

# Flood Resilience:

## Risks, Mitigation and Funding Solutions



Institute of Actuaries of Australia

HERITAGE BALLROOM, WESTIN HOTEL, SYDNEY

Monday, 16 May 2011

## Flood Mapping:

### NFID: Flood modelling science for insurers

Karl Jones

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## Agenda

- National Flood Information Database (NFID)
  - Background
  - Outline and status
  - How insurers can use NFID
  - Advantages of this approach
  - Limitations and caveats
- Where next for flood mapping in Australia?

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## NFID and Background

- Funded by insurers via the Insurance Council
- Part of a solution for the residential flood insurance issue
- Agreement with Governments to provide free access to flood risk data
- Database is built and managed by Risk Frontiers and Willis Re
- NFID allows insurers to assess risk, set premiums and therefore make flood insurance more readily available
- Flood cover is becoming more available

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## The Database

- Flood risk is represented in terms of frequency and severity of flooding affecting a property;
  - Frequency: 20, 50, 100 and Extreme flood events;
  - Severity: water depth (m) above ground level
- Based on G-NAF (Geocoded National Address File of Australia)
- Uses publicly available flood information sourced from state government and local councils
  - To avoid duplication and reduce inconsistencies

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## NFID continues to develop

- Development over a 3 year period;
  - Delivery of existing mapping in late 2008 / 2009
  - Expansion of database to new areas in WA, SA, Victoria (including Melbourne) in 2010 and maintenance
  - Ongoing expansion (e.g. QLD) and maintenance of existing areas in 2011
- NFID development is ongoing and continually improved;
  - New flood studies or data is available;
  - New terrain models are available
  - Updates to G-NAF (Geocoded National Address File)

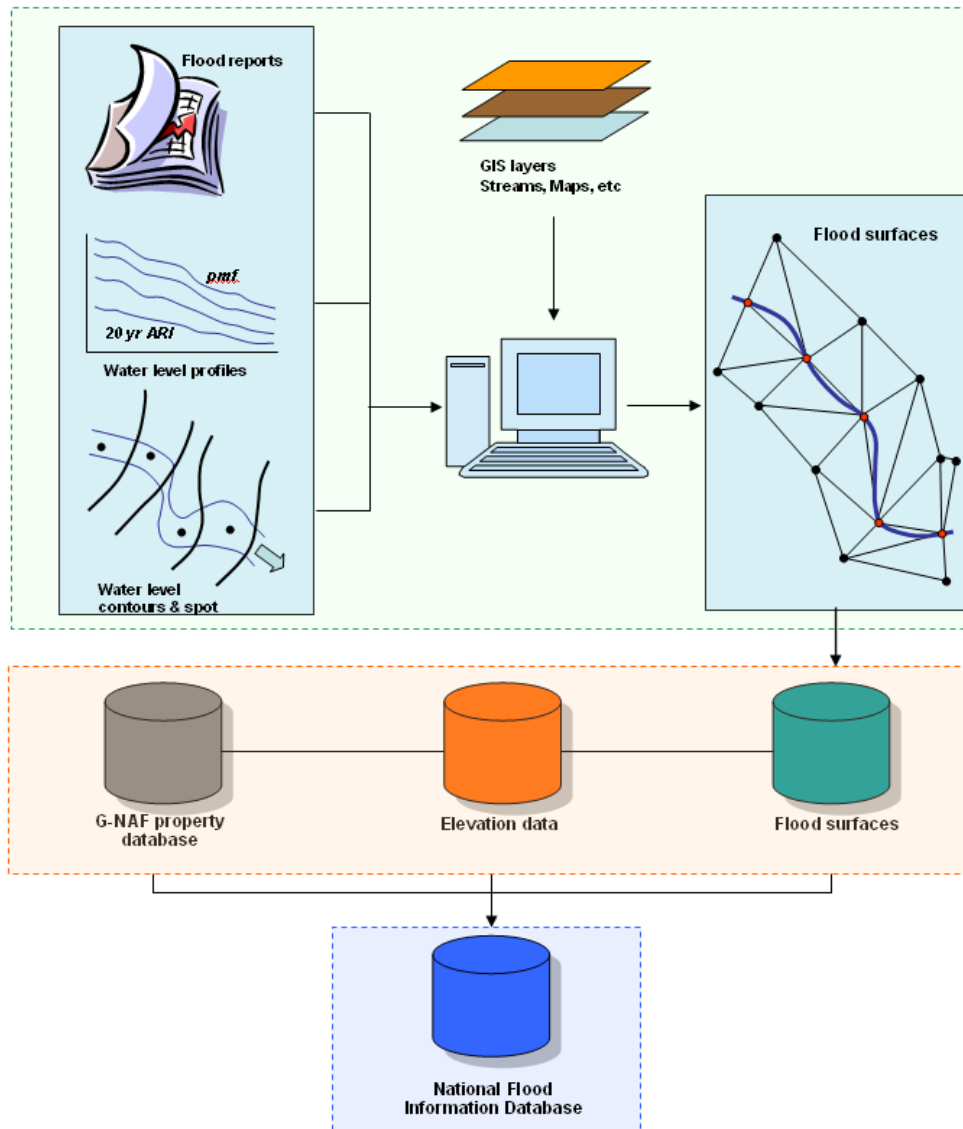
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| Field Name          | Data Type    | Description   | Examples/Constraints  |
|---------------------|--------------|---|---|
| ELEVATION           | Decimal(6,1) | Indicative ground elevation in metres above Australian Height Datum derived from SRTM data. | Valid value range [-99.9, 9999.9] metres.<br>-999.9 for elevation data not available. |
| FLOOD_DEPTH_20      | Decimal(4,1) | Water depth in metres above ground level at 20-year ARI flood level                         | Valid value range [0, 99.9]<br>-1 for "Not Available"                                 |
| FLOOD_DEPTH_50      | Decimal(4,1) | Water depth in metres above ground level at 50-year ARI flood level                         | Valid value range [0, 99.9]<br>-1 for "Not Available"                                 |
| FLOOD_DEPTH_100     | Decimal(4,1) | Water depth in metres above ground level at 100-year ARI flood level                        | Valid value range [0, 99.9]<br>-1 for "Not Available"                                 |
| FLOOD_DEPTH_EXTREME | Decimal(4,1) | Water depth in metres above ground level at extreme flood level                             | Valid value range [0, 99.9]<br>-1 for "Not Available"                                 |
| FLOOD_ARI_GL        | Integer      | Flood ARI at ground level (assuming floor height zero metres)                               | Valid range [19, 10001]<br>-1 for "Not Available"                                     |
| FLOOD_ARI_GL1M      | Integer      | Flood ARI at floor height of 1 metre  | Valid range [19, 10001]<br>-1 for "Not Available"                                     |
| FLOOD_ARI_GL2M      | Integer      | Flood ARI at floor height of 2 metres   | Valid range [19, 10001]<br>-1 for "Not Available"                                     |
| NOTES_ID            | Integer      | Reference ID for separate notes file  | Valid range [1, 9999]<br>Zero for "None"  |

