SURFACE TO SUBSURFACE CORRELATION

AT SHOOFLY VILLAGE, PAYSON, ARIZONA

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7 MAY 1985

SHOOFLY CHAPTER
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Introduction

The original purpose of this paper was to determine whether consistent surface to subsurface correlations of artifact categories could be demonstrated at Shoofly Village, a site with a compound wall and rocked-walled structures near Payson, Arizona. Identifying the areas of the site and the depth from the surface these correlations could be shown to exist was also part of the purpose of this paper. The reason for attempting this was to develop an aid for the decision making process in the excavation strategy at Shoofly Village. Since the research at Shoofly, like any archaeological investigation, has a limited amount of resources, any device that can conserve those resources should be considered.

The proper use of surface to subsurface correlations, in my opinion, would be to prevent duplication of information. There are three reasons to avoid this duplication. First, archaeological projects as a whole tend to suffer from having more empirical data than can be adequately dealt with in a reasonable amount of time. Second, it gets quite boring to repeatedly retrieve the same order of information while working in the field. Third, given the first two and the limited resources we are all so well acquainted with, it is even more important that we are not wasteful of our time and money when retrieving information to answer our questions. Once the information necessary to answer a question is acquired, there is no need for the same type of information. At that point it is time to move on to new problems and the information required of them.

Demonstrating that surface to subsurface correlations can be found to exist consistently at Shoofly Village does not mean that excavation can be dispensed with and only surface collections need be made. There are numerous archaeological problems that can only be answered through excavation. Change through time at a site is one that will never be answered without excavation, except in the case of horizontal stratigraphy, which Shoofly does not appear to have. The existence

of surface to subsurface correlations in an area of the site can be used to determine the amount of information that need be collected in that area. Consistent high surface to subsurface correlations would show that not as much excavation is needed in that area as opposed to an area where the correlations are variable or consistently low.

Hypothesis

The question of characterization of the subsurface from surface materials concerns depostion of the archaeological record and its transformation. A high degree of characterization would indicate either consistent depositional behavior throughout the levels with little post-depositional transformation or variable depositional behavior from level to level with post-depositional transformation processes that negate the variation in depositional behavior. A low degree of characterization would indicate variable depositional behavior with little post-depositional transformation or consisten depositional behavior with post-depositional transformation processes that produced variation in the archaeological record.

Excavation at Shoofly was carried out in natural levels. This means that post-depositional transforms between levels have been held to a minimum or else the difference between levels would not be recognizable. It can be argued that the transforms at Shoofly Village have occurred but instead of obscuring the natural stratigraphy completely, it has obscured sme of the levels and not others so that what was once five levels is now three. My response to this argument would be that since it is felt that soil build up at Shoofly has been a relatively slow process, this combining of only some of the levels of stratigraphy would not have occurred. Transformation processes able to combine some of the stratigraphic levels would have combined them all.

Since the effects of post-depositional transforms can be argued to be held to a minimum, but, of course, not non-existent, there is a hypothesis. Possible.

A high degree of characterization between surface and subsurface materials is indicative of consistent depositional behavior.

Methodology

When beginning this investigation, it was felt that some sort of correlation coefficient would be the best means of demonstrating a relationship between the surface and subsurface at Shoofly Village. Spearman's Rank-Order Correlation Coefficient was chosen since the data fit the requirements of the coefficient.

Thirteen artifact categories were chosen for use in the computations. The categories included six for ceramics and seven for lithics. The thirteen categories were to be ranked from highest to lowest for each of the two levels being corrleated. One level was always to be the surface and the other was to be a level below that surface. From this the Spearman's Rank-Order Correlation Coefficient was to be calculated.

After calculating the coefficients for the levels of fifteen excavation units at Shoofly Village, I came to the conclusion that using a correlation coefficient in this type of analysis was a misapplication of the procedure and therefore, the results were invalid. The Spearman's coefficient is a bivariate correlation statistic. This means that two variables are measured a number of times to see if they covary. What my manipulation of the data had done was to take two observation of thirteen variables and attempt to find covariation in the two observations. Perhaps an example will help in explaining the difference.

