Reconnecting River Country Program

Hydraulic modelling webinar

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What will be covered in the webinar?

An overview of the modelling to improve understanding of how the models have been developed, how they can be used and next steps

- What is a model?
- What are the models used for?
- How are models built and tested?
- Modelling assumptions
- Example model outputs
- Model status and next steps

- Q&A

What is a hydraulic model?

- A hydraulic model is a computer based representation of a river's channel and its floodplain that enables prediction of inundation extents, velocities and depths for flow events that the user specifies

- We can use satellite imagery and aerial photography to map inundation for flows that have occurred in the past BUT hydraulic models allow us to map inundation for different flows that are of interest

- Hydraulic models are often used for flood studies, where they are used to map much larger flows

Example of Sentinel satellite imagery

What are the models used for?

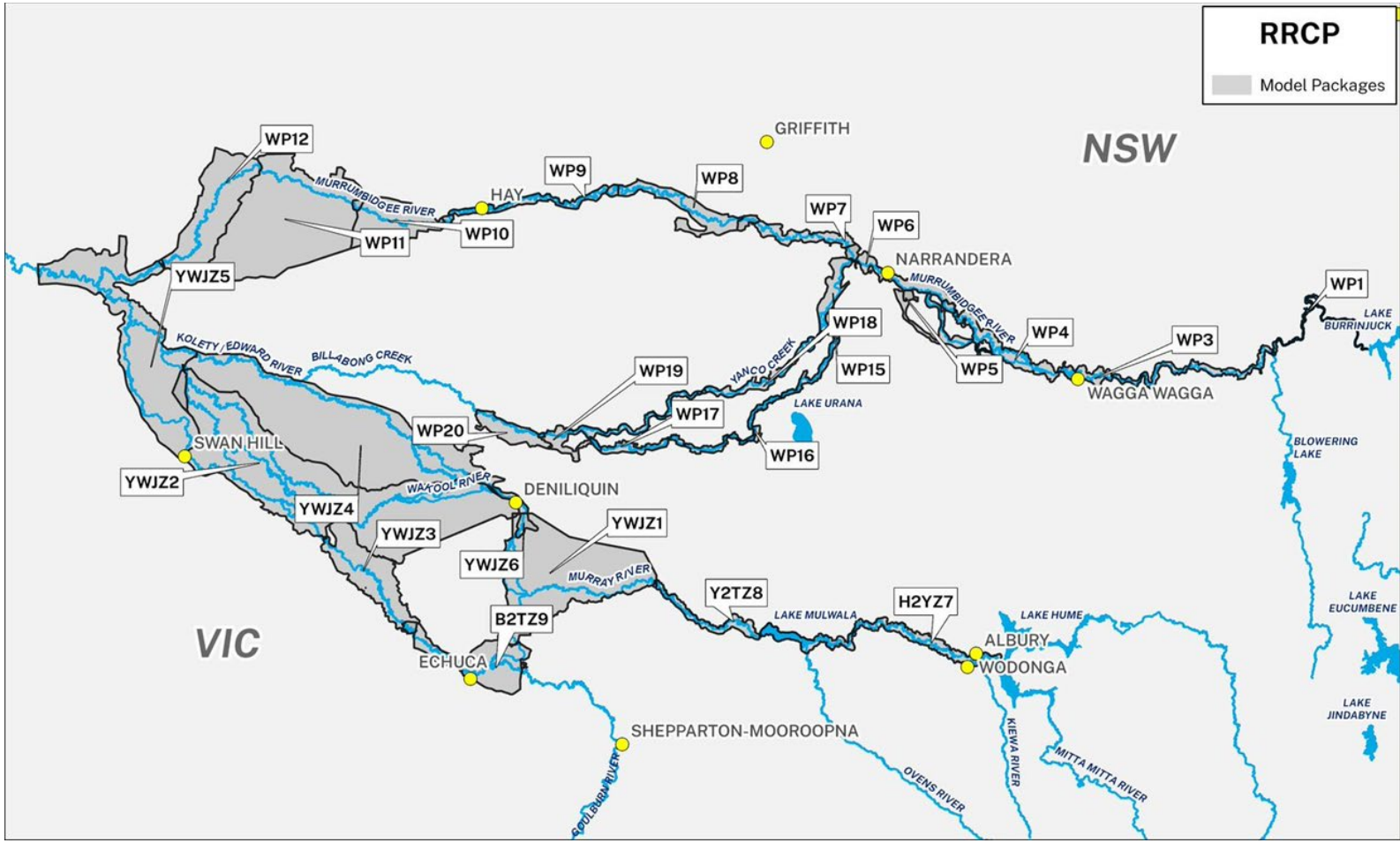
- For the Reconnecting River Country Program the primary purpose is to accurately map where flows will go under current flow limits and the flow limit options being investigated, including buffer flows
- The modelling complements satellite imagery and aerial photography of past flow events

