

## APPENDIX B: INTERIM FLOODGATE MANAGEMENT PROTOCOLS FOR KILLICK FLOODGATES



### REVISION/CHECKING HISTORY

REVISION NUMBER	REVISION DESCRIPTION	DATE	CHECKED BY		ISSUED BY	
0	Interim	March 2006				

## BACKGROUND

Apart from its intrinsic natural ecological values as an estuarine environment, Killick Creek serves two main functions from a human perspective:

- Assistance with flood mitigation during major flooding from the Macleay River and post-flood drainage from farm lands within the Upper Belmore Swamp; and
- Recreational use within the lower reaches, including primary contact activities such as swimming, particularly during the main holiday period (taken as early October to late April of each year).

These two functions sometimes conflict with each other, as well as with the natural values of the estuary. The Killick Creek floodgates, located within Killick Drain, can be partially manipulated to modify the impact of floodwaters and post-flood drainage on the Killick Creek receiving water environment. As such, management of the floodgates, as advocated by these protocols, can help to achieve the balance between the flood mitigation and recreation uses of the estuary, giving consideration also to the environmental attributes of the system.

## OBJECTIVES

The objectives of these Floodgate Management Protocols are:

1. to enable flood, drainage and groundwater management of agricultural lands within the Upper Belmore Swamp;
2. to minimise impacts of discharges from agricultural land on the condition and quality of water and aquatic ecosystems within Killick Creek; and
3. to prevent intrusion of saline waters into agricultural drains and freshwater wetlands upstream of Killick floodgates.

## WORKS REQUIRED

The protocols are based on manual modifications to dropboards and floodgates within Killick Drain, in response to measured water levels and water quality. A water quality monitoring station is already in operation approximately 80 metres upstream of the existing floodgate structure. The results obtained from this station will be used to drive the operational procedures for the floodgates. Therefore, this water quality station will need to be maintained while ever a balance is required between the competing anthropogenic interests of Killick Creek.

Infrastructure-based works required before the Killick Creek floodgates protocols can be implemented are:

1. Fabricate and install new fully interlocking and sealable dropboards on the upstream side of the existing floodgate structure, and an effective and efficient method of removal and reinstallation of the dropboards.
2. Incremental markings, relative to Australian Height Datum (AHD), on part of the floodgate structure to provide a visual indication of water levels in the drain (to help guide management

decisions during periods when the automatic water quality / water level monitoring station is off-line).

3. Carry out a *Conditions Assessment* of existing floodgates with repair / replacement, as necessary (refer Strategy H, see Section 6.3.2.1 of the Estuary Management Study and Plan for description, and Section 7.5 for implementation details).

In addition to the above, a single point contact with upstream landholders is required to confirm protocol actions before implementation. A backup contact should also be identified in the event that the first representative cannot be contacted.

Also, a local Council officer should be provided with a back-up hand-held water quality probe (which can also be used by the same officer for Entrance Management tasks – see Appendix A), to be used in the event that the automatic water quality station is off-line and telemetered water quality data is not available to Council during the decision making process.

## WATER QUALITY CRITERIA

Acceptable water quality criteria have been established for flood / drainage waters to be discharged into Killick Creek. These criteria are based on physico-chemical parameters only, as they can be monitored directly by the automated station or a hand-held probe. The criteria have been based loosely on ANZECC (2000) guidelines and have been established to protect the estuarine environment and minimise impacts on the recreational usage of the waterway. The criteria are designed to provide thresholds for acceptability. All parameters need to be within the defined thresholds for the overall water quality criteria to be met.

Interim water quality criteria are presented in Table B-1.

**Table B-1 Interim Water Quality Thresholds for Killick Floodgates**

Water quality constituent	Threshold
Dissolved oxygen	4 mg/L (minimum)
pH	5.5 (minimum)
Temperature	35°C (maximum)
Turbidity *	20 NTU (maximum)
Secchi depth	1.0 metres

\* if available

Modifications to these criteria may be made in the future following further consideration of environmental impacts and associated implications for management of upstream agricultural lands.

