

Earthwork Management at Petersburg National Battlefield



Dave Shockley
Chief, Resource Management
Petersburg National Battlefield
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GIS Mapping and Diagrams

Gates, Grant (Park Ranger, Petersburg National Battlefield)
Historical Text

McCullough, Ginger (GIS Technician, Petersburg National Battlefield)
GIS Mapping and Diagrams

Petersburg National Battlefield
1539 Hickory Hill Rd
Petersburg, VA 23803 USA
(804) 732-0171
Fax: (804) 862-7943

FOREWORD

This Earthwork Management Guide gives an overview of the history, legislated purpose and management issues of Petersburg National Battlefield, which affect earthwork management. This abbreviated guide, complete with illustrations, is designed to inform the reader of the many aspects that should be considered in the preservation, interpretation and maintenance of these historic structures.



INTRODUCTION

Petersburg National Battlefield was authorized by Congress as a unit of the National Park Service with the enabling legislation of July 3, 1926. The Park's purpose was stated as follows:

“In order to commemorate the campaign and siege and defense of Petersburg, Virginia in 1864 and 1865 and to preserve for historical purposes the breastworks, earthworks, walls, or other defenses or shelters used by the armies therein, the battlefields at Petersburg, in the State of Virginia, are declared a national battlefield....”

Petersburg National Battlefield preserves some of the most important physical remains and locations of the Siege of Petersburg, one of the most decisive military campaigns of the Civil War. This campaign took place in a semicircle around the City of Petersburg in an area of approximately 170 square miles. Here the soldiers of General Ulysses S. Grant's Union Command and Robert E. Lee's Army of Northern Virginia engaged in the final climactic battles of the Civil War in the decisive Virginia theater. Although Lee conducted a masterful defensive operation for nine and one half months, Grant's campaign of attrition forced the Confederate commander to evacuate Petersburg and retreat westward. The extensive earthworks and battle scarred landscape were left as a reminder of their ordeal.



Colquitt Salient, Confederate

NPS Photo

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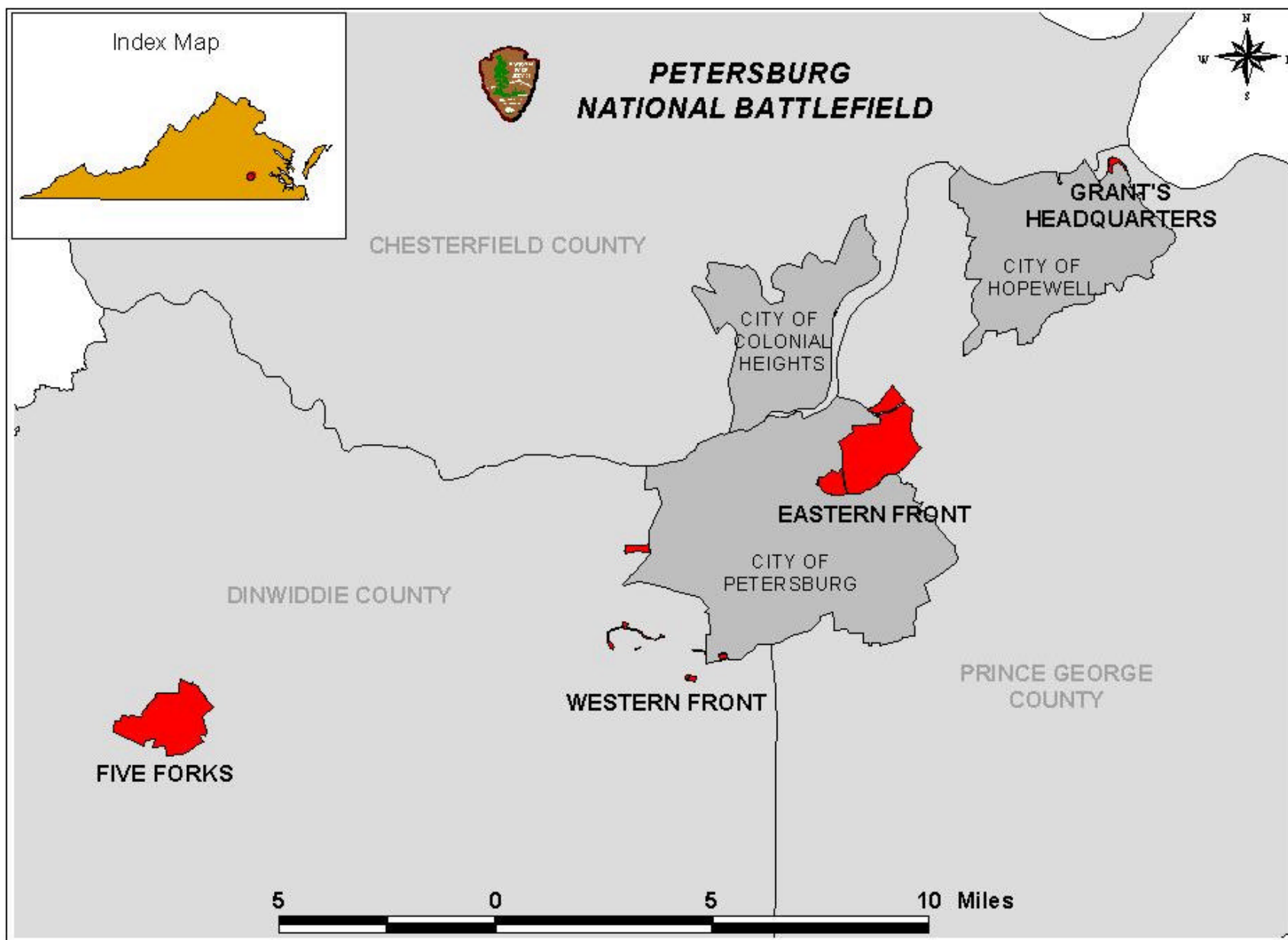
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Colquitt Salient, Confederate

NPS Photo



I. HISTORICAL SIGNIFICANCE

A. Earthworks

After four days of unsuccessful frontal assaults to capture Petersburg, Grant decided to cut the arteries leading to the heart of the Confederate supply center. To accomplish that task, Union soldiers built for their protection and Confederate soldiers for defense, the earthen fortifications that surrounded the city. This became a precursor to the trench warfare employed in World War I.

The fortifications included in the "Eastern Front" of Petersburg National Battlefield played strategic roles in key military actions. The original 55 batteries of the Confederate Dimmock Line were to protect the city from attack, but on June 15, 1864 more than a mile of the defensive line, Batteries 3 through 11, fell in the first Union assault. Elliott's salient was the segment of the Confederate line that was the target of a Union mining operation that resulted in the July 30, 1864 battle of the "Crater". Union Battery XIII and XVI would provide artillery support for the doomed attack. Fort Friend, Fort Haskell, Fort Stedman, Gracie's and Colquitt's salients all were part of Lee's last offensive, March 25, 1864: Gracie's and Colquitt's salients as the launching point for the attack and Fort Stedman, Fort Friend, Fort Haskell and Battery XI as objectives.

The seven Union forts of the "Western Front" were independent segments of the line and additions to Grant's tightening noose around Petersburg. These earthworks were engineering marvels, many containing elements not duplicated elsewhere. Fort Fisher was the largest of the fortifications built during the 292 days of military activity. They provided a defensive position against attack and were the launching point for all Union operations against the Confederate right flank including the final assaults of April 2, 1865, and the battle at Confederate Fort Gregg, which forced Lee to abandon Petersburg.

B. Archaeological Components

The archaeological resources at Petersburg National Battlefield are virtually untapped and promise a wealth of information about the men who lived, fought and died here. The armies that were embattled around Petersburg numbered more than 160,000 troops. These men provided most of the labor in building these fortifications, with the exception of the batteries of the original Dimmock Line, which was originally constructed using, among others, an African-American slave labor force. Due to their key positions, the fortifications were the targets of enemy attacks and thus received tremendous shelling. The earthworks also provided shelter for the men during the Petersburg campaign. As a garrison area, these fortifications hold a treasure of buried resources enlightening us to the soldier's daily life. When the Confederates abandoned Petersburg the Union armies followed immediately and the things that were not quickly gathered were left behind, much of which remains buried there today.



Rives Salient

NPS Photo

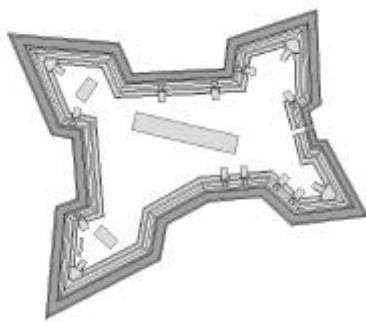
II. INVENTORY OF EXISTING EARTHWORKS:

A. Definitions of the Different Types of Earthworks on the Petersburg Battlefield

Battery- An artillery unit or the fortification constructed to defend such a unit

Breastworks- A hastily constructed fieldwork. Breastworks are constructed of earth, rock, and wood. They may or may not have ditches.

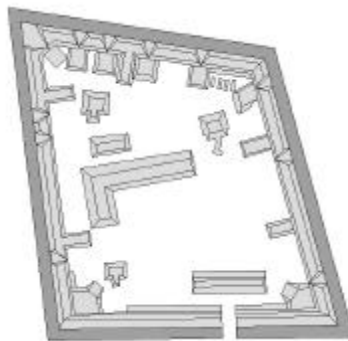
Fort- Any enclosed fortification.



Fort Fisher,
Petersburg
National
Battlefield

Redan- Small fortification with two faces built to cover camps, advanced posts, villages, bridges, etc. The rear of the work is usually open.

Redoubt- A fortification with an opening protected by a traverse.



Fort Haskell,
Petersburg
National
Battlefield

Salient- A section of the line extending to the front, covering an important area.

Terre-Plein- A level space in the fortification.

B. Prominent Earthen Structures Evident on the Battlefield Today

The park's **Eastern Front** is approximately 1444 acres and contains:

(Roman numerals denote Union batteries, Arabic numerals denote Confederate batteries)

	Wall/Moat	Terre-Plein	LCS Number*
Battery IV (Battery 5)	56,763 sq. ft.	26,833 sq. ft.	06764
Battery 7	8,322 sq. ft.	N/A	06766
Fort Friend (Battery 8)	26,581 sq. ft.	2,961 sq. ft.	06767
Fort Stedman	33,836 sq. ft.	17,116 sq. ft.	06770
Battery XI	22,574 sq. ft.	15,324 sq. ft.	06776
Colquitt's Salient	285,464 sq. ft.	NA	06772
Gracie's Salient	281,682 sq. ft.	NA	06774
Fort Haskell	49,387 sq. ft.	22,881 sq. ft.	06778
Battery XIII	13,231 sq. ft.	NA	06780
Battery XVI	14,087 sq. ft.	NA	81691
Elliott's Salient	15,623 sq. ft.	NA	81689

*LCS= List of Classified Structures

With the addition of connecting breastworks the park has approximately 19.6 miles of Civil War earthworks (Appendix D). An additional 1.5 miles of World War I training trenches are also located in the park (Appendix F).

The park's **Western Front** is approximately 117 acres and contains:

	Wall/Moat	Terre-Plein	LCS Number
Fort Wadsworth	76,748 sq. ft.	34,220 sq. ft.	06782
Fort Urmston	18,475 sq. ft.	9,638 sq. ft.	06783
Fort Conahey	22,520 sq. ft.	3,971 sq. ft.	06785
Fort Fisher	129,961 sq. ft.	62,679 sq. ft.	06788
Battery XXVII	19,295 sq. ft.	NA	06790
Fort Welch	26,654 sq. ft.	7,326 sq. ft.	06791
Fort Gregg (Union)	21,200 sq. ft.	4,894 sq. ft.	06793
Fort Wheaton	23,876 sq. ft.	11,869 sq. ft.	06789
Fort Gregg (Confederate)	43,864 sq. ft.	NA	06813

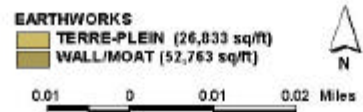
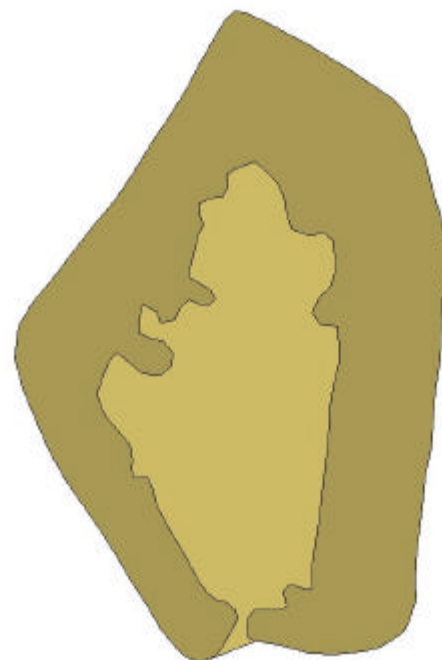
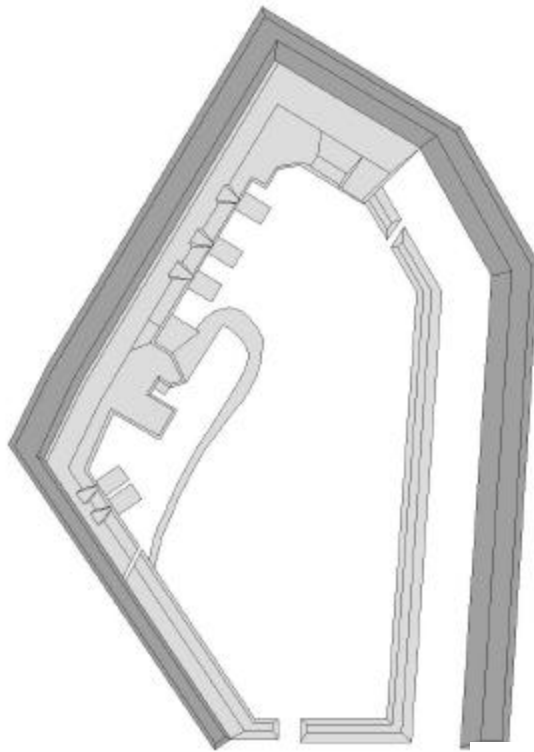
Approximately 6900 feet of Civil War breastworks and trenches connect the forts and batteries (Appendix E).

