TITLE: **[E-CM] Response to Notice of Motion - Western Drainage Scheme**

SUBMITTED BY: **Roads and Stormwater**

Validms

Supporting Community Life

LINKAGE TO INTEGRATED PLANNING AND REPORTING FRAMEWORK:

2	Supporting Community Life
2.3	Provide well serviced neighbourhoods
2.3.5	Ensure adequate stormwater drainage, flood management and evacuation systems are in place to protect people and property from flooding

SUMMARY OF REPORT:

At 17 March 2016 meeting, Council resolved the following in response to a notice of motion regarding the stormwater drainage system servicing Banora Point, known as the Western Drainage Scheme:

> ***"RESOLVED** that Council*
>
> 1. *Notes the difficulty in managing the water body within the Western Drainage Scheme particularly in regards to managing the various weed species.*
>
> 2. *Officers review the existing management plans for the Western Drainage Scheme and provide a brief report back to Council for consideration."*

This report responds to the second part of the resolution. Initially the focus of the report was to be weed management options, but now also addresses management options emanating from a significant fish kill event that subsequently occurred in the Vintage Lakes section of the drainage scheme in early April 2016.

RECOMMENDATION:

That the Western Drainage Scheme Operational Management Plan be reviewed following an updated survey of *Comb-Crested Jacana* habitat within the Banora Point Western Drainage Scheme during the 2016/17 summer.

REPORT:

The Banora Point Western Drainage Scheme is a man-made drainage system that was constructed in the 1990s. It provided a trunk drainage and stormwater quality system for a catchment of approximately 445ha, while also providing a source of fill for the surrounding residential development.

Design of the drainage system is based on the *"Banora Point / South Tweed Stormwater Management Plan"* (WBM Oceanics, 1997), which considered flood conveyance, water quality, acid sulphate soils and ecology. The drainage system adjacent to Club Banora and west of Greenway Drive (the "Western Drainage Scheme") comprises fresh water open drains and constructed lakes whose water levels are set at a constant level by a bund before discharging into Trutes Bay through floodgated culverts. The open drains and Lake Kimberley system east of Greenway Drive (the "Eastern Drainage Scheme") is subject to partial tidal exchange and discharges into Shallow Bay.

