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Description and metadata for a composite dataset used for development and validation of a predictive flood inundation and volume model

Project RQ7 Enhancing floodplain inundation and volume prediction to support environmental watering and water resources planning.
Deliverable T2.7.2

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Foreword

The Murray–Darling Water and Environment Research Program is an Australian Government initiative to strengthen scientific knowledge of the Murray–Darling Basin. It is designed to help inform water and environment management decisions which will improve outcomes for the Basin and its communities. Four priority themes have been identified as the focus of the strategic research: Climate Adaptation, Hydrology, Environmental Outcomes, and Social, Economic and Cultural Outcomes.

Research Question 7 (RQ7) – Enhancing floodplain inundation and volume prediction to support environmental watering and water resources planning – is one of the research projects in the Hydrology theme.

This report is technical note that describes a dataset that was collated in the first twelve months of the RQ7 research. The composite dataset will be used in the development and validation of the predict flood inundation and volume model. This report consists of three parts, corresponding to three subsets of data: Digital Elevation Model (DEM), hydrodynamic modelling results and gauged data.

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Acknowledgments

This work is carried out in CSIRO Land and Water as part of the Murray–Darling Water and Environment Research Program. The MD-WERP is an Australian Government initiative to strengthen scientific knowledge of the Murray–Darling Basin that is managed through a partnership between the Murray–Darling Basin Authority (MDBA), Commonwealth Environmental Water Office (CEWO) and the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

The authors thank Francis Chiew, David Post, Matthew Gibbs, Fazlul Karim, Jenet Austin, John Gallant, Biao Wang, Shaun Kim from CSIRO; Charlotte Dennis, Peter Shaw, Andrew Keogh from Murray–Darling Basin Authority; Graham Hammond, Robert Kay from Geoscience Australia; Nick Streeton, Simon Morton from NSW Department of Planning and Environment; Simon Fisher, Brent Aulsebrook from QLD Department of Regional Development, Manufacturing and Water; David Waters from QLD Department of Resources for useful discussions and/or coordinating access to data. Finally, we would like to thank the Geoscience Australia and the governments of New South Wales, South Australia, and Queensland for supplying us with the data described in this report.

The authors pay respect to the Traditional Owners and their Nations of the Murray−Darling Basin. We acknowledge their deep cultural, social, environmental, spiritual, and economic connection to their lands and waters.

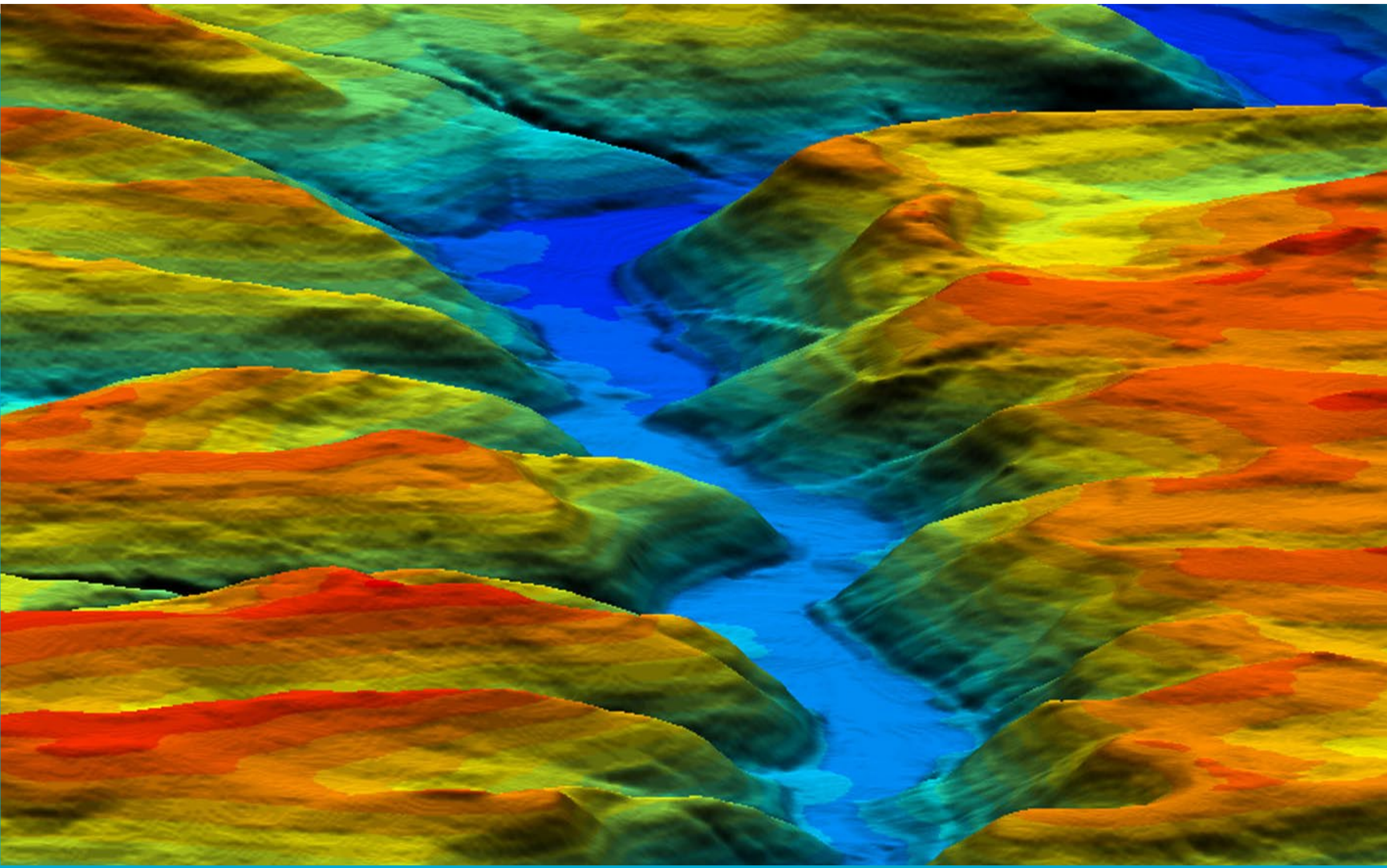
Executive summary

The RQ7 research aims to build on the capacity and models from previous research and develop a model that is suitable for systematic management and scenario planning, which requires multiple modelling runs across large areas, and over long simulation periods. The research will improve the prediction of flood inundation extent, depth and duration, and floodplain volumes.

Quality data is key to build a robust model. As an important part of the model development, a composite dataset has been collated during the first twelve months of the research. This dataset will be used for RQ7 model development and validation. The dataset has been uploaded to CSIRO Data Access Portal (https://data.csiro.au/). This report includes description and metadata for the dataset, which consists of 3 subsets of data: the DEM, the hydrodynamic modelling results, and the gauged data.

The main users of the project outputs will be the MDBA, Basin States, CEWO and hydrological and environmental consultants. The knowledge, data and tools developed in this project will enhance floodplain inundation and volume prediction and modelling under current and future climates and under different management options to inform environmental watering and water resources planning and adaptation.

Part I Digital Elevation Model (DEM)



1 Introduction

The DEM is essential for flood inundation modelling as terrain is the dominant factor that controls water movement. The high-resolution Light Detection and Ranging (LiDAR) DEM is ideal but is not available everywhere in Murray–Darling Basin (MDB).

In MDB, LiDAR data was collected in the floodplain area covering most part of floodplains along the main river channels (Figure 9) and the remaining area was covered by Shuttle Radar Topography Mission (SRTM)-derived DEM-H at 1 arcsecond resolution. We have adopted a method first developed by Gallant (2019) for adjusting the DEM-H to match the LiDAR data to remove abrupt steps at the boundary to ensure the combined data are suitable for flood modelling. Two main steps in the process are (1) removal of systematic vertical errors and (2) adjusting the less reliable DEM-H to match the LiDAR at the boundary. We have improved the method by fine-tuning the buffer size at the boundary of the two DEMs. The method successfully removed local steps and produced a satisfactory result as shown in Figure 1.