The “**Five Forks Unit**” is approximately 1115 acres and contains approximately 600 feet of breastworks. These include the "Angle" or return of the Confederate left flank, which Union General P.H. Sheridan considered the key to the Union victory.

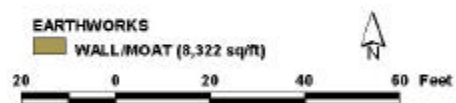
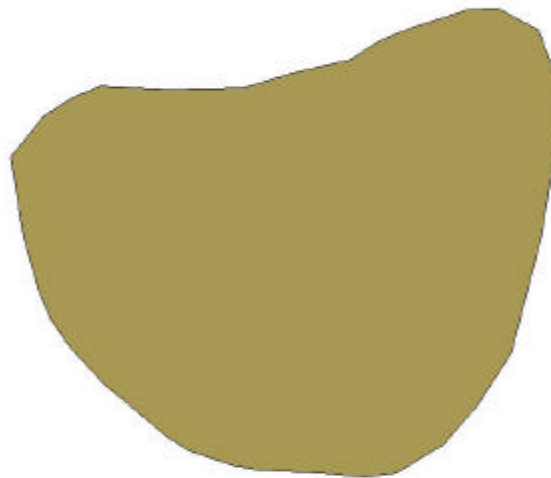
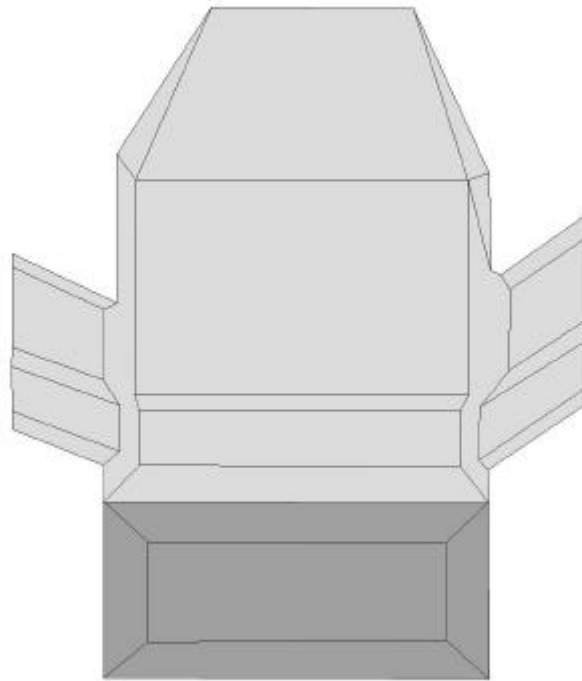
“**Grants Headquarters**”, which served as Grant's logistic center and base of supply, is approximately 21 acres and contains one redan overlooking the James River.

C. Historical Engineers Drawings and Current GPS Maps of Prominent Earthen Structures

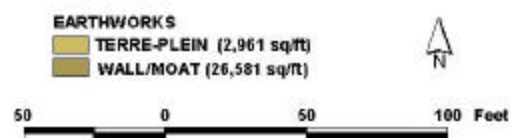
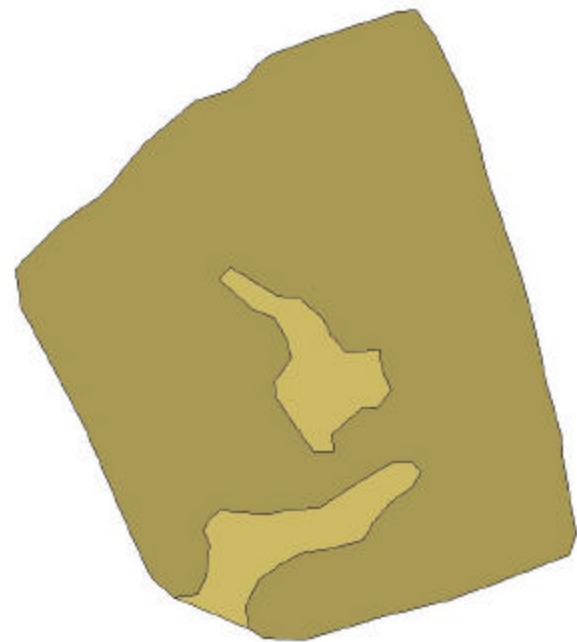
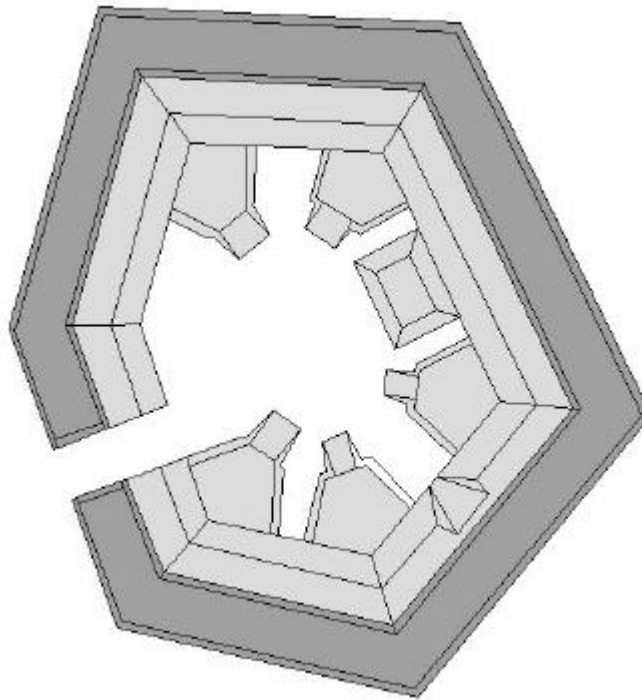
Battery IV



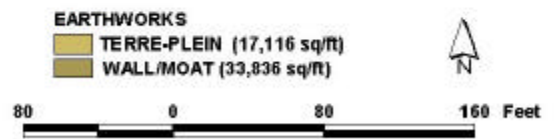
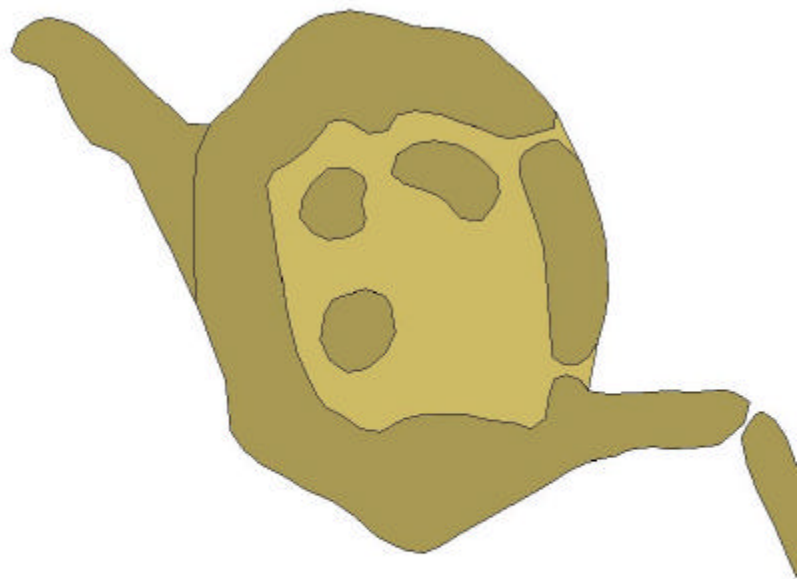
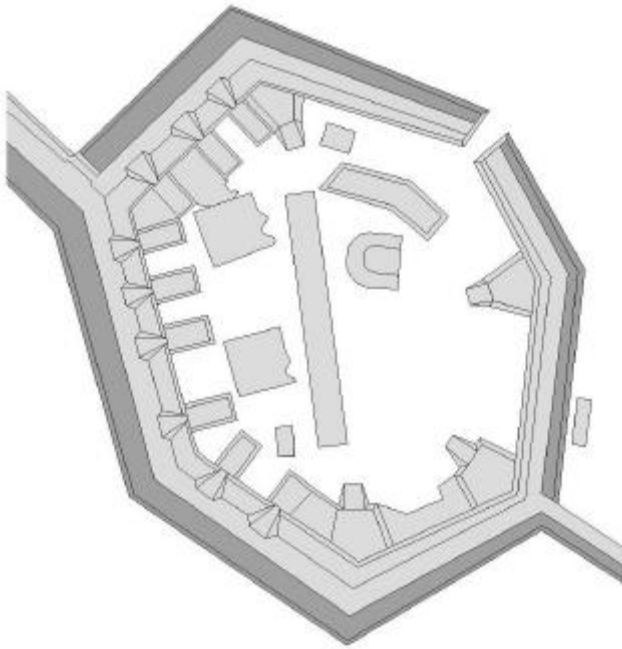
Battery 7



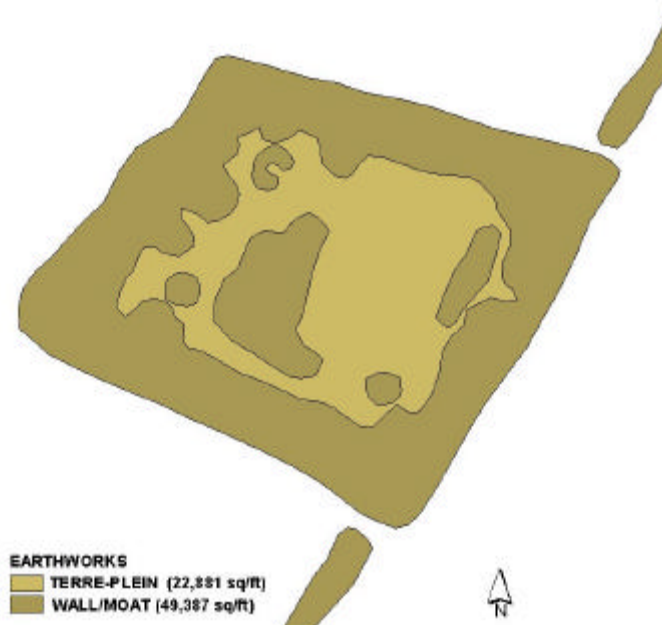
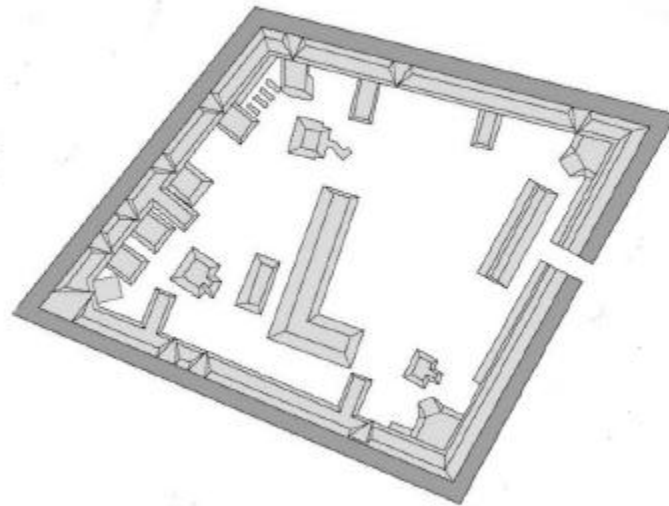
Fort Friend (Battery 8)



