed Shire Council to stop dumping sewage effluent into the Terranora Inlet and considers that:

- *The suite of statements in The University of Queensland report unequivocally shows that the discharge of sewage effluent from Banora Point Sewage Treatment Plant causes excessive levels of Total Nitrogen, Dissolved Nitrogen and Phosphorus in the Terranora System.*
- *The study shows that substantial quantities of sewage nitrogen are present in the leaves of the mangroves and in the phytoplankton.*
- *However the study does not give any information about what other impacts the sewage effluent has had on the rest of the ecosystem. This needs to be addressed.*
- *The situation in the Terranora System is representative of other parts of the Tweed River where sewage effluent is discharged. For example the August 2003 edition of the prestigious scientific journal 'Estuaries' (Vol. 26, No. 4A, p. 857-865 August 2003) contains a paper titled "Assessing the Seasonal Influence of Sewage and Agricultural Nutrient Inputs in a Subtropical River Estuary" authored by Simon D. Costanzo, Mark J. O'Donohue, and William C. Dennison. This paper uses the Delta (□ 15 Nitrogen methodology in the Tweed River to demonstrate: -*
  - *"Mangrove and macroalgal tissue (□15 N and % N proved a successful combination for discerning sewage and agricultural inputs. Elevated (□15 N and % N represented sewage inputs". P. 857.*
  - *"The continuous discharge of sewage N (enriched in 15 N) at 9 km up-river, results in a continuous elevated (□15 N signature in mangroves and macroalgae adjacent to this sewage outfall". P. 863-864.*

Response 2 - The EIS has undertaken a review of available literature and water quality data including the University of Queensland report "Tweed River Estuary Ecosystem Health Monitoring Program (2000 to 2001) – Final Report July 2003" to provide an appraisal of the current health of the Terranora Creek in which to base an assessment of the impacts of the proposed option.

As prefaced to Tweed Heads Environment Group in a letter dated 3rd November 2004 by Dr.Riku Koskela, Principal Aquatic Biologist, GHD:

> "The principal objective of the Tweed River EHMP (University of Queensland, 2003) was to describe in broad terms, both ecologically and spatially, the condition of the Tweed Estuary System. In my considered opinion the Tweed River EHMP was successful in this respect. The use of biological indicators

and measures was informative and the project appeared to be undertaken at an appropriate spatial and temporal scale to achieve the primary objective.

However the Tweed River EHMP has not been designed to deliver either an Environmental Impact Assessment of the upgrading of the Banora Point Sewage Treatment Facility or an appraisal of the performance of the sewage discharge associated with the plant. While the Tweed River EHMP provides a valuable insight into the general condition of the Tweed Estuary, in my considered professional judgment, I can find no appreciable project benefits in delaying the EIA for an ancillary project with little further direct benefit to the present project goals. "

Dr.Riku Koskela also states:

"While the Tweed River EHMP provides an appropriate description of regional environmental condition for the Tweed Estuary, the project design as presented within the project report, is fundamentally inadequate to provide a detailed description of either the performance of the Banora Point Effluent Discharge or its associated pollutant gradient. This is not surprising given that the program was not designed to undertake this appraisal (Simon Costanzo, personal communication). Not withstanding this fact, I feel obliged to outline some of the principal areas of weakness in the Tweed River EHMP with respect to the appraisal of the Banora Point Effluent discharge. These weaknesses include:

- Inadequate spatial and temporal scale,
- Inadequate replication and duplication of samples (for measurement error and QA/QC purposes),
- Inadequate consideration of hydrodynamic processes within the study area,
- Inadequate consideration of the effluent mixing zone,
- Inadequate integration of effluent quality monitoring.

This is not an exhaustive appraisal of the weaknesses associated with the program with respect to determination of discharge performance or assessment of the pollutant gradient. However it is clearly sufficient to reject the study conclusions associated with these issues."

Comment 3 - *In considering the two consultant's assessments ("Tweed Nutrient Management Plan" and the EIS) there appears to be a substantial increase of Nitrogen (51%) in the Terranora System Catchment between the years 2002 to 2005, yet an amazing reduction of phosphorus (41.6%.)*

Response 3 – To quantify the reasons for the differences between figures quoted in the "Tweed Nutrient Management Plan" prepared by Paterson Consultants Pty Ltd in July 2002 and GHD's report, it is important to establish the parameters and scope of each model.

The aim of the Catchment and WRP derived pollutant modelling investigation undertaken by GHD as part of the scope of the EIS, was to compare and assess the various reclaimed water management strategy options in terms of overall benefits to the Terranora catchment. To do this, a catchment pollutant model was developed using a recently developed, industry approved model (MUSIC) that could take into account the contribution of pollutants from the catchment as well as the mitigating influence of stormwater control measures and reuse options. The output of this model was then converted to predicted concentrations within the Terranora Inlet by using a previously developed MIKE11 model. The calculated concentrations and loads were compared directly to the established benchmarks.

Without examining the model and modelling parameters used by Paterson Consultants in 2002, it would be reasonable to state that the two models are different due to the following key features of GHD's modelling approach:

- A water quality model of the catchment was developed using the MUSIC (Model for Urban Stormwater Improvement Conceptualisation) software (CRC for Catchment Hydrology, 2004) to evaluate stormwater quality within the catchment. MUSIC provides the ability to simulate both quantity and quality of runoff from catchments ranging from a single house block up to many square kilometres, and the effect of a wide range of treatment facilities on the quantity and quality of runoff downstream using a range of time steps from daily down to 6 minutes. This model was obviously not used by Paterson Consultants as MUSIC was still in its infancy stage in 2002.
- Model development involved the following Terranora catchment specific data, all of which were selected or have been updated or introduced post-2002:
  - Climate data for the catchment was sourced from the Bureau of Meteorology (BoM) for the Elanora station rainfall. The Potential Evapotranspiration (PET) values were sourced from the Tweed Shire Council Development Design Specification – D7 Stormwater Quality (TSC, 2004);
  - The catchment areas and layout were determined using the Mapinfo GIS software and a DTM model supplied by Tweed Shire Council;
  - Land use information based on the TSC local environmental plan 2000 (LEP) was used in conjunction with recent aerial photography to obtain the area of each land use within each sub-catchment;
  - Council MUSIC guidelines (TSC, 2004) were used to characterise the hydrologic and pollutant export properties of each sub-catchment area into three land uses available. These are Rural, Urban and Forest/Undeveloped.
  - Rainfall / runoff parameters were sourced from the Tweed Shire Council Development Design Specification – D7 Stormwater Quality (TSC 2004);
  - Default pollutant export parameters, as given by Tweed Shire Council Development Design Specification – D7 Stormwater Quality (TSC 2004), were used;

After the catchment modelling was completed for the current situation and the various options, GHD compared the modelling results with the current water quality in Terranora Inlet at the various modelled locations. Based on the comparison, it was

reasonable to state that our modelling results correlated with recent water quality monitoring data.

Comment 4 *- Tweed Heads Environment Group sought an explanation from the EIS Manager, GHD Pty Ltd, by email on 6 October 2005 about the considerable differences of Nitrogen loadings shown in the power point presentation Number 38 (CRG Meeting of 24 July 2003) and the EIS (August 2005) present in flows from the WRP's and Cobaki/Terranora Catchments. There has been no reply to date.*

Response 4 – Refer to Response 1.

