

St David's Hall, Cardiff

Photogrammetric Rooftop Survey Metadata Report

Prepared
for

Taliesin Conservation

By



- BLACK MOUNTAINS ARCHAEOLOGY -
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ArchaeoDomus
Archaeological & Heritage Services

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Photogrammetric Survey Metadata Report

1 Introduction

- 1.1.1 Black Mountains Archaeology/Geomatics Ltd and ArchaeoDomus were commissioned by Taliesin Conservation to undertake a photogrammetric rooftop survey of the mansard roof on St David's Hall, Cardiff (Figure 1). The aim of the survey was to produce accurate, measured 3D photogrammetric modelling of the mansard roof utilising aerial (drone) digital cameras followed by the drafting of detailed plans and elevations in CAD.
- 1.1.2 The programme of photogrammetric building recording was implemented according to the standards set out in *Historic England's Photogrammetric Applications for Cultural Heritage Guidance for Good Practice* (Published 2017). Aerial (drone) survey was undertaken in accordance with the rules and regulations contained within *Air Navigation Order 2016* and its 2018 and 2019 amendments.

2 Location, Topography and Airspace

- 2.1.1 The photogrammetric survey area was located in Cardiff city centre on the corner of Working Street and Hill's Street at NGR ST 318396.065,176358.249. The survey's primary objective is to record the mansard roof of St David's Hall and was conducted on
- 2.1.2 St David's Hall is located within controlled Class D airspace (3000ft to FL105), Cardiff CTA 4. The photogrammetric (aerial) survey area was not positioned within restricted airspace. Restricted airspace within 10nm included Cardiff CTR (Surface to FL105) and Cardiff City Heliport and Cardiff University Hospital Heliport. Upper airspace included Cardiff CTA 4 (3000ft – FL105) and Cotswold CTA 12 (Class A 75-FL195FL).
- 2.1.3 A Non-Standard Flight (NSF) request was submitted to Civil Aviation Authority (CAA) on 23/02/21. The response received from Cardiff ATC confirmed the proposed flight had no restrictions.

3 Methodology

- 3.1.1 The survey was carried out by UAVs (drones) equipped with a Hasselblad 35mm equivalent 20mp, 1" sensor, 4k UHD camera and a 35mm equivalent (24mm) camera with a 12mp 1/2.3" CMOS sensor. The aerial survey was tied into the Ordnance Survey National Grid and Datum using an EMLID Reach GN55/ Glonass (GPS) Receiver and data logger with a <20mm tolerance. All 3D models were produced using proprietary photogrammetry software and aligned using known ground control points (GCPs). Dimensional control was then be applied to each model and then reprocessed using the new parameters and optimised cameras to create dense point clouds and high face count meshes. All high-resolution orthographic renders (orthomosaics) were exported and scaled in raster (TIFF) format

4 Results

- 4.1.1 The mansard roof survey created a dense point cloud of 92,870729 million points and high face count textured meshes (8192x8192 pixels) exported to OBJ format with a mean RMS error of 0.13cm. The Ground Sampling Distance (GSD) achieved was a great 0.97cm/pixel. Seven GCPs were used with a sub-20mm error margin to OSGB36

(National Grid). The 3D model (medium face count mesh) is hosted by us and can be viewed here <https://p3d.in/Q2hCl>.

4.1.2 A measurable interactive version of the 3D model (high face count mesh) can be found here

<https://cloud.pix4d.com/site/108154/dataset/891377/map?shareToken=eedc4507-d889-4d20-9078-574d9cacf79c>.

4.1.3 The deliverables for this project, in addition to the high face count 3D mesh noted above, include four detailed drawings in multiple formats accompanying this report together with 2D and 3D data:

- CAD Drawing Set (PDF, .3dm and .dwg) – x1 plan, x6 elevations (in x3 drawings)
- 3D textured mesh (.obj)
- Digital Surface Model (.geotiff)
- General HD aerial photographs
- Orthomosaic plan (.geotiff)
- 3D Point cloud (.las)

5 Staff Structure

- Richard Lewis MCifA UAV Pilot and 3D Modeller: responsible for project management, survey and post-survey operations. Civil Aviation Authority Operational Authorisation Number – **10885**.
- Ross Cook (ArchaeoDomus) UAV Pilot and 3D CAD Draftsperson: responsible for project management, survey and post-survey operations. Civil Aviation Authority PFCO Number – **10775**.

6 Copyright and Arbitration

6.1.1 Black Mountains Archaeology/Geomatics Ltd and ArchaeoDomus shall retain full copyright of any commissioned reports, 3D models, drawings, metadata, tender documents or other project documents, under the *Copyright, Designs and Patents Act 1988* (chapter IV) with all rights reserved; excepting that it hereby provides an exclusive licence to the client for the use of such documents by the client in all matters directly relating to the project.

