



bushfire&natural
HAZARDSCRC

RESILIENCE TO CLUSTERED DISASTER EVENTS ON THE COAST: **STORM SURGE**

Partner Briefing

3-4 December 2014



An Australian Government Initiative



Scott Nichol: Project Leader



Australian Government
Geoscience Australia

PROJECT TEAM & END USERS

- Official start July 1, 2014
- Researchers
 - Geoscience Australia
 - Scott Nichol, Jane Sexton, Martyn Hazelwood, Martine Woolf, Andrew McPherson, Duncan Moore, Gareth Davies, Wenping Jiang, Floyd Howard
 - University of Queensland
 - Tom Baldock, David Callaghan, Uriah Gravois (postdoc)
- End Users
 - NSW, Office of Environment & Heritage
 - SA, Dept of Environment, Water & Natural Resources
 - QLD, Dept of Science, Information Tech, Innovation & Arts
 - C/wealth Attorney General Dept

Shoreline dynamics

April 2003



9/24/2006

Shoreline dynamics

Oct 2004



Image © 2004 DigitalGlobe

Google earth

Imagery Date: 10/17/2004 28°00'56.03"S 153°3'05.719"E elev: 0 m eye alt: 3.50 km

Tour Guide 2003

Shoreline dynamics

June 2008



4/30/2009

Shoreline dynamics

April 2009



Imagery © 2004 DigitalGlobe

Google earth

Tour Guide 2003

Imagery Date: 4/30/2009 28°09'41.43" S 153°31'55.89" E elev: 0 m eye alt: 3.50 km

bnhcr.com.au

Shoreline dynamics

April 2010



6/24/2011

Shoreline dynamics

June 2011



Image © 2014 DigitalGlobe

Google earth

Imagery Date: 6/24/2011 28°08'57.17" S 153°01'16.97" E elev. 0m eye alt 3.50km

Tour Guide 2003

Shoreline dynamics

Sept 2012



Image © 2014 DigitalGlobe

Google earth

Imagery Date: 9/20/2012, 28°09'41.43" S 153°31'55.89" E elev: 0m eye alt: 3.50 km

Tour Guide 2003

Nov 2013



Image © 2014 DigitalGlobe

Google earth

Imagery Date: 11/2/2013 - 28°09'00.88" S 153°33'19.58" E elev: 0m eye alt: 3.50 km

