

An Overview of Photogrammetry for boat line development.

Maritime Museum Project including Lauren Davison (Maritime Archeologist), Dr Dougal Harris, John Wadsley and Peter Higgs.

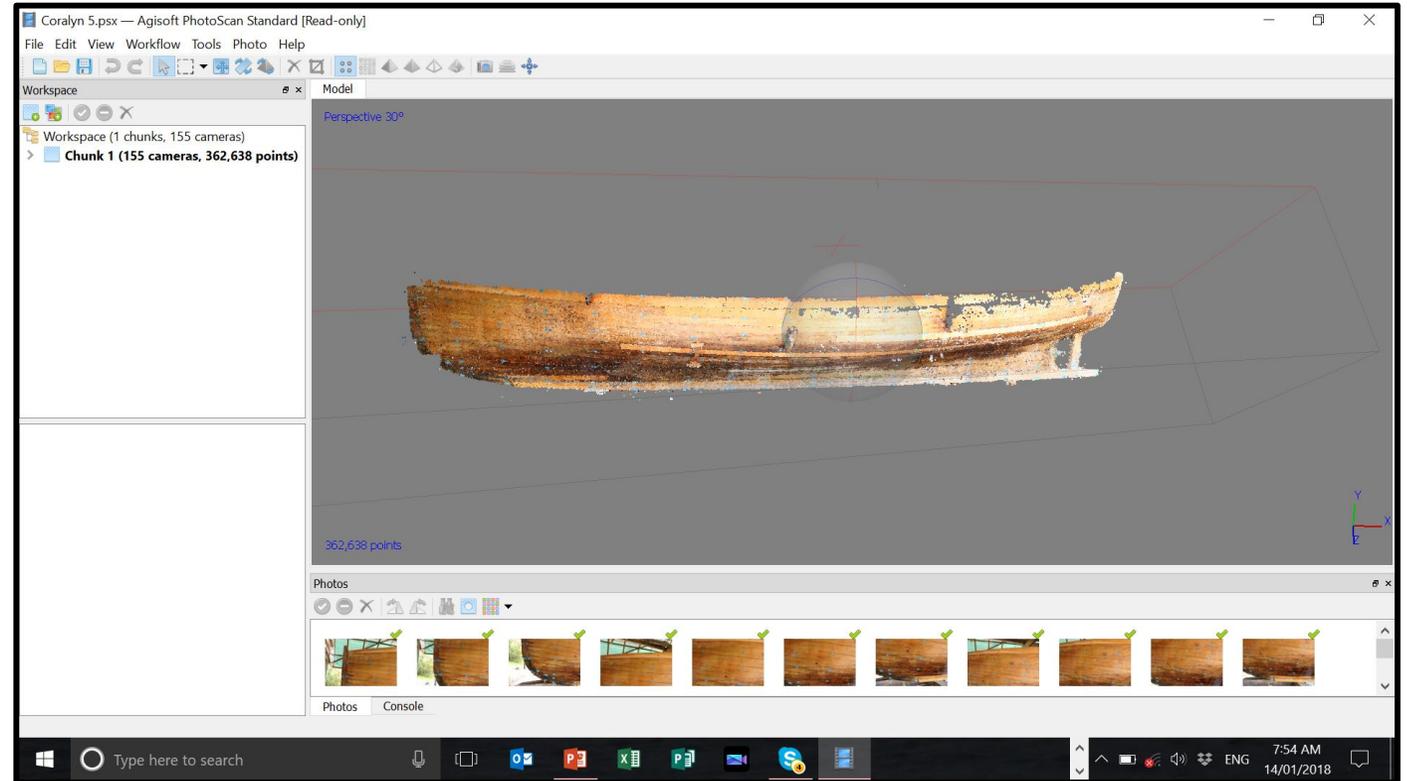
Previous users of this methodology.

- [The Center for Wooden Boats](#), Seattle USA recently [2014] led a year-long experiment to develop a new, low-cost method for using digital photogrammetry for long term monitoring of the condition of large objects and test the possibilities of this software to aid in documenting objects...
- In each scenario, a virtual 3D model was made of an actual boat, and in one case a Totem Pole.
- A 3D model is a representation of an object using a collection of points plotted on a grid with an x, y, and z coordinate system.
- Though there are many ways to create 3D models of an object, this research project primarily focused on building 3D models using an inexpensive software program called Agisoft Photoscan.
- A DSLR camera is used to take multiple overlapping shots of a hull which is capable of capturing data including depth points of the boats shape.

The DSLR Photogrammetry methodology.



Masking tape as depth dot targets on Coralyn. Photo P. Higgs.