6.1.2 Any dispute or difference arising out of a contract in relation to this work shall be referred for a decision in accordance with the Rules of the *Chartered Institute of Arbitrators* applying at the date of the agreement.

7 Acknowledgements and Copyright

7.1.1 The project was managed, surveyed, and reported by Richard Lewis BA MCifA and Ross Cook (ArchaeoDomus). The copyright of this report is held by Black Mountains Archaeology/Geomatics Ltd and ArchaeoDomus. Ordnance Survey maps are reproduced under licence 100058761. Black Mountains Archaeology/Geomatics Ltd retains copyright of any annotations.

8 Appendix I – Figures

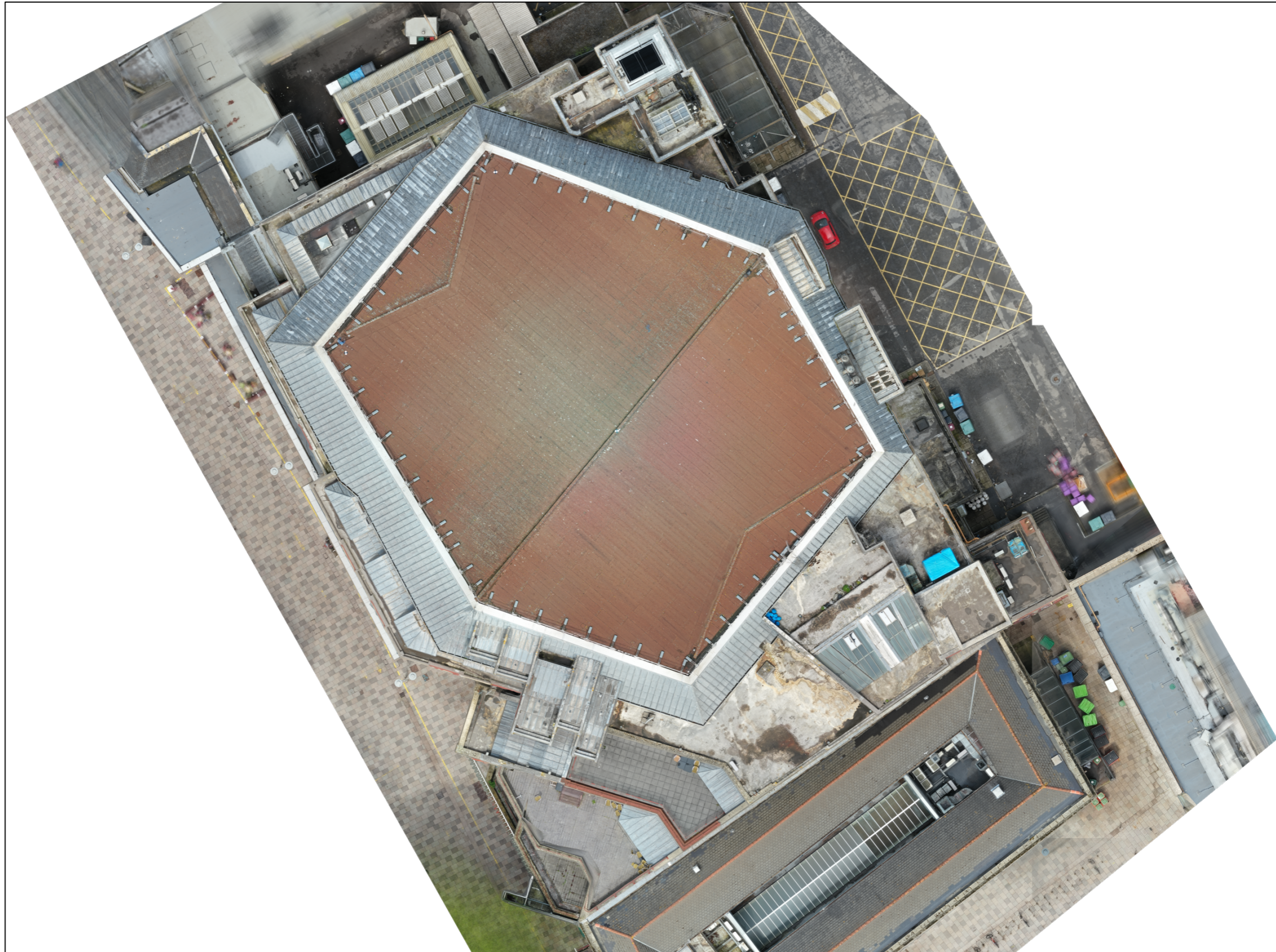


Figure 1. Photogrammetric orthomosaic plan of St David's Hall, Cardiff.



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Yn rhan o'n hawydd i wella ansawdd ein gwasanaeth, rydym yn croesawu unrhyw adborth y gallwch ei ddarparu.

As part of our desire to improve our quality of service we welcome any feedback you are able to provide.

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