

**RESTORATION OF DRAINAGE PATHS
BNR & SURROUNDS**

Preliminary Draft for Discussion

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OCTOBER, 2015

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410: Restoration of Drainage Paths - BNR &

Surrounds - Preliminary Draft for Discussion

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Date: _____

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FIGURES

Figure 1: Locality Plan [To be provided at a later date]

1. BACKGROUND

1.1. General

- 1.1.1. Intrapac are Project Managing the development of CURA A at Cumbalum near Ballina. Dr Webb of Stephen N Webb & Associates has been appointed by Intrapac to manage the Stormwater Drainage and Flooding issues.
- 1.1.2. At an early meeting with Ballina Shire Council (“Council”) to discuss stormwater issues, Council advised Intrapac to engage with the immediate downstream landholders to CURA A, Messrs Beddoes and Thomson, as they had major concerns about the likely impacts of this development, and prior developments, on stormwater drainage and flooding.
- 1.1.3. Soon after engaging with the landholders it became apparent that there had already been significant impacts on water levels affecting these landholders, and these impacts had been far larger than anything that might result from the development of CURA A.
- 1.1.4. A number of investigations and data collection exercises have been carried out by Intrapac since that time, and a number of meetings have been held with Council, culminating in the convening by Council of a stakeholder meeting on 22nd July 2015. As one of the outcomes of this meeting, Dr Webb was asked to prepare a brief report based on his investigations to date, and report on measures that could be undertaken to reduce the drainage problems. BMT WBM was nominated to peer review the report.
- 1.1.5. This report briefly summarises the data that has been collected, and the outcomes arising from this and many discussions with the landholders and other interested parties. The report then puts forward a series of Short Term and Longer Term measures for discussion. Some can be carried out at little cost, and with little or no further investigation. Other measures require further consideration and could involve significant costs.

2. A BRIEF HISTORY OF MAJOR EVENTS AFFECTING DRAINAGE WITHIN AND ADJOINING THE BNR LEADING UP TO THE PRESENT DAY

2.1.1. The following summary is based on discussions with various parties and published records. Many items have not been able to be verified and could be subject to change if further information becomes available:

- **Ballina Airport.** This was constructed many years ago (shown as “under construction” in a topographic map published more than 20 years ago, and shown in 1987 aerial photography, but not visible in 1979 photography). The construction of the airport appears to have cut across a number of man-made drains apparent in the area at that time.
- **An airstrip a short distance south of Ross Lane,** which runs broadly east-west, was constructed about 25 years ago. The airstrip severs Deadmans Creek and forms a low-level barrier between flows from the north and flows from the south at this location. It has the effect of limiting the flows to the BNR from the north in minor floods, at least on the western side of the floodplain. It also inhibits potential drainage from the BNR, and surrounding wetland areas, attempting to drain to the north. What, if any, approvals were obtained for this construction is unknown.
- **Blockage of drains near Ross Lane.** Approximately eight (8) years ago (December 2007), a “rock weir” was constructed across a drain joining the NR1 and NR2 drains just outside the western boundary of the BNR. I have been advised that at a similar time the NR2 was blocked by “rock-fill” at its junction with North Creek. These two works, in combination, had the effect of lifting water levels in the BNR at this point by about 0.5 metres, with consequent increases in water level and groundwater levels throughout the BNR and adjoining areas, including the Beddoes and Thomson properties. The raised water level is also likely to have increased flood levels in the vicinity for small to medium-sized floods.

I have been advised that the works (the “rock weir” and the “rock-fill” in the NR2 drain) were carried out under the authority of the RRCC. The NPWS would seem to have given permission for the “rock-fill” in the NR2 drain. The NPWS have provided me with an REF, dated 2003. This describes the proposal to block the NR2 drain at North Creek, but describes different works from those carried in or about 2007. It justifies the works, at least in part, by stating that the NR2 drain was not a “legal drain”. It also makes no reference to the “rock weir”, which was apparently constructed at about the same time. The REF makes no reference to the substantial water level change that would result from the existence of these two works at the same time.

3. AVAILABLE DATA

3.1. Existing Studies

3.1.1. A large number of studies have been carried out which are relevant to evaluating the stormwater drainage issues downstream of the CURA A development. A number of these have been initiated by Council, the more important being:

- Ballina Flood Study Update, BMT WBM,
- Ballina Floodplain Risk Management Study, BMT WBM, Volumes 1 & 2,
- Ballina Floodplain Risk Management Plan, BMT WBM,
- Newrybar Swamp Drainage and Flood Mitigation Study, Final Report, June 2015, BMT WBM.

