

Appendix A – Storm History

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Table of Contents

1 Introduction.....3

2 Storm Categories.....3

3 References5

List of Figures

- A.1 Extreme Storm events vs. Photogrammetry Dates
- A.2 Synoptic Chart from the coastal storms of June 1967

List of Tables

- A.1 Classification of Storms by Intensity

1 Introduction

This Appendix documents the history of storms that have occurred at the beach at Lake Cathie.

Coastal processes at Lake Cathie are impacted greatly by intense tropical and non-tropical storms which occur along the NSW coastline at irregular intervals. These storms are responsible for episodic events of sand transport and erosion which are evident when examining data such as photogrammetry in detail.

It is important to document the history of storms along the Port Macquarie-Hastings coastline in order to ascertain whether the observed beach changes can be related to the specific occurrence of these storms. The ultimate goal is to delineate which observed changes are caused by episodic events such as large coastal storms and which changes have underlying causes which are due to long-term cycles, natural fluctuations or are caused by anthropogenic influences.

The drop in atmospheric pressure and the winds and waves which often accompany large coastal storms can cause the ocean to rise above its normal level and if this occurs concurrently with high astronomical tides, flooding of low-lying coastal land and beach erosion can result (Blain Bremner & Williams, 1985).

2 Storm Categories

Storms which affect the NSW coast can fall under one of several categories – namely:

- Tropical Cyclones
- Easterly Trough Lows
- Inland Trough Lows
- Continental Lows
- Secondary Lows; and
- Anticyclonic Intensifications.

The majority of storms on the North and mid-North coasts are due to locally formed Easterly Trough Lows and tropical cyclones (NSW Government, 1990).

Blain Bremner and Williams (1985) documented all storms along the NSW coast between 1880 and 1980, with estimates of *significant* wave height made by examining synoptic charts from these dates, as well as historical shipping and press reports. Storms were assigned a severity rating based on a gradation of the *significant* wave heights. The storms were compartmentalised in terms of their severity and their location along the coast, whether they affected the far north coast, mid north coast, central coast or south coast. Lake Cathie is considered to be affected by storms impacting on the mid-north coast sector of NSW.

The categories of storms are illustrated in Table A.1.

Table A.1 – Classification of Storms by Intensity
(Blain Bremner and Williams, 1985)

Category	Significant Wave Height (m)	Severity
X	> 6.0 m	Extreme
A	5.0 m – 6.0 m	Severe
B	3.5 m – 5.0 m	Moderate
C	2.5 m – 3.5 m	Low

Further work was carried out by Lawson and Treloar (1986) expanding on the work of Blain Bremner and Williams to identify storms occurring between 1980 and 1985, using a combination of synoptic charts and Waverider buoy data.

Category X storms since 1985 were identified by examining Crowdy Head Waverider buoy records from 1985 – 2007 obtained from the Department of Commerce Manly Hydraulics Laboratory. A representative *significant* wave height at Lake Cathie was estimated from the combination of this data, and this enabled Category X storms ($H_s > 6.0\text{m}$) to be identified for the period from 1940 – 2007.

Category A, B and C storms (*i.e.* *significant* offshore wave heights less than 6.0m) were not included in the analysis.

Figure A.1 documents the extreme storm events and estimated *significant* wave heights for these events, and also plots the dates for which beach photogrammetry was available for analysis. Of particular note in the data is the occurrence of a major storm in June 1967 which caused severe erosion along the North Coast of NSW and had a peak *significant* wave height of around 10m. The synoptic chart for this storm is shown in Figure A.2 (Bureau of Meteorology, 2008). The closely spaced isobars on the chart indicate strong wind speeds along the north coast of NSW. Other notable storms that may have caused beach erosion at Lake Cathie occurred in 1954, 1974 and 1986.

3 References

Blain Bremner & Williams Pty Ltd (1985), "Elevated Ocean Levels – Storms affecting NSW Coast 1880 – 1980", Blain Bremner & Williams Report No. 85041, NSW Public Works Department, Coastal Branch.

Bureau of Meteorology (2008), "The Winter Storms of June 1967", Climate Education, East Coast Lows, <http://www.bom.gov.au/lam/climate/levelthree/c20thc/cyclone5.htm>

Department of Commerce Manly Hydraulics Laboratory (2008), Crowdy Head Waverider Storm History data 1985 – 2007, owned by Department of Environment and Climate Change.

