

# WARNER PARKS ALLÉE

2019

STORMWATER & LANDSCAPE  
PLANNING DOCUMENT

Artwork by Sharron Mallison



TARA ARMISTEAD  
LANDSCAPE  
ARCHITECTURE

**COLLIER**  
ENGINEERING CO., INC.  
CONSULTING • DESIGN • CONSTRUCTION



# CONTENTS

**1 PROJECT GOALS ... 3**

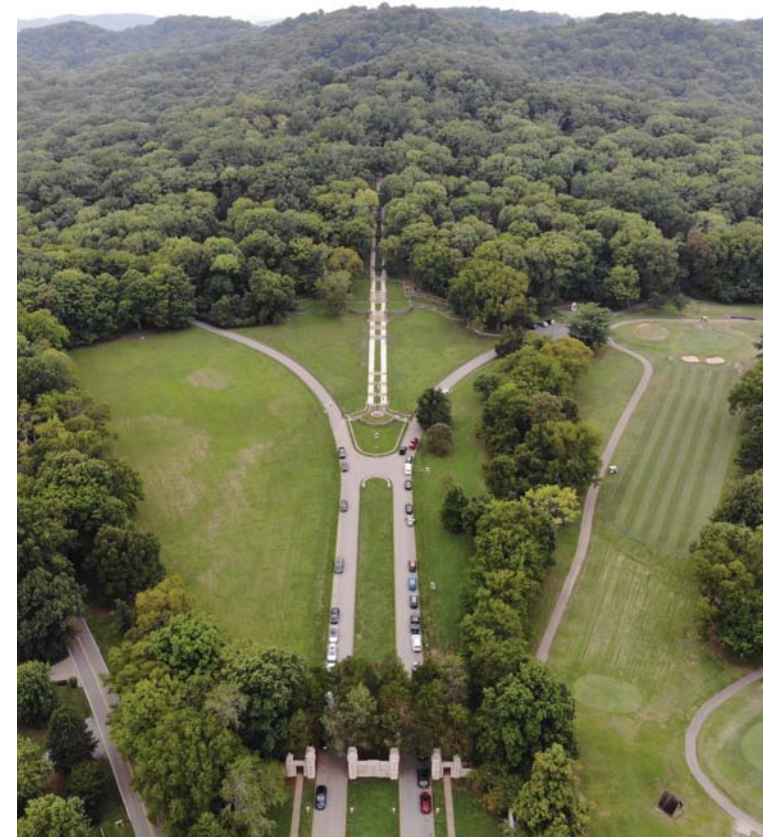
**2 HISTORICAL NARRATIVE ... 4**

**3 STORMWATER MANAGEMENT RECOMMENDATIONS ... 7**

**4 LANDSCAPE RECOMMENDATIONS ... 21**

**5 COST ESTIMATES AND MAINTENANCE ... 27**

**6 APPENDIX ... 29**



Percy Warner Park Entrance:  
The allee climbs a steep hill just  
inside of the sandstone gates.







# PROJECT GOALS

*The allee will be thoughtfully restored while preserving its historical context.*

The Warner Park Entrance Gates and Allee Restoration Plan is part of a continuing initiative that seeks to preserve, highlight and celebrate the historic nature of the existing sandstone entrance and allee. In the plan, the integrity of the historic stonework and landscape features will be preserved while updating them to better suit the needs of visitors. Concerns about the structural integrity will be addressed while providing solutions that are congruent with its historical context.

The first intention of this restoration plan is to repair and restore the damaged portions of the allee hardscape back to Bryant Fleming's original intent. It is also important to remove some trees to re-establish the original view sheds and forest density and address drainage and erosion at the site.

The second intention of this restoration plan is to replant and improve the health of the forest and surrounding landscape. Taking cues from Fleming's work to propose new native plantings that make the park a joy for future visitors.



Huldah Cheek and friends in Warner Park, 1932. photograph, Cheek Family Archives. (bottom image)

*“Can there be a day when all may know  
The feelings in my heart  
My understanding,  
Love of nature and of God  
That something that would be my  
Love to give,  
That all might learn to understand  
And live,  
To me the woods  
The meadows and the streams,  
All tell of life’s great love and beauty too.”  
-Bryant Fleming*



# HISTORICAL NARRATIVE

At its conception, the entrance to Percy Warner Park, aligned with Belle Meade Boulevard was intended to transition from the grand homes and the urban core of Nashville, to the beautifully preserved hills of the natural area. A street car line completed its route at the entrance gates, encouraging visitors to move into the park and up the allee slowly transitioning from urban life to complete wilderness. Today visitors still use the historic gates and allee as a meeting place and escape from the city. However, to maintain this iconic park, research on its history and a restoration to the designer's intent is vital.

This portion of Percy Warner Park was originally part of the Belle Meade Plantation, but later became Camp Andrew Jackson, a World War I training camp, in 1917. A granite monument to the soldiers who trained at this camp and died in France was erected on site in 1936 by the WPA, after Colonel Luke Lea and his wife, Percie Warner Lea, donated a total of 868 acres to establish the park in 1927. Colonel Lea requested that the park bear the name of his father-in-law, the late Percy Warner.

At the main entrance to the park, at the terminal point of Belle Meade Boulevard, are the gates of dressed sandstone, designed by locally prominent architect Edward Dougherty. They were dedicated in 1932 and construction was provided through a contract with John Oman, Jr. A \$20,000 gift from Mrs. Percy Warner and her daughters paid for construction of the entry gate, which was built as a memorial to Percy Warner. The design, monumental and extremely formal, reflects the character of Belle

Meade Boulevard, with its landscaped median, and of the grand houses built along the corridor.

Contrasting the formality of the gates, the allee steps respond to the endemic materials and topography. The limestone allee was designed by nationally known landscape architect Bryant Fleming of Ithaca, NY. Fleming was a lecturer and instructor in the Department of Landscape Art in the College of Agriculture at Cornell. In private practice he helped guide the development of parks in New York state, and Fleming and his associates had an extensive residential design practice all over the country, including estates in Belle Meade. Most prominently Cheekwood, a 100-acre estate where Fleming guided the design of the landscape, architecture, and interiors. (1) Fleming also designed the gardens of Edwin Warner's residence nearby which still remains true to its original design.

The impressive allee structure, approximately 875 feet long and 300 feet wide at its maximum width, was completed circa 1936. It climbs a steep hill just inside the sandstone gates. Though its historical precedents and its symmetrical arrangement are formal, like Dougherty's gates, the execution of the design is not. Built of rough, uncut limestone, the allee appears to be much more a part of the hillside than something applied to it. Combining formal planning and rustic construction, the allee provides the park visitor an elegant transition from the formality of Belle Meade Boulevard and main entrance gates, to the wild and rustic nature of the interior of the park. (2)



Plantings on the estate of George Schwab, c. 1930. glass slide, Cheekwood Estate and Gardens Archives. (top image)  
Stonework and plantings from a Fleming designed estate, c. 1930. glass slide, Cheekwood Estate and Gardens Archives. (bottom image)





From Top: Bryant Fleming; Percy Warner;  
Colonel Luke Lea

Today visitors continue to use Belle Meade Boulevard as a primary access point to the park, and thousands of pedestrians, bicyclists and motor vehicles enter the park through the sandstone gates each month. Heavy use and erosion have caused deterioration of the gates and allee over time. Restoration of the gates was recently completed, setting the stage for improvements to the stone allee.

As the city and surrounding neighborhoods were developed through the following decades, the park has been transformed into a centrally located, natural resource treasured by residents and visitors alike. Years of use and quiet public enjoyment are punctuated by these significant milestones:

- Warner Park was listed in the National Register of Historic Places in 1984. The sandstone memorial entrance and the Allee are “contributing structures” in the nomination and listing.
- Warner Park, including the Belle Meade entrance and Allee, was recognized and designated as a Historic Landmark District in 1999. The resulting Historic Landmark Overlay is locally administered by the Metropolitan Historic Zoning Commission.
- Two metal historical markers, authorized by the Metropolitan Historical Commission, are located in this area. The markers honor park founders Percy Warner and Col. Luke Lea, and provide interpretive information about their accomplishments.



Historic Images:  
Limestone Allee (top image)  
Sandstone Gates prior to construction of the Allee (bottom image)





Fleming's architectural landscape plan for Cheekwood, 1929. glass slide, Cheekwood Estate and Gardens Archives. (left image)



Stonework on the estate of Leslie Cheek, 1932. glass slide, Cheekwood Estate and Gardens Archives. (right image)



# STORMWATER MANAGEMENT RECOMMENDATIONS

## Map Legend

- Low Water Flow
- Medium Water Flow
- High Water Flow
- Ponding Area
- Horse Trail
- Park Road
- Scupper Locations

Throughout the Warner Allée there are consistent issues with poor grading and drainage. This can be seen in sedimentation, erosion, and ponding at various locations around the site. The proposed solutions detailed in this report would reduce the water flow on the stairs by around 70 percent.








# Stormwater Management Recommendations | Proposed Drainage Solutions - Overview

- 1 Remove sediment and debris from existing catch basin. Inspect pipe and structure for any damage and repair as necessary. Consider adding velocity dissipation to stone channel such that sediment is removed upstream and can be removed from channel prior to reaching catch basin. Provide cast iron grates at eastern and western most basins.
- 2 Replace existing culvert to convey more water under the road before over topping; rebuild stone headwalls. (Note: this structure is outside of original project scope and replacement calculations have not been provided)
- 3 Remove asphalt pavement and replace with pedestrian walkway to provide a more defined pathway connection between the WWI monument and the entrance path to the Allée. Provide stabilized aggregate paving for all existing grass pathways to match lower section of the Allée.

4 Note: Original drainage infrastructure and overland flow from the Allée all flows to the area between the Stone Gate Entrance and Percy Warner Golf Course. Water eventually drains across the golf course. Existing conditions at the Allée including sediment accumulation in existing drainage structures has diverted some stormwater runoff toward Page road east of the Stone Gates. Suggested improvements in this document may result in an increase of water draining to the golf course, but is consistent with historical drainage patterns. Drainage issues including standing water and erosion are noted within the golf course and at the Stone Gates. Drainage improvements and study of this area are not included in the scope of work of this document, but a cursory review of this area would suggest that sediment accumulation and generally flat terrain are contributing to ponding in several areas, as well as water draining through the Stone Gates. Vegetative cover at the Stone Gates that is appropriate for solar exposure and soil conditions is recommended to prevent ongoing erosion. Improved grass channels or swales between the Allée and golf course outfall are recommended to eliminate ponding and improve drainage.

## Map Legend

-  Low Water Flow Sheet Flow
-  Medium Water Flow Swale or Channel
-  High Water Flow Swale or Channel





## Stormwater Management Recommendations | Existing Conditions - Overview



### A. Upper Terrace

The Upper Terrace area consists of the upper park roadway, 15" cross-culvert, Alleé exit stairs, horse trail, and upper terrace. Due to the nature of the existing flow paths, many deficiencies are present in the upper terrace that contribute to uncontrolled runoff, channelization along pathways, erosion, ponding, and sedimentation.