3.1.2. The latter study in particular is relevant to these considerations. The study determined that drainage flows from the Cumbalum area are now from the South to the North (towards Ross Lane). It identifies and describes the "rock weir" in the drain connecting the NR1 and NR2 drains, and comments on the water level impact of the weir at the time it was observed. The report also examined a number of mitigation options relevant to the area, including Measure 9, which looked at a possible drainage connection from Roberts Creek to the Airport drain.

3.2. Aerial Photography

3.2.1. Current and historical aerial photography has been obtained for assessing present and historical development constraints likely to affect stormwater drainage design.

3.3. Survey

3.3.1. LiDAR data for the BNR and adjoining lands has been processed into a suitable form and a check survey carried out to validate the data. The check survey showed that the LiDAR data was accurate, and within its normal tolerances, and was therefore suitable for the purpose.

3.3.2. A survey traverse to determine water levels has also been completed around the western perimeter of the BNR with the objective of identifying water level elevations, accompanying ground levels, and water level gradients. This has been processed and provided to Council, adjoining landholders and BMT WBM.

3.4. Monitoring of Hydrologic Data

3.4.1. Water level and groundwater level monitoring equipment, as well as two rain gauges, have been installed on CURA A and downstream. One of the continuous water level recorders is effectively monitoring the BNR water level in the vicinity and one of the groundwater level monitoring gauges is expected to perform a similar function at higher water levels. The first set of readings have been taken and are awaiting reduction and plotting before being disseminated.

3.5. Consultations

3.5.1. Consultations have been held with:

- Council – a number of meetings with Council's engineers and planners,

- Downstream landholders – a number of meetings have been held with Colin Beddoes and Andrew & Jennie Thomson,
- NPWS – a meeting has been held with Mark Pittavino.

3.5.2. Field inspections have been held with:

- Downstream landholders and a number of interested parties carried out field inspections near Ross Lane, at the Airport and within the wetlands adjoining the landholder properties on 20th May 2015 (included Steve Webb and Bill Knobel of Intrapac, BHE representatives, four Council officers),
- Intrapac Surveyors to identify features requiring additional survey, including the drain blockages near Ross Lane,
- Recently Colin Beddoes took Steve Webb and Bill Moorhouse on a further inspection of the BNR and environs.

3.5.3. Council convened a meeting of approximately a dozen interested parties (Stakeholders) at Council on 22nd July 2015. A summary of outcomes from this meeting was disseminated by Council to all attendees shortly after the meeting.

4. ASSESSMENT OF PROPOSED MEASURES

4.1. General

- 4.1.1. The agreed priority at the first meeting of stakeholders was to identify measures that could be executed quickly and which would require little or minimal prior investigation. Measures have been identified below that are also likely to give the most impact for the least effort on the basis that these should be accorded priority. Such measures have been listed under “Short Term”.
- 4.1.2. Measures that will require the collection of more information, or require further hydraulic modelling or environmental assessment, have been identified under “Longer Term” below.

4.2. Short Term Measures

Measure 1A

This measure involves **dismantling of the rock weir**, possibly in stages, that was placed in the north-south drain joining the NR1 and NR2 drains just west of the BNR. As discussed above, this structure was built at the same time as the eastern end of the NR2 drain was blocked at North Creek. This measure would involve little direct cost.

Measure 1B

Removal of the blockage in the NR2 drain just west of North Creek. The blockage was installed at the same time as the weir was installed as referred to in Measure 1A. In combination, these two measures have caused extensive ponding within the BNR and in surrounding areas. Water levels have been increased by of the order of 0.5 m. This measure would require the removal of the largely rock-fill blockage, and the replacement of the floodgates which appear to have been removed. This would be moderately expensive to implement.

Measure 1C

Clearing of the NR2 drain from North Creek to the western end where it joins Deadmans Creek. The drain is overgrown and silted up after being closed for about 8 years. This would be moderately expensive to implement. This would complement measures **1A** and **1B**. As part of measures **1B** and **1C**, the NR2 should be gazetted as a “legal drain” after it has been fully restored.

Measure 1D

This involves cleaning out of the NR1 drain, particularly towards its western end. This is acknowledged as being a “legal” drain and thus should be maintained by Richmond River County Council (“RRCC”). It has apparently not been maintained for some time and is inhibiting drainage from the northern arm of Deadmans Creek. This would be relatively inexpensive to implement.

ASSESSMENT OF MEASURES 1A TO 1D

- Approvals required would involve at least the following – Council, NPWS, RRCC, and the landholder on whose land the weir is located (Richard Walsh).