## WATER LEVEL CRITERIA

Water levels in the agricultural drains upstream of the Killick Creek floodgates are controlled by the position of the dropboards. Higher water levels are retained in the drains at times to assist with acid sulfate soil management within the floodplain. During other times, maximum drainage from the

floodplain is required, particularly during Macleay River and/or Maria-Hastings River flood events or significant local rainfall within the Belmore Swamp area. Post-flood drainage is also critical for removing floodwaters from productive agricultural lands and minimising pasture losses due to extended inundation.

A number of different water levels have been defined to represent different modes of dropboard operation. These levels are based on minimising the discharge of flood and drainage waters to the downstream estuarine environment without unduly compromising the effectiveness of the overall flood mitigation scheme and the productivity of the upstream farm lands. Interim water level criteria for operation of the Killick floodgates / dropboards are provided in Table B-2.

**Table B-2 Interim Water Level Thresholds for Killick Floodgates**

Threshold	Action
0.50m AHD	<u>Increasing water level only</u> : If dropboards in place, remove dropboards to a level of -0.3m AHD
0.25m AHD	<u>Falling water level only</u> : If dropboards not in place, reinstall dropboards to a level of 0.25m AHD if WQ criteria are met, or a level of 0.50m AHD if WQ criteria are not met (refer Table B-1 for specification of WQ criteria)

Modifications to these criteria may be made in the future following further consideration of environmental impacts and associated implications for management of upstream agricultural lands.

