

## **Barbuda Historical Ecology Project 2009**

### **Assessment for Qualitative Field Analysis of Phosphates on Barbuda**

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#### **Approach**

During January of 2009 the CUNY Barbuda Historical Ecology Project began maximizing non-destructive survey techniques in order to assess land-use as well as map the extent for the Seaview site (BA16). Phosphate mapping and analysis was supervised by Dr. Tina Thurston from SUNY Buffalo and carried out by doctoral student Cory Look from the CUNY Graduate Center. Elevated concentrations of phosphate are a generalized signature of human activity in soils. As bone, manure, cess, cooking and food processing residues are deposited, concentrations begin to accumulate. There are other possible sources that may contribute to positive scoring such as certain modern fertilizers and local geology. Both of these issues will be addressed in this report. Qualitative phosphate results were scored on a scale of 1-5, whereby a score of 1 was negative for phosphates and scores of 2-5 were positive. Increasing numbers correlated with an increase in qualitative phosphate levels.

#### **Objectives 2009**

Our Objectives for the 2009 January season were:

- Assess the applicability for phosphate testing on prehistoric and historic sites in Barbuda.
- Direct phosphate analysis of contextual layers collected from the January 2008 season at both BA16 and BA1 to provide a baseline for phosphate survey.
- Mapping and analysis of cores collected every 50 meters and then every 25 meters in order to assess the extent of the Seaview site (BA16), beginning a preliminary phosphate map of the island.
- To ascertain a better understanding of how phosphates translate into cultural deposits on Barbuda

## Results

### Discussion of Direct Phosphate Testing of Contextual Layers

#### BA16 - Seaview

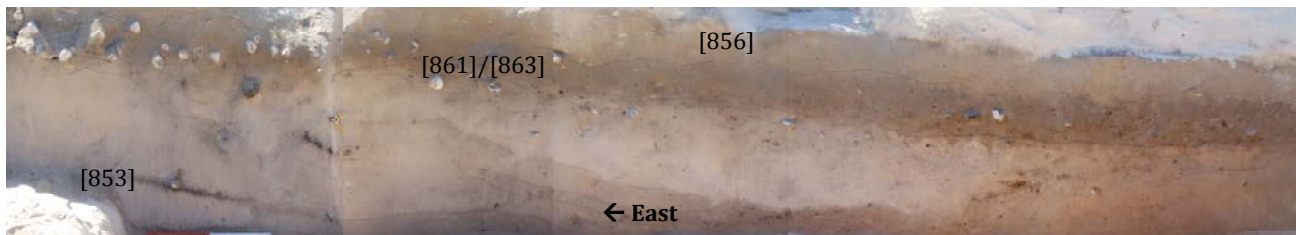
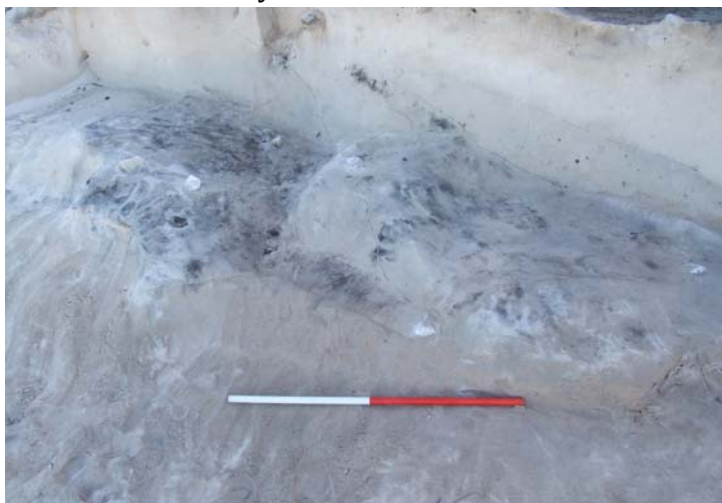