#### Key Concerns

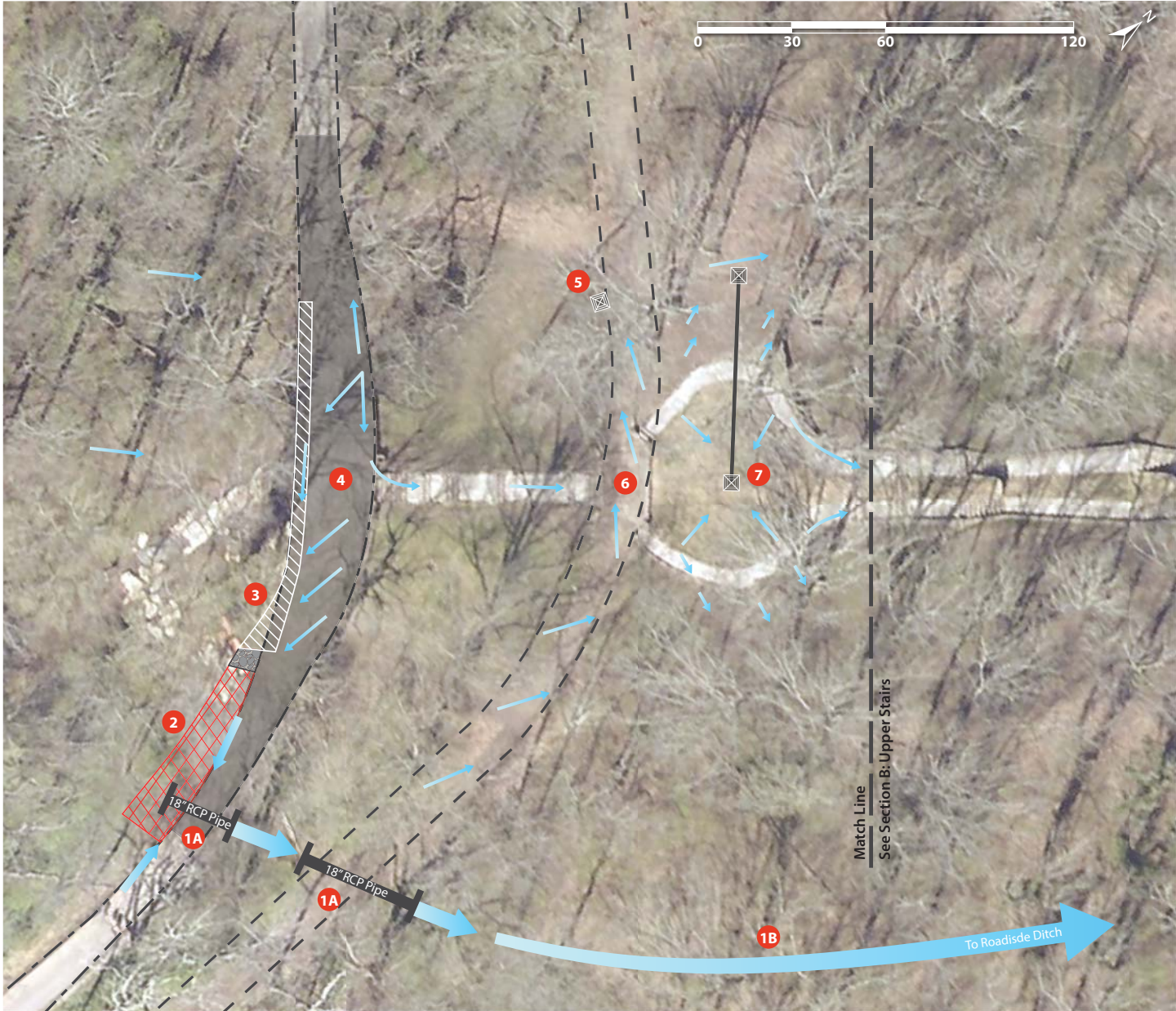
- 1 Ponding at wall east of Alleé exit.
- 2 15" Iron pipe culvert and failing headwall.
- 3 Channelization and erosion along the horse trail.
- 4 Uncontrolled runoff, undermined paver sections, erosion, and ponding.
- 5 Inlet with unknown outlet.

#### Map Legend

- Low Water Flow
- Medium Water Flow
- High Water Flow
- Horse Trail
- Park Road
- Scupper Locations







**A. Upper Terrace**

**Proposed Solutions**

- 1A** Remove the existing culvert and replace with 18" RCP pipe with stone headwalls. Provide new culvert at horse trail with stone headwalls.
- 1B** Provide/Improve existing swale to ensure water is conveyed water is conveyed to roadside ditch and does not travel back to allée steps.
- 2** Provide excavation as necessary to provide roadside ditch.
- 3** Remove existing asphalt and provide concrete or stone valley gutter to convey stormwater to roadside ditch.
- 4** Mill existing asphalt to re-profile road and provide positive drainage to valley gutter. Excavate and replace any settled areas as directed.
- 5** Remove sediment from catch basin and drain pipe to outlet
- 6** Regrade and/or top dress horse trail to ensure positive drainage to existing catch basin.
- 7** Provide area drain at graded low point within circular lawn. Provide 6-8" HDPE drain pipe to daylight. Provide stone headwall or mitered end cap at outlet.

**Map Legend**

- Low Water Flow
- Medium Water Flow
- High Water Flow
- Horse Trail
- Park Road
- Scupper Locations



## Stormwater Management Recommendations | Existing Conditions - Overview



### B. Upper Stairs

The Upper Stairs area consists of the stairs and pathways connecting the upper terrace to the lower terrace. Concentrated stormwater runoff entering the upper stairs, the running grades of the existing paths, and deficient channel grading along to the walls all contribute to the drainage concerns for this area. Deficiencies include sedimentation and inadequate runoff catchment at the scupper drains along the stairs, insufficient channel grading and capacity adjacent to the walls, transportation of sediment to lower areas of the Allée, and uncontrolled discharge leaving this area and entering the lower terrace.

#### Key Concerns

- 6 Scupper Locations
- 7 Deficient channels along walls

#### Map Legend

- Low Water Flow
- Medium Water Flow
- High Water Flow
- Ponding Area
- Scupper Locations







**B. Upper Stairs**

**Proposed Solutions**

- 8 Stone gutters will more effectively channel water to existing scuppers.
- 9 Stone trench at the bottom of the steps to help minimize volume of water and sediment going down the stairs and into the lower sections.
- 10 Channel regrading to more effectively divert water away from wall.

**Map Legend**

- Low Water Flow
- Medium Water Flow
- High Water Flow
- Ponding Area
- Stone Trench
- Stone Gutter
- Scupper Locations



## Stormwater Management Recommendations | Existing Conditions - Overview






### C. Lower Terrace

The Lower Terrace area connects the upper and lower stairs of the Allée. It consists of the eastern and western exit stairs along with tiered pathways on each side of the main Allée thoroughfare. Concentrated stormwater runoff entering from the upper stairs continues through the lower terrace transporting sediment to the lower stairs. Uncontrolled runoff enters this area over walls, through wall openings, and down stairs. This uncontrolled runoff has created erosion, ponding and sedimentation along the eastern pathways, and erosion at both the eastern and western exit stairs.

#### Key Concerns

- 8 Uncontrolled runoff entering Lower Terrace.
- 9 Erosion, ponding, and sedimentation along eastern pathways.
- 10 Erosion at eastern exit stairs.
- 11 Erosion at western exit stairs.

#### Map Legend

-  Low Water Flow
-  Medium Water Flow
-  High Water Flow







### C. Lower Stairs

#### Proposed Solutions

- 11 Channel regrading to more effectively divert water away from wall.
- 12 Existing surface to be replaced with stabilized limestone fines. This will reduce to overall runoff to the lower stairs.

#### Map Legend

- Low Water Flow (light blue arrow)
- Medium Water Flow (medium blue arrow)
- High Water Flow (dark blue arrow)
- Stone Trench (dark blue vertical bar)



## Stormwater Management Recommendations | Existing Conditions - Overview



### D. Lower Stairs

The Lower Stairs area connects the lower terrace to the Allée entrance and consists of the stairs, paths, and the grassed areas adjacent to the eastern and western walls of this section. Concentrated stormwater runoff entering from the lower terrace delivers sediment and fine aggregate, which settles along the shallower sloped paver paths. Under high intensity storms, there is potential for concentrated flow to enter the stairs from the east.

#### Key Concerns

- 12 Concentrated runoff from Lower Terrace
- 13 Sediment Deposits

#### Map Legend

- Low Water Flow
- Medium Water Flow
- High Water Flow
- Ponding Area







### D. Lower Stairs

#### Key Concerns

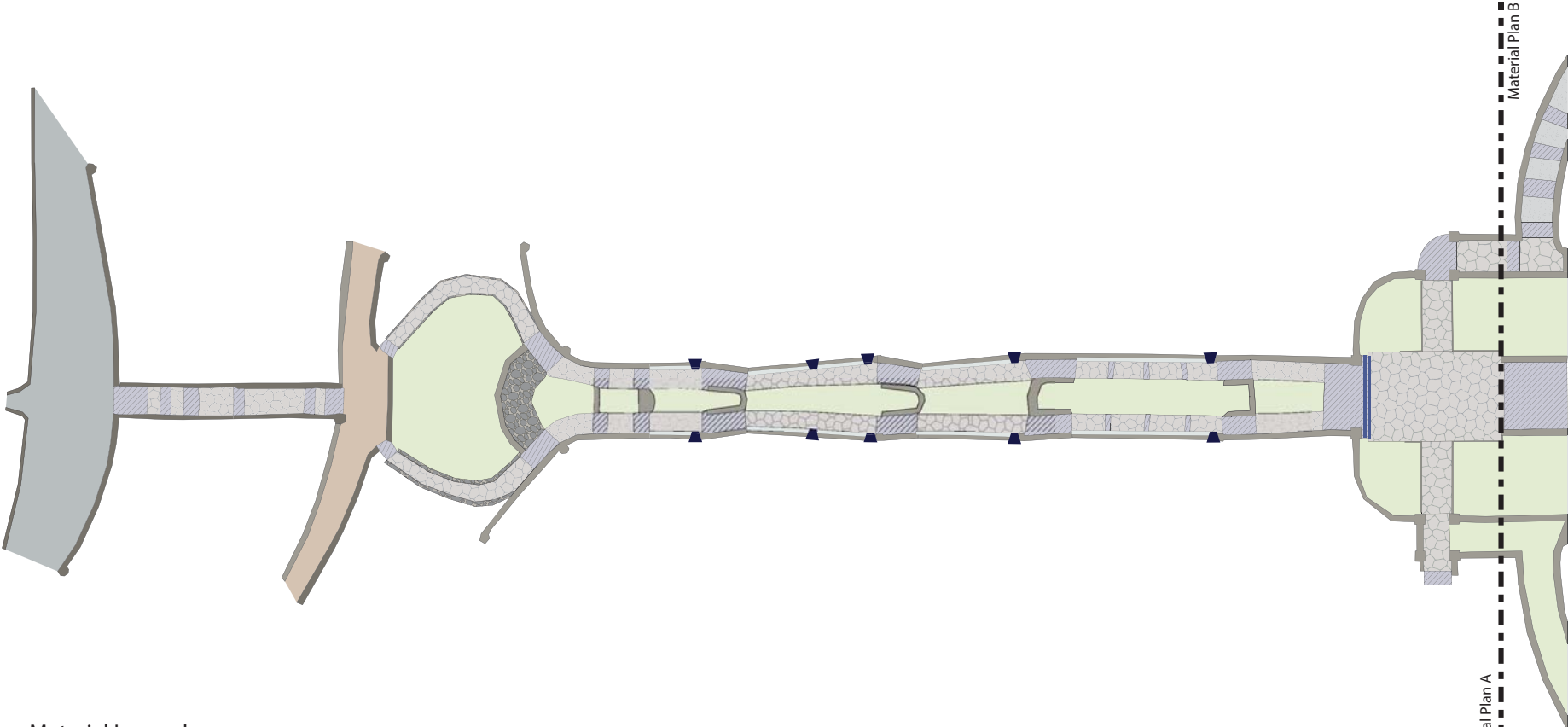
- 13 Existing surface to be replaced with stabilized limestone fines to withstand erosive forces of stormwater runoff. Crown walkway to drain away from the walkway.
- 14 Provide 2' limestone gutter and curb breaks to allow water to exit the walkway.
- 15 Regrade lawn as necessary to provide positive drainage away from walkway.
- 16 Remove sediment and debris from existing catch basin. Inspect pipe and structure for any damage and repair as necessary. Consider adding velocity dissipation to stone channel such that sediment is removed upstream and can be removed from channel prior to reaching catch basin. Provide cast iron grates at eastern and western most basins.

