John Brown House Preliminary Geophysical Survey Report

2008

Prepared by Thomas M. Urban

Data Collection:

Lisa Anderson, Wolfgang Borst, Sarah Dawson, Erin Fairburn, Alex Knodell, Thomas Leppard, Bradley Sekedat, Ian Straughn, Carolyn Swan, Jason Urbanus, and Christopher Witmore

Visitors to Site:

Susan Alcock (Joukowsky Institute), Kaitlin Deselatte (total station survey), Richard Gould (Anthropology), John Hermance (Geological Sciences), Krysta Ryzewski (total station survey)

All photographs and maps by author

Introduction:

Results of a geophysical reconnaissance survey of the historic John Brown House property in Providence, Rhode Island, are given in this report. The method of electromagnetic induction was chosen to broadly characterize the sub-surface environment of the site to aid in planning further geophysical and archaeological investigation of identifiable features that may be of historic interest. The survey revealed a number of anomalies, some of which warrant additional geophysical investigation, and at least one of which presently warrants archaeological investigation. A lengthy discussion of the principles of electromagnetic induction will not be included in this preliminary report. A concise interpretation of the results as well as recommendations for future investigation will be given. Discussion will focus on major features rather than small, discrete anomalies.

Survey Details:

Field Site: John Brown House, Providence, RI

Date/Time: Tuesday, May 20, 2009 - 8:18 a.m. to 4:23 p.m.

Method: Electromagnetic Induction (EM)