- To inform understanding of impacts and benefits (environmental, cultural, social, economic)
- As part of Program implementation – will inform landholder agreements

- Modelling is one of the tools used to inform the options assessment process and does not determine the best option
- Checking will occur through on-ground field validation and stakeholder feedback

RRCP Hydraulic Modelling

- Models are being built to provide high resolution and high accuracy inundation mapping for all project areas
- These models are a major improvement on the modelling used for previous constraints management projects
    - Relatively simple 1D modelling
    - Interpolation of satellite imagery of past events
- This has been a multi-million dollar investment in data collection and modelling by Australian and NSW Governments



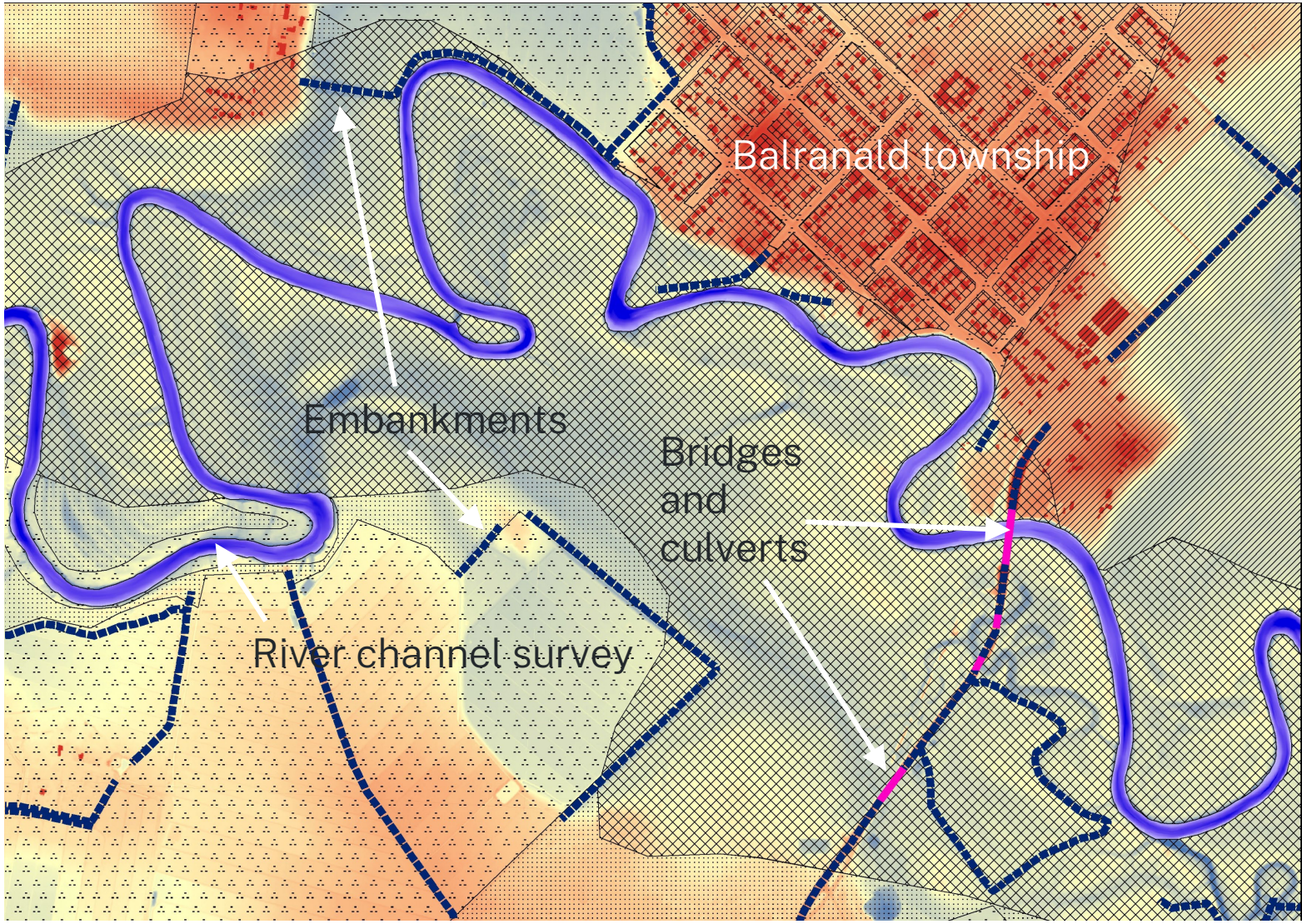
Map of model reaches

Building hydraulic models

- In building hydraulic models we endeavour to represent all the things that impact the movement of water:
  - River channel
  - Floodplain and wetland topography
  - Embankments
  - Bridges
  - Culverts
  - Vegetation (roughness)
  - Infiltration and evaporation

Model data inputs

- Detailed aerial topographic survey (LIDAR)
- River channel survey – boat-based survey of all major rivers and creeks
- Structure dimensions and levels – levees, bridges, culverts
- River channel and floodplain ‘roughness’ estimates
- Infiltration and evaporation loss rate estimates
- Inflows at gauges or other sites representing calibration events or flow scenarios



LIDAR

- Airborne, 3D laser scanning of the ground surface
- Used extensively for landscape surveys
- NSW Government has collected new LIDAR data across many project areas to ensure datasets are up-to-date for this modelling
- Typical vertical accuracy is +/- 10 to 20 cm