#### Map Legend

- Low Water Flow
- Medium Water Flow
- High Water Flow
- Ponding Area
- Stone Trench
- Stone Gutter



Stormwater Management Recommendations | **Proposed Material Plan**



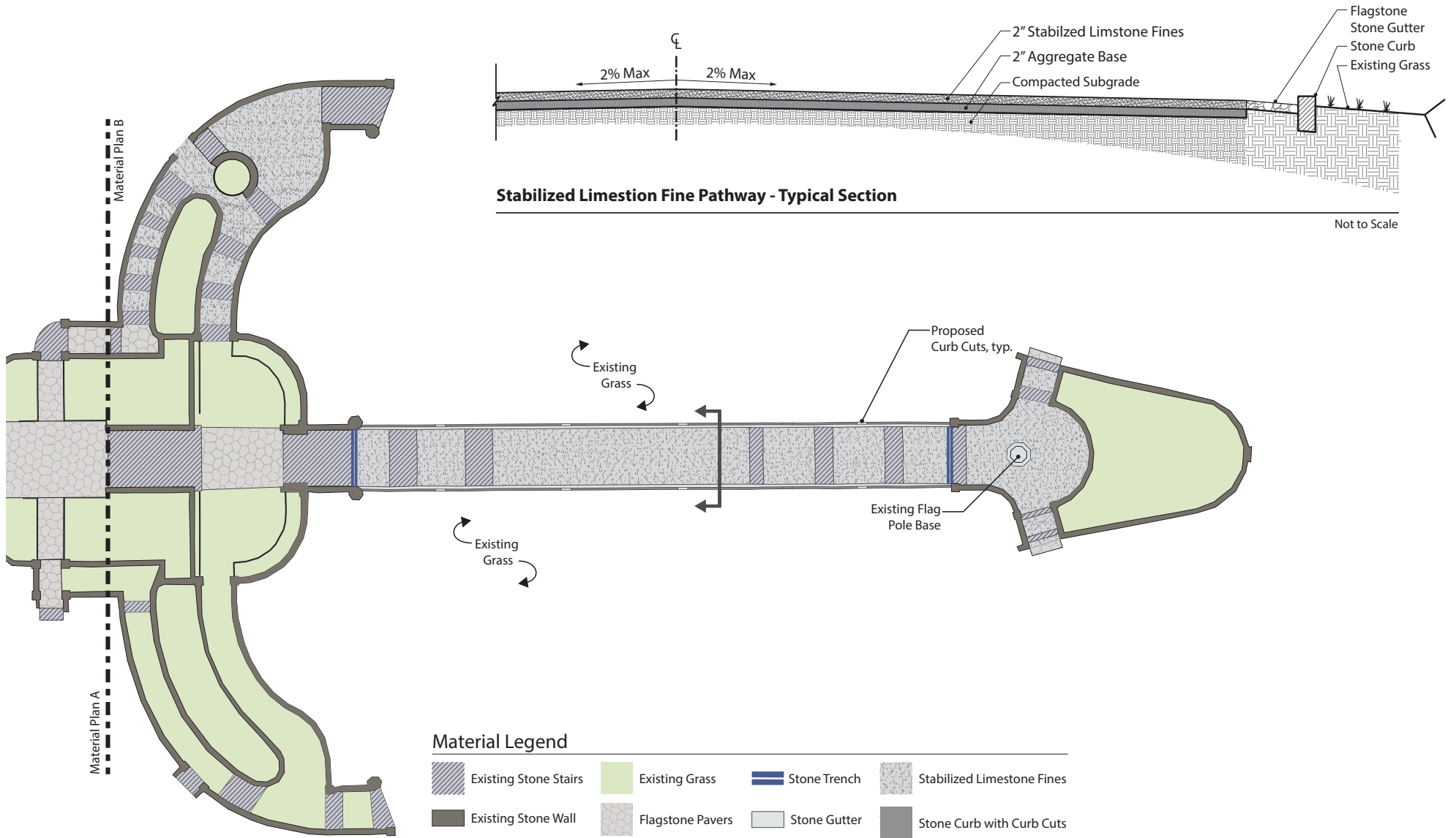
**Material Legend**

- |                       |                       |                            |                   |
|-----------------------|-----------------------|----------------------------|-------------------|
| Existing Asphalt Road | Existing Grass        | Flagstone Pavers           | Existing Scuppers |
| Existing Horse Trail  | Existing Stone Wall   | Stabilized Limestone Fines | Stone Gutter      |
| Existing Stone        | Existing Stone Stairs | Stone Trench               |                   |

Material Plan A  
Material Plan B



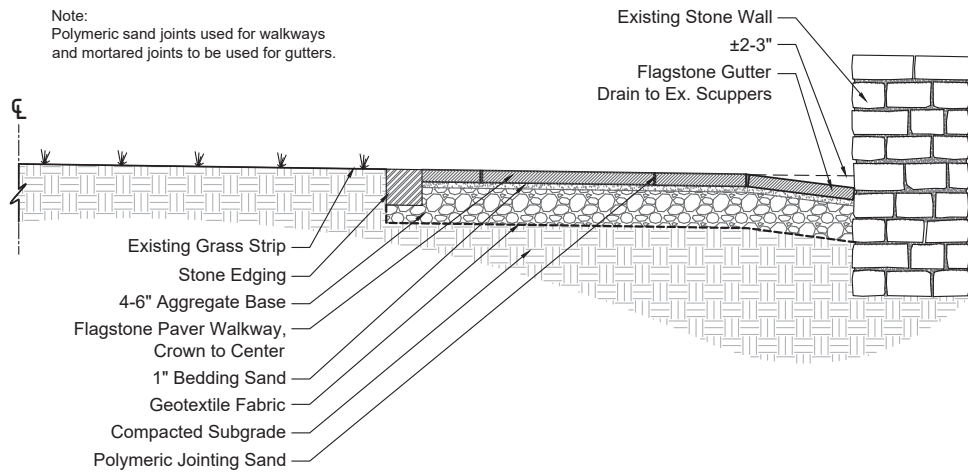




Not to Scale

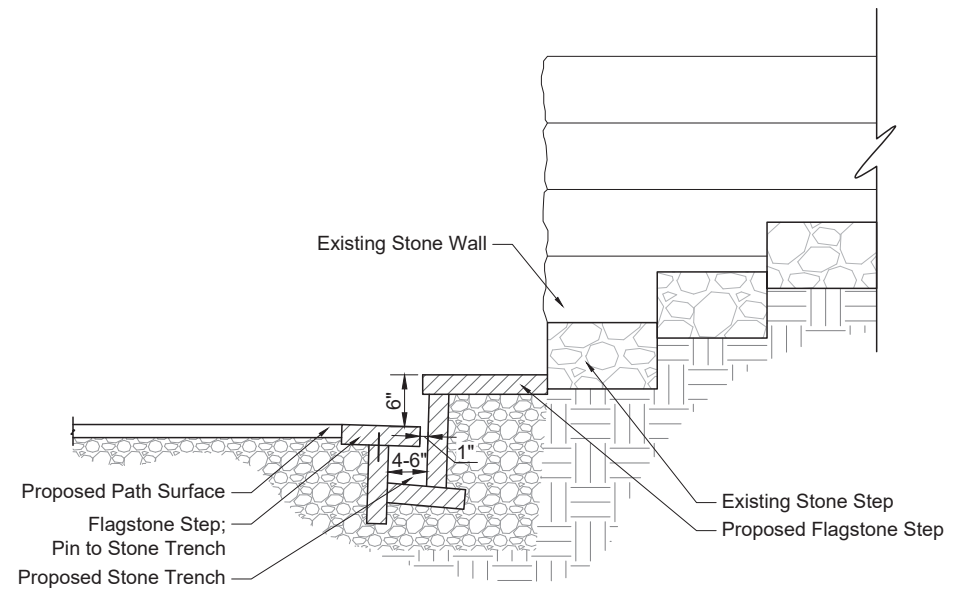






1 Flagstone Walkway and Gutter Conceptual Detail

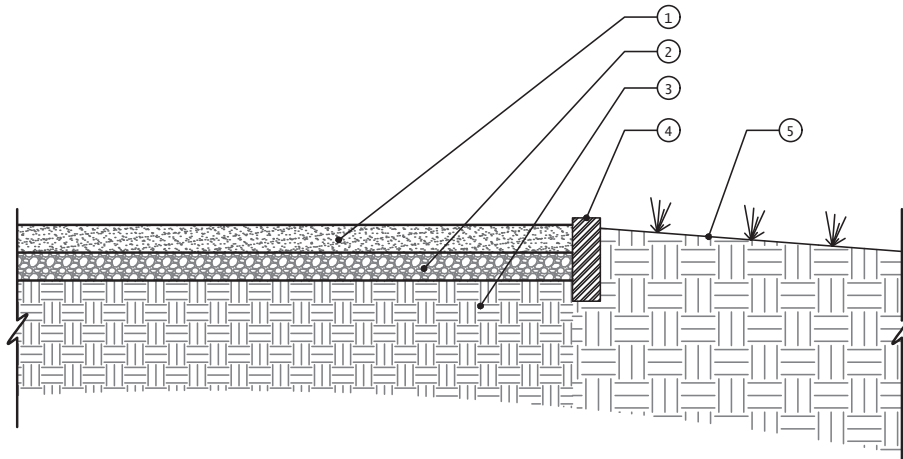
NTS



2 Stone Trench Conceptual Detail

NTS





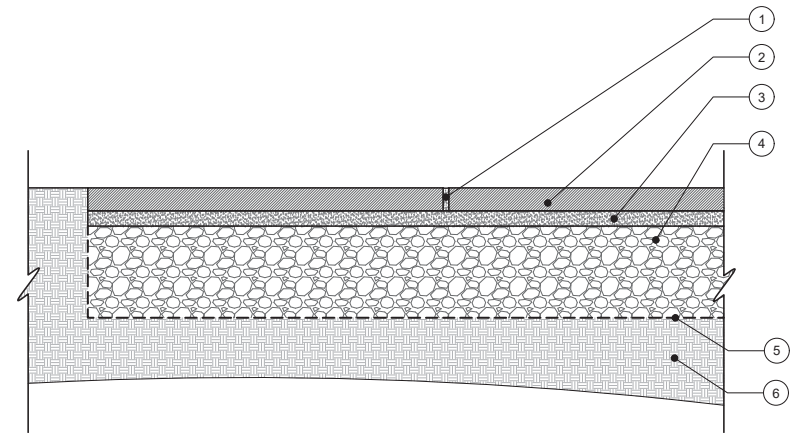
1. 2" Depth Organic-Lock Limestone Fines Pathway Aggregate
2. 2" Mineral Aggregate Base
3. Compacted Subgrade
4. Existing Stone Curb
5. Existing Grass

Notes:

- Pre-wet Organic-Lock Aggregate Blend is the preferred method of installation, this ensures that Organic-Lock Binder is homogeneously activated by water. If pre-wetting is not done at the quarry, The use of a front-loading tractor and a water source can Pre-wet Organic-Lock Pathway Aggregate on the job site. Slowly add water to the Organic-Lock Pathway Aggregate and turn it over until ~10% moisture content (24 gallons per imperial ton) is achieved.
- If Pre-wetting Organic-Lock Pathway Aggregate prior to spreading is not possible; Spray water after spreading the Organic-Lock Pathway Aggregate at an even rate over the entire surface. 24-45 gallons per 100 square feet is required. Use a moisture probe penetrating the full depth of the Organic-Lock Aggregate layer to ensure complete water saturation.
- If the slope of your project area is less than 2% a crown should be incorporated into the pathway
- If the slope of your project area is greater than 2% incorporate a cross slope into the pathway.
- Organic-Lock Pathway Aggregate must always be pre-wet for installation in high slope areas.
- Installation to be completed in accordance with manufacturer's specifications.

3 Stabilized Limestone Fine Pathway

NTS



1. Grey Polymeric Jointing Sand
2. 2" Tennessee Grey Irregular Flagstone; seal stone and joints with "Stone Tech (Dupont) Heavy Duty Exterior Sealer for Stone & Masonry" or approved equivalent; Max 1" joints
3. 1" Bedding Sand
4. 4-6" Aggregate base
5. Geotextile
6. Compacted Subgrade

4 Flagstone Paver Detail

NTS



# LANDSCAPE RECOMMENDATIONS

The purpose of this restoration project is both to improve the health of existing woodlands and grasses and to respect the history of this culturally significant landscape. As evidenced by the 1937 photograph, the view down the allee was crisp and clean. 75 years later, encroaching trees have limited the vista.

#### Recommendation #1

Remove and prune trees along the allee to open the view. Furthermore, the removal and pruning will help to highlight the specimen trees and bring light to the forest floor.