Fort Stedman

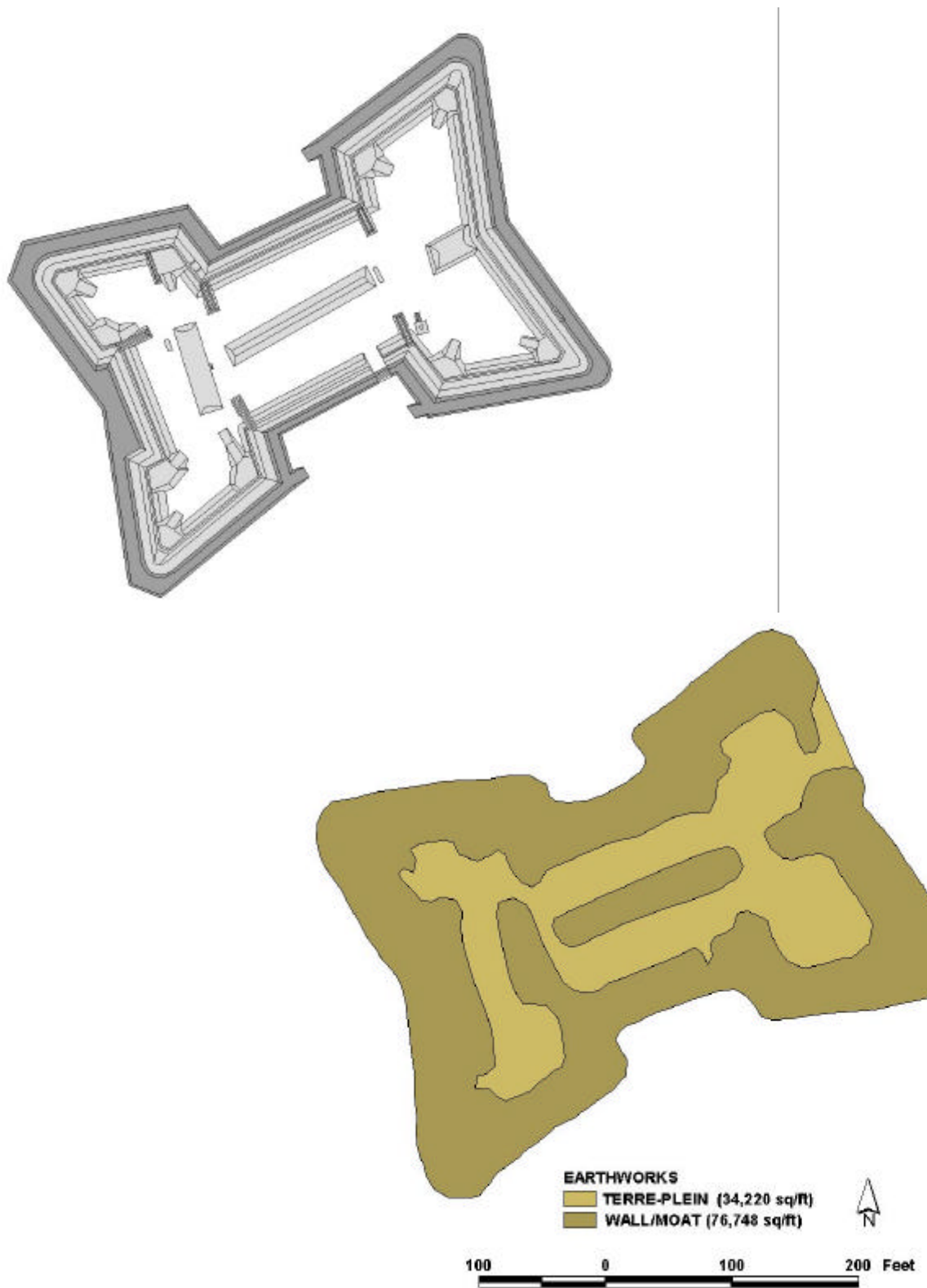


Fort Haskell

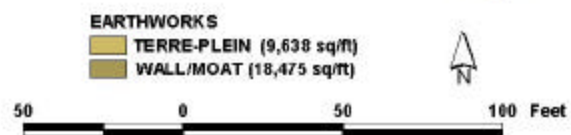
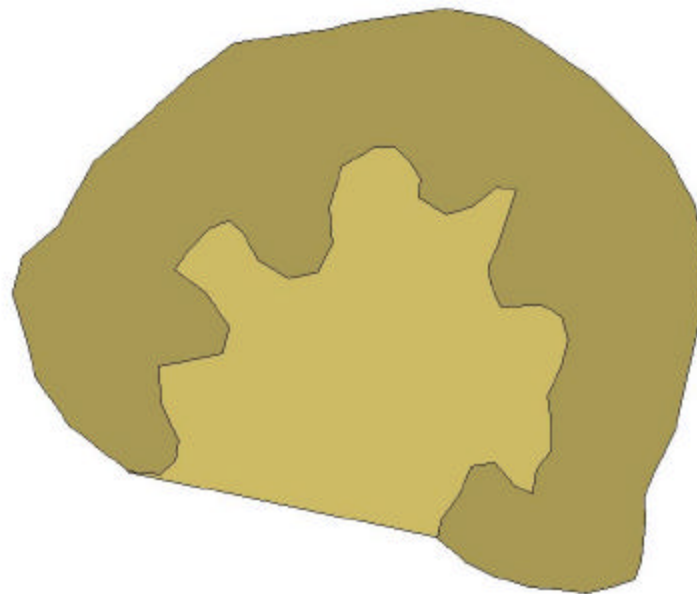
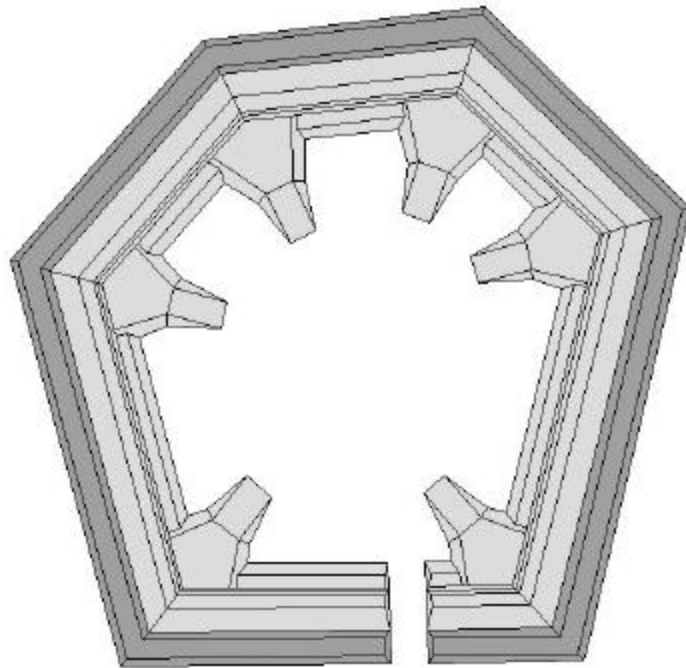


80 0 80 160 Feet

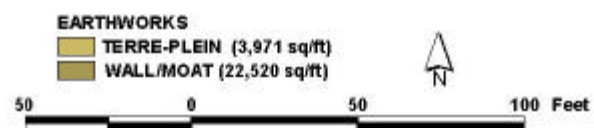
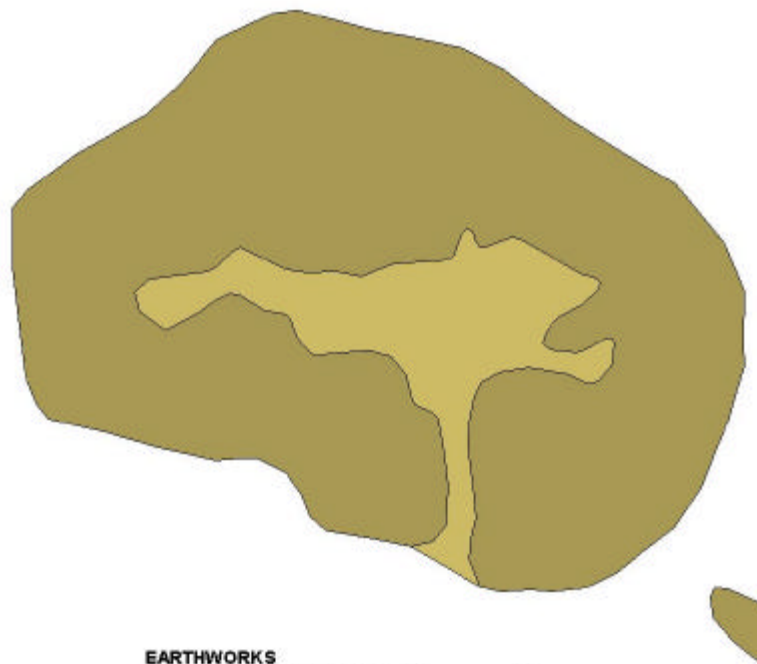
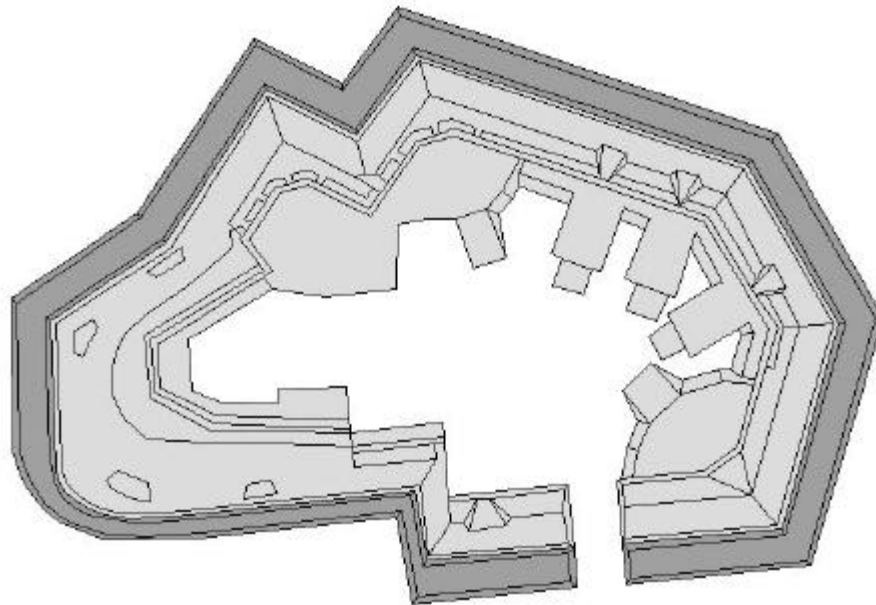
Fort Wadsworth



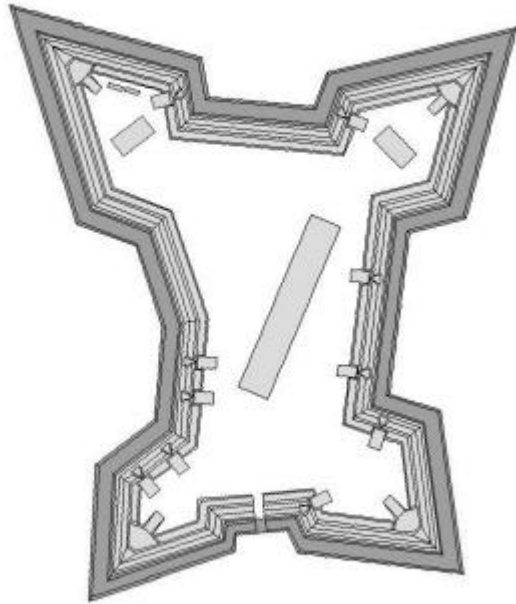
Fort Urmston



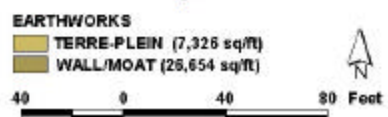
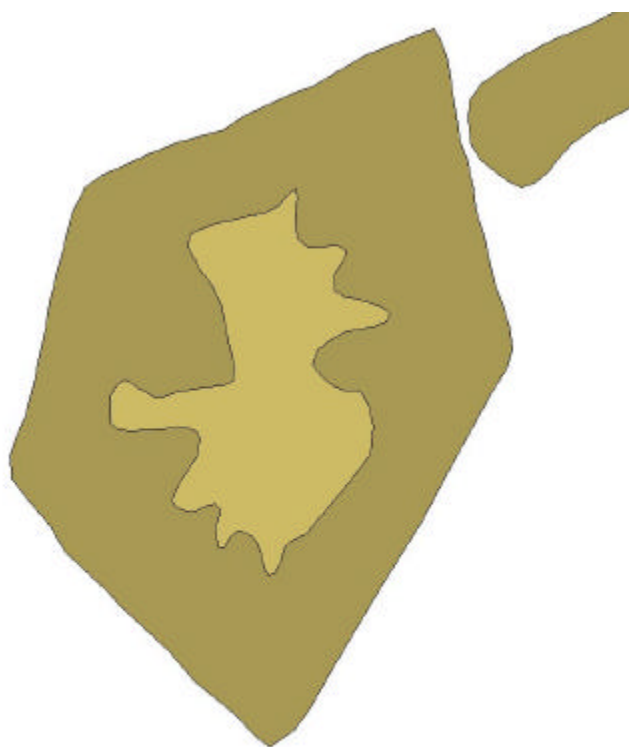
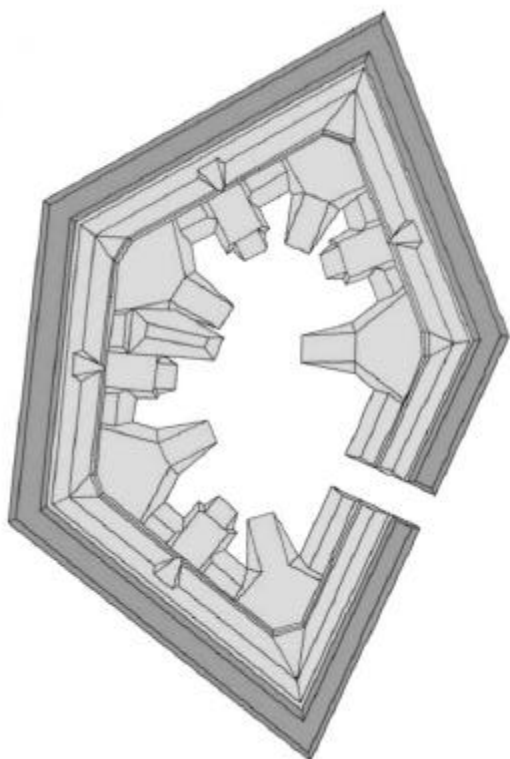
Fort Conahey



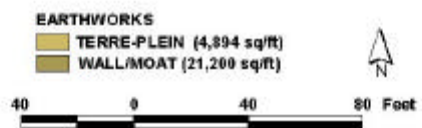
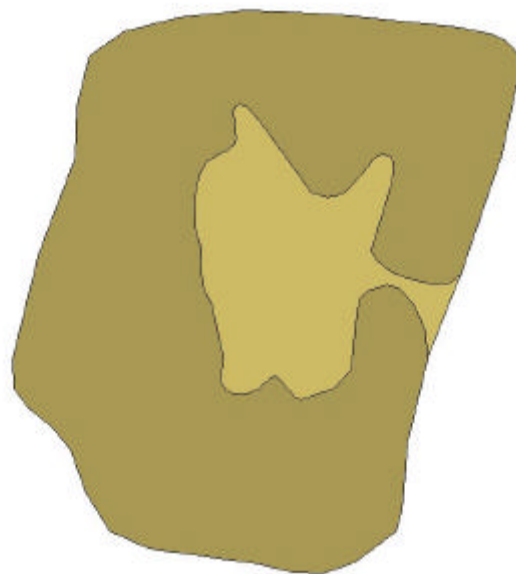
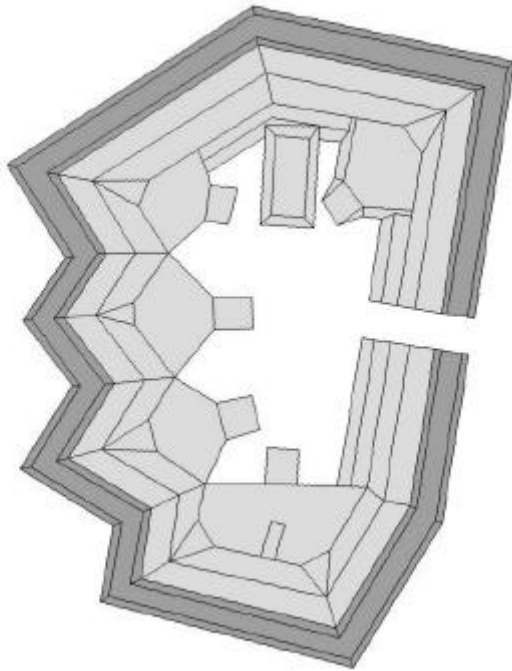
Fort Fisher