Equipment: GEM 2 multi-frequency, frequency domain EM unit by Geophex

Frequencies sampled: 450 Hz, 1170 Hz, 3930 Hz, 13590 Hz, 20010 Hz

Transect interval: .5 meters

Transect polarization: east to west

Sensor height: grade level

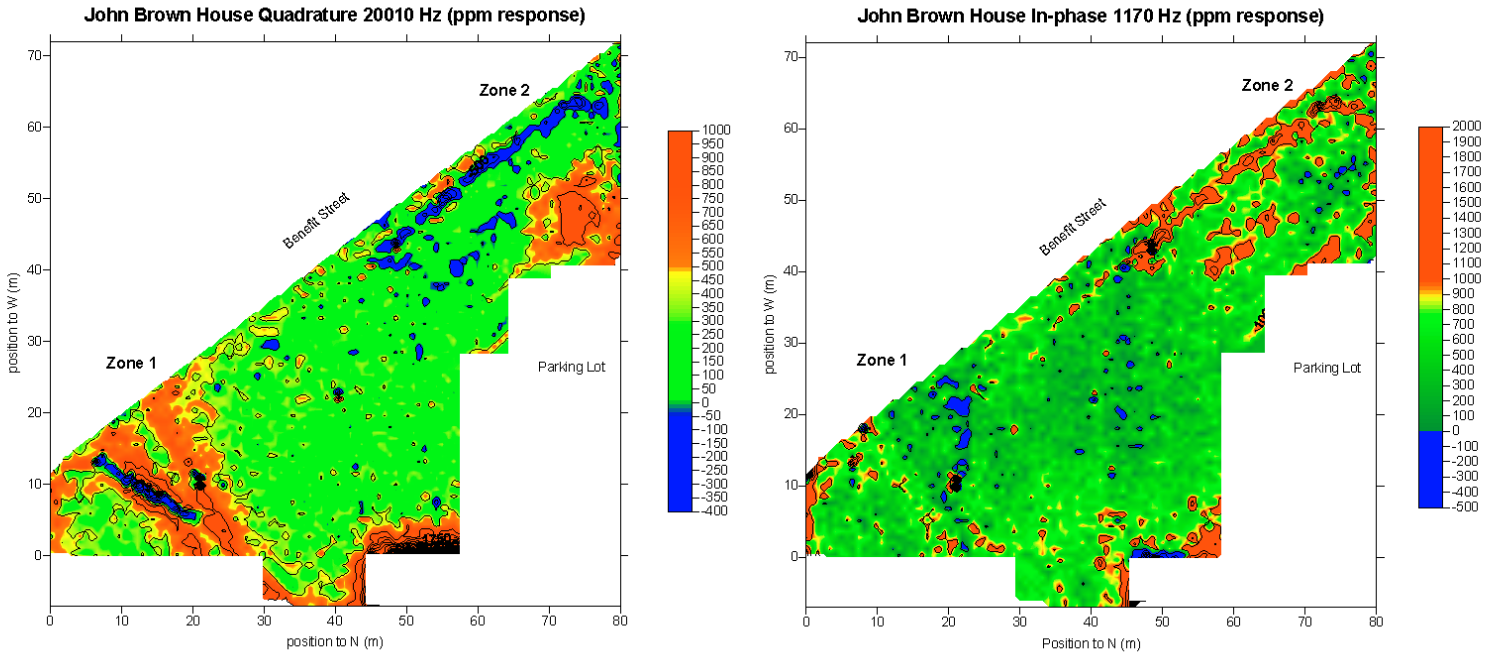

Figure 1: The above figure shows the quadrature (out of phase) response at 20010 Hz (left) and in-phase response at 1170 Hz (right). Two areas exhibiting multiple anomalous features of potential interest are identified in the figure as Zone 1 and Zone 2. The quadrature response generally indicates weaker conductors and is therefore frequently used to characterize terrain conductivity, while the in-phase response generally indicates stronger conductors and is sometimes use to characterize magnetic susceptibility. Note that some of the features so prominent in the quadrature response are nearly absent in the in-phase response, indicating that different physical properties are being characterized by each phase. Response may also vary with frequency. For example, some prominent anomalous features in Zone 1 are identifiable in the in-phase response at 20010 Hz (see figure 2 below), but not apparent at lower frequencies.

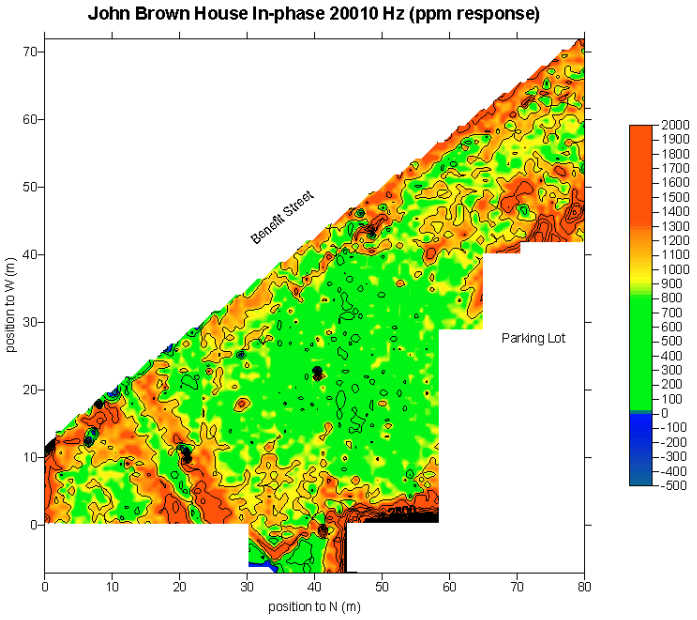

Figure 2: In-phase 20010 Hz. Notice that the resistive feature so prominent in the quadrature response at the same frequency is not visible here.