Comment 5 *- Tweed Heads Environment Group notes that following advice from Department of Infrastructure, Planning and Natural Resources in a letter dated 8 April 2004 (Ref.300380) the Tweed River Committee resolved to repeat the Tweed River Ecosystem Health Monitoring Program and place it in the 2005/2006 works program.*

This repeat program has not been done and thus the current ecosystem health of the Terranora System is unknown. We have observed increasing algal blooms and river infections at Terranora Inlet in recent years

Response 5 – Current Ecosystem Health

The principal objective of the Tweed River EHMP (University of Queensland, 2003) was to describe in broad terms, both ecologically and spatially, the condition of the Tweed Estuary System. The use of biological indicators and measures was informative and the project appeared to be undertaken at an appropriate spatial and temporal scale to achieve the primary objective.

With respect to the Terranora Estuary, this study identified rainfall and tidal flushing as principal drivers of ecological condition. This is logical given that:

- Stormwater runoff is the principal transport mechanism of catchment-derived pollutants, and
- Tidal action provides for the exchange of such pollutants with clean seawater.

As a result, ecosystem health appeared to demonstrate strong seasonality, with better performance recorded during the relatively dry winter period.

- Principal indicators included:
- Water quality and sediment nutrient fluxes,
- Phytoplankton composition and nutrient response,
- Stable isotope analysis, and
- Seagrass depth range,
- Mangrove condition.

One sampling station was located in the Terranora and Cobaki Broadwaters respectively, while three stations were located within the Terranora Inlet. Performance of the various physicochemical and biological indicators suggested that the Terranora

system (Terranora and Cobaki Broadwaters) was in "fair" condition. Condition of seagrass and mangroves within the Terranora System was ranked as fair to excellent, while the condition of riparian vegetation was ranked poor to good.

This is not surprising given that according to salinity concentration, the Terranora system appears to be tidally relatively well flushed. Water quality data for the Terranora Estuary indicate that water quality within Terranora Creek has progressively improved in recent years (refer to Figure 1). This is principally due to improvements in effluent treatment and the occurrence of drought conditions which have reduced catchment nutrient loads (the principal source of nutrient contaminants to the system). Mapping undertaken as part of the present EIS has demonstrated that seagrass and mangrove habitat has progressively increased over the same period, demonstrating that conditions are presently ideal for the maintenance of these primary habitats. While the continuation of broad scale habitat condition assessments of the Tweed Estuary should be supported, the statement within Comment 5 above, that "the current ecosystem health of the Terranora system in unknown", is clearly wrong.

Algal Blooms

With respect to the claim of increasing algal blooms within the estuary, there does not appear to be any scientifically credible evidence to support this position. The previous Health of the Waterways report (University of Queensland, 2003) indicated that both chlorophyll-a concentrations and phytoplankton counts were generally normal and lower than those found in the Terranora and Cobaki Broadwaters. Nitrogen is the principal nutrient driving algal growth within estuary systems. Examination of total nitrogen concentrations immediately downstream of the Banora Point outfall (refer to Figure 1) demonstrate that nutrient concentrations within the Terranora Creek system have progressively decreased over the past 15 years, principally due to progressive improvement in effluent treatment quality and the recent drought conditions. It is apparent that the principal drivers of algal growth for the Terranora system indicate a propensity for decreased algal growth in this system.

Faecal Coliforms

With respect to the claim of increased "infections" in the Terranora Creek, it is unclear what this term within Comment 5 actually refers to. If the author is proposing that bacterial content has increased in preceding years, then this is a factually incorrect statement. Figure 2 provides the faecal coliform counts for receiving waters immediately downstream of the Banora Point effluent discharge. This figure demonstrates a significant and progressive decrease in faecal coliform counts to negligible levels with respect to the present ANZECC guidelines for primary contact recreation (150 cfu/100ml).

***Comment 6** - Apart from urban use, three of the major Tweed Shire's WRPs are within a relatively short pipeline distance of cane growing, small cropping and grazing activities, all of which could use reclaimed water. There is no excuse why Tweed Shire cannot match other NSW Council's initiatives to reuse reclaimed water by providing pipeline infrastructure to distribute reclaimed water.*

Response 6 –

The scope of the effluent reuse study undertaken for the EIS was to broadly identify opportunities for reuse of reclaimed water from Banora Pt and Tweed Heads West WRPs within close proximity to the plants. Although agricultural and industrial use of reclaimed water was dismissed from further study in this EIS mainly due to distance from the WRPs, Council has embarked on significant reuse initiatives with industry for other WRPs that Council operate that are located closer to these uses.

Council is proposing in the EIS to upgrade both WRP's to treat collected sewage to the highest reuse quality. At the same time, Council has embarked on the development of an Integrated Water Cycle Management Strategy (refer Section 7.1.2 of the EIS) to manage town water supplies, sewerage and stormwater services within a whole of Shire framework. It is one of the intentions of this Strategy that further opportunities for reuse will be sought.

The primary aims of the IWCM process (being embarked on by Council as discussed above) are to reduce the demand on drinking water supplies by increasing sewage effluent reuse, to reduce effluent discharged to the local environment, to contain the cost of water supply to the Shire and to contribute to the Shire's water and sensitive urban design strategy.

Council has a well documented history in pursuing users of reclaimed water including turf and horticulture industries. It was originally proposed in 1999 that the Kingscliff WRP irrigate a proposed turf farm adjacent to the plant. This proposal was stopped due to community health concerns.

Council has identified an opportunity to reuse effluent from the recently upgraded Hastings Pt WRP for irrigation of a local commercial turf farm. The owner of the turf farm has expressed strong interest in the works proceeding.

Comment 7 *-The EIS advises on pages 5/6 that the current plant flow from the two WRPs is 10.8 and 2.6 ML per day or (13.4x365 per year) which totals 4891 ML.*

It would appear that the current reuse for urban irrigation is only 3.4755% and not 4.9% and will more than halve if the amount of reclaimed water increases from 44232 (2002) to 114335 (2031).

Insofar as residential (non potable) reuse is concerned the Estimate of Recycled Water Use Potential from the above table is only 16.8% of current plant flow (4891 ML) or only 6.02% of the predicted flow from the 2031 population (12642 ML).

Dismal performance by Tweed Shire Council in the dry land reuse of reclaimed wastewater.

Response 7 – The figure of 4.9% was calculated based on Banora Point WRP's current reuse volume of 170 ML/day divided by an old annual flow rate provided by Council. Based on the updated flow rate of 10.8 ML/day used in the recent EIS x 365 days gives a percentage of 4.3 %. The figure does not include Tweed Heads West flows and clearly states that in the paragraph on page 129 of the EIS.

You are correct in stating that total reuse from both plants equates to less than that (3.6%).

The third paragraph is also correct.

These figures are very low in terms of % of current and future annual plant flows.

As was identified in the Reuse Study (Bligh Tanner, 2004), even if irrigation of all urban areas was included in the reuse strategy, only a further 101 ML/year of reuse could be achieved, but would require significant capital infrastructure to irrigate.

Comment 8 - *Why cannot Tweed Shire Council match the performance of other nearby NSW Councils in their dry land reuse of treated effluent; eg Coffs Harbour, Mullumbimby and others and the Gold Coast City Council's use (Dual Reticulation and cane land reuse)?*

Advice has been received that while Coffs Harbour Council has an ocean outfall for treated wastewater, many types of users, as far away as Sawtell, use piped reclaimed water.

Response 8 – Refer to Response 6 for a summary of the initiatives currently being undertaken by Council to increase the reuse of treated effluent within the Shire.