Lawson and Treloar Pty Ltd (1986), "Elevated Ocean Levels – Storms affecting NSW Coast 1980 – 1985", NSW Public Works Department, Coastal Branch Report No. 86026.

NSW Government (1990), "Coastline Management Manual", September 1990.

Figures

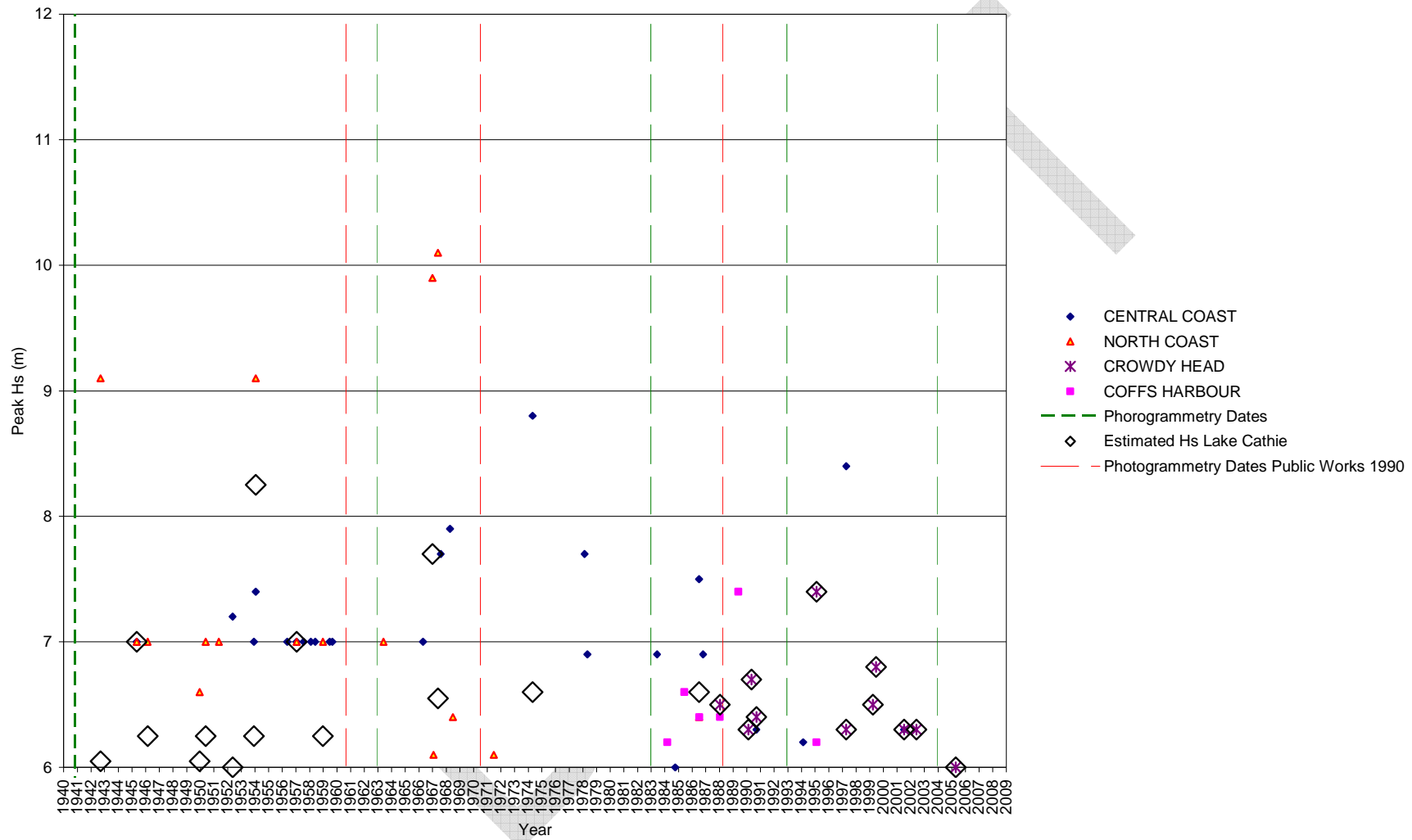


Figure A.1 – Extreme Storm events vs. Photogrammetry Dates

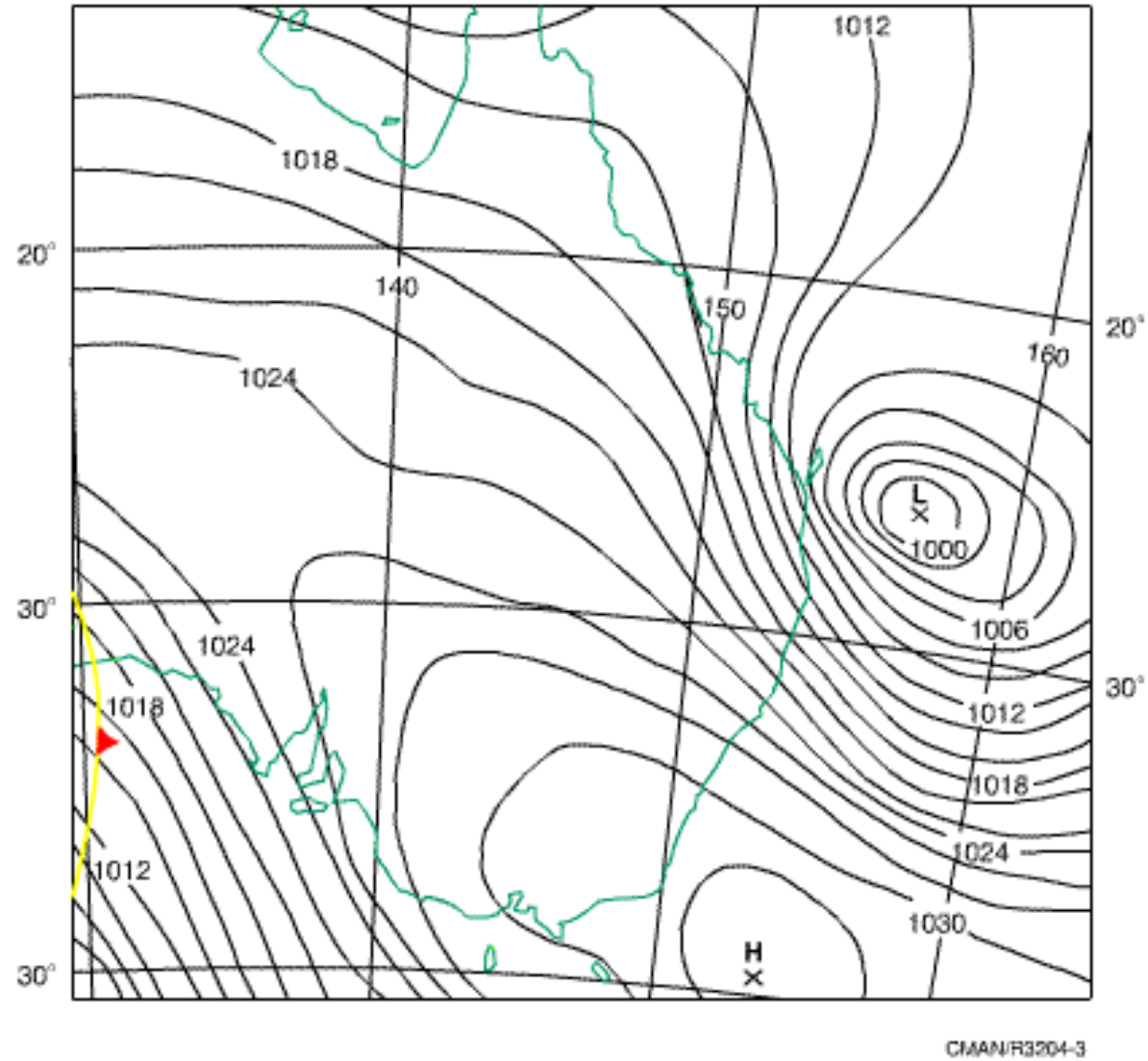


Figure A.2 – Synoptic Chart from the coastal storms of June 1967 (from Bureau of Meteorology, 2008).