Figure 1 – Profile of A2 from the Seaview Site BA16

Soil samples were collected during the January 2008 season from contextual layers of both sites BA1 and BA16. Based on qualitative results, phosphate testing identified three separate layers. From the profile (fig. 1), all three layers are visibly identifiable, although it should be noted that cultural material was scattered throughout the profile. By analyzing the remains found in each contextual layer we hope to ascertain a better understanding of how phosphates translates into cultural deposits on Barbuda. Context [856] was the first archaeological layer. The significant cultural deposit observed in [861]/[863] is observable in the profile image. These layers formed the dominant cultural deposit for A2 consisting of bone, mollusk, ceramics, and charcoal. These layers tested positive for phosphates as well. Of great interest is how samples for [861] and [863], which are the same context layer, were collected. Context [861] consisted of a thick cultural deposit along the eastern section. The thicker section of context [861] coincidentally tested higher for phosphates than the thinner southern layer [863]. The thin organic layer [853] was the first cultural layer encountered and consisted mostly of charcoal and small



amounts of cultural material. This layer continued along the profile although appeared truncated by 2 geological, Aeolian white/yellow sand layers. The upper layer of [853], separated by these sand layers, were assigned context [857]. [853] tested positive while [857] tested negative for phosphates.

[853] is the lower black layer separated by a sand deposit from upper [857] Photo looking SW

## Seaview (BA16) Area A1

During the 2008 season a small cooking pit was excavated and soil samples were collected as well. Samples [803] and [804] were collected from this feature and tested for phosphates. Both tested negative, which is consistent with our initial assessment that this was not used over a long temporal span but may have represented the remnants of a small ash dump.

## SV21

Located within the Mission Church Campsite is a small sinkhole approximately 2x4 meters. The landscape surrounding this area is predominantly exposed fossilized coral. SV21 was discovered during our phosphate survey, where a small concentration of cultural material found both in and surrounding this feature were noted. Large numbers of worked stones, shells and coral were found with unfinished beads and zemis. One fish vertebrate as well as a handful of crab claws and ceramics were found as well. Core samples were taken both directly inside the sinkhole and along the outer edge. Both samples tested negative for phosphates adding evidence for this being a small temporary production site.

## Indian Cave

A number of caves exist just south of the Seaview site. One cave in particular has two small petroglyphs. A test core was obtained within the vicinity of these cave etchings. We were able to obtain soil from depths of up to 45 cm. After 20 cm depth, clay deposits similar to those identified within the cracks of the quarry were observed. No cultural material was observed from the core sample taken. Of greater interest were the phosphate readings obtained. The first 30 cm gave significantly high readings for phosphates while 30-45 cm dropped significantly. One possibility for these high readings are the presence of bats around these caves, where the presence of guano can increase phosphate readings significantly.

Another possibility is the presence of phosphates in the geologic makeup of the Highlands. At one time, there was a brief attempt to mine phosphorous up in this region. (Watters 2005) While this is certainly a concern when interpreting results, it should be noted that negative phosphate results have been obtained both in the caves as well as the area surrounding the Highlands.



Fig. 3 Core sample taken from Indian Cave

## BA1 Indian Town Trail

Preliminary testing of phosphates was conducted for BA1. Previous seasons have shown that BA1 poses significant challenges for future excavations. Thick concentrations of cultural material are found in stratified layers 150-170 cm deep. Surface surveys suggest that the site is greater than 80,000 square meters. The sheer size as well as the dense vegetation has made it challenging in understanding both the landscape surrounding the site as well as the cultural material scattered along its surface.