Comment 9 - *Why should the West Tweed Sewerage plant be rebuilt at West Tweed Heads, when Council could build a Waste Water Plant closer to the 16,000 people who will reside at new subdivisions at Cobaki Lakes and Bilambil?*

The adjacent water starved agricultural land of the Cobaki and Piggabeen valleys would have capacity to utilise not only reclaimed wastewater from the subdivisions but also from the Banora Point Waste Water Plant. The ultimate (2030) population projection for the Banora Point and Tweed Heads West WRP's is between 72,000 and 92,000. Stage 3 upgrade of the Banora Point WRP provides capacity to serve 125,000 EP.

Response 9 – The Tweed Heads West sewage treatment plant site will be retained and replacement of this plant will be dependent on development options that may be available at Cobaki. The developers of the proposed Cobaki Lakes area have not indicated any certain timeframe for their development. Proposed development and its form are also never certain. Therefore a decision has not been made at this stage regarding a final sewage treatment option for Cobaki.

The option to pump sewage to Banora Point for treatment can only occur while capacity exists. This option will allow Council to rebuild the West Tweed Heads plant.

Tweed Shire Council is currently investigating reclaimed water reuse at a number of locations within the Shire including its Murwillumbah, Kingscliff and Hastings Point treatment plants and a reuse scheme for the Tweed Crematorium, Memorial Gardens and Arkinstall Park from the Banora Point Water Reclamation Plant (WRP).

The feasibility of an effluent re-use scheme for the Cobaki and Piggabeen valley areas depends on a number of factors including economic demand from potential markets and the availability of adequate areas of land for disposal. Demand is not known at

present and therefore expenditure of a large sum of money in installing an additional pipe cannot be justified. It is also premature to define the third pipe requirements for Cobaki as the treatment and conveyancing requirements are yet to be determined. It should also be noted that in times of continued wet weather, treated effluent would need to be eventually discharged to a water body.

Comment 10 *- The following news report provides further information on recycled water for Tweed and raises the question: Does this news report show that there is a lack of initiative for the dry land reuse of treated effluent by the Tweed Shire Council?*

Response 10 – Refer to Response 6 for a summary of the initiatives currently being undertaken by Council for reuse of treated effluent.

4.3 Department of Environment and Conservation Submission received by fax on 24 October, 2005

Comment 1 – Air Quality - Odour

We note from the consultant's odour modelling (Sec. 10.4.7) that there is a potential for offensive odours to be emitted from both the Banora Point and Tweed Heads sites. The modelling indicates that all sludge processing activities will need to be fully enclosed and that an extraction and scrubbing system will need to be added to the process. This proposal appears reasonable and it will be important that these air pollution control measures are included in the construction of both plants.

Notwithstanding the above, section 5.17 of the EIS indicates that "During the site inspection (of Banora Point) subjective observations indicated that the inlet works is the primary odour risk at the site at present. Sludge processing and storage was identified as a secondary risk." For this reason we strongly recommend that Council include in the augmentation works odour control mechanisms for the inlet works at both premises. These may include covering the inlet works and treating any waste air by scrubbing or treating by some other method such as biofilters or soil bed filters.

Response 1- It is intended that the Inlet works of both WRPs will be covered.

Comment 2 – Effluent Reuse

We endorse Council's proposal to pursue effluent reuse opportunities as a component of the effluent management strategy. We encourage adoption of dual reticulation in areas of new development and residential non-potable reuse as a priority in urban areas. As you may be aware, a number of such schemes have been implemented or are proposed in the North Coast area, including new developments on the Cumberland Ridge, Ballina and a planned development at West Yamba. Council have identified three new development opportunities for dual reticulation namely, Cobaki Lakes, Bilambil Heights and Area E.

In developing reuse strategy we suggest that Council use a preferred reuse hierarchy against which reuse options may be assessed. Such a hierarchy should be based around the following broad areas: -

• uses which replace potable water supply demands with effluent (eg. dual reticulation, existing sporting ground irrigation, industrial reuse opportunities);

• uses which replace water supply demands from natural supplies with effluent (eg agricultural reuse opportunities; industrial reuse opportunities);

• uses specifically created to utilise effluent (eg agricultural reuse including turf

farms, environmental regeneration projects).

In addition to this preferred reuse hierarchy we recommend that any strategy incorporate specific mechanisms to drive reuse up the hierarchy. Some options may include a Development Control Plan, which promotes dual reticulation in new development, retrofitting existing developments with dual reticulation; audits of industry and agriculture to identify reuse opportunities and a program to promote effluent reuse.

Response 2 –Council is currently embarking on an Integrated Water Cycle Management Strategy that aims to investigate all of the above options for encouraging greater reuse.

Comment 3 –Effluent Quality

The EIS assesses the performance of the two existing STPs and contains proposed future effluent quality standards for both plants based on water quality modelling. This information is identified in Table 2-5 and entitled "Current and Proposed Enhanced Effluent Quality". We note that several parameters of the proposed effluent quality standard are less stringent that the DEC'S "accepted modern technology" criteria for sewage treatment plants.

It is the DEC's policy that a standard reflecting accepted modern technology and best management practice should be adopted even though modelling may indicate that Water Quality Objectives can be satisfied with a lower standard. This is consistent with a precautionary approach and the philosophy of continual improvement outlined in the National Water Quality Management Strategy (Policies and Principles 1994) and also overcomes a tendency for waters to be polluted up to their limits whilst maximising the opportunity for present and future users of waterways to coexist.

For this reason we ask that Council revise its design criteria for Total Phosphorus (TP), Faecal Coliforms (FC) and Grease and Oils (TOG) to be consistent with the DEC'S "accepted modern technology criteria" for sewage treatment plants (i.e. TP 0.3 mgfL; FC <200 organisms/l 00 mL and TOG <2 mg/L). We also request Council to include a limit for Ammonia Nitrogen (of 2mg/L).

Response 3 - Council agrees to meeting DEC's proposed requirements for FC & TOG. Council however, is reluctant to impose a 0.3 mg/L TP requirement due to additional costs that would be borne by the project not only for capital works but for future ongoing operational costs in additional chemical dosing requirements. The EIS report document is able to demonstrate that a TP concentration of 2 mg/L will have no detrimental effect on the Terranora Inlet. Refer to section 10 of the EIS report for further information

Comment 4 – Water Quality Objectives

We are pleased to note that Council has adopted the water quality objectives as determined by the Tweed River Committee and based on the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC. 1992). It is also interesting to note that Terranora Creek is presently impacted on by diffuse source pollutants during periods of wet weather and under dry conditions that sewage effluent is the main contributor to pollution.

The use of the EIS process to identify and propose mitigating works for point source and diffuse source pollutants is commendable. Council's catchment rehabilitation with its rural and urban emphasis should facilitate lasting improvements to the water quality in the Terranora Creek.

Response 4 – Noted.

Comment 5 - Flora and Fauna

The DEC does not routinely provide comprehensive comments on threatened species and other flora and fauna aspects of a development proposal where there is no statutory responsibility to do so. We note with concern, however, that your consultant has recorded Alligator Weed Altarnanthera philoxeroides at both STP sites (Appendix H). As you may be aware, Alligator Weed is a noxious weed classified as WI (notifiable) under the Noxious Weeds Act (1993). This mailer should be promptly investigated to establish the possibility of identification or clerical error, or otherwise, notification to the local control authority in accordance with Council's responsibilities under the Act.

