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### Using BIM (Building Information Modeling) to Vizualize and Share Archaeological Data at Tall Hisban, Jordan

Ariel Solis

Andrews University, [solis@andrews.edu](mailto:solis@andrews.edu)

Rhonda Root

Andrews University, [rroot@andrews.edu](mailto:rroot@andrews.edu)

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# USING BIM (BUILDING INFORMATION MODELING) TO VISUALIZE AND SHARE ARCHAEOLOGICAL DATA AT TALL HISBAN, JORDAN.

ARIEL SOLIS, ASSISTANT PROFESSOR AND RHONDA ROOT PROFESSOR - SCHOOL OF ARCHITECTURE AND INTERIOR DESIGN

## ABSTRACT

Today, the field of archaeology is seeking to expand beyond the traditional sharing of information through printed books and archaeological publications, and be more relevant by using various new technologies, such as 3-D visualization, Building Information Modeling (BIM), and interactive media. We seek to continue to advance research that is being done in these areas. At Tall Hisban, Jordan (the first Madaba Plains Project archaeological site), many of these technologies are being used. However, the main objective of this project is to create a digital three-dimensional model of the Tall (entire site), showing the historical order of civilizations, how buildings were used in the past, and how they evolved over centuries. In order to accomplish this, the methodology will include Fine Art, Photogrammetry, BIM, and GIS interacting together. This multi-disciplinary approach will integrate through collaboration of archaeologists, artists, architects, computer engineers, surveyors, and the involvement of the local community. This is the first time BIM is being used at Tall Hisban, to model the buildings, host the archaeological data, and illustrate the different historical time periods of the site.

In this approach all this information will initially be contained within BIM, which will interact with other platforms, such as GIS and SQL. In addition, users will be able to interact with this information using Virtual Reality and Augmented Reality environments, which will expand to new audiences. The poster will contain a preliminary progress report on the findings from 2019.

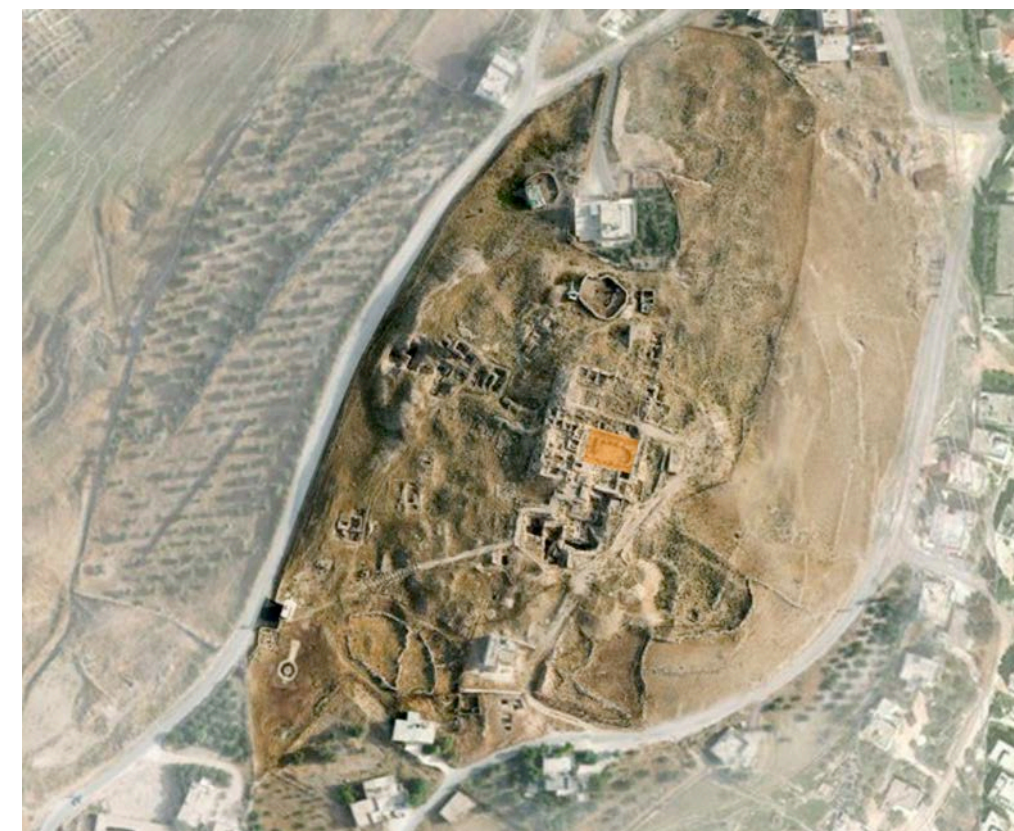


Fig. 1. Tall Hisban Site, Jordan (Madaba Plains Project)



