heritage

MDPI

Supplementary Information

Keppeler, J.G.; Rodriguez, M.; Koontz, S.; Wise, A.; Mink, P.; Crothers, G.; Murphy, P.R.; Robertson J.K.; Reyes-Centeno, H.; and Uhl, A. Remote sensing of American Revolutionary War fortification at Butts Hill (Portsmouth, Rhode Island).

Table S1. Data Processing Parameters in GPR-SLICE (Version 7.MT) [42].

1. Data Transfer	
	113 transects imported
2. Info File	
Unit/marker:	1
Time window (ns):	77.98
Samples/scan:	113
Resampled scans:	25
3. Convert Data	MALA 16 to 16 bit
4. Navigation	Artificial Markers[1]
5. Radargram Editing	
Input Directory:	\radar\
Threshold (0.5 =>5%):	0.2
Start from sample N:	0
Backup Nsamp:	0
Method[2]:	1: Nthreshold breach-Nsamp
Editing Type[3]:	auto 0ns line-by-line edit
6. Filtering	
Spectra + Gain filter[4]	gain: 140
	lin. Gain: 0
	exp. Gain: 0
	start pt.: 1
Bandpass filtering[5]	100 lo-cut; 1000 hi-cut
Kirchoff migration[6]	Dielectric = 9
Hilbert Processing[7]	Applied (magnitude)
7. Slicing	
Input Directory:	\hilbert\
# of slices:	20
% overlap:	50%
Bin parameter:	abs(amplitude)
Bins per mark:	4
File identifier:	H
7. Gridding	
Cell Size:	Draft
Search:	Standard
Grid Cell Size:	0.05
Search Type:	Rectangular
X-Search radius:	0.75
Y-Search radius:	0.75
Blanking radius:	0.75
Filter:	5 × 5 low pass[8]

[1] Data collected with a survey wheel (as in this study) is set to *Artificial Markers* in order to place marker tags on the scans defining the range recorded

[2] Breach of a defined threshold on the initial pulse; in this case, method 1 is to find the first sample where 20% maximum of the peak of the pulse is breached

[3] Computes the median time 0ns correction to control the edited radargrams from vertical perturbations from pulse truncation on noisy radargrams before the ground wave

[4] Applies automatic gain control (AGC) to amplify deeper signals

[5] Amplifies only a selected range of frequencies to suppress background noise.

[6] Applies Kirchoff's integral method (a summation of possible ray paths) to sharpen imaging resolution.

[7] Applies the Hilbert transform to focus on wave amplitude, making features more defined.

[8] See alternative imaging result without Hilbert processing and a 3 × 3 low-pass filter in Fig. S2.

