APPENDIX C

STRUCTURAL CALCULATIONS

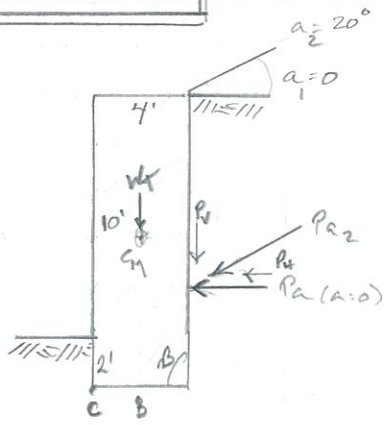
NOTE

Structural calculations are provided for information only as analytical support for the findings and conclusions regarding the investigation of life safety conditions discussed in Chapter I.3 Condition Assessment of the Historic Structure Report.

The following analysis of the fortification walls examines structural performance based on the height of soil retained and the slope of backfill, saturated soils, and seismic forces. Representative examples of (1) the highest areas of retained soil as at ten-foot retained soil heights seen at the West Bastion and the scarp (outside face) of the South Main Works, (2) areas with level backfill, (3) areas where where the top surface profile is sloped, (4) dry and saturated soil conditions observed at the site, and (5) the parking area retaining wall are reviewed.

DRY-STACKED STONE GRAVITY RETAINING WALL

* REVIEW OF TALLEST WALL CONSTRUCTION FOR STABILITY & APPLIED STRESSES



ASSUMPTIONS

$\beta = 90$

ϕ soil friction (Degrees) = 30°

$\gamma_1 = \gamma_2$ = clay w/ gravel = 120 lb/ft³

K_a = (a=0) = 0.333

K_a = (a=20°) = 0.4142

γ_s = RUBBLE MASONRY = 140 PCF

c_2 = 1000 lb/ft² (SM-SC)

$\sigma_{allow\ soil\ brg}$ = 2000 psf

NO SURCHARGE + NO SATURATED SOILS.

LOAD CASE #1

$a_1 = 0$ (BACKFILL LEVEL)

1. CHECK OVERTURNING

$H' = 10' + 2' = 12'$

$K_a = \tan^2\left(45 - \frac{\phi_1}{2}\right) = \frac{1}{3}$

$P_a = \frac{1}{2}\gamma(H')^2 \cdot K_a = \frac{1}{2} \cdot 120 \cdot 12^2 \cdot \frac{1}{3} = 2880\ \#/FT$

$P_h = P_a \qquad P_v = 0$

WALL AREA	WT.	Moment Arm	RESISTING MOMENT
1	6,720 #/LF	2'	13,440 #'

$M_O = \frac{H'}{3} \cdot P_a = \frac{12}{3} \cdot 2880 = 11{,}520\ \#'$

FS (OVERTURNING) $\frac{13{,}440}{11{,}520} = 1.16 < 1.5$ N.G.

(γ_r = 180 pcf

2. CHECK SLIDING

$FS_{(SLIDING)} = \frac{(\Sigma V)\tan(K_1\phi_1) + \beta K_2 c_2 + P_p}{P_a \cos\alpha} \geq 1.5$

say $K_1 = K_2 = 2/3$, assume $P_p = 0$

$= \frac{6{,}720 \cdot \tan\left(\frac{2}{3} \cdot 30\right) + 4' \cdot \frac{2}{3} \cdot 1000 + 0}{2880 \cdot 1} = \frac{2446 + 2666}{2880}$

$= 1.78 \geq 1.5$ OK

LOAD CASE #2

$a_2 = 20°$ (SLOPED BACKFILL

1. CHECK OVERTURNING

$H' = 12' \qquad K_a = 0.4142$

$P_a = 3579\ \#/FT$

$P_h = 3579 \cdot \cos 20° = 3363\ \#/FT$

$P_v = 3579 \cdot \sin 20° = 1224\ \#/FT$

$M_O = 3363\ \#' \cdot \frac{12}{3} = 13{,}452\ \#'$

$M_r = 13{,}440\ \#' + 1224\ \# \cdot 4' = 18{,}336\ \#'$

$\frac{M_r}{M_O} = 1.36 < 1.5$ N.G.

2. CHECK SLIDING

$F_S = \frac{(6{,}720 + 1224)\tan\frac{2}{3}30 + 4' \cdot \frac{2}{3} \cdot 1000}{3363\ \#} \geq 1.5$ (7944 #)

$= \frac{2891 + 2667}{3363} = 1.65$

$1.65 \geq 1.5$ OK

LC1 $a = 0°$ (CONTINUED)

3. CHECK PRESSURE @ TOE

$$e = \frac{B}{2} - \frac{\Sigma M_r - \Sigma M_o}{\Sigma V} = \frac{4}{2} - \frac{13{,}440^{\#'} - 11{,}520^{\#'}}{6{,}720^{\#}}$$

$$= 2 - \frac{1920}{6720} = 1.714'$$

$$q_{TOE} = \frac{\Sigma V}{B}\left[1 + \frac{6e}{B}\right] = \frac{6720}{4} \cdot \left[1 + \frac{6 \cdot 1.714}{4}\right]$$

$$= 5999 \text{ psf} \geq 2000 \text{ psf} \quad \underline{\text{N.G.}}$$

$$q_{HEEL} = \frac{\Sigma V}{B}\left[1 - \frac{6e}{B}\right] = \frac{6720}{4} \cdot \left[1 - \frac{6 \cdot 1.714}{4}\right]$$

$$= -2640 \text{ psf} \quad \underline{\text{N.G.}}$$

LC2 $a = 20°$ (CONTINUED)

3. CHECK PRESSURE @ TOE

$$e = \frac{B}{2} - \frac{\Sigma M_r - \Sigma M_o}{\Sigma V}$$

$$= \frac{4}{2} - \frac{16{,}336 - 13{,}452}{7944^{\#}} = 1.385'$$

$$q_{TOE} = \frac{\Sigma V}{B}\left[1 + \frac{6e}{B}\right] = \frac{7944}{4}\left[1 + \frac{1.385 \cdot 6}{4}\right]$$

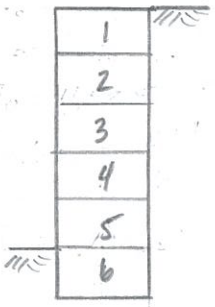
$$= 6111 \text{ PSF} \geq 2000 \text{ PSF} \quad \underline{\text{N.G.}}$$

$$q_{HEEL} = \frac{7944}{4}\left[1 - \frac{6 \cdot 1.385}{4}\right]$$

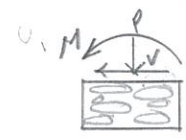
$$= -2140 \text{ PSF} \quad \underline{\text{N.G.}}$$

4. CHECK WALL STRESS $a = 0°$

FLEXURE + AXIAL σ



SEGMENT	AXIAL #	σ_A	S	MOMENT (#')	σ FLEXURE (PSI)	σ_e EXTERIOR FACE	σ_e INTERIOR FACE
1	1120#	+1.94 psi	460 in³	$\frac{1}{6}\gamma 2^3 \cdot 0.33 = 53$	±0.14 psi	+2.1 psi	+1.8 psi
2	2240#	+3.89 psi		$\frac{1}{6}\gamma 4^3 \cdot 0.33 = 422$	±1.1 psi	+5.0 psi	+2.8 psi
3	3360#	+5.83 psi		$\frac{1}{6}\gamma 6^3 \cdot 0.33 = 1426$	±3.7 psi	+9.5 psi	−3.7 psi N.G.
4	4480#	+7.78 psi		$\frac{1}{6}\gamma 8^3 \cdot 0.33 = 3380$	±8.8 psi	+16.6 psi	−8.8 psi N.G.
5	5600#	+9.72 psi		$\frac{1}{6}\gamma 10^3 \cdot 0.33 = 6600$	±17.2 psi	+26.9 psi	−17.2 psi N.G.
6	6720#	+11.67 psi		$\frac{1}{6}\gamma 12^3 \cdot 0.33 = 11{,}405$	±29.7 psi	+41.4 psi	−29.7 psi N.G.



note + = compression ; − = tension

SLIDING @ BASE $f_v = \frac{V}{A_m} = \frac{2880}{48.12} = 5$ psi

	σ_a	f_v	$\tan\theta$	f_a	
1	1.94	0.83	0.6	$1.16 > f_v$	OK
2	3.89	1.66	"	$2.37 > f_v$	OK
3	5.83	2.50	"	$3.57 > f_v$	OK
4	7.78	3.33	"	$4.6 > f_v$	OK
5	9.72	4.16	"	$5.8 > f_v$	OK
6	11.67	5 psi	"	$7.0 > f_v$	OK

FLEXURE

AXIAL

COMBINED — tension

COMBINED — w/o tension

∴ SINCE WALL NOT REINFORCED IT CANNOT RESIST TENSILE STRESS, HENCE COMPRESSION STRESSES ONLY.

SEGMENT	σ_A	σ_F	$\sigma_{EXT.}$	$\sigma_{INT.}$	
1	+1.94	+0.14	+2.1	+1.94	OK
2	+3.89	+1.1	+5.0	+3.89	OK
3	+5.83	+3.7	+13.2	0	OK
4	+7.78	+8.8	+25.6		OK
5	+9.72	+17.2	+44.1		OK
6	+11.67	+29.7	+71.1		OK

5. GRAVITY WALL SEISMIC EVALUATION

DETERMINE FS OF WALL FOR 0" DISPLACEMENT DURING EARTHQUAKE W/ PERMISSIBLE WALL MOVEMENT OF 1.5" ≈ (0.01 · H)

$\phi = 0 \quad \phi = 30°$

$P_{ae} = \frac{1}{2}\gamma H^2 (1 - K_v) K_{ae}$

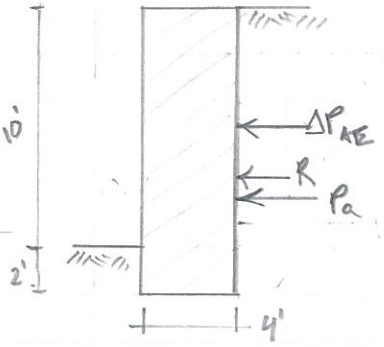
$K_v = 0 \quad \beta = 90°$

Eq $\delta = \phi/2 = 15°$ $\quad K_h = A_a \left(\frac{0.2 A_v^2}{A_a \cdot \Delta}\right)^{0.25}$ (1.5)

where $A_v = 0.1$

$A_a = 0.1 \quad \therefore K_h = 0.03$

$\theta' = \tan^{-1}\left[\frac{K_h}{1-K_v}\right] = \tan^{-1}\left(\frac{0.03}{1}\right) = 1.72°$



$$K_{AE} = \frac{\sin^2(\phi+\beta-\theta')}{\cos\theta' \sin^2\beta \sin(\beta-\theta'-\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\theta'-\alpha)}{\sin(\beta-\delta-\theta')\sin(\alpha+\beta)}}\right]^2} = \frac{0.775}{1.7485} = 0.443$$

(0.25, 0.47; 0.999, 1, 0.958, 0.95 · 1, 1.827)

$P_{AE} = \frac{1}{2} \cdot 120 \cdot 12^2 (1-0) 0.443 = 3828\ \#/ft$

P_a from other calc $= 2880\ \#/ft$

$\Delta P_{ae} = P_{ae} - P_a = 3828 - 2880 = 948\ \#/ft$

$\bar{z} = \frac{(0.6H \cdot \Delta P_{ae}) + (\frac{H}{3})(P_a)}{P_{ae}} = \frac{(0.6 \cdot 12') \cdot 948\#/ft + \frac{12'}{3} \cdot 2880}{3828} = \frac{6826 + 11520}{3828} = 4.8'$

$\theta' = 1.72° \quad C_{IE} = \frac{\sin(\beta-\delta) - \cos(\beta-\delta)\tan\phi}{\tan\phi} = \frac{\sin(90-15) - \cos(90-15)\tan 30°}{\tan 30° - \tan 1.72°}$

(0.966, 0.258, 0.577; 0.547)

$C_{IE} = 1.49$

$W_N = \frac{1}{2}\gamma H^2 K_{ae} C_{IE} = \frac{1}{2} \cdot 120 \cdot 12^2 \cdot 0.443 \cdot 1.49 = 5{,}703\ \#/ft$

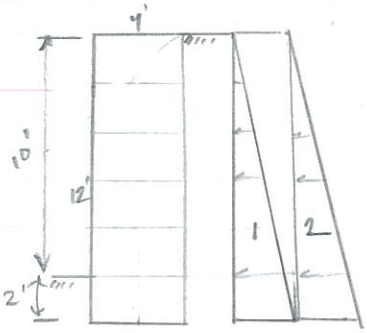
WITH 1.5 FS $= 5703 \times 1.5 = 8555\ \#/ft > 6{,}720\ \#$ NG

6. REVIEW OF GRAVITY WALL RESPONSE TO SATURATED SOIL CONDITIONS

ASSUMPTIONS:

$\beta = 90°$
$\phi = 30°$
$\gamma = 120$ pcf (DRY)
$\gamma_{SAT} = 140$ pcf (SUBMERGED)
$K_a = 0.333$
$\alpha = 0°$
NO SURCHARGE.

$K_1 = K_2 = 2/3$
$P_p = 0$
$\gamma_{STONE} = 140$ pcf
$C_2 = 1000$ psf (DRY) For SM-SC SOILS
$C_{2SAT} = 230$ (SUBMERGED)
$\sigma_{allow} = 2000$ psf



$e = \frac{V_v}{V_s} = 0.4$

$n = \frac{V_v}{V} = \frac{e}{1+e} = 0.286$

$S = \frac{V_w}{V_v} = 100\%$

$V_w = V_v$

$\gamma_{SAT} = (0.286 \cdot 62.4) + (120 \cdot 1) = 138$ pcf say 140 pcf

OVERTURNING

DEPTH (z)	σ (lb/ft²)	ACTIVE PRESSURE K_a	$\sigma \cdot K_a$	u	PASSIVE PRESSURE K_p	σK_p	C	$2C\sqrt{K_p}$	σ_p	u
0	0	1/3	0	0	3	0	230	796.7	0	0
12-1	$(140-62.4)\cdot 12' \cdot 93\%$	"	307.3 lb/ft²	0	3	2793	230	796.7	3590	0
12-2				$62.4 \cdot 12' = 749$ lb/ft²	0	0	0	0	0	749 #/ft²

$P_a = 1/2 \cdot 12' \cdot 307.3$ lb/ft² $+ 1/2 \cdot 749 \cdot 12' = 1844$ #/ft $+ 4494$ #/ft $= 6338$ # (NOTE: $2.2 \times P_a$ DRY)

$\bar{z} = \frac{(1844 \#/ft \cdot \frac{12}{3}) + (4494 \cdot \frac{12}{3})}{6338 \#} = \frac{7376 \#/ft + 17976 \#/ft}{6338 \#/ft} = 4'-0"$ ✓ (1/3)

$M_O = 4' \cdot 6338 \# = 25{,}352$ #'

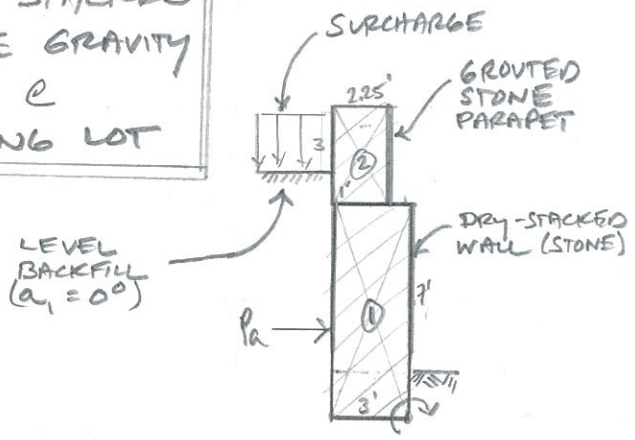
$M_R = 13{,}440$ #' per previous calc $\frac{M_R}{M_O} = 0.53 < 1.5$ NG

SLIDING (passive $P_p = 0$)

$F.S. = \frac{\Sigma V \tan K_1 \phi_1 + B K_2 C_2 + P_p}{P_a \cdot \cos \alpha} = \frac{6720 \cdot \tan 2/3 \cdot 30 + 4 \cdot 2/3 \cdot 230 + P_p}{6338 \cdot 1} = 0.48 < 1.5$ NG

P_p REQUIRED $= 6338 \# - (6338 \cdot 0.48) = 3296 \#$ $K_p = \tan^2(45 + \frac{30}{2}) = 3$ $P_p = 1/2 H^2 \cdot K_p \gamma = 720 \# < 3296 \#$ N.G.