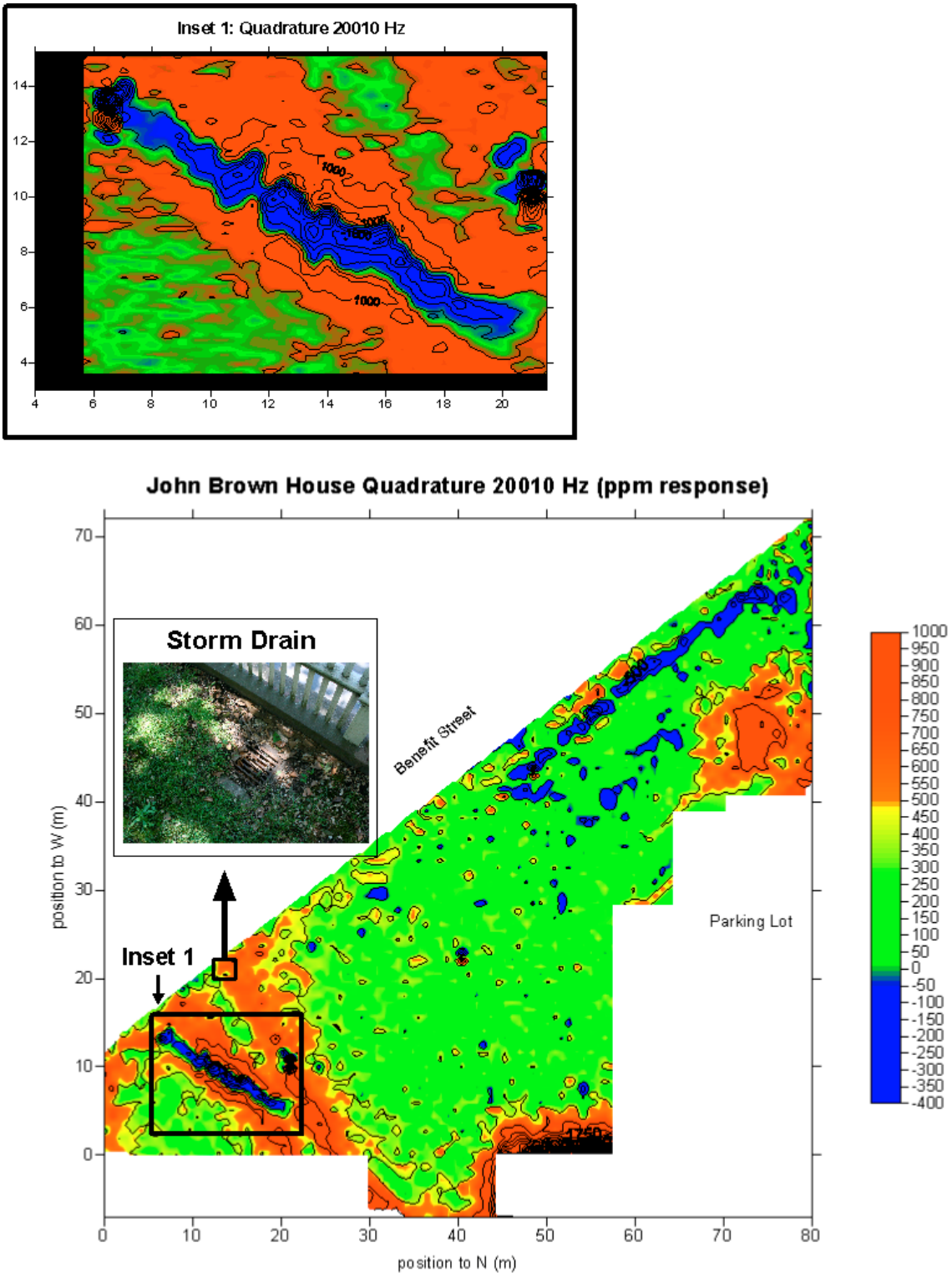

Figure 3: The above figure focuses attention on Zone 1. The resistive feature shown in Inset 1 of this figure may very well be related to historical infrastructure (i.e. a section of ceramic drainpipe) that was left behind when modern piping was introduced (indicated by the presence of a storm drain). Other elements of this feature are evident in the in-phase response at the same frequency (figure 2).