| Field Name         | Data Type | Description   | Examples/Constraints                              |
|--------------------|-----------|---|---|
| GNAF_PID           | Char(15)  | Specific ID for each address point  | Unique for each location<br>E.g. "GANSW714897411" |
| DEM_SOURCE         | Char(64)  | Source of elevation data used in depth and ARI calculations   | E.g. "NSW Dept. of Lands"                         |
| DEM_DATE           | Char(15)  | Year elevation data was created   | E.g. "1998"                                       |
| DEM_RESOLUTION     | Char(15)  | Resolution (cell size) of highest quality DEM   | E.g. "5m"   |
| FLOOD_STUDY_NAME   | Char(254) | Name of flood study(ies)  | E.g. "Singleton Council Flood Study"              |
| FLOOD_STUDY_SOURCE | Char(64)  | Source of flood study(ies)  | E.g. "Singleton Council"                          |
| FLOOD_STUDY_DATE   | Char(15)  | Year flood study(ies) released  | E.g. "2007"                                       |
| FLOOD_DATA_EXTRAP  | Char(32)  | List of flood surfaces which were interpolated / extrapolated from other flood data                   | E.g. "20 year, PMF"                               |
| LEVEE_INFORMATION  | Char(64)  | Field showing whether the flood study includes a levee system and what ARI the levee protects against | E.g. "Yes 100-year"                               |
| CONFIDENCE_LEVEL   | Integer   | Confidence measure based on DEM accuracy and flood data (1 = low; 5 = high)                           | E.g. "5"  |