DRY-STACKED STONE GRAVITY WALL @ PARKING LOT



ASSUMPTIONS

$\beta = 90°$ $\phi = 30°$

$\gamma_1 = \gamma_2 = 120\ lb/ft^3$

$K_a = (a=0) = 0.33$

$\gamma_s = 140\ pcf$

$C_2 = 1000\ lb/sf$

$\sigma_{allow\ brg} = 2000\ psf$

SURCHARGE: 100 psf (FOR VEHICLES)

ASSUME BOTTOM + TOP SLOPES ARE LEVEL.

1. CHECK OVERTURNING

$H' = 7' + 2' + 1' = 10'-0"$

$P_a = \frac{1}{2} K_a \cdot \gamma_{eq} H^2$

$\gamma_{eq} = \gamma + \left[\frac{\sin\beta}{\sin(\beta+\alpha)}\right]\left(\frac{2q}{H}\right)\cos\alpha$

$= 120 + \left[\frac{1}{1}\right]\left[\frac{2 \cdot 100\ psf}{10'}\right] \cdot 1 = 140\ pcf$

$P_a = \frac{1}{2} \cdot 0.33 \cdot 140 \cdot 10^2 = 2310\#/lf$

$P_h = P_a$ & $P_V = 0$

AREA	W_T	MOMENT ARM	RESISTING MOMENT
1	$9 \times 3' \times 140 = 3.78$	1.5'	5670 #'
2	$4 \times 2.25 \cdot 140 = 1.26$	1.875'	2363 #'
	5.04 K		$M_R = 8033$ #'

$M_O = \frac{H'}{3} \cdot P_a = \frac{10}{3} \cdot 2310\#/lf = 7692\#'$

$\frac{M_R}{M_O} = 1.04 < 1.5$ NG

2. CHECK SLIDING

$FS = \frac{(\Sigma V)\tan K_1\phi_1 + BK_2C_2 + P_p}{P_a \cdot \cos\alpha}$

say K_1 & $K_2 = 2/3$

w.c. assume $P_p = 0$

$FS = \frac{(5040\#)\tan\frac{2}{3}\cdot 30 + 3' \cdot \frac{2}{3} \cdot 1000}{2310\#}$

$= \frac{3834}{2310} = 1.65 > 1.5$ OK

3. CHECK PRESSURE OF SOIL @ BASE

$e = \frac{B}{2} - \frac{M_R - M_O}{V} = \frac{4}{2} - \frac{8033 - 7692}{5040} = 1.93'$

$q_{TOE} = \frac{V}{B}\left[\frac{1+6e}{B}\right] = \frac{5040}{4}\left(\frac{1+6\cdot 1.93}{4}\right)$

$= 3963\ psf > 2000$ NG

$q_{HEEL} = \frac{V}{B}\left[\frac{1-6e}{B}\right] = -3333$ (tension)

NG

note: if no surcharge $\gamma = 120\ pcf$ $P_a = 1980\#/lf$

OVERTURNING ⇒ $M_O = 6600\#'$ $\frac{M_R}{M_O} = 1.22 < 1.5$ NG

SLIDING ⇒ FS, $\frac{3834\#}{1980} = 1.94 > 1.5$ OK

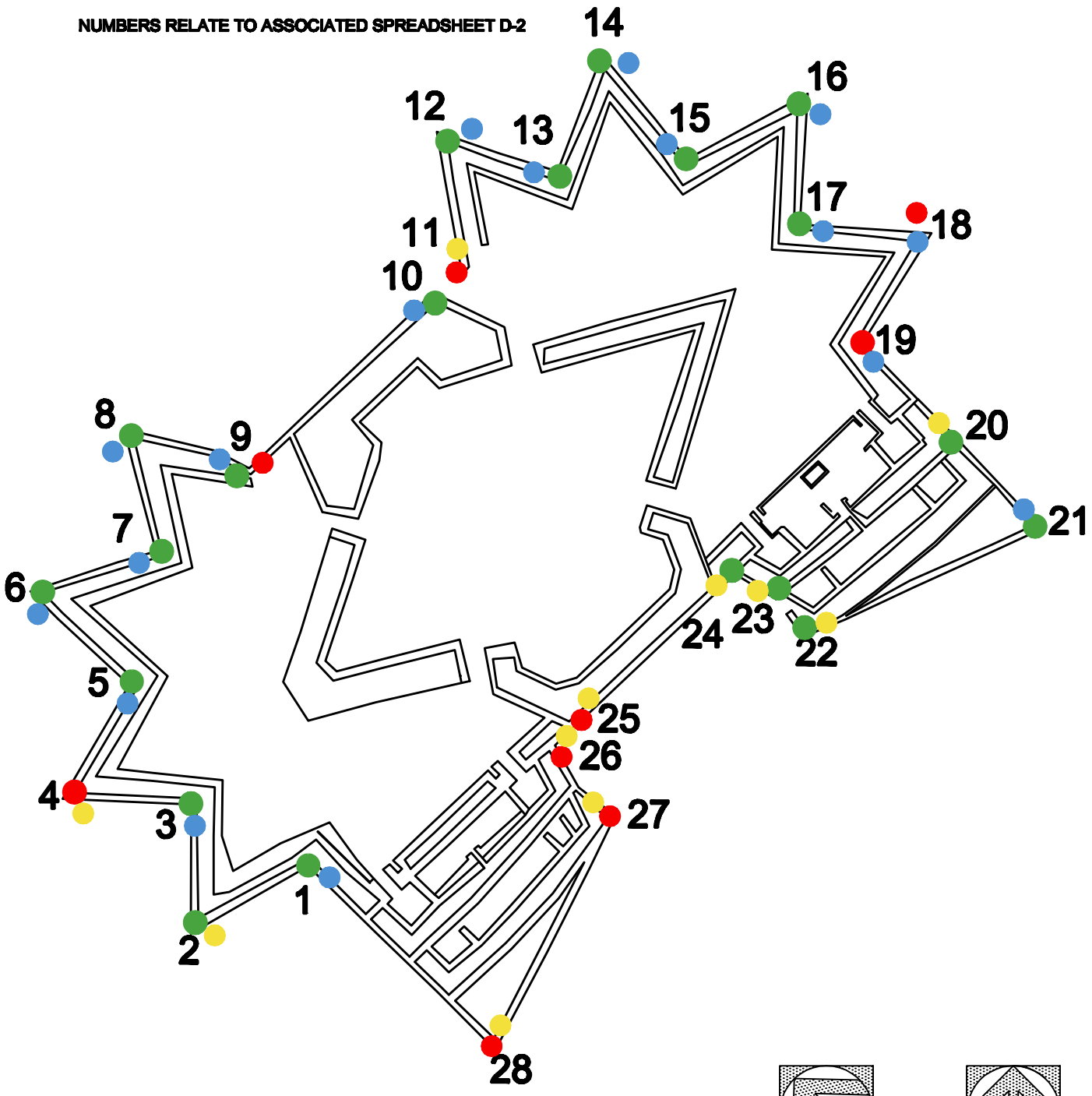
$e = 1.716'$ $q_{TOE} = 3558\ PSF$ OK $q_{HEEL} = -2928\ PSF$ NG

APPENDIX D

WALL HEIGHT - ELEVATION COMPARISON

GRADE APPEARS TO HAVE BEEN RAISED
GRADE APPEARS TO HAVE BEEN LOWERED
EXISTING WALL IS TALLER THAN 1864 PLAN
EXISTING WALL IS SHORTER THAN 1864 PLAN

NUMBERS RELATE TO ASSOCIATED SPREADSHEET D-2



WALL HEIGHT-ELEVATION STUDY

PLAN NORTH

TRUE NORTH

Fort Negley

Comparison of 1864 Drawing and Existing Wall Heights and Grades

	1864					2013					Bot - Diff	Top - Diff	Height-Diff
											2003-1864	2003-1864	2003-1864
Location	Bottom	Top	Wall Height	Bot - Adj	Top - Adj	Bottom	Top	Adjust	Wall Height				
1	251.7	252.7	1	609.2	610.2	610.72	611.27		0.55	Corner Redan1/bastion	1.52	1.07	-0.45
2	246	252.9	6.9	603.5	610.4	603.8	610.97		7.17	Redan 1 point	0.3	0.57	0.27
3	251.2	252.8	1.6	608.7	610.3	609.97	610.91		0.94	Corner Redan1/2	1.27	0.61	-0.66
4	249.5	252.4	2.9	607	609.9	603.1	609.55		6.45	Redan 2 point	-3.9	-0.35	3.55
5	249.4	252.4	3	606.9	609.9	608.04	609.8		1.76	Corner Redan 2/3	1.14	-0.1	-1.24
6	237.5	252	14.5	595	609.5	598.41	609.42		11.01	Redan 3 point	3.41	-0.08	-3.49
7	249.7	252	2.3	607.2	609.5	608.56	610.67		2.11	Corner Redan 3/4	1.36	1.17	-0.19
8	242	252	10	599.5	609.5	602.02	608.96		6.94	Redan 4 point	2.52	-0.54	-3.06
9	252.2	255.9	3.7	609.7	621.1	612.5	612.74		0.24	Corner Redan 4/West Main	2.8	-8.36	-3.46
CO	256.6	263.6	7	614.1	621.1	612.5	619.85		7.35	W end N Main Works	-1.6	-1.25	0.35
10	254.5	262.7	8.2	612	620.2	612.55	620.5		7.95	N Main works at Sallyport (E)	0.55	0.3	-0.25
11	255.6	256.4	0.8	613.1	613.9	612.65	614.66		2.01	Redan 5 at Sallyport	-0.45	0.76	1.21
12	242	255.4	13.4	599.5	612.9	600.93	607.81		6.88	Redan 5 point	1.43	-5.09	-6.52
13	248.4	253	4.6	605.9	610.5	607.37	611.63		4.26	Corner Redan 5/6	1.47	1.13	-0.34
14	241.3	252.61	11.31	598.8	610.11	599.63	606.43	1.7	8.5	Redan 6 point	0.83	-3.68	-2.81
15	249	253.4	4.4	606.5	610.9	607.9	611.32		3.42	Corner Redan 6/7	1.4	0.42	-0.98
16	243.5	250.6	7.1	601	608.1	602.29	607.41		5.12	Redan 7 point	1.29	-0.69	-1.98
17	249.2	254.8	5.6	606.7	612.3	609.48	612.05		2.57	Corner Redan 7/8	2.78	-0.25	-3.03
18	245.3	252.4	7.1	602.8	609.9	602.71	608.85		6.14	Redan 8 point	-0.09	-1.05	-0.96
19	251.2	255	3.8	608.7	612.5	607.89	610.46		2.57	Corner Redan 8/Bastion	-0.81	-2.04	-1.23
20	244.9	245	0.1	602.4	602.5	602.44	607.65		5.21	Mid point/step east bastion	0.04	5.15	5.11
21	224.5	231.6	7.1	582	589.1	582.8	589.34		6.54	SE corner east Bastion	0.8	0.24	-0.56
22	237.6	241	3.4	595.1	598.5	596.66	601.01		4.35	SW corner east Bastion	1.56	2.51	0.95
23	250.7	254	3.3	608.2	611.5	609.3	613.53		4.23	E end South Main Works low	1.1	2.03	0.93
24	250.7	256.6	5.9	608.2	614.1	609.3	619.09		9.79	E end South Main Works high	1.1	4.99	3.89
25	252.3	259.4	7.1	609.8	616.9	609.27	619.3		10.03	W end South Main Works high	-0.53	2.4	2.93
26	254.3	256.4	2.1	611.8	613.9	609.27	613.75		4.48	W end South Main Works low	-2.53	-0.15	2.38
27	242.5	248	5.5	600	605.5	598.1	603.84	0.59	6.33	East corner west Bastion	-1.9	-1.66	0.83
28	232.9	237.6	4.7	590.4	595.1	588.17	595.31		7.14	West corner west Bastion	-2.23	0.21	2.44
	261					620				Bedrock? At Palisade Area 3			

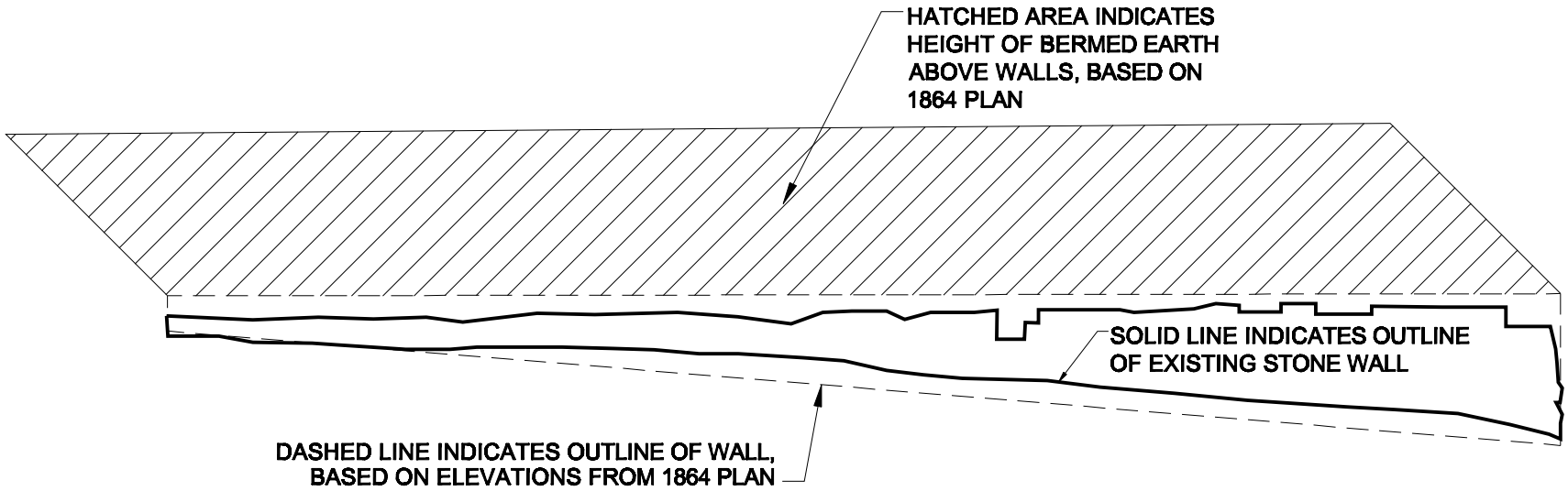
Red indicates an elevation that was not given or was not clear on drawing or survey, value shown is an interpolation

Blue indicates an existing wall that has crumbled, affecting the values in the table

Green indicates values showing bottom of existing wall is above bottom of 1864 wall - assumed fill

Purple indicates an existing wall that is shorter than the 1864 wall

Redan Points
North Main Works
East Bastion
South Main Works
West Bastion



COMPARISON OF 1864 PLAN AND EXISTING WALL PROFILES REDAN #1 - EXTERIOR - NORTH SIDE

APPENDIX E

REPORT OF ARCHAEOLOGICAL INVESTIGATIONS (2013)

Fort Negley (40DV189) Historic Structures Report: Archaeological Investigations

Davidson County, Tennessee

NEW SOUTH ASSOCIATES, INC.