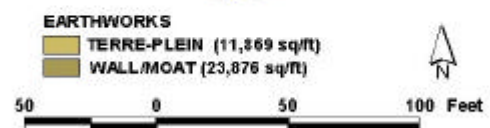
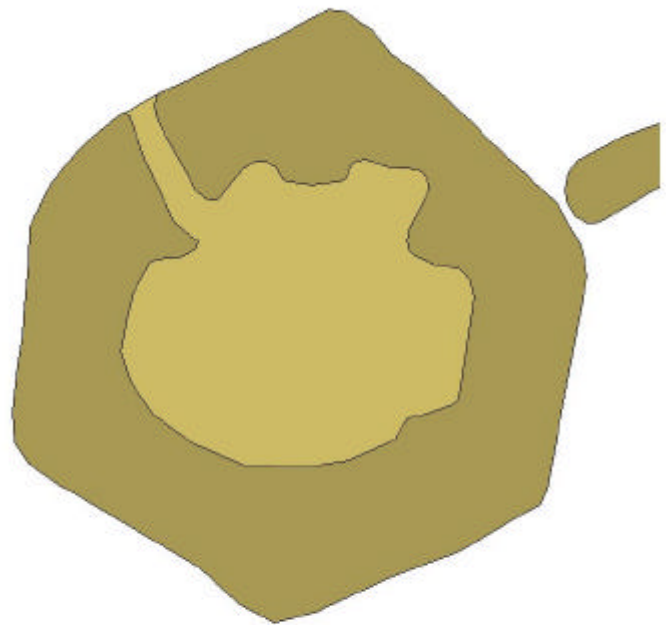
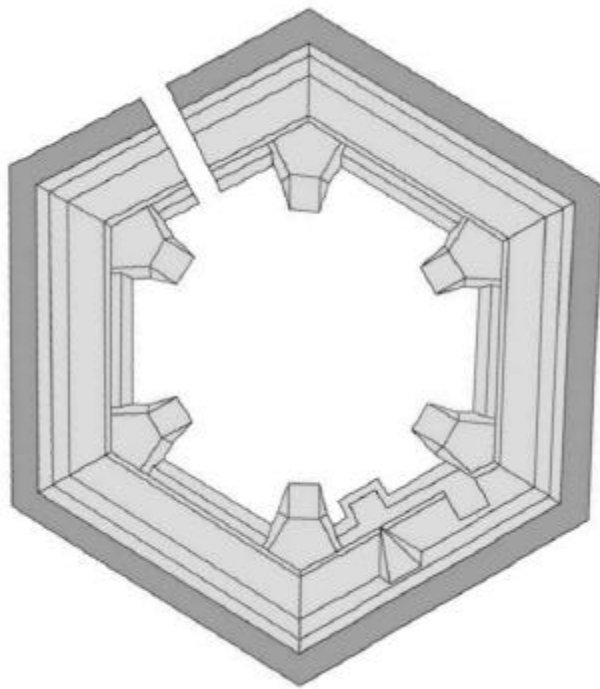
Fort Welch



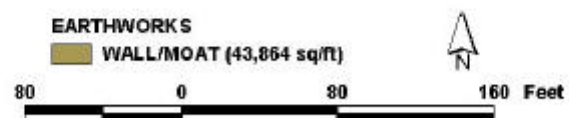
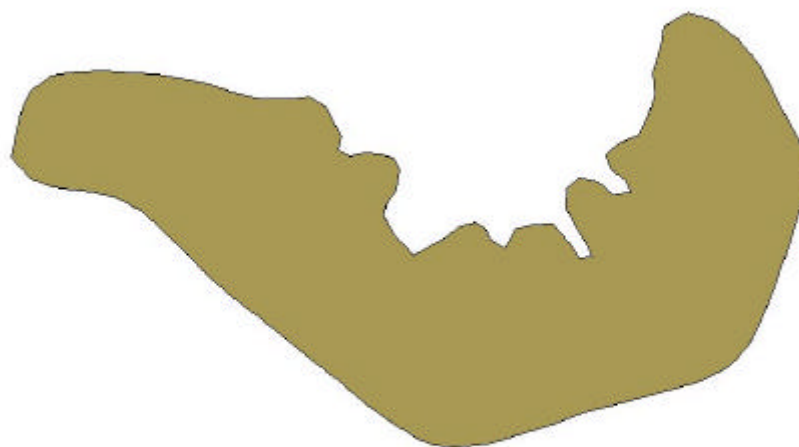
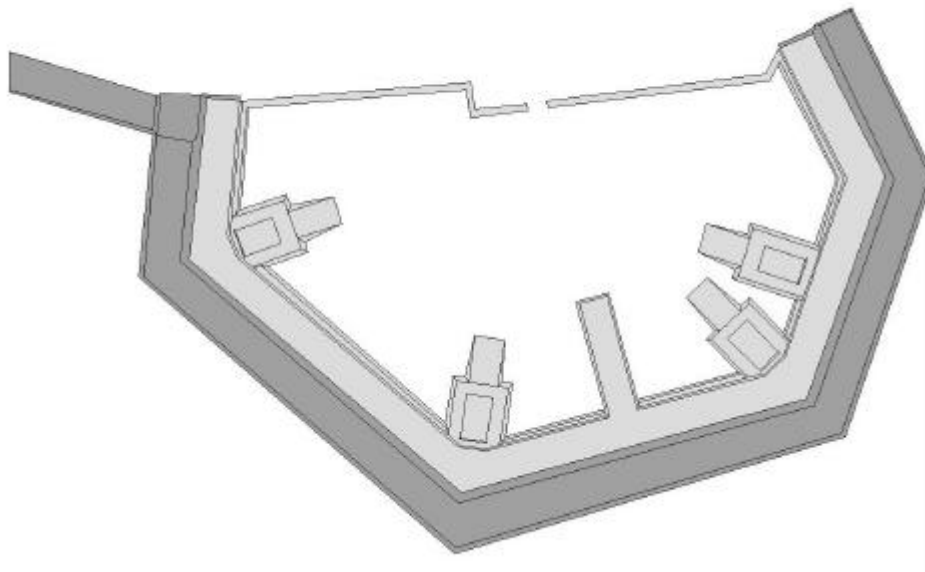
Fort Gregg (Union)



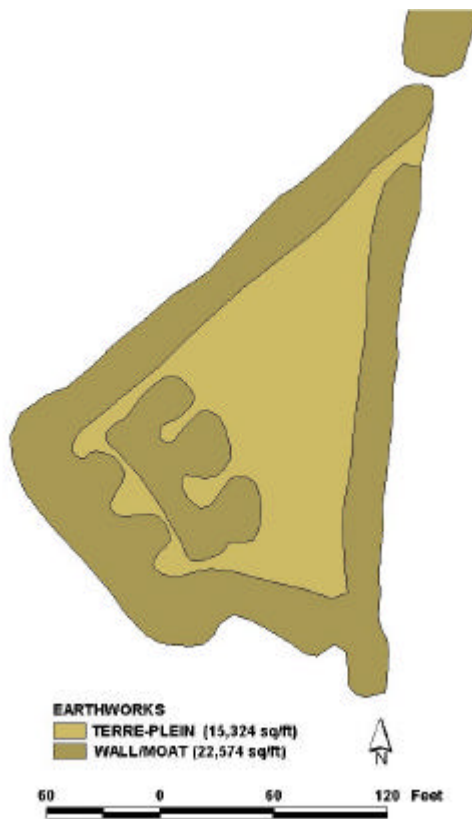
Fort Wheaton



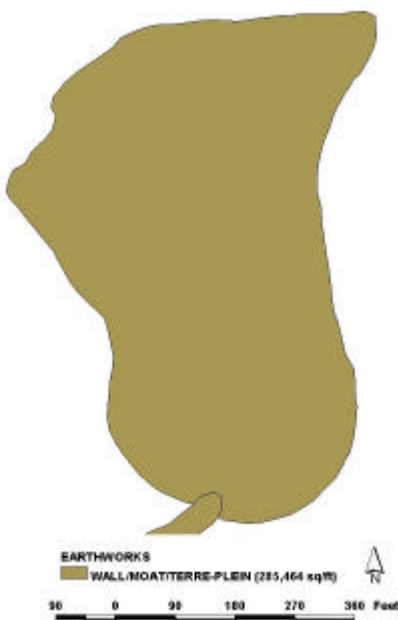
Fort Gregg (Confederate)



*Battery XI**

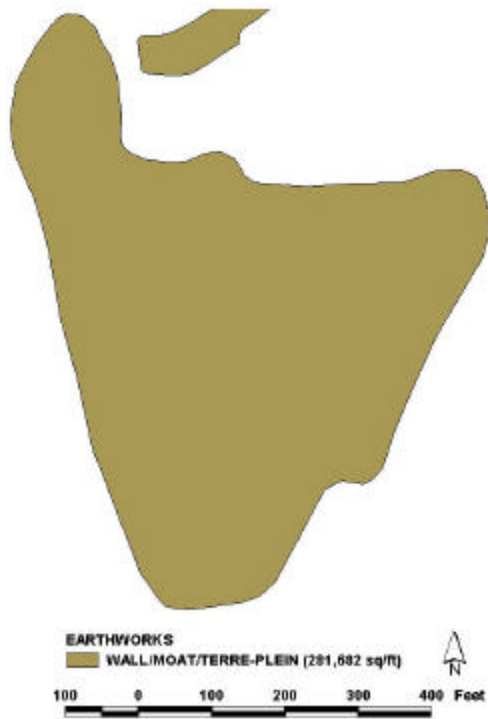


*Colauitt's Salient**



**engineers drawings not on record*

*Gracie's Salient**

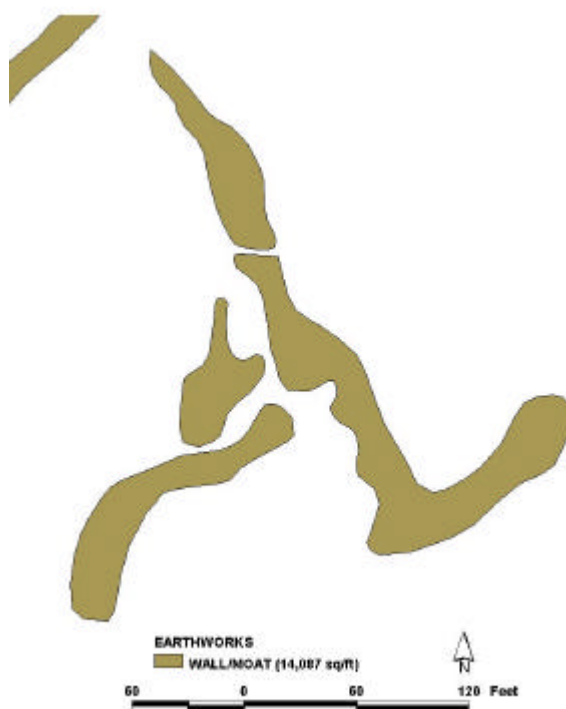


*Battery XIII**

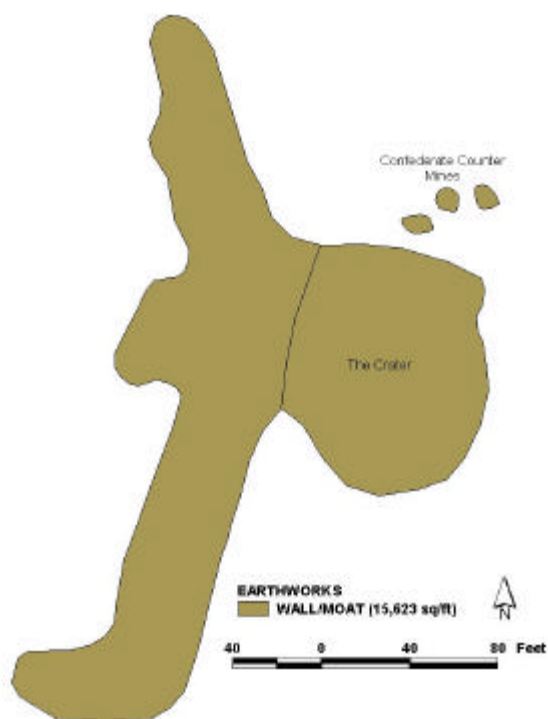


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*Battery XVI**

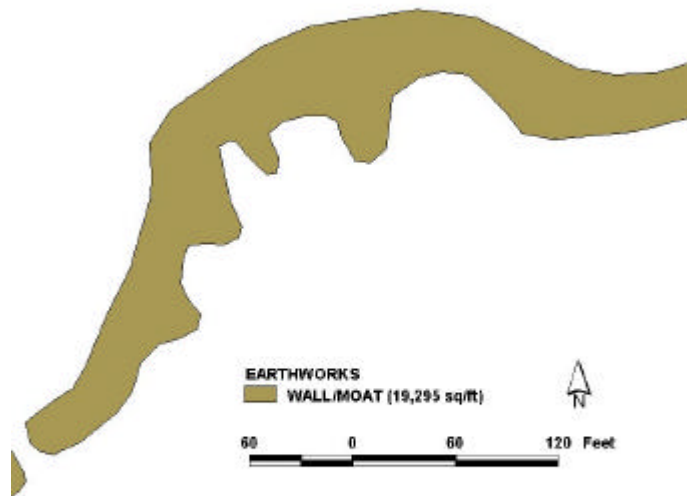


*Elliot's Salient**



**engineers drawings not on record*

*Battery XXVII**



**engineers drawings not on record*

III. MANAGEMENT OBJECTIVES:

The following six objectives are collectively considered to arrive at a holistic earthworks management plan:

- A. Preserve the Historical Structures and associated Features**
{Purpose of the park is to preserve for historical purposes the earthworks, breastworks, walls, forts and other structures}
- B. Provide Interpretive Value**
{To interpret to the public the integrity and significance of the site and its structures}
- C. Promote Sustainability of the Historic Sites, per selected management action**
{Ability to effectively and economically establish a preservation treatment and maintain it over time}
- D. Provide Visitor Accessibility**
{Historic features should be physically and visually accessible}
- E. Provide a Safe Environment**
{Falling hazards from trees/limbs, holes caused by decayed stumps or dug by groundhogs and by illegal relic hunters should be eliminated. Foot trails and bridges should provide safe passage to allow for visitor safety}
- F. Consider Effects on other non-historic Resources** {Removal of trees or other undesirable vegetation should not have a negative impact on threatened or endangered Species or wetlands, if present}



Painting of Union counter-attack on Fort Stedman, 3/25/1865

IV. CONDITIONS AND IMPACTS AFFECTING EARTHWORKS:

A. Conditions/Impacts Affecting the Preservation of Structures and Features



Uprooted trees, often caused by strong wind events (i.e. microburst, tornadoes, hurricanes) , displace large sections of soil and destroy the integrity of the historic features. (Wind Damage at Battery XIII, 4/1998)



Any tree is subject to being windthrown but trees greater than 12" dbh (diameter breast height) have a higher risk. (Wind Damage at Battery XIII, 4/1998)



Moderate wind events that occur after the soil is saturated due to rain or snow will also uproot trees. (Ft. Fisher, 3/99)



Mature trees succumb to natural tree mortality. This is a major concern to park management because many of the trees have already reached their maturity and others are fast approaching it. (Fort Stedman, 7/1997)



Trees growing on the tops and sides of earthworks are more susceptible to being windthrown due to weaker root systems. (Fort Stedman, 7/1997)



Where earthworks are left in forest cover, visitors gravitate to the top of the earthworks for a better view and create trails running along the crest of the works. This compacts the soil, increases runoff and leads to more erosion. When trees are removed and tall grass is planted, visitors can see the features. The tall grass restricts their access to the top and trails do not develop. (Fort Conahey, 2/2000)



Uprooted trees also damage earthworks by crushing parapets upon impact. (Wind Damage at Battery XIII, 4/1998)



Depression caused by uprooted tree in previous photo.
(Battery XIII, 4/1998)



Steep slopes prevent leaf or forest litter from providing an adequate cover to prevent erosion (Battery XI, 7/1997)



Limited ground vegetation, partially due to insufficient sunlight, does not provide adequate erosion protection. (Battery XI, 8/1997)



Native clump grasses have provided limited coverage against erosion (Battery IV, 11/1998)



Sparse vegetation encourages the growth of undesirable plants (i.e. saplings, exotics). (Battery IV, 11/1998)



Many times, trees do not exhibit exterior signs of disease or heart rot. (Fort Stedman, 9/1997)



Many mature trees have, or are susceptible to, “heart rot”. (Fort Stedman, 9/1997)



Decay and insect infestation also leads to tree mortality. (Fort Stedman, 9/1997)



Trees located atop forts and batteries are more susceptible to lightning strikes because of their prominent location upon the landscape. (Fort Stedman, 8/1997)



Large limbs frequently fall and impale the earthworks at depths up to four (4) feet. (Fort Stedman, 4/1996)



Groundhogs often burrow into earthworks and create additional erosion impacts. (Battery XI, 7/1997)

B. Conditions/Impacts Affecting the Interpretive Values



Uprooted trees displace archaeological resources. (Battery XIII, 4/1998)



Uprooted trees can also damage historic artillery pieces. (Battery XIII, 4/1998)

C. Conditions/Impacts Affecting Sustainability

- Maintaining earthworks under a heavy forest canopy and dense understory does not satisfy the Park's management objective for interpretation, safety, or visitor accessibility.
- Earthworks under a forest canopy with little or no understory will be subject to erosion, not only from natural forces, but also from visitors scaling the earthworks.
- Grass planted under a forest canopy does not receive sufficient sunlight to provide a thorough grass cover for protection from erosion.
- Any large trees on the earthworks are subject to windthrow.
- Earthworks with no trees and a tall grass cover that provides protection from erosion is the preferred treatment that will achieve all of management's objectives listed in Section III.
- Designing trails and waysides to "steer" and inform the visitors is critical. (See Appendix G)
- An important component of sustainability is the ability to implement and maintain the selected treatment with available funds and staff.
- Prescribed burning is not an option due to the close proximity to private and public housing, and major roads. Additionally, prescribed burning requires that certain weather conditions must be within prescription. Park management believes the risk of maintaining earthworks by fire exceeds safety parameters in the Eastern and Western Front units of the park.
- Mowing is a cost effective and time efficient practice to maintain a healthy stand of grass and keep undesirable woody-stem plants from invading the earthworks. Mowing with specialized equipment on a semi-annual basis is a versatile method that is cheaper and safer than prescribed burning. Mowing is a less labor-intensive operation with a wider window of when the work can be accomplished. Burning, on the other hand, requires more personnel and is limited to windows dictated by weather conditions. Proper mowing practices has provided protection from erosion and defined the earthen landscape to give the visitors a good interpretive experience. The Park has demonstrated that this management practice works and is sustainable.

D. Conditions/Impacts Affecting Visitor Accessibility

Vegetation, such as brush and trees, impede not only the view of the earthworks but also accessibility to the fort. Thick understory also provides concealment for relic hunters.
BEFORE



Fort Wadsworth, 5/1994

AFTER



Fort Wadsworth, 3/1995

E. Conditions/Impacts Affecting a Safe Environment



Falling limbs can cause serious injury to visitors. (Fort Stedman, 8/1997)



Trees die and stumps rot creating hidden hazards for visitors. (Fort Stedman 3/98)

F. Conditions/Impacts Affecting Non-historic Resources

Impacts to the non-historic resources may include:

- Threatened and Endangered Species (T&E)

An inventory of the possible presence of T&E species should be conducted prior to vegetation removal.

- Wetlands

Generally speaking, forts, batteries and salients were constructed on the high ground, which would eliminate or reduce any occurrence of wetlands. If wetlands are found, mitigation of the wetlands still could be utilized based on the importance of the cultural resource.

- Trees

Tree removal can effect wildlife habitat. Dead, hollow trees pose a safety hazard to visitors justifying their removal for safety.

G. Additional Issues Affecting Earthwork Management



The cost of removing windthrown trees, associated root systems and repairing the damage is substantially more expensive than felling trees and removing them prior to storm events. (Battery XIII, 5/1998)



Through the media, the public is educated about the problems associated with trees growing on earthworks and the urgency for their preservation. (Battery XIII, 4/1998)

V. FUNDAMENTALS FOR EARTHWORK MANAGEMENT AT PETERSBURG NATIONAL BATTLEFIELD

When cultural and natural resources seem to be in conflict, priority is given to the cultural resources based on the following justifications:

- Petersburg National Battlefield was established specifically to preserve and interpret the historical events that occurred in 1864 and 1865. Therefore, Petersburg National Battlefield is a “cultural” park where the natural resources support the cultural resources.
- The Historic Sites, Buildings and Antiquities Act (see Appendix B) declared a national policy to preserve for public use historic sites, buildings and objects of national significance. This Act places great importance on the protection of battlefields and forts.
- The Organic Act directs us to protect the resources and to provide for the enjoyment of those same resources by the public. (See Appendix A)

The principles outlined below are based on over twenty years of field applications at Petersburg National Battlefield. Additionally, these principles are cost effective and can be maintained with park resources, staff and volunteers.

A. Tree Removal

The removal of trees from earthworks is necessary to protect them from the negative impacts that were previously listed in Section IV.

B. Erosion Control

Once the trees are removed, a grass cover on the earthworks is necessary to help prevent erosion. Additionally, the grass cover will enable visitors to better visualize the contours and features associated with these earthworks.

C. Seed Selection

The grass seed selected is based on:

- how effective is it in preventing erosion on sloped surfaces
- if the grass will grow well in our particular region
- if the soil is conducive to the selected seed
- how quickly the seed will germinate
- the availability of the seed
- the cost of the seed
- field results, not theories
- the effectiveness of selected grass seed being planted via hydroseeding techniques

For over a quarter century, the park has been using a variety of turf grasses for erosion control on earthworks. In 1994, the park began using *single stem tall fescue* exclusively for earthwork preservation projects because of its characteristics as an effective erosion control. This grass:

- provides a thick, uniform coverage
- is drought resistant
- grows well in our region and soils
- is readily available from local markets
- is quick to germinate and provide a thorough cover
- is economically priced
- can be seeded easily by hydroseeding
- is an effective erosion control grass
- grows well on sloped surfaces, and
- has yielded good results in field applications

Tall Fescue works well when allowed to grow high. It then has a natural tendency to lay over. This provides a protective layer from falling precipitation, which runs over the long blades of grass. The grass is mowed once in the spring and once in the fall at a height of five inches.

On February 3, 1999, Executive Order 13122 - Invasive Species was issued. (See Appendix C) This Act was written to address the introduction, spread, and control of invasive species and provide for the restoration of native species. Tall Fescue, like most other turf grasses, is not a native grass even though it has been growing in North America for a couple hundred years. There is also debate about its invasive tendencies. (Some specialists on this subject believe it is not invasive at all while others believe it is, but only at a low level.) Sec. 2 (3) of this Act also states that the agency is not authorized to carry out actions that are likely to cause or promote the introduction or spread of invasive species unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive plants.

Even with the issuance of this Act, the Park still feels its use of fescue is justified because:

- There appears to be no risk of harm in conjunction with its use.
- Its benefits for erosion control have been field tested and proven effective.
- Its use on sloped surfaces has been endorsed by the Natural Resource Conservation Service, NRCS (formerly known as the Soil Conservation Service). In addition, the NRCS does not advise the use of native grasses on steep sloped surfaces for the purpose of erosion control. They also stated that native grasses grow well in flat, open fields but not on sloped surfaces like earthworks.



Battery IV has been used to test the effects of native grass on earthworks but its use has not proven to be an effective cover. Native grasses are growing well in field adjacent to the earthworks but not on the steep slopes of the earthworks. There, oak, sweetgum, holly, greenbriar, poison ivy, Japanese Honeysuckle and pine saplings outcompete the native grasses. (Battery IV, 1/2000)

- The Virginia Natural Heritage Program endorses our use of fescue. They state that the park is justified in using fescue over native species because of the park's location (i.e. longitude and latitude), the resources we are preserving (i.e. earthworks), the park's mandate to protect the earthworks (i.e. enabling legislation), and the unsuccessful establishment of native grasses on earthworks at Battery IV.
- The Army Corps of Engineers have observed the field results of the park's earthworks preservation techniques and endorses the park's preservation strategies.
- Fescue continues to be widely used throughout the National Park Service, especially around visitor centers and a variety of public use areas. This grass is not highly invasive and has been in use in America for a couple hundred years. The National Park Service has neither banned nor restricted its use because of its benefits in landscaped areas and its effectiveness in erosion control.

D. Hydroseeding

Hydroseeding is the most cost-effective form of seeding large areas. It provides erosion protection even before the grass germinates, and it is less damaging to the earthworks than hand seeding or plugging.



Fort Stedman (9/1997)

E. Maintenance

Earthworks can be economically maintained with park resource, i.e. staff and funding.
(See Section VIII)

VI. TREATMENT

A. Preparing Contracts

Prepare applicable contracts (i.e. herbicide treatment, removal of understory vegetation, tree felling and removal, stump grinding and/or treatment, hydroseeding).

B. Prepping Site (Clearing)

***Treat site with a broadleaf herbicide**



If an area is overgrown with an understory of herbaceous plants, treat with an approved herbicide. Do not cut plants immediately after application. Wait several weeks to allow herbicide to be absorbed through the leaves and penetrate into the root system. Check herbicide label for application times. (Fort Wadsworth, 10/1994)

***Cut understory and tree saplings using various types of equipment.**



Brush mower with boom allows mowing without driving on earthworks.
(Fort Wadsworth, 10/1994)



Rough cut understory down to 5 inches. (Fort Wadsworth, 10/1994)



Walk-behind powered mowers mulch and cut remaining stubble down to ground level. (Fort Wadsworth, 10/1994)



Chainsaws and brushcutters are used to cut woody stem plants flush with ground. (Fort Wadsworth, 10/1994)

***Collect soil samples from various locations and submit to laboratory for analysis to determine current pH and nitrate level**



Soil samples are necessary in order to prescribe the correct rate of fertilizer and lime. (2/2000)

***Remove branches that may impale the ground before trees are felled**



Use bucket truck or tree climbers to remove branches in the direction of the fall. (Battery XI, 9/1997)

***Fell and remove large trees from earthworks in areas where lower vegetation has already been removed**



Use “soft logging” techniques to ensure felled trees will not impact or impale any historical features. These features include the earthworks, bomb-proofs, magazines, etc. (Battery XI, 9/1997)



Flush cut all deciduous tree stumps level with ground. (Battery XI, 9/1997)

***Treat deciduous tree stumps within one hour to reduce the possibility of the tree re-sprouting**



Use an effective, approved stump treatment. Conifers will not resprout and therefore do not need to be treated. (Fort Wadsworth, 10/1994)

***Cut trees into sections before removal**



The use of vehicles with flotation tires will reduce the occurrence of ruts being left on the landscape. (Battery XI, 9/1997)



Cranes can assist in getting large pieces out and over earthwork walls. This method is most useful when access to the fort is limited. (Battery XIII, 4/1998)

*** Rake any remaining vegetation or duff off the earthworks to ensure a good soil/seed contact for germination**



Hand raking is necessary to remove duff from the earthworks. (Fort Wadsworth, 10/1994)



Fort Wadsworth after hand raking. (Fort Wadsworth, 10/1994)



Once the duff is off the earthworks, mechanical means can be employed for raking into piles.
(Fort Wadsworth, 10/1994)



Removal of duff is easily handled at this point by a front-end loader. (Fort Wadsworth, 10/1994)

*** Stump removal and rehabilitation**



Grind stumps approximately four (4) inches below grade. Deciduous tree stumps should be ground at least three months after herbicide treatment which will allow the stump treatment to be more effective. (Fort Stedman, 9/1997)



Fill void of stump with topsoil prior to seeding. This will better enable mowers to cut grass. (Fort Stedman, 9/1997)

*** Aerate earthworks**



Use a “spiked” roller. DO NOT use the plugged type. (Fort Wadsworth, 10/1994)



Aerate earthworks prior to hydroseeding. (Fort Wadsworth, 10/1994)

C. Seeding

- Hydroseeding should occur as soon as possible after the earthworks have been raked down to mineral soil to reduce erosion potential from wind or precipitation.
- Selected grass seed for hydroseeding should meet specifications. (Outlined in Section V)
- Placing straw on earthworks after they are seeded will provide an extra measure of protection.
- Irrigate the earthworks to jump-start seed germination if precipitation is not in the immediate weather forecast.