Response 5 – With respect to the DEC comments on Alligator weed (Alternanthera philoxeroides), this was a mis-identification of the species in wetlands immediately north of the Banora Point STP and a clerical error within Appendix H that the species was present at West Tweed STP.

5. Conclusions and Recommendation

The Banora Point EIS was publicly exhibited in accordance with the requirements of the Environmental Planning and Assessment Act, 1979. Two representations were received during this exhibition period and subsequently have been addressed in this Report.

Issues raised in the representations mainly focused on opportunities for effluent quality and environmental impacts to the Terranora system.

These representations indicate the potential impacts associated with constructing and operating the project. The issues raised in the above submissions will be addressed through the development and implementation of recommended mitigation measures including the catchment mitigation programme and effective monitoring programs.

Providing the above are implemented, it is recommended that project be approved.

References

Air Noise Environment Pty Ltd (2005) Noise and Odour Assessment

Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ) (2000), Guidelines for Fresh and Marine Water Quality. ANZECC, Australia

Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ), (2000b), National Water Quality Management Strategy, Publication 14 – Guidelines for Sewerage Systems – Use of Reclaimed Water, November 2000

Bligh Tanner Pty Ltd, (2004), Banora Point & Tweed Heads West STPs Water Recycling, Report prepared for GHD Pty and TSC, November 2004

CRC for Catchment Hydrology, (2004), MUSIC Version 2.0.1 modelling software and users' manual, January 2004

GHD (2004a). *Banora Point Sewage Treatment Plant Effluent Quality. Concept Design.* Draft report submitted to TSC, August 2004.

GHD (2004b), Banora Point and Tweed Heads West WRP Option Evaluation Workshops – Information Pack, GHD, Brisbane, November 2004

GHD (2004c), Banora Point and Tweed Heads West WRP Option Evaluation Workshops – Summary Report, GHD, Brisbane, December, 2004

GHD (2005), EIS for Banora Point STP Reclaimed Water Management Strategy – Modelling of Pollutants from Catchments to Tweed River Entrance, GHD, Brisbane, March 2005

University of Queensland, (2003), Terranora and Cobaki Broadwater components of the Tweed River Estuary - Ecosystem Health Monitoring Program

Acronyms

TERM	DEFINITION
ADWF	Average Dry Weather Flow (of sewage)
ANZECC	Australian and New Zealand Environment and Conservation Council
BNR	Biological nutrient removal
BOD	Biochemical oxygen demand
DEC	Department of Environment and Conservation
DO	Dissolved Oxygen
DG	Director General
EIS	Environmental Impact Statement
EP	Equivalent population, ie. persons
ha	Hectares
NPV	Net Present Value
TP	Total Phosphorus
PWWF	Peak wet weather flow
SS	Suspended solids
TDS	Total dissolved solids
TSC	Tweed Shire Council

Appendix A

Copies of Representations Made

(a) A rural catchment project involving the provision of incentives to landholders to restore waterways.
(b) An urban project involving modelling of the existing stormwater system to identify locations for stormwater improvement initiatives.

5 Discharge excess water to Terranora Creek on the Ebb Tide **(as is already the case).**

Tweed Heads Environment Group Inc Comment

1. ***Tweed Heads Environment Group contends that the continued discharge of sewage effluent to the Terranora Creek system is unacceptable to the Tweed Heads community.***

   At the Community Reference Group meeting of 24 July 2003, Comparisons Table (presentation Number 38) of the Effluent Disposal Strategy showed the following loadings of total nitrogen and phosphorus:

	2002		**2031**	
Population	44242		114335	
	Total Nitrogen kg/d	**Total Phosphorus kg/d**	**Total Nitrogen kg/d**	**Total Phosphorus kg/d**
Current Discharge	77	71		
Preferred Strategy Enhanced Effluent Quality to Terranora Creek			143	57

Main Points

(i) The 2002 discharge of effluent to Terranora Creek for a population of 44,242 adds 77 kg N/day, which is 539 kg N/week or (one half tonne of Nitrogen per week) or about the nitrogen in three (3) bags of ammonium sulphate fertiliser per week.
(ii) With the population increase to 114335 in 2031 the discharge of effluent will add 143 kg N/day, which is 1001kg N/week (1 Tonne N/week) or about the nitrogen from 6 bags of ammonium sulphate fertiliser per week. *That quantity is twice as much now.*
(iii) Throughout the Community Reference group consultation Tweed Shire Council preferred community group members have unanimously opposed strategy of dumping sewage wastewater. At no time was Option 6 considered to be an option
We reiterate our opposition to the preferred strategy of the Tweed Shire Council.

- AS AN ACTIVE PARTICIPANT WITHIN THE COMMUNITY REFERENCE GROUP (which met finally on 24 November 2003) and the concern raised by participants over the process, and the support of many for a re-run of the workshop of the Options Evaluation workshop. TWEED HEADS ENVIRONMENT GROUP INC. DOES NOT PROVIDE IN-PRINCIPLE SUPPORT FOR TWEED SHIRE COUNCIL'S PREFERRED STRATEGY.

- BASED ON SOUND SCIENTIFIC EVIDENCE FROM REPUTABLE AUTHORITIES AT THE UNIVERSITY OF QUEENSLAND THE TWEED HEADS ENVIRONMENT GROUP INC. STRONGLY OBJECTS TO THE PREFERRED STRATEGY.

- THUS THE COUNCIL PROCEEDS WITH THE STRATEGY IN DIRECT OPPOSITION TO THE SCIENTIFICALLY BASED POSITION OF THE TWEED HEADS ENVIRONMENT GROUP INC. and

Tweed Heads Environment Group Inc Comment

2. ***There will be catastrophic consequences for the already sick ecosystem health of the 'Closed' Terranora System should Tweed Shire Council's preferred strategy proceed.***

   Tweed Heads Environment Group Inc. and their scientific consultant team have analysed the statements in The University of Queensland report "TWEED RIVER ESTUARY ECOSYSTEM HEALTH MONITORING PROGRAM (2000 TO 2001) - FINAL REPORT JULY 2003" that support the case for the Tweed Shire Council to stop dumping sewage effluent into the Terranora Inlet and considers that:

- *The suite of statements in The University of Queensland report unequivocally shows that the discharge of sewage effluent from Banora Point Sewage Treatment Plant causes excessive levels of Total Nitrogen, Dissolved Nitrogen and Phosphorus in the Terranora System.*

- *The study shows that substantial quantities of sewage nitrogen are present in the leaves of the mangroves and in the phytoplankton.*

- *However the study does not give any information about what other impacts the sewage effluent has had on the rest of the ecosystem. This needs to be addressed.*

- *The situation in the Terranora System is representative of other parts of the Tweed River where sewage effluent is discharged. For example the August 2003 edition of the prestigious scientific journal 'Estuaries' (Vol. 26, No. 4A, p. 857-865 August 2003) contains a paper titled "Assessing the Seasonal Influence of Sewage and Agricultural Nutrient Inputs in a Subtropical River Estuary" authored by Simon D. Costanzo, Mark J. O'Donohue, and William C. Dennison. This paper uses the Delta (δ 15 Nitrogen methodology in the Tweed River to demonstrate: -*

  1. "Mangrove and macroalgal tissue (δ15 N and % N proved a successful combination for discerning sewage and agricultural inputs. Elevated (δ15 N and % N represented sewage inputs". P. 857.

  2. "The continuous discharge of sewage N (enriched in 15 N) at 9 km up-river, results in a continuous elevated (δ15 N signature in mangroves and macroalgae adjacent to this sewage outfall". P. 863-864.