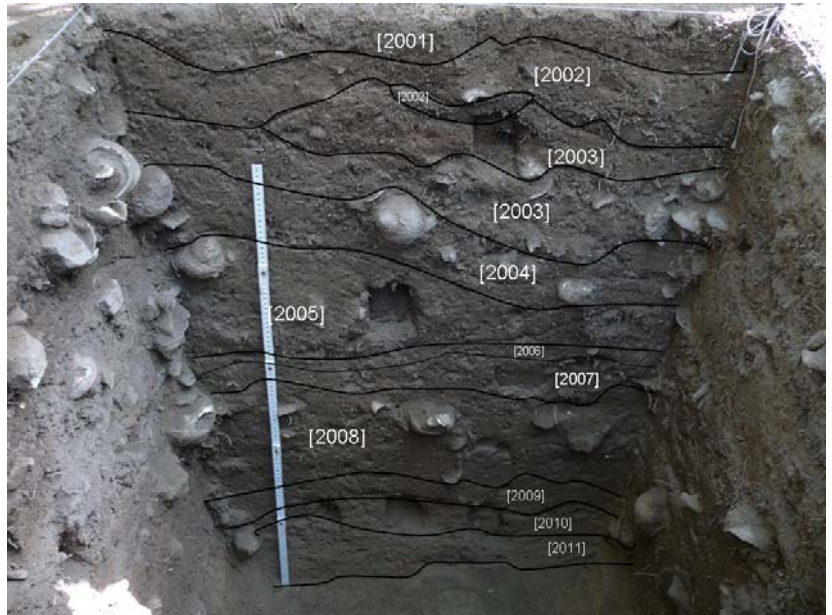


Fig. 4 BA1 Area C- South Wall profile

Soil samples were collected from a 1x1 meter test trench (Fig. 4) dug during the 2008 season at Indian Town Trail site code BA1. Samples were collected for both flotation as well as soil thin sectioning. The phosphate readings indicate a continuous deposition of cultural material within the observed profile (table 1). Only context [2008] and [2011] tested negative with context [2011] being the sterile layer.

It should be noted that the intensity of qualitative phosphate results are much higher for BA1 versus BA16 suggesting a more intense occupation. This is consistent with deposits observed from respective profiles (Fig. 1 & 4).

## TRB-5



Fig. 5 Infill at TRB5

During the 2008 season, a series of test trenches were dug in order to assess the site boundaries. The test trench at TRB5 expanded to 2x2 meters due to the discovery of a charred wooden post. To the south of the post, and extending into the southern profile, a conical shaped dark soil outline was observed at 2.4 meters deep. The dark infill

may have been remnants of a storage pit or possibly infill associated with the charred post. Soil samples were collected from this dark infill that was floated and tested for phosphates during the 2009 field season. Phosphates came up negative lending support for the infill directly associated with the charred post. Preliminary results from flotation show a lack of cultural material but an abundance of fragmented charcoal. It should be noted that approximately 15 meters east of this feature did test positive for phosphates.

### **Island Phosphate Survey**

We had two objectives for testing phosphates this season. Our first objective was to establish a baseline for prehistoric sites on the island of Barbuda, both early ceramic and late ceramic periods respectively. Our second goal was to define an optimal sampling strategy in order to maximize resolution without sacrificing the area covered by our survey. In meeting our two objectives we attempted to better define the site boundaries of BA16 by collecting phosphate samples at 50 meter as well as 25 meter intervals.