Hydroseeding at Fort Wadsworth from perimeter using truck mounted hydroseeder. (11/1994)

Sometimes hydroseeding vehicles cannot access forts which requires the use of hoses. (Fort Stedman, 9/1997)





Straw can be applied for additional erosion protection. (Fort Stedman, 9/1997)



Jute netting should be applied only on those areas that are too steep to be mowed. It is inappropriate in areas to be mowed (as shown above) because the netting becomes entangled in mower blades, ripping up large sections of jute and metal staples. (Fort Gregg, 1992)

VII. TRANSITION FROM FOREST/SHRUB COVER TO GRASS COVER AT FORT WADSWORTH, (1994/95)



BEFORE
TREATMENT

AFTER FOREST/SHRUB IS
REMOVED AND PRIOR
TO HYDROSEEDING



THREE MONTHS
AFTER
HYDROSEEDING

SEVEN MONTHS AFTER HYDROSEEDING



FORT WADSWORTH
May 1995



VIII. MAINTENANCE

A. Grass Cutting



Specialized mowers are used to cut sloped surfaces of earthworks. Mowers automatically adjust to the angle of the slope. Mowers are also equipped with floatation tires that provide safe operation and do not mar earthworks. (Battery IV, 6/1999)



Grass is cut at a height of five (5) inches on the earthworks twice a year, i.e. once in mid-spring and once in early fall. This will allow adequate time for the grass to grow tall and provide a protective cover for the earthworks over the summer and winter periods. (Fort Wadsworth, 5/1995)



Should the spring or fall growing season be less than ideal, i.e. drought conditions, cutting can be reduced to once a year. However, a minimum of one (1) cutting a year is necessary to keep “volunteer” woody stem plants from becoming reestablished. This photo shows oak saplings at a height of six feet and sweetgum saplings at a height of seven feet after just eighteen months of growth. (Battery IV, 1/2000)



Grass is cut to a height of three (3) inches on the terreplein of the fort to allow visitor access. (Fort Wadsworth, 5/1995)



Maintaining a tall grass on the earthworks outlines the features of the forts, batteries and salients. It also serves as a deterrent to keep visitors from walking on top of the walls. To protect earthworks, grass is not mowed when the ground is wet. (Fort Wadsworth, 5/1995)

B. Nutrient Applications

Soil samples should be taken once every two years. The results will indicate the amounts of phosphorus, potassium, calcium, and magnesium the soil can provide to the grass and what, if any, supplemental fertilizer is needed. It will also indicate the acidity (pH) of the soil and whether lime is needed.

- If the pH levels need to be brought up, lime can be added (per soil sample prescription) at six-month intervals.
- Fertilizing cool season grasses, i.e. tall fescue, is best done in late summer or fall.

C. Irrigation

- It may be necessary to irrigate earthworks during the first year if drought conditions occur. After grass is established, irrigation is not normally needed.
- If a site is irrigated, a slow, deep soaking method is necessary to promote a deep root system.

D. Aeration

- Aerate at a minimum of once every two years with a “spike” type roller to promote air transfer in the soil and to reduce compaction of soil.

CONCLUSION

Petersburg National Battlefield is set aside for the public to reflect upon the significance of the events that occurred here. Petersburg National Battlefield is a memorial to those who made the supreme sacrifice and is a reminder of the horrors of war.

Presently, the battlefield's landscape only partially portrays the vastness of the siege that occurred here in 1864-65. Still, within the boundaries of the park are many of the significant sites, original earthworks and fortifications, which are associated with the siege.

Earthwork management is fundamental to meeting the expectations of the visitors and to fulfilling the purpose of the park. This does come at a price; earthwork management cannot be a "hands-off" approach. The park feels the concept of letting the forest grow over the battlefield landscape and fortifications is unacceptable.

Preserving the earthworks and associated battlefield landscapes in a manner that the events of history can be perceived by the visitor is the best management practice.



APPENDIX A

National Park Service Organic Act

16 U.S.C. 1 et seq. (1988), Aug. 25, 1916, ch. 408, 39 Stat. 535

There is created in the Department of the Interior a service to be called the National Park Service, which shall be under the charge of a director. The Secretary of the Interior shall appoint the director, and there shall also be in said service such subordinate officers, clerks, and employees as may be appropriated for by Congress. The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified, except such as are under the jurisdiction of the Secretary of the Army, as provided by law, by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

In 1916, the Department of the Interior was responsible for 12 national parks, 19 national monuments, and 2 reservations. The U.S. Forest Service managed the Grand Canyon and Mt. Olympus (Olympic National Park) mainly for timber harvest. The Army stationed a cavalry unit in Yellowstone year round and sent troops to Yosemite and Sequoia in the summer. The superintendents in charge of Interior lands had little or no experience managing natural areas and little or no help from the Department. Because of bad roads and scanty accommodations, comparatively few people visited the parks. Without public support, Congress would not allocate funding--parks in 1916 were run on less than a shoestring. From 1911 to 1915, numerous bills to establish a bureau of national parks had been introduced, but none had gotten out of committee. In 1916, Stephen Mather joined the Department and with Horace Albright began an aggressive campaign to educate congressmen and the public concerning the value of the national parks. Their campaign worked. In the summer of 1916, Congress passed the Organic Act, establishing the National Park Service to manage and protect national parks, monuments, and reservations.

The authors of the Organic Act were well aware of the conflicts between use and preservation, but they also knew that Congress would never agree to exclude these areas from public use. Frederick Law Olmsted, Jr., came up with the language that defines the Park Service today. By law, the National Park Service is mandated to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." This carefully chosen language has weathered numerous lawsuits which have in general served to strengthen the National Park Service's resource protection powers.

By 1970, the National Park System included historical parks, scenic riverways, recreation areas, and a variety of other designations. Some units' enabling legislation included special provisions that permitted consumptive activities in that unit, such as fishing, hunting, trapping, and mining. To clear up any confusion of the overall mission for each unit, Congress amended the Organic Act with language that tied all units back to the purposes stated in the Organic Act. Thus, while each unit is to be administered according to its enabling legislation, each is also ultimately to be managed following the directives of the Organic Act. (Also see General Authorities Act)

In 1974-76, the Sierra Club sued the National Park Service to take action against commercial loggers, whose activities outside the boundaries of Redwood National Park were damaging park resources. When Redwood was created, portions of the Redwood Creek watershed were left out of the original boundary for political reasons. Congress had authorized the Secretary to acquire easements and enter into management agreements with the timber companies, but the Park Service had not taken these actions, resulting in the lawsuit. The courts ruled that the Park Service had not taken the appropriate actions to protect the park, and the Park Service then asked Congress for help in taking such actions. (*Sierra Club v Department of the Interior*, 376 F. Supp. W N.D.Cal. 1974); *Ibid.*, 398 F. Supp. 284(1975); *Ibid.*, 424 F. Supp. 172 (1976).)

In response, Congress passed an amendment in 1978 to the Organic Act that addressed the problem. It

also generically strengthened the National Park Service's protective function. This amendment states that "the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress." Thus, Congress' intent for each park as established in the park enabling legislation is upheld by the Organic Act, as well as Congress' option of amending that legislation if necessary. (Also see Redwood National Park Act)

As amended, the Organic Act allows the Secretary a great deal of latitude in making management decisions, and the courts have consistently upheld this latitude, especially if it is supported by careful study and planning. The Secretary can exclude a use that is detrimental to resources, or allow a use if it is determined to be appropriate. For example, commercial fishing is prohibited in Everglades National Park. When deciding a lawsuit brought by commercial fishermen challenging the regulation, the court carefully reviewed the planning and public information process and ruled that the Park Service was well within its administrative authority. (*Orgallized Fishermen v. Watt*, 590 F. Supp. 805 (S.D. Pla 1984); affirmed, 77 F.2d 1544 (11th Cir. 1985).) When the National Rifle Association challenged the Park Service's right to ban hunting and trapping (except where part of the unit's enabling legislation), the court ruled that the Organic Act clearly provided for the protection of wildlife and that the Park Service was acting within its authority. (*National Rifle Association v Potter*, 628 F. Supp. 903 (O.O.C. 1986).)

Alternatively, the Secretary can permit a use if it has been clearly proven not to threaten resources. For example, at Cape Cod the general management plan allows off-road vehicle (ORV) use under guidelines designed to protect the ecological integrity of the area. Environmental groups sued to stop ORV use altogether, on the assumption that any ORV use would permanently damage the ecosystem. The court ruled that the management plan adequately protected the ecosystem and that "Park Service decisions were the result of carefully designed, scientifically based studies and continued monitoring efforts." (*Conservation Law Foundation v Clark*, 590 F. Supp. 1467 (0. Mass. 1984).) The Organic Act will undoubtedly continue to be tested and defined in the courts. As it stands, it provides a powerful weapon in the National Park Service's continued battle to protect the nation's natural and cultural resources.

References

Albright, Horace. 1985. *The Birth of the National Park Service: The Founding Years, 1912-1933*. Howe Brothers, Salt Lake City, Chicago.

Mantell, Michael A., and Philip C. Metzger. 1990. The Organic Act and the Stewardship of Resources within Park Boundaries. Chapter 2 in *Managing the National Park System: A Handbook on Legal Duties, Opportunities, and Tools*. The Conservation Foundation, Baltimore, Maryland

APPENDIX B

Historic Sites, Buildings and Antiquities Act

16 U.S.C. 461 et seq. (1988), Aug. 21, 1935, ch. 593, 49 Stat. 666

The Historic Sites Act declared "a national policy to preserve for public use historic sites, buildings and objects of national significance...." To carry out this policy, the act assigned broad powers and duties to the Secretary of the Interior acting through the National Park Service. The Secretary was directed to "secure, collate, and preserve drawings, plans, photographs, and other data of historic and archaeological sites, buildings, and objects." The Secretary was to survey historic properties "for the purpose of determining which possess exceptional value as commemorating or illustrating the history of the United States." The Secretary was authorized to conduct historical and archeological research; to "restore, reconstruct, rehabilitate, preserve, and maintain" historic properties directly or through cooperative agreements with other parties; to mark historic properties with tablets; to establish and maintain museums in connection with historic properties and develop an educational program to inform the public about them; and to acquire historic properties provided that no federal funds were obligated ahead of congressional appropriations.

The act also established an Advisory Board on National Parks, Historic Sites, Buildings, and Monuments. It was to consist of up to 11 persons appointed by the Secretary and include people with expertise in history, archeology, architecture, and "human geography" {later amended to replace "human geography" with "anthropology, biology, geology, and related disciplines"}. It was to advise the Secretary on matters relating to the parks and the treatment and general administration of historic properties.

The Historic Sites Act was as much a legal ratification of existing activities as a prescription for new ones. In the early 1930s the Park Service had moved dramatically into the historic sites field, especially with its acquisition of the War Department's historic battlefields and forts and the national capital parks in a 1933 government reorganization. That same year the Service obtained Depression relief funds to hire unemployed architects and launch the Historic American Buildings Survey (HABS). Several of the authorities in the act sanctioned what the Service was already doing at its new historic properties and in the HABS program, lending congressional support to the perpetuation of this work. The language underpinning HABS was used in 1969 to justify a companion program, the Historic American Engineering Record.

New activity also resulted from the act. In 1936 the National Park Service inaugurated the National Survey of Historic Sites and Buildings, which examined properties representing various themes of American history and prehistory to identify those possessing national significance. Initially it was expected that most places so identified would be brought into the National Park System. Some of these had cooperative agreements negotiated with their owners, were designated "national historic sites" by the Secretary, and ultimately came under National Park Service administration; a few remained national historic sites outside the National Park System. By far the most remained unaffiliated with the Park Service, however, and a new designation-national historic landmark-was adopted in 1960 to recognize these sites. As of 1992, secretaries of the Interior had designated more than 2,000 national historic landmarks. The National Historic Landmarks Survey, as the program is now called, continues to identify nationally significant historic properties in all forms of ownership (including properties of discrete historical identity within parks) and to identify and review the national significance of candidates for the National Park System.

In 1962 the Park Service used the act's authority to launch a comparable survey for natural areas. This has resulted in secretarial designation of almost 600 properties as national natural landmarks.