Fig. 2. Tall Hisban aerial view, Jordan (Madaba Plains Project)

## METHODOLOGY

Building Information Modeling (BIM) was developed for the Architectural, Engineering, and Construction industries (AEC), but BIM has been utilized in some Archaeological projects in the last decade (Autodesk). At Hisban, this is the first attempt to utilize BIM to visualize and share data about the project. The team has developed a methodology that includes using field notes and sketches, photogrammetry, point cloud mesh, and Autodesk Revit (BIM) for modeling the buildings. The objective of the whole project is to model the entire site. Beginning with reconstructing the Byzantine Acropolis Church that is on the summit (Fig.1, 2). The church will be used as a Beta test to identify the best workflow, and find potential challenges, as the team prepares to reconstruct all the time periods on the entire site. There are many BIM softwares such as ArchiCAD, Bentley, and Autodesk Revit, for this project the team has chosen to use Revit as the BIM platform.

The team's documentation methods includes traditional field notes, photogrammetry with a hand held or tripod supported digital camera - GoPro Hero4 (Fig.3 and 4), where photos are uploaded to the cloud using Autodesk ReCap (Realty Capture and 3D Scanning Software) to create a point cloud drawing (Fig.5). Once the point cloud drawing is created its imported into Revit and used as a based drawing in order to start modeling the structure (Fig.6, 7).

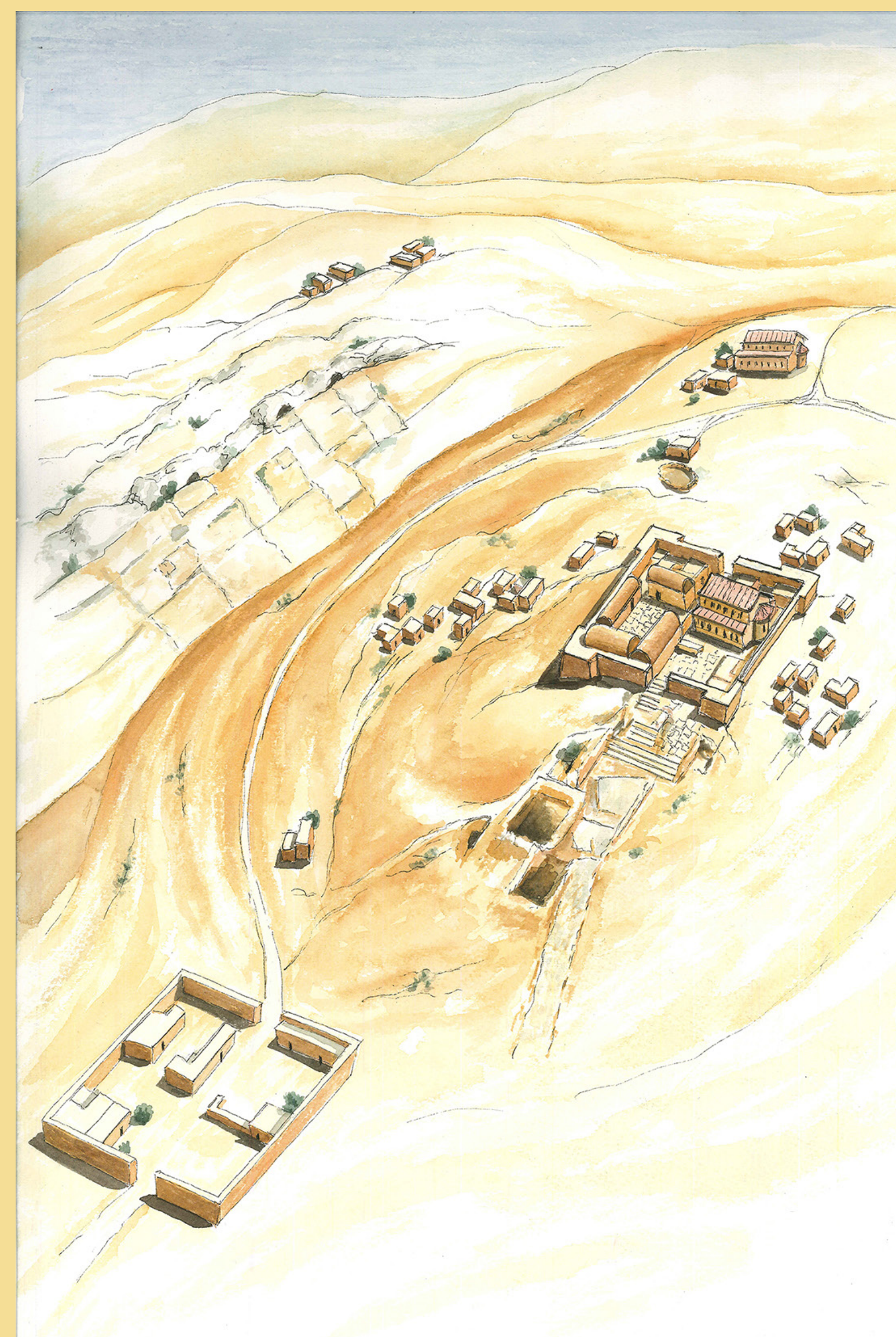
The benefit of using a point cloud drawing as a based to model the buildings is the ability to have a realistic overlay that can be rotated, tilted, lifted or be observed as if the viewer were orbiting around the 3D model. The advantage of using Autodesk Revit and ReCap is that both softwares have academic licenses, allowing faculty and students to continue researching without additional software cost. An important part of the research is the ability to symbiotically share the traditional artistic methods with the BIM software to create the digital reconstruction (Fig. 8 and 9). The next step will be to attach archaeological data directly to every BIM element in the models (i.e. walls, windows, columns, ceiling, floors, structural framing, etc.) that will interact with GIS.