- The Banora Point/and Tweed Heads West Water Reclamation Plants (WRP)'s Reclaimed Water Management Strategy - Environmental Impact Statement (EIS) advises on page 169 Table 10 – 1 that the Terranora System Catchment has the following concentrations within the Terranora system:

2005 - (EIS page 169 Table 10 – 1)

Nutrient Source	**Existing Load**		**Ultimate Stage 2 Load 85000 (t/yr) Reuse effluent quality Catchment mitigation**	
	TN	**TP**	**TN**	**TP**
WRP's	**32.1**	**22.3**	**22.3**	**8.9**
Cobaki/Terranora Catchment	*88.1*	*15.3*	*70.5*	*11.3*
Total	**120.2**	**37.6**	**92.8**	**20.2**

In July 2002 Paterson Consultants Pty Limited prepared a Report titled "Tweed Nutrient Management Plan" for the NSW Department of Land and Water Conservation.

The Report "Tweed Nutrient Management Plan" (TNMP) p.6 reads:

"The total nutrient production for the Tweed River catchment was estimated, using the Tweed Nutrient Model approach as:

Total Phosphorus	76 tonnes
Total Nitrogen	308 tonnes

The nutrient generation from the various land uses in the Tweed Catchment were separately derived.

The specific contributions of various land uses were ranked."

Rank	**Contributor**	**Nutrient Generation (tonnes/yr)**	
		Phosphorus	**Nitrogen**
1	Sewerage Treatment Plants	30.20	33.44
2	Sugar Cane	12.43	69.36
3	Cropping – other than Sugar cane	9.10	12.98
4	Grazing > 100 m from stream	5.71	49.44
5	Grazing – other than above	4.26	39.52
6	Urban	5.94	21.77
7	Forestry – natural unlogged, > 33% slope	2.97	29.86
8	Forestry – other than above	2.08	37.19
9	Point Sources (other than STP's)	2.89	8.60
	Total	75.58	302.16

The ranking of nutrient generation from various sub-catchments was also assessed using the Tweed Nutrient model. The ranking of nutrient generation by sub catchment is given below:

Rank	Name	Nutrient Generation (tonnes/yr)	
		Phosphorus	Nitrogen
1	Cobaki/Terranora	26.21	51.09
2	Middle Tweed	18.46	86.19
3	Oxley	6.90	47.80
4	Rous River	7.60	42.30
5	Upper Tweed	5.60	53.40
6	Lower Tweed	6.50	37.60

Tweed Heads Environment Group Inc comment

In considering the two consultant's assessments ("Tweed Nutrient Management Plan" and the EIS) there appears to be a substantial increase of Nitrogen (51%) in the Terranora System Catchment between the years 2002 to 2005, yet an amazing reduction of phosphorus (41.6%.) Tweed Heads Environment Group sought an explanation from the EIS Manager, GHD Pty Ltd, by email on 6 October 2005 about the considerable differences of Nitrogen loadings shown in the power point presentation Number 38 (CRG Meeting of 24 July 2003) and the EIS (August 2005) present in flows from the WRP's and Cobaki/Terranora Catchments. There has been no reply to date.

Tweed Heads Environment Group notes that following advice from Department of Infrastructure, Planning and Natural Resources in a letter dated 8 April 2004 (Ref.300380) the Tweed River Committee resolved to repeat the Tweed River Ecosystem Health Monitoring Program and place it in the 2005/2006 works program.

This repeat program has not been done and thus the current ecosystem health of the Terranora System is unknown. We have observed increasing algal blooms and river infections at Terranora Inlet in recent years

Conclusion

Tweed Heads Environment Group considers that:

- *Regardless of the outcome of Council's Banora Point/and Tweed Heads West Water Reclamation Plants (WRP)'s Reclaimed Water Management Strategy, Tweed Shire Council should implement a Terranora and Cobaki catchment rehabilitation program. Since 1998 there appears to be a record increase of nutrients (88.1 tonnes of Nitrogen) in the Terranora System Catchment, which amount is greater than all the sugar cane (69.36 tonnes) grown in the Tweed Catchment. – (TNMP-***July 2002 Paterson Consultants Pty Limited).**
- *The recommendation of the Tweed River Committee to repeat the Tweed River Ecosystem Health Monitoring Program and place it in the 2005/2006 works program should be implemented before any increase of EPA licence is approved.*
  In particular the long overdue Ecosystem Health Monitoring Program for the Terranora and Cobaki Broadwaters should be carried out.
- **TWEED HEADS ENVIRONMENT GROUP DOES NOT PROVIDE IN-PRINCIPLE SUPPORT FOR TWEED SHIRE COUNCIL'S PREFERRED STRATEGY.**

While Tweed Shire Council proposes to implement the following two separate projects, it is understood that a rehabilitation plan has yet to been made. The proposal is:

(a) A rural catchment project involving the provision of incentives to landholders to restore waterways.

(b) An urban project involving modelling of the existing stormwater system to identify locations for stormwater improvement initiatives.

Other Signs of Estuarine Water Stress in the closed Terranora System Catchment

In 1998 the Department of Land and Water Conservation prepared a NSW State Summary "STRESSED RIVERS ASSESSMENT REPORT", which included the Terranora System catchment.

The Summary of Stress Classifications for Terranora System Catchment is as follows

Classifications for Terranora System Catchment

Cobaki Broadwater Catchment Area - Cobaki / Piggabeen Creeks

SUB CATCHMENT	OVERALL STRESS CLASSIFICATION	FULL DEVELOPMENT STRESS CLASSIFICATION	HYDROLOGY STRESS RATING	ENVIRONMENTAL STRESS RATING	IDENTIFIED CONSERVATION	
					NPWS	FISHERIES
COBAKI BROADWATER	S2	S2	MEDIUM	HIGH	YES	YES
COBAKI CREEK	S1	S1	HIGH	HIGH	YES	YES
PIGGABEEN CREEK	S3	S3	HIGH	MEDIUM	YES	YES

Terranora Broadwater Catchment Area - Bilambil/Duroby Creeks

TERRANORA BROADWATER	S2	S2	MEDIUM	HIGH	YES	YES
BILAMBIL CREEK	U1	U1	HIGH	LOW	NO	YES
DUROBY	S4	S3	MEDIUM	MEDIUM	NO	YES

CODE

S1,S3 WATER EXTRACTION IS LIKELY TO BE CONTRIBUTING TO ENVIRONMENTAL STRESS

S2,S4 WATER EXTRACTION MAY BE CONTRIBUTING TO ENVIRONMENTAL STRESS

U1 IMMEDIATE INDICATIONS ARE THAT WATER EXTRACTION ISCAUSING A PROBLEM. HOWEVER, MORE DETAILED EVALUATION SHOULD BE UNDERTAKEN TO CONFIRM.IT IS LIKELY THAT CONFLICT AMONG USERS MAY BE OCCURING DURING CRITICAL PERIODS

Information that questions the sole use of ANZECC 2000 Guidelines

The NSW Environment Protection Authority (1996) reported that the state of the Cobaki Broadwater was generally "bad", with local inputs of poorer water quality exerting control over water quality in the Lower Tweed Estuary System.

Reference KEC Science Report 'Water Quality in the Lower Tweed Estuary System (August 1998 Para. 2.0 p.3)

The KEC Science Report further advises that:

"It is of some concern that a variety of reports have subjected raw data to the various ANZECC criteria to determine water quality compliance.

In most circumstances, comparison of raw data to threshold limits is not an appropriate method of assessment.