# Phosphate Site Map

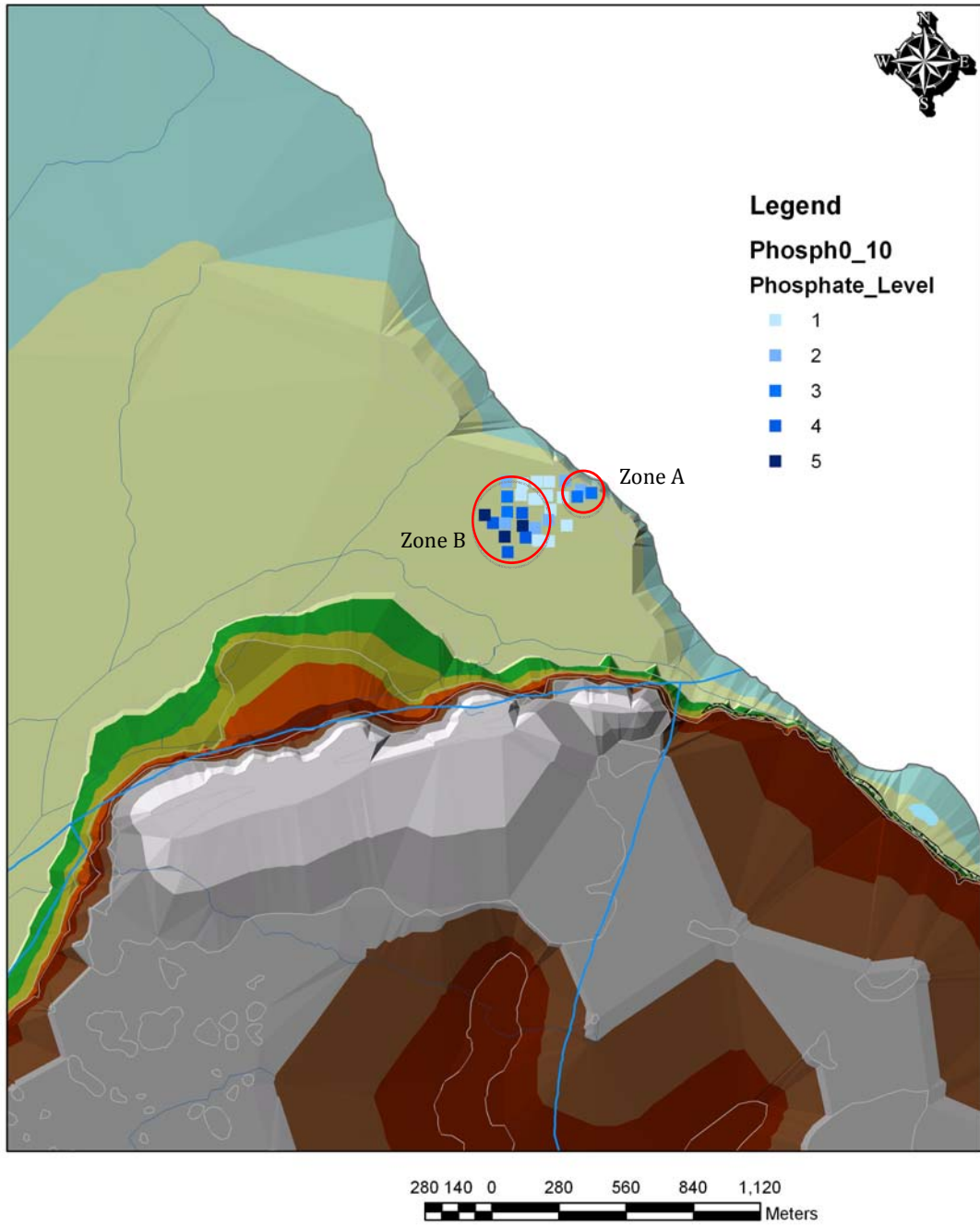


Fig. 6 Phosphate Map at 50 Meter Resolution

## **Sampling at 50 Meter Intervals**

### *Seaview (BA16)*

The strategy of taking cores every 50 meters produced results that allowed us to identify archaeological sites as well as potential modifications of the landscape. Based on direct analysis of contextual layers along with a number of test cores and shovel test pits, BA16 can be identified by phosphate readings of 2 and 3 respectively in Zone A (Fig. 6). An increase in phosphates can be observed in Zone B. This area had high phosphate levels of 3,4 and 5. While a few conch shells and adzes were observed on the surface, a number of shovel test pits found no cultural material present. This region had been used for industrial phosphate mining (Pers. Com. John Mussington) where remnants of past activity can be found up on Gun Shop Cliff, a late 19<sup>th</sup> century building connected to a brief phosphate-mining enterprise. This structure was first examined by David Watters in 1978, and is located at the base of Indian Cave along the Highland escarpment. This is one of the few historic structures that post-date the Codrington's lease on the island. Further analysis needs to be completed in order to see whether the high phosphate levels recorded during survey have formed naturally through erosion, or rather connected historically with past enterprises.