This poster demonstrate the success of the initial processes of the collaboration.

## PROCESS WORK



Fig. 8. Heshan Acropolis Church interior view - artist rendering - Rhonda Root ©2019



Heshan Tell Artist Rendering - Rhonda Root ©2019



Fig. 9. Acropolis Church Interior Autodesk Revit Model - in process - Ariel Solis ©2019



Fig. 3. Field Images for Photogrammetry - Ariel Solis ©2019



Byzantine Acropolis Church capital.

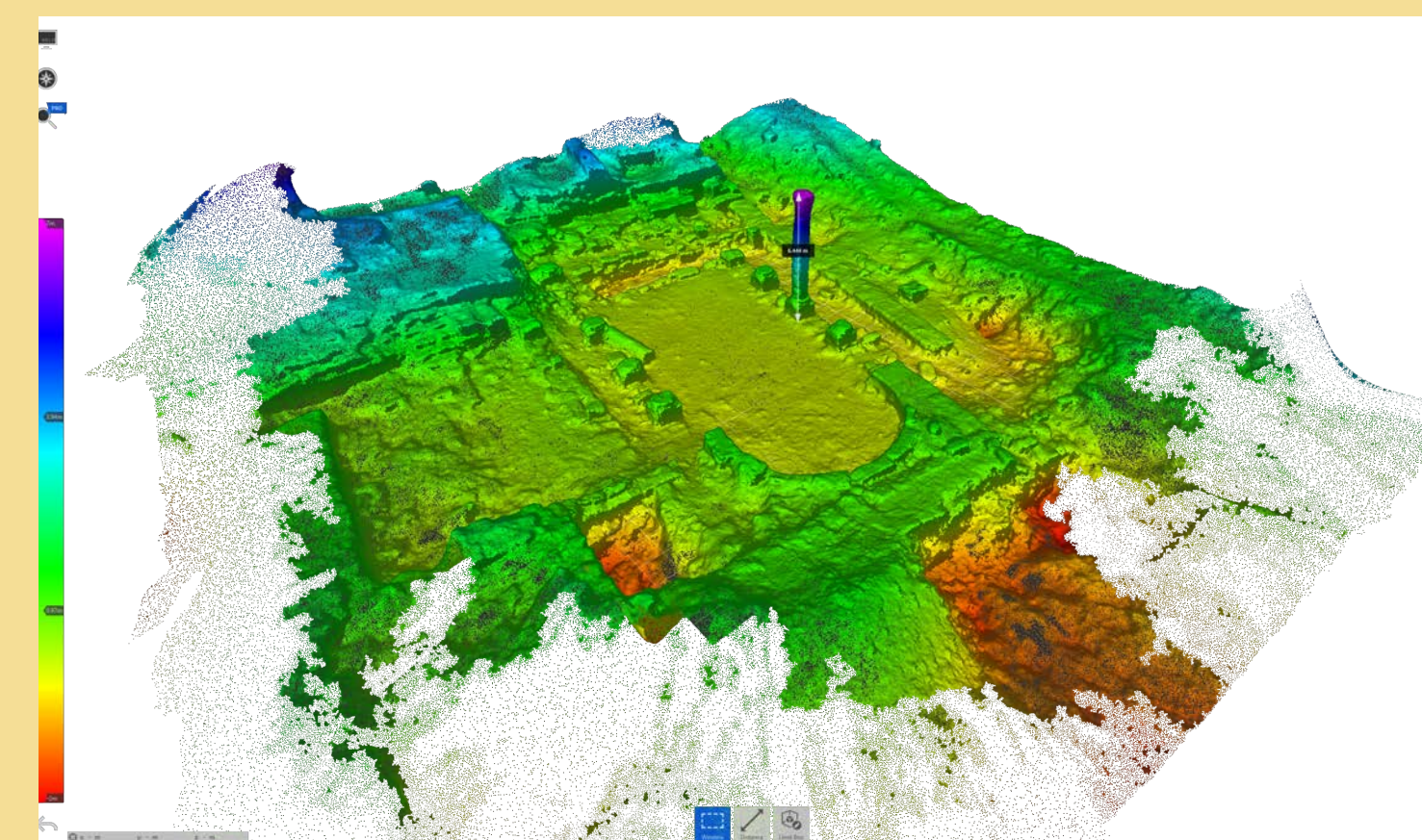


Fig. 5. Autodesk ReCap Photogrammetry elevation study - Ariel Solis ©2019



Fig. 6a. Photogrammetry image imported into Autodesk Revit. Ariel Solis ©2019



Fig. 7a. 3-D Axonometric image imported into Autodesk Revit. Ariel Solis ©2019



Fig. 6b. Photogrammetry overlay with columns. Ariel Solis ©2019



Fig. 7b. 3-D Axonometric image Photogrammetry overlay with columns. Ariel Solis ©2019



