Some hydrologic thoughts on Painkalac

Roundtable – 27th March 2024

Rory Nathan
rory.nathan@unimelb.edu.au

Key hydrologic documents that I am aware of:

Undated – post 2004

PAINKALAC ESTUARY MANAGEMENT PLAN

Surf COAST SHIRE

2008

Environmental Flow Determination for Painkalac Creek

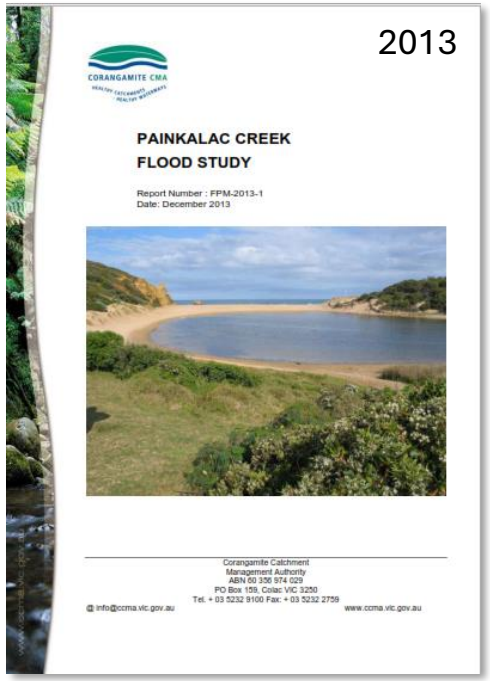
Final Recommendations

Prepared by
Tim Doeg, Geoff Vietz and Paul Boon

for the
Corangamite Catchment Management Authority

February 2008

2013



CORANGAMITE CMA

PAINKALAC CREEK FLOOD STUDY

Report Number : FPM-2013-1
Date: December 2013

Corangamite Catchment Management Authority
ABN 60 336 974 029
PO Box 159, Colac VIC 3250
Tel. + 03 5232 9100 Fax: + 03 5232 2759
info@ccma.vic.gov.au www.ccma.vic.gov.au

2016

Watering Proposal for Painkalac Creek

December 2016

2021

Water management
from basin to biofilm

by

Krista Bonfantine

B.S., Colorado State University
M.S., University of New Mexico
Ph.D., Deakin University

Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy
Deakin University

June 2021

2023

Discussion Paper, Surf Coast Shire
Painkalac Action Group
30 Oct 2023

Background

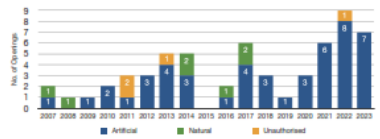
- The Painkalac Dam was constructed in 1975 to provide drinking water for Aireys Inlet and Fairhaven until it was decommissioned in 2016.
- During the 1950's houses were constructed along the eastern side of the Painkalac floodplain. When the height of the Painkalac exceeds 2.2 metres (measured at the bridge on the Great Ocean Road), the lowest lying houses start to become inundated at their boundary. Over floor height flooding occurs at a higher water level.[1]
- The Surf Coast Shire (SCS) are responsible for managing this flood risk and do so by artificially opening the estuary mouth to the ocean.
- The Painkalac Estuary has in the past opened naturally to the ocean. This last occurred in 2017.
- The Painkalac has flooded on three occasions since 2000 - in 2001, 2007 and 2011. Flooding occurred after significant localised rainfall that resulted in water flow from the dam ranging from 600 to 2,000 megalitres per day[2] and stormwater runoff to the natural watercourse of the floodplain.[3]