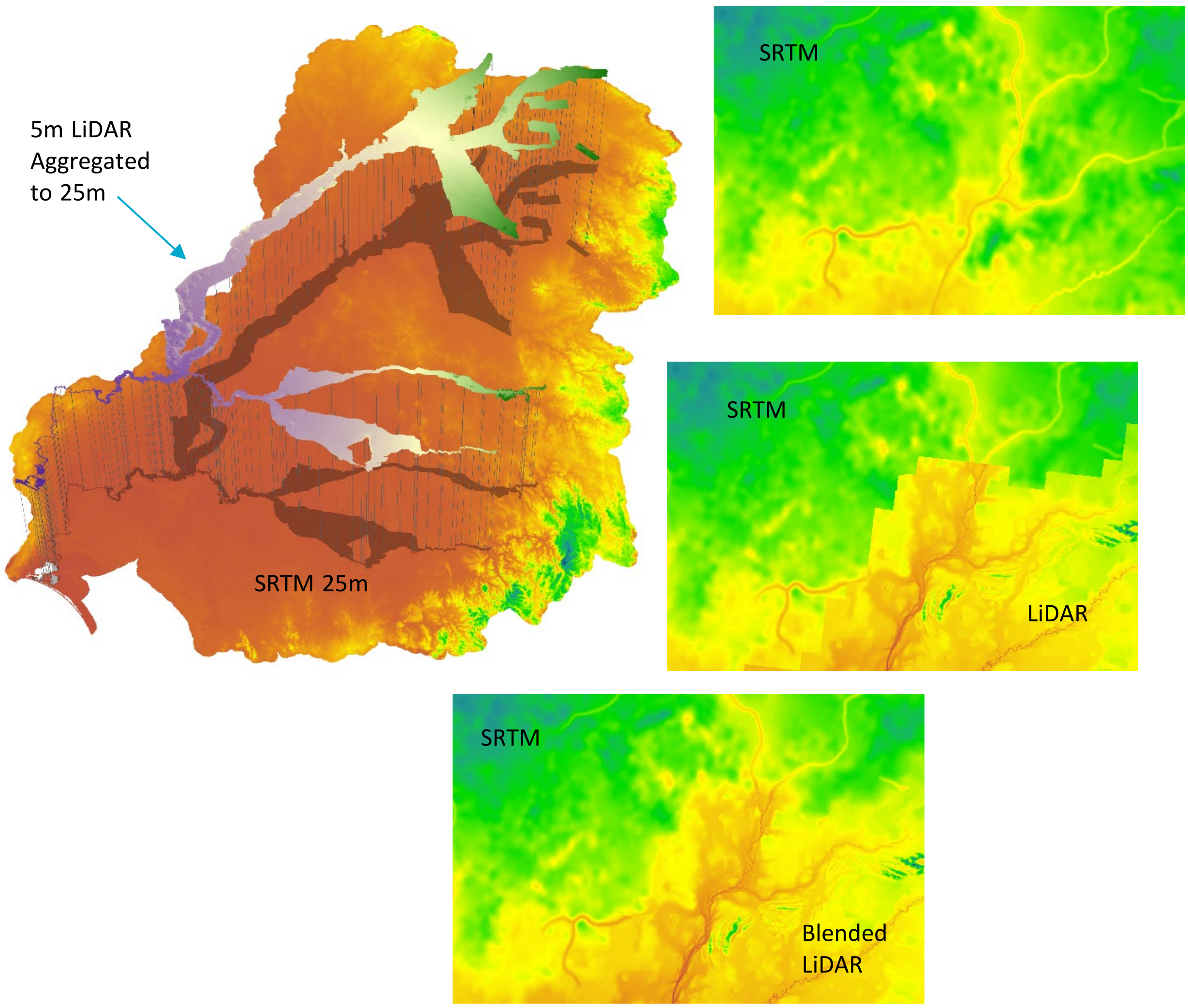


Figure 1 Merging LiDAR DEM and SRTM: the original SRTM and LiDAR DEM are shown in the large map on the left; the top right insert shows a zoomed in view of SRTM; the middle insert shows the abrupt change (local steps) at the boundary of the two datasets; the bottom insert shows the merged data with the abrupt change removed.

As new DEM datasets are gradually becoming available, we have set up a strategic project in CSIRO to investigate better methods (including methods using AI/ML) to merge different datasets, including SRTM, FABDEM (Forest And Building removed Copernicus DEM) (derived from Copernicus DEM), LiDAR, and Photogrammetry data. We will be using the outcome from the strategic project to update the DEM whenever a new dataset becomes available.

The data can be accessed from the CSIRO Data Access Portal (https://data.csiro.au/collection/csiro:54828) and can be cited as:

Marvanek, Steve; Teng, Jin; Penton, Dave; Mateo, Cherry; Khanam, Fathaha; Ticehurst, Catherine; Vaze, Jai (2022): LIDAR enhanced SRTM Digital Elevation Model (DEM) for Murray Darling Basin. v1. CSIRO. Data Collection. https://doi.org/10.25919/5n0m-1682

2 Metadata

2.1 SRTM and LiDAR combined DEM at 25 m resolution

Location	**https://data.csiro.au/collection/csiro:54828**
File name	SRTM_LiDAR_Combined_25m_v2022.tif
Format	TIFF
Size	14.3 GB
Projection	GDA_1994_Australia_Albers; ESPG 3577
Resolution	25 m
Extent	**West** 138.56 **East** 152.50 **North** -24.57 **South** -37.68 Murray Darling Basin

2.2 SRTM and LiDAR combined DEM at 1 arc second resolution

Location	**https://data.csiro.au/collection/csiro:54828**
File name	SRTM_LiDAR_combined_1sec_WGS84_conformed_to_WOFS_v2022.tif
Format	TIFF
Size	5.28 GB
Projection	GCS_WGS_1984; ESPG 4326
Resolution	1 sec (0.0002698 dd)
Extent	**West** 138.56 **East** 152.50 **North** -24.57 **South** -37.68 Murray Darling Basin

2.3 SRTM and LiDAR DEM at 5 m resolution

Location	**https://data.csiro.au/collection/csiro:54828**
File name	SRTM_LIDAR_Combined_5m_resample_with_5m_LIDAR.tif
Format	TIFF
Size	148 GB
Projection	MGA 55 GDA_1994_Australia_Albers; ESPG 3577
Resolution	5 m
Extent	**West** 138.56 **East** 152.50 **North** -24.57 **South** -37.68 Murray–Darling Basin

3 Processing steps

3.1 LiDAR

LiDAR data was acquired from existing CSIRO past project LiDAR holdings as of June 2021. The sources of the data are consistent with those of Elvis - Elevation and Depth - Foundation Spatial Data (https://elevation.fsdf.org.au/). These holdings comprised of datasets of varying projections resolutions and have been processed to remove gaps and discontinuity at the boundaries.

LiDAR that was not already at 5m resolution were transformed to 5m. 1m LiDAR was aggregated to 5m (ArcGIS->SpatialAnalyst->Generalization->Aggregate, 5x5cell, MEAN) and 2m LiDAR was resampled to 5m (ArcGIS->DataManagement->RasterProcessing->Resample, bilinear). Once all input layers existed at 5m resolution they were merged (ArcGIS->DataManagement->RasterDataset->Mosiac) into a single target 5m raster in the GA Albers GCS (EPSG 3577).

Overlapping values of input layers were resolved by taking the MINIMUM of the overlapping cell values. Minimum was used to ensure that LiDAR images with actual in-channel elevations (due to being water free at the time flown) or those which had bathymetry enforced, were not overridden by hydro-flattened in-channel values from an overlapping image. Visual inspection of the result found there to be slight edge effect, with any visible “seams” between LiDAR edges deemed to be insignificant given the subsequent aggregation of the data to 25m that would occur for blending with the SRTM.

3.2 Namoi Gap fill with 5m Photogrammetry DEM

The merged LiDAR coverage resulted in a continuous LiDAR coverage of the main river channels from the Balonne, MacIntyre, Macquarie, Namoi, Murrumbidgee, and Murray rivers to the Murray mouth, save for a gap in the Namoi between Narrabri and Wee Waa (Figure 2). 5 m Photogrammetry DEM was used to bridge this gap to provide a continuous high-resolution coverage along the Namoi (Figure 3). The source Photogrammetry tiles are acquired from Elvis. These were merged into a single rectangular piece before being merged with the LiDAR.

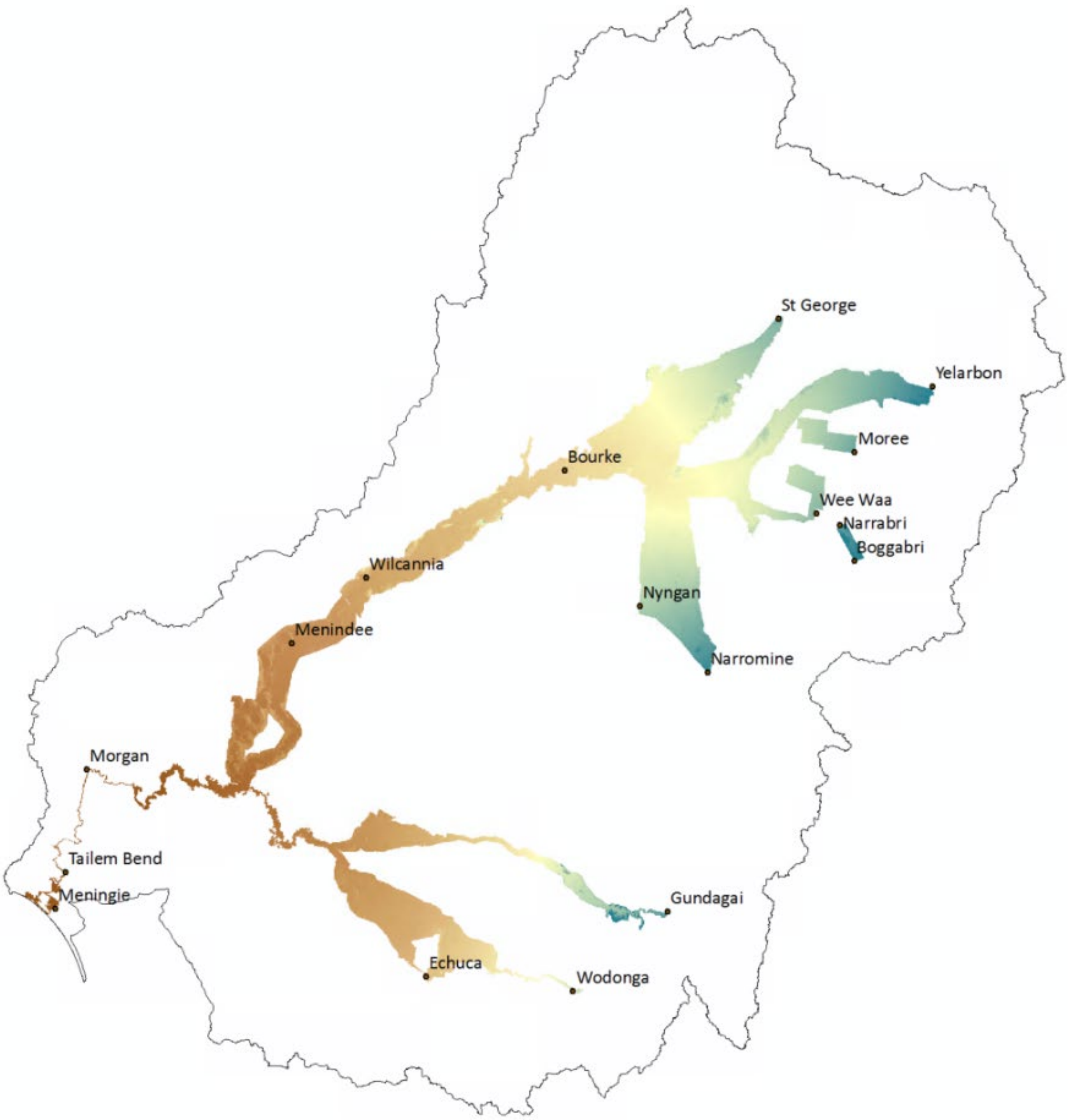


Figure 2 Merged LiDAR DEM with a gap in the Namoi between Narrabri and Wee Waa.