Let us say that I am examining a lithic assemblage and I want to know if by knowing the width of a specific type of projectile point, say , Dalton points, I might be able to say something about the thickness of the point. What I would do would be to take thirteen Dalton points and measure the thickness and width of each of those points. Then I would be able to determine the correlation coefficient for the width to thickness of Dalton points in my assemblage.

In the example there were thirteen of the same type of measurements

taken for two variables and the two variables were correlated. With the Shoofly data there were two measurements made for thirteen different variables and the two sets of measurements were correlated. The difference between the two cases is what I feel makes the application of correlation coefficients inappropriate for the surface to subsurface test at Shoofly.

Luckily all was not lost. While still calculating the correlation coefficients, it was suggested that a ratio of ceramics to ceramics plus lithics be calculated for every level. This ratio would vary from 0, indicationg all lithics, to +1, all ceramics. It was further suggested that this ratio be observed to see how it would vary with the correlations. Since I no longer had the correlation coefficient to wotk with I decided to see what could be done with the ceramic to ceramic plus lithic ratio (C/CL).

Thanks to the help of Ms. Helen O'Brien, the C/CL considers more categories than were available for the Spearman's calculations. The ceramics in the ratio is the sum of Verde Tonto undecorated wares for any location, nine categories were used instead of the original six ceramic categories, and the lithics are the total number of lithics for an area. What the C/CL is, then, is a ratio of the total Verde Tonto wares to the total number of lithics plus the total of Verde Tonto. Therefore, the C/CL characterizes the depositional behavior involving those artifact categories for the prehistoric inhabitants of Shoofly Village.

Because Verde Tonto is an undecorated ware it is felt that the effects of surface collecting and pothunting on the C/CL were minimal since decorated wares tend to be the artifacts most coveted by vandals and pothunters. Projectile points are the category of lithics most likely to be removed from the surface or pothunted for the same reasons. Since projectile points tend to be a relatively small portion of the lithic assemblage, it is also felt that their deletion from the record would have little effect in the C/CL.

Because the C/CL is considered to be representative of depositional behavior

at Shoofly, a high degree of similarity between levels at a given locus should represent consistent behavior and support the hypothesis. A high degree of similarity is defined as a 0.1 or less difference between the highest and lowest C/CLs for the levels at a given locus. A low degree of similarity is defined as a difference greater then 0.1.

Data

The C/CL was computed for every loci at the site that had artifacts in two or more levels since two was the minimum number necessary to determine the degree of similarity. There were 76 loci in a total of 50 excavation units that had two or more useable levles. Thirty five of the excavation units were 1x1 m. test pits that were selected through a stratified systematic unaligned sampling strategy. In this way, part of each area of the site was excavated. (See Appendix 1 for a map of the site and locations of the excavation units.

Results

It was found that of the 76 loci there were 29 with a high degree of similarity or a difference of 0.1 or less between the highest and lowest C/ CL for the levels at that locus. The excavation units were then grouped by Presumed Locus Type and by Location. Presumed Locus Type(PLT) is a type of architectural space, e.g., a large rectangular room or plaza in an open area. Location is an area that includes rooms and plazas and is felt to be demarcated by architectural style and walls, either compound or structure. They are named by the compass quadrant they occur in, i.e., North, Northeast, Southwest, etc..