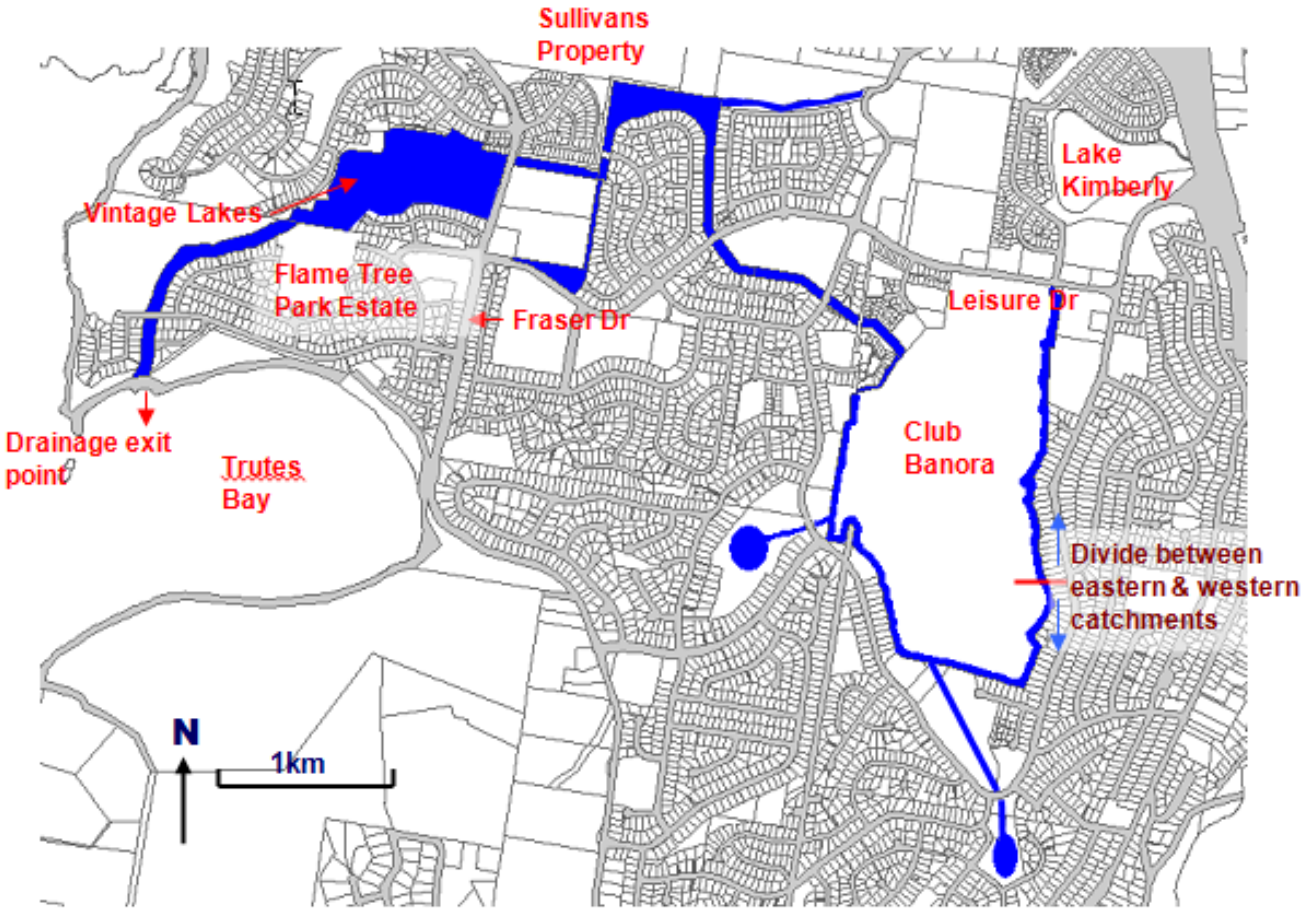

Figure 1. Locality map showing the location of the drainage scheme.
Operational drainage channels

Existing Management Plans

Maintenance and operation of the drainage system is conducted according to the *"Western Drainage Scheme Operational Management Plan"* (Tweed Shire Council, 2003). This plan deals with Council's statutory obligations, environmental and safety risks, weed management, fauna considerations, and the various maintenance options available to manage water quality, aquatic vegetation, and sedimentation.

Maintenance of the drainage scheme occurs under approval 0666/2001DA, originally issued in August 2001. This was subsequently amended in October 2003 to incorporate the Western Drainage Scheme Operational Management Plan (OMP).

Management Issues

Given the scheme's proximity to residences and public open space, and limitations in its design, the drainage system has been the source of frequent complaint from residents and their representative groups throughout its operational life. These complaints generally relate to weed growth, sedimentation and litter/green waste in the open drains, and associated concerns for water quality, odour, pest management, flooding and wildlife health. Overall the drainage system is poorly understood by residents, who frequently refer to it as a natural watercourse, and confuse aesthetic concerns with operational and health issues.

Weed Management

The drainage system provides conditions suitable for a range of aquatic vegetation growth. This includes some problem weeds, including the noxious weeds *Salvinia molesta* and *Cabomba caroliniana*. Clearing noxious weeds from drains is complex and accounts for most of Council's maintenance budget for the Western Drainage Scheme. While salvinia can be successfully harvested, there currently is no successful control method for the underwater weed cabomba. Attempts to clear cabomba can in fact encourage its growth at the expense of desired plants. Salvinia was last harvested from the drains in late 2015. Wandering jew (*Tradescantia albiflora*) is another common weed in the drainage scheme.