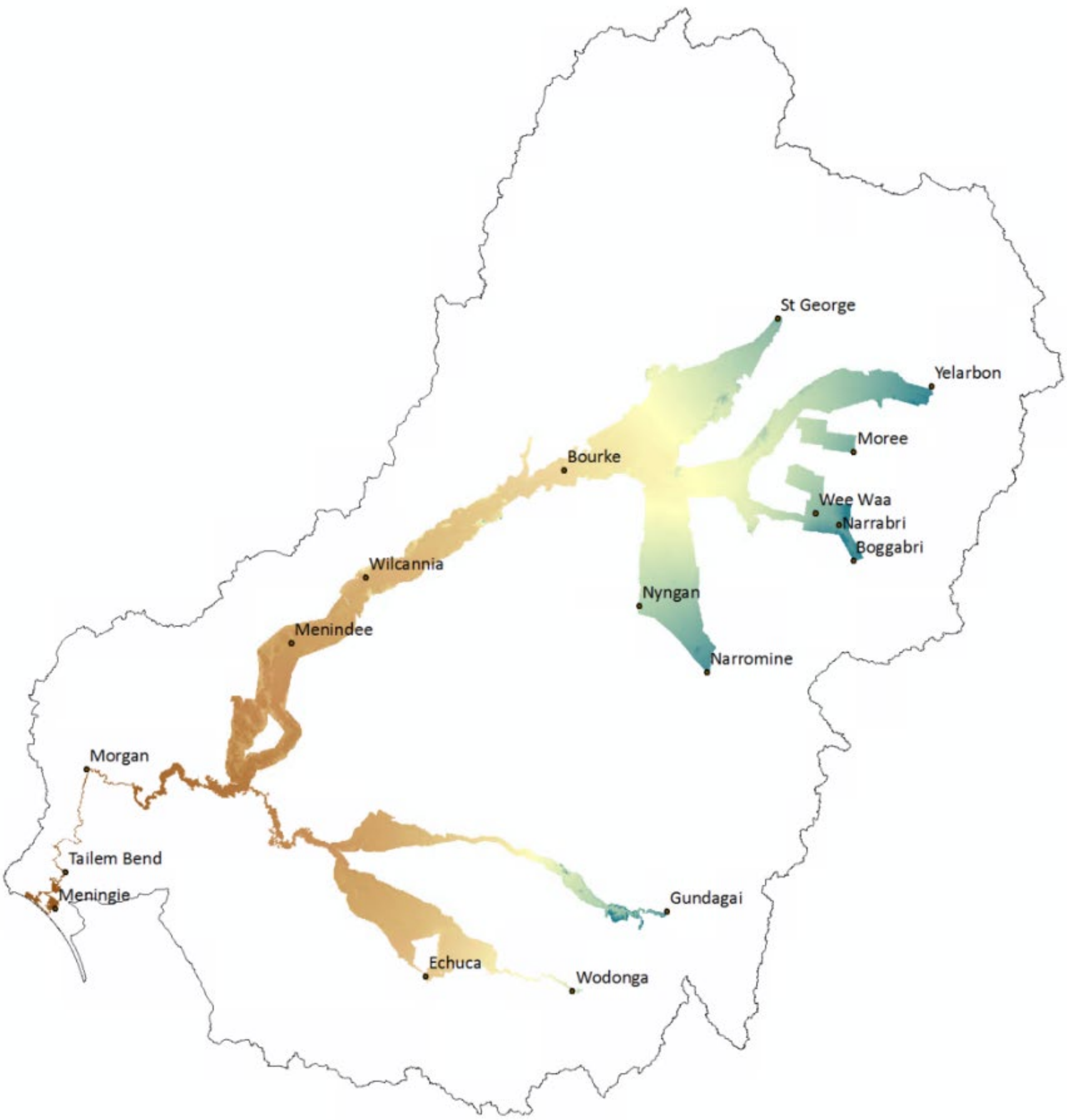


Figure 3 The gap in the Namoi between Narrabri and Wee Waa filled with 5m photogrammetry DEM.

As the LiDAR elevation is more accurate, the insertion of the Photogrammetry was such that where photogrammetry data overlapped LiDAR data, the LiDAR value took precedence. Because of this there was a more pronounced edge effect at the interface between the LiDAR and the Photogrammetry. But these seams were "washed out" once the data was aggregated from 5 m to 25 m.

The merged 5m LiDAR data layer was aggregated to 25 m for blending with the SRTM.

3.3 SRTM

The hydrologically corrected 1 sec SRTM was clipped to the MDB extent (with a 10 km buffer), reprojected from WGS84 1sec and snapped to same cell resolution and projection of the 25 m LiDAR DEM (i.e., GDA_1994_Australia_Albers; ESPG 3577, using ArcGIS-> ProjectRaster).

3.4 Blending 25 m LiDAR with 25 m SRTM

Using a variation on the principles of Gallant (2019), the 25 m LiDAR elevations were merged with the 25 m SRTM elevations. Edge differences were smoothed out by linearly attenuating the difference between LiDAR and SRTM values at the interface of the two layers to a zero difference over 1000 m out from the interface.

This was achieved as follows:

Firstly, the height of the SRTM was adjusted to negate the global mean difference between it and the LiDAR layer. In this case the SRTM layer was lowered by 2.1 m (the mean difference in elevation values in the STRM/LiDAR overlap). Essentially partially correcting for the height datum difference between the LiDAR (AHD) and the SRTM (EGM96).

A polygon footprint of the 25 m LiDAR coverage was buffered out to 1000 m. The perimeter outline of the buffered polygon was then converted to points at 100 m equal intervals, and these points given a difference value of zero.

To these were combined the cell centroids (points) of the difference between the lowered SRTM and the LiDAR of the outermost LiDAR cells (i.e., the “rim” cells of the lowered SRTM / LiDAR difference layer.

These mass points of SRTM / LiDAR difference at the LiDAR's edge and 0 difference 1000 m out from the edge were input as spot elevation data for the generation of a TIN. Whereby the resulting TIN facets sloped linearly from the difference magnitude at the LiDAR's edge to zero difference 1000 m out.

The resultant TIN was rasterised, clipped to the buffered LiDAR footprint.

From here the layers were combined to create an MDB-wide difference raster comprising of three zones.

Table 1 Processing rules applied to different zones to create a difference raster.

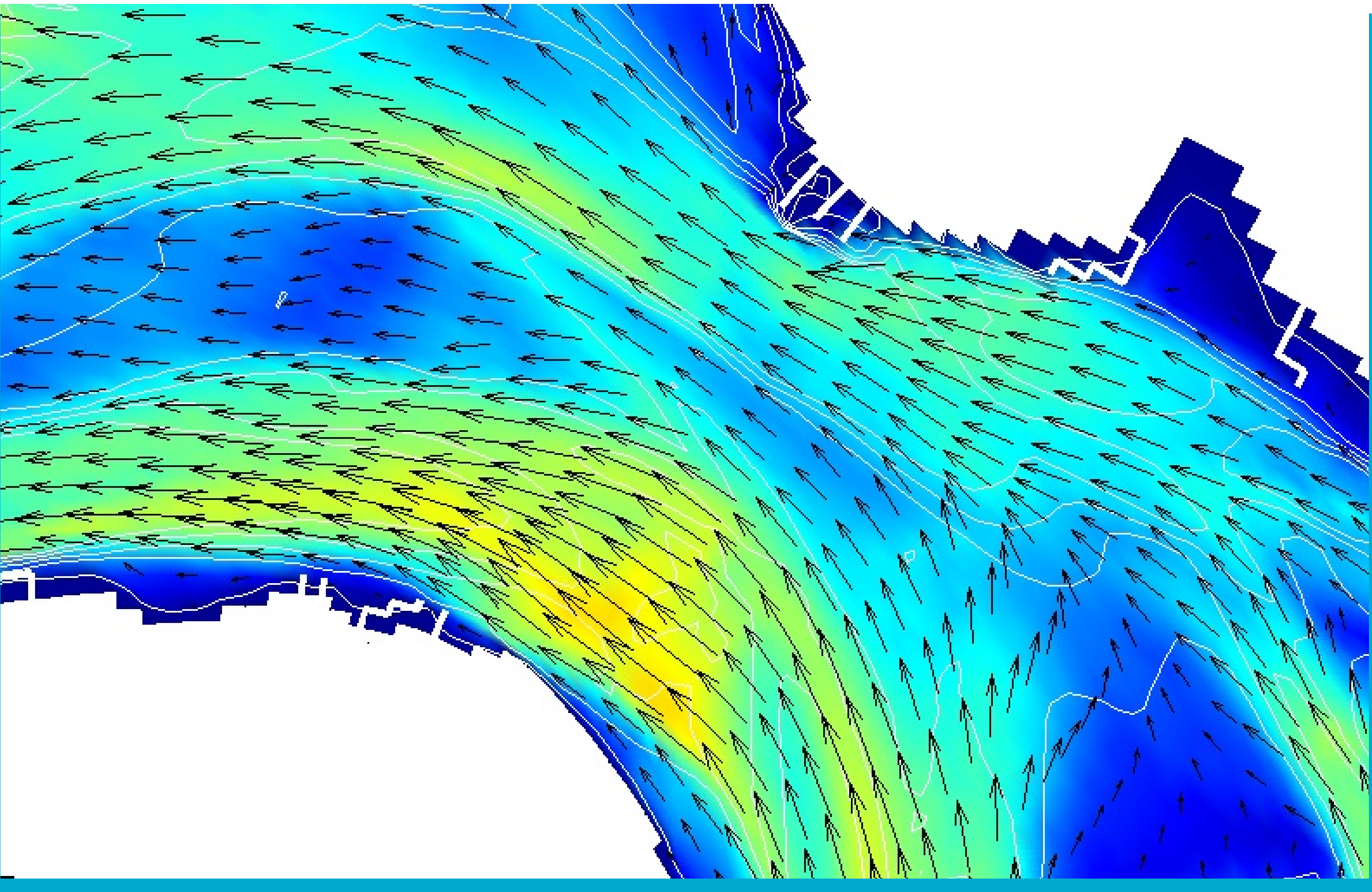
Zone	Extent	Cell value
1	Within the 25 m LiDAR footprint	Difference (LiDAR minus lowered STRM)
2	Between the LiDAR’s edge and the 1000 m buffer	Edge difference attenuated to zero 1000 m out
3	Remaining lowered STRM extent beyond the 1000 m buffered footprint	Zero

This difference layer was then added to the lowered SRTM to produce the final blended output whereby the elevation values are:

Table 2 Processing rules applied to different zones to produce the final output.