While the site location of BA16 can be identified at 50 meter intervals, this strategy did not provide the resolution necessary to identify the site's extent. By taking samples at smaller intervals we were able to increase our resolution and better identify cultural deposits surrounding the site. An approximate area of 50,000 square meters was mapped during this survey.

### *Indian Town Trail (BA1)*

The core used during BA1's phosphate survey had a maximum depth of 30 cm. Core samples were taken at fifty meter intervals and varied considerably across the landscape. Since test trenches have shown that deposits can reach depths of 120-170 cm for this region, additional samples will be collected to better interpret our findings. Since we were able to pick up considerable variation of phosphate readings across the landscape, it may be possible to identify the spatial distribution of middens and apply these methods to pre-existing models for village settlement. By focusing resources in a strategically defined space, we may minimize the need for mechanical scraping of surfaces due to the large scale of these sites.

During the 2008 season, we visited a neighboring farm to the southeast of BA1 in order to assess the site's boundaries. Aside from scant fragments of West Indian top shell and conch, there did not appear to be any exposed cultural material on the surface of the plowed farm. This year, we were allowed to take a number of soil samples for phosphate testing. Two areas tested positive for phosphates, which after minimal scraping of the topsoil revealed significant concentrations of West Indian top shell, conch, lithics, and heavy undecorated pottery consistent with material found at BA1. In one of these areas, we found clay deposits at 50-70 cm

depths. The area directly in the center of the plowed zone tested negative as did areas outside of the plow zone. This is consistent with the farmer's assertion that no manuring had occurred except for the natural grazing of his sheep. These findings suggest that BA1 does extend further West directly into the modern farm and that modern farming practices do not seem to obscure phosphate results.

### **Sampling at 25 Meter Intervals**

Core samples were collected at 25-meter intervals. Based on previous test trenches, we concentrated on the Seaview site in an attempt at increasing the resolution of our phosphate map. Preliminary testing covered 3,750 square meters. Three areas tested positive for phosphates. (See Fig. 7) Positive phosphate results were in close proximity east of TRB5, a post-hole excavated during the 2008 season. Test cores BA16-9 and BA16-10 were taken within the vicinity of area G, a test unit that produced ZIC and WOR pottery as well as substantial amounts of shell and bone. The third area was not exposed, although shell and burnt charcoal were noted within the core.

At 25-meter intervals, we were able to get a better sense of Seaview's site boundaries as well as the spatial distribution of cultural deposits within the immediate vicinity of the erosion face. The next phase of our survey will be to dramatically expand the mapping of phosphates at Seaview, especially towards the direction of Indian Town Trail, to see if there is any overlap. By identifying a spatial overlap for these two sites, it may be possible to increase our understanding of the chronology for settlement and/or abandonment during Saladoid and Post-Saladoid phases on Barbuda. We are also in the preliminary stages of incorporating soil resistivity as a means to compliment these non-destructive techniques.