Fort Negley (40DV189) Historic Structures Report: Archaeological Investigations

Davidson County, Tennessee

RFP 297344

Report submitted to:

John Milner Associates, Inc. • 471 West Main Street Suite 200 • Louisville, Kentucky 40202

Report prepared by:

New South Associates • 6150 East Ponce de Leon Avenue • Stone Mountain, Georgia 30083

Brad Botwick – Principal Investigator

Ryan W. Robinson – Archaeologist and Author

November 15, 2013 • Final Report
New South Associates Technical Report 2603

ABSTRACT

New South Associates, Inc. conducted archaeological investigations at Fort Negley (40DV189), a National Register of Historic Places (NRHP) property in Davidson County, Tennessee. This work was completed for John Milner Associates, Inc. of Louisville, Kentucky in support of a Historic Structures Report.

Fort Negley is listed on the NRHP for its Civil War and Works Progress Administration (WPA) significance. The fort was constructed by the Union Army in 1862 and occupied until 1867. Efforts to reconstruct elements of the fort were initiated in 1935 as part of the WPA program and included renovation of masonry fortifications. The fort is currently part of the Fort Negley Historical Park managed by the Nashville Metropolitan Board of Parks and Recreation.

The archaeological investigations were designed to expose and examine the foundation of existing masonry walls and to aid in determining the temporal affiliations of significant periods of construction. Two trenches were excavated along the exterior of outer walls of Fort Negley. Trench 1 was located along the south wall of the fort, and Trench 2 was located along the east wall of the east bastion. Excavation of Trench 1 was terminated prior to exposing the base of the wall due to safety considerations and the foundation construction here could not be determined. The foundation of the east bastion wall was exposed in Trench 2, indicating it was constructed in a stepped fashion to accommodate the southward slope of the hillside on which it sat. The wall was built on base courses of limestone blocks placed atop limestone slabs and residuum at the Trench 2 location. The temporal affiliations of the stone walls and many of the strata in Trenches 1 and 2 could not be determined by the data recovered. However, several fill layers sampled in Trench 1, including material used in the construction of a berm along the south wall of Fort Negley, were likely deposited in the twentieth century.

ACKNOWLEDGEMENTS

Charles Raith from John Milner Associates Inc. facilitated the successful completion of the archaeological investigations. Krista Castillo, Museum Coordinator for the Fort Negley Visitor Center and Park, provided valuable insight into the history of occupation and cultural resource management at Fort Negley. Krista also aided with access to the project area and made the fieldwork more comfortable and enjoyable by providing amenities, refreshments, and pleasant company. Zada Law, Director, Fullerton Laboratory for Spatial Technology, Middle Tennessee State University, also provided valuable insight into the history of occupation and cultural resource management at Fort Negley and gave input on the placement of archaeological trenches. Suzanne Hoyal, Site File Curator with the Tennessee Division of Archaeology, was integral in facilitating the site file search and records review and her assistance is greatly appreciated.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

New South Associates, Inc. (New South) conducted archaeological investigations at Fort Negley (40DV189) in Davidson County, Tennessee, between June 11 and 18, 2013. The project was completed for John Milner Associates, Inc. of Louisville, Kentucky in support of a Historic Structures Report.

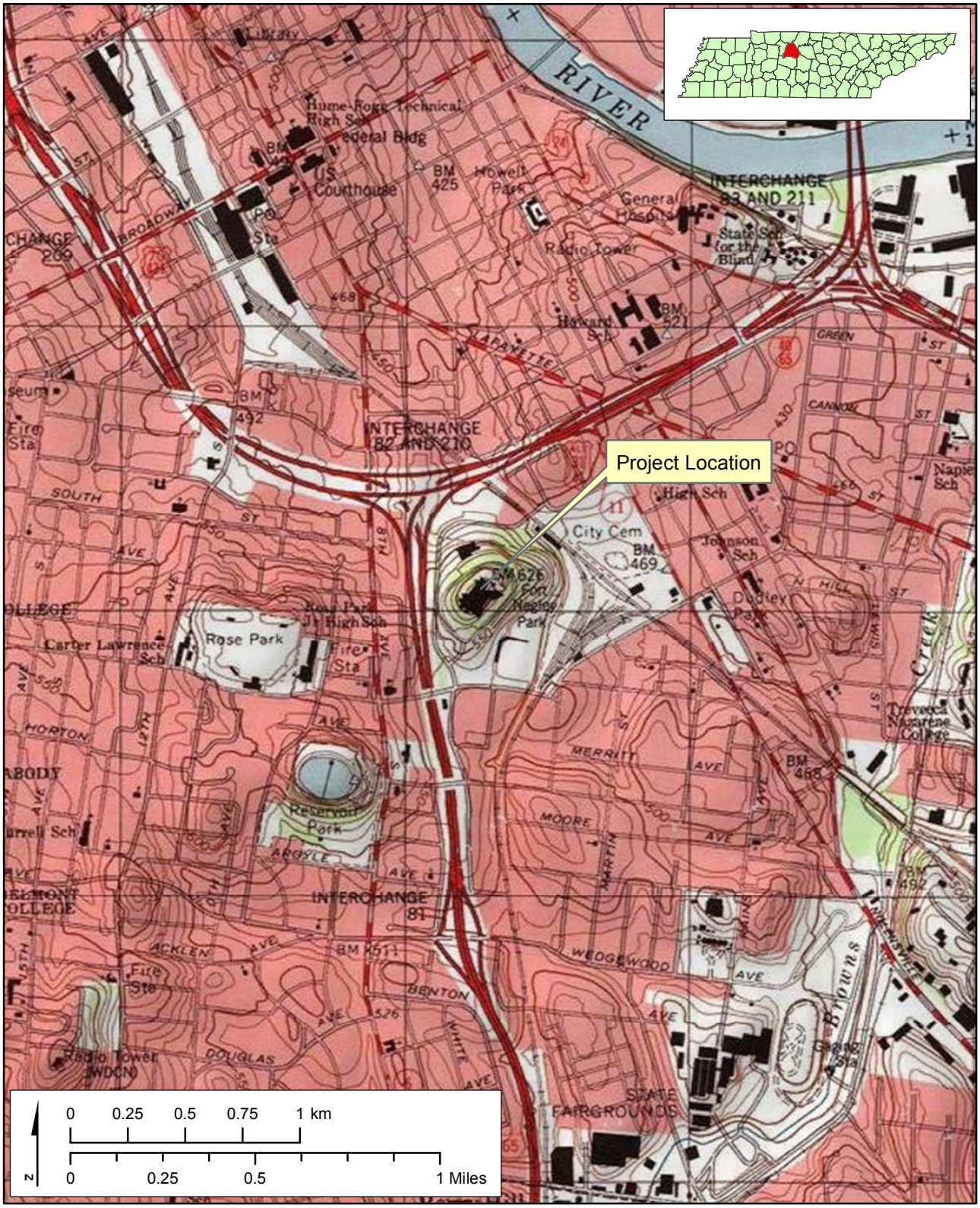
Fort Negley, a National Register of Historic Places (NRHP) property, is located in Nashville, Tennessee, approximately 1.5 miles southeast of the State Capital (Figure 1). Fort Negley was initially constructed in 1862 by Union forces and was occupied by the Union Army until 1867. A reconstruction effort was initiated at Fort Negley in 1935 using laborers from the Works Progress Administration (WPA) program with reconstruction of the masonry walls being the focal point of this effort. Fort Negley is listed on the NRHP for both the Civil War era and the WPA era significance.

The archaeological study was designed to expose and examine the foundation construction of existing masonry walls and to aid in determining significant periods of construction of stone fortifications at Fort Negley. Two trenches were excavated on the exterior sides of the outer walls. The base of the wall foundation was not exposed in one of the trenches due to unsafe excavation conditions and the base of the wall foundation was exposed in the second trench.

Brad Botwick served as Principal Investigator for the project. Ryan Robinson served as the Field Director and authored this report. The project would not have been successful without the assistance of Andrew Brown, Archaeological Field Technician.

This report describes the objectives, methods, and results of this survey, and is organized into four chapters, including this introduction. Previous Investigations are discussed in Chapter II. Field and laboratory methods are presented in Chapter III and the results and recommendations are presented in Chapter IV. A copy of the specimen catalogue is provided in Appendix A. The environmental setting and cultural context of the project area are discussed elsewhere in this Historic Structures Report.

Figure 1.
Project Location Map



Source: 1984 USGS Nashville West, Tennessee Quadrangle

II. PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

A site file search and records review was conducted at the Tennessee Division of Archaeology (TDOA) on May 29, 2013. Copies of the 40DV189 Site Survey Record, excerpts of relevant United States Geological Survey 7.5 minute series quadrangle maps, and relevant reports were obtained during the visit to TDOA. Krista Castillo, Museum Coordinator for the Fort Negley Visitor Center and Park and Zada Law, Director, Fullerton Laboratory for Spatial Technology, Middle Tennessee State University, provided additional background information. Among the background information collected and examined for the current project are reports of three archaeological studies that have been completed at Fort Negley prior to the current study. These studies indicate the nature of archaeological deposits at the site and provide expectations for the present study.

Panamerican Consultants, Inc. conducted an archaeological and archival study of Fort Negley in 1993 to determine what extent of the existing structure dates to the original Civil War construction and what extent dates to the WPA reconstruction (Bergstresser et al. 1994). Results of the 1993 investigation indicate that the WPA reconstruction of Fort Negley closely follows the original ground plan and that the visible portions of the existing structure likely date to the WPA reconstruction. Several courses of Civil War era masonry construction identified below grade indicate that sections of the WPA walls may have been constructed on top of remnants of the Civil War structure. The investigation also revealed that while artifacts from the Union occupation of the fort were re-deposited in twentieth-century fill layers associated with the WPA reconstruction and subsequent park maintenance, Civil War era archaeological deposits may be preserved below the twentieth-century deposits.

DuVall & Associates, Inc. conducted archaeological investigations at Fort Negley in 1999 (Allen 2000). This survey was associated with efforts to stabilize and repair portions of the WPA masonry walls and was designed to "test and assess the nature of archaeological deposits within a series of impact areas scheduled to be restored or stabilized" (Allen 2000). Emphasis was placed on determining the integrity of Civil War era deposits in areas adjacent to the existing masonry walls. Results of the 1999 investigations indicated that Civil War era deposits found at shallow depths along the fort's interior walls and adjacent to the existing walls' exterior have likely been disturbed by the WPA restoration efforts. However, there may still be Civil War deposits at these locations below 50 centimeters. Civil War era deposits are also likely to be

preserved on the exterior of the fort outside of the main gate. These 1999 results corroborate the findings by Panamerican Consultants, Inc. in 1993 that suggested portions of the WPA masonry walls were constructed atop Civil War era footings and walls (Bergstresser et al. 1994).

Alexander Archaeological Consultants, Inc. conducted Phase II Archaeological Testing at Fort Negley in 2007 that was designed to evaluate archaeological resources at the location of a proposed flagpole installation in the stockade area of the fort (Alexander et al. 2007). The identification of a trench feature in a 2x2-meter area prompted additional exposure of the feature. Ten square meters were excavated, and the work uncovered the north bastion of the stockade in its entirety and portions of the main palisade line to the east and west of the bastion. Limited testing at the base of the stockade trench indicated that it had been excavated into bedrock to a depth of approximately 30 centimeters. Large palisade posts were placed in circular holes that were cut into bedrock where the west bastion wall and main palisade intersected. It was determined that the feature was associated with the construction of both the Civil War era stockade and the reconstructed WPA stockade.

III. ARCHAEOLOGICAL METHODS

FIELD METHODS

This study was designed to provide exposure the existing masonry walls' foundation and to aid in determining temporal affiliations of significant periods of construction of stone walls at the fort. Two trenches were placed adjacent to existing walls at locations selected by the consulting structural engineers and were excavated using shovels, small picks, and trowels (Figures 2 and 3). In addition to exposing the sub-grade masonry, artificial berms that were adjacent and parallel to the exterior walls were sampled at both trenches.

Sedimentary strata and soil horizons were generally excavated as natural layers. Individual strata and horizons were excavated in arbitrary four-inch levels in natural layers when the boundaries were unclear. Sedimentary strata and soil horizons were assigned zone designations in the field; zone designations were assigned Roman numerals beginning with Zone I and increasing with consecutive strata or horizons as they were encountered. Zone designations were specific to each of the two trenches and all zone designations were converted to stratum designations during the analysis phase of the investigation.

Grid north was established at a magnetic bearing of 322 degrees (38˚ west of magnetic north) at each trench, and the grid directions are referenced throughout this report when referring to the trenches as well as features of the fort (e.g. walls). All measurements were recorded in English units. Vertical control was maintained by measuring to leveled strings extended from wooden datum stakes. Sediment and soil morphological characteristics, e.g. color and texture, were recorded for each stratum or soil horizon. Representative profiles were photographed and drawn to scale. All sediment and soils were screened through 0.25-inch hardware cloth to facilitate artifact recovery. Artifacts were collected according to excavation unit and level. Artifacts that occurred in bulk, such as brick and slag, were sampled. Recovered artifacts were delivered to New South's Stone Mountain, Georgia laboratory for analysis and temporary curation. All excavated limestone rubble was counted and weighed on site then backfilled into the trenches from which it was excavated.

LABORATORY METHODS

All recovered artifacts were transported to the Stone Mountain, Georgia laboratory facilities of New South Associates, where they were washed, cataloged, and analyzed. Analysis included

Figure 2.
Map Showing Locations of Trenches 1 and 2

Source: ESRI Resource Data

Figure 3.
General Photographs of Trenches 1 and 2

A. Location of Trench 1, Facing East along the South Wall

B. Location of Trench 2, Facing Southwest towards the East Bastion.

cleaning, identifying, cataloging, and curation preparation. Distinct provenience numbers were assigned to each shovel test and surface collection point. Artifacts from each provenience were divided by class and type, and assigned a catalog number.

Historic artifacts were cataloged using a database developed by New South Associates for 4th Dimension Software. Historic items were identified using sources such as Orser (1988), South (1977), and Brown (1982) for ceramics, Nelson (1968) for nails, Jones and Sullivan (1985) for bottle glass, and other sources for various other artifact categories.

All artifacts and paperwork collections are currently housed at New South Associates but will be prepared for curation at the Fort Negley Visitor Center and Park, Davidson County, Tennessee. Artifacts will be placed in separate virgin polyethylene bags by artifact form. Acid-free identification tags will be generated, and the artifact bags will be labeled with the appropriate catalog number, artifact identification, and number of artifacts present. Artifact bags will then be placed in pre-labeled and tagged bags containing all other materials recovered from the same provenience. All provenience bags will be sorted by provenience number and placed in a larger container with all other materials from a given site. Once all artifacts and documentation are completed for the project (including the final report), the assembled collection will be submitted to the curation facility for future research.

IV. RESULTS AND RECOMMENDATIONS

New South conducted the archaeological investigations in order to expose and examine the foundation construction of existing masonry walls and to aid in determining if they date to the Civil War or the WPA periods. Strata in both of Trenches 1 and 2 consisted of fill layers. A natural soil profile, formed in residuum, was excavated at the deepest levels of Trench 2.