Zone	Extent	Cell value
1	Within the 25 m LiDAR footprint	25 m LiDAR elevation
2	Between the LiDAR's edge and the 1000 m buffer	LiDAR's edge elevation blended to SRTM over 1000 m
3	Remaining lowered STRM extent beyond the 1000 m buffered footprint	Lowered SRTM elevation

Part II Hydrodynamic modelling results



1 Introduction

The RQ7 newly proposed model's predicted water depth will need to be validated with 'true' water depth across the floodplain. As the water depth observations on floodplain are rare and difficult to obtain, for the purposes of the validation, we will be limited by using the depth predicted by a hydrodynamic model as 'true' water depth. Although there are many previous hydrodynamic modelling experiments carried out in MDB, only a few of them have the datasets available in the format and quality that can be used for the purpose of the RQ7 research. For the comparison to be meaningful, it was essential for the hydrodynamic model to be of the highest standard. The RQ7 project evaluated hydrodynamic models based on:

- whether they were peer reviewed, especially whether they had been revised and improved based on experience or feedback.
- whether they were calibrated to dynamic conditions (as distinct from steady-state models).
- the quality of DEM and channel bathymetry – only those based on high resolution LiDAR digital terrain models were considered.
- the resolution of the floodplain in the modelling, with preference to flexible meshes.
- consistency with other information such as gauged levels and spot heights.

The project identified models that best met these criteria – three of which would be used in an initial assessment of model accuracy and an additional two that would be acquired for later analysis. For the initial three models, we extracted outputs of model depth for calibration events to use as validation datasets. This dataset encompassed three locations in MDB, 11 river reaches and seven calibration events.

Table 3 Selected flood modelling projects in MDB

Location	Organisation	Purpose	Model	More Information
The South Australian section of River Murray	SA Department for Environment and Water (DEW)	Environmental flow	MIKE FLOOD	Montazeri & Gibbs (2020)
Lower Balonne and Middle Darling System	CSIRO MDBA	Water management Environmental flow	MIKE 21	Dutta et al. (2016)

Namoi River	NSW Office of Environment and Heritage (now NSW Department of Planning and Environment or DPE)	Healthy floodplains and general flood studies and investigations	MIKE 11 MIKE 21 Flexible Mesh (FM) MIKE FLOOD FM	(NSW OEH, 2017)

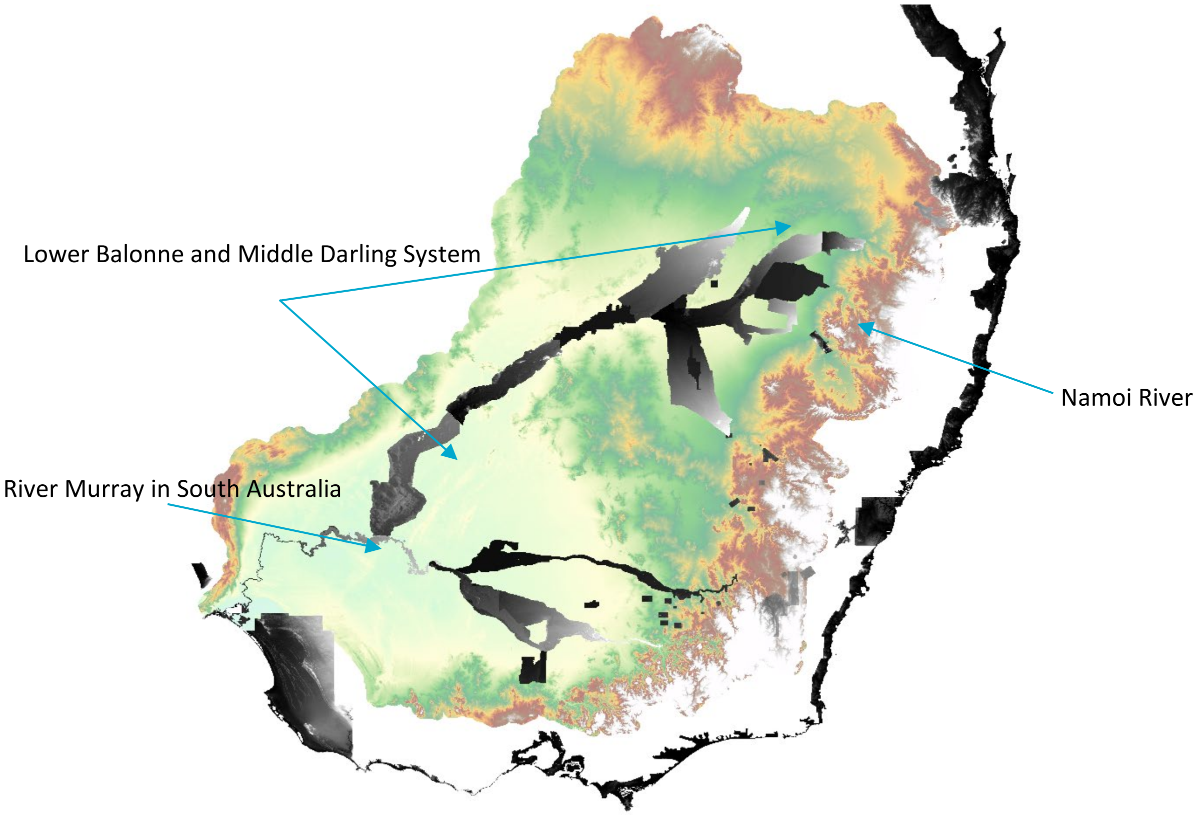


Figure 4 Spatial location of three selected flood modelling projects.

The data can be accessed from the CSIRO Data Access Portal (https://data.csiro.au/collection/csiro:54823) and can be cited as:

Penton, Dave; Teng, Jin; Mateo, Cherry; Marvanek, Steve; Khanam, Fathaha; Ticehurst, Catherine; Vaze, Jai; Karim, Fazlul; Gibbs, Matt; Streeton, Nick; Morton, Simon (2022): Hydrodynamic modelling results collection. v1. CSIRO. Data Collection. csiro:54823.

2 Metadata

2.1 Namoi River

NSW DPE provided outputs from the Lower Namoi Valley floodplain model development in .dfsu format (a proprietary DHI MIKE format). These were exported to shapefile for the period 19980720 to 19980731. These shapefiles were then rasterised at a 5m resolution.

Location	**https://data.csiro.au/collection/csiro:54823v1/Namoi**
File convention	ShapeFile_Attribute\2DResults_elements_000.tif where: Attribute is one of Depth/Elevation; and 000 is a number representing hours since the 1998-07-20
Size	63 GB
Temporal	6 hours
Projection	MGA_55
Resolution	5m
Extent	**West** 149.236556 **East** 149.728713 **North** -29.906282 **South** -30.311287

For reference, the calibration results described in the report were:

Table 4 Observed and simulated (dynamic) maximum water levels for July 1998 flood

Station ID	Station Name	Observed (mAHD)	Simulated (mAHD)
419039	Namoi River at Mollee	205.22	205.73
419059	Namoi River at d/s Gunidgera Weir	191.82	191.78
419061	Gunidgera Creek at d/s Regulator	191.61	191.43
419900	Namoi River at Glencoe	195.89	196.21

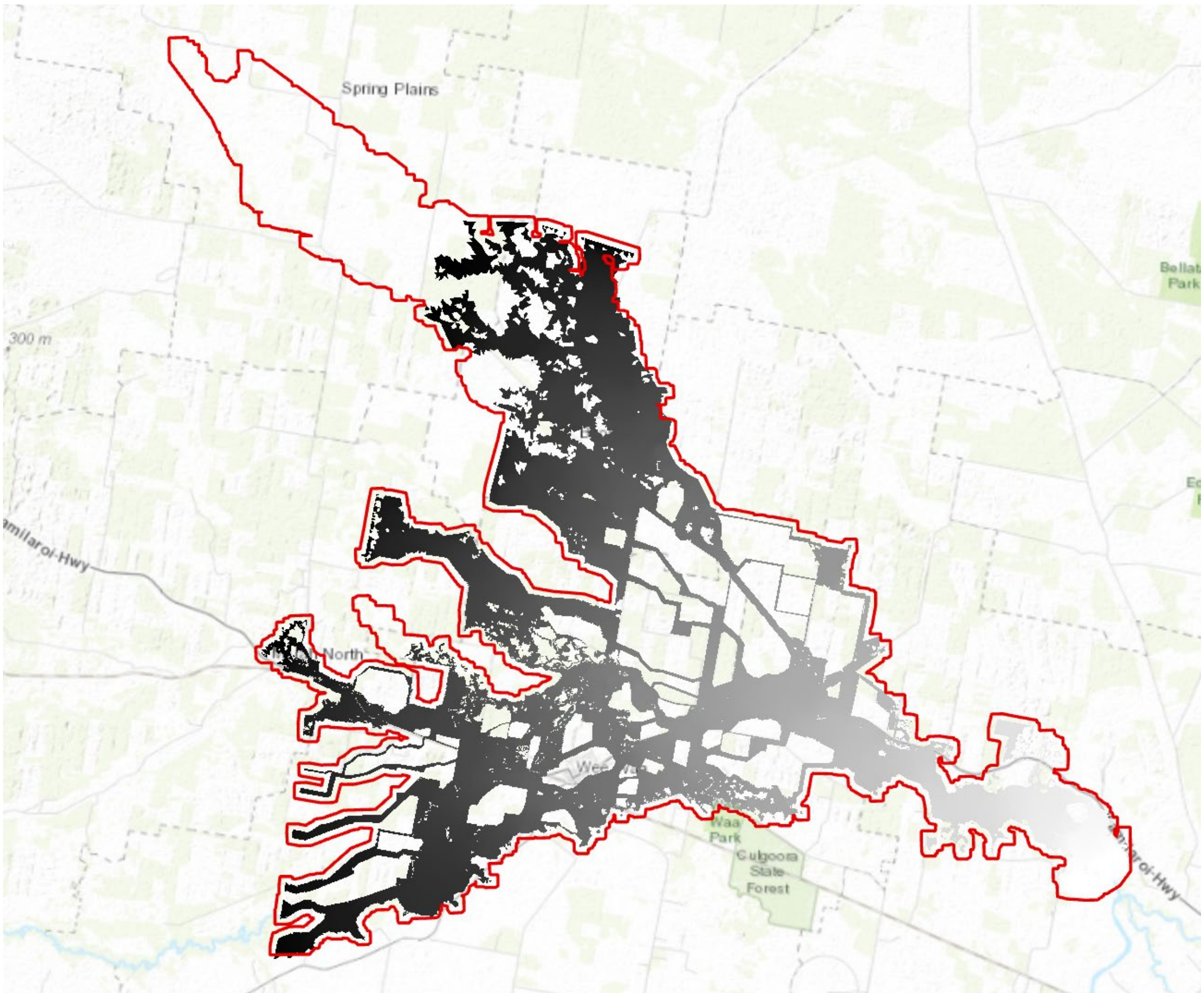


Figure 5 Namoi River modelling extent.