# Phosphate Site Map

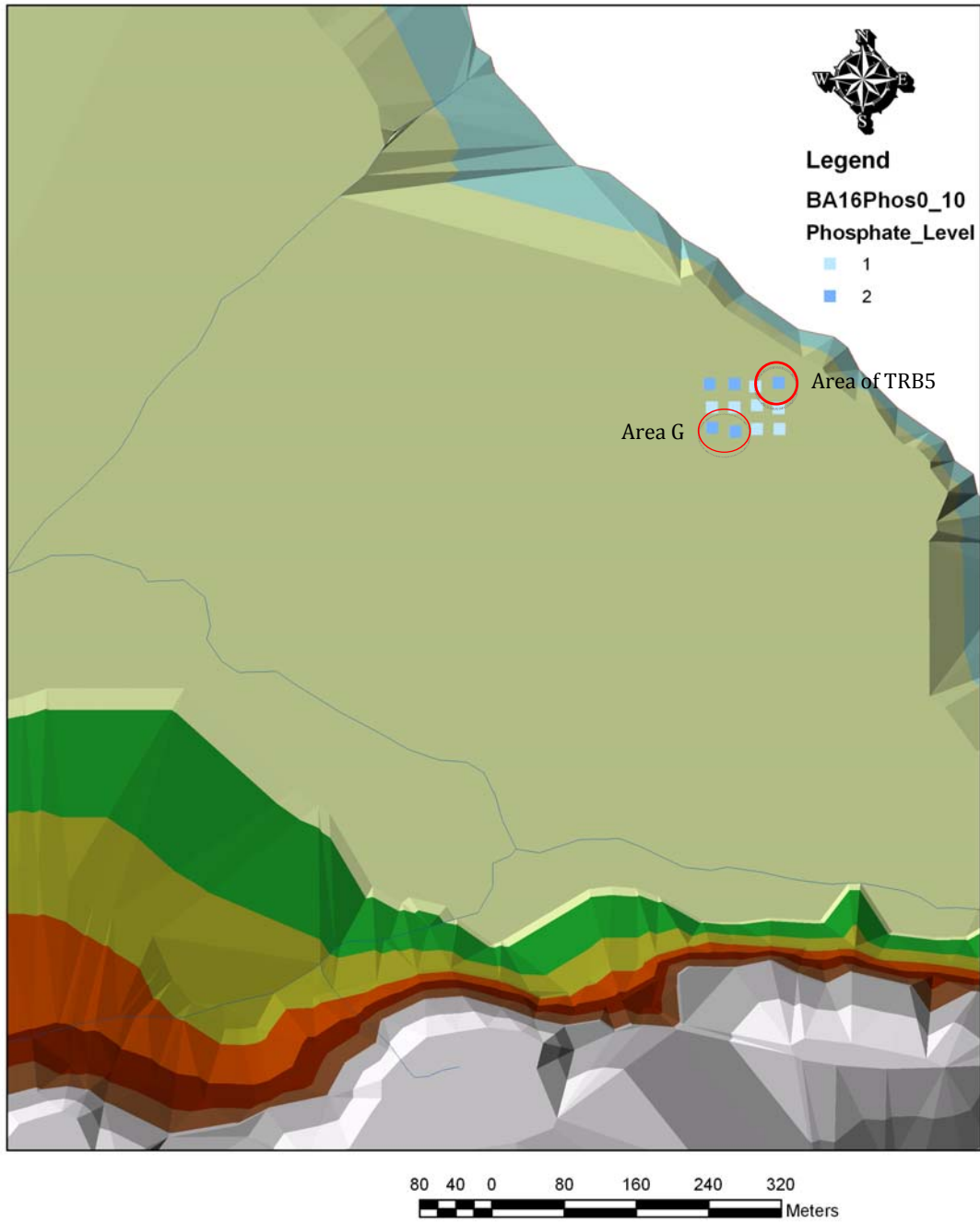


Fig. 7 Phosphate Map at 25 Meter Resolution

## **Discussion and Future Goals**

Preliminary phosphate samples were collected from BA1, although it should be noted that the core extensions were not available during this survey and maximum depths collected were approximately 30 cm. This initial survey covered only 10,000 square meters of the 80,000 square meters of cultural material scattered upon the surface. Phosphate analysis holds a great deal of potential for BA1 due to the dense cover of vegetation and difficulties in assessing surface scatter. The area at the base of the quarry has been bulldozed, while the area south appears relatively undisturbed. Further phosphate testing of this area would help recover some of the lost information from the disturbed area and possibly indicate how much of the area has been disturbed. Preliminary phosphate results have been shown to be much higher at BA1, and three test trenches with depths of 120-150cm of stratified cultural material are consistent with these results.

Since a number of sites on Barbuda have been plowed or bulldozed, it has been difficult assessing the limits of these sites due to the level of disturbance. Since phosphate analysis is minimally impacted by these practices it maybe possible to better delimit these areas of occupation. Future analysis may also indicate the intensity of these sites. Two potential candidates are the Saladoid site Sufferer's as well as the Archaic site BA4, both originally identified by Dr. David Watters.