Tour Guide 7001

Shoreline dynamics

April 2014



Image © 2014 DigitalGlobe

Google earth

Imagery Date: 4/3/2014 28°09'46.43" S 153°31'55.89" E elev. 0 m eye alt: 3.50 km

bnhcrc.com.au

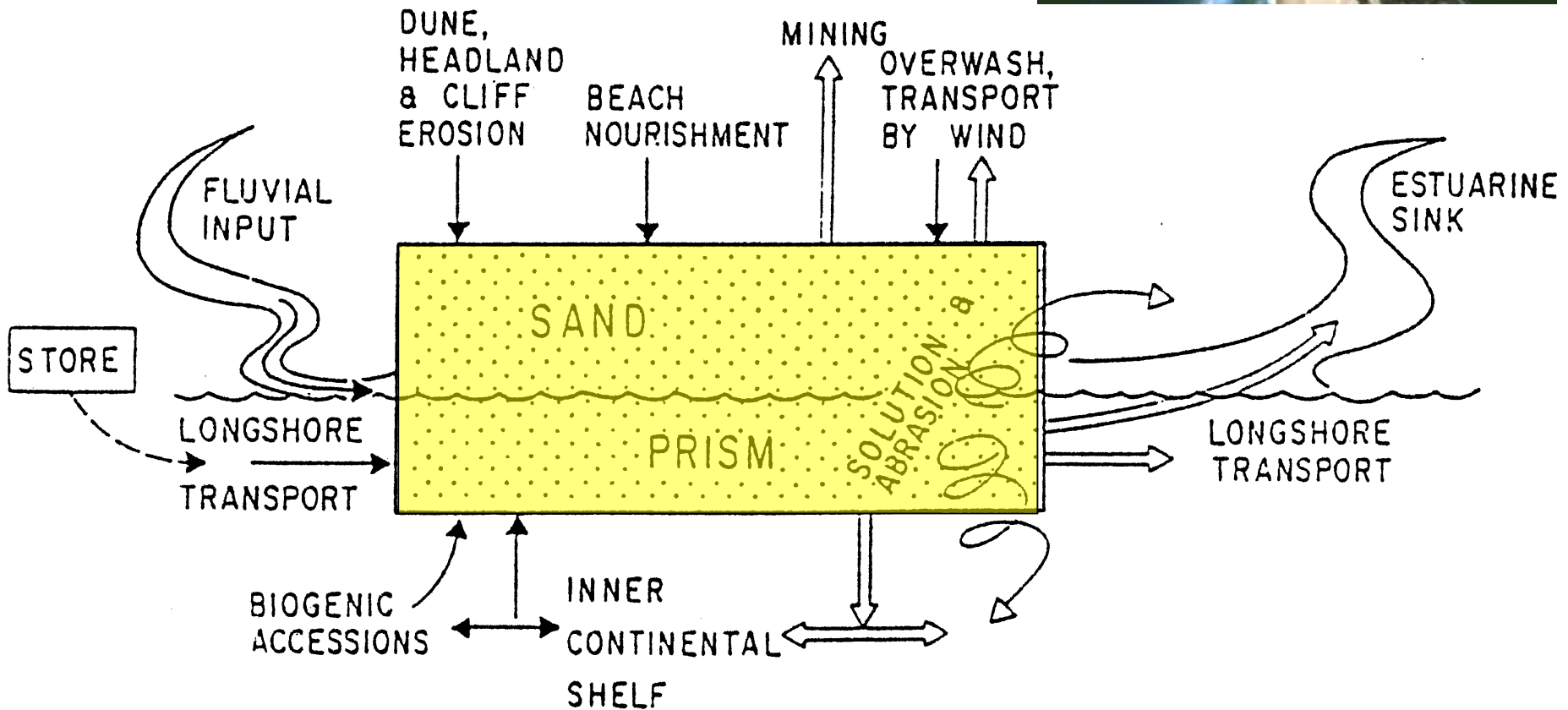
THE PROBLEM

- Coastal communities and infrastructure are at risk from the impacts of storm surge