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## NFID status

| Version | Date      | GNAF reference | Addresses with Flood Risk Data |
|---------|-----------|----------------|--------------------------------|
| 1.0     | 17-Dec-08 | Aug-08         | 672,270                        |
| 1.1     | 23-Dec-08 | Aug-08         | 1,185,367                      |
| 1.2     | 11-Mar-09 | Aug-08         | 1,436,261                      |
| 1.3     | 18-May-09 | Aug-08         | 1,436,261                      |
| 2.0     | 15-Jul-09 | Aug-08         | 1,556,300                      |
| 2.1     | 21-Dec-09 | Aug-08         | 1,631,219                      |
| 2.2     | 30-Mar-10 | Aug-08         | 2,570,024                      |
| 2.3     | 30-Jun-10 | Feb-10         | 4,635,006                      |
| 2.4     | 3-Dec-10  | Aug-10         | 4,965,681                      |
| 2.5     | 2-May-11  | Feb-11         | 5,151,259                      |
| 2.6     | ...       | ...            | ...                            |



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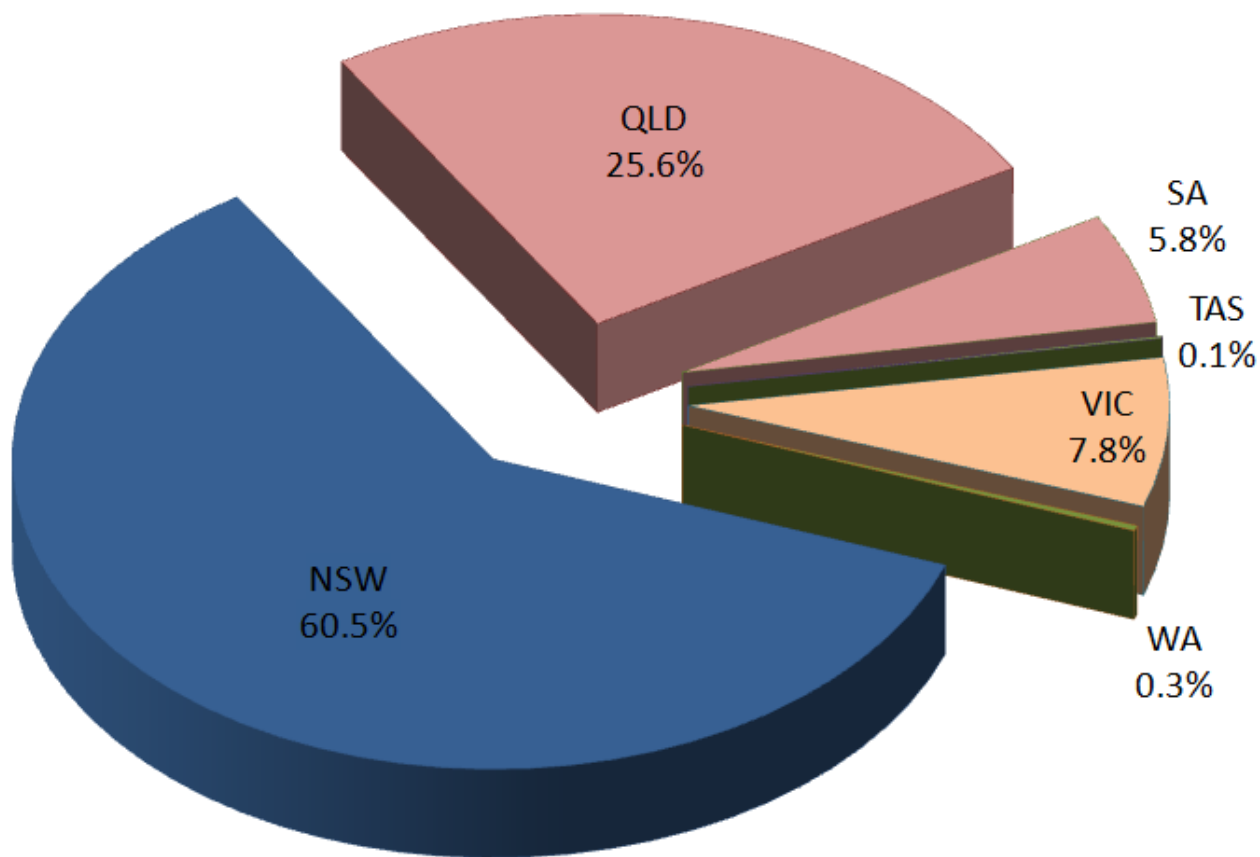


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## Breakdown by State



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## How insurers use flood data

“If an insurance company does not have the information or capability to understand the risk involved, it will not provide the policy”

Patrick Snowball, CEO Suncorp, *The Australian*, 17.2.11

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## Using NFID data

- Pricing
  - Return period (frequency)
  - Severity (depth)
- Understanding and managing accumulations
- Reinsurance
  - Flood is a key focus
  - Price for the cover
  - Evidence of a risk managed approach