Estuary Openings

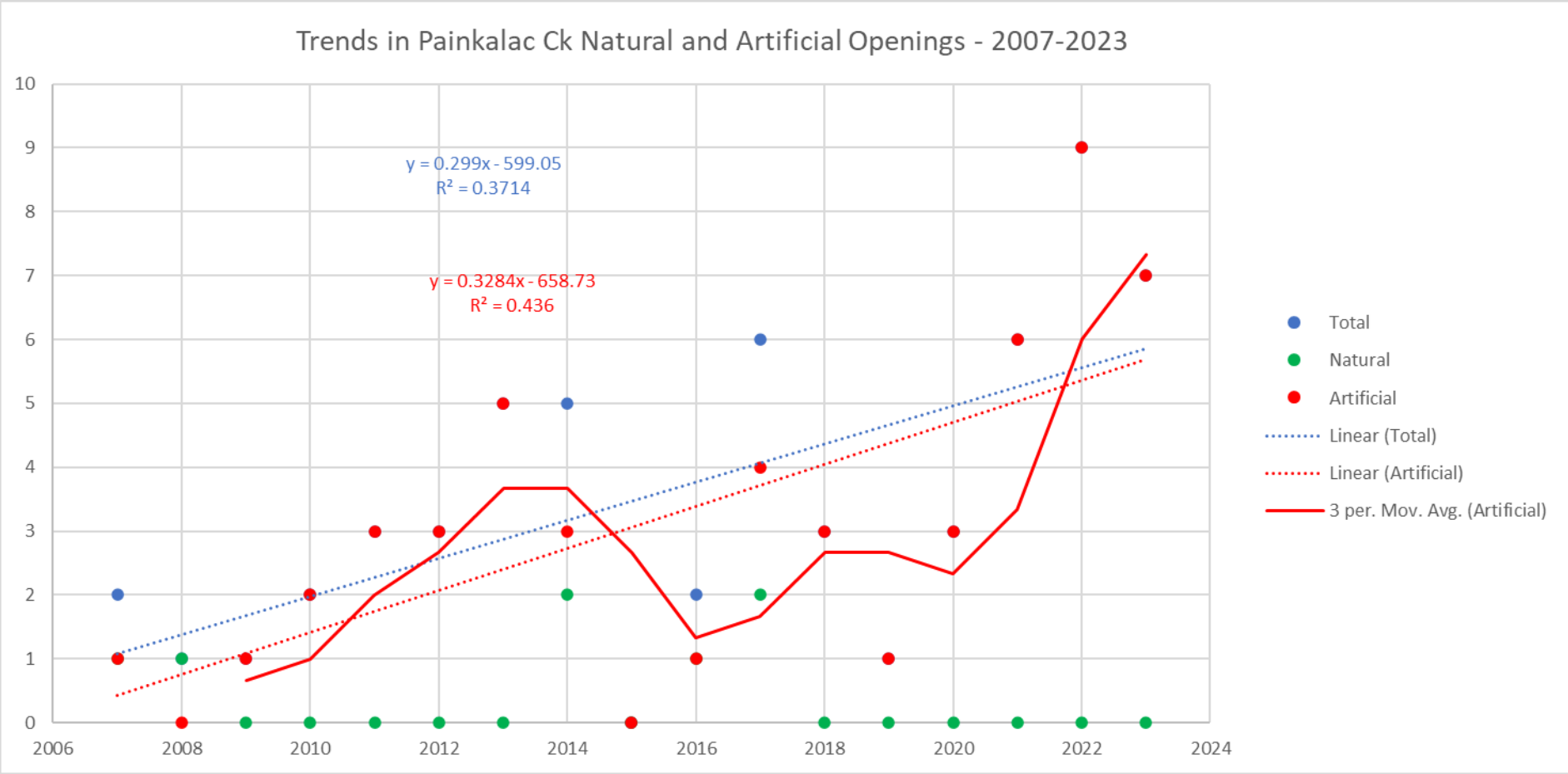
The last 3 years have seen a significant change to estuary opening protocols. From 2021 to date there have been 22 artificial openings, a 300% increase from 2015 to 2020 when there were 7 artificial openings. Many of these openings occurred during key periods when connectivity and floodplain inundation are critical to ecosystem life cycle stages (Apr-Jun/Sep-Nov).

A report commissioned by the Corangamite Catchment Management Authority (CCMA) in 2020 states that each additional estuary opening leads to greater disturbance of the ecosystem and increases the risk of environmental damage, and that artificial openings actually increase the frequency of openings compared to what would occur naturally.[4]

Graph 1- Painkalac Estuary Openings 2007 - 2023[5]