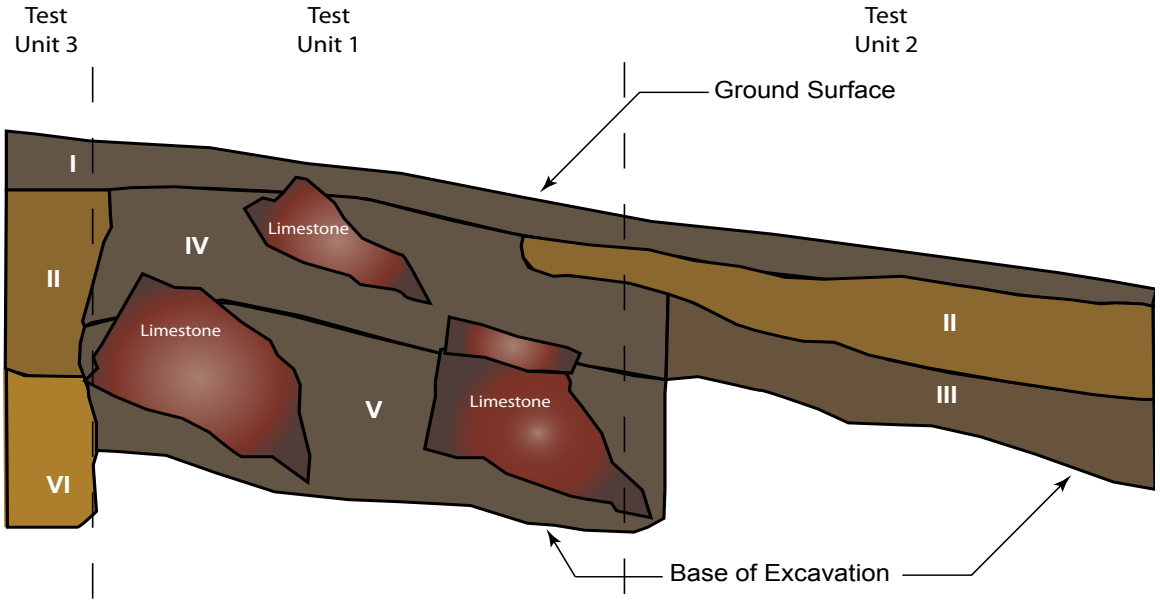
Concerns about the safety of exposing the foundation of the south wall—a task that would have required undercutting limestone blocks that were bulging towards the excavation—caused the termination of excavation in Trench 1 prior to reaching the base of the wall foundation. The base of the wall was exposed in Trench 2 where limestone blocks were positioned atop limestone slabs and residuum.

TRENCH 1

Trench 1 was placed along the south wall of the south main works, roughly halfway between the west and east bastions (see Figure 3a). Trench 1 was aligned perpendicular to the south wall and measured 6x3 feet at the ground surface. Trench 1 was initially established and excavated as two 3x3-foot units: Unit 1 was placed in the north half of the trench, immediately adjacent to and abutting the south wall where it met the ground surface, while Unit 2 was placed in the south half. A third unit, Unit 3, was established to the north of Unit 1 after excavation indicated that the wall sloped inward and away from the excavation unit. Unit 3 was opened four inches below ground surface, measured 0.5x3 feet, and was intended to sample sediments from below a bulging section of the south wall. Units 1, 2, and 3 were excavated to maximum depth of 24, 11, and 24 inches below ground surface, respectively. Excavation of Trench 1 was terminated due to unsafe excavation conditions prior to exposing the wall's foundation; and therefore, the construction method and materials of this foundation were not determined.

Six strata were sampled in Trench 1 (Figure 4; Table 1). Stratum I mantled the surface of Trench 1 and was an A horizon formed in the existing fill. Stratum II was a layer of artificial fill located directly below Stratum I in the southern approximate one half and far northern portion of Trench 1. Stratum III was artificial fill located in the southern approximate one half of Trench 1, directly below Stratum II. Stratum IV was present directly below Stratum I in the northern portion of Trench 1; although the same color and texture as Stratum I, Stratum IV was differentiated by a more compact consistency and a greater content of angular limestone rubble. Stratum IV was the top layer of construction material of the berm that parallels the south wall of

Figure 4.
East Wall Profile of Trench 1



Stratum I = 10YR 3/2 Very Dark Grayish Brown Silt Loam
Stratum II = Mixed: 10YR 3/2 Very Dark Grayish Brown, 10YR 3/3 Dark Brown, and 10YR 4/6 Dark Yellowish Brown Silty Clay Loam
Stratum III = Mixed: 10YR 3/3 Dark Brown, 10YR 4/6 Dark Yellowish Brown, and 10YR 5/4 Yellowish Brown Gravelly Silt Loam
Stratum IV = 10YR 3/2 Very Dark Grayish Brown Silt Loam
Stratum V = 10YR 3/2 Very Dark Grayish Brown Silt Loam with Angular Limestone, Cobbles, and Boulders
Stratum VI = Mixed: 10YR 3/3 Dark Brown, 10YR 4/6 Dark Yellowish Brown, 10YR 5/8 Yellowish Brown, and 10YR 7/1 Light Gray Clay Loam

the fort. Stratum V was directly below Stratum IV and consisted of a linear deposit of limestone rock that formed the core or base of the berm (Figure 5). Strata IV and V thus were the same matrix, but were distinguished by the deposit of limestone in the lower stratum. Stratum VI was a layer of fill located directly below Stratum II in the northern portion of Trench. The deepest excavation levels of Trench 1 extended into Stratum VI.

Table 1. Descriptions of Strata Sampled in Trench 1

Stratum	Color and Texture	Field Designation	Interpretation
I	Dark grayish brown (10YR 3/2) silt loam	Zone I	Stratum I is an A horizon formed in fill.
II	Mixed very dark grayish brown (10YR 3/2), dark brown (3/3), and dark yellowish brown (10YR 4/6) silty clay loam	Zone II (north end of Trench 1) and Zone IV (south end of Trench 1)	Stratum II is a fill layer along either side of the berm that parallels the south wall.
IIA	Very dark grayish brown (10YR 3/2) silty clay loam with coarse mottles of strong brown (7.5YR 5/8), yellowish brown (10YR 5/8), and gray (10YR 6/1)	Feature 1	Stratum IIA is a rodent disturbance.
III	Mixed dark brown (10YR 3/3), dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/4) gravelly silt loam	Zone V	Stratum III is a fill layer in the south end of Trench 1.
IV	Very dark brown (10YR 3/2) silt loam with angular limestone cobbles	Zone III	Stratum IV is the top layer of the berm that parallels the south wall.
V	Angular limestone cobbles and boulders with very dark grayish brown (10YR 3/2) silt loam filling the interstices between limestone particles	Feature 2	Stratum V cores the berm that parallels the south wall.
VI	Mixed dark brown (10YR3/3), dark yellowish brown (10YR 4/6), yellowish brown (10YR 5/8) and light gray (10YR 7/1) clay loam	Zone VI	Stratum VI is a fill layer between the berm and the south wall.

Stratum IIA is a rodent disturbance that was identified as a possible feature, Feature 1, in Trench 1. The surface of the disturbance was identified in the northeast quadrant of the trench, at the surface of Stratum II. Stratum IIA consisted of a very dark grayish brown (10YR 3/2) oval stain with coarse mottles of strong brown (7.5YR 5/8), yellowish brown (10YR 5/8), and gray (10YR 6/1). Upon excavation, several open, meandering burrows were observed throughout the stain and extending into surrounding strata.

Figure 5.
Photographs of Limestone Berm Core in Trench 1

A. Limestone Exposed at Top of Stratum V

B. Limestone Core of Berm after Excavation

Artifacts were recovered from all six strata sampled in Trench 1 (Appendix A). A summary of the Trench 1 artifacts by stratum is provided (excluding faunal specimens and samples of bulk artifacts, e.g. brick and slag) can be found in Table 2. The artifacts recovered from all strata sampled in Trench 1 include brick fragments, shards of clear container glass, and corroded pieces of iron/steel. Shards of chimney glass and flat glass were recovered from most of the Trench 1 strata. Temporally-diagnostic artifacts recovered from Trench 1 date from the nineteenth and twentieth centuries and include: three cut nail fragments, one fragment of a milk glass canning seal, one fragment of a plastic hair brush/comb, two unidentified plastic items, one Prosser button, three pieces of plain whiteware, and one piece of unidentified whiteware. Faunal remains recovered from Trench 1 include bone (nonhuman) and shell; several of the bone specimens were recovered from within and in close proximity to rodent disturbances and the amount of bone attributable to non-cultural processes is unknown.

Table 2. Summary of Artifacts Recovered from Trench 1

Artifact Name	Stratum I count (weight [g])	Stratum II count (weight [g])	Stratum III count (weight [g])	Stratum IV count (weight [g])	Stratum V count (weight [g])	Stratum VI count (weight [g])
Bolt and/or Bracket	0	0	1 (14.2)	0	0	0
Button, Porcelain > 0.5 inch	0	1 (1.4)	0	0	0	0
Canning Seal, Milk glass	0	1 (5.2)	0	0	0	0
Chimney Glass, Body	6 (0.6)	4 (0.5)	0	0	2 (0.1)	0
Container Glass, Amber	1 (0.5)	6 (7)	2 (1.9)	0	0	0
Container Glass, Clear	4 (23.1)	21 (31)	13 (26.6)	1 (5.7)	2 (2.1)	1 (2.2)
Container Glass, Green	0	0	1 (0.4)	0	0	0
Container Glass, Light Green	1 (0.4)	0	0	0	0	6 (11.4)
Container Glass, Olive Green	0	0	0	1 (0.9)	0	1 (1.1)
Eyelet/Rivet/Grommet, Brass	0	1 (0.1)	0	0	0	0
Glass, Burned	0	0	0	5 (2.8)	0	0
Glass, Unmeasured Flat	0	13 (33.5)	9 (32.1)	1 (2.2)	1 (0.6)	1 (1.7)
Iron/ Steel, Unidentified/ Corroded	1 (0.5)	21 (21.5)	1 (0.5)	2 (2)	1 (19.7)	2 (0.2)
Lead, Unidentified	0	2 (5.3)	0	0	0	0
Metal Object, Miscellaneous	0	0	0	1 (0.6)	0	0
Metal Object, Unidentified	0	1 (1)	0	0	0	0
Nail, Cut fragment	1 (2)	0	0	2 (3.5)	0	0

Table 2. Summary of Artifacts Recovered from Trench 1

Artifact Name	Stratum I count (weight [g])	Stratum II count (weight [g])	Stratum III count (weight [g])	Stratum IV count (weight [g])	Stratum V count (weight [g])	Stratum VI count (weight [g])
Nail, Other, Tack	0	1 (0.6)	0	0	0	0
Nail, Unidentified Fragment	0	9 (38.8)	0	0	2 (1.8)	1 (5.3)
Plastic Hair Brush/Comb	0	0	0	1 (4.4)	0	0
Plastic Item, Unidentified	0	2 (2.4)	0	0	0	0
Stoneware, Grey Salt Glazed, Unidentified	0	1 (7.7)	0	0	0	0
Stoneware, Unidentified	0	0	0	0	0	0
White Bodied Earthenware, Burned/ Unidentified	0	5 (4.4)	0	0	0	0
Whiteware, Plain	0	2 (2.6)	0	0	0	1 (0.8)
Whiteware, Unidentified	0	0	0	1 (1.3)	0	0
Total	14 (27.1)	91 (163)	27 (75.7)	15 (23.4)	8 (24.3)	13 (22.7)

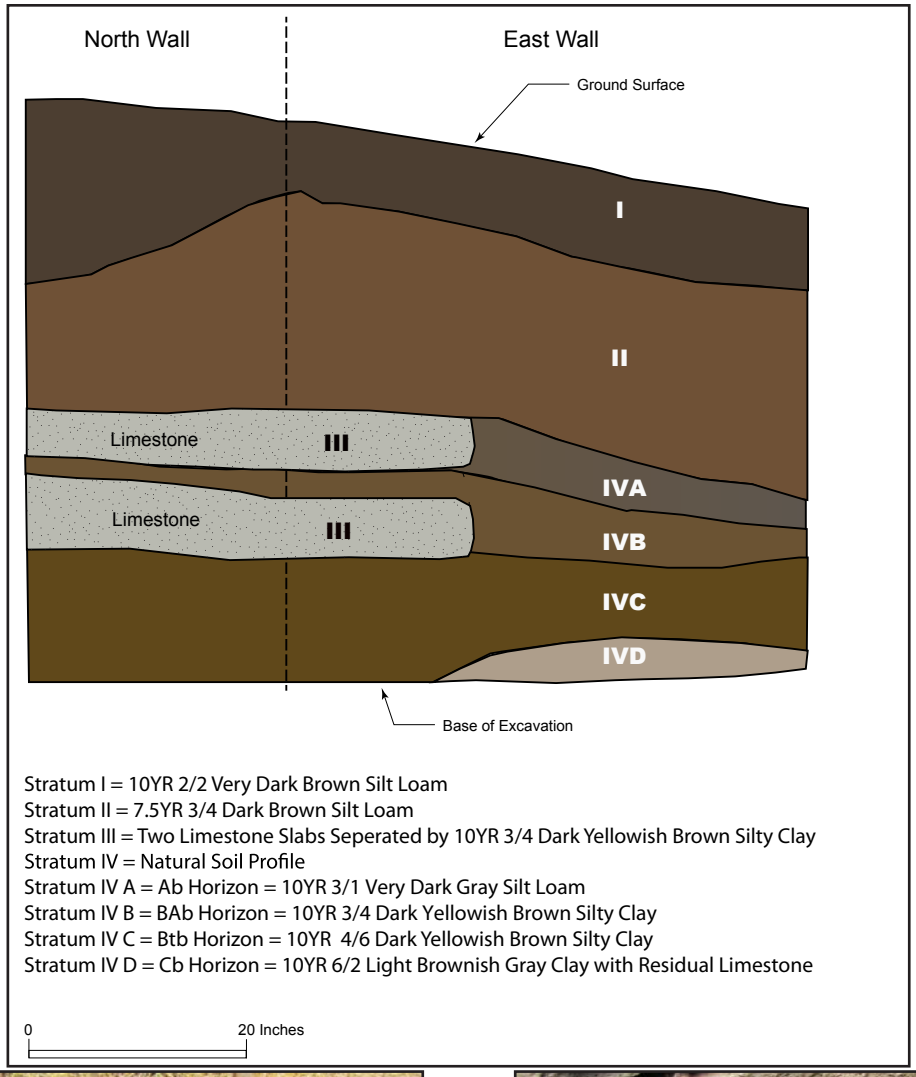
Two unidentified plastic items have beginning dates of 1868 (Miller 2000), and one milk glass canning seal that dates from 1869 (Baugher-Perlin 1982) were recovered from Stratum II. One fragment of a pyralin plastic hair brush/comb that dates as early as 1915 was recovered from Stratum IV (Miller 2000). Strata II and IV were adjacent to one another in the north end of Trench 1; Stratum II was adjacent to the upper portion of Stratum IV and partially overlay a section of Stratum IV along the south half of Trench 1. Both Strata II and IV were directly below Stratum I in Trench 1 (see Figure 4). Therefore, Strata I, II, and IV date to the twentieth century and not to the Civil War construction period. Similarities in color and texture between Stratum IV and Stratum V, as well as their apparent functional relationship as berm fill, suggest that these strata are contemporaneous and that Stratum V, also, dates to the twentieth century.

The temporal affiliations of Strata III and VI in Trench 1 are not clear. Although several of the artifact types could date as early as the Civil War, these types remain in production through the present (e.g. clear container glass and Prosser buttons). Therefore, these strata cannot be clearly linked to the Civil War or the WPA era.