#### Recommendation #2

Clear underbrush 50' back from woodland edge. Removal of invasive species can be done by FOWP volunteers. The health of the forest is improved, and the visual transition from the open allee to the woodland edge is softened.

#### Recommendation #3

Plant flowering understory trees along woodland edge. Do not plant any trees closer than 30' to allee steps/walkway. Replace fescue with native grasses.

The records were searched for the original drawings and/or written documentation by the original designers in order to understand the intent of the work. No original drawings were found. The only available data are photographs taken at the time of completion. The design team met with the Cheekwood Botanical Garden to review Bryant Fleming's glass slides and diaries for further information on the allee. This revealed some common practices on other properties in Belle Meade.

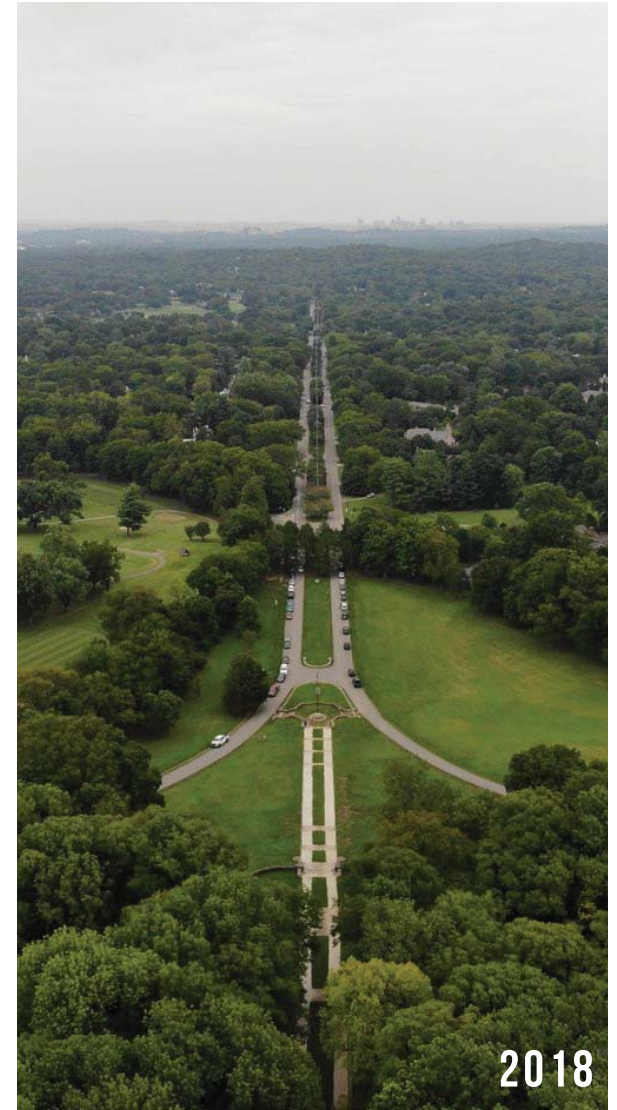




# LANDSCAPE RECOMMENDATIONS

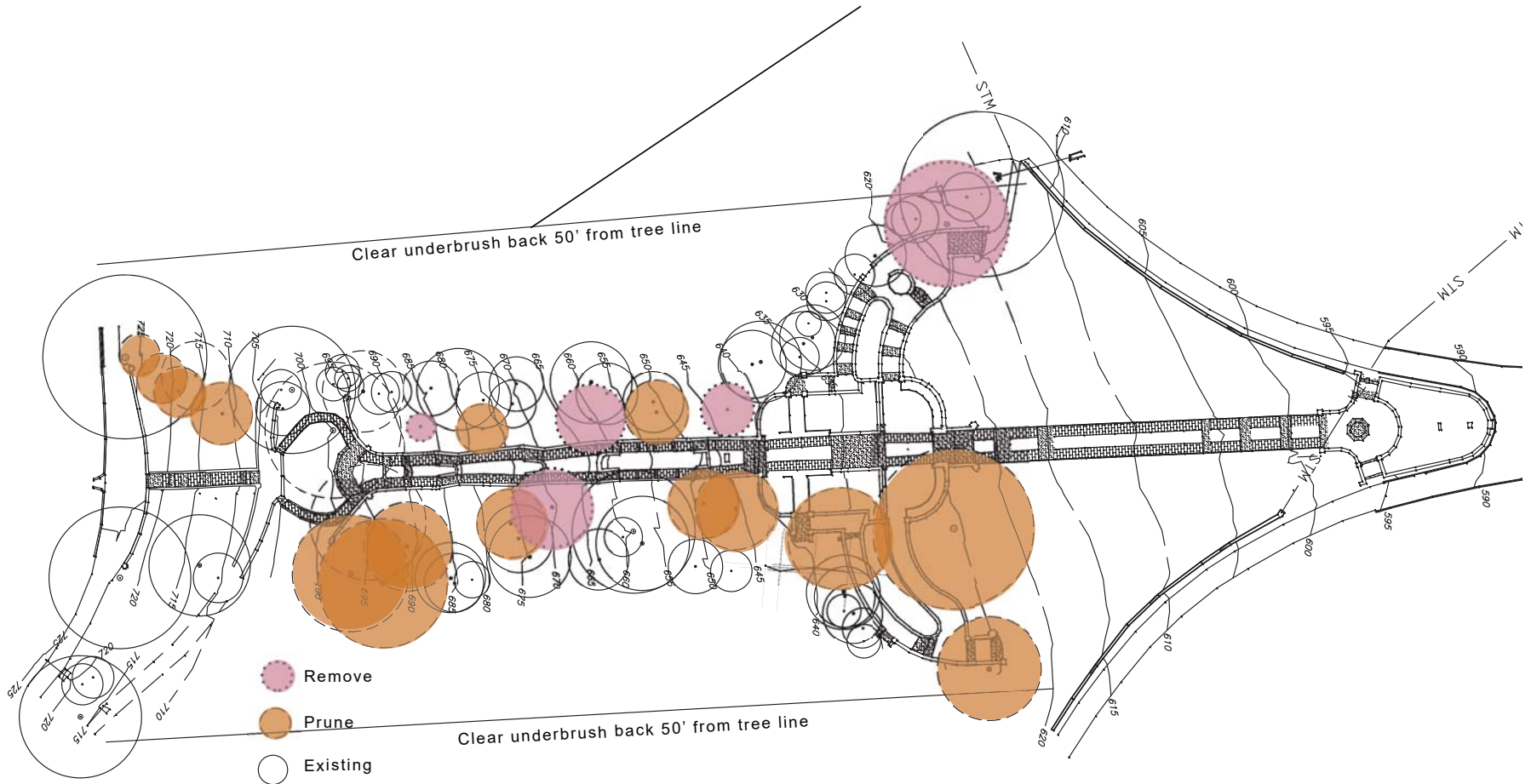
These photos reveal the growth of the city of Belle Meade, but also the tremendous growth of the tree canopy that now covers most of the park. Opening up this canopy is important for the health of the understory plants as well as the flowering trees and shrubs that provide habitat and food for native fauna.

We propose the addition of native understory trees and grasses to improve the health, diversity and beauty of the park. These additions are very much in the spirit of Bryant Fleming, seamlessly blending the natural and the designed landscape. Planting redbud and dogwood will beautify the site while also providing a more diverse ecosystem. Adding native grasses will improve the look of the lawn spaces and lighten the work load of the maintenance crews.



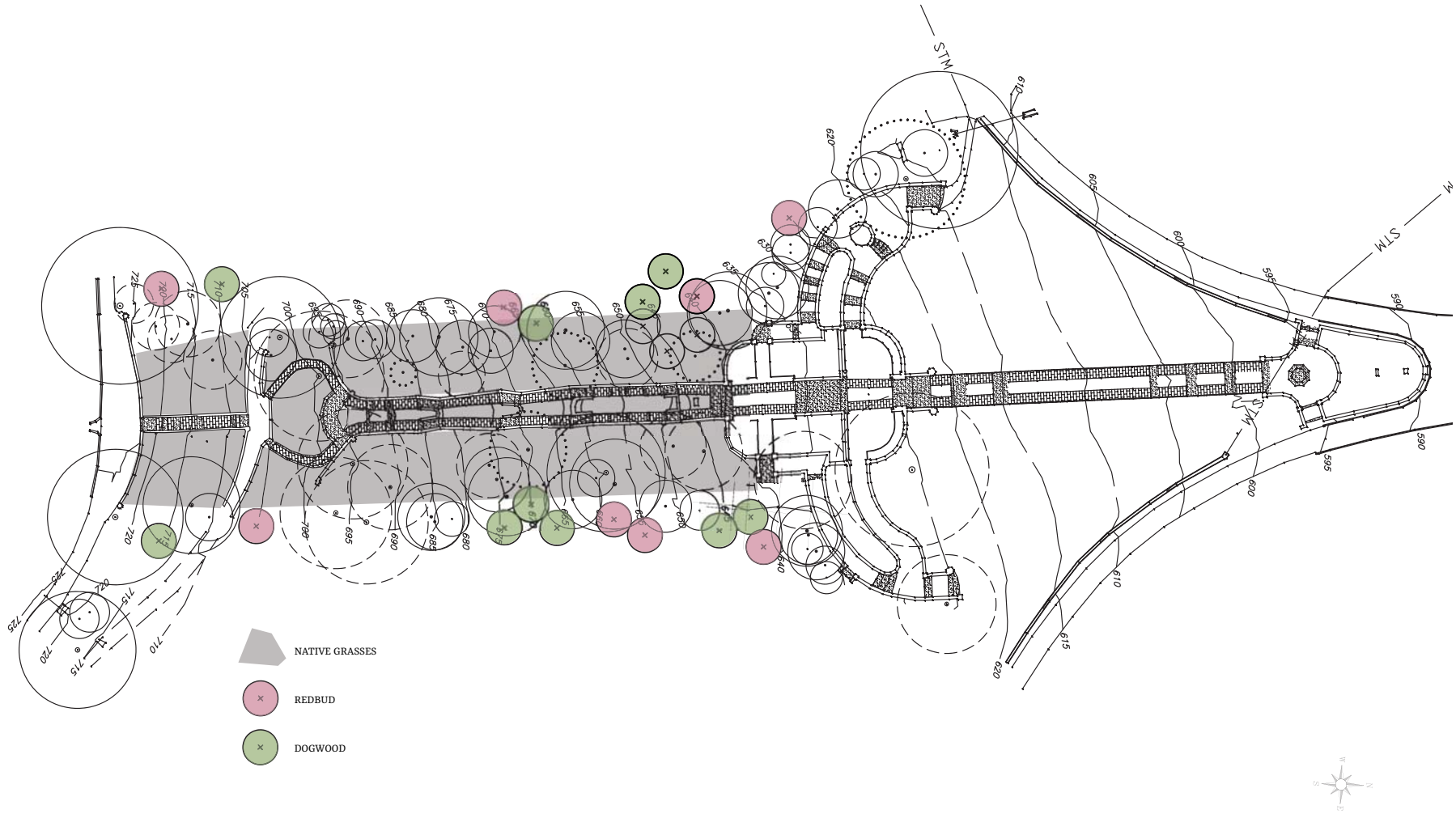


# LANDSCAPE RECOMMENDATIONS - REMOVE & PRUNE TREES ALONG ALLEE



SCALE: 1/8" = 1'-0"