- Funding would be required to implement these measures. Some measures involve very little funding, but others will require more. Funding was raised as an issue at the stakeholder meeting at Council on 22nd July. It was understood from that meeting that various Government/Local Government parties were going to meet and discuss funding sources after that meeting.
- Regular monitoring of water levels along the Water Level Traverse already set up and reported would be required. Intrapac would take on that responsibility in the short to medium term. A new Water Level Traverse would need to be done just before any works are implemented, and at intervals of about 1 month depending on how fast water levels drop. A continuous automatic water level recorder installed on the Thomson property by Intrapac would assist in monitoring changes. A water level recorder on the lower part of the CURA A property may also assist.
- It is my opinion that no further hydraulic or ecological investigations are necessary before implementing measures **1A** to **1D**. This is because:
 1. These measures will largely reverse the actions taken to block the drains in or adjoining the BNR in December 2007 [from the information made available to me to date, there appears to have been inadequate prior assessment and consultation before these measures were implemented],
 2. These measures will restore drainage paths and water levels to those that prevailed prior to December 2007,
 3. Monitoring of water levels recently has shown that there is a steady reduction in water levels from the Thomson/Beddoes farms northwards to the “rock weir” (removal of the blockages should therefore reduce water levels adjoining the Thomson/Beddoes lands),
 4. Colin Beddoes’ observations, whilst visiting the areas near the “rock weir” over a period of more than 10 years, is that water levels have been consistently higher (by the order of 0.5 metres) since the blockages occurred, resulting in elevated water levels at his and the Thomson’s properties over the same period,
 5. Although not formal observations, several people have alluded to dieback in the vegetation in the BNR since the blockages occurred. It is therefore likely that removal of the blockages will reverse this process, or at least reduce any further adverse impacts from elevated water levels.

Measure 2A

Although not necessarily obvious at this time, it is likely that when the water level is lowered at the northern end of the BNR by the works proposed above, some locations along the flowpath from the Thomson’s land to the NR2 drain will have minor hydraulic obstructions such as silt, fallen trees and minor embankments for farm vehicle access. It may be appropriate once the water levels reach some sort of equilibrium, that the flow path should be inspected to determine if any such features are artificially increasing the water levels. All of this flowpath lies outside the BNR. The permission of landholders would need to be sought to carry out any such maintenance works.

4.3. Longer Term Measures

- 4.3.1. Based on observations of water levels after **Measures 1** and **2** are implemented, other obstructed flowpaths could be considered for clearing. This would largely if not entirely have to be outside the limits of the BNR. Also it should be kept in mind that the primary purpose of the current exercise is to restore the drainage to something like it was 8 years ago before the identified drains were blocked. Any further clearing of obstructed flowpaths may require hydraulic, economic and environmental justification. Significant costs could be involved to establish a case for further works, in addition to implementation and maintenance costs.

Measure 3A

Investigate clearing a flowpath from Roberts Creek near the Thomson/Beddoes properties to the existing drain near the Airport which flows into North Creek. A measure similar to this has been examined in a preliminary way in the recent Newrybar Swamp Drainage and Flood Mitigation Study ("Measure 9"). Such a measure is favoured by the Thomson/Beddoes landholders. It is attractive hydraulically as it would provide a more direct path to North Creek and could lower water levels further after implementation of **Measures 1** and **2** above. Drainage improvements may be able to be implemented in a less intrusive way than anticipated in the Newrybar Drainage Study, by keeping the invert level high (i.e. above the PASS level), and concentrating on levelling/reducing artificially high ground levels which are present in limited areas between the Airport drain and the properties. This measure should only be considered further after water levels stabilise following implementation of **Measures 1** and **2**.

Measure 3B

Investigate restoring some of the drainage paths from the wetlands south of the BNR to North Creek that were blocked during the construction of the airport. These could be regarded as an extension of **Measure 3A**. Similar qualifications apply.

- 4.3.2. **Measures 1** and **2** will largely restore conditions in the northern part of the BNR and surrounding lands to how they were in December 2007. Even with these measures implemented, drainage paths will still be limited and possibly inadequate for the northern areas, as Deadmans Creek has been blocked (see Section 2 discussion), the existing channel of Deadmans Creek north of the blockage is known to be severely congested, and further potential development of CURA B may put additional pressures on drainage in this general area. The following measure has therefore been identified.

Measure 4A

This measure involves investigation of drainage constraints and further remedial measures in the northern section of the swamp, being largely immediately south of Ross Lane and west of the BNR. Different stakeholders would have an interest in this measure, and a different group may need to be convened by Council to investigate remedial drainage measures in this area, if deemed appropriate.