After grouping the excavation units by PLT and Location the degrees of similarity for each loci were examined to see if more high degrees of similarity occurred in that category when compared to the total number of loci for that category. In only one group, out of seven, under location did the number of loci with a high degree of similarity exceed half of the total number of loci

in that location. The location was the North location with eight out of a total of fourteen loci receiving a high degree of similarity. In the PLT category, three PLTs out of seven had more than half of their loci characterized by a high degree of similarity. The three were Circular or Oval Rooms(8/14), Three-Sided Rooms(2/3), and Large Rectangular Rooms(10/15). (See Appendix 2 for a summary of the degrees of similarity and Appendices 3 for the total listing of the C/CL and high degrees of similarity

Discussion

It was shown that in three PLTs , more than half of the total loci for that PLT had a high degree of similarity. This would seem to indicate a greater consistency of depositional behavior in Circular or Oval Rooms, Three-Sided Rooms, and Large Rectangular Rooms. The implications of this for any excavation strategy are that less work needs to be done in those three areas to be able to characterize the depositional behavior in them and more effort will be needed in the other PLTs to be able to characterize them. The same may be said for the Locations with the North location requiring less work and the others requiring more.

Another avenue of research that was not covered by this paper would be to examine the areas that have low degrees of similarity and determine if they have consistentlly low degrees of similarity because the C/CL consistently goes up between levels, or down, or does both. A pattern of rising or lowering of the C/CL between levels might also be used to charterize areas and aid in development of an excavation strategy.

The purpose of this paper was to determine if correlations existed between the surface and subsurface of an excavation unit. Although it was demonstrated that the original method would not work a substitute method was developed and used to determine degrees of similarity between excavated levels. It is methods

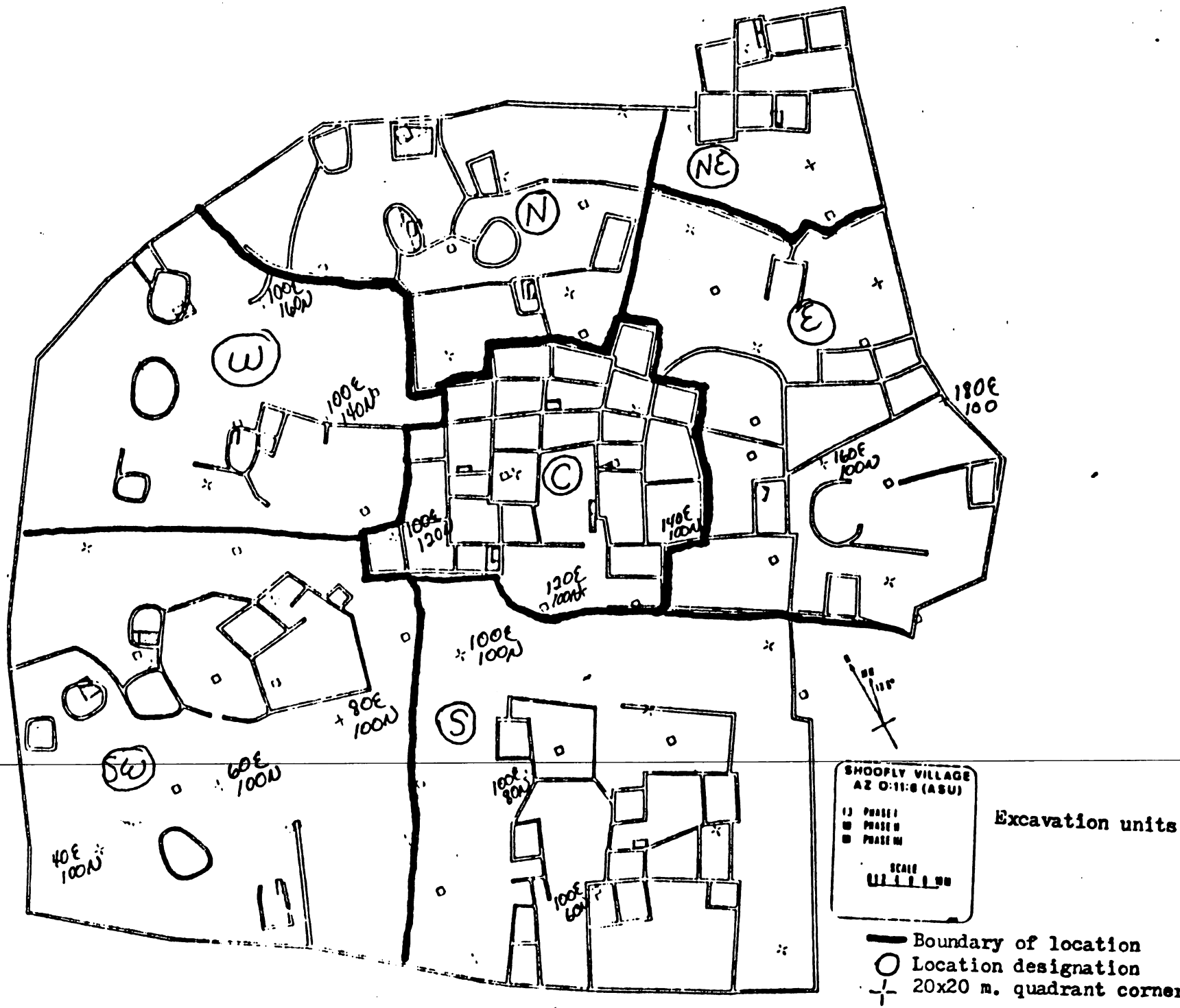
such as this that will allow archaeologists to direct their efforts where they are needed most to answer their research questions. It is also methods like this that will be called for with increasing frequency in the future as the resources for archaeological research become smaller and more difficult to obtain.