# LANDSCAPE RECOMMENDATIONS - PROPOSED PLANTING



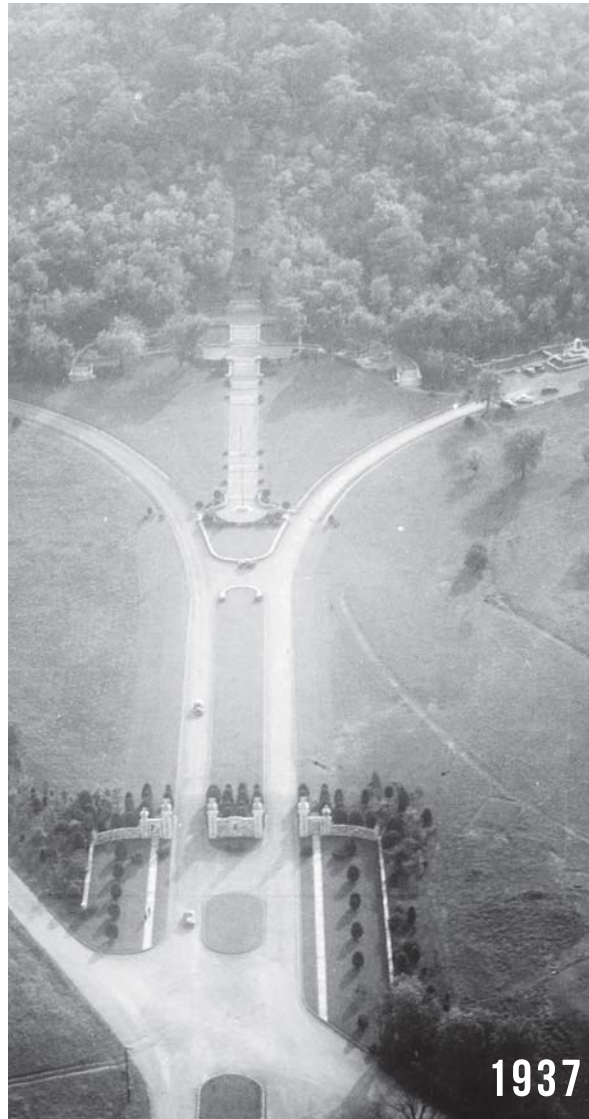
SCALE: 1/8" = 1'-0"



# LANDSCAPE RECOMMENDATIONS

*Sandstone Gate and  
the Lower Allee*

---

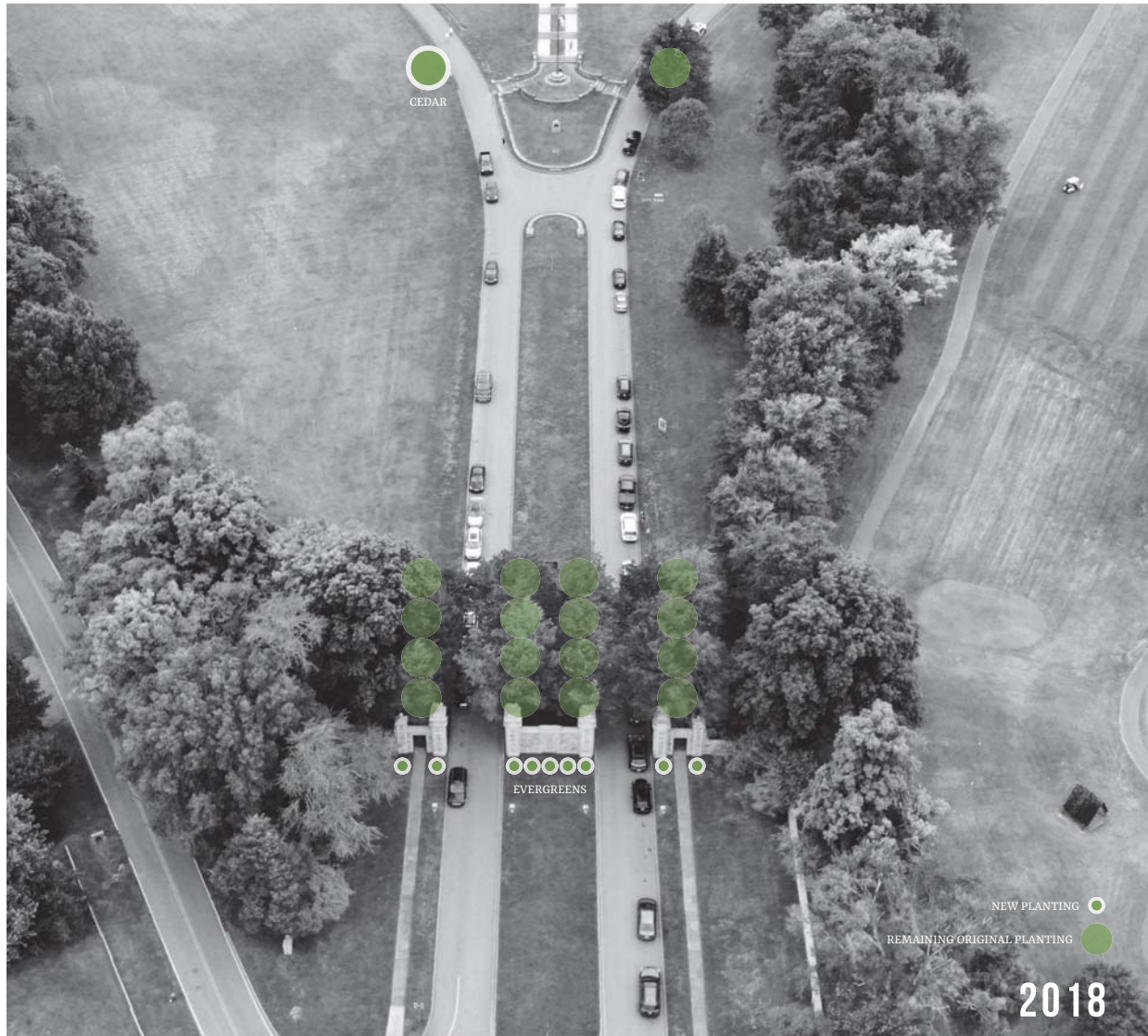


Historic



Current

## LANDSCAPE RECOMMENDATIONS - ORIGINAL PLANTING & ADDITIONS



Recommended

The only plants still in existence from the original planting are the junipers behind the gates and one solitary juniper in the top right of the image at left, as evidenced by historic photos. While there were originally more ornamental plantings, we do not recommend replanting for reasons of maintenance. We are proposing the following improvements that consider the original intent and character of the park.

### Proposed Planting:

- 1: Add low evergreens to replace historic juniper in front of gate. This planting will help with maintenance and mask light fixtures.
- 2: Repair irrigation at sandstone gates.
- 3: Add one Cedar to mirror original remaining tree.



Stormwater Management Recommendations | Opinion of Costs

<b>PROJECT NAME:</b> Warner Park Allee
<b>PROJECT LOCATION:</b> 1225 Belle Meade Blvd, Nashville, TN 37205
<b>BUDGET STATUS:</b>
<b>CONTRACT TYPE:</b>
<b>DATE:</b> January 31, 2019

Stormwater, Roadway, and Landscape Improvements					
Item No.	Description	QTY	UNIT	Unit Price	Total
	Upper Road Drainage Improvements and Paving	1	LS	\$ 100,000.00	\$ 100,000.00
	Grading and shaping (horse trail, channel, and lawn)	900	CY	\$ 30.00	\$ 27,000.00
	General EPSC Measures and Maintenance	1	LS	\$ 2,000.00	\$ 12,500.00
	Seed and Straw Mulch	12000	SY	\$ 1.00	\$ 12,000.00
	Water Jet cleaning of existing pipes and drainage structures	1	LS	\$ 5,000.00	\$ 5,000.00
	Vegetation Clearing and Grubbing	3200	SY	\$ 2.50	\$ 8,000.00
	Stone Trench	70	LF	\$ 260.00	\$ 18,200.00
	Stone Gutter	715	LF	\$ 85.00	\$ 60,775.00
	Wax Polymer Stabilized Limestone Fines	7500	SF	\$ 8.00	\$ 60,000.00
	Base Stone	350	TON	\$ 55.00	\$ 19,250.00
	Flagstone Pavers	6000	SF	\$ 50.00	\$ 300,000.00
	Removal and Pruning	4	DAYS	\$ 2,200.00	\$ 8,800.00
	Flowering Trees	18	EA	\$ 250.00	\$ 4,500.00
	Grassland Restoration	1	ACRE	\$ 12,000.00	\$ 12,000.00
	<i>Subtotal</i>				\$ 648,025.00
	<i>Contract General Conditions and Mobilizations</i>				\$ 32,401.25
	<i>Contractor Profit and Overhead</i>				\$ 97,203.75
	<i>Architecture &amp; Engineering CD's and Construction Oversight</i>				\$ 64,802.50
	<b>Site Total</b>				<b>\$ 842,432.50</b>

Tradesman Group, INC. Masonry Resoration					
Item No.	Description	QTY	UNIT	Unit Price	Total
802-05.01	Temporary Tree Protection	1000	LF	\$ 10.76	\$ 10,760.00
209-08.03	Temporary Silt Fence Without Backing	500	LF	\$ 11.30	\$ 5,650.00
612-06.02	Cleaning Stone Masonry Surface	37500	SF	\$ 6.64	\$ 249,000.00
202-04.01	Removal of Structures (Selective Demo of Existing Masonry)	110	CY	\$ 261.19	\$ 28,730.90
612-02.01H	Nonuniform-course stone masonry (salvaged onsite)	1500	CF	\$ 94.44	\$ 141,660.00
612-0H	Nonuniform-course stone masonry	600	CF	\$ 168.42	\$ 101,052.00
612-06.01	Repointing of Stone Masonry	57950	LF	\$ 10.48	\$ 607,316.00
604-15.02H	Portland Cement Grout	450	BAG	\$ 15.70	\$ 7,065.00
801-01.00	Seeding (Turf)	1200	SY	\$ 6.98	\$ 8,376.00
	Mobilization	1	EA	\$ 28,990.25	\$ 28,990.25
	<i>Subtotal</i>				\$ 1,188,600.15
	<i>Contingency</i>				\$ 118,860.02
	<b>Allee Masonry Restoration Total</b>				<b>\$ 1,307,460.17</b>

Tradesman Group, INC. World War I Memorial Masonry Resoration					
Item No.	Description	QTY	UNIT	Unit Price	Total
612-06.02	Cleaning Stone Masonry Surface	1654	SF	\$ 6.64	\$ 10,982.56
202-04.01	Removal of Structures (Selective Demo of Existing Masonry)	6	CY	\$ 261.19	\$ 1,567.14
612-02.01H	Nonuniform-course stone masonry (salvaged onsite)	89	CF	\$ 94.44	\$ 8,405.16
612-0H	Nonuniform-course stone masonry	29	CF	\$ 168.42	\$ 4,884.18
612-06.01	Repointing of Stone Masonry	4871	LF	\$ 10.48	\$ 51,048.08
604-15.02H	Portland Cement Grout	40	BAG	\$ 15.70	\$ 628.00
801-01.00	Seeding (Turf)	570	SY	\$ 6.98	\$ 3,978.60
	Mobilization	1	EA	\$ 2,037.34	\$ 2,037.34
	<i>Subtotal</i>				\$ 83,531.06
	<i>Contingency</i>				\$ 12,529.66
	<b>WWI Masonry Restoration Total</b>				<b>\$ 96,060.72</b>
	<b>ESTIMATED PROJECT BUDGET</b>				<b>\$ 2,245,953.38</b>

Tradesman Group Notes and Exclusions

1. No costs for excavations are included.
2. No costs are included for an archaeologist.
3. No provisions or costs for below grade work including footers or foundation work are included.
4. No costs for drainage are included.
5. No provisions or costs are included to ensure steps are code compliant.
6. No provisions or costs\*\* are included for installation of new flagstone walking surfaces where pavers or gravel or gravel currently exists.
7. Cleaning assumes bio-degradable non-toxic cleaning agent such as D2 Biological Solution and light to medium pressure wash; no containment included for use of aggressive cleaning agents.

\*\*Costs can be estimated for flagstone at \$46.24 SF for irregular flagstone and \$53.14 for sawn flagstone without demolition, excavation or sub-base preparation for flagstone.