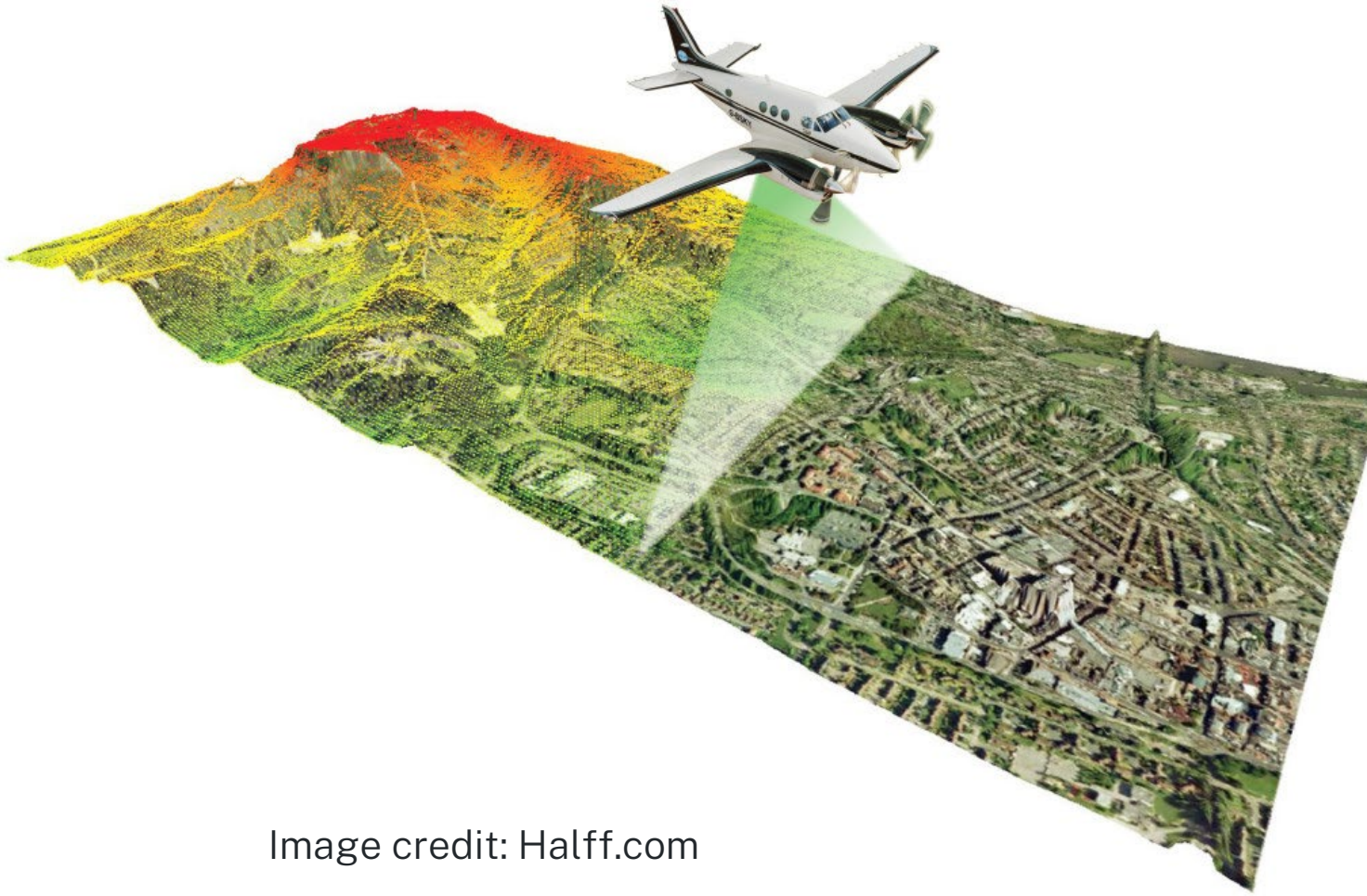