APPENDIX 1

MAP OF SHOOFLY VILLAGE

SHOWING BOUNDARIES OF LOCATIONS,

AND EXCAVATION UNITS


NE
N
E
W
C
S
SW
100E 160N
100E 140N
180E 100
160E 100N
100E 120N
140E 100N
120E 100N
100E 100N
80E 100N
60E 100N
40E 100N
100E 80N
100E 60N
SHOOFLY VILLAGE
AZ O:11:8 (ASU)
PHASE I
PHASE II
PHASE III
SCALE
Excavation units
Boundary of location
Location designation
20x20 m. quadrant corner

APPENDIX 2

NUMBER OF LOCI WITH HIGH DEGREES OF SIMILARITY AND TOTAL NUMBER OF LOCI PER CATEGORY OF LOCATION AND PRESUMED LOCUS TYPE

(Example)

SW 4/17

↑ Number of loci with high degree of similarity

↑ Number of total loci per category

Location

SW 4/17
S 4/9
E 2/9
N 8/14
C 5/14
NE 4/7
W 4/9
no location 0/1

Categories of Location

SW-Southwest
S-South
E-East
N-North
C-Center
NE-Northeast
W-West

Presumed Location Type

CR 8/14
TSR 2/3
RRL 10/15
RRM 2/7
POP 3/16
PAR 3/17
Misc. 1/4

Categories of Presumed Locus Type

RRM-Rectangular room medium (Shortest wall less than four m. but greater than two m.

RRL-Rectangular room large(Shortest wall greater than four m.)

CR-Circular or oval shaped room

TSR-Three-Sided Room

POP-Plaza in open area(usually large)

PAR-Plaza among rooms(usually small)

WEX-Wall clarrification(exterior compound wall)

OUTM-Outside compound wall: midden

OUTO-Outside compound wall: open space

APPENDIX 3

C/CL BY PLT

WITH HIGH DEGREES OF SIMILARITY LISTED

(EXAMPLE)

UNIT DESIGNATION → 49E 121N ← LOCATION SW

LEVEL	LOCUS	C/CL
0-0	0	
1-0	0.94	
0-1	0.83	*0.02 ← HIGH DEGREE OF SIMILARITY
1-1	0.85	

(Level 0=surface)