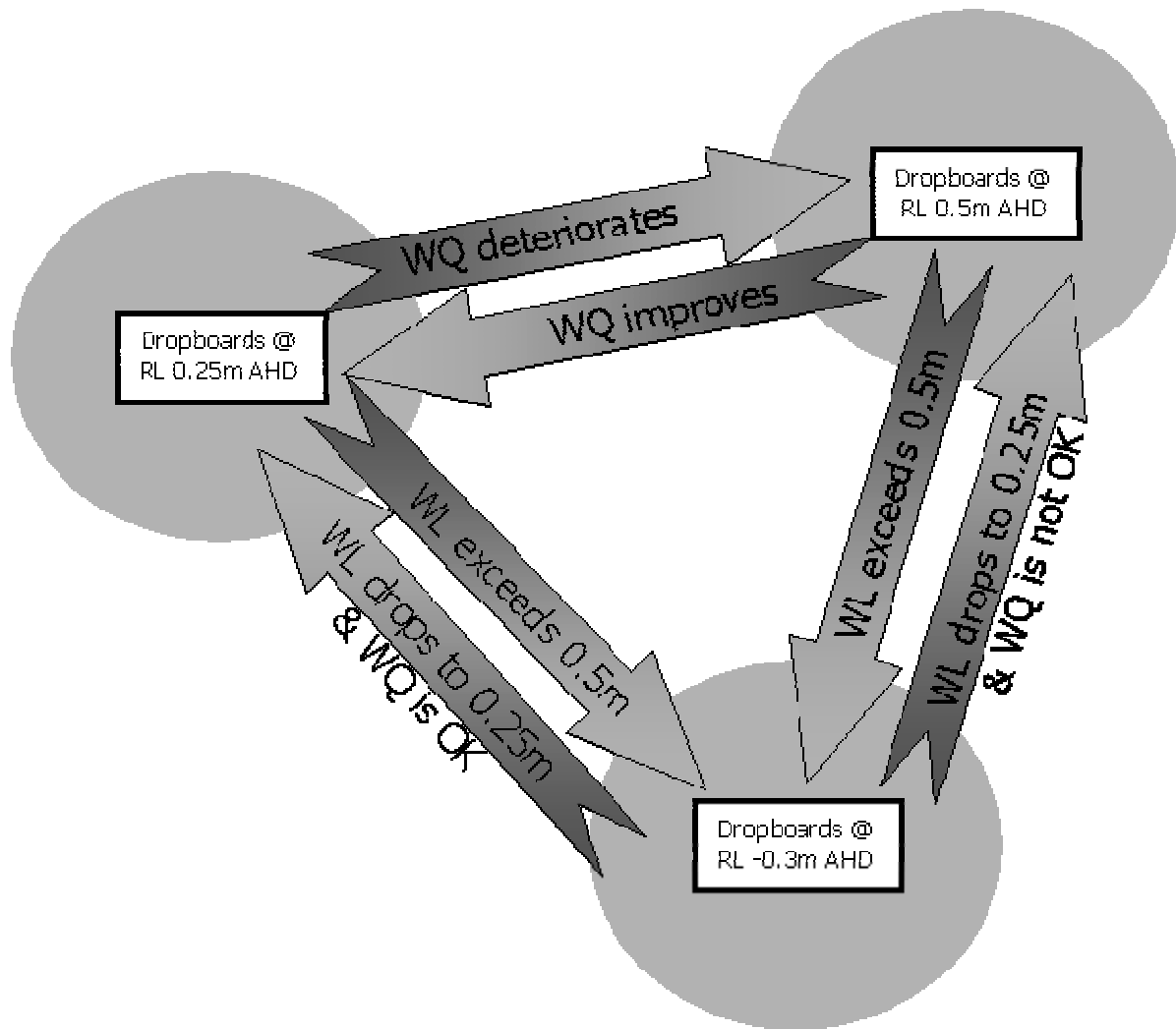
## OPERATIONAL PROCEDURES

Operational procedures for management of the Killick Creek floodgates are based on water levels and water quality that are recorded within the drain upstream of the floodgates every 15 minutes. Water levels and water quality data from the existing Killick Drain water quality station are available from Council's web-site (<http://www.mhl.nsw.gov.au/www/kempuserwq.htmlx>), and are uploaded to the web approximately every 3 hours.

The principles of floodgate operation are based on:

- maintaining a minimum water level in the agricultural drains of 0.25m AHD;
- allowing unimpeded drainage of water from the floodplain when water levels in the drain are elevated (above 0.25m AHD) and while ever water quality meets the specified criteria;
- limiting drainage of water from the floodplain if it is of poor quality (i.e. does not meet the water quality criteria) to intermittent 'pulse' events or 'slugs' (of approximate volume 25ML, as defined by the volume held within approximately 6.5km of agricultural drain [typically 15 metres wide] between levels of RL 0.25m and 0.5m AHD). The 'pulse' discharge volume is approximately 20% - 25% of the tidal prism of Killick Creek (i.e. the volume exchanged with the ocean every tide, see MHL, 2002);
- Unimpeded drainage of *flood waters* from the floodplain (as defined by water levels in the drain in excess of RL 0.5m AHD).

Operational procedures for the Killick Creek dropboards are summarised in Figure B-1.



**Figure B-1 Interim Operational Procedure Flow Chart for Management of Killick Creek Floodgates**

The operational procedures are based on three (3) modes, or states, for the dropboards.

Mode 1: boards in place to a level of RL 0.25m AHD – standard position during non flood times when water quality in the upstream drain meets the defined criteria (refer Table B-1).

Mode 2: boards in place to a level of RL 0.50m AHD – standard position during non-flood times when water quality in the upstream drain *does not meet* the defined criteria (refer Table B-1).

Mode 3: boards removed to a level of RL -0.3m AHD – position during floods and post-flood drainage, regardless of water quality conditions in the agricultural drains.

- Step 1: When water levels exceed RL 0.5m AHD, the dropboards will be removed to a level of RL -0.3m AHD (i.e. remove all boards except the bottom board). Dropboards are to remain removed until water levels fall to below 0.25m AHD. Once water levels reach 0.25m AHD and water quality in the upstream drain meets the specified criteria, follow Step 2. If water quality does not meet the criteria, follow Step 3.
- Step 2: When water levels fall to 0.25m AHD and water quality criteria are met, dropboards will be replaced to a level of 0.25m AHD. Continued drainage from the floodplain is permitted by overtopping of the dropboards, whilst maintaining a minimum water level for acid sulfate soil management. If on-going water quality monitoring indicates deterioration of the water (i.e. no longer meets the water quality criteria), then follow Step 3.
- Step 3: If water quality criteria are not met, dropboards will be replaced to a level of 0.50m AHD. Drainage from the floodplain is effectively prevented until water levels once again reach RL 0.5m AHD (at which time the dropboards will again be removed, following Step 1 above). If on-going water quality monitoring indicates improvement in the quality of water within the upstream agricultural drain (to meet the water quality criteria), then follow Step 2.