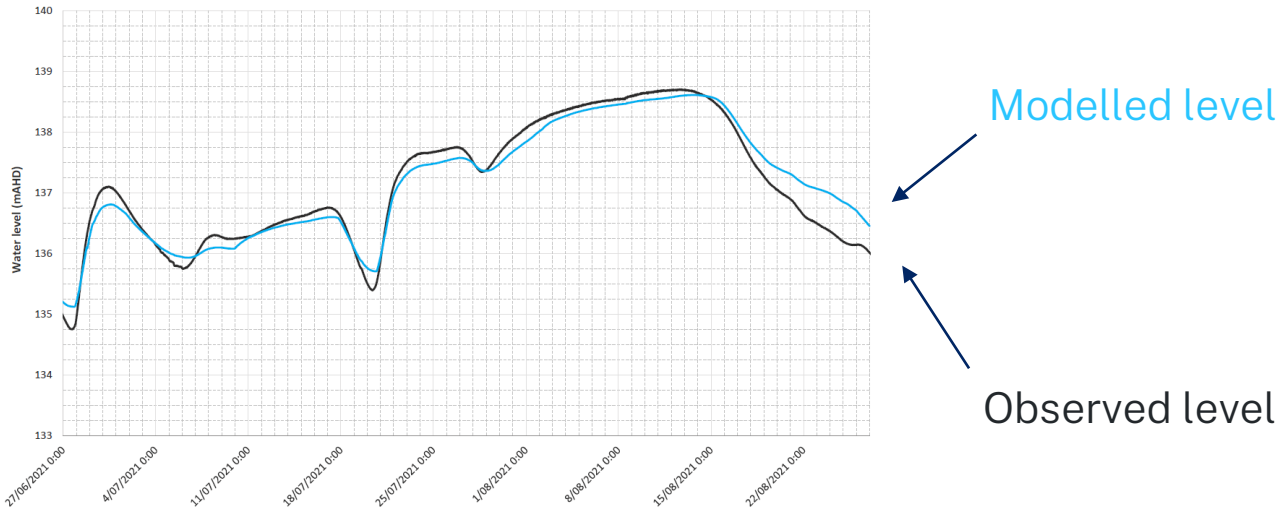