2.2 The South Australian section of River Murray

SA DEW provided access to three products: 1) the Weir Pool Data for South Australia, 2) the results of a dynamic hydraulic model for a minor flood, and 3) results of a hydraulic model simulation of the 1956 Murray flood. From these we generated shapefile outputs, then converted these to rasters.

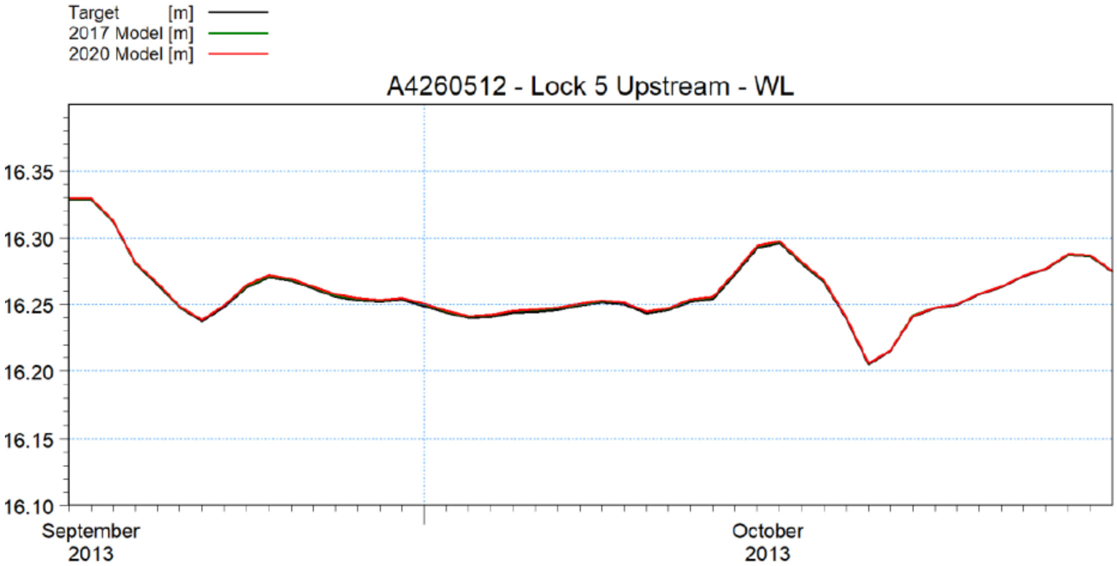
2.2.1 Weir pool data

Location	**https://data.csiro.au/collection/csiro:54823v1/SA_Murray/Weir_pool_data**
File convention	WPX\WPY_AttributeUnit.tif where: X is the weir pool number (same as source) Y is an identifier of the weir pool flow and level (same as source) Attribute is one of Depth_m/Elev_mAHD.
Size	100 GB
Temporal	By discharge from 5GL/day to 100GL/day (slight variation by weir pool)
Projection	MGA_54
Resolution	5m
Extent	Weir Pool 1 **West** 139.610104 **East** 139.932334 **North** -34.009302 **South** -34.353350 Weir Pool 2 **West** 139.912180 **East** 140.361745 **North** -34.076617 **South** -34.217736 Weir Pool 3 **West** 140.342223 **East** 140.600610 **North** -34.185406 **South** -34.458588 Weir Pool 4 **West** 140.556458 **East** 140.827673 **North** -34.180287 **South** -34.343072 Weir Pool 5 **West** 140.699763 **East** 140.897600 **North** -33.969436 **South** -34.189230

Figure 6 SA River Murray weir pool modelling extent.

2.2.2 Modelling results for 2013 flood

2020 SA hydraulic model of the Murray outputs. The calibration results for 2013 flood are in https://data.csiro.au/collection/csiro:54823v1/SA Murray/2013_DynamicFlood/DEW_L3-L6_Calibration_Report_rev3-2.pdf (graphs shown below). Details of the recalibration of the 2020 model are available from SA DEW on request. The modelled peak event magnitude is between 0.00m and 0.12m of the observed event (0m, 0m, +0.1m, +0.11m, 0m, +0.2m, +0.12m, 0m, +0.8m, 0m) as shown.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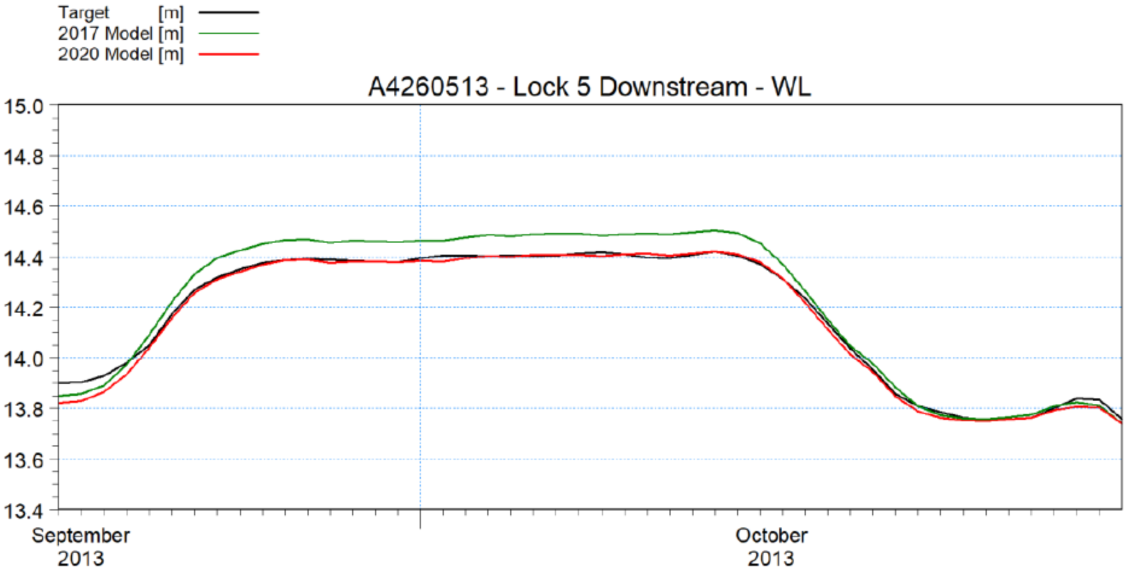
2017 Model [m]
2020 Model [m]
A4260512 - Lock 5 Upstream - WL
16.35
16.30
16.25
16.20
16.15
16.10
September
2013
October
2013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2020 Model [m]
A4260513 - Lock 5 Downstream - WL
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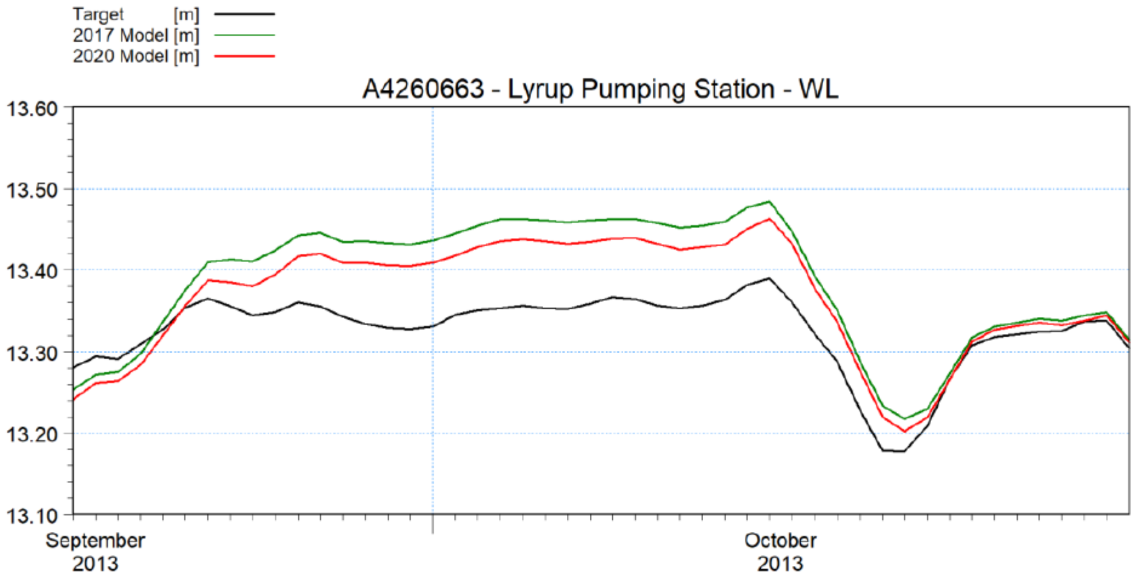
14.8
14.6
14.4
14.2
14.0
13.8
13.6
13.4
September
2013
October
2013