Further indications of "poor" ecosystem health in the closed Terranora System Catchment

STATEMENTS IN THE UNIVERSITY OF QUEENSLAND REPORT *"TWEED RIVER ESTUARY ECOSYSTEM HEALTH MONITORING PROGRAM (2000 TO 2001) - FINAL REPORT JULY 2003"* THAT SUPPORT THE CASE FOR TWEED SHIRE COUNCIL TO STOP DUMPING SEWAGE EFFLUENT IN THE TWEED RIVER WITH SPECIFIC REFERENCE TO THE TERRANORA SYSTEM CATCHMENT

The following statements are from the above Report:

WATER QUALITY KEY PROCESSES

2.4.23 Dissolved Nitrogen species – Terranora System – (page 31)

- The **Banora Point Sewage Treatment Plant** wastewater outfall site in Terranora Inlet (TI2) exhibited very high dissolved nitrogen species concentrations.
- Elevated nutrient levels at the **Banora Point Sewage Treatment Plant** wastewater outfall (TI2) appear localised.

2.4.26 Orthophosphate – Terranora System (pages 34/35)

- The highest orthophosphate (PO_4) levels throughout the whole estuary were recorded in the Terranora Inlet (TI2).
- The **Banora Point Sewage Treatment Plant** wastewater outfall site in Terranora Inlet (TI2) exhibited very high dissolved phosphorus concentrations.
- Elevated dissolved phosphorus levels at the **Banora Point Sewage Treatment Plant** wastewater outfall (TI2) appear localised.

2.4.29 Total Nitrogen – Terranora System (pages 39/40)

- The **Banora Point Sewage Treatment Plant** wastewater outfall site in Terranora Inlet (TI2) exhibited very high total nitrogen concentrations.
- Elevated total nitrogen levels at the **Banora Point Sewage Treatment Plant** wastewater outfall (TI2) appear localised.

2.4.32 Total Phosphorus – Terranora System (Page 40)

- The highest total phosphorus levels recorded throughout the estuary were recorded in the Terranora Inlet (TI2).

2.9 Terranora System (page 68)

The **Banora Point Sewage Treatment Plant** releases its treated effluent into the mid Terranora Inlet (TI2).

Nitrate and total nitrogen peaked at this site to very high levels in both the wet and the flood seasons and then decreased both upstream and downstream of the **Sewage Treatment Plants** to reasonably low levels. This is due to **effluent** release as it is a very localised peak in nitrate.

Dissolved inorganic phosphate and total phosphorus were also very high and very localised to the **Sewage Treatment Plant** site located in the Terranora Inlet which provides further evidence of **Sewage Treatment Plant** impacts at this site.

4.5.7 Tracing Nutrients in Wet Season – Terranora System (page152)

- A strong gradient in **sewage impact** was clearly evident across the System with highly enriched values recorded at the mouth of the Inlet, significant enrichment recorded at the TI2, near the **Banora Point Sewage Treatment Plant**, and then decreasing into the Broadwaters.
- An enriched signal was evident in the Terranora Broadwater
- The parallel trend in nitrogen tissue content and stable isotope enrichment provides evidence of its combined use as a tool to distinguish between nitrogen sources.

4.5.8 **Tracing Nutrients in Dry Season – Terranora System** (page 152)

- The most enriched signal was found at TI2, the site close to the **Banora Point Sewage Treatment Plant** outfall.
- Similar to the ambient data in the wet season, the Terranora Broadwater was enriched in nitrogen.
- Again, the parallel trend in nitrogen tissue content and stable isotope enrichment provides evidence of its combined use as a tool to distinguish between nitrogen sources.

4.5.9 Tracing Nutrients in Flood Event – Terranora System (page153)

- The most enriched site was again found at site TI2, near the **Banora Point Sewage Treatment Plant** outfall.
- The active bioindicators showed some enrichment in both the Cobaki and Terranora Broadwaters.
- The long-term passive indicators showed very high enrichment for the site next to the **Banora Point Sewage Treatment Plant** as well as the Terranora Broadwater.

4.7.3 Terranora System (page 171/172)
The mouth of the Terranora Inlet exhibited "sewage impacts" in the wet and flood. This sewage influence no doubt arises from the sewage release further upstream at the Banora Point outfall and exposes the Inlet mouth to sewage-derived nitrogen.

Upstream at the Banora Point Sewage Treatment Plant, a considerable sewage impact was evident all year round.
The ecosystem is taking up locally released sewage nitrogen, and phytoplankton populations are responding to elevated nutrients to a certain extent.
The highest phytoplankton response throughout the Terranora System was found in the Terranora Broadwater and to a lesser extent in the Cobaki Broadwater.
The broadwaters exhibited poor health in the wet and flood event as indicated by the suite of biological indicators.
There was good agreement between water quality measurements and anthropogenic nutrient bioindicators.

6.9 Wet Seasonal Functional Zones (page 204/205
"Wastewater" Functional Zone (page 218)
The Terranora Inlet site, near Banora Point Sewage Treatment Plant, exhibited excessive levels of dissolved and total nitrogen and phosphorus as well as exhibiting an enriched nitrogen wastewater signal (mangrove delta N).

6.10 Dry Season Functional Zones) (page 209
"Wastewater" Functional Zone (page211)
Only one site was clearly impacted by wastewater alone, namely in the mid Terranora Inlet site (TI2).
The Terranora Inlet site, near the **Banora Point Sewage Treatment Plant**, exhibited fairly high levels of dissolved and total nitrogen and phosphorus as well as exhibiting enriched nitrogen wastewater signals for both the short-term and long-term nutrient indicators.

6.11 Flood Event Functional Zones (Page 213)
"Wastewater" Functional Zone (page215)
One wastewater cluster formed in the flood event (except for short-term wastewater impacts experienced in the "Clean" Zone).
The mid Terranora Inlet (TI2) clustered into the wastewater zone.
The Terranora Inlet site, near **Banora Point Sewage Treatment Plant**, exhibited excessive levels of dissolved and total nitrogen and phosphorus as well as exhibiting an enriched nitrogen wastewater signal for both the short-term and long-term indicators.

6.12 Annual Functional Zones in Estuarine Health (pages 217/218)
The annual mean was calculated for each parameter sampled in the wet, dry and flood seasons. Means were then analysed using K-Means Clustering and MDS (Multi Dimensional Scaling) analyses to provide an annual snapshot of functional zone health.
Functional zones were then mapped across the whole estuary.

Tweed Heads Environment Group Inc. comment: -
The Terranora Inlet site (T12) near Banora Point Sewage Treatment Plant showed major nutrient impacts due to sewage.
It fell into the "Wastewater Functional Zone (see Figure 6-15)

6.14.5 Terranora Inlet Key Findings (page 222)

- The Terranora Inlet exhibited a marked gradient in water quality due to the localised eutrophic hotspot near the **Banora Point Sewage Treatment Plant.**
- Exposed to sewage N in the wetter periods.
- Localised nutrient hotspot near **Banora Point Sewage Treatment Plant.**
- Low turbidity but light limitation indicating high bloom risk waters.
- This hotspot appeared to be localised as the inlet mouth was flushed.

Tweed Heads Environment Group: comment
The suite of statements in The University of Queensland report unequivocally shows that the discharge of sewage effluent from Banora Point Sewage Treatment Plant causes excessive levels of Total Nitrogen, Dissolved Nitrogen and Phosphorus in the Terranora System.