Left to right: salvinia, cabomba, wandering jew (NSW WeedWise, DPI)

There are a number of desirable native species such as water lily and water fern (*azolla pinnata*) in the drainage scheme. Azolla in particular is frequently mistaken for a water weed or algae. These desirable species play an important role in the management of the drainage system as they take up nutrients from the water and compete against algal and weed species. The OMP specifies that *"non-noxious aquatic macrophytes will not be subject to mechanical control measures unless they compromise the safe function of the stormwater drains"*.

Left to Right: water lilies supporting a comb-crested jacana (www.birdphotos.com.au), azolla (NSW WeedWise, DPI)

Threatened Species Constraints

Water lilies in the drainage scheme provide foraging, roosting and breeding habitat for the Comb-crested Jacana, which is listed as Vulnerable under the NSW *Threatened Species Conservation Act, 1995*. The jacana nests from January to March, with a fledgling period from February to June.

The approval for maintenance of the drainage system (0666/2001DA.01) includes specific conditions requiring monitoring of the jacanas and limiting maintenance works such as sediment removal, to periods outside of the breeding season - August to October.

The OMP was based on jacana surveys in 2000, 2001 and 2003 which estimated a population of 16, 17 and 5 individuals respectively throughout the Western Drainage Scheme. Threats to the jacana population included predation by fauna, disturbance of nesting sites by human activities, and declining water lily growth.

No further jacana surveys have been undertaken, despite the requirements of the approval for drainage maintenance and the recommendations of the OMP. The water lily habitat suitable for the jacanas is now thought to be limited mainly to the golf course canal, and the drain between Club Banora and Riversdale Boulevard.

Water Quality

In terms of current condition, the drainage system is functional hydraulically and the water quality does not pose any significant health risks. The waterbody is however eutrophic, that is, over-saturated with nutrients (phosphorus and nitrogen) and exhibiting a boom and bust cycle of aquatic vegetation growth. Within the system itself, the impacts of aquatic weeds are largely aesthetic, however it is acknowledged that the current summer season has seen significant weed growth due to high temperatures and few storm events to flush the system, until recently.

The flat topography through the whole drainage scheme means all of the drains are permanently ponded waterbodies that only flow in response to rainfall. The ponded nature of the drains, and the proximity to large residential areas and the golf course means that they are a sink for stormwater pollutants from untreated urban stormwater runoff - particularly sediments from development sites and nutrients from sources such as fertilisers and detergents. Water birds are another source of nutrient in the system. Large numbers of birds have been attracted to the area by people feeding them.

Due to the developed nature of the catchment, the drainage system receives significant inputs of litter, and this accumulates in certain areas causing aesthetic impacts and pollution of the environment.

A short term water quality monitoring program was implemented in 2013 in the central part of the system. Monitoring showed elevated levels of nitrogen, which is characteristic of an urban stormwater system. There is currently no ongoing routine water quality monitoring program for the fresh water sections of the Western Drainage Scheme, despite the recommendations of the OMP that sampling and testing for water quality be undertaken twice yearly. Rather, water quality monitoring has been related to specific issues or events only.

In a broader context, the outflow of urban stormwater from the Western Drainage Scheme is a significant source of nutrients being discharged into Trutes Bay, part of Terranora Broadwater. Reduction of the nutrient source is a high priority action identified in the Cobaki - Terranora Broadwater Coastal Zone Management Plan.

Fish Kills

The Vintage Lakes section of the Western Drainage Scheme was subject to a significant fish kill in April 2016. This is not unprecedented - similar fish kills occurred in March 2001 and January 2005.

Latent conditions in Vintage Lakes are thought to be the cause of the fish kill - below average lead up rain, persistent warm conditions, and widespread red azolla growth across the surface of the lake indicating high levels of nutrient in the lake. The fish kill was generally limited to a very large number of mature mullet within the lake, which suffocated due to lack of dissolved oxygen (DO) in the water. Low DO levels are associated with a lack of flow or turbulence in waterbodies, together with the decomposition of aquatic plants.