Fig. 6c. Photogrammetry overlay with walls. Ariel Solis ©2019

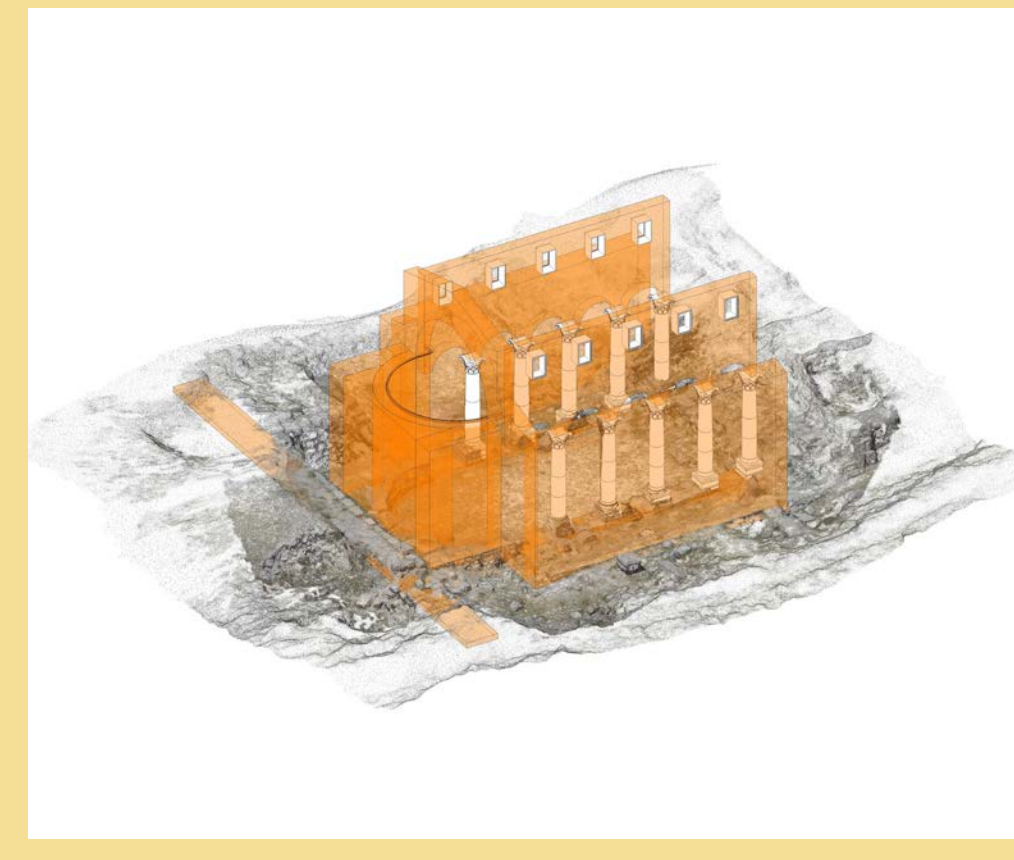