# COST ESTIMATES AND MAINTENANCE

Maintenance Plan		Recommended Months											
Maintenance Activity	Maintenance Interval	January	February	March	April	May	June	July	August	September	October	November	December
<b>Inspection/Monitoring</b>	Monthly												
Inspect stormwater and drainage features (culverts, ditches, gutters, etc.) and ensure that there are no obvious signs of impairment or failure.													
<b>Maintain Ditches</b>	Quarterly												
Remove excess silt, debris, and litter from ditches													
<b>Maintain Culvert</b>	Quarterly												
Ensure that culvert hasn't become filled with excess silt, debris, and litter.													
<b>Slope Maintenance/Repair</b>	Quarterly												
Check slopes for any erosion or similar forms of degradation. Repair as necessary													
<b>Limestone Fine Inspection</b>	Quarterly												
Check the surface for any deformations such as rills (a shallow channel cut in the ground by running water) or ponding low points. Ensure pathway maintains positive drainage													
<b>Trench/Gutter Cleanout</b>	Bi-Annual												
Use appropriate methods to remove excess sediment from trenches and gutters													
<b>Weed Control</b>	Annual												
Remove invasive plants and apply appropriate weed control measures.													
<b>Leaf Removal</b>	Annual												
Remove dead leaves from Allee with extra attention paid to clearing any drainage channels.													
<b>Mowing</b>	As Necessary												
Trim grass areas as necessary to appropriate height.													



# APPENDIX

## Masonry Condition Assessment Percy Warner Alleé

prepared for

**Metro-Nashville Parks & Recreation**  
**P.O. Box 196340**  
**Nashville TN 37219**



January 27, 2019



Prepared by:

**The Tradesmen Group, Inc.**  
**8465 Rausch Drive**  
**Plain City OH 43064**  
**614-799-0889**

TN Contractor's License #47676

Report by: Susan D. Turner FAIA



Masonry Condition Assessment  
Percy Warner Alleé and WW I Memorial, Metro-Nashville Parks & Recreation

### Table of Contents

Introduction	2
Alleé General Observations	3
Alleé Recommendations	5
Alleé Annotated Photos	6
North Flagpole Observations and Recommendations	19
WWI Memorial General Observations	20
WWI Memorial Recommendations	21
WWI Memorial Annotated Photos	22
Proposed Methods and Materials for Masonry Restoration	27
Alleé Plans	32-33
Project Estimates	34-35



## INTRODUCTION

This report is a Condition Assessment of the stone masonry of the Percy Warner Stone Alleé steps and World War I Memorial in Percy Warner Park in Nashville Tennessee. It should not be construed as a comprehensive report of all conditions related to the stone masonry, but rather a basic assessment to inform and provide guidance for future efforts to care for and maintain the masonry of the steps and walls.

On January 3, 2019 Alan Frye and Susan Turner of The Tradesmen Group, Inc. (TTG) visited Percy Warner Alleé steps and World War I Memorial to inspect and document basic existing conditions through visual observation made from the ground. Extensive photographs were taken of observed conditions of the masonry.

The following report demonstrates observed conditions of stone masonry. Recommendations for repair/rehabilitation and restoration efforts are described in detail below. Recommendations in summary:

- 1) Complete an effective site water mitigation plan, in advance of completing the masonry repairs. Some, but not all, of the scope is contained in the report named Stormwater and Landscape Planning Document dated 2018.
- 2) Repoint 100% of all mortar joints. The existing mortar is cracked and deteriorated.
- 3) Clean 100% of all masonry. This will freshen the appearance, but more importantly, prepare the stone to receive a good bond to the new mortar.
- 4) Reconstruct some walls and some small areas of the Alleé where the masonry is significantly displaced.
- 5) Allow for replacement of existing fractured stones, which will fail in the course of the mortar removal.
- 6) Replace pavers from a previous project with flagstones in a pattern more consistent with the original fabric. This is as recommended in the Stormwater and Landscape Planning Document dated 2018.
- 7) Refinish flagpole and base with new paint finish.



## ALLEÉ GENERAL OBSERVATIONS

### Alleé Site:

The site was visited just after a lot of rain had occurred. It is readily apparent that precipitation is being channeled naturally by the ground conditions such that water is streaming over the stairs and paths. The mortar is washing out, the water brings debris across the steps, and also washes away gravel walk paths. This has been identified in prior study of the Alleé.

Originally, clay pipe drains were placed at the base of the wall to drain water out of higher areas and onto lower areas. In some of these locations grade has dropped leaving these pipes above the level where they are effective for drainage. It may be possible to lower the pipe in the wall to provide better drainage in certain locations, but it is not recommended to raise the grade, since the natural water table will be below any new fill. See Photo 8.

### Alleé Stairs:

The existing stairs do not comply with the International Building Code 2012 (IBC) which is adopted by the City of Nashville. The stairs are not built in compliance with the rise run and parameters, the risers are not consistent in height in accordance with code, and there is an absence of handrails. With that being said, the implementation of code related upgrades would fundamentally detract from the existing historic appearance of this landscape, and hence upgrades are not recommended. See Photos 7, 10, 20, and 25.

The stairs are comprised of individual stones with a flagstone pattern. The mortar joint is very wide, and typically skyward facing. Where top surfaces are uneven, water can accumulate and lead to icy patches in the winter. Only where stones are missing or severely eroded would these small areas of ponding be addressed. See Photo 5.

### Alleé Walls:

Observation of the stone walls adjacent to the stairs noted presence of soiled conditions throughout wall areas. Stones are random in size and shape, and are in good condition for the most part. There are some stones which have fractured and will need to be replaced when in skyward facing locations. Fracturing of the stone can be caused by inherent weaknesses of the stone which fracture in the weathering process. Fractured stones which survive the mortar removal can remain in place; those that break apart will be salvaged for other uses and replaced in kind. See Photos 3 and 4.

Mortar joints throughout the assemblies appear to be original, in poor shape (eroded, cracked, missing). As mortar is exposed to weather, the wind and rain and freezing conditions combine to generally erode the surface. Over time, fine fissures occur, and these permit tiny amounts of moisture in. This water freezes and thaws cyclically, causing further opening, gradually forming a





crack, or forcing the mortar away from the stone (debonding). These cracks further deteriorate in the exposed environment, and it cyclically worsens the condition of the mortar. The moisture and cracks form a good substrate, when windborne dust and dirt enter the cracks, resulting in the entire wall being covered in lichen and moss. Biologic growth of this type retains moisture on the surface and cracked and missing mortar joints allow moisture infiltration that accelerates damage to historic masonry assemblies. See Photos 1 and 2. There are select areas of repointing completed on the structure in 2001, but a full repointing was not performed. See Photo 9. These are in good condition, but more work is required, almost twenty years later.

The top of the wall has large areas of skyward facing mortar. Like the face of the wall, the mortar is missing in some places, cracked in others, and covered in moss and lichen. See Photo 12. It is especially important that the top of the wall be maintained, since this is a direct path for water to get into the core of the wall. With freezing and thawing cycles over many winters, this will inflict damage to the core of the wall, resulting in bulging and fracturing. It is likely that freeze / thaw action caused the displacement of the missing stone noted, which was removed from the wall before TTG's site visit and requires replacement.

In isolated locations, stair treads and the top of the wall at the end pilasters have indentations which are collecting water. It is not known whether these are missing a stone, or the mortar has deteriorated. See Photo 5 and 6.

Select locations of wall appear to have some differential movement, due to either the original foundation inadequacy, or caused by the extreme moisture conditions changing the nearing conditions. Regardless, the net effect is that there are cracks through the wall, but the walls are stable. These walls will not be reset but will be repointed to close up the crack against moisture. See Photos 13, 14, 15. In one location, the roots of a large tree has pushed out the wall causing bulging, cracking and displacement. The wall has lost its integrity and needs resetting. See Photo 16 and 17.

Some locations of wall have been extremely washed out by site water and the stones have come out of plane, and in extreme circumstances, have fallen out of the wall. It cannot be understated that it is imperative to complete effective site water control prior to completing the masonry work. Where extreme water conditions are present, walls have large cracks, with mortar, sand, and dirt washing through the joints. See Photos 18, 19, 20, 21 and 23. These areas designated for rebuilding are marked on plans at the end of this document.

The retaining wall at south side of south roadway at top of stairs was dry stacked and has displaced with the amount of water flowing down the slopes in the area. As a result of the water, freeze thaw action has displaced the dry stacked stones, resulting in the wall being out of plumb and some stones getting out of position. See Photo 25.

The retaining wall at the north side of the south roadway has water passing through it, resulting in efflorescence, a whitish deposit of water-borne salts which crystallize on the surface of the wall as



the moisture evaporates. See Photo 26. The efflorescence is not harmful as it stands but must be removed for a solid bond of the new mortar to the stone. What is harmful is the quantity of moisture which is coming from the back (road side) of the wall to the front visible face. This moisture will saturate the mortar, resulting in freeze and thaw action which fractures the mortar. Without elimination of the source of the moisture, this cycle will continue and prevent warranting of the repointing of this section of wall.

### Alleé Summary Recommendations

Based on the above identified conditions stated above, the following treatments are recommended to best preserve and restore existing stone masonry substrates of the Percy Warner Alleé.

1. Complete an effective site water mitigation in advance of the masonry repair project (or concurrently). Some of this scope is contained in the recommended work of the 2018 Stormwater and Landscape Planning Document (by others).
2. Clean stone substrates to greatest extent possible with gentlest means possible to remove organic and atmospheric soiling without causing damage to existing substrates.
3. Remove and repoint all above grade mortar joints throughout entire structure with Type N mortar, matching appearance, strength and porosity to original mortar in accordance with Preservation Brief #2.
4. Replace severely damaged stone with new matching limestone. New stone shall match as best as possible in size, dimension, shape, profile, contour, color, texture, and finish.
5. Where tops of pilasters have indentations which accumulate water, it will be built up with stone or mortar wash (as appropriate) to prevent the ponding of water.
6. Dismantle and reconstruct small and large areas of wall where there is general displacement of stone, or lack of integrity left from washed out mortar. For the south wall at the south roadway, reset dry-stack stones with mortar bed.
7. Where possible, salvaged stone will be reused. Where new stone is required, it shall match as best as possible in size, dimension, shape, profile, contour, color, texture, and finish, and be utilized where it will provide the least visual distraction.

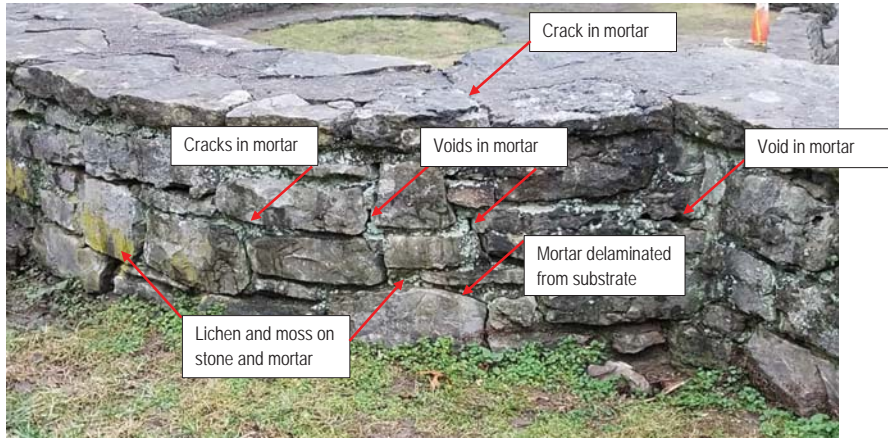


Photo 1 – Extent of mortar deterioration typical on site.

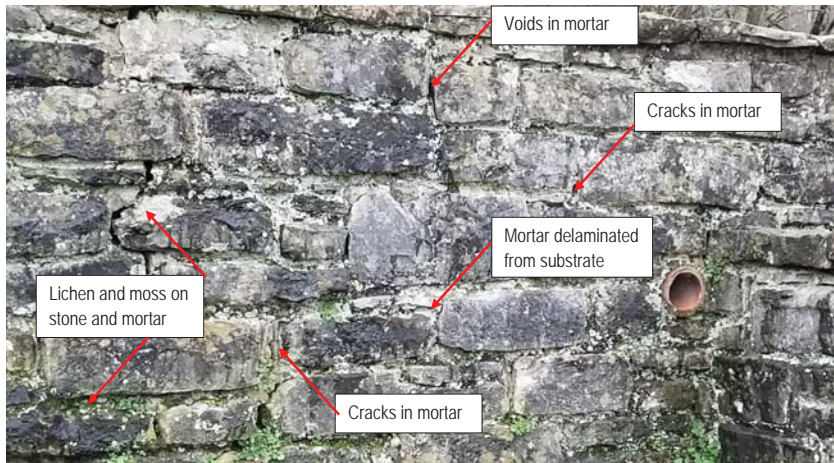


Photo 2 – Extent of mortar deterioration typical on site.