While the study shows that substantial quantities of sewage nitrogen are present in the leaves of the mangroves and in the phytoplankton, the study does not give any information about what other impacts the sewage effluent has had on the rest of the ecosystem.
The lack of this quantitive benchmark needs to be addressed and the quantity of sewage nitrogen in the environment measured. The current high levels of Faecal Coliform at Banora Point and Tweed Heads West WRP's (p.9 EIS) may explain the increasing incidence of river infections being experienced in Terranora Inlet. Dangerous sewage derived algae (Pfiesteria type organisms) are known to kill and harm estuarine fish stocks.

Other Tweed Shire Council Options

1. Implement a Reclaimed Water Reuse Strategy; (from the one already in use).
2. Discharge excess water to Terranora Creek on the Ebb Tide (as is already the case).
3. Rebuild the late 1960's Tweed Heads West WRP and improve EP from 10,000 to 12,000, and treat sewage to reuse standard.

Tweed Shire Council advises that reclaimed water will continue to be used for irrigation of golf courses (1 only?), and Council will continue to pursue irrigation and other reuse opportunities as part of the Shire-wide Integrated Water cycle Planning process, currently in its planning phase.
Council claims that because the area is almost urban, the primary reuse opportunities identified in the effluent reuse study for the areas surrounding the plant were:

- Urban irrigation
- Residential non-potable supply

Comment: Apart from urban use, three of the major Tweed Shire's WRPs are within a relatively short pipeline distance of cane growing, small cropping and grazing activities, all of which could use reclaimed water. There is no excuse why Tweed Shire cannot match other NSW Council's initiatives to reuse reclaimed water by providing pipeline infrastructure to distribute reclaimed water.

Urban irrigation
The EIS (p.161) advises "On average 170 ML of secondary treated, disinfected effluent is reused per year from Banora Point WRP for the Coolangatta and Tweed Heads Golf Course. This equates to approximately 4.9% of the total annual plant flow".
Residential non-potable supply
The EIS (p.161) advises:
A preliminary estimate of residential non-potable reuse potential in Banora Point/Tweed Heads has been prepared and the results are:

Estimate of Recycled Water Use Potential

Use	**Gross**	**Net**	**Average Demand (ML/yr)**	**Peak Demand (ML/dy)**
Residential (Non- Potable)				
Cobaki Lakes	4444 lots	4444 lots	359	2.9
Bilambil Heights	2963 lots	2963 lots	239	2.0
Area E	1852 lots	1852 lots	149	1.2
Allowance for open Space in residential Areas			75	0.6
Total	**9259 lots**		**822**	**6.7**

Tweed Heads Environment Group comment:

The EIS advises on pages 5/6 that the current plant flow from the two WRPs is 10.8 and 2.6 ML per day or (13.4x365 per year) which totals 4891 ML.

It would appear that the current reuse for urban irrigation is only 3.4755% and not 4.9% and will more than halve if the amount of reclaimed water increases from 44232 (2002) to 114335 (2031).

Insofar as residential (non potable) reuse is concerned the Estimate of Recycled Water Use Potential from the above table is only 16.8% of current plant flow (4891 ML) or only 6.02% of the predicted flow from the 2031 population (12642 ML).

Dismal performance by Tweed Shire Council in the dry land reuse of reclaimed sewage wastewater.

On 5 November 2003 Council approved a new wastewater treatment plant to service a population of 10,200 in a catchment taking in the villages of Kingscliff, Fingal Head, Chinderah, Cudgen, Casuarina and Salt. Further areas including Kings Forest, Seaside and South Kingscliff are currently proposed for development. The redevelopment of parts of the existing town for multi-level units also is contributing to the population significantly.

The EIS for the Kingscliff WWTP (December 2002) was publicly exhibited for the period 16 December 2002 to 14 February 2003) which was a holiday time for those interested in making a submission. During this period of time Tweed Shire Council kept 'secret' from the public until 16 June 2003, Draft Final Report (September 2002) from THE UNIVERSITY OF QUEENSLAND titled ***"TWEED RIVER ESTUARY ECOSYSTEM HEALTH MONITORING PROGRAM (2000 TO 2001)".***

This report would provide the disturbing message to the public that: ""The continuous discharge of sewage N (enriched in 15 N) at 9 km up-river, results in a continuous elevated (δ15 N signature in mangroves and macroalgae adjacent to this sewage outfall" (the site of the existing Kingscliff WWTP). Thus this scientific report was not available for public scrutiny during the public exhibition of the Kingscliffe WWTP EIS.

Council Minutes of 20 November 2002 advise " The Department NSW Agriculture, The Environment Protection Authority and the Department of Land & Water Conservation have concerns with the extent of effluent management options considered in the (Kingscliff WWTP) draft EIS. They have recommended Council further investigate high value effluent reuse options such as crop irrigation in the Cudgen area, Indirect Potable re-use and Urban Non-potable re-use (Dual Reticulation)".

The EPA advised Tweed Shire Council in January 2003 that:

"Effluent Quality Criteria for growth beyond the initial 25000 EP will be largely determined by the demonstrated performance of the 1st stage of the development including the quality of the effluent produced and the extent that effluent reuse strategies have been implemented and effective in reducing the pollutant load discharged directly into the environment".

This raises the following questions for the Tweed Shire Council in its strategy for dry land reuse of reclaimed sewage wastewater:

1. *Why cannot Tweed Shire Council match the performance of other nearby NSW Councils in their dry land reuse of treated effluent; eg Coffs Harbour, Mullumbimby and others and the Gold Coast City Council's use (Dual Reticulation and cane land reuse)?*

   Advice has been received that while Coffs Harbour Council has an ocean outfall for treated wastewater, many types of users, as far away as Sawtell, use piped reclaimed water.

2. *Why should the West Tweed Sewerage plant be rebuilt at West Tweed Heads, when Council could build a Waste Water Plant closer to the 16,000 people who will reside at new subdivisions at Cobaki Lakes and Bilambil?*
The adjacent water starved agricultural land of the Cobaki and Piggabeen valleys would have capacity to utilise not only reclaimed wastewater from the subdivisions but also from the Banora Point Waste Water Plant. The ultimate (2030) population projection for the Banora Point and Tweed Heads West WRP's is between 72,000 and 92,000.
Stage 3 upgrade of the Banora Point WRP provides capacity to serve 125,000 EP.

3. The following news report provides further information on recycled water for Tweed and raises the question: Does this news report show that there is a lack of initiative for the dry land reuse of treated effluent by the Tweed Shire Council?
The Tweed Mail 20 May 2005 reports: "**Recycled water for Lakes.** The Gold Coast City Council will enter into an agreement with Tweed Shire Council for recycled water from Elanora treatment facility to be used at the Cobaki Lakes development project. The Cobaki development covers 606 hectares and will include its own wastewater treatment plant, when housing within the development is completed.
Until that happens, developers are seeking to supplement their sewer system with recycled water for a 10-year period.
A report tabled on the city council's Water Sustainability Committee last week, states the distribution of wastewater to Cobaki would entail the building of a wastewater rising main from the Tugun pumping station. Cost and maintenance on the main would be the responsibility of the Tweed Shire Council. There would be no cost to the Gold Coast.
The infrastructure construction should be completed by the end of this year"

4. Thus the Tweed Shire Council proceeds with its preferred strategy "Discharge excess water to Terranora Creek on the Ebb Tide" in direct opposition to the scientifically based position of the Tweed Heads Environment Group Inc. and against the preference of community groups.