Vintage Lakes fish kills, January 2005 (left) and April 2016 (right), both showing dead mature mullet and widespread red azolla coverage.

Water monitoring following the April 2016 fish kill confirms that Vintage Lakes is generally low in DO, and even following extensive rainfall in June 2016 DO levels did not rise significantly.

Laboratory testing ruled out other contaminants such as pesticides, sewage overflows, or algal blooms as the cause of the fish kill.

Measures such as water circulating pumps and mechanical aerators have previously been investigated for use in Vintage Lakes to address low DO, however their costs to hire / purchase and run outweigh the potential limited benefits to the overall drainage system. Any new budget allocations would be better spent on targeting nutrient levels in the waterbodies.

Legal Constraints

Council is party to a deed of agreement with Twin Towns Services Club Limited (Club Banora). The canal that surrounds the Club Banora golf course forms the headwaters to the Western Drainage Scheme, and is owned by the Club and is contained within an easement benefitting Council. Council has constructed various physical barriers along the drainage scheme to prevent saline water intrusion into the golf course canal, which is used by Club Banora to irrigate the golf course. The deed of agreement and terms of the easement prevent changes to the tidal regime in the Western Drainage Scheme, and the risk of salt contamination of the golf course canal. Club Banora is permitted to remove sediment from the canal to maintain a minimum depth of 1.5m under the terms of the easement, and the OMP.

OPTIONS:

Management Options

As Council has previously acknowledged, optimal management of the drainage system is complex.

The growth and removal of aquatic weeds by mechanical means removes nutrients from the drainage scheme and potentially improves water quality discharged to Trutes Bay. This is the current method, which consumes most of the annual maintenance budget for the Western Drainage Scheme. In terms of nutrient and biomass removal efficiency, mechanical weed removal has many advantages over other possible options for nutrient removal.

Alternate control measures that kill aquatic weeds, such as salvinia weevils or herbicides, are problematic as the decaying plant material consumes dissolved oxygen and releases nutrients into the water column. Bottom sediments are already a significant source of nutrients within the drainage scheme.

In response to recommendations of the *Cobaki-Terranora Coastal Zone Management Plan*, in 2010 Council commissioned a review of potential actions that could be undertaken to improve water quality in the western drainage scheme, and to reduce impacts on Trutes Bay. The following twelve actions were identified with possible benefits to water quality and other environmental attributes.

1. Education strategy to discourage bird feeding;
2. Diversion works in the Russell Way lake to capture and remove sediments;
3. Bunding off a section of Vintage Lakes for sediment and weed management;
4. Construct a treatment wetland for diverted flows from Russell Way lake;
5. Construct treatment wetlands for diverted flows through Vintage Lakes and from surrounding urban stormwater outlets;
6. Re-profiling and revegetation of lake edges;
7. Re-establish fresh water regime in constructed wetlands downstream of Vintage Lakes;
8. Convert pond off Amaroo Drive into a treatment wetland;
9. Involvement in the potential redevelopment of the golf course to fill in or rehabilitate sections of the canal;

10. Re-establish native submerged macrophyte species;
11. Remove and rehabilitate drain sediments;
12. Re-profile and revegetate the drainage system.

From this list there was no single recommendation that could be affordably or practically implemented to address the inherent problems within the system.

As an alternative, the Natural Resource Management Unit is currently trialling floating reed beds in the section of canal upstream of Fraser Drive. The reed beds are small floating pontoons that support plants that take up nutrients from the water in the channel, without affecting flood height or duration. The trial will allow assessment of the durability of the reed beds and potential damage from birds or vandals. If they prove successful, a full scale deployment will be considered with the aim of improving the quality of water being discharged from the Western Drainage Scheme into Trutes Bay and Terranora Broadwater.