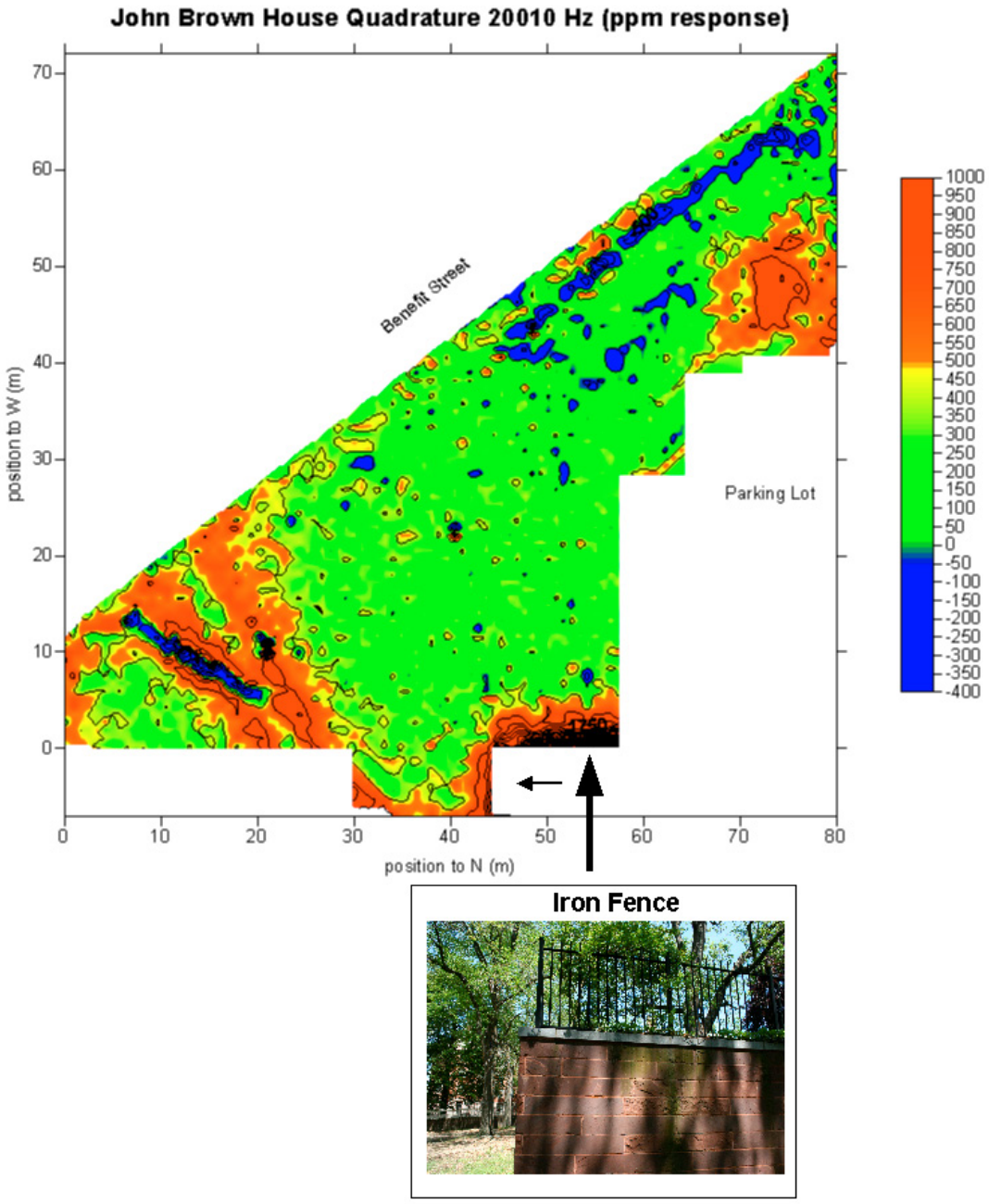

Figure 4: This figure highlights an anomalous area that is most likely related to the presence of an iron fence on a property adjacent to the John Brown House. Potential archaeological targets in this area will be masked by the presence of this highly conductive feature. Because of this strong response when using electromagnetic induction or magnetometry, it is often best to investigate the area within several meters of such a feature with ground penetrating radar or DC resistivity.