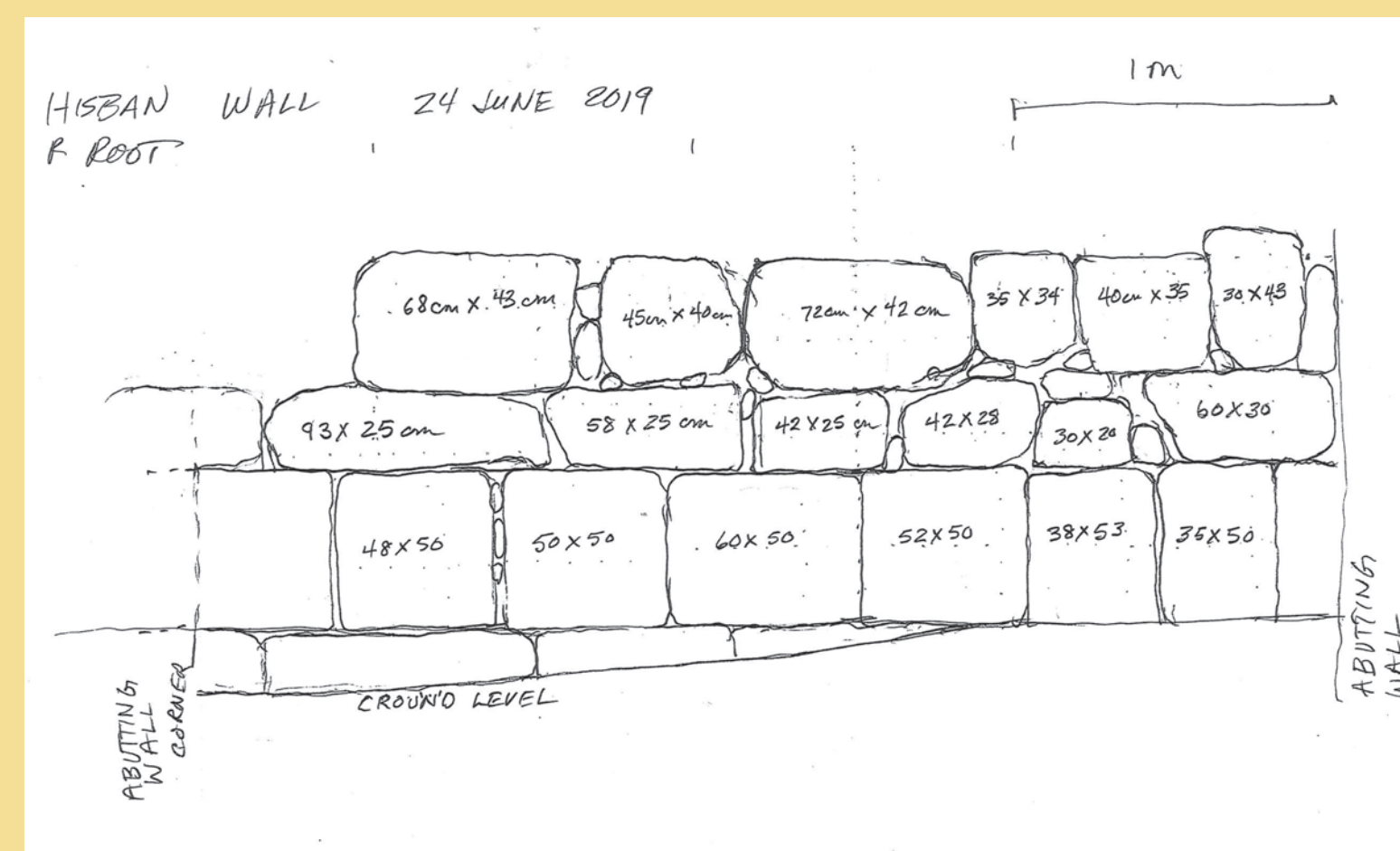
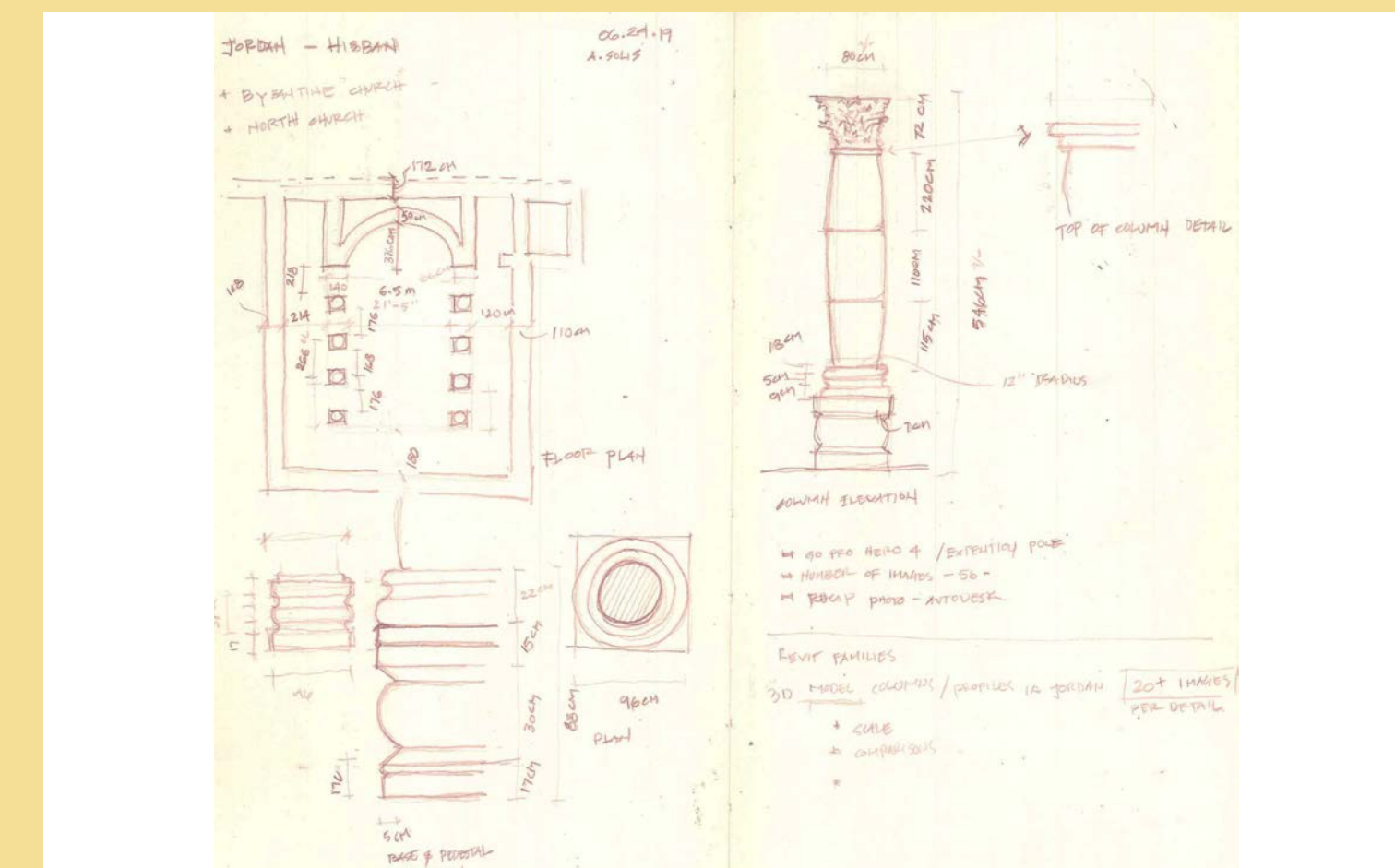