The 3D model produced in Agisoft Photoscan by up loading the photos and using Workflow to align photos. This process like other Agisoft work flow processes takes time.

The MMT boat lines projects.

- Initially under the guidance of Peta Knott MMT ran a project to create 3d models of using the Total Station Methodology. This involves the use of surveying equipment known as a Total Station to develop the 3 D model. The WBGT Inc has been involved in this and done its own Project.
- The 3 D model data was then ran through Naval Architecture SW (MaxSurf Modeller SW) by Dr Dougal Harris.
- The Total Station methodology is an expensive project because of the need to hire the Total Station surveying equipment.
- The MMT have funded this project as a trial to establish the viability of Photogrammetry for taking boat lines.

What do we do with the photogrammetry process?

- It is a requirement to have the boat out of the water, either on the hard or a slip.
- Firstly, we mark out the boat using a graduated stringline around the gunwhale and survey type staffs at 90° to the WL to form a grid over the hull, [Show model examples](#). A good mark out can be achieved with masking tape which may be enhanced with a dot of a different colour on it.
- It also helps for scaling purposes to include a scale bar, e.g. a survey staff.
- We take photos that are measuring the depth to each point and there may be thousands of points. The depth and other data is collated automatically by the DSLR camera.
- Set the DSLR to manual and try and maintain a common focus point. Agisoft Photoscan does not align photos very well when many foci points are used for the photos.
- Start taking photos but you need to allow that the photos overlap the previous photo by at least 50%. This demands a large number of photos. [Show example](#).
- Then take photos beam on, stern on and bow on. Also take and record measurements on LOD, LWL if possible, Beam and height of keel to the top of the bow and stern.

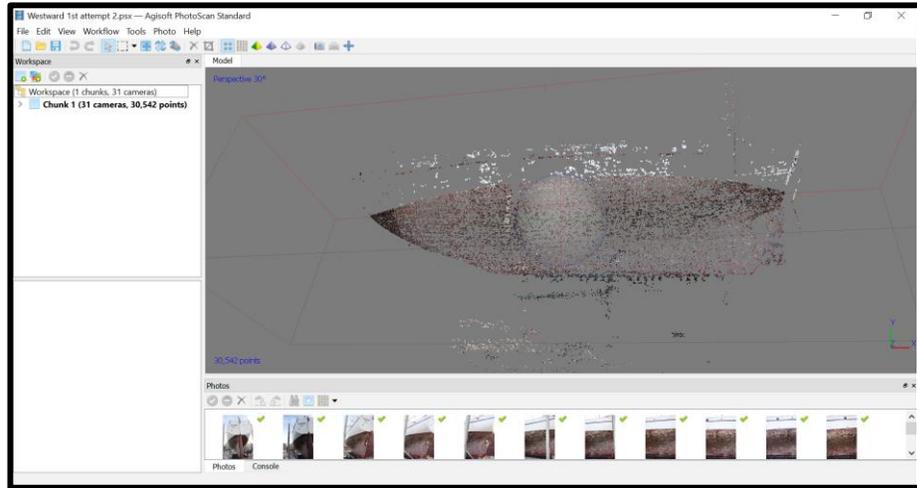
Now take your photos to Agisoft Photoscan!

- We load the photos to an appropriate folder in our computer.
- Open Agisoft Photoscan (I only use Standard) and in Workflow add the photos from the appropriate folder. This takes a little time. **Show example.** Save your work.
- Once loaded go to AP Workflow again and this time select Align Photos. Depending on the number of photos and points data collected this process can take many hours. Hence the need for large memory and it is best not to use the computer while this occurs. Save your work.
- Once complete, a rough outline of a 3D image appears as a sparse point cloud (tie points). Depending on photo background noise there will be some cleaning up of unwanted points. **Show example. Save your work.**

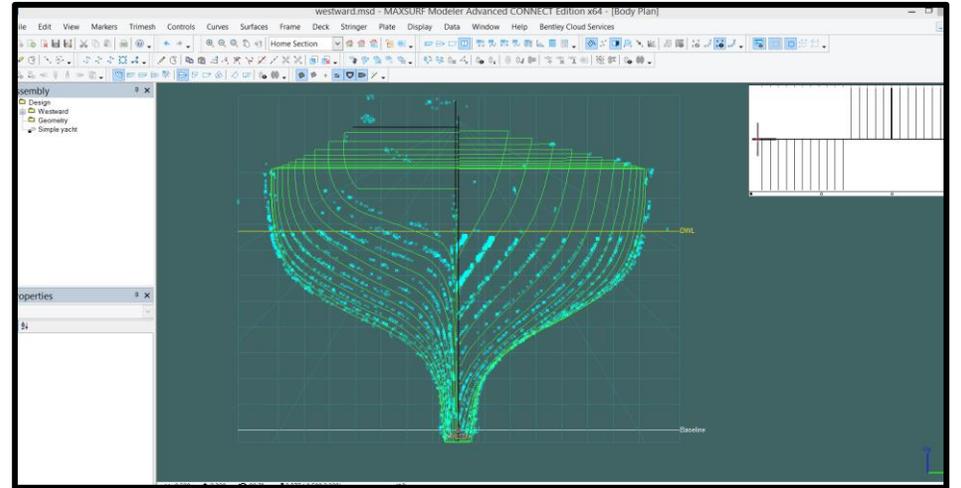
Once the Background Noise is cleaned up!

