

## 2 Analysis

Australia, and in particular Queensland, is prone to a long list of natural hazards, including flooding, cyclones, severe storms, bushfire, landslide and earthquakes.

The recent flood events seen across the State have highlighted the importance of considered land use planning that responds to the risks presented by natural hazards and particularly flooding.

Understanding how our river systems work here in Queensland acknowledges that an integrated approach to land use planning on floodplains is required to bring together the diverse issues and stakeholders that affect, or are affected by, floodplain management. This approach takes flooding behaviour, flood risk and flood hazard into account, along with all other relevant planning factors.

The end product of this process is a floodplain management plan that facilitates the use of the floodplain for appropriate purposes; limits flood hazard, and damage to socially acceptable levels; enhances the waterway and floodplain environment; and fosters flood warning, response, evacuation, clean-up and recovery in the onset and aftermath of a flood.

*Floodplain Management in Australia – Best Practice Principles* recommends the adoption of an approach to floodplain management at a total catchment (sub-basin) level beyond the LGA boundaries.

This sub-basin perspective is needed in order to manage effectively the result of existing development and the cumulative effects of future development on stormwater and mainstream flooding. This perspective includes both the upstream and downstream implications of proposed land use developments and floodplain management activities.

This approach will require collaboration from many stakeholders to support the ultimate goal of integrated management of our floodplains. This approach should extend beyond the development assessment process.

Traditionally a flood study is a comprehensive technical investigation of flooding behaviour that defines the extent, depth and velocity of floodwaters for floods of various magnitudes.

There are two principle components to a flood study:

**Hydrologic analysis** or estimation of flood discharges for floods of various magnitudes.

**Hydraulic analysis** or determination of the extent, depths and velocities of flooding.

This level of detail is not always required to facilitate improved floodplain management. In recognition of the time and cost to prepare detailed flood mapping and studies by Councils, the Authority, with the support of DERM, commenced a mapping exercise in June 2011 to establish interim mapping of floodplains to support Councils' existing planning schemes.

The dataset to inform the interim mapping product to be identified as *Interim Floodplain Assessment Overlay* (Floodplain Maps) was developed using the following overall principles:

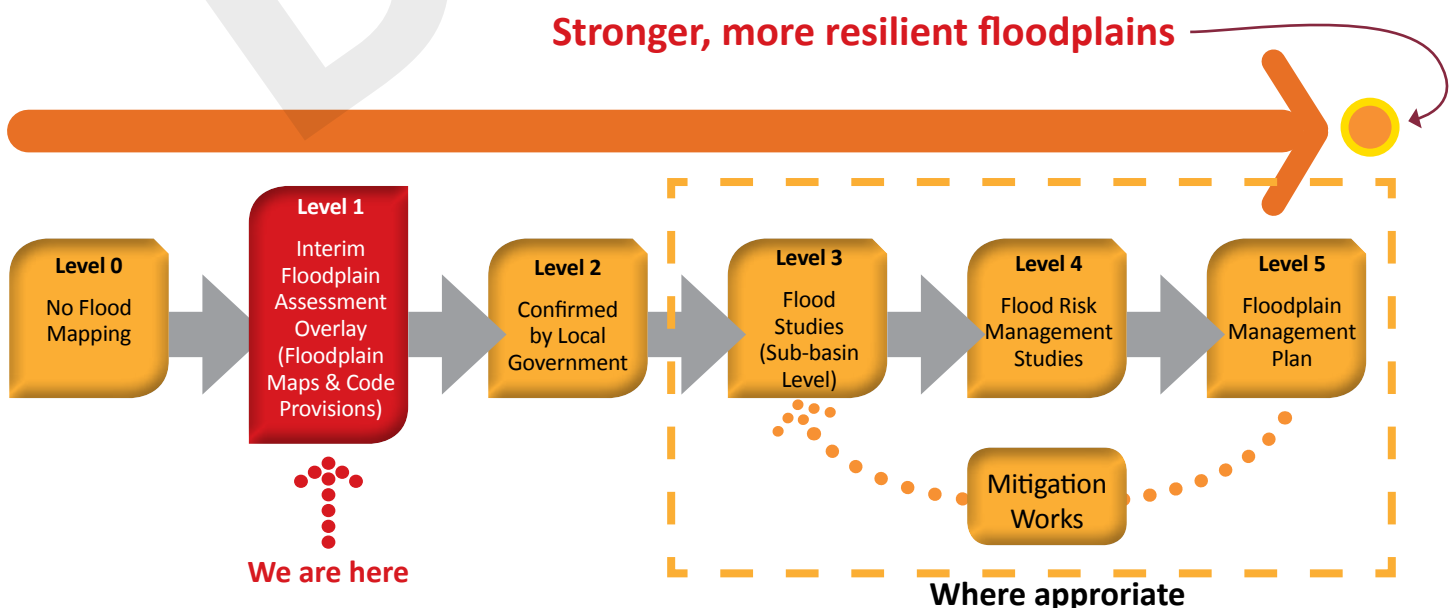
- suitability for a Statewide approach
- a consistent approach
- repeatable if more accurate data is available in the future
- evidential and justifiable