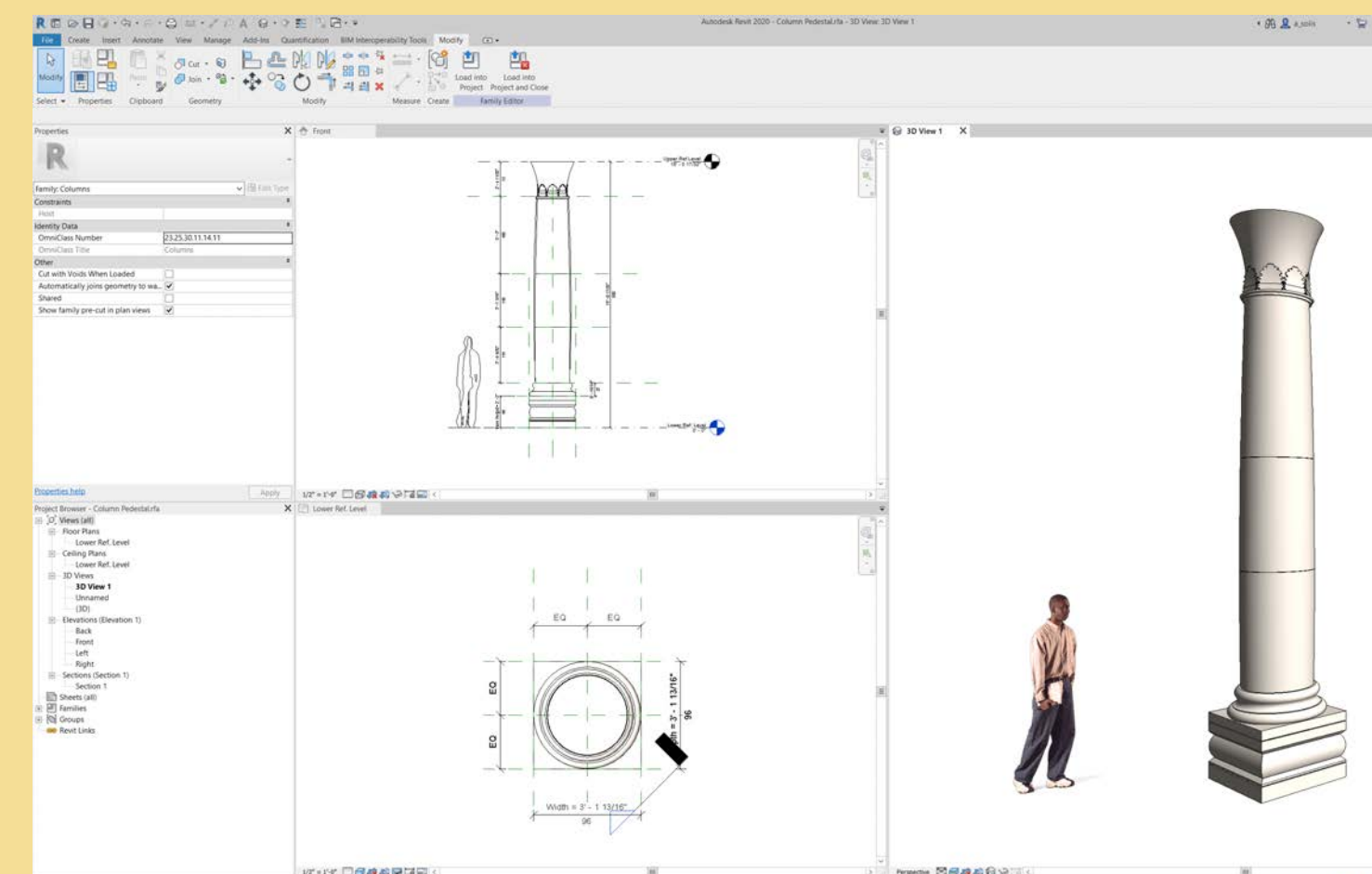
Fig. 7c. 3-D Axonometric overlay with walls. Ariel Solis ©2019



