Coastal Information Sheet

Coastal Imaging System

- November 2001 -

Introduction

The Northern Gold Coast Coastal Imaging System has involved the installation of a leading-edge technology known as the ARGUS coastal imaging system. The sophisticated system allows the quantitative, continuous and long-term monitoring of dynamic sandy beach systems. It is particularly effective in detecting the changes and identifying the trends of the shoreline as well as the onshore and offshore bars.

The system was installed on the Gold Coast in July 1999 by the Water Research Laboratory (WRL) with the assistance of WL|delft hydraulics (the Netherlands) and the Australian Defence Force Academy. Operations commenced in August 1999, coinciding with the start of construction on the artificial reef at Narrowneck.

Northern Gold Coast Beach Protection Strategy (NGCBPS)

The imaging system is part of the environmental monitoring programme for the GCCC's NGCBPS. This strategy involves coastal protection measures, specifically concerned with the 1.75km of beaches between Main Beach and Cavill Avenue at Surfers Paradise. The objectives of the strategy are to:

1. Provide protection against major storm events;
2. Widen the beach and dunes in the Surfers Paradise area to provide additional open space; and
3. To improve surfing conditions.

These objectives will be achieved through a combination of sand nourishment works and the construction of an artificial reef.

Sand Nourishment

Sand nourishment works were undertaken between February 1999 and June 2000. Approximately 1,170,000m^3 of sand, sourced from improvement works to widen the navigation channel in the Broadwater, was placed on northern Gold Coast beaches.

Artificial Reef

An artificial reef was constructed off the beach at Narrowneck between August 1999 and December 2000. The structure, consisting of 2 primary layers, is made up of 390 geotextile containers (up to 300 tonnes each). The purpose of the reef is to promote beach widening through acting as a coastal control point by intercepting wave energy and promoting the development of a salient, and to improve surfing conditions. Further construction of the reef is to be undertaken in late 2001 and in future years.

ARGUS Coastal Imaging System

The ARGUS Coastal Imaging System on the Gold Coast consists of four cameras pointed obliquely along the coastline, two to the north and two to the south. Each camera is connected to a small image-processing unit that captures, pre-processes and transfers the images. They are located externally on the roof of a highrise, the Focus Building on the Surfers Paradise Esplanade. They are approximately 100m above mean sea level, 900m south of Narrowneck.

The ARGUS cameras collect images every daylight hour. Three types of images are obtained and a fourth created through post-processing techniques. These are:

1. Snap-Shot Images
2. Time-Exposure Images
3. Variance Images
4. Day Time-Exposure Images

Shoreline Changes

The imaging system and corresponding analysis has been in operation for 2 years now, from August 1999 to July 2001. In this time changes in the shoreline of northern Gold Coast beaches have been detected as follows:

The mid tide beach width has varied by over 100m along the entire 4500m study region. In the central region this change was typically between 50-100m (the place of sand nourishment efforts) while the north and south saw changes of up to 50m.

This general trend of an increasing beach width was most impressive during the initial 18 months of monitoring. This was due to the rapid growth in the nourishment areas, however a lag in beach response was evident. Whereas between the 18 to 24-month period there was a general erosion trend. This can be attributed to storm activity from February to July 2001, whereby the beaches were eroded rapidly, partially recovered and then eroded again as can be seen in the Figure 1.

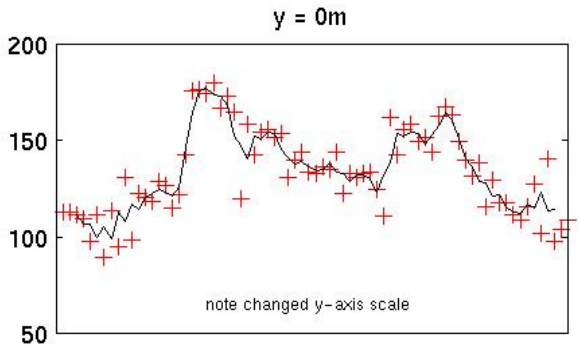

Figure 1 – Time Series of Beach Width
August 1999 – July 2001

No dominant cyclic changes in the underlying behaviour of the beach have emerged. In fact, the dominant beach change that is discernable during this period is the sand nourishment during 1999-2000.

Shoreline Trends

Shoreline trends, associated with the artificial reef, have also been detected. Over the 24-month period a series of erosion and accretion events emerged. The results include:

- North Transect: a net increase in beach width of 40-50m.
- Centre and South Transect: a net increase in beach width of 50-60m.

However, the storms of March, April and July 2001 resulted in the recession of the shoreline, with the final beach approximately 30m wider than that at the commencement of the monitoring program.

Wave Breaking and the Reef

Waves breaking on the reef have been visible in the ARGUS images, especially those breaking across the two halves of the reef. In January 2000, there were visible waves breaking for at least 1 hour for a total of 20 days. While in April 2000 this rate increased to at least an hour for a total of 30 days. From the middle of 2000 and onwards waves have been breaking for at least one hourly image per day for at least 90% of the time as can be seen in Figure 2.

Additionally, waves have also been observed to be breaking on the adjacent storm bar. For example, in early 2000 waves breaking on the reef were occurring around 20% of the time, indicating that 80% of the time waves were breaking on the adjacent bar (see Figure 2).

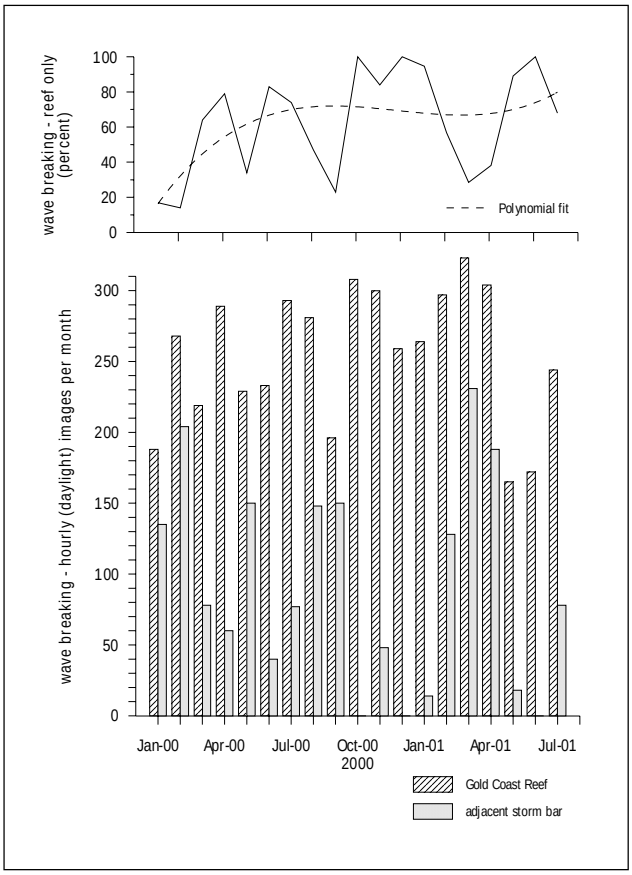

Figure 2 – Assessment of Wave Breaking on Reef and Adjacent Bar
Hourly Images (January 2000 – July 2001

For more information:
http://www.wrl.unsw.edu.au/coastalimaging/

Reference:
Turner, I.L. 2001, *Analysis of Shoreline Change: February 2001 – July 2001 (Report 4)*, The University of New South Wales Water Research Laboratory, Manly Vale.