TRENCH 2

Trench 2 was placed at the southeast corner of the fort, along the exterior wall of the east bastion (Figure 6) and measured 4x2 feet. The east bastion wall sits on a hillside that slopes to the south. Trench 2 was excavated as one unit, Unit 4, and had a maximum depth of 55 inches below

Figure 6.
Trench 2 Profile



A. North Wall Profile of Trench 2

B. West Wall Oblique View of Trench 2 Showing the Basal Course of Cut Stones on a Limestone Slab (Left of Photograph) and Residuum.

ground surface. The foundation of the east bastion wall was exposed, and the basal courses of limestone blocks were positioned atop limestone slabs and residuum. It was stepped out to accommodate the southward slope of the hillside.

Four strata were sampled in Trench 2 (Figures 6; Table 3). Strata I, II, and III were fill layers, Stratum IV was natural residuum and soil horizons that formed in Stratum IV are designated Stratum IVA through Stratum IVD. Stratum I is an A horizon, which becomes thicker at the east bastion wall, where it fills a trench or other linear depression. In profile, this depression was between the wall and a berm that was parallel to it. Stratum II is fill material that was used to construct the berm. This berm and ditch were covered by Stratum I and not visible at the surface. Stratum III reflects two limestone slabs that were separated by a thin layer of dark yellowish brown silty clay. These slabs formed the base of the east bastion wall and extended north and east beyond the excavation limits. The exact dimensions of the slabs are unknown. Stratum IV is natural residuum that formed from limestone bedrock. Soil horizons that formed on the residuum are designated Stratum IVA through IVD.

Table 3. Descriptions of Strata Sampled in Trench 2

Stratum	Color	Field Designation	Interpretation
I	Very dark brown (10YR 2/2) silt loam	Zone I and Zone II	Stratum I is the A horizon that mantles Trench 2 and fills a trench or linear depression that was parallel and adjacent to the masonry wall.
II	Dark brown (7.5YR 3/4) silt loam with 25-50 percent angular limestone gravels and cobbles	Zone III and Zone IV	Stratum II is fill that the berm is constructed of.
III	Two limestone slabs separated by a thin layer of dark yellowish brown (10YR 3/4) silty clay	N/A	Limestone slabs in Stratum III are wall footers.
IV	N/A	N/A	Stratum IV is natural limestone residuum.
IVA	Very dark gray (10YR 3/1) silt loam	Zone V	Stratum IVA is an Ab horizon.
IVB	Dark yellowish brown (10YR 3/4) silty clay	Zone VI	Stratum IVB is a BAb horizon.
IVC	Dark yellowish brown (10YR 4/6) silty clay	Zone VII	Stratum IVC is a Btb horizon.
IVD	Light brownish gray (10YR 6/2) clay with weathered limestone fragments	Zone VIII	Stratum IVD is a Cb horizon.

Artifacts were recovered only from Strata I and II (Appendix A). A summary of the Trench 2 artifacts by stratum is provided in Table 4 (excluding faunal specimens and samples of bulk artifacts, e.g. brick and slag). Both strata yielded brick fragments, shards of container glass (amber and clear), corroded pieces of iron/steel, cut nail fragments, charcoal, and slag, but the quantities were greater in Stratum I. Stratum I also yielded a more diverse assemblage, containing types not recovered from Stratum II, including: chimney glass, cinder/clinkers, coal, concrete, aqua container glass, green container glass, light green container glass, milk glass container glass, unmeasured flat glass, one graphite object, stoneware, and whiteware. In contrast, the only artifact types recovered from Stratum II that were not present in Stratum I are one piece of olive green container glass and one unidentified metal object.

The earliest temporally diagnostic artifacts consist of two pieces of milk glass from Stratum I. Milk glass has a start date of 1743 (Miller 2000). Other temporally diagnostic artifacts date from the nineteenth century and consist of three cut nail fragments and three pieces of plain whiteware. Two of the cut nail fragments and all three pieces of plain whiteware were recovered from Stratum I, one cut nail fragment was recovered from Stratum II. All of these artifacts types were produced throughout the nineteenth century and into the twentieth century; therefore, they do not provide concise dates for the strata from this trench.

Table 4. Summary of Artifacts Recovered from Trench 2

Artifact Name	Stratum I count (weight [g])	Stratum II count (weight [g])
Chimney Glass, Body	1 (0.1)	0
Container Glass, Amber	14 (96.4)	1 (1.7)
Container Glass, Aqua	1 (0.3)	0
Container Glass, Clear	18 (69.5)	1 (1)
Container Glass, Green	1 (7.1)	0
Container Glass, Light Green	1 (3.1)	0
Container Glass, Olive Green	0	1 (0.7)
Container Glass, Milk Glass	2 (0.3)	0
Glass, Unmeasured Flat	12 (74.7)	0
Graphite Object	1 (4.4)	0
Iron/ Steel, Unidentified/ Corroded	45 (40.8)	1 (3.9)
Metal Object, Unidentified	0	1 (6.8)
Nail, Cut Common, Unmeasured	2 (13.3)	1 (1.8)
Nail, Unidentified Fragment	8 (6.6)	0
Stoneware, Unidentified	1 (15.8)	0
Whiteware, Plain	3 (31.8)	0
Total	110 (364.2)	6 (15.9)

The differences in quantity and diversity of the Strata I and II assemblages could reflect different time periods or formation processes. Stratum II consists of limestone rubble that served as the fill material for the berm that parallels the east bastion wall. The higher number of artifacts in Stratum I may be a result of its position at the ground surface. Differences in the quantity and types of artifacts from Strata I and II may also reflect separate parent material sources of the fill. Fill material for Stratum I may have been borrowed from an area with a higher artifact density and material for Stratum II may have been borrowed from an area with a lower artifact density. Again, however, these strata cannot be dated precisely and so they cannot be definitively related to either the Civil War or the WPA era.

SUMMARY OF RESULTS AND RECOMMENDATIONS

Excavation of Trench 1 was terminated prior to exposing the base of the south wall due to safety considerations, and construction of the south wall's foundation could not be determined. Likewise, the temporal affiliation of the stone wall in Trench 1 could not be determined by the data recovered. Strata I, II, IV, and V in Trench 1 likely date from the twentieth century, and the ages of Strata III and VI could not be determined. Strata IV and V in Trench 1 consist of fill material used in the construction of the berm that parallels the south wall of Fort Negley. The purpose and chronology of other fill layers sampled in Trench 1 is not known.

The foundation of the east bastion wall was exposed in Trench 2 and the basal courses of limestone blocks were positioned atop limestone slabs (Stratum III) and residuum (Stratum IVD). In addition, the foundation of the east bastion wall was stepped to accommodate the southward slope of the hillside on which it was constructed. Despite exposing the east bastion wall foundation, the temporal affiliation of the stone wall could not be determined. Stratum II in this trench consisted of fill material used to build a berm along the east bastion wall. Stratum I was the A horizon and filled the ditch or depression at the east bastion wall. The artifacts from Strata I and II do not clearly indicate if the fill layers in Trench 2 reflect Civil War era building events or WPA reconstruction. Temporally diagnostic artifacts from both strata have lengthy manufacturing date ranges and do not provide precise dates.

The results of this study could not definitively determine the dates of wall construction or the ages of the associated fill strata within the two test trenches. Additional archaeological excavations should be conducted along stone walls at Fort Negley in order to examine the foundation construction of existing walls and to aid in determining the temporal affiliations of construction events. Further excavations along the exterior and interior walls may provide insight into temporal affiliations of the stone walls, fill layers, and construction techniques used.

Additional investigations along the exterior walls at Fort Negley may also provide insight into the intended function of landscape elements at the fort. Although the ditch along the east bastion at Trench 2 may have been designed to remain open to facilitate drainage along the wall, the intended function of this ditch could not be determined by the current investigation. Likewise, the intended functions of the berms that parallel the exterior walls at both trench locations are uncertain. Further exposure and sampling of these features is recommended in order to better understand their intended functions.

REFERENCES CITED

Alexander, Lawrence, Hanan Browning, and Carl Kuttruff

2007 *Phase II Archeological Investigations of Fort Negley Proposed Flagpole Installation Site, Davidson County, Tennessee*. Alexander Archaeological Consultants, Inc. Submitted to Zada Law Consulting. Copies available from Alexander Archaeological Consultants, Inc. Tennessee.

Allen, Dan Sumner

2000 *Report of 1999 Investigations at Fort Negley: Tennessee Archaeological Site 40DV189, A Federal Army Civil War Period Military Site in Davidson County, Tennessee*. DuVall & Associates, Inc. Submitted to Leatherwood Inc. for the Metropolitan Board of Parks and Recreation; Copies available from DuVall & Associates, Inc., Franklin, Tennessee.

Baugher-Perlin, Sherene

1982 Analyzing Glass Bottles for Chronology, Function, and Trade Networks. In *Archaeology of Urban America, the Search for Pattern and Process*, edited by Roy S. Dickens Jr., pp. 259–273. Academic Press, New York, New York.

Bergstresser, Jack R., Shari D. Moore, and Susan L. Nielsen

1994 *Fort Negley 130 Years Later: An Archeological Assessment*. Panamerican Consultants, Inc. Submitted to Government of Nashville and Davidson County; Copies available from Panamerican Consultants, Inc., Tennessee.

Brown, Ann R.

1982 Historic Ceramic Typology with Principal Dates of Manufacture and Descriptive Characteristics for Identification. *Deldot Archeology*. Series 15.

Jones, Olive R., and Catherine Sullivan

1985 *The Parks Canada Glass Glossary for the Description of Containers, Tableware, Flat Glass, and Closures*. National Historic Parks and Sites Branch, Parks Canada, Environment Canada.

Miller, George L.

2000 Telling Time for Archaeologists. *Northeast Historical Archaeology* 29:1–22.

Nelson, Lee H.

1968 Nail Chronology as an Aid to Dating Old Buildings. *Technical Leaflet No. 15* 24(11). American Association for State and Local History, Nashville, Tennessee.

Orser, Charles E., Jr.

1988 *The Material Basis of the Postbellum Tenant Plantation: Historical Archaeology in the South Carolina Piedmont*. University of Georgia Press, Athens, Georgia.

South, Stanley

1977 *Method and Theory In Historical Archaeology*. Academic Press, Inc., London.

APPENDIX A: SPECIMEN CATALOG

Specimen Catalog

County: Davidson County
State: Tennessee
Project: Ft. Negley Historic Structures (2013)

State Site #	Prov Bag #	Excavation Unit	Vertical Location	Count/ Weight	Artifact Description	Field Date
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	1 (0.1g)	Chimney Glass, Body, Unidentified	6/11/13
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	1 (0.4g)	Container Glass, Light Green	6/11/13
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	1 (0.3g)	Mortar	6/11/13
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	1 (0.5g)	Iron/ Steel, Unidentified/ Corroded	6/11/13
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	1 (0.9g)	Brick, Unidentified	6/11/13
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	1 (2g)	Nail, Cut Fragment	6/11/13
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	1 (18g)	Container Glass, Clear, embossed '...OLD...TIME...'	6/11/13
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	5 (33.4g)	Stone, Unmodified, concretions	6/11/13
40DV189	1	Trench 1, Unit 1	Level 1, 10.5-13 indb, Stratum I	5 (33.4g)	Stone, Non-Cultural, concretions	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	3 (0.7g)	Coal	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	4 (0.7g)	Charcoal	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	3 (0.8g)	Shell, Unidentified	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	1 (0.4g)	Mortar	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	2 (0.4g)	Brick, Unidentified	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	6 (5.3g)	Iron/ Steel, Unidentified/ Corroded	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	1 (1.2g)	Container Glass, Clear	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	3 (6g)	Nail, Unidentified Fragment	6/11/13
40DV189	2	Trench 1, Unit 1	Level 1, 10-14 indb, Stratum II	2 (21.8g)	Stone, Unmodified, concretions	6/11/13
40DV189	3	Trench 1, Unit 1	Level 1, 13 indb, Stratum II	1 (50.3g)	Shell, Clam	6/11/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	5 (4.4g)	White Bodied Earthenware, Burned/ Unidentified	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	2 (0.6g)	Coal	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	1 (0.7g)	Charcoal	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	3 (2.3g)	Cinder/Clinker	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	2 (2g)	Stone, Indeterminant	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	5 (24.8g)	Glass, Unmeasured Flat	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	1 (1.4g)	Button, Porcelain, Prosser	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	7 (5.2g)	Iron/ Steel, Unidentified/ Corroded	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	1 (0.1g)	Eyelet/Rivet/Grommet, Brass	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	3 (6g)	Iron Oxide Concretion	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	3 (19.7g)	Nail, Unidentified Fragment	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	1 (0.2g)	Chimney Glass, Body, Unidentified	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	3 (0.9g)	Container Glass, Clear	6/12/13
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	6 (39g)	Brick, Unidentified	6/12/13

New South Associates, Inc.
6150 E. Ponce de Leon Avenue
Stone Mountain, GA 30083

Specimen Catalog

County: Davidson County
State: Tennessee
Project: Ft. Negley Historic Structures (2013)

State Site #	Prov Bag #	Excavation Unit	Vertical Location	Count/ Weight	Artifact Description	Field Date
40DV189	4	Trench 1, Unit 1	Level 2, 14-17.5 indb, Stratum II	3 (3.1g)	Bone, Non-Human	6/12/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	1 (1g)	Metal Object, Unidentified, non iron/steel	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	2 (5.3g)	Lead, Unidentified	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	1 (8.3g)	Stone, Indeterminant	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	5 (8.4g)	Iron/ Steel, Unidentified/ Corroded	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	3 (13.1g)	Nail, Unidentified Fragment	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	1 (0.6g)	Nail, Other, Tack	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	1 (0.4g)	Charcoal	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	1 (1.4g)	Cinder/Clinker	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	2 (0.9g)	Brick, Unidentified	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	1 (1.7g)	Whiteware, Plain	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	1 (7.7g)	Stoneware, Grey Salt Glazed, Unidentified	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	2 (1.1g)	Stone, Unmodified, limestone	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	2 (6.4g)	Shell, Unidentified, concreted	6/13/13
40DV189	5	Trench 1, Unit 1	Level 3, 17.5-21 indb, Stratum II	2 (1.2g)	Bone, Non-Human	6/13/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (0.6g)	Metal Object, Miscellaneous, brass ring	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (1.3g)	Whiteware, Unidentified, Unidentified Partial Maker's Mark	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	2 (2g)	Iron/ Steel, Unidentified/ Corroded	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	2 (1.1g)	Stone, Indeterminant	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	5 (2.8g)	Glass, Burned	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (0.9g)	Container Glass, Olive Green	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (2.2g)	Glass, Unmeasured Flat	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (5.7g)	Container Glass, Clear	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (14.5g)	Iron Oxide Concretion	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (4.4g)	Plastic Hair Brush/Comb	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	2 (3.5g)	Nail, Cut Fragment	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	2 (40g)	Brick, Unidentified	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (1g)	Bone, Non-Human	6/11/13
40DV189	6	Trench 1, Unit 1	Level 1, 13-15.5 indb, Stratum IV	1 (1.6g)	Shell, Unidentified	6/11/13
40DV189	7	Trench 1, Unit 1	Level 1, 21-24 indb, Stratum VI	2 (0.2g)	Iron/ Steel, Unidentified/ Corroded	6/13/13
40DV189	7	Trench 1, Unit 1	Level 1, 21-24 indb, Stratum VI	1 (0.8g)	Whiteware, Plain	6/13/13
40DV189	7	Trench 1, Unit 1	Level 1, 21-24 indb, Stratum VI	1 (1.1g)	Container Glass, Olive Green	6/13/13
40DV189	8	Trench 1, Unit 1 & 3	Level 2, 24-31 indb, Stratum VI	2 (2.6g)	Brick, Unidentified	6/18/13

Specimen Catalog

County: Davidson County
State: Tennessee
Project: Ft. Negley Historic Structures (2013)