Circular or Oval Rooms

49E 121N	0-0	0.	
SW	1-0	0.90	
	1-2	0.25	
	2-2	0.83	
59E 123N	0-0	0.90	
SW	1-0	0.91	
	2-0	0.79	
	3-0	0.77	
	4-0	0.89	
	1-1	0	
	2-1	0	*0.0
	3-1	0	
85E 143N	0-0	0.94	
W	1-0	0.90	
	2-0	1	*0.1
	3-0	0.90	
	4-0	0.91	
89E 165N	0-0	0.93	
W	1-0	0.85	
	2-0	0.84	*0.1
	3-0	0.84	
	4-0	0.83	
	5-0	0.91	
	0-1	0.85	
	1-1	0.85	
	2-1	0	
	1-2	0	
	2-2	0.85	
	3-2	0	
	1-3	0	
	2-3	0	*0
133E 142N	0-0	0.88	
N	1-0	0.87	*0.05
	2-0	0.92	
	0-3	0	
	1-3	0	
	2-3	0	*0
	3-3	0	
123E 158N	0-0	0.87	
N	1-0	0.85	
	2-0	0.88	*0.06
	3-0	0.91	
	4-0	0.87	
	0-2	0.94	
	1-2	0.92	*0.03
	2-2	0.91	
	1-4	0	
	2-4	0.87	

Outside Compound Wall: Open Space

47E 141N	0-0	0.75	
SW	1-0	0.81	*0.1
	2-0	0.85	

Outside Compound Wall: Midden

141E 71N	0-0	0.96
no	1-0	0.82
location	2-0	0.76
	3-0	0.88
	4-0	0.90

Wall Clarrification(Exterior compound wall)

161E 73N	0-0	0.94
E	1-0	0.88
	2-0	0.84
	3-0	0.82
	1-1	0.76
	2-1	0.88
	3-1	0.93

Three-Sided Rooms

60E 80N SW	0-0	0.94	
	1-0	0.91	*0.03
	2-0	0.93	
	3-0	0.93	
110E 64N S	0-0	0.88	
	1-0	0.89	
	2-0	0.81	*0.08
	3-0	0.86	
	4-0	0.84	
126E 94N	0-0	0.88	
	1-0	0.87	
	2-0	0.96	
	3-0	1.0	

Rectangular Room Medium

111E 110N C	0-0	0.95	
	1-0	0.93	*0.02
	2-0	0.93	
	3-0	0.93	
	0-1	0.824	
	1-1	0	
134E 114N C	0-0	1	
	1-0	0.93	
	2-0	0.88	
	3-0	0.87	
	4-0	0.86	
	5-0	0.94	
	0-2	0	
	1-2	0	
	2-2	0	*0.0
	3-2	0	
	4-2	0	
	0-3	0.43	
	1-3	0	
	2-3	0	
	3-3	0	
101E 60N S	0-0	0.9	
	1-0	0.74	
	2-0	0.97	
	3-0	0	
	0-1	0.99	
	1-1	0.92	
	2-1	0	

Rectangular Rooms Large

113E 124N C	0-0	0.92	
	1-0	0.90	
	2-0	0.84	
	3-0	0.91	
	4-0	0.89	
	5-0	1.0	
118E 120N C	0-0	0.81	
	1-0	0.91	
	2-0	0.97	
	3-0	0.95	
	4-0	0.97	
	5-0	0.93	
	6-0	0.96	
	7-0	0.97	
	8-0	0.97	
129E 174N N	0-0	0.80	
	1-0	0.86	
	2-0	0.83	*0.06
	3-0	0.86	
	0-1	0.88	
	1-1	0.84	*0.04
	2-1	0.84	
	0-2	0	
	1-2	0.92	
	0-3	0	
	1-3	0.11	
	2-3	0.43	
	0-4	0	
	1-4	0	
	2-4	0	*0
	3-4	0	
130E 125N C	0-0	0.92	
	1-0	0.95	*0.06
	2-0	0.89	
	3-0	0.91	
176E 103N	0-0	0.89	
	1-0	0.85	
	2-0	0.83	*0.1
	3-0	0.83	
178E 148N	0-0	0.87	
	1-0	0.82	
	2-0	0.85	*0.07
	3-0	0.86	
	4-0	0.89	

Rectangular Rooms Large (cont.)