Photo 3 - Example of cracked and fractured stones.



Photo 4 - Example of cracked and fractured stones.





Photo 5 - Example of skyward surface in need of mortar wash to prevent water accumulation.



Photo 6 - Example of skyward surface in need of stonework or mortar wash to prevent water accumulation.



Photo 7 - Area of steps where water washes down, deteriorates mortar, deposits sand and mud, and saturates masonry causing heavy moss growth.



Photo 8 - Retaining wall where original clay drainage pipes have ended up well above grade level, rendering them ineffective.





Photo 9 - Pier that was repointed in a previous restoration project in 2001, along with pavers which placed by that project.



Photo 10 – Steps are comprised of individual stones, in a flagstone pattern, with inconsistent tread depth and riser height, with wide mortar joints skyward facing. Note lack of handrail.

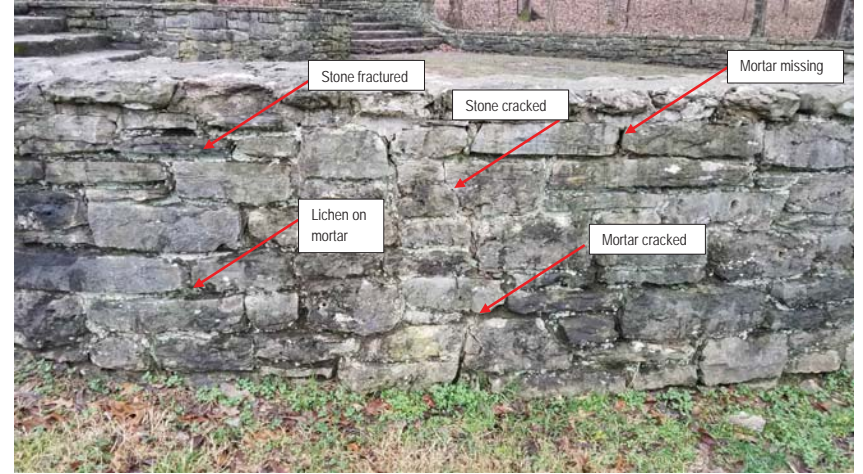


Photo 11 – Mortar is old, covered with lichen and moss, has cracks, and is missing in some cases. Stone is in relatively good condition, but has cracked in some locations, and fractured elsewhere.



Photo 12 - The top of the wall with skyward facing mortar, cracks, open joints, moss and lichen.



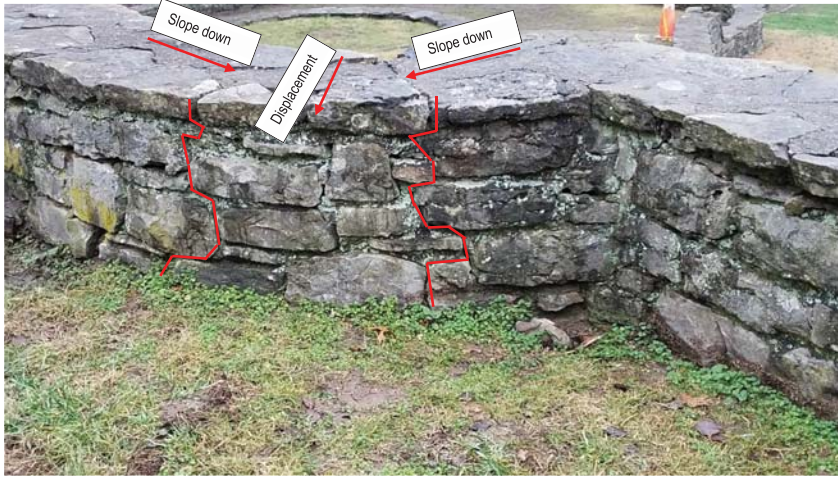


Photo 13 Crack through wall with settlement; Crack to be cut out and repointed



Photo 14 Cracking through wall due to minor differential movement; Crack to be cut out and repointed



Photo 15 - Wall with differential movement causing crack; Crack to be cut out and repointed. Indentation in top of pier catching water and in need to filling with stone or mortar wash



Photo 16 Displacement of wall due to tree roots. This portion of the wall needs to be reset.





Photo 17 Displacement of wall due to tree roots. This portion of the wall needs to be reset.

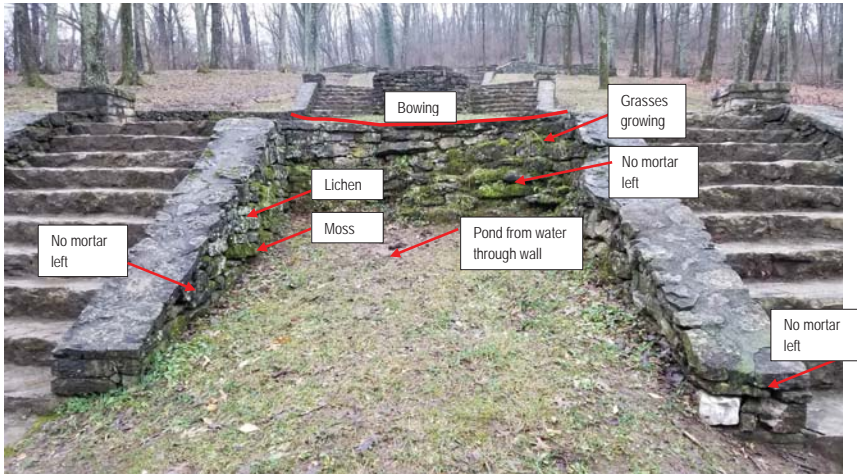


Photo 18 - Retaining wall to be rebuilt. All mortar has washed out, wall is displacing. This portion of the wall needs to be reset.



Photo 19 – Low retaining wall to be rebuilt. All mortar has washed out, wall is displacing. Note wash out of soil in lawn adjacent. Water mitigation must be completed before masonry work.



Photo 20 - Retaining wall to be rebuilt. All mortar has washed out, wall is displacing. Note irregular height of treads and lack of handrails and guard rails.





Photo 21 - Retaining wall to be rebuilt. All mortar has washed out, wall is displacing.



Photo 22 - Storm drainage placed to west of previous photo has failed.



Photo 23 - Sidewall where all mortar has washed out and required rebuilding. Moisture from lawn side of wall back washing into scupper due to slopes.



Photo 24 - Crescent area of steps / seating that has displaced and is washing out due to saturation from surface groundwater





Photo 25 - Retaining wall at south side of roadway at top of stairs was dry stacked and has displaced. Proposal to reset wall with mortar.

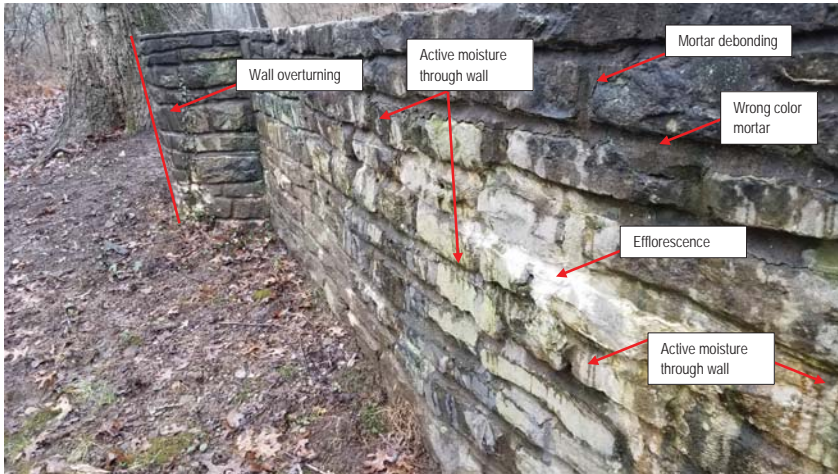


Photo 26 - Retaining wall at north side of roadway at top of stairs exhibiting efflorescence due to moisture passing straight through wall. Civil water mitigation may reduce effect in future.

### NORTH FLAGPOLE

There is a flagpole on axis with the Allée, which has weathered over time. While it was not identified in the scope of this study, it should be noted that the finish on the base has eroded, leaving a mottled appearance. This is not a purely aesthetic problem, because the oxidation (rust) on the surface is an indication that the metal substrate is being compromised by deteriorated paint film. See Photo 29.

### Flagpole Summary Recommendations

Based on the above identified conditions, it is recommended to refinish the metal base and flagpole. The materials of the flagpole and base will be identified, and the paint tested for lead. Based on the findings, a suitable refinishing process will be selected. Once the substrate is clean, a new exterior grade industrial paint film will be applied, of a type which can be field-repaired in the future.



Photo 29 - Flagpole is not in scope, but paint film has weathered, and substrate exposed.





## GENERAL OBSERVATIONS – WORLD WAR I MEMORIAL

### Site:

The site was visited just after a heavy rain event. It is readily apparent that site water is being channeled naturally by the ground conditions such that water is streaming into the memorial and over walls and paths. See Photo 30. This area of the World War I memorial has not been identified at all in the stormwater study of 2018 named Stormwater and Landscape Planning Document. It is imperative that effective storm water management be installed in the area to aggressively re-route the water away from the structure and into appropriately sized storm management system, to prevent surface runoff from damaging completed masonry repairs subject to this matter.

There is a large slope above the memorial, from which water flows into the corner of the memorial, washing away grasses, and depositing silt which has changed grade in the SE corner. See Photo 31 and 32. Other water from the slope above comes to the back of the retaining wall, which blocks its passage, and silt is deposited to the back side of the wall, and it washes to the east. See Photos 34 and 35.

The condition of the walls and steps are similar to the Alleé observations indicated in the report above. The paths, walls and stairs of the Memorial are mortar set, and the mortar is washing out from the excessive flowing water. The moisture is resulting in the growth of moisture and lichen, which holds moisture in the masonry structures and further deterioration. This contributes to the weathering of the mortar, including cracking, delamination and washing out. Further, the tops of the walls are parged with mortar, which also has deteriorated. This condition is more critical to the long-term retention of the memorial, since water which enters these cracks go directly into the interior of the wall assembly, where freeze thaw action causes destabilization of the core masonry. See Photos 37 and 38.

The site water also saturates the stone over which it cascades. Where stone is less than perfect, the moisture enters tiny fissures in the stone, which deteriorates the stone over time with the freeze-thaw cycles. There are some stones which are cracking or fracturing, in similar quantities of 5 to 10% replacement required for the Alleé. See Photos 37 and 39.

The flagstone paths around the memorial appear to be of the same vintage as the construction of the memorial. Rather than replace them as will be done on the Alleé, these stones should be repointed in situ, but more deeply than typical areas of repointing. See Photo 39.

There is a small bridge at the east end of the Memorial. See Photos 35 and 36. It is displaying the same level of deterioration as the rest of the stonework. However, it additionally has a crack adjacent to the keystone. See Photo 37. Since there is no displacement of the keystone, it can be repointing in situ.



## Summary Recommendations – World War I Memorial

Based on the above identified conditions stated above, the following treatments are recommended to best preserve and restore existing stone masonry substrates of the Percy Warner World War I Memorial.

1. Develop and execute an effective water management plan to address this memorial, in advance of the masonry repair project (or concurrently).
2. Clean stone substrates of the memorial to greatest extent possible with gentlest means possible to remove organic and atmospheric soiling without causing damage to existing substrates.
3. Remove and repoint all above grade mortar joints throughout entire memorial with Type N mortar, matching appearance, strength and porosity to original mortar in accordance with Preservation Brief #2.
4. Replace severely damaged stones with new matching limestone. New stones shall match as best as possible in size, dimension, shape, profile, contour, color, texture, and finish.
5. At the bridge structure, assess the nature of the cracking at the apex of the arch to determine whether reconstruction or in situ repairs are required. If required, dismantle and reconstruct areas of arch where there is lack of integrity left from washed out mortar.
6. Where possible, salvaged stone will be reused. Where new stone is required, it shall match as best as possible in size, dimension, shape, profile, contour, color, texture, and finish, and be utilized where it is will provide the least visual distraction.