- Clustered surge events means little time for recovery of the coastline
- By not accounting for the impact of clustered events we may underestimate the risk to coastal assets



PROJECT APPROACH

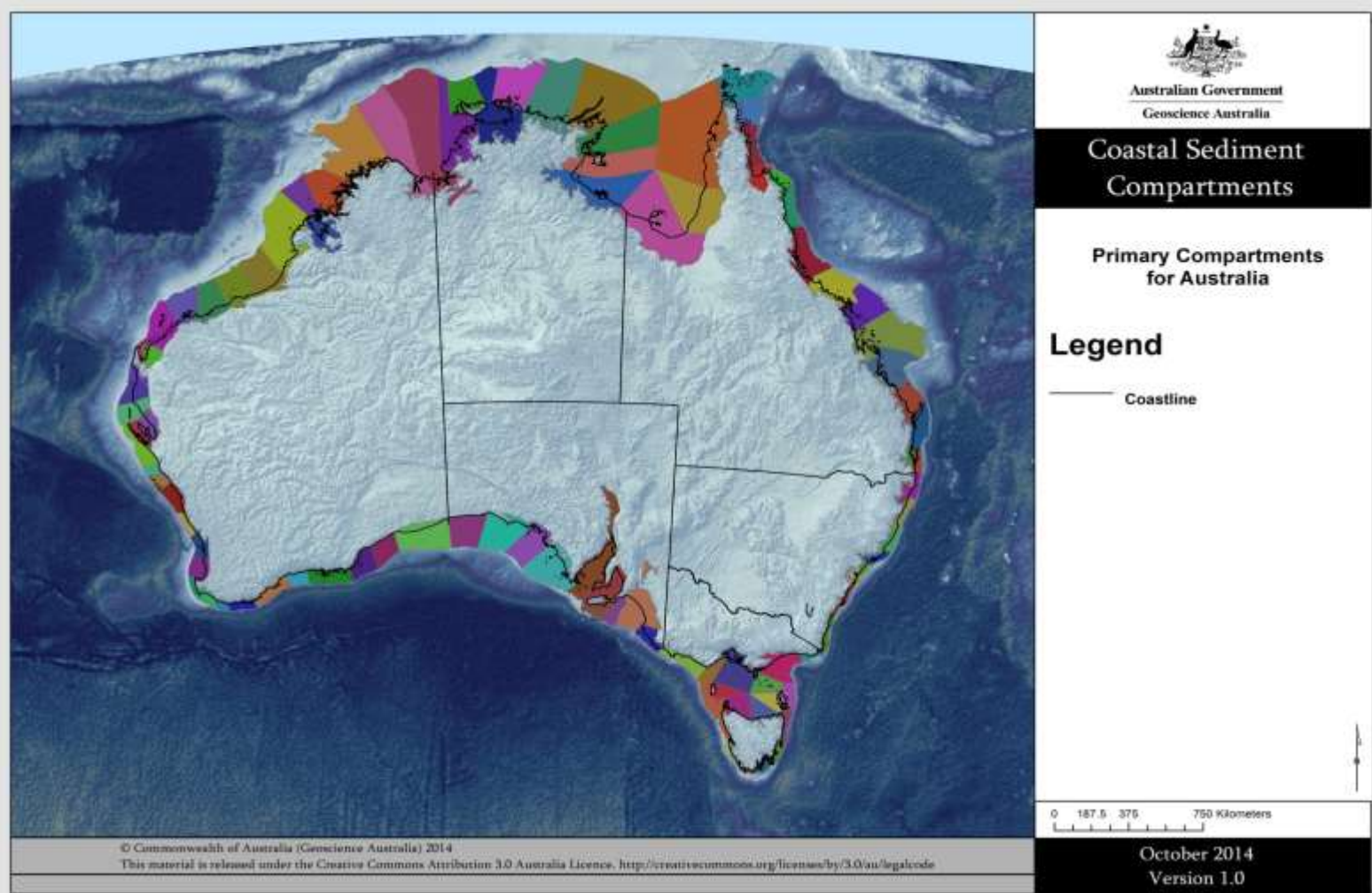
EROSION IN THE CONTEXT OF THE
COASTAL SEDIMENT SYSTEM:
SOURCES, SINKS & PATHWAYS



