

# Metadata Report

Project Name Decadal DSMs of Apollo Bay, Victoria, Australia, 1946, 66, 71, 77 and 86.

## Summary

This collection is composed of five different datasets. These relate to point clouds, DSMs and photomosaics generated through Structure-from-Motion (SfM) technique applied to historical aerial photography taken in May 1946, Mar 1966, Jan 1971, Feb 1977 and Mar 1986. Their surficial areas range from 3 km<sup>2</sup> (1966) to 16.3 km<sup>2</sup> (1977).

These datasets were originally generated to quantify decadal volumetric changes along sandy beaches of the iconic Great Ocean Road, in Australia. Results of this study, as well as further details of these datasets were published elsewhere (Carvalho, R. C. et al. Quantifying decadal volumetric changes along sandy beaches using improved historical aerial photographic models and contemporary data. Earth Surface Processes and Landforms, 2021).

## Personnel

Data processing of these historical datasets was conducted by Rafael C. Carvalho.

## Site Information

Dataset spatial bounds are:

May 1946 – North: 5708517 South: 728878 East: 732686 West: 5703510

Mar 1966 – North: 5709056 South: 731508 East: 732886 West: 5706024

Jan 1971 – North: 5709458 South: 730683 East: 733024 West: 5704422

Feb 1977 – North: 5710578 South: 729726 East: 734359 West: 5703351

Mar 1986 – North: 5709383 South: 730251 East: 732843 West: 5703944

Dataset extents in KMZ format are also available for download.

## Products

- Coordinate system of datasets



Horizontal: Geocentric Datum of Australia 1994(GDA94)/Map Grid of Australia 54 H (MGA54)  
[EPSG: 28354]

Vertical: Australian Height Datum (AHD)

- Spatial resolution

Spatial resolution of individual datasets:

May 1946 – 50.7 cm

Mar 1966 – 11.9 cm

Jan 1971 – 12 cm

Feb 1977 – 15.5 cm

Mar 1986 – 15.3 cm

- Horizontal Accuracy

Horizontal accuracy based on the georeferencing RMSE of individual datasets:

May 1946 – 1.65 m

Mar 1966 – 0.73 m

Jan 1971 – 0.78 m

Feb 1977 – 0.72 m

Mar 1986 – 0.69 m

- Vertical Accuracy

Vertical accuracy based on the RMSE of individual datasets:

May 1946 – 3.07 m

Mar 1966 – 0.83 m

Jan 1971 – 0.68 m

Feb 1977 – 0.67 m

Mar 1986 – 0.74 m

- Data formats

Point clouds (Las), DSMs (Tif) and Photomosaics (Tif).

- Data processing methods

Scanned historical aerial photographs in high resolution (approximately 250 Mb/photo) digital format (.tiff) were selected and processed in Pix4Dmapper. Original flight scale ranged from 1:7,200 (1971) to 1:15,840 (1946). The black frame around each selected photograph was removed using a batch cropping process in Adobe Photoshop prior to SfM processing. Processing of historical datasets started with arbitrary coordinates (no scale, orientation and absolute



position information). Initial SfM processing used full keypoints image scale. Point cloud densification was created with half-sized image, optimal point density and a minimum number of three matches.

Arbitrary DSMs were generated using noise and sharp surface smoothing filtering, and Inverse Distance Weighting interpolation. The DSMs and orthomosaics allowed a preliminary understanding of the spatial extent of each dataset and visual identification of undisturbed parts of the landscape from where GCP locations could be identified. This approach guaranteed a good spread of control points throughout each DSM.

Airborne LiDAR data were used to georeference (minimum of 17 GCPs/dataset) and calculate the accuracy of historical datasets. The 1946 DSM (1.65 m) obtained the highest georeferencing RMSE for all historical models, whereas the others had much lower RMSEs (0.69 - 0.78 m range).

Georeferenced point clouds were generated by re-processing the arbitrary products with GCPs a posteriori, with 0.5 m accuracy in X, Y and Z domains. This was performed using the same initial processing and point cloud densification configurations. Final models used a minimum of 17 GCPs each.

### Misc Notes

Dataset Acknowledgement: The creator of these datasets would appreciate being contacted before their use in future projects or publications.

Research funds for this project, as well as aerial imagery was provided by the Victorian Department of Environment, Land, Water and Planning as part of the Victorian Coastal Monitoring Program (VCMP) supported by the Sustainability Fund, Deakin University and the University of Melbourne.