Image credit: Halff.com

Model calibration

- Calibration is used to check the model represents the landscape correctly and to adjust model parameters (e.g. roughness and losses) to ensure that the model represents real-world conditions
- Models are run for past events in the flow range of interest, where data is available to check the model (e.g. 2021 flow events)
- Models results are checked against
    - Gauged flows and levels
    - Aerial photography or satellite imagery
    - On-ground water level recordings and observations



Flows modelled to date

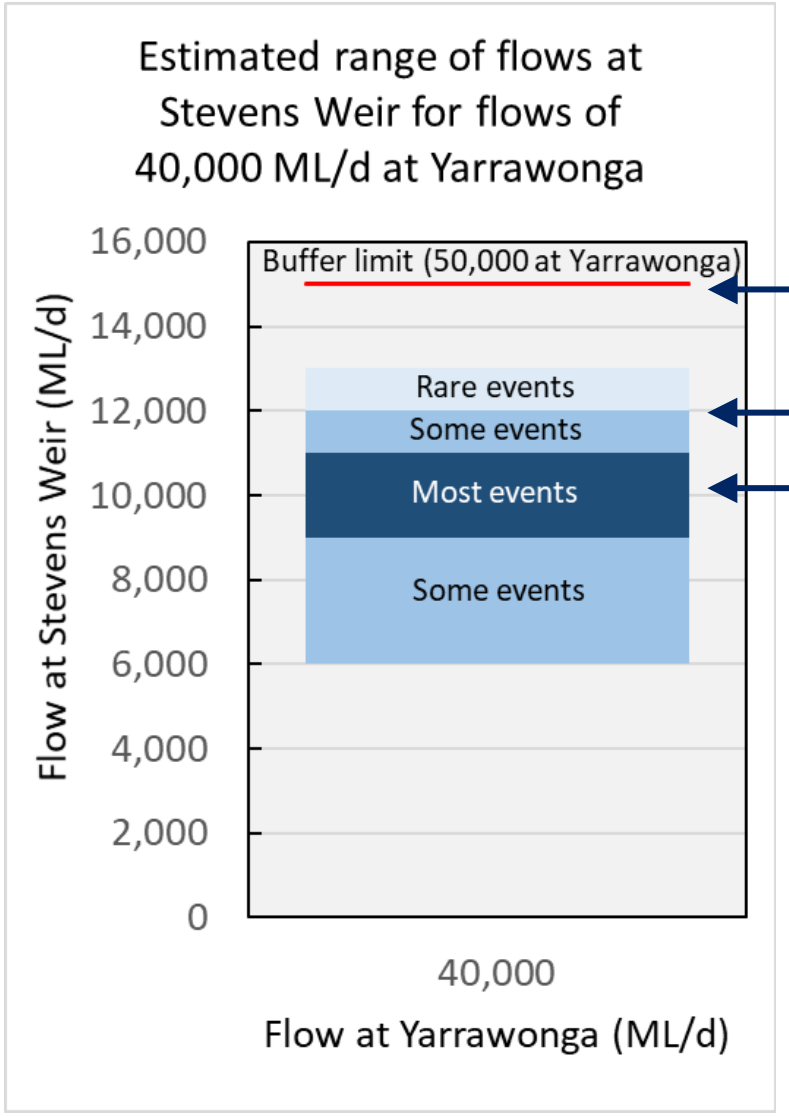
Murray at Doctors Point	Murray downstream of Yarrawonga
Base case – 25,000 ML/d	Base case – 15,000 ML/d
30,000 ML/d	25,000 ML/d
40,000 ML/d	30,000 ML/d
	40,000 ML/d
	45,000 ML/d
	Maximum buffer – 50,000 ML/d

Murrumbidgee at Wagga
Base case – 22,000 ML/d
32,000 ML/d
36,000 ML/d
40,000 ML/d
Maximum buffer – 45,000 ML/d

The maximum buffer is **not a draft flow option** and is for impact mitigation consideration only