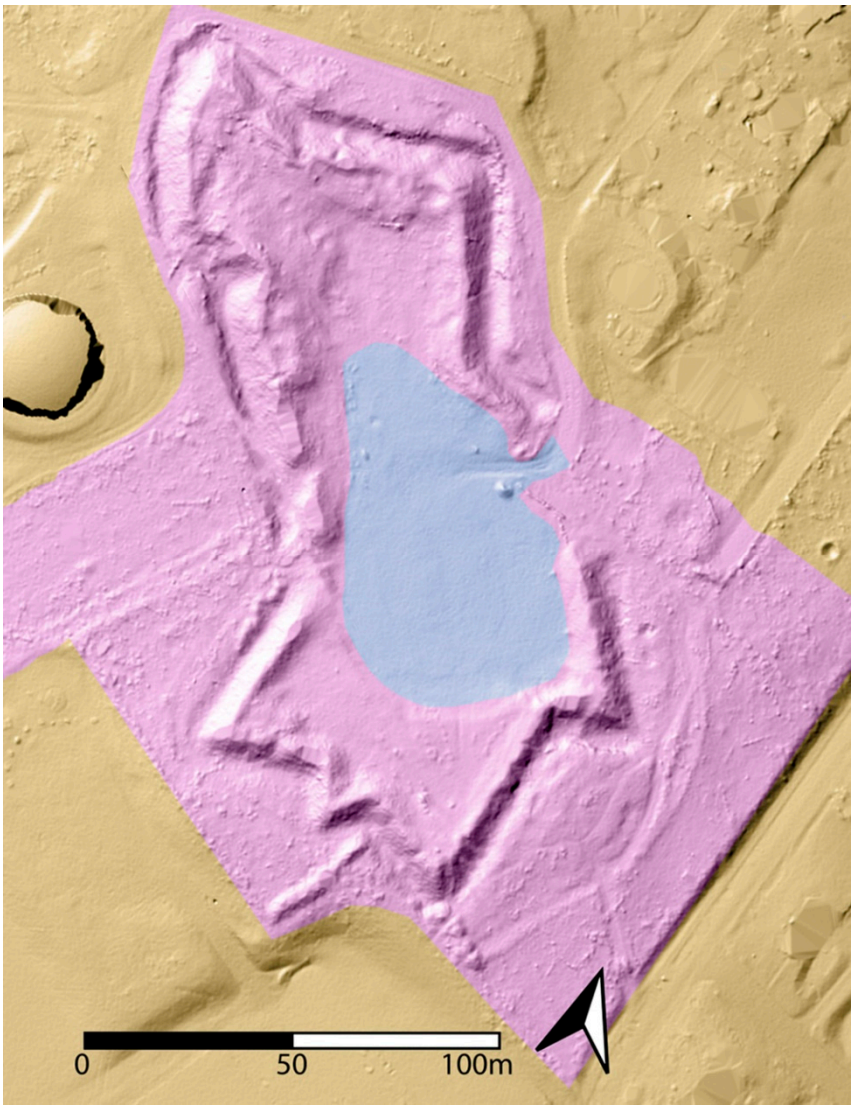


Figure S1. Archaeological Sensitivity Map. Surface map produced from RIGIS [17] LiDAR data processed in QGIS [18] (reference: EPGS:32619). Adapted from Waller [7]: high sensitivity (pink) indicates a higher probability of archeological deposits while low sensitivity (gray) represents areas of lower probability due to extensive land modification. Moderate sensitivity (yellow) are areas more distant to the fort, with some probability of archaeological deposits due to moderate impact of 19th-21st century land use and landscape modification (see main text).

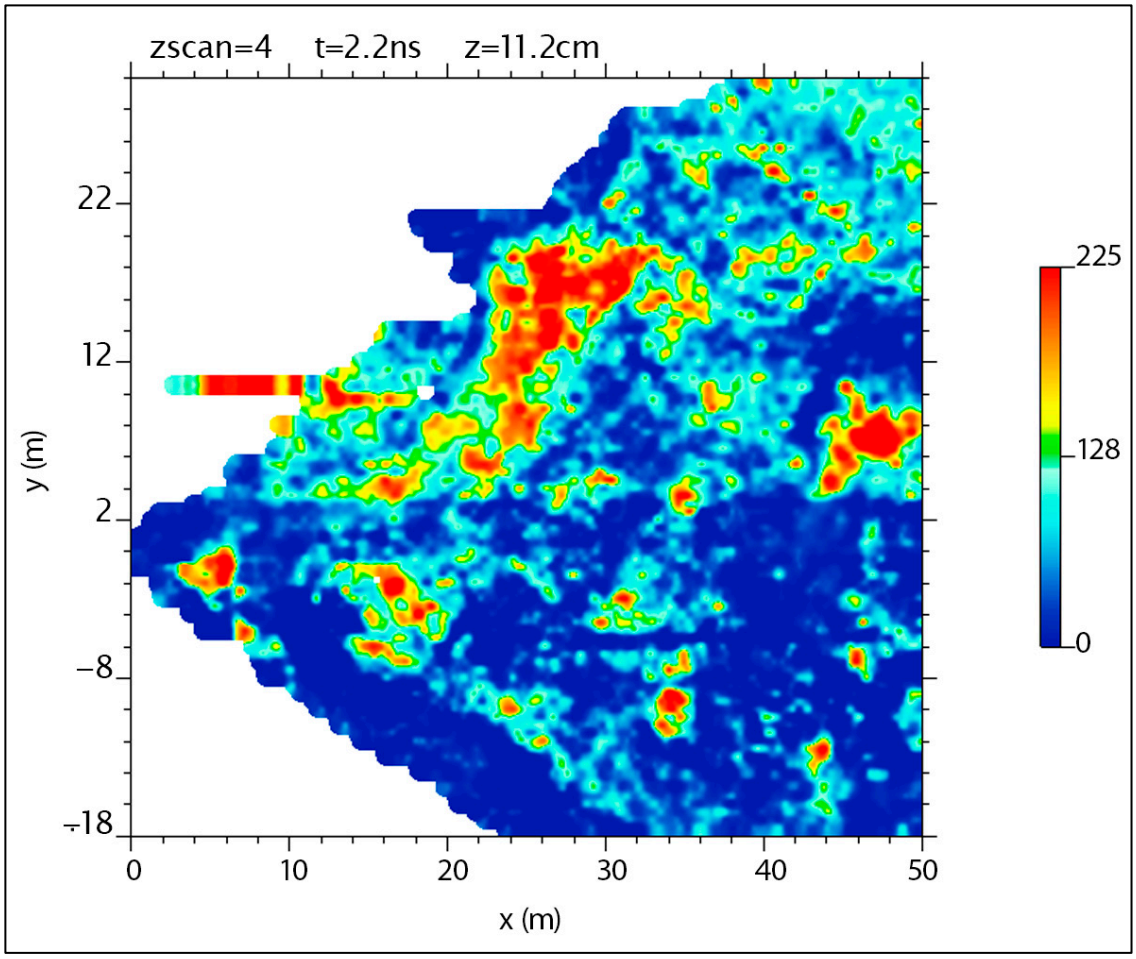


Figure S2. Alternative GPR Imaging. C-Scan of GPR data after bandpass filtering and before Hilbert transformation in a 3 × 3 low pass filter, processed in GPR-SLICE [42]. Heat bars are relative subsurface density values, with red designating high density (N=255) and blue indicating low density (N=0). Graph axes are distances in meters (m). Abbreviations: zscan = *z*-plane scan (i.e. C-scan or time slice), t = time, ns = nanoseconds, z = depth from surface in centimeters (cm).