- Save your work.
 - Now export the work as an .obj file.
 - At this point we send the file to Dr Dougal Harris and he does his magic with his Naval Architecture SW.
 - However, we can proceed with the following AgiSoft Photoscan Workflow functions;
 - Build a Dense Point Cloud
 - Build a Polygon Mesh
 - Build Texture for the Mesh, refer to the US Wooden Boat Centre report.
 - Scale your 3D model. We need to use the Agisoft Photoscan Pro program and have a bigger PC than I have. However, this could obviate using Naval Architecture SW.
- Show examples.

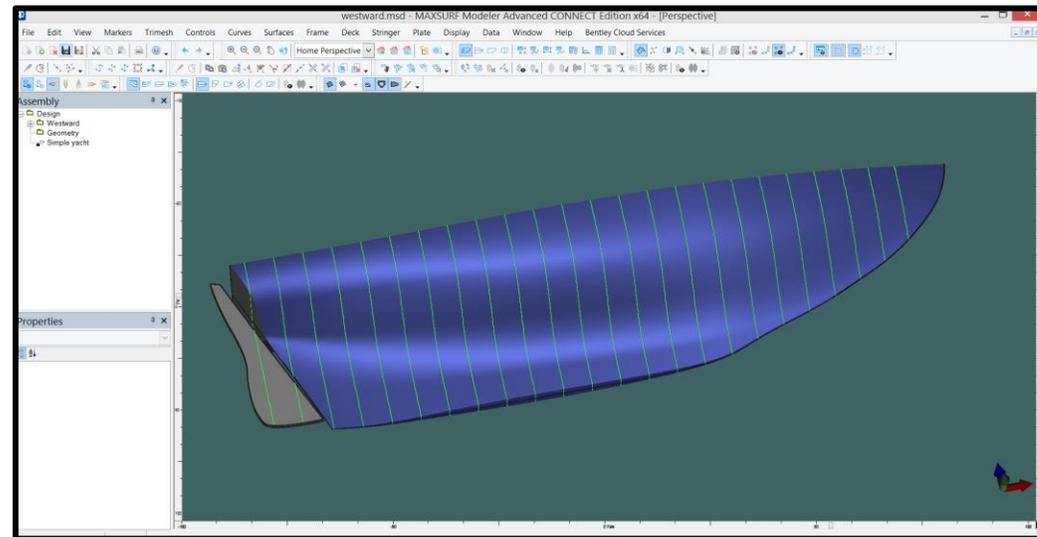
Westward to date.



Westward point cloud in Agisoft Photoscan with 30,542 points by Lauren Davison and Peter Higgs