Target [m]
2017 Model [m]
2020 Model [m]
A4260663 - Lyrup Pumping Station - WL
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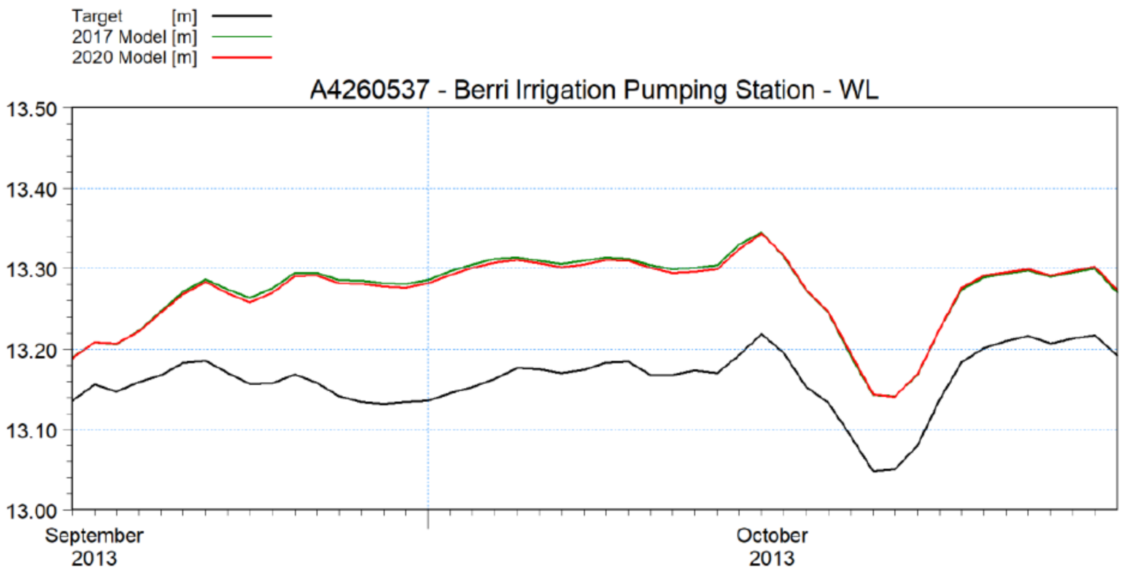
13.50
13.40
13.30
13.20
13.10
September
2013
October
2013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2020 Model [m]
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13.30
13.20
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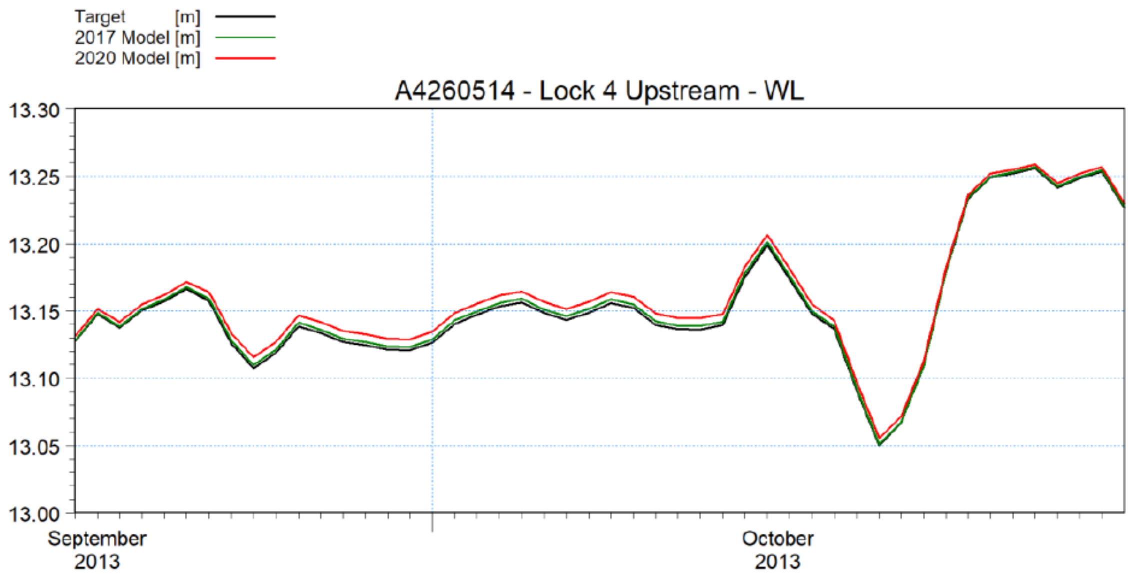
13.00
September
2013
October
2013


Target [m]
2017 Model [m]
2020 Model [m]
A4260514 - Lock 4 Upstream - WL
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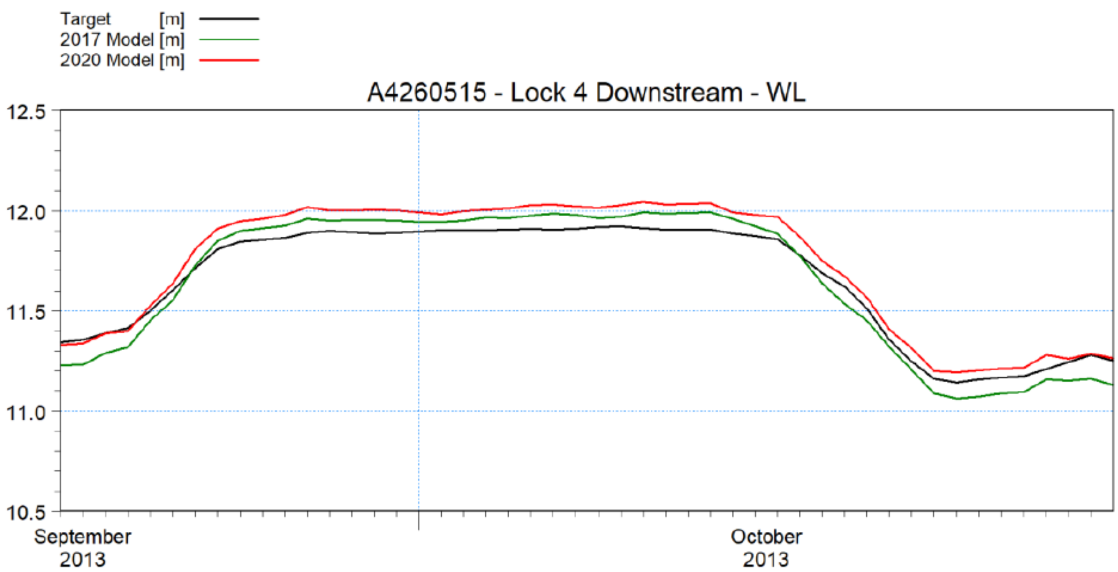
13.25
13.20
13.15
13.10
13.05
13.00
September
2013
October
2013


Target [m]
2017 Model [m]
2020 Model [m]
A4260515 - Lock 4 Downstream - WL
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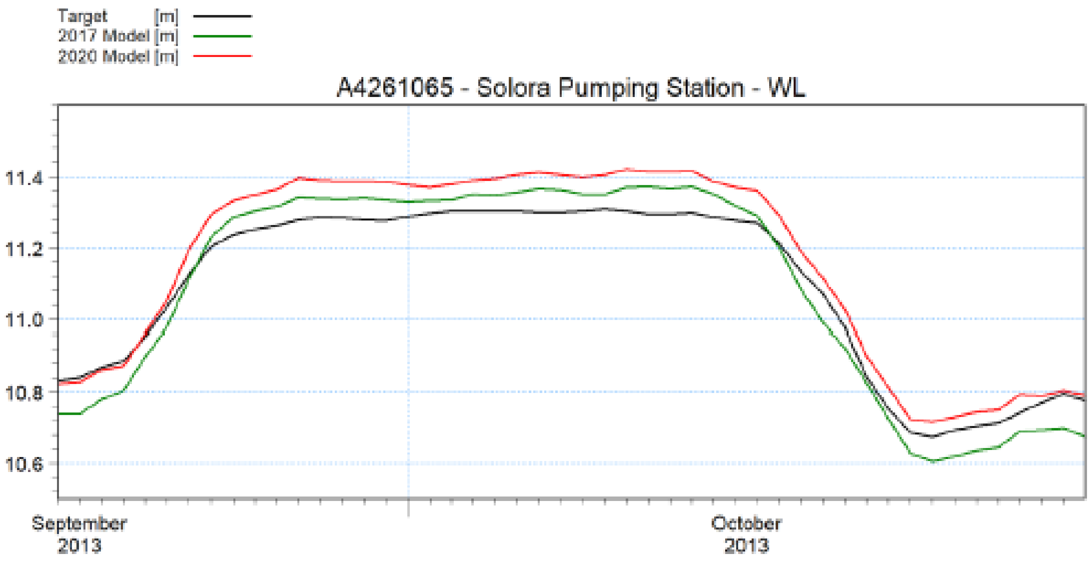
12.0
11.5
11.0
10.5
September
2013
October
2013


Target [m]
2017 Model [m]
2020 Model [m]
A4261065 - Solora Pumping Station - WL
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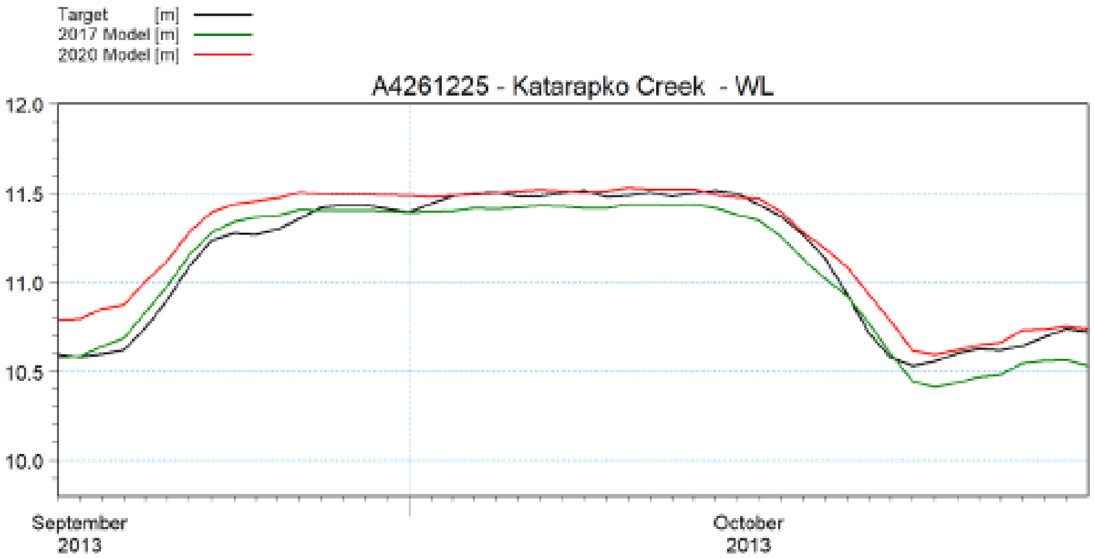
11.2
11.0
10.8
10.6
September 2013
October 2013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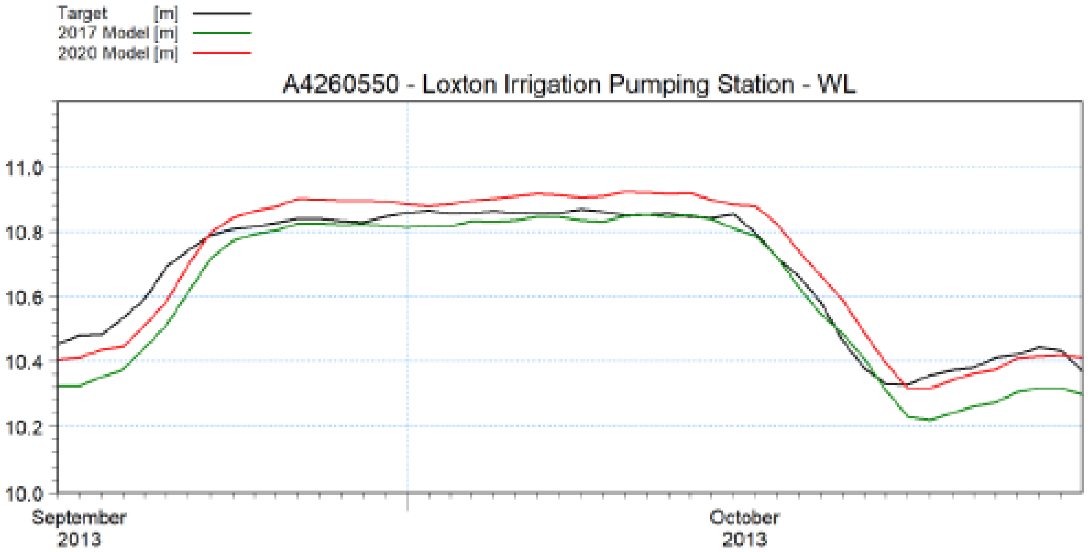
11.0
10.5
10.0
September 2013
October 2013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10.6
10.4
10.2
10.0
September 2013
October 2013