State Site #	Prov Bag #	Excavation Unit	Vertical Location	Count/ Weight	Artifact Description	Field Date
40DV189	8	Trench 1, Unit 1 & 3	Level 2, 24-31 indb, Stratum VI	1 (2.2g)	Container Glass, Clear	6/18/13
40DV189	8	Trench 1, Unit 1 & 3	Level 2, 24-31 indb, Stratum VI	1 (1.7g)	Glass, Unmeasured Flat	6/18/13
40DV189	8	Trench 1, Unit 1 & 3	Level 2, 24-31 indb, Stratum VI	6 (11.4g)	Container Glass, Light Green	6/18/13
40DV189	8	Trench 1, Unit 1 & 3	Level 2, 24-31 indb, Stratum VI	1 (5.3g)	Nail, Unidentified Fragment	6/18/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	1 (0.5g)	Whiteware, Plain	6/11/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	1 (0.6g)	Container Glass, Clear	6/11/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	1 (1.4g)	Container Glass, Amber	6/11/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	1 (1.3g)	Container Glass, Olive Green	6/11/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	1 (0.6g)	Brick, Unidentified	6/11/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	2 (1.8g)	Coal	6/11/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	1 (8.6g)	Container Glass, Aqua, bottle neck, fragment	6/11/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	4 (5.9g)	Nail, Unidentified Fragment	6/11/13
40DV189	9	Trench 1, Unit 1, Feature 1, S	Level 1, 13-19 indb, Stratum IIA	1 (0.1g)	Teeth, Non-Human	6/11/13
40DV189	10	Trench 1, Unit 1, Feature 1, N	Level 1, 13-19 indb, Stratum IIA	1 (0.2g)	Whiteware, Plain	6/11/13
40DV189	10	Trench 1, Unit 1, Feature 1, N	Level 1, 13-19 indb, Stratum IIA	3 (128.7g)	Brick, Unidentified	6/11/13
40DV189	10	Trench 1, Unit 1, Feature 1, N	Level 1, 13-19 indb, Stratum IIA	2 (5.4g)	Nail, Unidentified Fragment	6/11/13
40DV189	10	Trench 1, Unit 1, Feature 1, N	Level 1, 13-19 indb, Stratum IIA	1 (4.1g)	Coal	6/11/13
40DV189	11	Trench 1, Unit 2	Level 1, 17.5-18 indb, Stratum I	1 (0.5g)	Container Glass, Amber	6/12/13
40DV189	11	Trench 1, Unit 2	Level 1, 17.5-18 indb, Stratum I	5 (0.5g)	Chimney Glass, Body, Unidentified	6/12/13
40DV189	11	Trench 1, Unit 2	Level 1, 17.5-18 indb, Stratum I	3 (1.5g)	Brick, Unidentified	6/12/13
40DV189	11	Trench 1, Unit 2	Level 1, 17.5-18 indb, Stratum I	3 (4.5g)	Iron Oxide Concretion	6/12/13
40DV189	11	Trench 1, Unit 2	Level 1, 17.5-18 indb, Stratum I	3 (5.1g)	Container Glass, Clear	6/12/13

Specimen Catalog

County: Davidson County
State: Tennessee
Project: Ft. Negley Historic Structures (2013)

State Site #	Prov Bag #	Excavation Unit	Vertical Location	Count/ Weight	Artifact Description	Field Date
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	1 (2.5g)	Sandstone	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	1 (5.2g)	Canning Seal, Milk Glass	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	2 (0.2g)	Chimney Glass, Body, Unidentified	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	2 (2g)	Container Glass, Amber	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	8 (10.8g)	Container Glass, Clear	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	1 (0.8g)	Iron/ Steel, Unidentified/ Corroded	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	2 (2.4g)	Plastic Item, Unidentified	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	7 (7.5g)	Brick, Unidentified	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	2 (10.5g)	Stone, Unmodified	6/12/13
40DV189	12	Trench 1, Unit 2	Level 1, 18-21 indb, Stratum II	1 (1.8g)	Bone, Non-Human	6/12/13
40DV189	13	Trench 1, Unit 2	Level 2, 21-22 indb, Stratum II	1 (0.5g)	Brick, Unidentified	6/13/13
40DV189	13	Trench 1, Unit 2	Level 2, 21-22 indb, Stratum II	1 (0.9g)	Whiteware, Plain	6/13/13
40DV189	13	Trench 1, Unit 2	Level 2, 21-22 indb, Stratum II	2 (0.5g)	Coal	6/13/13
40DV189	13	Trench 1, Unit 2	Level 2, 21-22 indb, Stratum II	1 (0.1g)	Chimney Glass, Body, Unidentified	6/13/13
40DV189	13	Trench 1, Unit 2	Level 2, 21-22 indb, Stratum II	4 (1.4g)	Glass, Unmeasured Flat	6/13/13
40DV189	13	Trench 1, Unit 2	Level 2, 21-22 indb, Stratum II	4 (6.8g)	Container Glass, Amber	6/13/13
40DV189	13	Trench 1, Unit 2	Level 2, 21-22 indb, Stratum II	9 (18.1g)	Container Glass, Clear	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	15 (30.6g)	Brick, Unidentified	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	1 (14.2g)	Bolt And/Or Bracket	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	1 (0.5g)	Iron/ Steel, Unidentified/ Corroded	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	1 (0.4g)	Container Glass, Green	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	5 (6.2g)	Glass, Unmeasured Flat	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	13 (26.6g)	Container Glass, Clear	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	2 (1.9g)	Container Glass, Amber	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	2 (0.5g)	Charcoal	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	2 (0.9g)	Cinder/Clinker	6/13/13

Specimen Catalog

County: Davidson County
State: Tennessee
Project: Ft. Negley Historic Structures (2013)

State Site #	Prov Bag #	Excavation Unit	Vertical Location	Count/ Weight	Artifact Description	Field Date
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	2 (6.9g)	Stone, Unmodified, limestone	6/13/13
40DV189	14	Trench 1, Unit 2	Level 1, 25.5-28.5 indb, Stratum III	2 (0.6g)	Bone, Non-Human	6/13/13
40DV189	15	Trench 1, Unit 1 & 2, Feature 2, SE	Level 1, 15.5-28 indb, Stratum V	2 (1.1g)	Charcoal	6/18/13
40DV189	15	Trench 1, Unit 1 & 2, Feature 2, SE	Level 1, 15.5-28 indb, Stratum V	2 (1.8g)	Nail, Unidentified Fragment	6/18/13
40DV189	15	Trench 1, Unit 1 & 2, Feature 2, SE	Level 1, 15.5-28 indb, Stratum V	2 (0.1g)	Chimney Glass, Body, Unidentified	6/18/13
40DV189	15	Trench 1, Unit 1 & 2, Feature 2, SE	Level 1, 15.5-28 indb, Stratum V	1 (1.7g)	Container Glass, Clear	6/18/13
40DV189	15	Trench 1, Unit 1 & 2, Feature 2, SE	Level 1, 15.5-28 indb, Stratum V	2 (8.8g)	Shell, concretion	6/18/13
40DV189	15	Trench 1, Unit 1 & 2, Feature 2, SE	Level 1, 15.5-28 indb, Stratum V	15 (16.6g)	Brick, Unidentified	6/18/13
40DV189	15	Trench 1, Unit 1 & 2, Feature 2, SE	Level 1, 15.5-28 indb, Stratum V	1 (0.2g)	Bone, Non-Human	6/18/13
40DV189	16	Trench 1, Unit 1, Feature 2, NW	15.5-28 indb, Stratum V	1 (2.9g)	Shell	6/12/13
40DV189	16	Trench 1, Unit 1, Feature 2, NW	15.5-28 indb, Stratum V	1 (0.6g)	Glass, Unmeasured Flat	6/12/13
40DV189	16	Trench 1, Unit 1, Feature 2, NW	15.5-28 indb, Stratum V	1 (0.4g)	Container Glass, Clear	6/12/13
40DV189	16	Trench 1, Unit 1, Feature 2, NW	15.5-28 indb, Stratum V	1 (19.7g)	Iron/ Steel, Unidentified/ Corroded	6/12/13
40DV189	16	Trench 1, Unit 1, Feature 2, NW	15.5-28 indb, Stratum V	3 (25.6g)	Brick, Unidentified	6/12/13
40DV189	17	Trench 1, Unit 3	Level 1, 11-21 indb, Stratum II	4 (7.3g)	Glass, Unmeasured Flat	6/13/13
40DV189	17	Trench 1, Unit 3	Level 1, 11-21 indb, Stratum II	2 (3.3g)	Coal	6/13/13
40DV189	17	Trench 1, Unit 3	Level 1, 11-21 indb, Stratum II	1 (2.4g)	Slag	6/13/13
40DV189	17	Trench 1, Unit 3	Level 1, 11-21 indb, Stratum II	3 (2g)	Cinder/Clinker	6/13/13
40DV189	17	Trench 1, Unit 3	Level 1, 11-21 indb, Stratum II	2 (1.8g)	Iron/ Steel, Unidentified/ Corroded	6/13/13
40DV189	17	Trench 1, Unit 3	Level 1, 11-21 indb, Stratum II	2 (4g)	Shell, concretions	6/13/13
40DV189	17	Trench 1, Unit 3	Level 1, 11-21 indb, Stratum II	5 (17.9g)	Brick, Unidentified	6/13/13

Specimen Catalog

County: Davidson County
State: Tennessee
Project: Ft. Negley Historic Structures (2013)

State Site #	Prov Bag #	Excavation Unit	Vertical Location	Count/ Weight	Artifact Description	Field Date
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	6 (66.9g)	Container Glass, Amber	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	1 (29.4g)	Whiteware, Plain	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	7 (30.7g)	Glass, Unmeasured Flat	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	2 (1.6g)	Coal	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	2 (0.7g)	Nail, Unidentified Fragment	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	2 (5.9g)	Iron/ Steel, Unidentified/ Corroded	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	5 (9.3g)	Slag	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	5 (11.4g)	Brick, Unidentified	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	1 (3.1g)	Container Glass, Light Green	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	2 (1.3g)	Container Glass, Clear	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	1 (4.4g)	Graphite Object	6/13/13
40DV189	18	Trench 2, Unit 4	Level 1, 14-19 indb, Stratum I	2 (2.1g)	Cinder/Clinker	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	2 (133.9g)	Brick, Unidentified	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	5 (17.3g)	Container Glass, Amber	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	7 (19.6g)	Container Glass, Clear	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	1 (15.8g)	Stoneware, Unidentified	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	1 (0.3g)	Container Glass, Aqua	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	2 (12.1g)	Coal	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	6 (13.3g)	Slag	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	1 (1.6g)	Glass, Unmeasured Flat	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	26 (15.1g)	Iron/ Steel, Unidentified/ Corroded	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	4 (4.2g)	Nail, Unidentified Fragment	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	1 (4.7g)	Nail, Cut Common, Unmeasured	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	1 (6.6g)	Concrete	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	1 (1g)	Charcoal	6/13/13
40DV189	19	Trench 2, Unit 4	Level 1, 19-23 indb, Stratum I	6 (1.8g)	Bone, Non-Human	6/13/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	2 (1.7g)	Nail, Unidentified Fragment	6/14/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	2 (2.1g)	Brick, Unidentified	6/14/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	1 (0.3g)	Slag	6/14/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	17 (19.8g)	Iron/ Steel, Unidentified/ Corroded	6/14/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	1 (2.4g)	Whiteware, Plain	6/14/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	2 (0.3g)	Container Glass, Milk Glass	6/14/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	1 (0.1g)	Chimney Glass, Body, Unidentified	6/14/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	2 (3.4g)	Glass, Unmeasured Flat	6/14/13
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	2 (10.7g)	Container Glass, Amber	6/14/13

Specimen Catalog

County: Davidson County
State: Tennessee
Project: Ft. Negley Historic Structures (2013)

State Site #	Prov Bag #	Excavation Unit	Vertical Location	Count/ Weight	Artifact Description	Field Date
40DV189	20	Trench 2, Unit 4	Level 2, 23-27 indb, Stratum I	6 (6.5g)	Container Glass, Clear	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	6 (1.4g)	Slag	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	1 (40.4g)	Container Glass, Clear, Neck and Finish Fragment	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	2 (39g)	Glass, Unmeasured Flat	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	1 (1.5g)	Container Glass, Amber	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	2 (1.5g)	Brick, Unidentified	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	1 (1.5g)	Coal	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	2 (1.7g)	Container Glass, Clear	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	1 (7.1g)	Container Glass, Green	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	1 (8.6g)	Nail, Cut Common, Unmeasured	6/14/13
40DV189	21	Trench 2, Unit 4	Level 3, 27-30.5 indb, Stratum I	2 (5.9g)	Cinder/Clinker	6/14/13
40DV189	22	Trench 2, Unit 4	Level 1, 30.5-35 indb, Stratum II	10 (275.7g)	Brick, Unidentified	6/14/13
40DV189	22	Trench 2, Unit 4	Level 1, 30.5-35 indb, Stratum II	2 (27.7g)	Bone, Non-Human	6/14/13
40DV189	22	Trench 2, Unit 4	Level 1, 30.5-35 indb, Stratum II	1 (1.7g)	Container Glass, Amber	6/14/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	32 (499.6g)	Brick, Unidentified	6/17/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	5 (17.1g)	Bone, Non-Human	6/17/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	1 (3.9g)	Iron/ Steel, Unidentified/ Corroded	6/17/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	1 (6.8g)	Metal Object, Unidentified, brass/copper	6/17/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	2 (0.6g)	Slag	6/17/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	1 (1.8g)	Nail, Cut Common, Unmeasured	6/17/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	1 (0.3g)	Charcoal	6/17/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	1 (0.7g)	Container Glass, Olive Green	6/17/13
40DV189	23	Trench 2, Unit 4	Level 1, 35-55 indb, Stratum II	1 (1g)	Container Glass, Clear	6/17/13

APPENDIX G

COST ESTIMATE

FORT NEGLEY
HISTORICAL STRUCTURE REPORT
NASHVILLE, TENNESSEE
SCHEMATIC DESIGN COST ESTIMATE

The following information must be considered and used in conjunction with the Construction Cost Estimate.

1. Information used in the preparation of this Estimate includes:

   A. John Milner Associates Schematic Design Drawing Set, dated October 10, 2013, received by ICI October 11, 2013.

   B. John Milner Associates Historical Structure Report, dated October 10, 2013, received by ICI October 11, 2013.

2. This Estimate is developed and documented according to the Work Recommendations and Priorities, as outlined in the Historical Structure Report.

3. This Estimate is based on fourth quarter, 2013 construction unit prices. No escalation has been included. Once a construction period has been established, the appropriate escalation factor, based on three percent (3%) per year must be added.

4. The general contractor's overhead and profit are included in General Requirements, which is added following the Estimate Details.

5. No architectural, engineering, or project management fees are included in this Estimate except for geotechnical and structural monitoring and design services as indicated.

6. The purpose of this Estimate is to establish a Schematic Design Budget for the described work. Once more detailed investigations and design have been completed, this Estimate should be revised and updated.