Davies, 1974

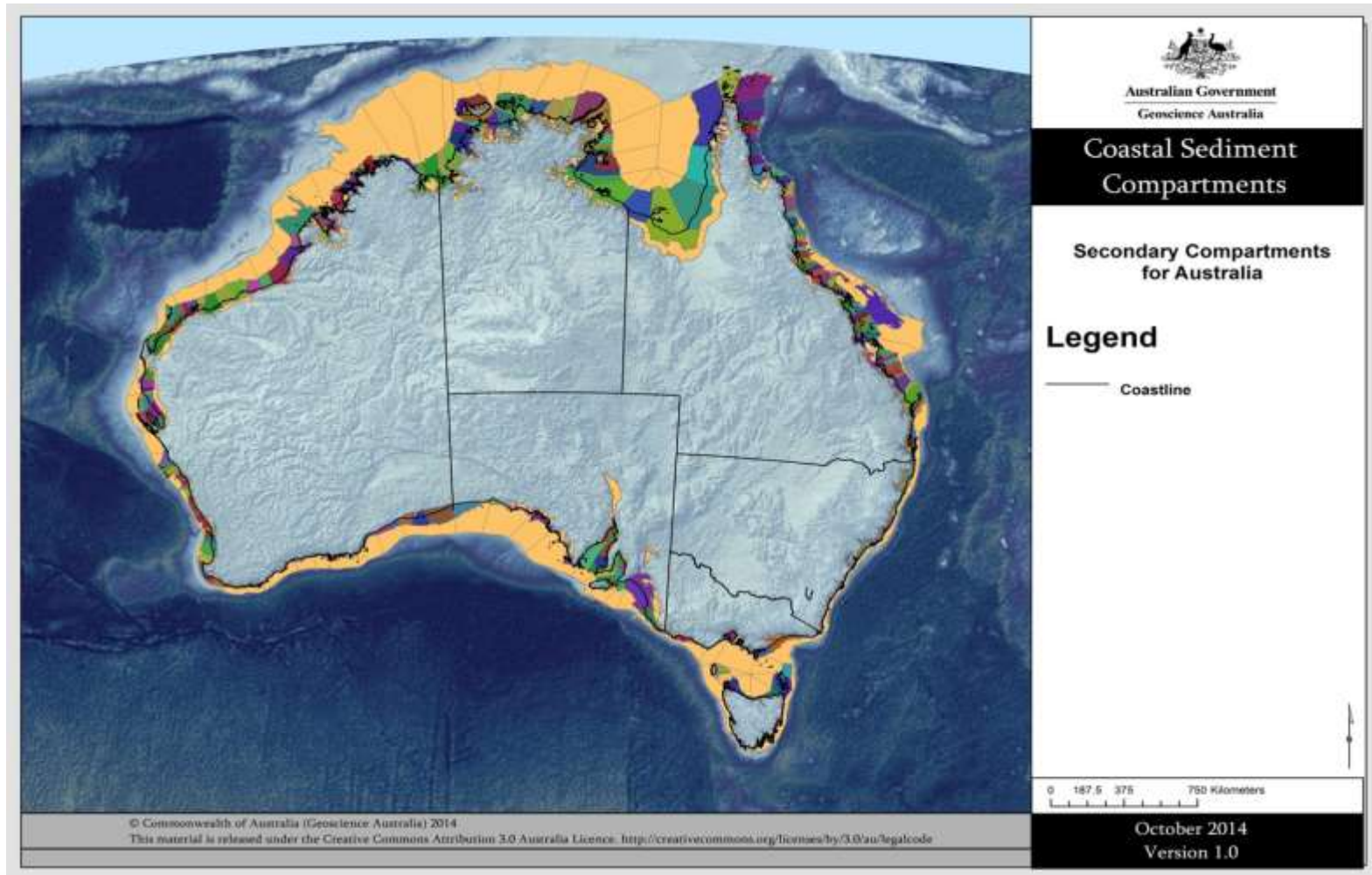
PROJECT APPROACH

COASTAL SEDIMENT COMPARTMENTS – AT THE NATIONAL SCALE



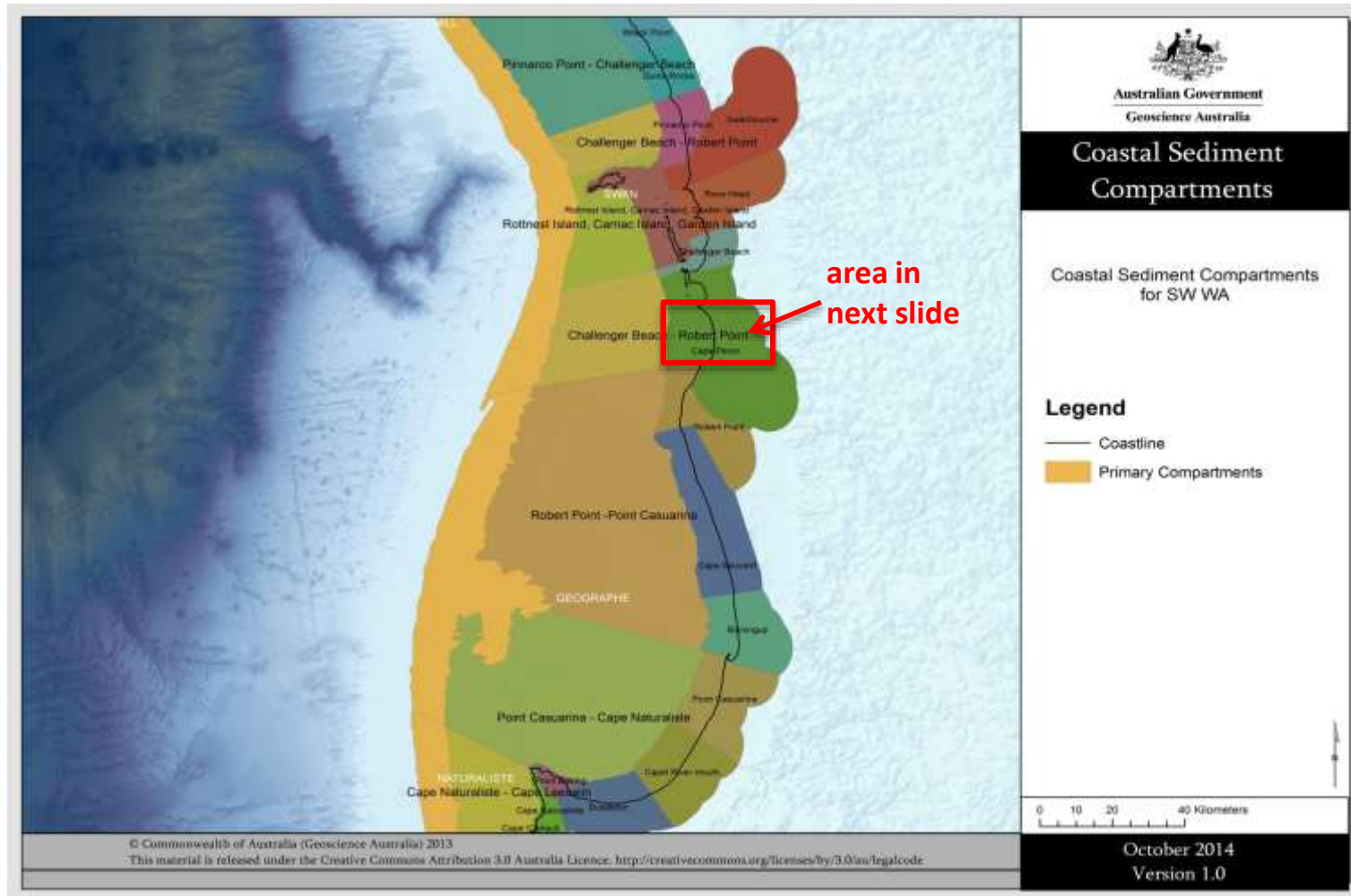
PROJECT APPROACH

COASTAL SEDIMENT COMPARTMENTS – AT THE NATIONAL SCALE



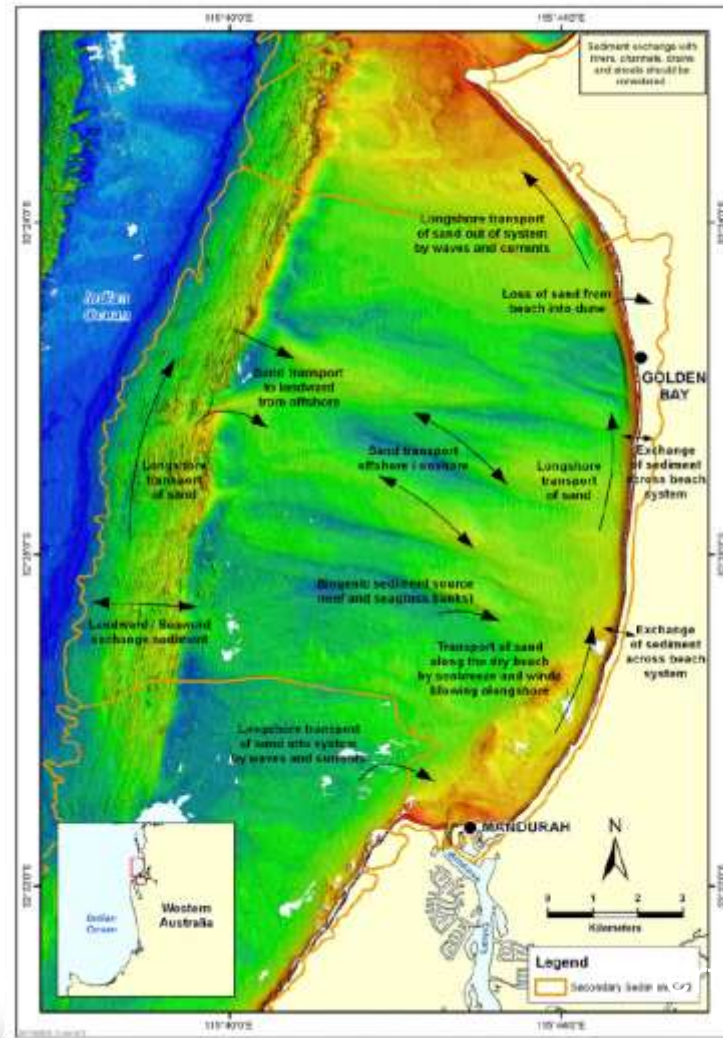
PROJECT APPROACH

COASTAL SEDIMENT COMPARTMENTS – AT THE NATIONAL SCALE



PROJECT APPROACH

COASTAL SEDIMENT CELLS – EXTENDING RECENT WORK IN WA



(source: Stul T, Gozzard JR, Elliot IG and Elliot MJ, 2012)

METHODOLOGY – CASE STUDIES

- Identify coastal landform systems that are **vulnerable to erosion** during storm surge events
- Develop **modelled storm surge** events to represent clustering at study sites
- Reconstruct **shoreline response** to clustered storms
- **Assess numerical models** quantifying coastal response to storm surge based on coastal system characteristics
- Collect **field data** to validate findings
- **Quantify the impact** of clustered storm surge events on coastal assets (buildings and infrastructure).