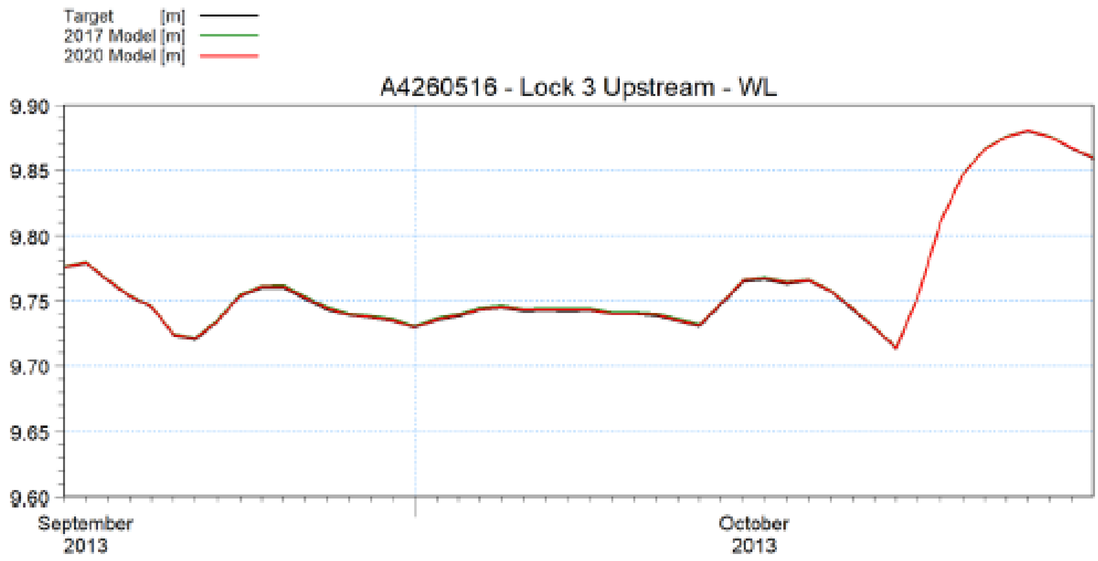

Figure 7 SA River Murray weir pool modelling calibration results.

Location	**https://data.csiro.au/collection/csiro:54823v1/SA_Murray/2013_DynamicFlood/**
File convention	Attribute\l3to6_sarfiip_12sep-11nov_concat_elements_00.tif where: Attribute is one of Depth/Elevation; and 00 is a number representing days since 2013-09-06
Size	110 GB
Temporal	Daily over the range 2013-09-06 to 2013-11-03
Projection	MGA_54
Resolution	5m
Extent	**West** 140.323867 **East** 140.898172 **North** -33.955884 **South** -34.459202

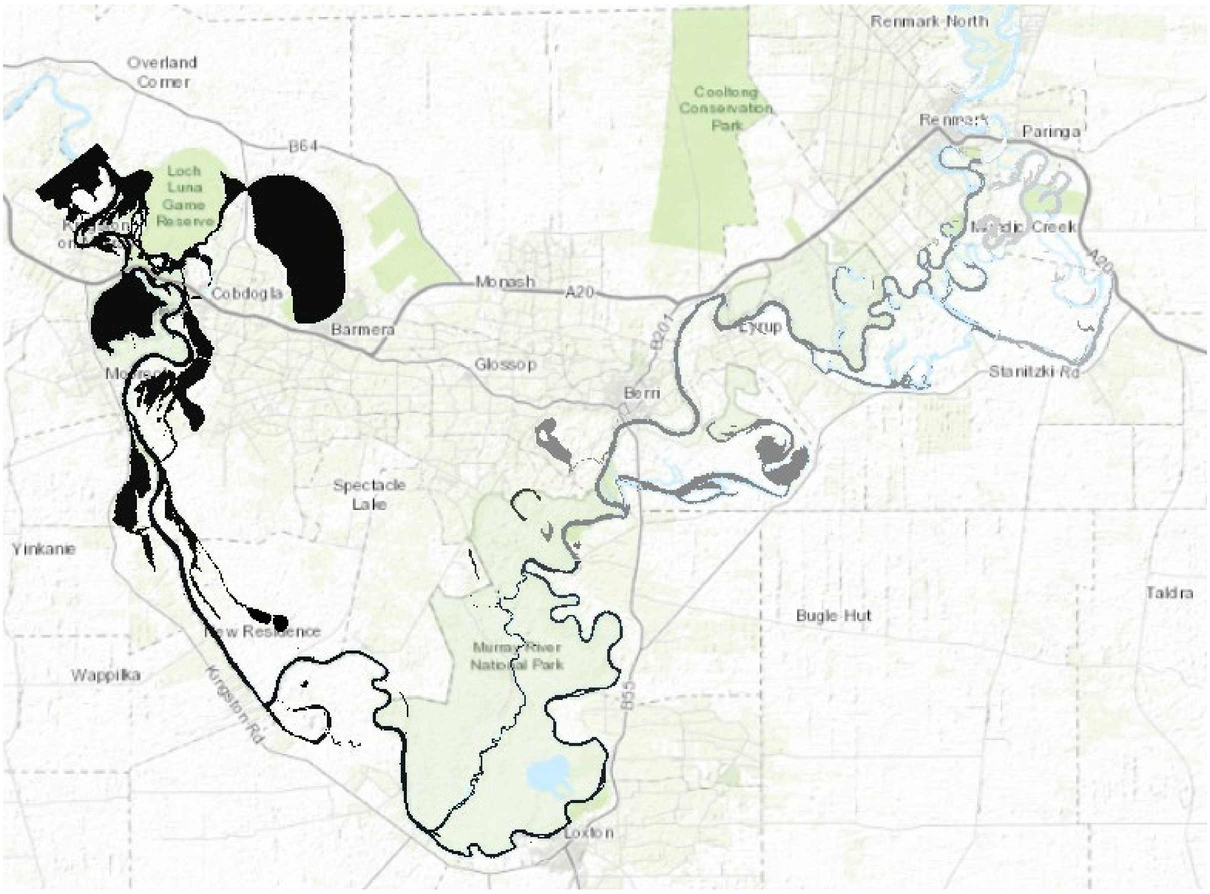

Figure 8 SA River Murray 2013 flood modelling extent.

2.2.3 Modelling results for 1956 flood

Location	**https://data.csiro.au/collection/csiro:54823v1/SA_Murray/2013_DynamicFlood/1956_Full_Extent**
File convention	Inundation_1956_ Attribute.tif where: Attribute is one of Depth/Elevation
Size	479 MB
Temporal	Single output of peak event
Projection	MGA_54
Resolution	5m
Extent	**West** 139.214885 **East** 140.829542 **North** -33.991550 **South** -35.438544

Figure 9 SA River Murray 1956 flood modelling extent.

2.3 Lower Balonne and Middle Darling System

Outputs from the Lower Balonne System (LBS) hydraulic model (developed at CSIRO for MDBA) were converted to 5m rasters. For performance reasons the LBS system hydraulic model runs on a regular 90m grid rotated from the N/S axis to reduce the amount of no-data space in memory. Converting to raster involved converting the output of dfsu files to shapefiles, then rasterising to a 5m grid, then rotating the raster -44.99999997734 around the pivot point = "422000 6665000".

Location	**https://data.csiro.au/collection/csiro:54823v1/LBS**
File convention	YYYY\ShapefileAttribute\LBS_ReCali_CS_YYYY_cells_000.tif where: YYYY is one of 1995, 2008, 2010 or 2012 Attribute is one of _elevation for elevation or nothing for depth; and 000 is a number representing hours since the start of flood
Size	210 GB for all the tif files (other temporary files should be ignored/removed). Halve this for just the rotated finals
Temporal	1995-12-27 to 1996-01-30 2008-01-19 to 2008-02-23 2010-12-28 to 2011-01-28 2012-01-28 to 2012-03-02 6 hourly
Projection	MGA_55
Resolution	5m
Extent	**West** 145.931392 **East** 149.189310 **North** -27.633393 **South** -30.472966