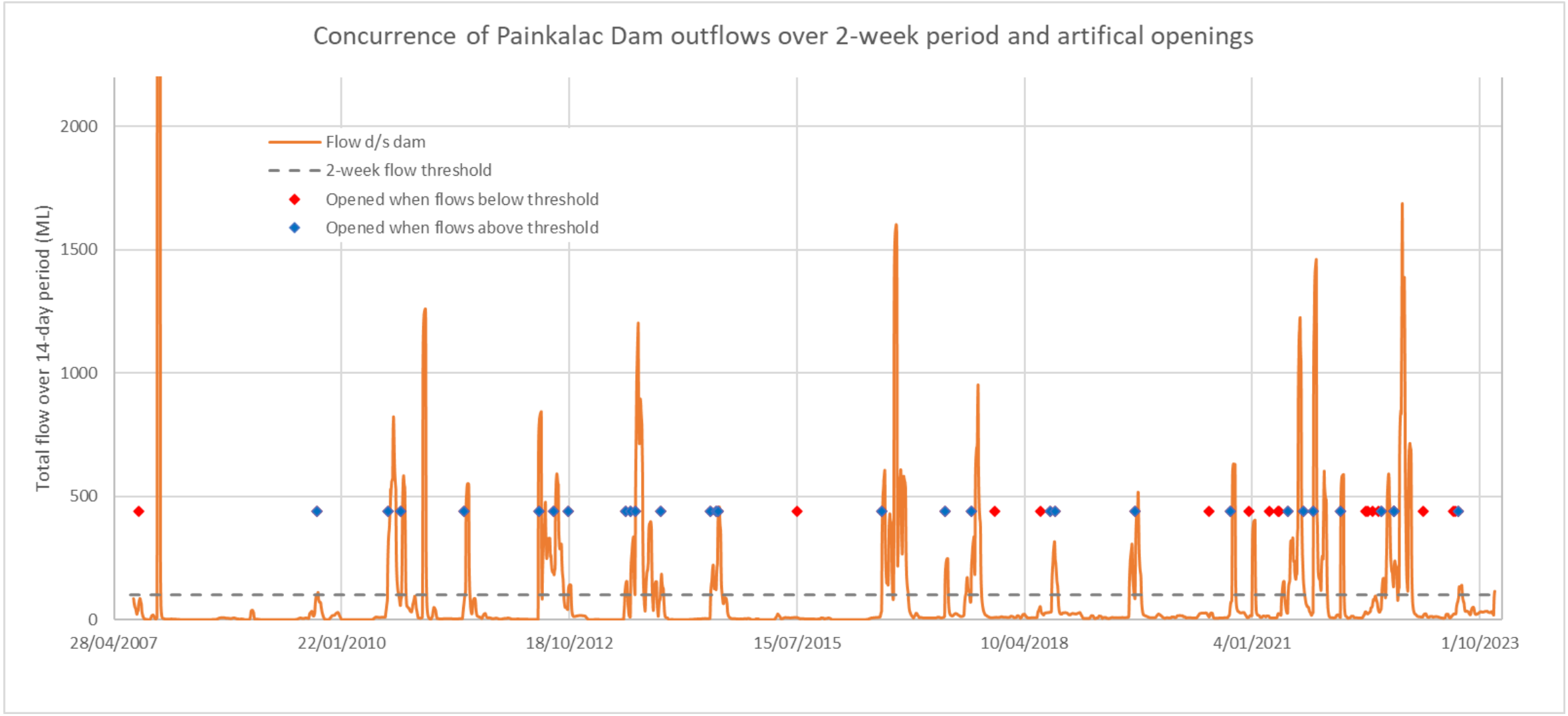


Artificial openings have increased over time …

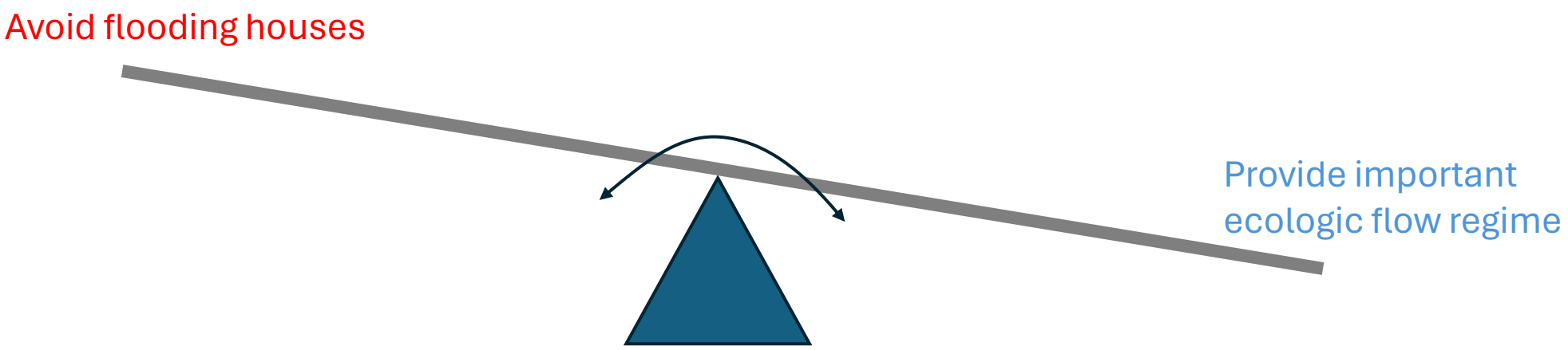


Artificial openings have increased over time …

and this doesn't appear to be linked to higher flow conditions.



The see-saw


Avoid flooding houses
Provide important ecologic flow regime

Climate change: a crisis of variability

- Climate “whiplash” extremes will increase in intensity and frequency
- Rainfall intensities will increase
- Rainfall patterns will change
- Small floods will get smaller, large floods will get bigger
  (water security worsens, flood damages increase)
- Increased sea levels
- Historic information is of decreasing relevance

Climate change: a crisis of variability

- Climate “whiplash” extremes will increase in intensity and frequency
- Rainfall intensities will increase
- Rainfall patterns will change
- Small floods will get smaller, large floods will get bigger
  (water security worsens, flood damages increase)
- Increased sea levels
- Historic information is of decreasing relevance

- Risk of extreme floods will ~double by 2100
- Risk of flushing flows will ~halve(?)

Can we operationalise these decisions?

- Update information on flood risks and ecological objectives
- Agree objective trigger levels for:
  - mitigating flood risks
  - providing ecological benefits
- Develop simple functional relationship between key (telemetered inputs) and levels
- Provide simple but physics-informed forecasts (based on rainfall, or flow, telemetry and hydrologic/hydraulic modelling)