The advisory board appointed under the act played an important role in formulating the Park Service's historic preservation policies, evaluating properties for historic landmark designation, and considering proposed parks. Public Law 94-458 of October 7, 1976, changed the board's name to National

Park System Advisory Board, set four-year terms for its members, and provided for its termination in 1990. Public Law 101-628 of November 28, 1990, extended the board until 1995, expanded its membership to 16, and charged it with recommending natural as well as historic landmark designations to the Secretary.

Among the more consequential provisions of the Historic Sites Act has been Section 2(e), which authorizes the Secretary to contract and make cooperative agreements with public and private bodies and persons to "protect, preserve, maintain, or operate" historic properties in public or private ownership. This general authority has served valuable preservation purposes. When Bess Truman died in 1982, for example, it allowed Secretary Watt to enter into a cooperative agreement with her estate to protect the Truman house until it could be brought into the National Park System by a specific act of Congress the following year.

Historic Sites, Buildings and Antiquities Act of 1935. 1980. Department of the Interior Law Library, Washington, D.C. (A legislative history compilation.) -

Mackintosh, Barry. 1985. *The Historic Sites Survey and National Historic Landmarks Program: A History.* National Park Service, History Division, Washington, D.C.

APPENDIX C

Executive Order (Invasive Species)

Executive Order 13112 of February 3, 1999

Invasive Species

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.), Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended (16 U.S.C. 4701 et seq.), Lacey Act, as amended (18 U.S.C. 42), Federal Plant Pest Act (7 U.S.C. 150aa et seq.), Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2801 et seq.), Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), and other pertinent statutes, to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause, it is ordered as follows:

Section 1. Definitions.

- (a) ``Alien species'' means, with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.
- (b) ``Control'' means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of invasive species and to prevent further invasions.
- (c) ``Ecosystem'' means the complex of a community of organisms and its environment.
- (d) ``Federal agency'' means an executive department or agency, but does not include independent establishments as defined by 5 U.S.C. 104.
- (e) ``Introduction'' means the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.
- (f) ``Invasive species'' means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.
- (g) ``Native species'' means, with respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.
- (h) ``Species'' means a group of organisms all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms.
- (i) ``Stakeholders'' means, but is not limited to, State, tribal, and local government agencies, academic institutions, the scientific community, nongovernmental entities including environmental, agricultural, and conservation organizations, trade groups, commercial interests, and private landowners.
- (j) ``United States'' means the 50 States, the District of Columbia, Puerto Rico, Guam, and all possessions, territories, and the territorial sea of the United States.

Sec. 2. Federal Agency Duties.

- (a) Each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law,
- (1) identify such actions;
 - (2) subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them; and
 - (3) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.
- (b) Federal agencies shall pursue the duties set forth in this section in consultation with the Invasive Species Council, consistent with the Invasive Species Management Plan and in cooperation with stakeholders, as appropriate, and, as approved by the Department of State, when Federal agencies are working with international organizations and foreign nations.

Sec. 3. Invasive Species Council.

- (a) An Invasive Species Council (Council) is hereby established whose members shall include the Secretary of State, the Secretary of the Treasury, the Secretary of Defense, the Secretary of the Interior, the Secretary of Agriculture, the Secretary of Commerce, the Secretary of Transportation, and the Administrator of the Environmental Protection Agency. The Council shall be Co-Chaired by the Secretary of the Interior, the Secretary of Agriculture, and the Secretary of Commerce. The Council may invite additional Federal agency representatives to be members, including representatives from subcabinet bureaus or offices with significant responsibilities concerning invasive species, and may prescribe special procedures for their participation. The Secretary of the Interior shall, with concurrence of the Co-Chairs, appoint an Executive Director of the Council and shall provide the staff and administrative support for the Council.
- (b) The Secretary of the Interior shall establish an advisory committee under the Federal Advisory Committee Act, 5 U.S.C. App., to provide information and advice for consideration by the Council, and shall, after consultation with other members of the Council, appoint members of the advisory committee representing stakeholders. Among other things, the advisory committee shall recommend plans and actions at local, tribal, State, regional, and ecosystem-based levels to achieve the goals and objectives of the Management Plan in section 5 of

this order. The advisory committee shall act in cooperation with stakeholders and existing organizations addressing invasive species. The Department of the Interior shall provide the administrative and financial support for the advisory committee.

Sec. 4. Duties of the Invasive Species Council. The Invasive Species Council shall provide national leadership regarding invasive species, and shall:

- (a) oversee the implementation of this order and see that the Federal agency activities concerning invasive species are coordinated, complementary, cost-efficient, and effective, relying to the extent feasible and appropriate on existing organizations addressing invasive species, such as the Aquatic Nuisance Species Task Force, the Federal Interagency Committee for the Management of Noxious and Exotic Weeds, and the Committee on Environment and Natural Resources;
- (b) encourage planning and action at local, tribal, State, regional, and ecosystem-based levels to achieve the goals and objectives of the Management Plan in section 5 of this order, in cooperation with stakeholders and existing organizations addressing invasive species;
- (c) develop recommendations for international cooperation in addressing invasive species;
- (d) develop, in consultation with the Council on Environmental Quality, guidance to Federal agencies pursuant to the National Environmental Policy Act on prevention and control of invasive species, including the procurement, use, and maintenance of native species as they affect invasive species;
- (e) facilitate development of a coordinated network among Federal agencies to document, evaluate, and monitor impacts from invasive species on the economy, the environment, and human health;
- (f) facilitate establishment of a coordinated, up-to-date information-sharing system that utilizes, to the greatest extent practicable, the Internet; this system shall facilitate access to and exchange of information concerning invasive species, including, but not limited to, information on distribution and abundance of invasive species; life histories of such species and invasive characteristics; economic, environmental, and human health impacts; management techniques, and laws and programs for management, research, and public education; and
- (g) prepare and issue a national Invasive Species Management Plan as set forth in section 5 of this order.

Sec. 5. Invasive Species Management Plan.

- (a) Within 18 months after issuance of this order, the Council shall prepare and issue the first edition of a National Invasive Species Management Plan (Management Plan), which shall detail and recommend performance-oriented goals and objectives and specific measures of success for Federal agency efforts concerning invasive species. The Management Plan shall recommend specific objectives and measures for carrying out each of the Federal agency duties established in section 2(a) of this order and shall set forth steps to be taken by the Council to carry out the duties assigned to it under section 4 of this order. The Management Plan shall be developed through a public process and in consultation with Federal agencies and stakeholders.

(b) The first edition of the Management Plan shall include a review of existing and prospective approaches and authorities for preventing the introduction and spread of invasive species, including those for identifying pathways by which invasive species are introduced and for minimizing the risk of introductions via those pathways, and shall identify research needs and recommend measures to minimize the risk that introductions will occur. Such recommended measures shall provide for a science-based process to evaluate risks associated with introduction and spread of invasive species and a coordinated and systematic risk-based process to identify, monitor, and interdict pathways that may be involved in the introduction of invasive species. If recommended measures are not authorized by current law, the Council shall develop and recommend to the President through its Co-Chairs legislative proposals for necessary changes in authority.

(c) The Council shall update the Management Plan biennially and shall concurrently evaluate and report on success in achieving the goals and objectives set forth in the Management Plan. The Management Plan shall identify the personnel, other resources, and additional levels of coordination needed to achieve the Management Plan's identified goals and objectives, and the Council shall provide each edition of the Management Plan and each report on it to the Office of Management and Budget. Within 18 months after measures have been recommended by the Council in any edition of the Management Plan, each Federal agency whose action is required to implement such measures shall either take the action recommended or shall provide the Council with an explanation of why the action is not feasible. The Council shall assess the effectiveness of this order no less than once each 5 years after the order is issued and shall report to the Office of Management and Budget on whether the order should be revised.

Sec. 6. Judicial Review and Administration.

(a) This order is intended only to improve the internal management of the executive branch and is not intended to create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by a party against the United States, its agencies, its officers, or any other person.

(b) Executive Order 11987 of May 24, 1977, is hereby revoked.

(c) The requirements of this order do not affect the obligations of Federal agencies under 16 U.S.C. 4713 with respect to ballast water programs.

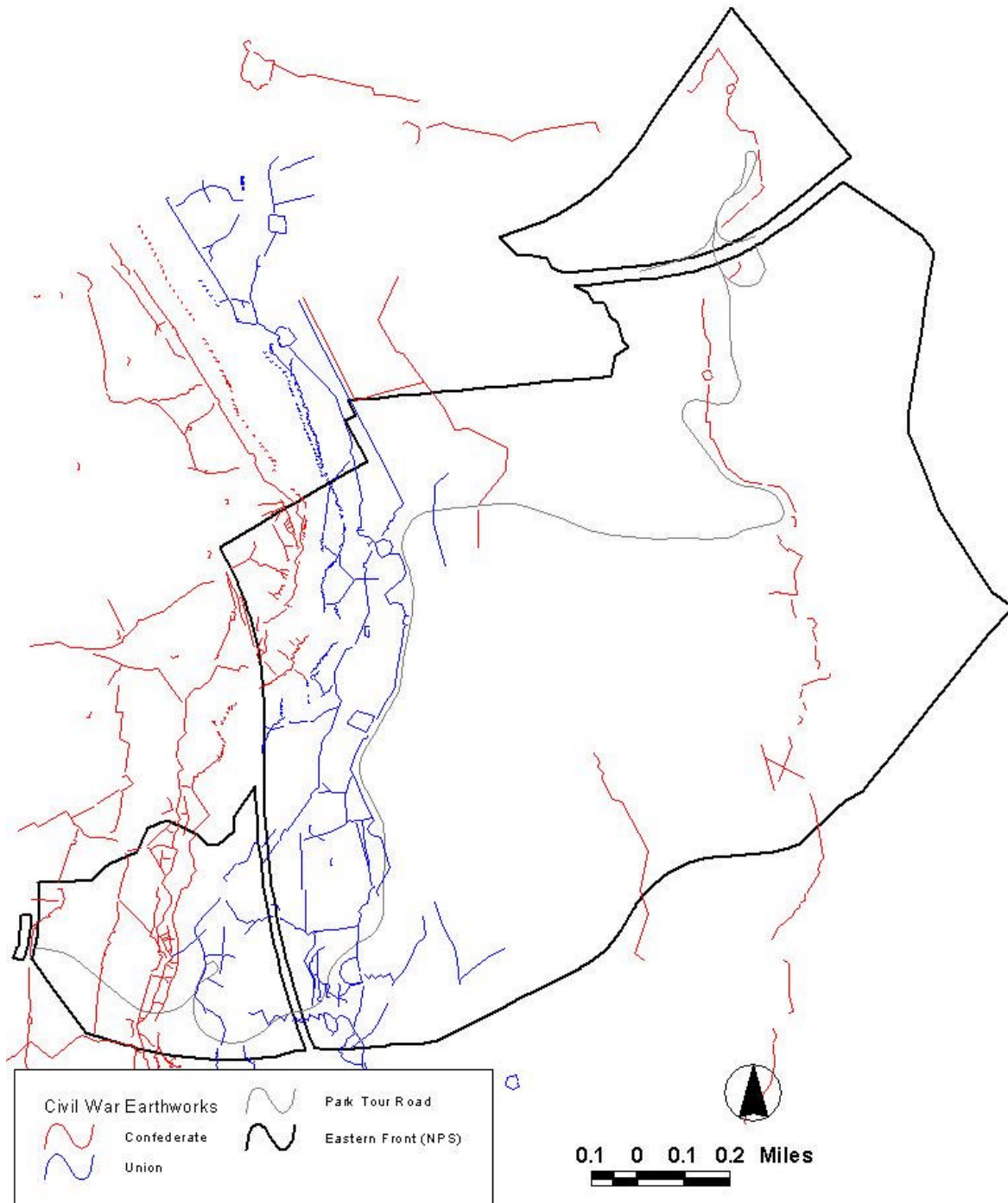
(d) The requirements of section 2(a)(3) of this order shall not apply to any action of the Department of State or Department of Defense if the Secretary of State or the Secretary of Defense finds that exemption from such requirements is necessary for foreign policy or national security reasons.

(Presidential Sig.)

THE WHITE HOUSE,
February 3, 1999.