180E 159N NE	0-0	1	
	1-0	0.88	
	2-0	0.87	
	3-0	0.88	
	1-2	0	*0
	2-2	0	
	1-3	0	*0
	2-3	0	
148E 101N E	0-0	0.90	
	1-0	0.86	
	2-0	0.86	*0.05
	3-0	0.91	
	4-0	0.90	

Plaza in Open Area

54E 101N SW	1-0	0.60	
	2-0	0	
66E 88N SW	0-0	0.81	
	1-0	0.75	
	2-0	0.86	
	3-0	1.0	
	0-1	0.86	
	1-1	0.80	*0.09
	2-1	0.77	
67E 148N W	0-0	0.69	
	1-0	0.79	
	2-0	0.81	
	3-0	0.89	
78E 128N SW	0-0	0.91	
	1-0	0.77	
	2-0	0.91	
	3-0	0.89	
81E 65N SW	0-0	0.90	
	1-0	0.77	
	2-0	1.0	
94E 105N SW	0-0	1	
	1-0	0.93	
	2-0	0	
98E 125N W	0-0	0.80	
	1-0	0.86	
	2-0	0.46	

Plaza in Open Space (cont.)

86E 85N SW	0-0	0.86	
	1-0	0.82	
	2-0	0.82	
	3-0	0.79	
	4-0	0.81	
	5-0	0.93	
	1-1	0	
	2-1	0.96	
	1-2	0.81	
	2-2	0	
87E 145N W	0-0	0	
	1-0	0.87	
	2-0	0.88	
	3-0	0.90	
107E 140N W	0-0	0.84	
	1-0	0.90	*0.06
	2-0	0.86	
114E 100N	0-0	1	
	1-0	0.98	*0.02
	2-0	1	
167E 153N NE	0-0	0.97	
	1-0	0.60	
	2-0	0.76	
	3-0	0.97	
178E 148N	0-0	0.79	
	1-0	0.86	
	2-0	0.83	
	3-0	0.94	

Plaza Among Rooms

58E 121N	1-0	0.89	
SW	2-0	0.83	
	3-0	0.77	
74E 108N	0-0	0.75	
SW	1-0	0.81	
	2-0	0.84	
	3-0	1	
106E 80N	0-0	0.90	
S	1-0	0.91	
	2-0	0.86	*0.05
	3-0	0.90	
109E 160N	0-0	0	
N	1-0	0.83	
	2-0	0.81	
	3-0	1	
121E 74N	0-0	1	
S	1-0	0.64	
	2-0	0.83	
	3-0	0.52	
127E 154N	0-0	1	
N	1-0	0.92	
	2-0	0.92	*0.1
	3-0	0.92	
	4-0	0.90	
128E 109N	1-0	0.74	
C	2-0	0.79	
	3-0	0.92	
	4-0	0.92	
	0-1	0	
	1-1	0	*0
	2-1	0	
	0-2	0.94	
	1-2	0	
	2-2	0.88	
	3-2	0	
	0-3	0.89	
	1-3	0.90	
	2-3	0.82	
	3-3	0	
138E 134N	0-0	0.85	
N	1-0	0.89	
	2-0	1	
147E 91N	0-0	0.85	
E	1-0	0.73	
	2-0	0.85	
147E 151N	0-0	0.78	
N	1-0	0.88	
	2-0	1	
	3-0	0.78	
154E 111N	0-0	0.93	
E	1-0	0.84	
	2-0	0.72	
	3-0	0.82	
158E 131N	0-0	0.528	
E	1-0	0.89	
	2-0	0.88	
	3-0	0	
	4-0	0.97	
167E 93N	0-0	0.85	
E	1-0	0.78	
	2-0	0.95	
	3-0	0.88	
174E 113N	0-0	0.92	
E	1-0	0.80	
	2-0	0.80	
	3-0	1	