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South Carolina Historical Geo-Referencing Project Methodology

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Introduction

In 1977, the former South Carolina Coastal Council, now the SCDHEC – Division of Ocean and Coastal Resource Management (SCDHEC – OCRM), flew the coastal counties to collect a series of aerial images. These images provided a baseline representation of the South Carolina coast at the establishment of the SC Coastal Program. These images, which at the start of this project existed solely in hard copy format, reside at the Charleston SCDHEC - OCRM office. Since these were the only copies of these images, it was critical that they were made digital for long-term preservation. Having these images in digital form allows staff to accomplish the tasks of identifying structures, such as docks or erosion control devices, finding freshwater wetlands, and viewing fill areas.

The object of this project was to scan and georeference the 1977 images so that they could be viewed and analyzed within GIS software. There were originally 2,896 individual false color infrared diapositive images on 9" x 9" Kodak Safety Film. An addition 161 frames covering part of the Grand Strand region were added part way through the project.

Methodology: Aerial Services Inc.

The following steps were performed by Aerial Services Inc. once film was received from the SCDHEC - OCRM. Film frames were transported back and forth between OCRM and ASI via FedEx shipping.

1. The cut film was inspected and logged into a tracking system.
2. Images were placed on a light table and cleaned. This included removal of overlays, tape, and labels.
3. New labels were affixed to the images in a location that would not impact the scan.
4. Images were then scanned at 12.5 microns on a Leica DSW700 scanner. Images were not on a roll so each image was individually placed on the scanner bed for scanning.
5. Images .tif files were opened using Photo Shop and reviewed for quality. Quality check was for cleanliness of the scan (free of hair and dust), full imagery capture, and orientation of the image. Images were rotated as needed, base on flight direction so that North was at the top of the scan when opened. Artifacts that remain on the imagery and can not be removed include scratches on the diapositive and vignetting around the outside edge of the frames due to camera technology of 1977 and atmospheric conditions during acquisition.
6. The Quad files that were supplied indicating frame centers were manually transferred into ArcMap, and frame centers were then auto-calculated and exported to an ascii file.
7. The asciii frame center file and the images were then merged together in Intergraph's ISAT software (an Aerial Triangulation software). They were merged together using identical frame names. The original intention was to use ISAT to perform

aerialtriangulation. Aerial Triangulation was attempted. Due to the condition of the imagery and the available camera information, normal triangulation was not feasible. The main problem with the imagery stems from how the diapositives were stored. Images left on the roll, are kept in a sealed canister, and in a temperature controlled environment have more integrity to the original condition when flown. This allows one to create a camera file close enough to be used for the entire project. With the images being cut apart and used by individuals (with light tables, etc.), the images were subjected to various temperatures causing the diapositives to stretch. In order to perform aerialtriangulation new camera files were going to have to be generated for each frame or small groups of frames to remove the distortion. The maximum number of images that were grouped and run through aerialtriangulation with a single camera file was four.

8. ISAT was used to write out preliminary .tfw files to be used in ArcMap Geo-Referencing module instead of using the conventional aerialtriangulation approach. The preliminary tfw files allowed for the image to be placed in roughly the right coordinate space with rotation (images came into ArcMap either north up or north down; if north down, then they were rotated 180 degrees) when imported to ArcMap.
9. ArcMap Geo-Referencing second order polynomials, newly rectified images were written out one at a time.
10. Rectified images were then reviewed for quality and accuracy against NAIP 2011 imagery. Images were also checked against adjacent historical images.
11. Once Imagery passed QA/QC, they went through OrthoVista for seamlines generation, color balancing and were tile cuts.
12. Georeferenced mosaicked images in Geo-Tiff format in the specified tiling schema were then written out.
13. Individual images were written out using the frame center location and the size of the frame as cut tiles. This allows geo-referenced images that are accurate and visually appealing to the user. Tile grid is also supplied as a quick reference to frame locations.
14. Metadata was created and is viewable through ArcCatalog.