JOHN MILNER ASSOCIATES ICI #: 213957
FORT NEGLEY Prep: mcf/gel
HISTORICAL STRUCTURE REPORT Date: 10/31/2013
NASHVILLE, TENNESSEE Revised: 01/29/2014

SUMMARY - SCHEMATIC DESIGN COST ESTIMATE

Account	Description			Amount
	Phase One (within the next 3 months):			
	- Immediate Temporary Structural Stabilization *			$ 49,680
	- Structural Design Services			$ 56,500
	- Landscape Recommendations			$ -
		Subtotal		$ 106,180
		Escalation	0%	-
		PHASE ONE TOTAL		**$ 106,180**
	Phase Two (within the next 12 months):			
	- Temporary Structural Stabilization			$ 451,174
	- Structural Design Services			$ 46,850
	- Priority 1 Landscape Recommendations			$ 104,369
	- Priority 2 Landscape Recommendations			$ 81,903
		Subtotal		$ 684,296
		Escalation	2%	13,686
		PHASE TWO TOTAL		**$ 697,982**
	Phase Three (within the next 36 months):			
	- Permanent Structural Repairs *			$ 1,074,641
	- Structural Design Services			$ 71,850
	- Priority 1 Landscape Recommendations			incl. in Structural Repairs
	- Priority 2 Landscape Recommendations			$ 259,820
	- Priority 3 Landscape Recommendations			$ 2,107,016
		Subtotal		$ 3,513,326
		Escalation	6%	210,800
		PHASE THREE TOTAL		**$ 3,724,126**
		TOTAL (ALL THREE PHASES)		**$ 4,528,288**

* Base Estimate with No Alternates

JOHN MILNER ASSOCIATES ICI #: 213957
FORT NEGLEY Prep: mcf/gel
HISTORICAL STRUCTURE REPORT Date: 10/31/2013
NASHVILLE, TENNESSEE Revised: 01/29/2014

SUMMARY - SCHEMATIC DESIGN COST ESTIMATE - PHASE 'ONE'

	Description	Quantity	Unit	Unit Cost	Amount
	PHASE 'ONE' - IMMEDIATE TEMPORARY STRUCTURAL STABILIZATION (within the next 3 months)				
1.	Shore West Bastion Tunnel:				
	- Install (4) Galvanized Steel Shoring Posts, Built to the Underside of the Existing Beam Supporting Cracked Lintels, Bear Posts on Double 2x12PT Sill Plate on Grade	1	LS	$ 7,500.00	$ 7,500
2.	Brace East Bastion Walls:				
	- Install (4) Galvanized Steel Shoring Posts, Built to the Underside of the Existing Stone Lintels	1	LS	7,500.00	7,500
	- Brace Tunnel Walls Which Are Currently Bulging with PT Walers and PT Wood Braces	60	LF	350.00	21,000
	Subtotal				$ 36,000
	Contingency	15%			5,400
	Subtotal				$ 41,400
	Gen. Req., Gen. Conditions, OH&P	20%			8,280
	PHASE 'ONE' - IMMEDIATE TEMPORARY STRUCTURAL STABILIZATION TOTAL				**$ 49,680**
FEES	**PHASE ONE STRUCTURAL DESIGN SERVICES**				
1.	Phase One Structural Engineering Design Services	1	LS	5,000.00	5,000
3.	Visually monitor crack gauges inserted between horizontal & vertical cracks in exterior walls of existing structure at monthly intervals , after periods of rainfall, high wind events, and/or seismic activity for review by the engineer of record (Start-up - Year 1)*	1	LS	36,500.00	36,500
2.	Engage a Geotechnical Engineer to Investigate the Historic Fortification Retaining Walls as a Necessary Precedent to Development of Phase Three Repair Design by Structural Engineer	1	LS	15,000.00	15,000
	PHASE 'ONE' - STRUCTURAL DESIGN SERVICES TOTAL ADD				**$ 56,500**

*Based on (12) monthly surveys and (7) additional surveys following periods of extreme weather and seismic events (parameters of these visits to be defined). Assumes structural engineer will design & facilitate monitoring plan, & owner will retain a testing agency to install monitors, perform monitoring & issue reports after each visit for engineer's review. Engineer will conduct initial site visit to confirm conditions & identify locations of monitoring and return for prebid meeting with prospective testing agencies.

	Description	Quantity	Unit	Unit Cost	Amount
ALT	**PHASE 'ONE' ALTERNATE # 1 - RECONSTRUCT CHEEK WALLS IN LIEU OF SHORING:**				
1.	Shore West Bastion Tunnel:				
	- Deduct Install (4) Galvanized Steel Shoring Posts, Built to the Underside of the Existing Beam Supporting Cracked Lintels, Bear Posts on Double 2x12PT Sill Plate on Grade	(1)	LS	$ 7,500.00	$ (7,500)
	- Add Reconstruct Cheek Walls in lieu of Shoring:				
	- Construct Wall (4' Thick)	400	SF	200.00	80,000
	- Replace Lintel and Parapet Above Tunnel	40	SF	275.00	11,000
	Subtotal				$ 83,500
	Contingency	15%			12,525
	Subtotal				$ 96,025
	Gen. Req., Gen. Conditions, OH&P	20%			19,205
	PHASE 'ONE' ALTERNATE # 1 TOTAL				**$ 115,230**
ALT	**PHASE 'ONE' ALTERNATE # 2 - PT OR GALV. BRACES IN LIEU OF PT WALERS AND PT BRACES**				
2.	Brace East Bastion Walls:				
	- Deduct Brace Tunnel Walls Which Are Currently Bulging with PT Walers and PT Wood Braces	(60)	LF	$ 350.00	$ (21,000)
	- Add Use PT or Galvanized Braces - Set the Braces to the Opposing Bulging Wall and Connect them to the Stud Wall Supporting Lintels	60	LF	425.00	25,500
	Subtotal				$ 4,500
	Contingency	15%			675
	Subtotal				$ 5,175
	Gen. Req., Gen. Conditions, OH&P	20%			1,035
	PHASE 'ONE' ALTERNATE # 2 TOTAL				**$ 6,210**

JOHN MILNER ASSOCIATES ICI #: 213957
FORT NEGLEY Prep: mcf/gel
HISTORICAL STRUCTURE REPORT Date: 10/31/2013
NASHVILLE, TENNESSEE Revised: 01/29/2014

SUMMARY - SCHEMATIC DESIGN COST ESTIMATE - PHASE 'TWO'

	Description	Quantity	Unit	Unit Cost	Amount
	PHASE 'TWO' - TEMPORARY STRUCTURAL STABILIZATION (within the next 12 months)				
1.	Install Temporary Bracing at Fortification Walls. Assume Waler/Strut/Kicker/Strong Back with Sonotube Footing: *(The Below Cost is based on the Order of Magnitude Cost for Structural Bracing shown in HSR)*				
	- at Redan 1 - Low Wall, 10 LF	1	LS	$ 4,500.00	$ 4,500
	- at Redan 2 - Assume Low Wall, 10 LF	1	LS	4,500.00	4,500
	- at Redan 3 - at Corner, 9' High, 20 LF	1	LS	9,000.00	9,000
	- at Redan 4 - at Corner, 6' High, 20 LF	1	LS	9,000.00	9,000
	- at Redan 5 - 6' High, 20 LF	1	LS	6,750.00	6,750
	- at Redan 6 - at Corner, 6' High, 20 LF	1	LS	9,000.00	9,000
	- at Redan 7 - 6' High, 25 LF	1	LS	6,750.00	6,750
	- at Redan 8 - 6.5' High, 20 LF	1	LS	6,750.00	6,750
	- at East Bastion Walls:				
	- at North Wall - 10' High	100	LF	337.50	33,750
	- at East Wall - 7 High	120	LF	337.50	40,500
	- at South Main Works - 10' High	120	LF	337.50	40,500
	- at West Bastion Walls:				
	- at East Wall - 7' High	120	LF	337.50	40,500
	- at South Wall - 10' High	75	LF	337.50	25,313
	- at North Main Works - at Corner, Assume 10' High, 20 LF	1	LS	9,000.00	9,000
	- at East Sally Port:				
	- at North Wall - at Corner, Assume 10' High, 25 LF	1	LS	9,000.00	9,000
	- at South Wall - at Corner, Assume 10' High, 30 LF	1	LS	9,000.00	9,000
	- Prepare Mockups for Repair Option 2 - Soil Anchors	1	LS	10,000.00	10,000
2.	Install Temporary Bracing at Parking Area Retaining Wall	150	LF	337.50	50,625
	- Perform Selective Tree Removal	1	LS	2,500.00	2,500
	Subtotal				$ 326,938
	Contingency	15%			49,041
	Subtotal				$ 375,978
	Gen. Req., Gen. Conditions, OH&P	20%			75,196
	PHASE 'TWO' - TEMPORARY STRUCTURAL STABILIZATION TOTAL				**$ 451,174**
FEES	**PHASE TWO STRUCTURAL DESIGN SERVICES**				
3.	Visually monitor crack gauges inserted in exterior walls of existing structure, based on (12) monthly surveys & (7) additional surveys following periods of extreme weather and/or seismic events with review by structural engineer (Annually after Start-Up Year - Year 2)	1	LS	21,850.00	21,850
4.	Phase Two Structural Engineering Design Services	1	LS	25,000.00	25,000
	PHASE 'TWO' - STRUCTURAL DESIGN SERVICES TOTAL ADD				**$ 46,850**

	Description	Quantity	Unit	Unit Cost	Amount
	PHASE 'TWO' - LANDSCAPE WORK RECOMMENDATIONS (within the next 12 months)				
	Priority 1:				
1.	Drainage Inlets and Culverts:				
	- Remove Debris and Clogging of Stone Lined Inlets	20	EA	150.00	3,000
	- Re-Set Inlet Caps and Cornerblocks and Re-Grade Around Inlets as Required. Replace Concrete Caps with Limestone, Install New Grates and Lower the Top of Casting Elevations	38	EA	$1,250.00	47,500
2.	Boardwalks and Decks:				
	- Replace Damaged Deck Boards - 2x6, 6 LF Each	60	EA	150.00	9,000
	- Replace Damaged Curb Units - 4x4, 12 LF Each	14	EA	275.00	3,850
	- Replace Bowed or Damaged Railing Caps - 2x4, 6 LF Each	4	EA	125.00	500
	- Clean and Prep Weld Joints in the Galvanized Steel Handrail System and Apply Galvanizing Primer.	16	EA	100.00	1,600
	- Paint All Handrails with Zinc-Rich Primer/Enamel Paint:				
	- Free Standing Pipe Rail	293	LF	20.00	5,860
	- Handrail Mounted on Wood Guardrail	288	LF	15.00	4,320
	Subtotal				$ 75,630
	Contingency	15%			11,345
	Subtotal				$ 86,975
	Gen. Req., Gen. Conditions, OH&P	20%			17,395
	PHASE 'TWO' - PRIORITY 1 LANDSCAPE RECOMMENDATIONS SUBTOTAL				**$ 104,369**
	Priority 2:				
1.	Park Entrance Gate and Walls:				
	- Replace Cracked Lintel Unit or Stabilize in Place:				
	- 3 LF	2	EA	$ 1,250.00	$ 2,500
	- 6 LF	1	EA	2,000.00	2,000
	- Clean, Under Direction of Professional Conservator, the Entrance Feature. Repoint Where Required and Replace Broken/Damaged Masonry Units	1	LS	2,500.00	2,500
2.	Loop Road Retaining Wall:				
	- Remove Vegetation, Inspect Wall Once Clear and Repair as Required	1	LS	5,000.00	5,000
	Fort Road Retaining Wall:				
	- Remove Vegetation, Inspect Wall Once Clear and Repair as Required	1	LS	5,000.00	5,000
3.	Drainage Inlets and Culverts:				
	- Re-Grade Grass and Gravel Surfaces at Roadway as Req., Add New Drainage Grates in Pavement as Req. - 1/2mile	1	LS	25,000.00	25,000

	Description	Quantity	Unit	Unit Cost	Amount
	PHASE 'TWO' - LANDSCAPE WORK RECOMMENDATIONS (within the next 12 months) (continued)				
	Priority 2 (continued):				
4.	Stone Stairways:				
	- Re-Set Displaced Stones on the Summit Stairway	60	SF	35.00	2,100
	- Re-Set Flagstone Paving on Landings	190	SF	25.00	4,750
5.	Vegetation:				
	- Cut English Ivy at Base of Shade Trees, Remove (Assume Quantity of Trees)	20	EA	125.00	2,500
	- Remove aggressive plant species (honeysuckle, privet, etc.)	2	Acres	4,000.00	8,000
	Subtotal				$ 59,350
	Contingency	15%			8,903
	Subtotal				$ 68,253
	Gen. Req., Gen. Conditions, OH&P	20%			13,651
	PHASE 'TWO' - PRIORITY 2 LANDSCAPE RECOMMENDATIONS SUBTOTAL				**$ 81,903**
	PHASE 'TWO' LANDSCAPE RECOMMENDATIONS TOTAL				**$ 186,272**

JOHN MILNER ASSOCIATES ICI #: 213957
FORT NEGLEY Prep: mcf/gel
HISTORICAL STRUCTURE REPORT Date: 10/31/2013
NASHVILLE, TENNESSEE Revised: 01/29/2014

SUMMARY - SCHEMATIC DESIGN COST ESTIMATE - PHASE 'THREE'

	Description	Quantity	Unit	Unit Cost	Amount
	PHASE 'THREE' - PERMANENT STRUCTURAL REPAIRS (within the next 36 months)				
1.	Reinforce Fortification Wall - Install Soil Anchors in Walls Temporarily Shored in Phase 2 work:				
	- Install Anchors in Single Row, Spaced 8' O.C., Including Scaffolding:				
	(The Below Cost is based on the Order of Magnitude Cost for Structural Bracing recommended in HSR)				
	- at Redan 1 - Low Wall, 10 LF	2	EA	$ 3,250.00	$ 6,500
	- at Redan 2 - Assume Low Wall, 10 LF	2	EA	3,250.00	6,500
	- at Redan 3 - at Corner, 9' High, 20 LF	4	EA	3,250.00	13,000
	- at Redan 4 - at Corner, 6' High, 20 LF	4	EA	3,250.00	13,000
	- at Redan 5 - 6' High, 20 LF	3	EA	3,250.00	9,750
	- at Redan 6 - at Corner, 6' High, 20 LF	4	EA	3,250.00	13,000
	- at Redan 7 - 6' High, 25 LF	3	EA	3,250.00	9,750
	- at Redan 8 - 6.5' High, 20 LF	3	EA	3,250.00	9,750
	- at East Bastion Walls:				
	- at North Wall - 10' High	14	EA	3,250.00	45,500
	- at East Wall - 7 High	16	EA	3,250.00	52,000
	- at South Main Works - 10' High	16	EA	3,250.00	52,000
	- at West Bastion Walls:				
	- at East Wall - 7' High	16	EA	3,250.00	52,000
	- at South Wall - 10' High	11	EA	3,250.00	35,750
	- at North Main Works - at Corner, Assume 10' High, 20 LF	4	EA	3,250.00	13,000
	- at East Sally Port:				
	- at North Wall - at Corner, Assume 10' High, 25 LF	4	EA	3,250.00	13,000
	- at South Wall - at Corner, Assume 10' High, 30 LF	4	EA	3,250.00	13,000
	- Repair Localized Masonry Wall at Voids, Assuming 10% of Wall to Be Reinforced	700	SF	100.00	70,000
	- Assume Remove Temporary Bracing	755	LF	35.00	26,425
	- Restore West Bastion Tunnel (see Priority One - Alt. 1)				91,000
2.	Repair Parking Area Retaining Wall:				
	- Reconstruct Parapet Using Dry-Stacked Masonry	180	LF	350.00	63,000
	- If Structural Analysis Shows Dry-Stacked Walls to have Insufficient Car Impact Resistance, Install Bollards (Assume 1 Bollard Every 5')	36	EA	550.00	19,800
	- Install Soil Anchors - 8' O.C., Incl. Scaffolding	23	EA	3,250.00	74,750
	- Perform Masonry Infill and Repairs	200	SF	100.00	20,000
	- Infill Soil Lost From Corner Collapses	15	CY	100.00	1,500
	- Install Drainable Fill Along Heel of Retaining Wall, Includes Removal of Existing and Shoring as Required	180	LF	275.00	49,500
	- Assume Remove Temporary Bracing	150	LF	35.00	5,250
	Subtotal				$ 778,725
	Contingency	15%			116,809
	Subtotal				$ 895,534
	Gen. Req., Gen. Conditions, OH&P	20%			179,107
	PHASE 'THREE' - PERMANENT STRUCTURAL REPAIRS TOTAL				**$ 1,074,641**