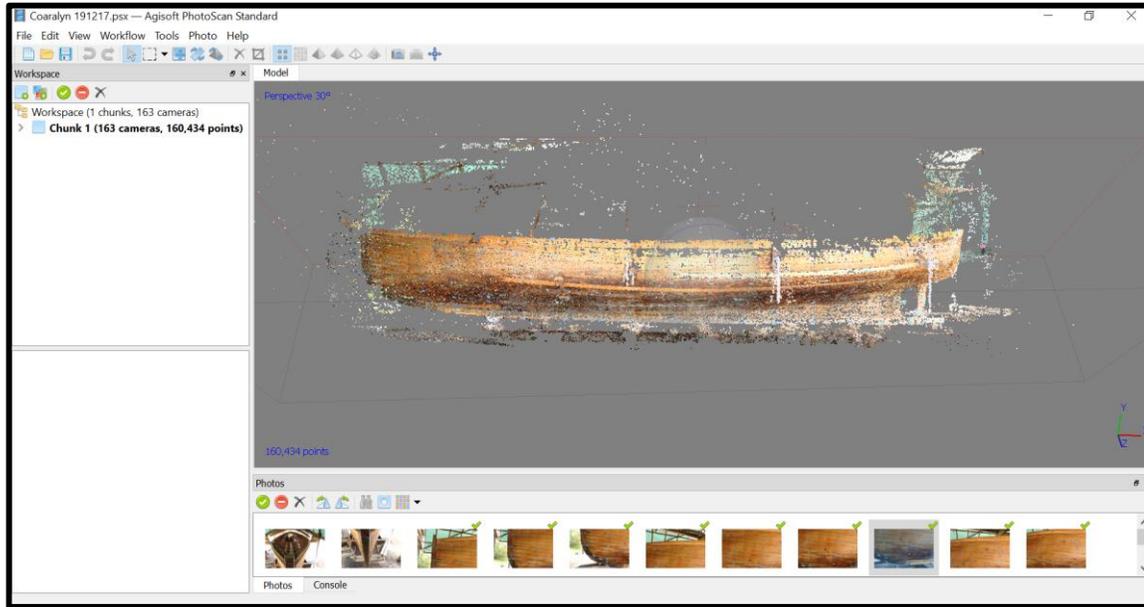


Westward Lines development in MaxSurf Modeller by Dr Dougal Harris.



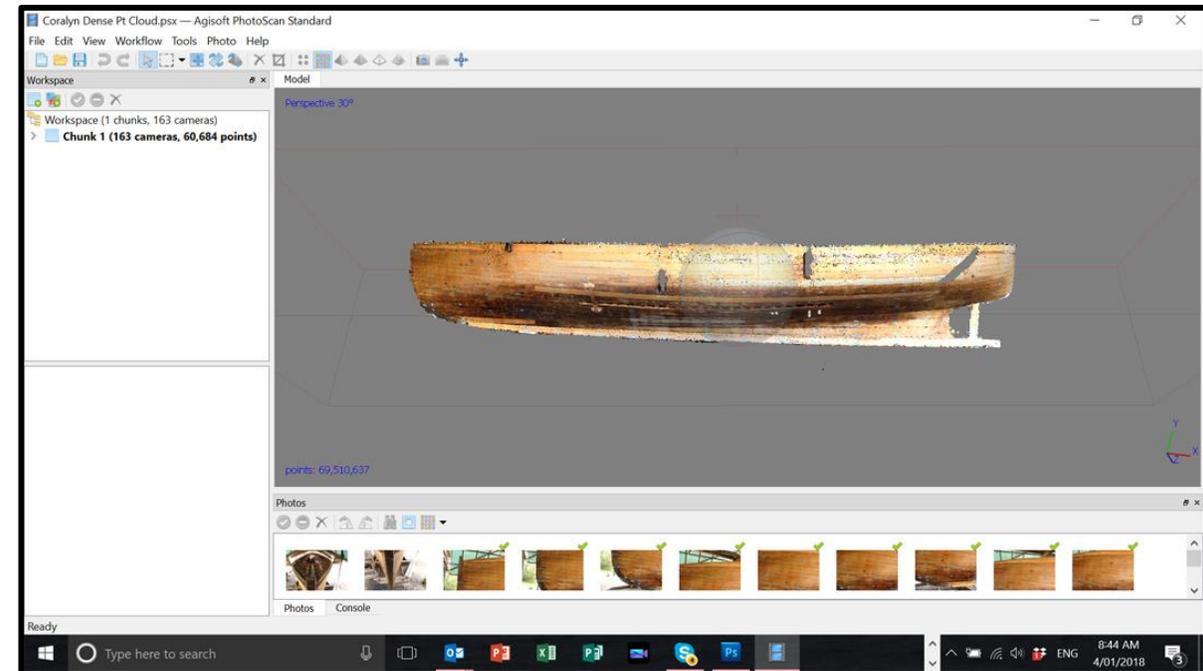
Westward 3D model in MaxSurf Modeller SW to scale by Dr Dougal Harris.