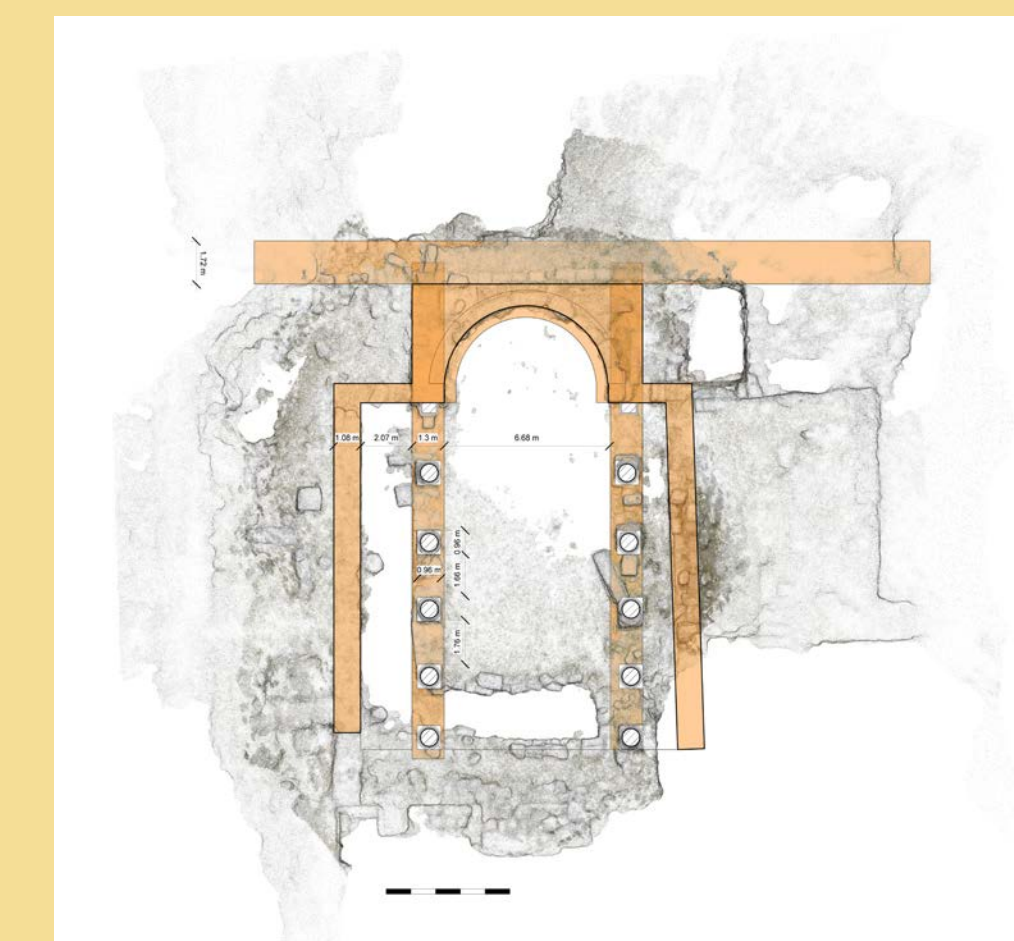
Example of Field Notes - drawing of existing wall dimensions. Rhonda Root ©2019