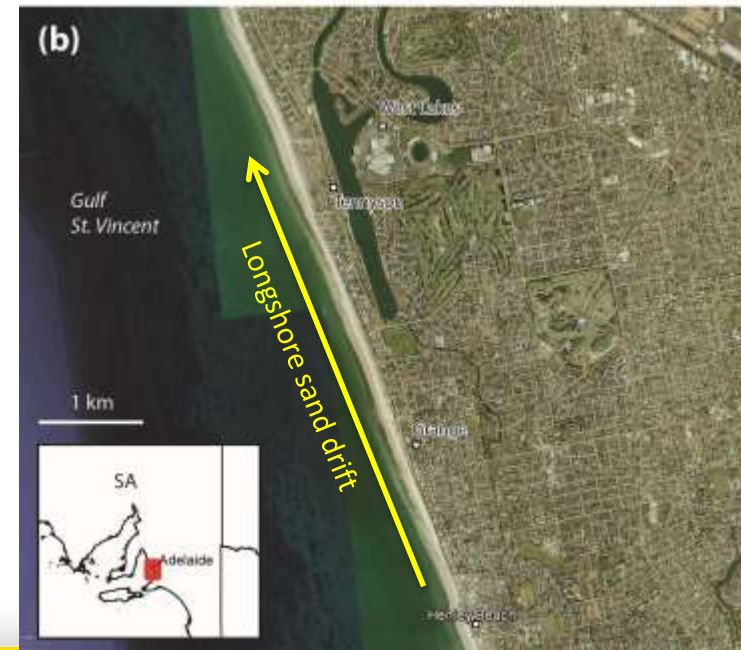


PROJECT GOALS & OUTCOMES

- **A standard framework** for integrating coastal studies across a range of scales (local/regional/national)
- **A demonstrated methodology**
 - for quantifying the impact of clustered events on coastal infrastructure
 - for including clustering as part of integrated quantitative risk and impact modelling approach for storm surge
- Recommendations for **a national approach** to the acquisition of coastal data for studies to minimise the impacts of coastal risks

PROJECT ACHIEVEMENTS: SITE SELECTION

- Workshop 14 October, 2014
 - Science team + End Users
 - Sites selected using agreed criteria
- **Old Bar Beach, NSW (central coast)**
 - An erosion 'hotspot'
 - Science challenges re: coastal processes
 - **Adelaide Metropolitan Beaches, SA**
 - Required sand nourishment since 1970s
 - Clustered storms not previously considered in management strategies



STUDY SITES

SELECTION CRITERIA



Existing Data:

- Elevation – LiDAR derived elevation surfaces is key, both topo and bathy
- Geomorphology – over and above the NSW CCA dataset would be useful
- Stratigraphy – subsurface studies to help inform estimates of sediment volumes
- Previous local studies – in particular, sediment transport or process modelling

Priority Areas for End-users – particularly sites where a better understanding of shoreline response to coastal storms, and impacts on infrastructure is needed for land use planning