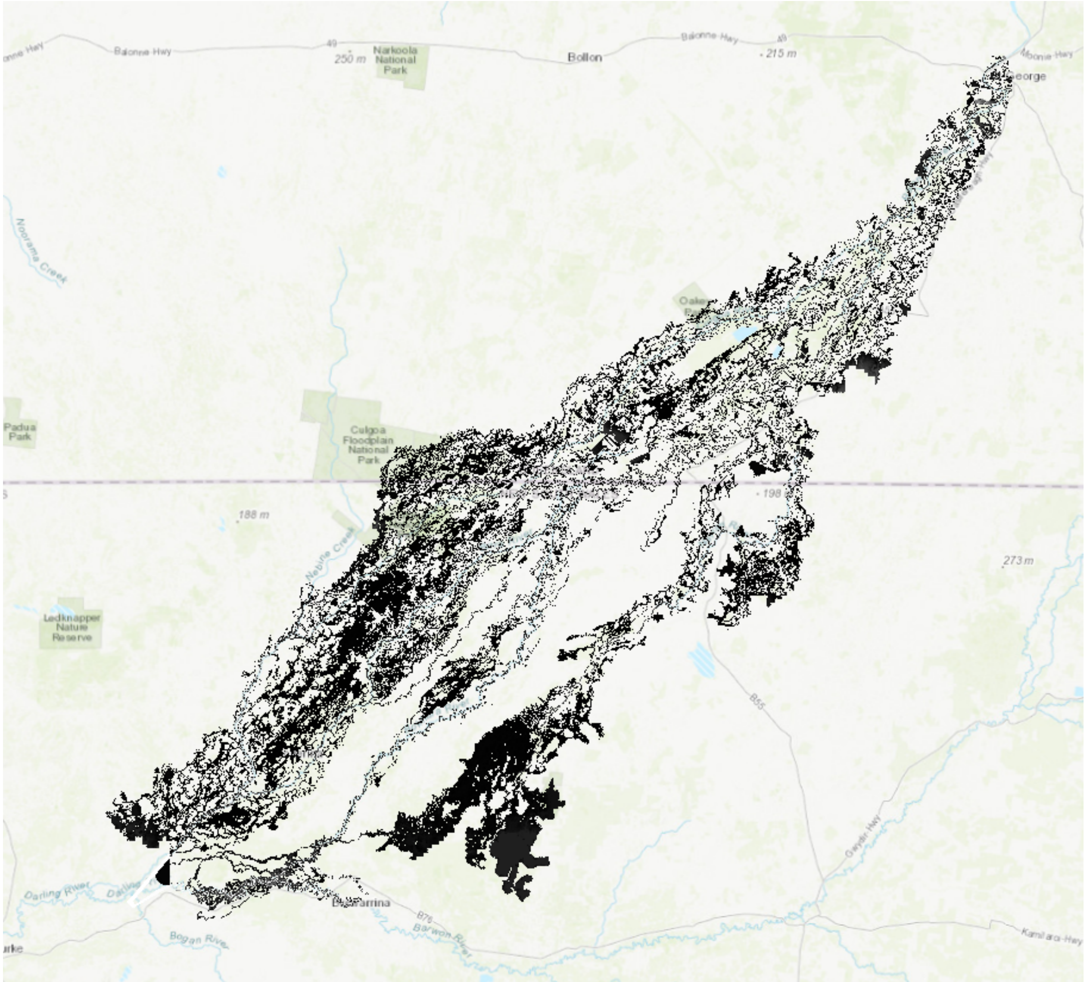

Figure 10 LBS flood modelling extent.

Part III Gauged data

1 Introduction

There are three main types of gauge data used for the MDB-WERP-RQ7 project: 1) gauge network information, 2) time series at the gauges, and 3) rating curves and/or velocity data. The information for each gauge were gathered from five sources: Bureau of Meteorology (BoM) for the streamflow data, and other information from the South Australian government, Queensland government, MDBA, and the Australian Water Resources Assessment – River (AWRA-R) modelling team. The figure below shows the sources of various information for each gauge within the MDB.

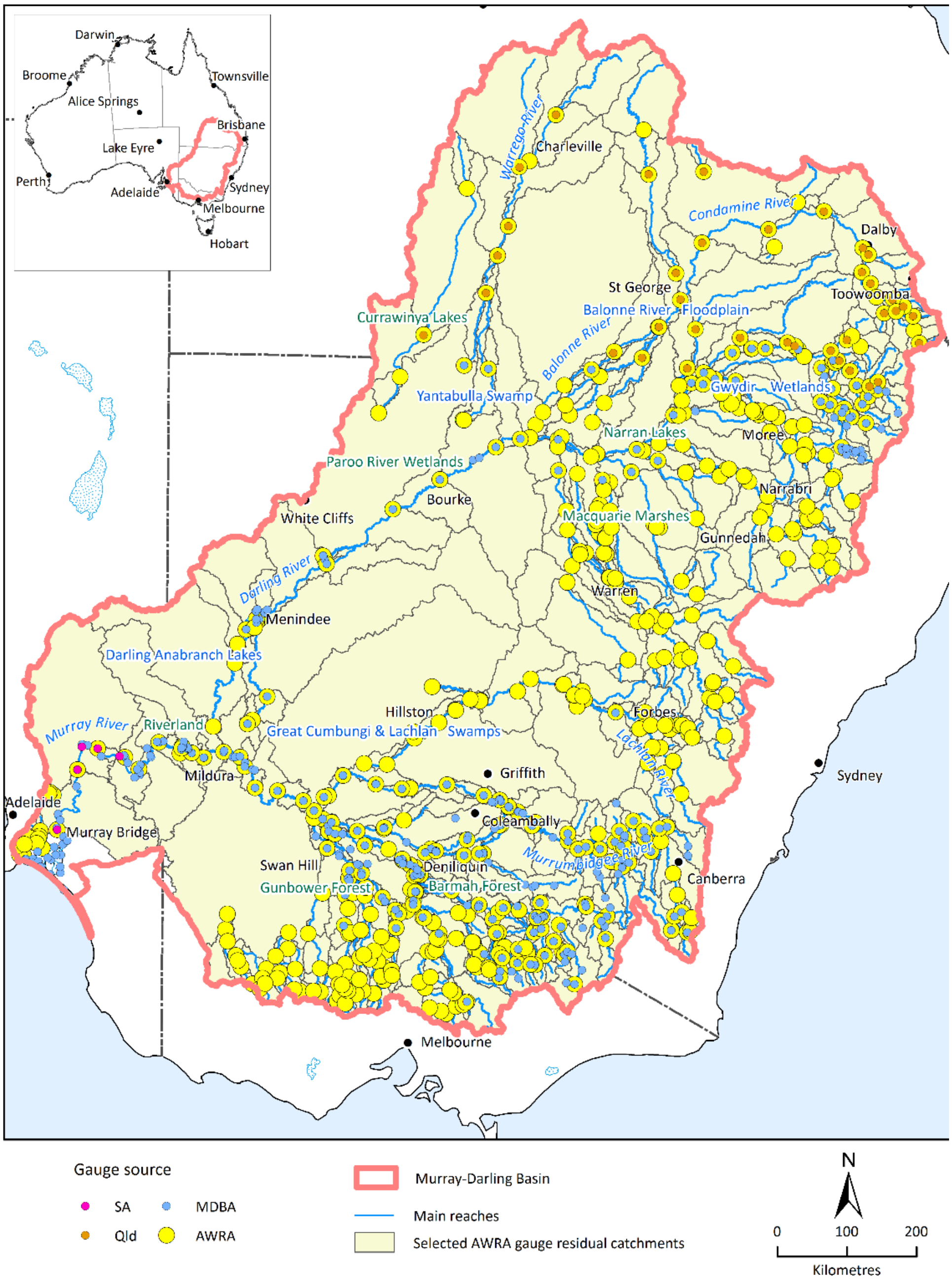

Figure 11 location of the gauge network.

The data can be accessed from the CSIRO Data Access Portal (https://data.csiro.au/collection/csiro:54834) and can be cited as:

Mateo, Cherry; Teng, Jin; Penton, Dave; Marvanek, Steve; Khanam, Fathaha; Ticehurst, Catherine; Vaze, Jai; Wang, Bill (2022): Gauged Data for the Murray–Darling Basin. v1. CSIRO. Data Collection. csiro:54834

2 Metadata

2.1 Gauge Location and Network

There are two main sources of gauge location in the MDB, the AWRA-R model and the MDBA.

The data from AWRA-R covers the entire MDB with 535 gauges, some of those are dummy nodes which were used for modelling purposes. Details about the shapefile are as follows:

Location	**https://data.csiro.au/collection/csiro:54834/Gauge_Network/AWRA-R/AWRA_Rv4_MDB_gauges.shp**
Size	15 KB
Number of gauges	535
File format	Point shapefile
Information provided	FID, node ID, node name, latitude, longitude, nearest FID, distance to the nearest gauge

The data from MDBA contains 347 gauges located in the states of NSW, ACT, Victoria, and South Australia. Details about the shapefile are as follows:

Location	**https://data.csiro.au/collection/csiro:54834/Gauge_Network/MDBA/Gauging_Stations_for_CSIRO_ALL.shp**
Size	10 KB
Number of gauges	347
File format	Point shapefile
Information provided	FID, site number, main basin, basin, hydstra name, short name, site name, latitude, longitude, availability of parameters

2.2 Time Series

The streamflow daily data (from 9am to 9am) for 519 gauges within the MDB were downloaded by Bill Wang from the BoM website. The streamflow data are available in ML/d. Please refer to the table below for more details.

Location	**https://data.csiro.au/collection/csiro:54834/Time_Series/CSV_MLD/**
Size	179 MB
Temporal resolution	Daily
File format	CSV
Naming convention	[Gauge_ID].csv

The gauge streamflow statistics were also calculated by Bill Wang. Please refer to the table below for more information about the gauge statistics.

Location	**https://data.csiro.au/collection/csiro:54834/Time_Series/MDB_available_gauges_statistics.csv**
Size	61 KB
File format	CSV
Information provided	Longitude, latitude, start date, end date, total missing days, total valid days, mean annual flow, total no flow days, annual no flow days at 1st, 10th, 25th, 50th, 75th, 90th, and 100th percentiles, annual missing days for the same percentiles as the annual no flow days

The data quality statistics above were used to categorize the gauges in the AWRA-Rv4 MDB gauge network shapefile into "good" or "bad". Gauges with valid streamflow for more than 90% of the time series and with end date past 01/01/1990 were classified as "good" and marked with '1' in the shapefile. Gauges which do not have streamflow data or do not pass the criteria stated were marked with '0'. Please refer to the table below for more information.

Location	**https://data.csiro.au/collection/csiro:54834/Time_Series/ AWRA_Rv4_MDB_gauges_with_FlowStats_frBWang.shp**
Size	15 KB
File format	Shapefile
Information provided	Node ID, node name, longitude, latitude, near FID, near distance, end date, total missing days, total valid days, percent missing, good (1)/not so good (0) quality

Acronyms

AWRA: Australian Water Resource Assessment

BoM: Bureau of Meteorology

CEWO: Commonwealth Environmental Water Office

DAP: Data Access Portal

DEM: Digital Elevation Model

DEW: SA Department of Environment and Water

DPE: NSW Department of Planning and Environment

DR: QLD Department of Resources

DRDMW: QLD Department of Regional Development, Manufacturing and Water

FABDEM: Forest And Building removed Copernicus DEM

GA: Geoscience Australia

LiDAR: Light Detection and Ranging

MDB: Murray—Darling Basin

MDBA: Murray—Darling Basin Authority

NSW: New South Wales

QLD: Queensland

RQ7: Research Question 7 – Enhancing Floodplain Inundation and Volume Prediction to Support Environmental Watering and Water Resources Planning

SA: South Australia

SRTM: Shuttle Radar Topography Mission

References

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