APPENDIX D

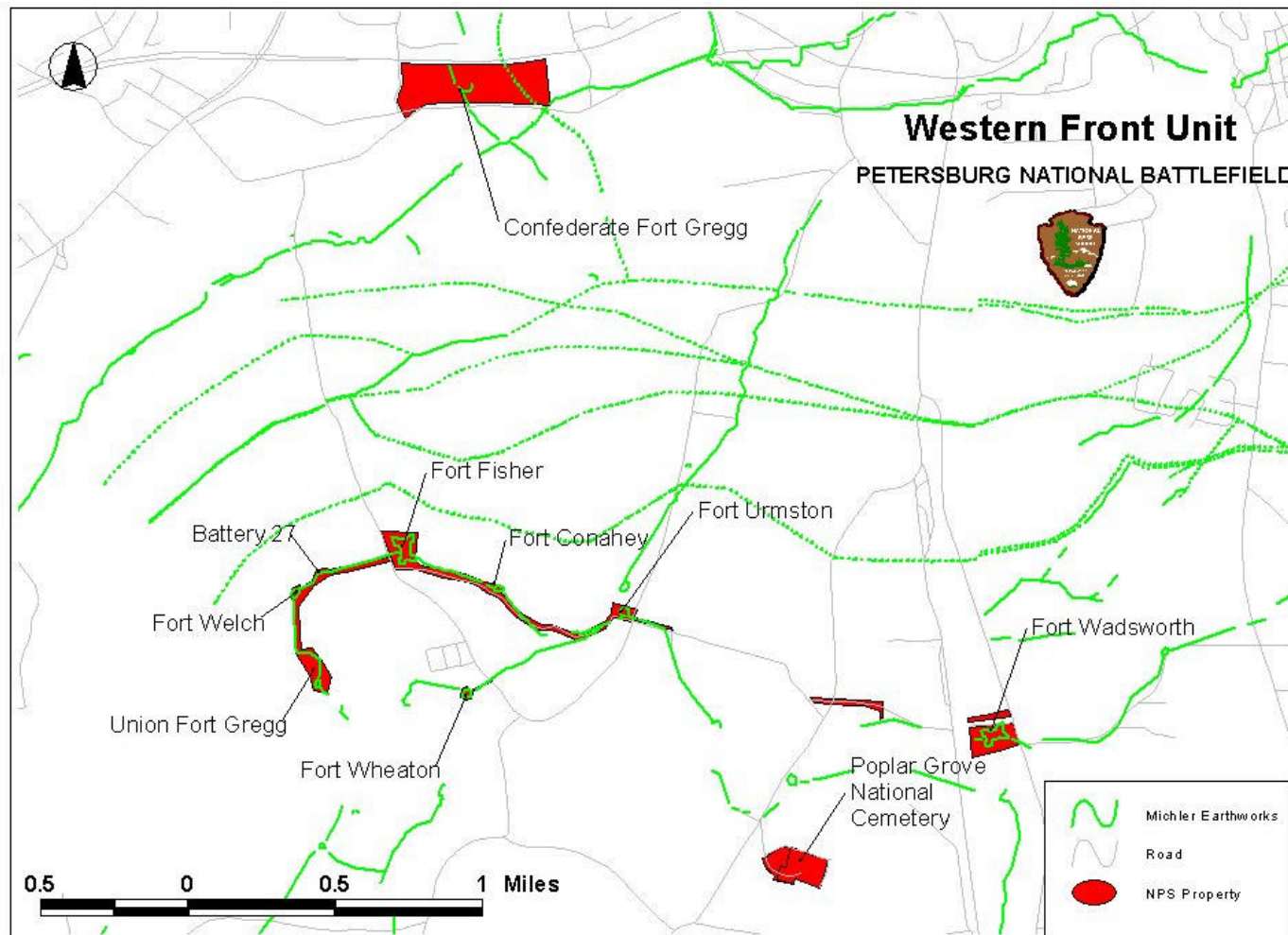
Michler* Map of Petersburg National Battlefield Eastern Front



* Surveyed under the direction of Brigadier General N. Michler; surveyed by Major J.E. Weyss, 1867. Shows all lines as of April, 1865.

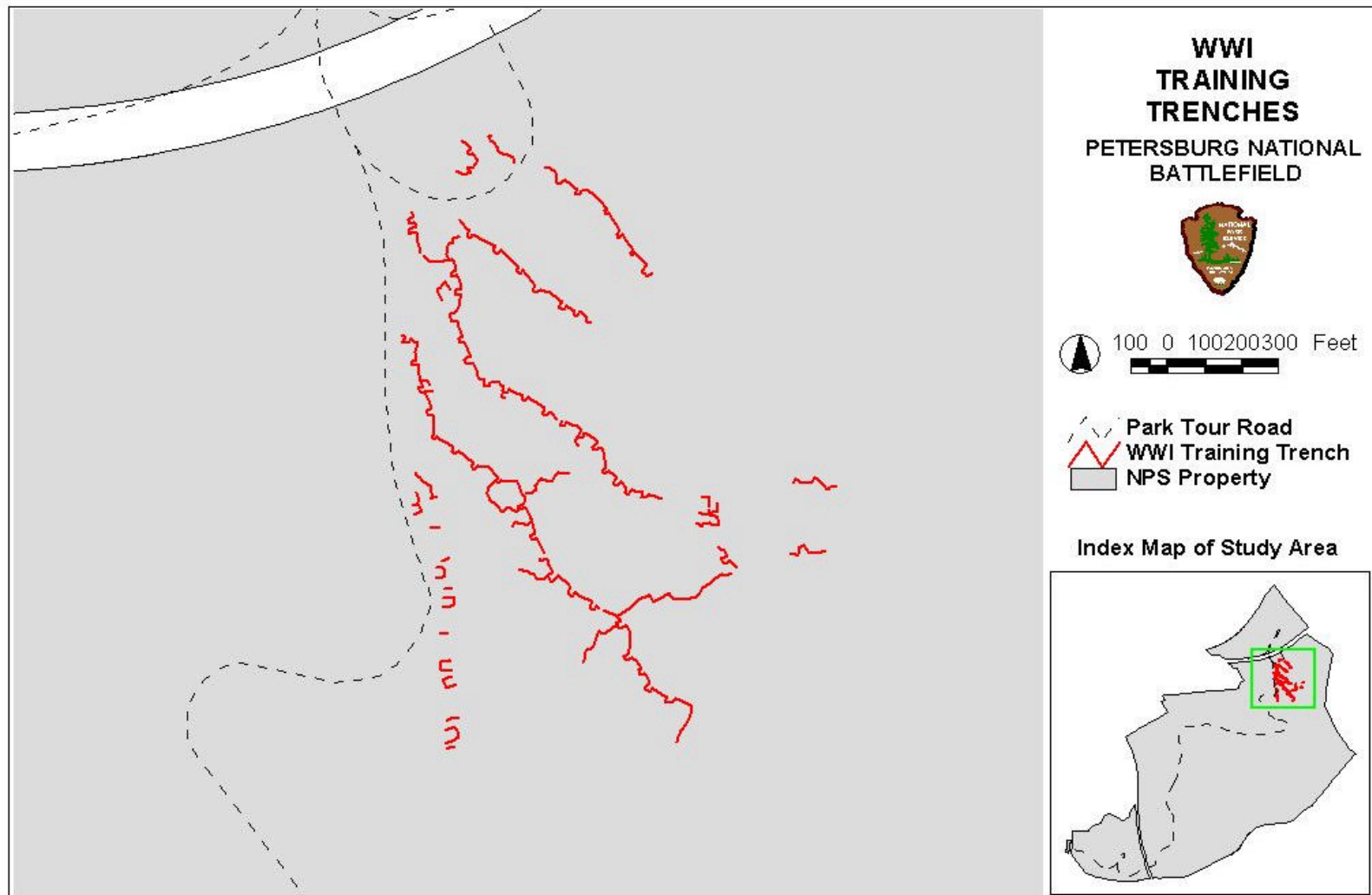
APPENDIX E

Michler Map of Petersburg National Battlefield Western Front



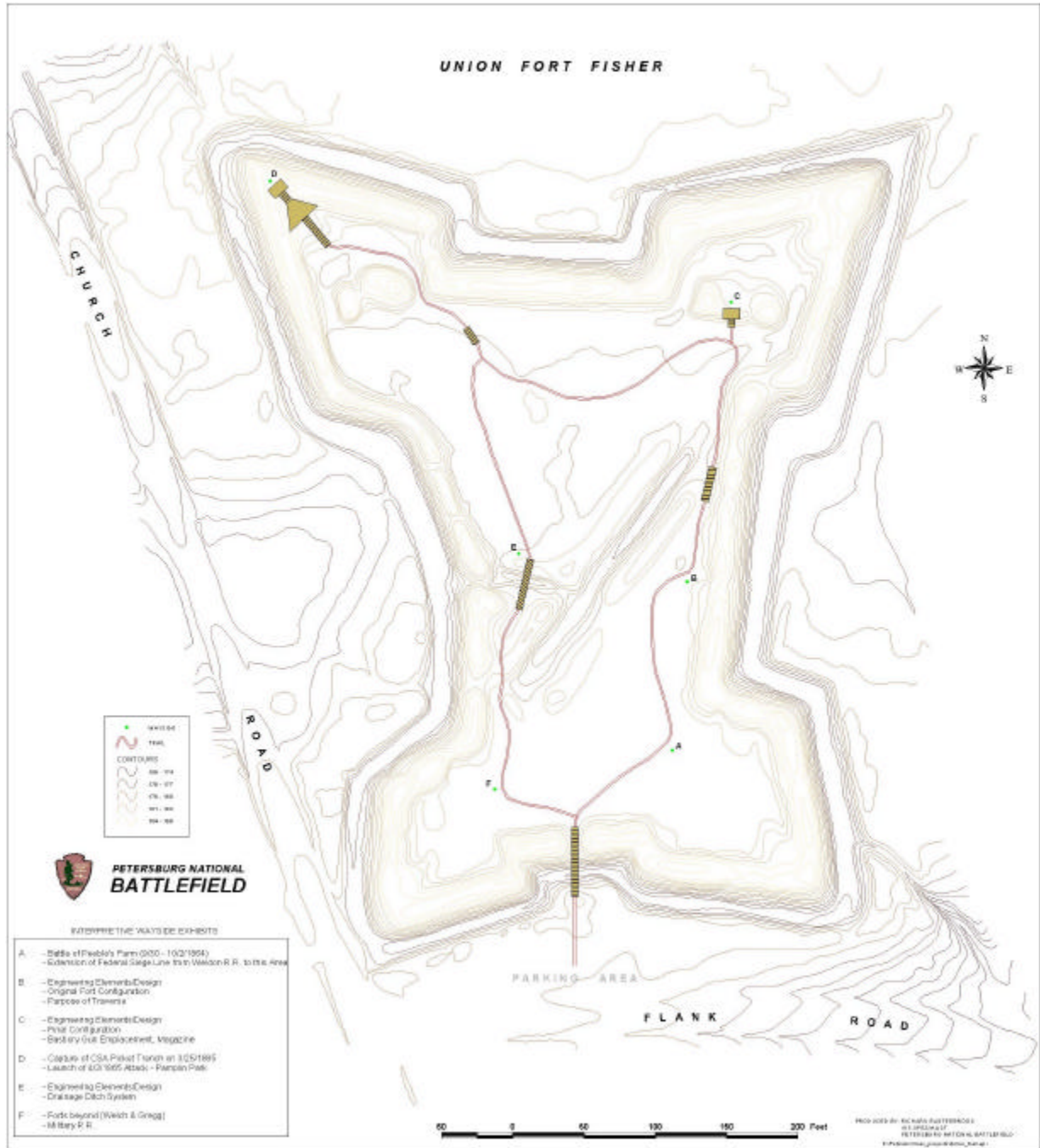
APPENDIX F

World War I Training Trenches



APPENDIX G

Fort Fisher Interpretive Plan



APPENDIX H

Newspaper Article

Storm damaged park's earthworks

**Civil War era
cannon unscathed**

BY JON POPE

TIMES-DISPATCH STAFF WRITER

PETERSBURG — The earthworks created by Union soldiers at Battery 13 in the Petersburg National Battlefield were designed to save lives.

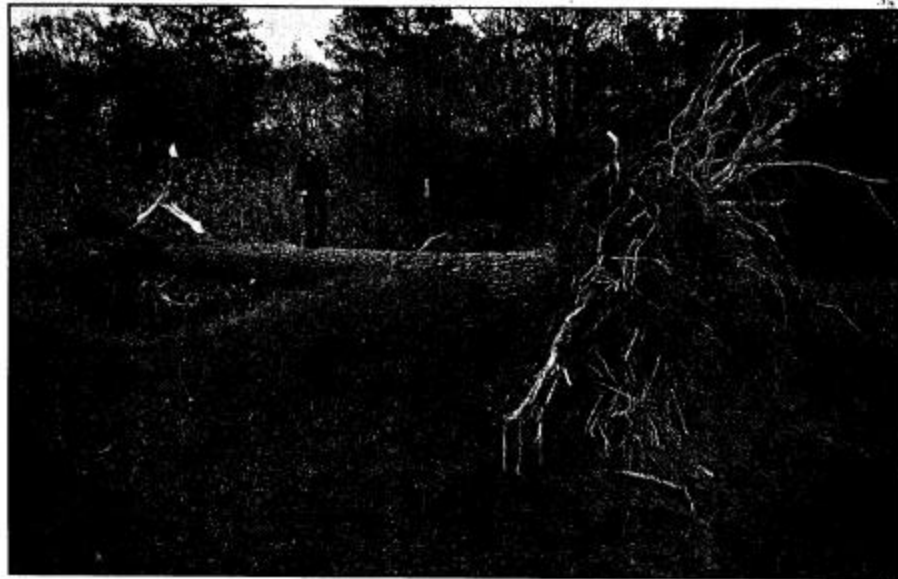
On Thursday afternoon, the earthen fortification saved a Civil War era cannon from being smashed by a massive poplar.

High winds from a severe thunderstorm felled trees in several areas of the 1,500-acre park. The earthworks at Battery 13 sustained the most damage, said Dave Shockley, resource manager for the national battlefield.

About a dozen pine, poplar and oak at Battery 13 were uprooted between 2:30 and 3 p.m. Thursday. Several of the hardwoods felled during the storm were trees that had taken root on the earthworks in the 130-plus years since they were used.

Shockley said he was on a conference call with National Park Service officials in Washington and Philadelphia discussing a project to remove the trees from Battery 13 and other earthworks at the park when the destruction occurred.

He said trees have been removed from earthworks at other sites in the park in an effort to prevent what happened at Battery 13. "This is a graphic illustration of what will happen" if the trees aren't removed from the earthworks, Shockley said



ALEXA WELCH EDLUND/TIMES DISPATCH

FELLED. Dave Shockley stands on a tree uprooted at the battlefield's Battery 13 by Thursday's storms. The trees grew up from the earthworks in the more than 130 years since they were built by Union troops.

yesterday while surveying the damage.

He said officials will try to determine next week how to repair the earthworks. A crane will be used to remove the trees.

The cannon that was saved by the earthworks was one of three in Battery 13. The barrels of the cannons are original, but the bases are concrete restorations, Shockley said. The felled poplar had a nick in its

bark where it apparently grazed a cannon wheel, but yesterday it was resting about four inches above the cannon.

Battery 13 is a few hundred yards from the site of the Battle of the Crater, Petersburg's most famous Civil War engagement. Union troops fired on Confederates from Battery 13 during the Battle of the Crater, Shockley said.

Mike Rusnak, a meteorologist

from the National Weather Service in Wakefield, said he hadn't seen the damage, but "we're figuring that was straight-line wind damage from a severe thunderstorm."

He described "straight-line wind damage" as a downburst of strong winds from a thunderstorm not related to a tornado. As it hits the ground, it expands, generating wind speeds that could exceed 100 mph, Rusnak said.