Model assumptions

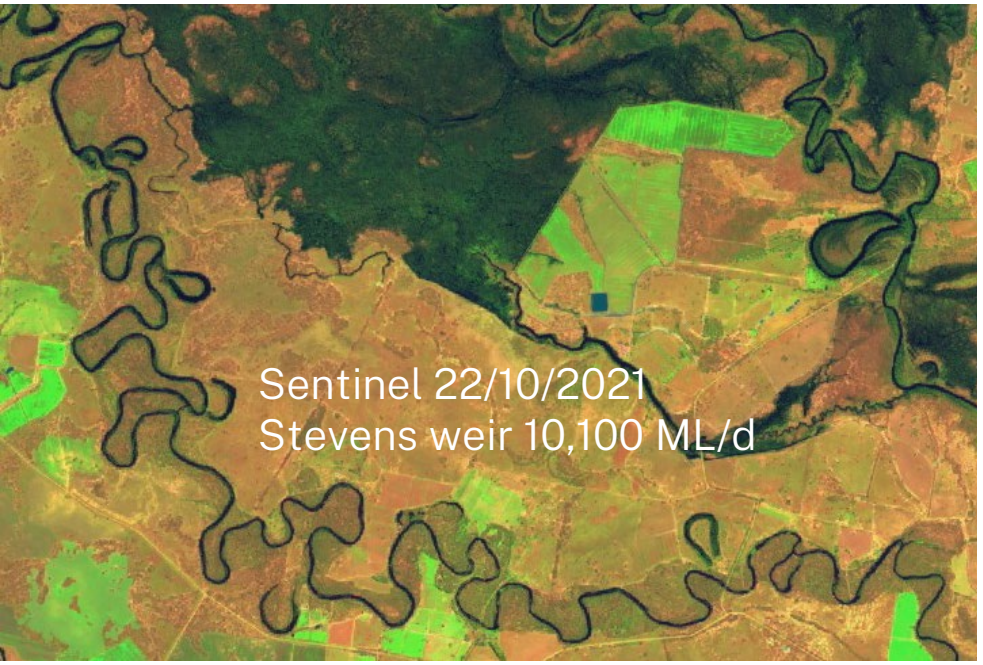
- The modelling adopts conservative assumptions with the aim of giving conservative (upper end) predictions of inundation extents and water levels
  - Models are calibrated to favour over-prediction
  - Models are run with conservative, 'upper end' flow estimates
  - Models are run with substantially longer duration flows than we anticipate being ordered for the environment
  - Models adopt conservative infiltration and evaporation rates (allowing for pre-wet catchment conditions)
- Buffer flows for impact mitigation are also modelled
- **Key outcome - most environmental flow deliveries will result in smaller areas of inundation than shown by the model extents**