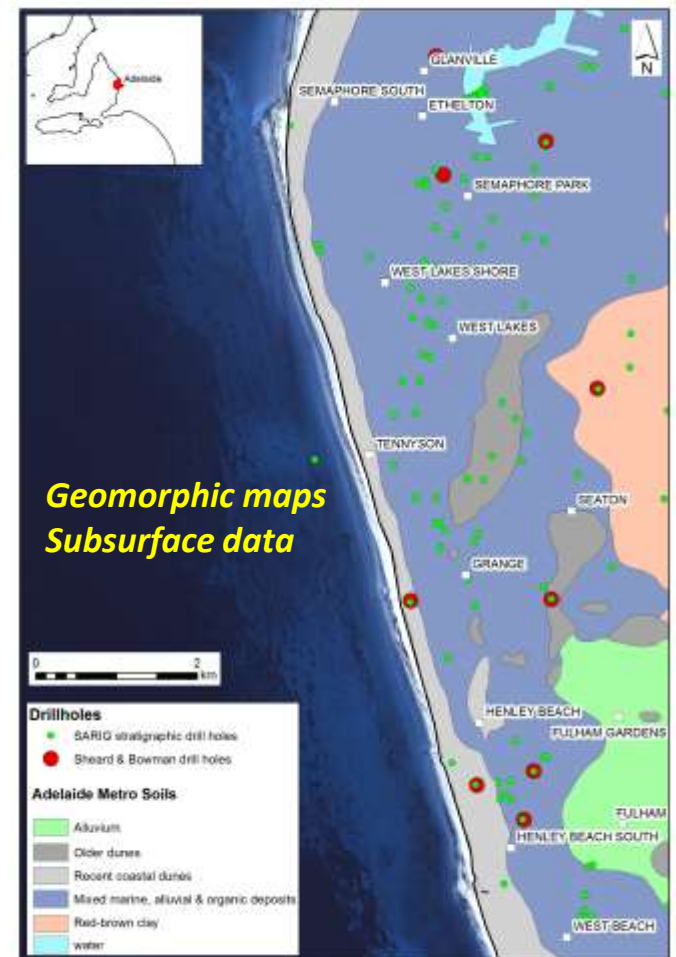
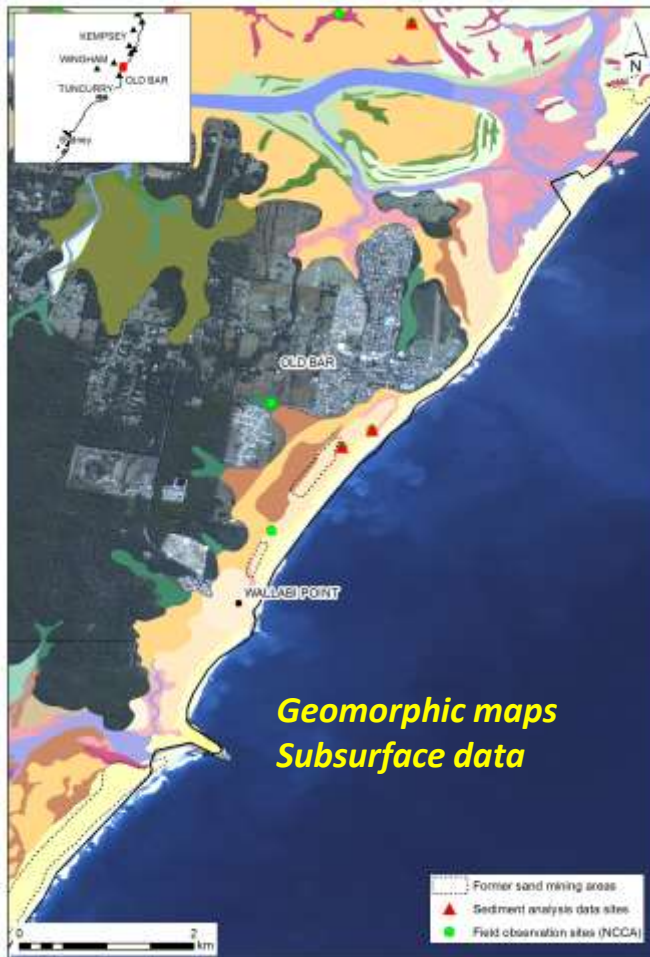
Representative of a common coastal (beach-barrier) morphotype – this will ensure applicability of developed approach to other locations.

Sites where clustered storms (may) have occurred and there is data on these events