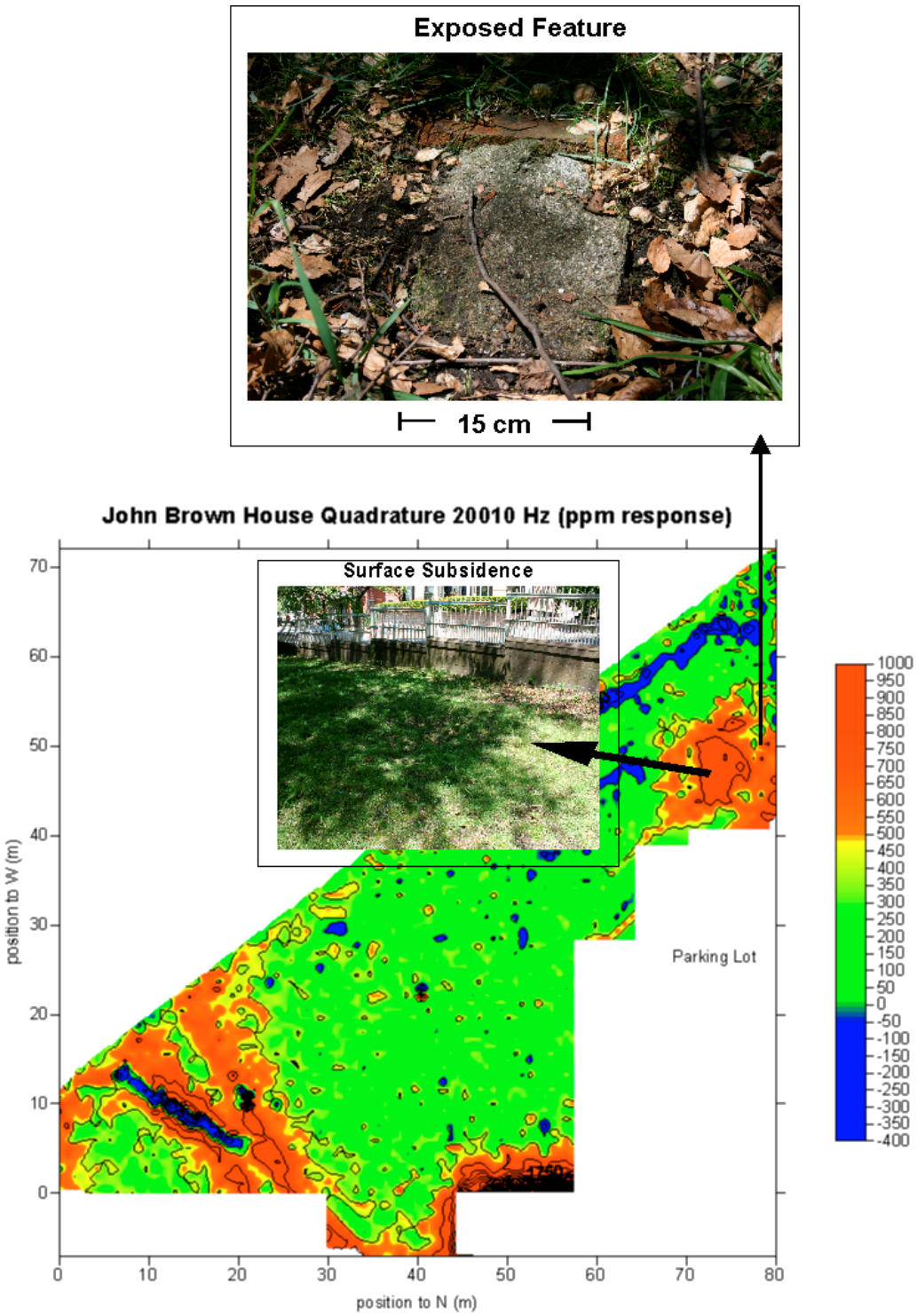

Figure 5: This figure focuses on Zone 2. A particular area within that zone, shown in red, warrants archaeological investigation. This anomalous area may well be the footprint of an historic structure, and exhibits some morphological evidence at the surface as shown in the photos. An additional linear anomaly within this zone is more ambiguous. Show above in blue, as a non-conducting feature, the same feature appears in the in-phase data (see figure 1) as a conductive feature. This may be the result of the in-phase and quadrature responding to different physical elements of the same feature. The conductive element of the feature has been confirmed with a follow up TW-6 survey. Further geophysical investigation could help determine whether this feature warrants excavation, or is an area of modern infrastructure to be avoided.

Discussion and Recommendations:

In light of the electromagnetic survey results, several possibilities for further investigation of identified anomalies exist. The feature shown in the last figure (figure 5) should be investigated archaeologically (i.e. excavation), but could also be examined in greater detail geophysically prior to ground truthing. Other anomalous features in zone 2 are more ambiguous and follow up geophysical investigation of select sub-sections could greatly contribute to answering outstanding question about the physical nature of these features and whether they may warrant excavation. An iron fence (figure 4) very likely generated at least one anomaly. Yet another area (figure 3) exhibits several anomalous features that appear to be spatially related and may represent a palimpsest of modern and historical features, making interpretation less than straight forward. Whether portions of this latter area warrant archaeological investigation is hinged on the questions that might be of interest to the archaeologists. This area can also be further characterized geophysically if it is deemed to be of potential archaeological interest. Elements of a sprinkler system identified on site do not spatially correspond to the anomalies highlighted in this report. In summary, recommendations for further investigation are as follows:

Zone 1: *May be further investigated geophysically if deemed of interest to archaeological goals. This feature may be further characterized with a combination of several methods prior to excavation to ensure that modern infrastructure is avoided.*

Zone 2: *The feature in this zone that may be the footprint of a structure should be investigated archaeologically and possibly further defined geophysically. The more ambiguous linear features in this zone should be further investigated geophysically to aid in determining whether they are modern or historic. The specific recommendation for further geophysical investigation is magnetic gradiometry, TW-6, and DC resistivity over a region of this zone.*