Recommendations

1. Tweed Heads Environment Group recommends immediate cessation of discharge of sewage effluent into the already sick Terranora Inlet.
2.Tweed Heads Environment Group and other community groups are dissatisfied with the conduct, lack of response to questions and correspondence in the process of the Banora Point/Tweed Heads West STP's, Evaluation Workshops on Reclaimed Water Release Options held on 4 & *23* November 2004.
3. Tweed Heads Environment Group and other community groups will continue to protest Tweed Shire Council's preferred option of dumping sewage wastewater into the already 'sick' Terranora System.

We request that you give consideration to our submission.
Please acknowledge receipt of this submission.

Yours faithfully,

R W Murray

Richard W Murray
Secretary

CC Memorandum

Forwarded for your information and attention:

The Hon Robert J Debus, Minister for the Environment
Neville Newell, MP State Member for Tweed
Justine Elliot, Member for Richmond
The Administrators, Tweed Shire Council
The Manager, Tweed Shire Council
Mr Jon Keats NSW Environment Protection Agency
Department of Infrastructure Planning & Natural Resources GPO Box 3927 Sydney NSW
Patrick Dwyer NSW Fisheries PO Box 154 Ballina NSW 2478
Tweed Byron Local Aboriginal Land Council
Tweed River Committee
Tweed Cane Growers
Tweed Heads Chamber of Commerce
Tweed Sun
Daily News
Banora Point Residents Association
Caldera Environment Centre
Kingscliff Ratepayers & Progress Association Inc.
Oxley Cove Action Group
Surfrider Foundation - Tweed and Gold Coast
Tweed District Residents & Ratepayers
Tweed River Cruises

Department of
Environment and Conservation (NSW)

Your reference :
Our reference : 256810A1/06 GR10462
Contact : Ian Greenbank – 66402510

:

Jennifer McMahon
Project Manager
GHD
GPO Box 668
BRISBANE QLD 4001

Dear Ms McMahon

BANORA POINT AND WEST TWEED SEWERAGE AUGMENTATION EIS

I refer to our letter to Council of 1 September 2005 concerning the Banora Point and West Tweed Sewerage Augmentation Environmental Impact Statement (EIS). In this regard I also refer to our letter of 21 July 2004 concerning suggested matters to be addressed in the EIS.

We have reviewed the document (which was received on 4 October 2005) and offer the following comments:-

Air Quality - Odour

We note from the consultant's odour modelling (Sec. 10.4.7) that there is a potential for offensive odours to be emitted from both the Banora Point and Tweed Heads sites. The modelling indicates that all sludge processing activities will need to be fully enclosed and that an extraction and scrubbing system will need to be added to the process. This proposal appears reasonable and it will be important that these air pollution control measures are included in the construction of both plants.

Notwithstanding the above, section 5.17 of the EIS indicates that "During the site inspection (of Banora Point) subjective observations indicated that the inlet works is the primary odour risk at the site at present. Sludge processing and storage was identified as a secondary risk." For this reason we strongly recommend that Council include in the augmentation works odour control mechanisms for the inlet works at both premises. These may include covering the inlet works and treating any waste air by scrubbing or treating by some other method such as biofilters or soil bed filters.

Effluent Reuse

We endorse Council's proposal to pursue effluent reuse opportunities as a component of the effluent management strategy. We encourage adoption of dual reticulation in areas of new development and residential non-potable reuse as a priority in urban areas. As you may be aware, a number of such schemes have been implemented or are proposed in the North Coast area, including new developments on the Cumberland Ridge, Ballina and a planned development at West Yamba. Council have identified three new development opportunities for dual reticulation namely, Cobaki Lakes, Bilambil Heights and Area E.

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is a noxious weed classified as W1 (notifiable) under the Noxious Weeds Act (1993). This matter should be promptly investigated to establish the possibility of identification or clerical error, or otherwise, notification to the local control authority in accordance with Council's responsibilities under the Act.

If you have any inquiries please contact our Ian Greenbank on 66402510.

Yours sincerely

GRAEME BUDD
A/Manager, North Coast
North East Branch
Environment Protection & Regulation Division

Department of
Environment and Conservation (NSW)

Fax to:	Jennifer MacMahon	**of:**	GHD
Fax no:	0733163333		
From:	Graeme Budd	**of:**	
Phone no:	0266402505		
Date:	24 October 2004		
cc:			
Number of pages (including this page):	3		

Message

Dear Jennifer

Thanks for the opportunity to provide comment on Banora Point/west Tweed EIS.

Please find attached our response. Please accept my apologies for not meeting your deadline.

Regards

Graeme Budd

Head Waters and Catchments Unit

24-OCT-2005 16:06 FROM-EPA +61 2 66427743 T-905 P.003/004 F-310

In developing reuse strategy we suggest that Council use a preferred reuse hierarchy against which reuse options may be assessed. Such a hierarchy should be based around the following broad areas:

- uses which replace potable water supply demands with effluent [eg. dual reticulation, existing sporting ground irrigation, industrial reuse opportunities];
- uses which replace water supply demands from natural supplies with effluent [eg agricultural reuse opportunities; industrial reuse opportunities];
- uses specifically created to utilise effluent [eg agricultural reuse including turf farms, environmental regeneration projects].

In addition to this preferred reuse hierarchy we recommend that any strategy incorporate specific mechanisms to drive reuse up the hierarchy. Some options may include a Development Control Plan, which promotes dual reticulation in new development, retrofitting existing developments with dual reticulation; audits of industry and agriculture to identify reuse opportunities and a program to promote effluent reuse.

Effluent Quality

The EIS assesses the performance of the two existing STPs and contains proposed future effluent quality standards for both plants based on water quality modelling. This information is identified in Table 2-5 and entitled "Current and Proposed Enhanced Effluent Quality". We note that several parameters of the proposed effluent quality standard are less stringent that the DEC's "accepted modern technology" criteria for sewage treatment plants.

It is the DEC's policy that a standard reflecting accepted modern technology and best management practice should be adopted even though modelling may indicate that Water Quality Objectives can be satisfied with a lower standard. This is consistent with a precautionary approach and the philosophy of continual improvement outlined in the National Water Quality Management Strategy (Policies and Principles 1994) and also overcomes a tendency for waters to be polluted up to their limits whilst maximising the opportunity for present and future users of waterways to coexist.

For this reason we ask that Council revise its design criteria for Total Phosphorus (TP), Faecal Coliforms (FC) and Grease and Oils (TOG) to be consistent with the DEC's "accepted modern technology criteria" for sewage treatment plants (i.e. TP < 0.3 mg/L; FC <200 organisms/100 mL and TOG < 2 mg/L). We also request Council to include a limit for Ammonia Nitrogen (of 2mg/L).

Water Quality Objectives.

We are pleased to note that Council has adopted the water quality objectives as determined by the Tweed River Committee and based on the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 1992). It is also interesting to note that Terranora Creek is presently impacted on by diffuse source pollutants during periods of wet weather and under dry conditions that sewage effluent is the main contributor to pollution.

The use of the EIS process to identify and propose mitigating works for point source and diffuse source pollutants is commendable. Council's catchment rehabilitation with its rural and urban emphasis should facilitate lasting improvements to the water quality in the Terranora Creek.

Flora and Fauna

The DEC does not routinely provide comprehensive comments on threatened species and other flora and fauna aspects of a development proposal where there is no statutory responsibility to do so. We note with concern, however, that your consultant has recorded Alligator Weed *Alternanthera philoxeroides* at both STP sites (Appendix H). As you may be aware, Alligator Weed

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
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