Coralyn to date

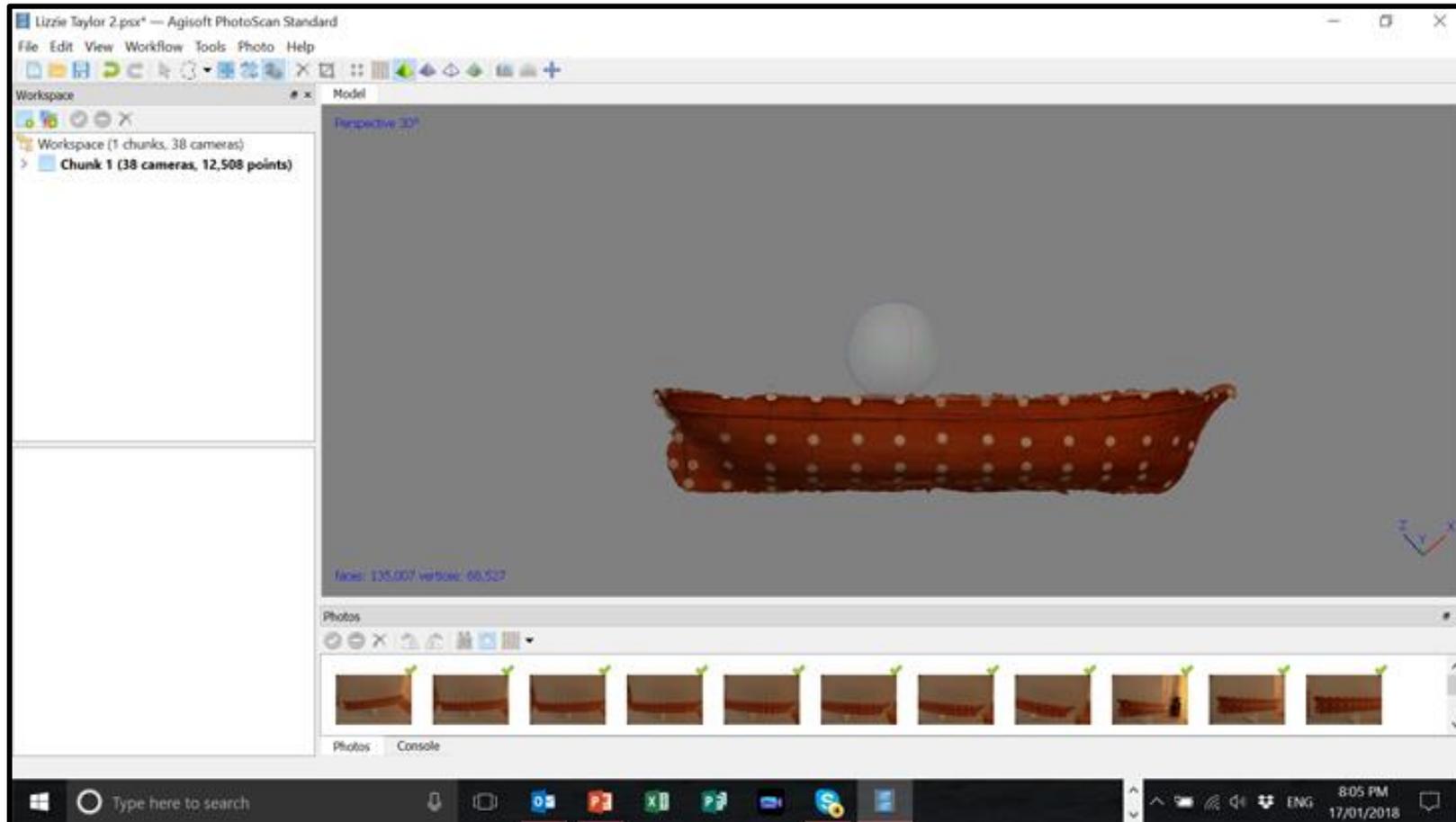


Coralyn as a Point Cloud in AP before clean up of back and foreground point not required.

Coralyn as a Point Cloud in AP after clean up. The clean up process removed over 2,000 points to now total 362,638 points. It has now been sent to Dr Dougal Harris for his work.



It is also possible to get a 3D wire frame of a ½ model.



An Agisoft Photoscan 3D image of ½ Model of an early Tasmanian Trading Ketch. Similar size to the Annie Taylor. The model is yet to be extended to the Agisoft 3D wire frame view. It also has not yet been rendered in MaxSurf.

Pros and Cons of Photogrammetry thus far!

- It is less costly than the Total Station method.
- The availability and affordability of DSLR cameras makes Photogrammetry an affordable option.
- Currently we are using a 3 stage process;
 - Photogrammetry
 - Agisoft Photoscan build of the 3D images
 - Use of Dr Dougal Harris's Naval Architecture SW to develop the scaled lines of boats. This is expensive.
- Agisoft Photoscan and other similar 3D SW programs are affordable but require large memory and time for the 3D images to resolve.

Advantages of Photogrammetry for WBGT Inc.

- We are often asked to accept boats that are gifted to us! We could follow the US Wooden boat Centre Lead?
- Depending on the size and our available space and human and financial resources that may or may not be possible.
- However, we could run a Photogrammetry project to record the details and lines of boats.
- Particularly, those that have Tasmania Historic value.

One of the US Wooden Boat Centre's Collection