It is proposed that the nominated Council officer(s) are made aware of threshold exceedences in water level and water quality via automated alerts sent via email and/or mobile phone SMS. For example, alerts can be sent when water levels reach 0.25m and 0.5m, while any change in exceedance or compliance with water quality thresholds can also be notified.

## **INTEGRATION WITH KILLICK CREEK ENTRANCE MANAGEMENT POLICY**

To ensure minimum effect on the water quality and aquatic ecosystem of the Killick Creek estuary, discharges from the agricultural drains should only be permitted when the creek entrance is open, thus allowing tidal exchange of waters between the estuary and the ocean.

If the entrance is closed and an intermittent 'pulsed' discharge of water agricultural waters (of poor water quality) is proposed, then the entrance of Killick Creek should be opened artificially in accordance with the provisions specified in the Killick Creek Entrance Management Policy. Similarly, if discharge through Killick Creek is required during Macleay River / Hastings-Maria catchment flood events (with water levels in the upstream drain exceeding 0.5m AHD), then the entrance of Killick Creek should be opened artificially as per the Entrance Management Policy (refer Appendix A of the Estuary Management Plan for interim protocols to be used in the Entrance Management Policy).

The entrance does not need to be opened artificially while ever the water quality in the upstream drain meets the specified criteria and water levels are less than 0.5m AHD. Poor water quality within the downstream reach of Killick Creek will trigger an artificial opening, as per the provisions of the Entrance Management Policy.

## RESPONSIBILITIES

The primary responsibility for implementation of the Killick Creek floodgate management protocols are with Kempsey Shire Council. Given the applicability of the protocols to both floodplain management and estuary management, works and implementation could be partly funded through State Government's Floodplain Management and Estuary Management Programs.

The nominated Council officer(s) for implementation of these protocols have not yet been named.

Council is also required to consult with the upstream landholders regarding drainage through the Killick Creek floodgates. Consultation will be with an appointed representative of the landholders. This representative, and a reserve representative, has not yet been appointed by Council.

## REPORTING

Continuous water level and water quality data and associated floodgates / dropboards status should be reported on a periodic basis to the Coast and Estuary Management Committee and the Scotts / Killick Drain Floodplain Management Working Group.

An annual report on the operation of the floodgates and the effectiveness of these protocols shall be prepared by Council officers and presented to the Coast and Estuary Management Committee, the Scotts / Killick Drain Floodplain Management Working Group, and Kempsey Shire Council.

## PROTOCOL REVIEW

On an annual basis, consultation will be held with the upstream landholders (or representatives thereof) to determine the effectiveness and appropriateness of adopted thresholds for water levels and water quality. Any changes to the protocol thresholds or operational procedures will first need to be ratified by Council and the Coast and Estuary Management Committee prior to implementation.

## CURRENT CONTACTS

Agency	Contact	Phone and email details
Kempsey Shire Council	Ron Kemsley	6566 3248 <a href="mailto:ron.kemsley@kempsey.nsw.gov.au">ron.kemsley@kempsey.nsw.gov.au</a>
DNR	John Schmidt	6562 0707 <a href="mailto:John.Schmidt@dipnr.nsw.gov.au">John.Schmidt@dipnr.nsw.gov.au</a>
DPI-Fisheries	Marcus Riches	6626 1370 <a href="mailto:marcus.riches@dpi.nsw.gov.au">marcus.riches@dpi.nsw.gov.au</a>
Belmore River landholders	Malcolm Ptolemy	

## PROTOCOL AGREEMENT

Agency	Signatory	Signed	Date
Kempsey Shire Council	General Manager	.....	
DNR	Regional Director	.....	
DPI-Fisheries	Regional Director	.....	
Belmore River landholders	Malcolm Ptolemy	.....	
Kempsey Coast and Estuary Management Committee	Chair	.....	
Macleay River Floodplain Management Committee	Chair	.....	