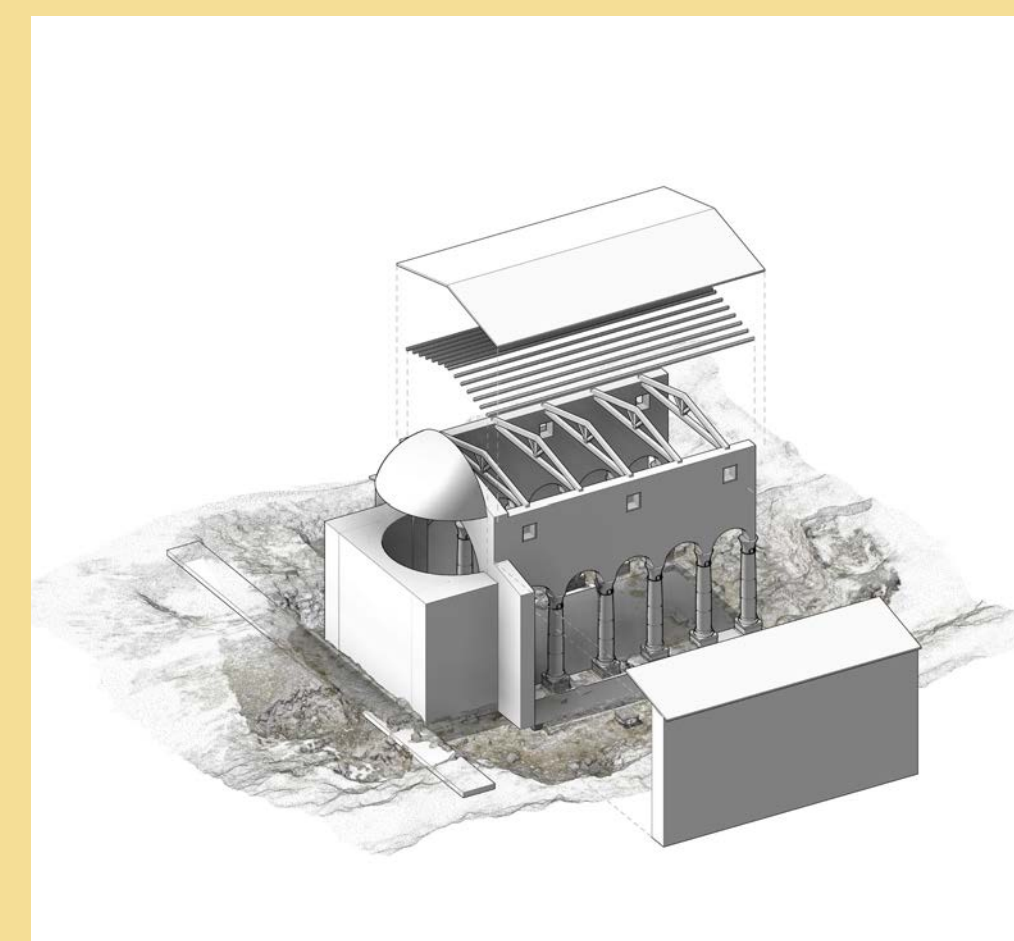
Example of field notes - column location, pedestal, capital details - Ariel Solis ©2019



Modeling of the column in Autodesk Revit - Ariel Solis ©2019



Photogrammetry overlay plan - Ariel Solis ©2019



Autodesk Revit exploded view demonstrating architectural features. Ariel Solis ©2019

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INFORMATION MODELING FOR VIRTUAL HERITAGE APPLICATION. Google Docs web publication.  
 (a) Dept. of Architecture and Urban Planning, Faculty of Engineering, Ghent University, J. Platestraat 22, Ghent, Belgium - (p.pauwels@ugent.be, r.verstraeten.romald@ugent.be) (b) Dept. of Electronics and Urban Planning, Faculty of Engineering, Ghent University, J. Platestraat 22, Ghent, Belgium - (roth.vanstraeten.jan.vancampenhout@ugent.be)

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Oystein S. LaBianca, Ph.D.  
 Professor of Anthropology,  
 Director, Hisban Cultural Heritage Project  
 Associate Director, Institute of Archaeology  
 Andrews University, Berrien Springs.

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 Adjunct Professor of Archaeology and Anthropology, Assistant  
 Director of Publication and Research Associate in Near Eastern  
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