Tidal flushing, as occurs in the Eastern Drainage Scheme, is effective in controlling weed growth and ensuring good oxygenation in Lake Kimberley. The Western Drainage Scheme is physically capable of allowing a degree of tidal flushing by altering the floodgates and bunds downstream of Vintage Lakes. However the existing Deed of Agreement with Club Banora prohibits further consideration due to the risk of saline intrusion to the golf course. A change in the drainage regime from fresh to salt water would also impact on various flora and fauna species in the Western Drainage Scheme, and would require thorough environmental impact assessment. This management option cannot be considered further at this time.

It is not feasible to significantly alter the contributing catchments, drainage configuration, or stormwater discharge points for the Western Drainage Scheme, given the fixed nature of this infrastructure within the urban structure of Banora Point. Previous concepts to engineer scheme improvements have been cost prohibitive and/or likely to involve significant environmental disturbance.

The existing approvals and management plans outline Council's expected service levels and responsibilities around drainage maintenance. These service levels acknowledge the constraints imposed by Threatened Species management, and the Deed of Agreement with Club Banora.

Further water quality monitoring, although expected under the OMP, is of limited value for ongoing management, given the eutrophic nature of the waterbodies is already well established.

The factor that is most likely to have changed in the years since the OMP was adopted relates to the presence of the Comb-crested Jacana and its preferred habitat. The OMP imposes restrictions throughout the whole Western Drainage Scheme, however it is thought that the suitable jacana habitat is now limited mainly to the golf course canal and the drain between Club Banora and Riversdale Boulevard. A thorough survey of the water lily habitat, and for the presence of the birds themselves is recommended in the upcoming breeding season. Should changes be observed, this could enable a review of the OMP and modification of 0666/2001DA to relax the maintenance limitations imposed outside of the August to October period in sections of the Western Drainage Scheme. That is, this could allow for additional sediment and weed removal within the system.

In the short term, sediment and weed removal from the sections of open drain behind Birkdale Court and Avondale Drive is planned for August 2016.

In terms of nutrient and biomass removal efficiency and noxious weed management, mechanical weed removal remains the preferred treatment option for the Western Drainage Scheme. Mechanical harvesting will be scheduled for November / December 2016. Other actions such as trialling the floating reed beds will also continue.

In response to this report, Council may resolve to:

1. Accept the recommendations of the report, or to
2. Request alternate operational and/or maintenance measures be further investigated, with a report on cost implications to be provided.

CONCLUSION:

The Western Drainage Scheme has an established Operational Management Plan which tries to address the various requirements of maintaining an effective and safe drainage system within a range of constraints. Unfortunately the drainage scheme is subject to regular nutrient loads from adjoining urban development which in turn promotes noxious weed growth and water quality issues. Management of the drainage scheme is complex, however this is not well understood by adjacent residents.

COUNCIL IMPLICATIONS:

a. Policy:
Western Drainage Scheme Operational Management Plan (2003).
Management Plans

b. Budget/Long Term Financial Plan:
Council has allocated $109,000 in 2016/17 for maintenance of the Banora Point Western Drainage Scheme. The majority of this funding will be spent on aquatic noxious weed removal performed once per summer. Around $26,000 of this annual allocation is spent on mowing the areas along the drain banks. Additional funding would permit increased frequency/extent of noxious weed maintenance and sediment removal, however the constraints described in the report remain, pending further review (i.e. restrictions to disturbing jacana habitat outside of August to October each year).

c. Legal:
Refer to above discussion on the Deed of Agreement with Twin Towns Services Club Limited.

d. Communication/Engagement:
Inform - We will keep you informed.

The issues around ongoing management of the Western Drainage Scheme are frequently raised by media, local residents, and residents associations, such as the Banora Point and District Residents Association. Council officers will continue to respond to these enquiries in accordance with the OMP.

UNDER SEPARATE COVER/FURTHER INFORMATION:

Nil.