

Visualizing an integrated landscape through ground-based LiDAR, geophysical archaeology, and archaeological excavation

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INTRODUCTION

The method of 3D laser scanning (*aka* ground-based LiDAR) provides a new way of digitally connecting above-ground and below-ground imaging, acquired through ground-penetrating radar, magnetometry, and earth resistance methods (Rogers 2014). A multi-year project is investigating pre-American Revolutionary War era house forts in the Mohawk River Valley west of Albany, New York (Stull, Rogers, and Hurley 2014). During the 18th century the Mohawk River Valley was New York's colonial frontier (Venables 1967: 7). The area was being settled through British colonial expansion, Dutch colonists, and Palatine Germans (Kammen 1975: 177–178; Otterness 2004: 71) amidst villages of the Mohawk Nation of the Haudenosaunee (Iroquois) confederacy. The threat of attack or invasion by the French based in western New York and Canada, as occurred in the end of the 17th century as far east as Schenectady (Kammen 1975:143–145), resulted in the construction of forts and fortified houses.

In the mid 1800s two fortified houses were built about 25 miles apart on the north side of the Mohawk River. One was Fort Johnson, built by William Johnson, later Sir William Johnson, Superintendent of Indian Affairs for the Northern Region. The second was built by Johannes Klock, a German-Dutch trader, and the house is referred to as Fort Klock. Both structures were fortified houses of stone, built to display a specific status in this mixed social context, and served as strong points for defending the residents and neighboring settlers in case of attack. Despite their functional similarity, date of construction

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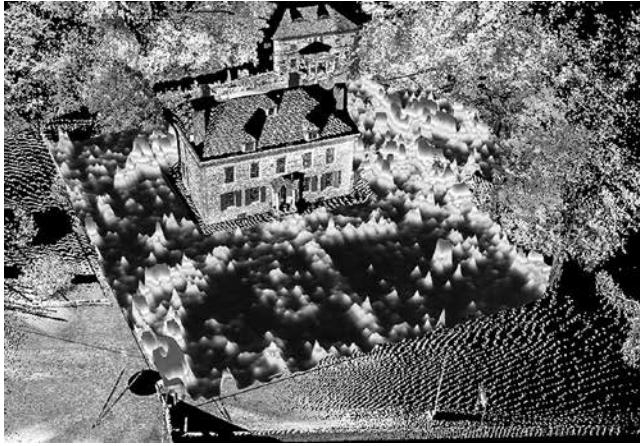


Fig. 1. Integrated landscape view of the Old Fort Johnson National Landmark site combining 3D laser scan with results from GPR analysis at ~ 0.35 m to 0.42 m below the surface. The GPR slice is shown with the z-axis representing reflection amplitude

and nearby location, these two houses are markedly different in appearance and spatial organization. The houses were built to create a cultural identity for each owner and those cultural identities were quite different (Stull *et al.* 2014).

DATA COLLECTION METHODS

A ground-penetrating radar survey was conducted using a Geophysical Survey Systems, Inc. SIR-3000 ground-penetrating radar system and survey cart with a central antenna frequency of 400 MHz. The control unit was set at 100 scans per linear meter, which corresponds to a radar pulse into the ground every centimeter along each transect with transects spaced 0.50 m apart. A time window of 30 ns with 512 samples per scan was used, corresponding to a reading taken every vertical 0.002 m down to a depth of approximately one meter. An earth resistance survey was conducted using a Geoscan Research RM-15 with multiplexer configured in the twin parallel probe array mode with five mobile probes at 0.25 m intervals and readings taken every 0.50 m along each transect. A fluxgate gradiometry survey was conducted using a Geoscan FM 256 fluxgate gradiometer sampling at a rate of 16 data points per meter, resulting in a data point every 0.06 m along each transect with transect lines spaced 0.25 m apart. A caesium magnetometry survey was conducted using a Geometrics G-858 optically pumped magnetometer system. The two sensors were spaced horizontally 0.25 m apart on a cart to cover two transects with each pass. The sampling rate was set to 10 Hz corresponding readings, taken every 0.05 m along each transect at the chosen walking speed. All instruments gathered data using a zigzag mode along N–S traverses. The 3D laser scan was conducted using a Leica C-10 whilst taking

readings every 5 mm with multiple scan stations outside of the house and a minimum of two scan stations per interior room.

RESULTS

Through geophysical archaeology, 3D laser scanning, and targeted archaeological excavation a better understanding of the integrated landscape was achieved. The landscapes in front of each house serve as an indicator of social practice and behavior in the same manner as the houses themselves. The area in front of Old Fort Johnson contained protected outbuildings and formal paving that served as an active working space. The identity created by the form of Fort Klock and the use of the yard was purposefully and distinctly different from the English elite. Johannes Klock was appealing to the Dutch, German Palatine, and Native American inhabitants of the region, whereas William Johnson was appealing to the colonial elite and Native Americans. The activities pursued in and around the houses were constructed to establish different types of presence. The fortified nature of the houses and enclosing defenses along with the material goods is similar at Old Fort Johnson and Fort Klock, but the identity and status of the two owners and houses were deliberately and distinctly different (Stull, Rogers and Hurley 2014).

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