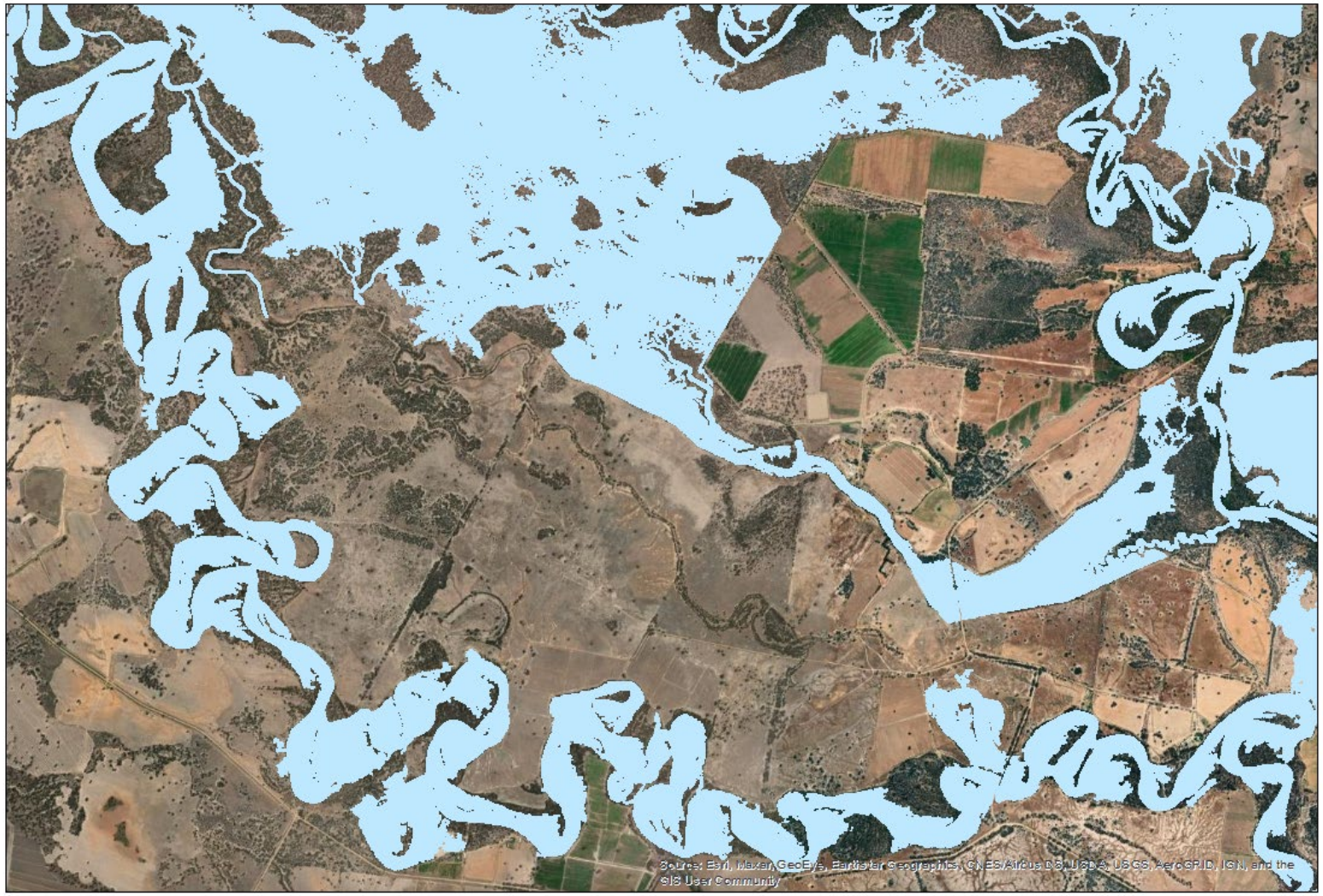


Example outputs – for 40,000 ML/d flow option

Stevens weir flow	Stevens weir level
9,500 ML/d	4.88 m
12,000 ML/d	5.47 m
15,000 ML/d	5.88 m

- Modelled 'upper' extent for 40,000 ML/d at Yarrawonga, 12,000 ML/d at Stevens weir mid blue
- Most events will have an inundation extent similar to the dark blue, 9,500 ML/d at Stevens weir
- Buffer extent for impact mitigation is light blue, 15,000 ML/d at Stevens weir





Modelling status and next steps

- Models are built, provisional mapping is mostly prepared, and these provide a foundation for the project going forward
- Modelling has been checked against aerial photography and satellite imagery, but is yet to be checked on-ground with landholders and other stakeholders - it should therefore be treated as provisional
- Future steps
    - Ground truthing – with landholders and other stakeholders
        - Checking input data – e.g. embankments, culverts and other structures
        - Checking inundation extents
        - Starting with Case study, Community Snapshot, On-Country assessment and Regional Focus Group participants (in 2022), and then expanding to other landholders and stakeholders (2023 and beyond, after receiving further funding)
    - Model updates – taking into account feedback and any additional data collection, including in response to any future flow events
    - This will take time and likely be in iterative process through 2023 and beyond (after receiving further funding)

How will models be used?

- As an input to landholder and stakeholder engagement
    - Demonstrating the areas predicted to be inundated under the flow limit options being investigated
    - To obtain feedback on the flow limit options being investigated – impacts and benefits
- As an input to cost/benefit analysis for the Strategic Business Case
    - Identifying the area that would potentially require impact mitigation for each flow limit option
    - Estimating the number of bridges, culverts and other structures that may be needed for each option
- To inform landholder agreements (to be confirmed after receiving further funding)

How will the modelling be shared?

Our current intention is to share via:

- Web platform (publicly available)
- Landholder case studies, community snapshots and on-Country assessments
    - One-on-one demonstration of mapping by LLS and DPE staff
    - Hardcopy maps provided if requested

Feedback is welcome on best the approaches

Reconnecting River Country Program

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