## **Concerns**

It should be noted that soil samples tested directly from context layers were sealed in large plastic bags, stored in wooden crates, and housed in the Council's storage shed for one year. For future research we will address the concerns of long-term sample storage in the Caribbean.

Phosphate testing does not distinguish between sterile soil and areas where sparse cultural material is present. In order to properly assess site boundaries, quantitative analysis is strongly suggested. Attempts have been made on Montserrat using phosphate fractionation to distinguish between the inside and outside of Saladoid village rings.

Further investigation is required to assess the geologic affect of phosphates naturally occurring on the island of Barbuda. Based on preliminary results, the geology has not obscured the archaeological findings thus far, but strong awareness for potential noise must be strongly considered.

## Tables

Table 1. Direct Phosphate Testing of Context Layers

Bag Code	Area	Context	Results
BA16	2	853	2
	2	856	2
	2	857	1
	2	858	1
	2	860	1
	2	861	1
	2	861	2
	2	863	2
	2	866	2
	2	867	1
BA16	TRB3	Level 6	2
BA16	G	702	1
		701	1
BA16	TRB1	Level 1	1
BA16	D	803	1
	D	804	1
TRB5		1001	1
		Layer 4	1
BA1	C	2003	2
		2004	2
		2005	3
		2006	3
		2007	2
		2008	1
		2009	3
		2010	2
		2011	1

Table 2. Phosphate Results of Survey

<b>Bag Code</b>	<b>Lab #</b>	<b>0-10</b>	<b>10-20</b>	<b>20-30</b>	<b>30-40</b>	<b>40-50</b>	<b>50-60</b>	<b>60-70</b>
SV1	1-3	1	1					
SV2	4-6	2	2	2				
SV3	7-9	1	1	2				
SV4	10-11	2	1					
SV5	12	3						
SV6	13-17	3	2	1	1	1		
SV7	18	1						
SV8	19	1						
SV9	20-22	1	1	1				
SV10	23	1						
SV11	24-25	1	1					
SV12	N/A							
SV13	26	1						
SV14	27	1						
SV15	28-29	1						
SV16	30	2						
SV17	31-33	3	3	4				
SV18	34	3						
SV19	35-37	4	3	4				
SV20	38-39	2	3					
SV21	40	5						
SV22	41-44	2	2	3	3			
SV23	45-48	4	4	4	4			
SV24	49	5						
SV25	50	4						
SV26	51-52	5	5					
SV27	53-54	4	4					
SV28	55-56	1	3					
SV29	57	1						
SV30	58-59	2	1					
SV31	60	1						
<b>Bag Code</b>								
BA16-1	1-3	2	1	1				
BA16-2	4-9	2	2	1	1	1	1	
BA16-3	10-13	1	1	1	1			
BA16-4	14-16	2	2	2				
BA16-5	17-19	1	1	1				
BA16-6	20-23	1	1	1	1			
BA16-7	24-27	1	1	1	1			

BA16-8	28-31	1	1	1	1			
BA16-9	32-35	2	1	1	2			
BA16-10	36-39	2	1	1	1			
BA16-11	40-41	1	2					
BA16-12	42-45	1	3	2	1			
ITT1	1-2	1	1					
ITT2	3-5	3	2	3				
ITT3	6-7	1	1					
ITT4	8-11	2	2	1	1			
ITT5	12-15	1	1	1	1			
ITT6	16-18	2	1	1				
ITT7	N/a							
ITT8	19-21	2	1	1				
FM1	1	1	2	1				
FM2	2	1	1	1				
FM3	3	2	1	1	1	1	1	2
FM4	4	1	1					
FM5	5	1	1					
Ind Cave	1	4	5	4	2	1		

**CODING**

SV = refers to core samples taken at 50 meter intervals surrounding Seaview

BA16 = refers to core samples taken at 25 meter intervals on/at the Seaview site

ITT = refers to core samples taken at 50 meter intervals on/at Indian Town Trail

FM = Farm at the base of the Highlands by Two Foot Bay

Ind Cave = Indian Cave, location of the petroglyphs