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## Limitations and assumptions

- Caveats and sources of uncertainty include:
  - G-NAF represents addresses as single points
  - Resolution/accuracy of terrain model
  - Overland flooding, drainage surcharge, coastal inundation not considered
  - Velocity information not included
  - Assumes flood defences function as designed
- Baseline for continued improvement and for individual insurers to build upon

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- Map shows 100yr depth (above ground) for commercial premises
- G-NAF centroid does not detect partial flooding across land parcel for large commercial premises
- May also underestimate flooding where there is a variation in water depth across land parcel

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## Where next for flood mapping: NFID

- Queensland is the next focus
- Government data required
- Continued updates
  - Flood studies
  - Elevation models (IFSAR / LiDAR)
  - Very flexible structure design for update

## Where next for flood mapping: NFID

- NFID is a core dataset but won't meet all the needs of all insurers
  - It has a residential focus
  - Smaller and regional rural settlements may not be included
  - Is only as good as the flood data and the elevation model
  - It is not a flood “map”

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## Building upon NFID

- No 'one size fits all' solution
- NFID can be enhanced by users
  - Commercial focus
  - Rural or small settlements
  - Where Govts have not released flood data
  - Vulnerability
  - Pricing and premiums



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## How to use Flood data

- An insurer wanting to understand flood risk:
  - Use NFID as your starting point
  - It is the most consistent and comprehensive dataset
  - Need G-NAF and we'd recommend GIS
  - Alternative is to reinvent the wheel, spend a large sum of money, or have a less comprehensive solution

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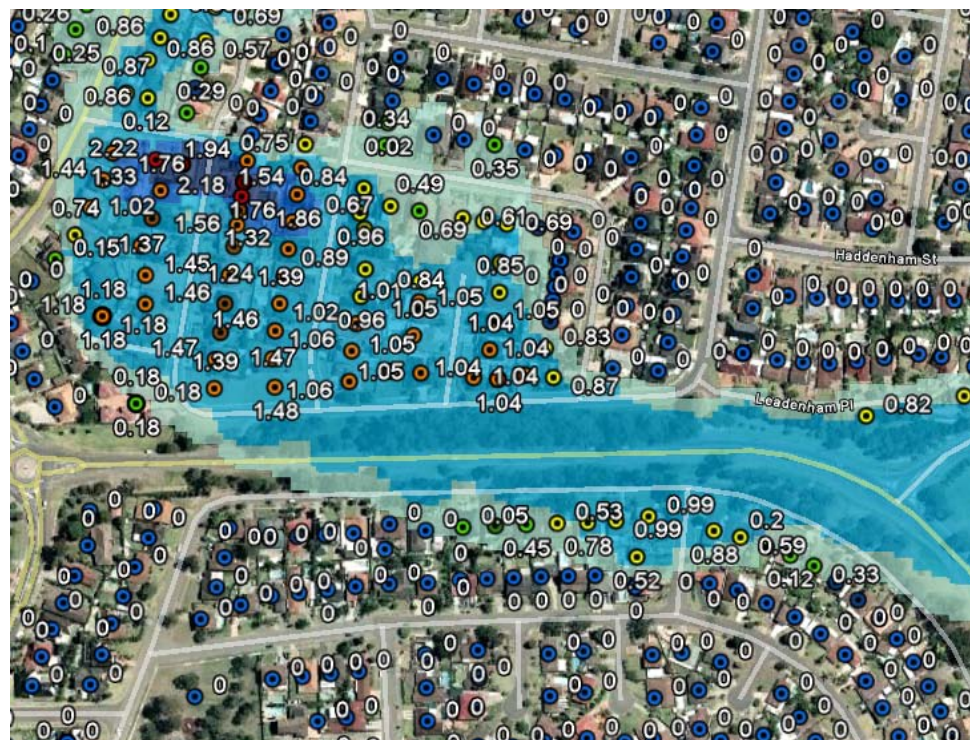
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## The science of Flood Modelling

- Flood is a location specific peril requiring high resolution
  - “Bottom up” vs. “Top down” approach
  - Vendor modelling companies don't often model flood
  - Flood modelling is a geographical and engineering science
  - Mapping at lower resolution may seem more cost effective and simpler but will produce inconsistent results
  - Beware of cheap imitations



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## Summary

- NFID is the core dataset for insurers to use and to build upon
- Insurers and Governments working together to develop a solution
  - Govts need to continue to provide (good) data
  - Rhetoric must be backed by action
- Flood modelling is a complex science
- No short cuts; quality OR compromise