PROJECT ACHIEVEMENTS: DATA AUDIT & COMPILATION

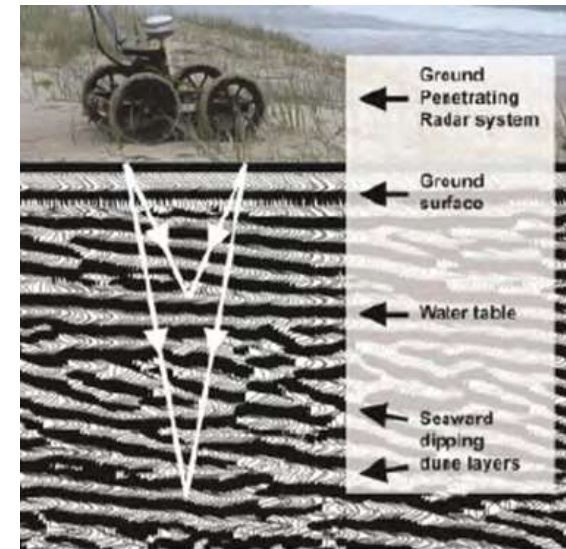
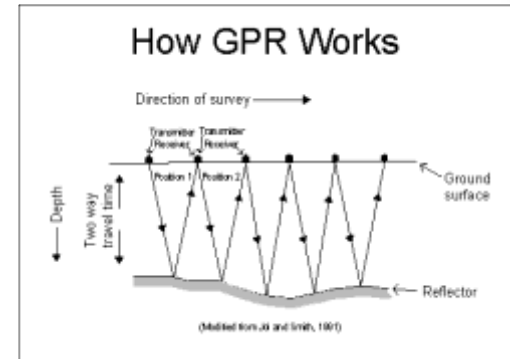
Dataset	Format	Application
National		
Primary Sediment Compartments	GIS	Context for study sites
Secondary Sediment Compartments	GIS	Context for study sites; modelling
Tertiary Boundaries	GIS	Context for study sites; modelling
Geomorphic Units	GIS	Field work; modelling
Local/Regional		
Soil Maps (SA)	GIS	Field work; modelling
Drillholes (SA)	GIS	Field work; modelling
Extreme Water Levels	Tba	Cluster modelling
Wave Buoy Data	Tba	Model calibration

PROJECT ACHIEVEMENTS: SITE CHARACTERISATION – UNDER WAY



PROJECT PLANNING: FIELDWORK

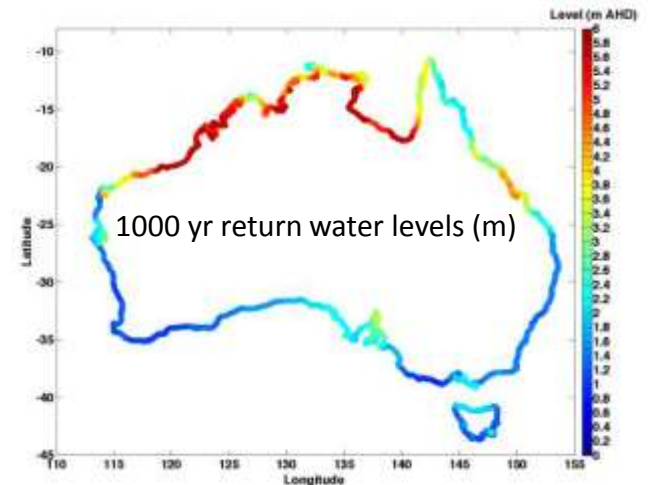
- Purpose:
 - Assist site characterisation
 - Baseline information for shoreline modelling
- Scheduled:
 - Feb/March 2015
 - GPR used to find **rock basement** of dune system & map **old storm lines**
 - Used to estimate potential sediment **volumes** that can be mobilised in extreme events



PROJECT PLANNING: CLUSTERED EVENTS

FOCUS OF OUR DISCUSSION AT THIS MEETING

- ACECRC extreme water level dataset to drive modelling
- NARCLiM hindcast wave data could be useful for understanding frequency but not use for driving data
- Waverider buoys for model validation/calibration



NSW Offshore Wave Data Stations



NARCLiM

NSW | ACT Regional Climate Modelling project

DESCRIPTION MEETINGS/EVENTS PROJECTS PUBLICATIONS DATA PROJECT TEAM CONTACT

The NARCLiM (NSW / ACT Regional Climate Modelling) project is producing an ensemble of regional climate projections for south-east Australia in collaboration with the NSW government Office of Environment and Heritage. This ensemble is designed to provide robust projections that span the range of likely future changes in climate. A wide variety of climate variables will be available at high temporal and spatial resolution for use in impacts and adaptation research.



PROJECT PLANNING: SHORELINE MODELLING

- Will get underway Jan 2015 (UQ postdoc)
- Determine appropriate model approach
 - Investigate available options
 - Integrate cross-shore and long-shore component
 - Test etc
- Collecting input data
 - Elevation
 - Wave, wind, etc



NEXT STEPS

- Finalise Workshop Report following end-users comment
- Finalise Science Plan (Dec milestone)
- Finalise Field Work Plan (Dec milestone)

- Progress the Case Studies
 - Field Work – Feb/March
 - Integrate datasets for uptake into modelling

Questions ?