In terms of a maturity model for floodplain mapping, the Floodplain Maps are at level one and provide a framework for communities to decide priorities for more detailed flood studies (*Refer to Figure 4*).

### Flood Mapping Maturity Levels

Level 0	No Flood Mapping
Level 1	Sub-Basin 'Interim Floodplain Assessment Overlay Mapping'
Level 2	Confirmed (by local govt) Floodplain Assessment Overlay Mapping. Potential to adopt as equivalent to Probable Maximum Flood defined at Sub-Basin level.
Level 3	Flood Studies completed in priority areas.
Level 4	Flood Risk Management Study
Level 5	Implemented Floodplain Management Plan

Figure 4 – Flood Maturity Mapping Model



The following is an overview and summary of each dataset used in the compilation of the floodplain maps:

## Land zone 1



**general term: estuarine (tidal flats and beaches)**

*Quaternary estuarine and marine deposits subject to periodic inundation by saline or brackish marine waters. Includes mangroves, salt pans, off-shore tidal flats and tidal beaches. Soils are predominantly Hydrosols (saline muds, clays and sands) or beach sand.*

## Land zone 3



**general term: alluvium (river and creek flats)**

*Quaternary alluvial systems, including floodplains, alluvial plains, alluvial fans, terraces, levees, swamps, channels, closed depressions and fine textured palaeo-estuarine deposits. Also includes estuarine plains currently under fresh water influence, inland lakes and associated dune systems (lunettes). Excludes talus slopes, colluvial deposits and pediments. Includes a diverse range of soils, predominantly Vertosols and Sodosols, also with Hydrosols in higher rainfall areas.*

## SALI Soil Limitation Mapping

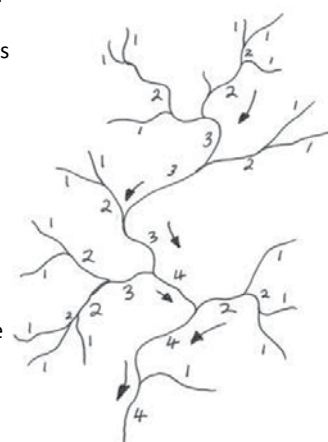
Refers to a soil type which has a limitation of flooding. Soil qualities and limitations are properties that can be assessed on an individual soil material basis and can affect the viability and sustainability of land uses.

## Contours

Contour data with 10 metre vertical intervals available over the whole State has been used. In some selected cases to aid the visual interpretation, other available contour information has been used.

## Stream Orders

Starting at the headwater, the stream is assigned number one to be made 1st order. As several 1st order streams converge the resultant stream becomes 2nd order. Two 2nd order streams converging form a 3rd order, etc. This is known as the Strahler Method. The number of orders in Queensland's Sub-Basins vary. The Dawson River sub-basin for example is classified to a 9th order. Flooding can occur in the headwater streams (ie. 1st order), but is more likely to be significant in higher order streams. For each sub-basin the appropriate stream orders have been selected to use in developing the Floodplain Mapping.