	Description	Quantity	Unit	Unit Cost	Amount
	PHASE 'THREE' - PERMANENT STRUCTURAL REPAIRS (within the next 36 months)(continued)				
FEES	**PHASE THREE STRUCTURAL DESIGN SERVICES**				
1.	Visually monitor crack gauges inserted in exterior walls of existing structure, based on (12) monthly surveys & (7) additional surveys following periods of extreme weather and/or seismic events with review by structural engineer (Annually after Start-Up Year - Year 3)	1	LS	21,850.00	21,850
2.	Phase Three Structural Engineering Design Services	1	LS	50,000.00	50,000
	PHASE 'THREE' - STRUCTURAL DESIGN SERVICES TOTAL ADD				**$ 71,850**
ALT	**PHASE THREE ALTERNATE # 1 - CONCRETE BUTTRESS IN LIEU OF SOIL ANCHORS/SCAFFOLD**				
1.	Parking Area Retaining Wall:				
	- Deduct Soil Anchors - 8' O.C., Incl. Scaffolding	(23)	EA	$ 3,250.00	$ (74,750)
	- Add Construct Concrete Buttress Along Wall (No Scaffold)	4	EA	20,000.00	80,000
	Subtotal				$ 5,250
	Contingency	15%			788
	Subtotal				$ 6,038
	Gen. Req., Gen. Conditions, OH&P	20%			1,208
	PHASE 'THREE' - STRUCTURAL ALTERNATE # 1 TOTAL ADD				**$ 7,245**

	Description	Quantity	Unit	Unit Cost	Amount
	PHASE 'THREE' - LANDSCAPE WORK RECOMMENDATIONS (within the next 36 months)				
	Priority 1:				
1.	Parking Area Retaining Wall:			Included in Structural Repairs (2) above	
	Priority 2:				
1.	Park Entrance Gate and Walls:				
	- Repair, Repoint, and Clean the End Pier of the Southern Wing Wall	1	LS	$ 3,500.00	$ 3,500
	- Repair the Bowed and Displaced Section of North Wall	10	LF	325.00	3,250
	- Repair the Bowed and Displaced Section of South Wall	25	LF	325.00	8,125
2.	Loop Road Retaining Wall:				
	- Reconstruct In-Kind Damaged Loop Road Retaining Wall, Consult Engineer to Ensure Wall Condition is Adequate to Handle Load Conditions	60	LF	500.00	30,000
3.	Stone Stairways:				
	- Reconstruct Lower Stairway	80	SF	150.00	12,000
4.	Boardwalks and Decks:				
	- Construct New Boardwalk Through the West Sally Port to Connect the Inner Works to the Existing Boardwalk, Terminating in the West Ravelin Ditch - 5' Wide:				
	- Support Structure with Foundations - Spaced 3' O.C.	30	EA	1,000.00	30,000
	- Boardwalk Decking	425	SF	30.00	12,750
	- Railing	170	LF	135.00	22,950
	- Construct New Boardwalk Through the East Sally Port to Connect the Inner Works to the Existing Boardwalk, Terminating in the East Ravelin Ditch - 5' Wide:				
	- Support Structure with Foundations - Spaced 3' O.C.	30	EA	1,000.00	30,000
	- Boardwalk Decking	425	SF	30.00	12,750
	- Railing	170	LF	135.00	22,950
	Subtotal				$ 188,275
	Contingency	15%			28,241
	Subtotal				$ 216,516
	Gen. Req., Gen. Conditions, OH&P	20%			43,303
	PHASE 'THREE' - PRIORITY 2 LANDSCAPE RECOMMENDATIONS SUBOTAL				**$ 259,820**
	Priority 3:				
1.	Park Entrance Gate and Walls:				
	- Monitor and Repair Cracking in Mortar Cap at Southern Wing.	25	LF	75.00	1,875
	- Investigate Bolt Holes in Keystone, If These Represent a Sign/Plaque That Was Original to the Structure, Install a Replica - One Location	1	EA	$ 5,000.00	$ 5,000
2.	Loop Road:				
	- Enhance Drainage of Flat Portions of Road by Adding a "Super Elevation" by Milling and Resurfacing the Road at a Varying Depth	1,355	SY	40.00	54,200
	- Re-Grade the High and Low Grass Sides to Drain to the Inlets - Includes Excavation, Re-Spreading, and Re-Seeding	835	SY	30.00	25,050
	- Selectively Remove Trees on Both Sides to Open Up Views (Assume Quantity)	20	EA	750.00	15,000

	Description	Quantity	Unit	Unit Cost	Amount
	PHASE 'THREE' - LANDSCAPE WORK RECOMMENDATIONS (within the next 36 months) (continued)				
	Priority 3 (continued):				
3.	Fort Road:				
	- Reconfigure Upper End of Fort Road to Provide Clear Transition into the Fort that also Incorporates the Stone Stairway and Gravel Path (Assume Quantity)	1,200	SF	15.00	18,000
4.	Renovate Gravel Pathway:				
	- Remove Gravel Top Layer and Underlying Gravel to Subsoil	1,472	SF	1.50	2,208
	- Remove and Re-Set Limestone Edging	665	LF	20.00	13,300
	- Replace units that have Cracked	50	EA	200.00	10,000
	- Fill with New Gravel, Compact in Place	1,472	SF	5.00	7,360
5.	Stone Edging:				
	- Re-Set Existing Limestone Edging Along Loop Road, Fort Road, and the Gravel Pathway	1,000	LF	20.00	20,000
	- Replace Other Missing or Damaged Limestone Edging	400	LF	45.00	18,000
6.	Vegetation/Views and Vistas (see also 'Loop Road' above):				
	- Selectively Prune Hackberry Trees that Block View of Downtown (Assume Quantity)	10	EA	350.00	3,500
	- Selectively Clear Brush and Wood Undergrowth Around the Perimeter of Loop Road (Assume Quantity)	2	Acres	4,500.00	9,000
	- Re-vegetate portions of the site with native grasses, native wildflowers, & groundcover using mix of species (Assume Quantity)	2	Acres	10,000.00	20,000
	- Annual Maintenance by Outside Contractor: Assume 7 monthly maintenance days (April – October) to remove vegetation from walls, & 2 herbicide applications per year	1	Year	15,000.00	15,000
7.	Signage:				
	- Monitor Conditions of Phenolic Sign Panels, Replace as Needed	5	EA	500.00	2,500
	- Replace Regulatory Sign - 18" x 24" Phenolic Panel with Block Lettering on Color Background in Corten Frame	2	EA	450.00	900
8.	Furnishings:				
	- Replace WPA Stone Monument with New Stone to Match Original, Including Engraved Inscription. Transfer the Existing Monument to the Visitor Center for Storage or Display	1	LS	5,000.00	5,000
9.	**Other Visitor Amenities** (Optional - Discussed in the HSR):				
	- Composting Toilet Package, with Exavation and Enclosure	1	EA	$20,000.00	20,000
	- Solar Powered Pathway Light with Foundation (Assume Quantity)	40	EA	8,500.00	340,000
	Subtotal				$ 1,526,823
	Contingency	15%			229,023
	Subtotal				$ 1,755,847
	Gen. Req., Gen. Conditions, OH&P	20%			351,169
	PHASE 'THREE' - PRIORITY 3 LANDSCAPE RECOMMENDATIONS SUBTOTAL				**$ 2,107,016**
	PHASE 'THREE' - LANDSCAPE RECOMMENDATIONS TOTAL				**$ 2,366,836**

APPENDIX H

BIBLIOGRAPHY

APPENDIX H. BIBLIOGRAPHY

American Park Design References

McClelland, Linda Flint. *Building the National Parks*. Baltimore: The Johns Hopkins University Press, 1998.

National Park Service. *Park and Recreation Structures*, by Albert H. Good. U. S. Department of the Interior, 1938. Reprint, New York: Princeton Architectural Press, 1999.

National Park Service. "Proceedings of National Park Service Conference of State Park Authorities," edited by Herbert Maier McClelland. Washington, D.C.: U. S. Department of the Interior, mimeographed, February 25, 1935. Quoted in McClelland, *Building the National Parks,* 395-396.

National Park Service. Western Regional Office, Division of Cultural Resource Management. *Rustic Architecture, 1916-1942*, by William C. Tweed, Laura E. Soulliere, and Henry G. Law. U. S. Department of the Interior, February 1977. Accessed August 20, 2013, http://www.nps.gov/history/ history/ online_books/rusticarch/introduction.htm#2.

Fortification Engineering References

Hinds, James & Edmund Fitzgerald. *Bulwark and Bastion: A Look at Musket Era Fortifications With a Glance at Period Siegecraft and Stone Walls and Iron Guns: Forts and Their Effectiveness in the Civil War.* Council of Abandoned Military Posts, 1996.

Kaufmann, J. E. and H. W. Kaufmann. *Fortress America: The Forts That Defended America, 1600 to the Present*. Cambridge, Massachusetts: Da Capo Press, 2004.

Law, Zada. "The Construction of Fort Negley: The Civil War Era." Middle Tennessee State University. May 8, 2009.

Mahan, Dennis Hart and James Mercur. *Permanent Fortifications.* New York: John Wiley & Sons, 1898.

Miller, Francis Trevelyan. *Forts and Artillery: The Photographic History of the Civil War*. A.S. Barnes & Company, 1957.

National Park Service and KEA Environmental. Seacoast Fortifications Preservation Manual. July 1999.

Pacific Northwest Preservation Partnership. *Historic Fortification Preservation Handbook*. Washington State Parks and Recreation Commission, 2003.

Robinson, Willard B. *American Forts: Architectural Form and Function*. Chicago, University of Illinois Press, 1977.

Weaver, John R. *A Legacy of Brick and Stone: American Coastal Defense Forts of the Third System, 1816-1867*. McLean, Virginia: Redoubt Press, 2001.

Dry-Stacked Stone Engineering References

Central Federal Lands Highway Division. *Rockery Design and Construction Guidelines*. U. S. Department of Transportation: Federal Highway Administration, November 2006. Publication No. FHWA-CFL/TD-06-006.

Dry Stone Conservancy. *Building and Repairing Dry Stone Fences and Retaining Walls*. Fifth Printing. Lexington, Kentucky: Dry Stone Conservancy, 2001.

Dry Stone Walling Association. *Stonework: A Technical Guide to Standards and Identification of Common Faults in Dry Stone Walling*. 2012.

Structural Engineering References

American Society of Civil Engineers. *ASCE Standard 7-10: Minimum Design Loads for Buildings and Other Structures*. Reston, Virginia: American Society of Civil Engineers, 2010.

Das, Braja M. *Principles of Foundation Engineering*. Third Edition. New York: PWS Publishing Company, 1995.

Kidder, Frank. *The Architects' and Builders' Pocket Book*. Sixteenth Edition. New York: John Wiley & Sons, 1916.

Masonry Standards Joint Committee. *Building Code Requirements and Specifications for Masonry Structures.* 2011.

Fort Negley Archaeological Investigation References

Alexander, Lawrence, Hanan Browning, and Carl Kuttruff. *Phase II Archeological Investigations of Fort Negley Proposed Flagpole Installation Site, Davidson County, Tennessee.* Alexander Archaeological Consultants, Inc., Wildwood, Georgia. Submitted to Zada Law Archaeological Consulting and Metropolitan Nashville-Davidson County Parks and Recreation, December 2007. Copy on file at Fort Negley Visitor Center (FNVC).

Allen, Dan Sumner. *Report of 1999 Investigations at Fort Negley: Tennessee Archaeological Site 40DV189, A Federal Army Civil War Period Military Site in Davidson County, Tennessee.* DuVall & Associates, Inc., Franklin, Tennessee. Submitted to Leatherwood Inc. for the Metropolitan Board of Parks and Recreation, June 2000. Copy on file at FNVC.

Bergstresser, Jack R., Shari D. Moore, and Susan L. Nielsen. *Fort Negley 130 Years Later: An Archeological Assessment*. Panamerican Consultants, Inc., Tuscaloosa, Alabama. Submitted to Government of Nashville and Davidson County, January 1994. Copy on file at FNVC.

Fort Negley Historical References

Carey, Bill. "A City Swept Clean: How urban renewal, for better and for worse, created the city we know today." *Nashville Scene*, September 6, 2001. Accessed August 24, 2013. http://www.nashvillescene.com/nashville/a-city-swept-clean/Content?oid=1186025.

Contraband Camps. *The Tennessee Encyclopedia of History and Culture, Version 2.0*. Accessed August 26, 2013. http://tennesseeencyclopedia.net/entry.php?rec=305.

Ferguson, John Hill. "Civil War Diaries, Book 1 (February 28, 1962 – November 10, 1862)." Microfilm at Tennessee State Library and Archives. Original diaries are in the holdings of the Henry Pfeiffer Library, MacMurray College, Jacksonville, Illinois. JPG file provided by FNVC.

Lovett, Bobby L. *Nashville's Fort Negley: A Symbol of Blacks' Involvement with the Union Army.* Trial and Triumph: Essays in Tennessee's African American History, pp. 111-127. Edited by Carroll Van West. Knoxville: University of Tennessee Press, 2002. Scanned copy of excerpt provided by FNVC.

Smith, Steven D. "National Archives Search for Fort Negley, Nashville, Tennessee." South Carolina Institute of Archaeology and Anthropology, University of South Carolina. Submitted to Hickerson-Fowlkes, Inc., Architects, April 3, 1988. PDF file provided by FNVC.

Fort Negley Planning and Improvement References

"Fort Negley Master Plan." Hickerson-Fowlkes, Inc., Architects; The Office of Michael Emrick, AlA; Hawkins Partners, Inc.; and Zada L. Law, Consulting Archaeologist. Submitted to Metropolitan Government of Nashville and Davidson County, Tennessee, November 1996.

"Fort Negley Park: A Study for the Metropolitan Historical Commission." Miller, Wihry & Lee, Inc., Nashville, Tennessee. Submitted to Metropolitan Historical Commission, October 1980. Copy on file at FNVC.

"Fort Negley Stabilization and Restoration - Combined Immediate and Phase One for the Metropolitan Board of Parks and Recreation, Nashville, Tennessee, Metro Project No. 80PR440." Hickerson Fowlkes Architects. Project Manual, July 8, 1998. Copy on file at FNVC.

Hollingsworth, Robert. "Progress Report Since Last Meeting." Leatherwood, Inc., general contractor. Submitted to Metro Parks, February 24, 1999. Copy on file at FNVC.

Jones, Ronald. Letter to Jim Thompson, Metropolitan Nashville Parks Department. "Ft. Negley Stabilization and Restoration, GEC Project No. 104-00-399." March 28, 2000. Copy on file at FNVC.

Metropolitan Board of Parks and Recreation. "Nashville Civil War Center at Fort Negley: 2007 Supplement to the 1996 Fort Negley Master Plan." Copy on file at FNVC.

Metropolitan Historical Commission. "Report to Mayor Phil Bredesen from the Fort Negley Advisory Committee." June 1, 1994. Copy on file at FNVC.

Metropolitan Planning Commission and Metropolitan Board of Parks and Recreation."Inventory of Parks." June 1985. Copy on file at FNVC.

National Recreation Association. "A Study of Recreation and Parks in Nashville and Davidson County Tennessee." July 1957. Copy of excerpt on file at FNVC.

"Phase 1 Fort Negley Historical Park Improvements, Nashville, Tennessee, Metro Proj. No. 80PR440a." Moody-Nolan, Inc., architect. Project Manual, June 25, 2004, with Supplemental Drawings, August 18 & 24, 2004. Copy on file at FNVC.

Reed, Graham."Fort Negley Condition Report Documented by Graham Reed 1992." Submitted to Metropolitan Historical Commission. Document completed March 6, 2013. Copy on file at FNVC.