## Imagery

Aerial imagery across the State is captured using different modes. The most common is through Landsat 5. Landsat 5 is the fifth satellite of the Landsat program. It was launched on 1 March 1984, with the primary goal of providing a global archive of satellite images. The program is managed by United States Geological Survey (USGS), and data from Landsat 5 is collected and distributed from the USGS's Center for Earth Resources Observation and Science. Australia like many countries has an agreement with the USGS where new satellite imagery is downloaded every 16 days and provided to Geoscience Australia. The imagery has a pixel resolution of 30 metres. In addition to Landsat more detailed aerial photography captured at the time of a flood over a town and cities has been used where available. During the summer 2010/2011 events, approximately 100 towns were captured with high resolution aerial imagery.

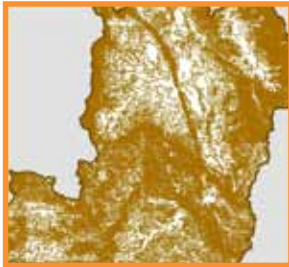
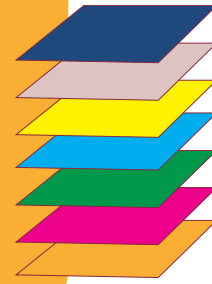
## What are Land Zones?

Land zones represent major differences in geology and in the associated landforms, soils, and physical processes that gave rise to distinctive landforms or continue to shape them (Sattler and Williams 1999). Land zones are generally derived by amalgamating a range of geological, land system and/or soil mapping units at 1:100 000 to 1:250 000 scale. *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 3.1. Updated September 2005. Queensland Herbarium*

**This is the largest mapping exercise currently underway in Australia. The mapping has been undertaken at a sub-basin level. Many Councils may have more than one sub-basin within their Local Government Area.**

The Interim Floodplain Assessment Overlay (Floodplain Maps) was developed using multiple datasets. An example is shown for the Dawson River sub-basin:

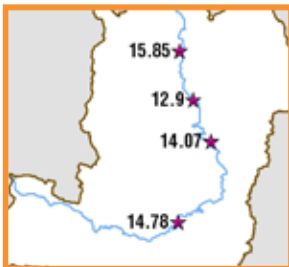
- 10 metre contours
- Landsat imagery
- Gauging stations
- Stream orders 5 – 9
- Flood extent for 2011 generated from aerial photography
- Pre-clear vegetation mapping of Landzones 1 & 3 combined with soil flooding limitation mapping
- Aerial photography taken at or near flood peak



Contours



Landsat



Gauging Heights



Stream Orders



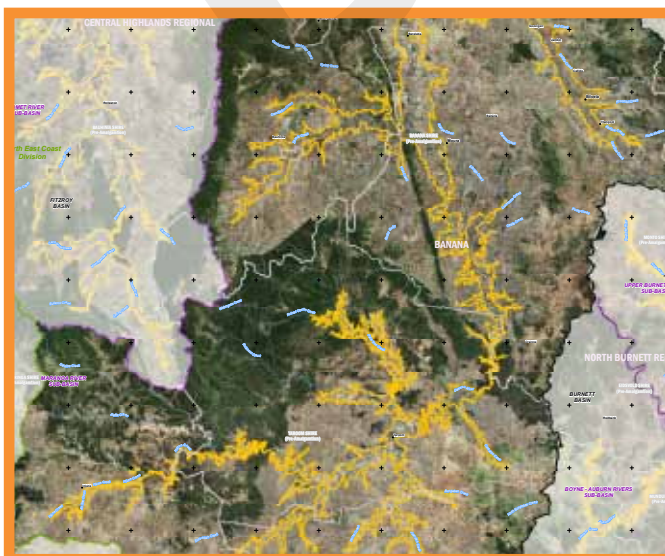
Pre Clear Mapping



Aerial Taken – Theodore

The mapping product will be provided to Councils as:

- a Mapbook (a series of A3 Mapsheets covering the whole sub-basin) in both electronic and hard copy format;
- digital data compatible with geographic information systems (GIS) and
- interactive lot and plan search
- all mapping is available at [www.qld.gov.au/floodcheck](http://www.qld.gov.au/floodcheck)
- Until the mapping is locally verified and checked by Council it will remain as interim.



Example: Interim Floodplain Assessment Overlay for the Dawson River Sub-basin



Example: Interim Floodplain Assessment Overlay for the town of Bilola