Photo 30 - World War I Memorial context view with path of water marked.



Photo 31 - World War I Memorial general view, with specific water issue in SE marked.



Photo 32 - World War I Memorial path of water SE corner



Photo 33 - World War I Memorial path of water from south, moving east, carrying silt





Photo 34 - World War I Memorial back of bridge, with path of water from south, moving east - quantity of water in the recent storm event resulted in overwhelming the storm drainage, and deposition of debris.



Photo 35 - World War I Memorial front of bridge with area of concern marked (see next photo)

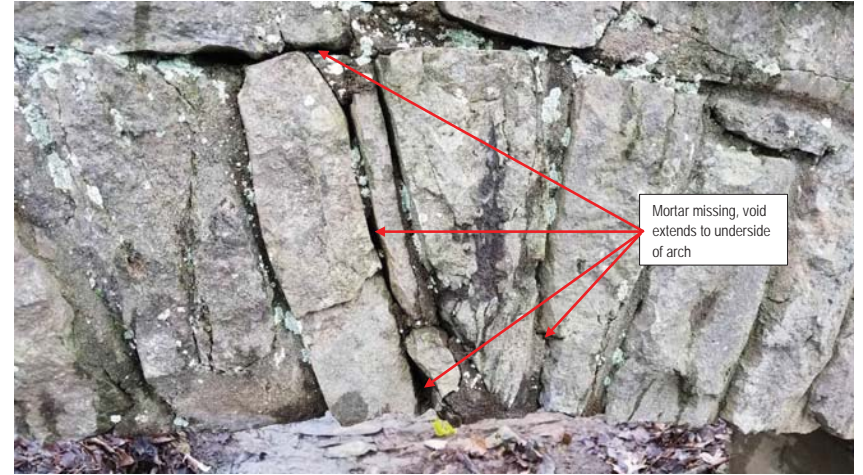
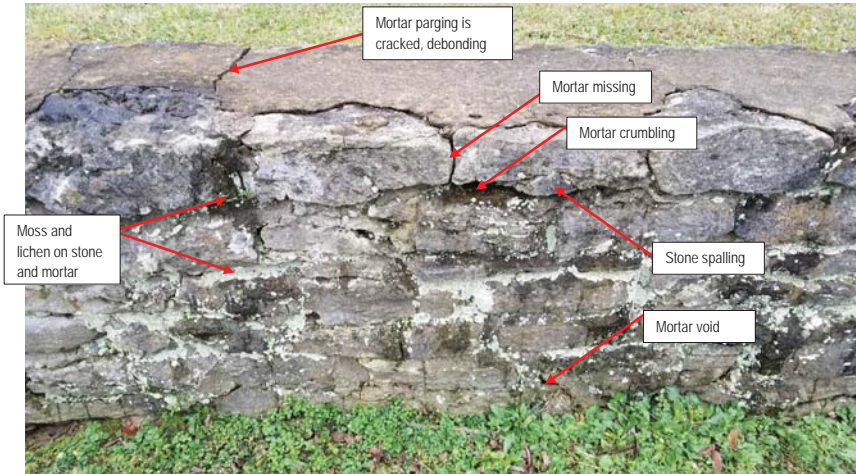


Photo 36 - World War I Memorial keystone arch (area of concern) is missing mortar, and has large crack passing down face and under arch. Study of structure is required.

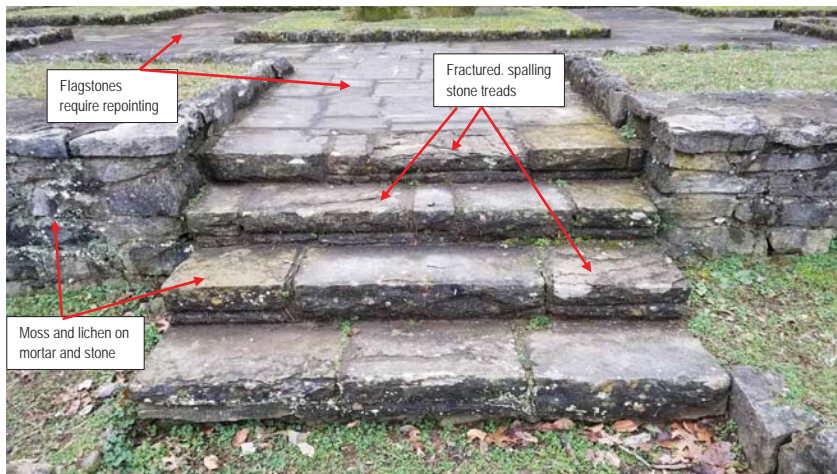


Photo 37 - World War I Memorial west side of bridge. Note spalling stones, poor condition of mortar, typical of the memorial.





**Photo 38 - World War I Memorial typical wall. Note spalling stones, poor condition of mortar, typical of the Memorial.**



**Photo 39 - World War I Memorial front steps conditions, typical of all areas of steps and flagstones on the Memorial.**

## PROPOSED METHODS AND MATERIALS FOR MASONRY RESTORATION

TTG proposes to utilize the following methods and materials in execution of all work for restoration of the stone walls and steps of the Warner Park Alleé. Methods & materials will be compliant with Secretary of Interior Standards for Treatment of Historic Structures.

### Masonry Cleaning

TTG proposes to clean the masonry to address soiled and stained conditions on the Alleé structures. Cleaning will be in accordance with Preservation Brief #1 “Assessing Cleaning & Water Repellent Treatments for Historic Masonry Building” and will utilize gentlest means possible without causing damage to masonry substrates. Cleaning techniques will be evaluated in trials to determine effectiveness and appropriateness of each method and material.

- 1) General Cleaning – Objective is to remove basic atmospheric and extensive organic soiling from all walls and step structures to achieve general uniformity of appearance of the natural properties of the stone masonry of the Alleé structures, without causing damage to the stone during the cleaning process.
  - a. General cleaning will be accomplished with cold and hot (as needed) low to medium water pressure cleaning without chemical detergents.
    - i. It is proposed to begin with cold water spray in low to medium pressure combined with hand scrubbing and rinsing. If this alone will remove soiled conditions no further cleaning techniques will be utilized.
    - ii. If cold water cleaning is ineffective, hot water spray application will be used, with low to medium pressure, combined with hand scrubbing and rinsing to remove soiled conditions to present a uniform clean appearance.
    - iii. Biological Stain Removal – Where there are stubborn biological stains that are not responsive to general cleaning efforts without causing damage to masonry substrates, biological cleaning will be accomplished using a bio-degradable non-toxic light detergent cleaner such as D2 Biological Cleaner in conjunction with general cleaning methods.

### Mortar Removal & Tuckpointing

TTG proposes to utilize the following methods to remove and replace mortar joints on Warner Park Alleé structures. Mortar removal & tuckpointing shall be consistent with Preservation Brief #2 Repointing Mortar Joints in Historic Masonry Buildings and ASTM E2660 Standard Guide for Repointing Historic Masonry.

- 1) Mortar Removal – Objective is to remove all failed and deficient mortar throughout the structures applicable to this contract. Failed and deficient mortar joints are defined as those that are cracked, open or missing and that can allow water infiltration into the structure.





- a. Removal efforts shall utilize center-cut-and-chip method to avoid damage to existing stone units. All chisel work and chipping of mortar will be accomplished by hand with hammer and chisel. Mortar joint removal will also conform to requirements of Preservation Brief #2 and produce removed joints that are approximately 2.5 times as deep when removed as they are wide. Removed joints will have clean and square backs.

- 2) Mortar Formulation – Objective is to match new mortar to existing mortar to highest degree possible so that new mortar is indistinguishable from existing when placed in the wall and weathered for six months.

New mortar shall be formulated to match original or adjacent mortar to the greatest extent possible. In design phase, TTG shall obtain mortar samples which will be tested to determine the types of binder and aggregate profile to be utilized, including size and color distribution range of the aggregate. TTG shall source new aggregate with matching size and color properties to existing aggregates. New mortar shall be formulated to match original mortar in color, aggregate content, relative hardness and porosity.

Anticipated mortar formula will be a Type N mortar:

- 1 part grey/white Portland cement
- 1 part hydrated lime
- 6 parts sand (aggregate)

Exact mortar formulation will be confirmed in design phase trials samples.

- 3) Tuckpointing preparation – Objective is to remove and properly prepare faulty mortar joints for installation of new mortar. Removed mortar joints shall conform to the following:
  - a. Joint depth removal to equal 2.5 times as deep as it is wide
  - b. Joint backs square and uniform
  - c. Removal of all clinging mortar to adjacent masonry units without causing damage to masonry units
  - d. Removed joints shall be free from dust and debris
  - e. Just prior to placement of new mortar pre-hydrate joints with water to produce surface saturated dry (SSD) conditions
- 4) Tuckpointing – Objective is to install new mortar into properly prepared mortar joints to result in watertight mortar joints that are visually identical to adjacent mortar joints. No field or lab testing was conducted on the mortar to determine the type of sand and cement used in the mortar. New mortar will be matched to the historic mortar for color, sizes of aggregate, type of cement, and strength and porosity. Proper historic mortar formulation should include an aggregate base with varied size aggregates from fines to largest aggregates maximum size equaling approximately 1/3 of the width of a typical mortar joint for the wall. Acceptable guidelines on particle size for aggregates used for historic masonry can be found in ASTM C 144. Additional useful guidelines for use of suitable aggregate in historic mortars can be found in Preservation Brief #2 published by Secretary of the Interior, National Park Service. Placement of new mortar shall conform to the following:



- a. Mortar shall be mixed and pre-hydrated in compliance with ASTM E2260.
- b. Mortar used for placement shall be sufficiently firm such that it can be formed into the shape of a ball.
- c. Mortar shall be neatly placed by hand into joints in layers to avoid smearing on adjacent masonry units. Joints shall be compacted to ensure mortar completely fills each joint.
- d. Mortar shall be tooled to desired tooled profile or finish once mortar achieves initial set. Mortar joint shall be tooled to match adjacent mortar as closely as possible.
- e. New mortar joints shall be cleaned to expose aggregate, after mortar has fully cured.
- 5) Post tuckpointing cure of new mortar – Objective is to facilitate proper cure of mortar after placement. Newly placed mortar will be cured in the following manner:
  - a. Newly placed mortar shall be protected from exposure to high wind, excessive heat and sunlight and freezing temperatures.
  - b. Newly placed mortar shall be hydrated 3-4 times daily for 72 hours minimum following placement to ensure mortar cures in a moist or dampened condition.
- 6) In locations where there are water-retaining indentations on skyward facing surfaces, a mortar wash will be installed, or the stone replaced to make a level surface as appropriate, to prevent the accumulation of water.

**Resetting Displaced Stone**

TTG proposes the following methods to remove and reset displaced stone on the Alleé structures. Resetting repairs shall be consistent with industry standards for setting of limestone. Objective of resetting displaced and loose stone is to correct conditions that resulted in stone becoming displaced in the alignment with adjacent stones and to correct conditions which may permit water infiltration due to separated or open mortar joints.

- 1) Displaced stone will be assessed in the field to determine extent of displacement, suitability and limitations/constraints for resetting of affected stone units as applicable.
- 2) Stone selected for resetting will be carefully removed without causing damage to the displaced stone, or adjacent stone. Removal method will remove perimeter joints and loosen stone in its cavity.
- 3) Substrates and backup masonry to receive the reset stone will be inspected and repaired as required to ensure sound conditions exist to install new bed mortar and the stone.
- 4) Stone will be reset in full bed of mortar and filled solid on all four sides with mortar in accordance with ASTM C1713 Standard Specification for Mortar for Repair of Historic Masonry. Mortar will be matched to existing/original mortar consistent with mortar formulated for tuckpointing repairs.



#### Stone Replacement –

TTG proposes the following methods to replace stone on the Alleé structures. Replacement of stone units shall be consistent with industry standards. Objective of replacing damaged or faulty stone is to replace stone that detract from the performance and/or aesthetics of the stone structures of the Alleé, or that cannot be reasonably repaired through other means. Replacement stone should match original stone as closely as possible in type, color, shape, dimension, contour, texture, and finish.

- 1) Stone units of the structure will be assessed in the field to determine which stone units are candidates for replacement. Replacement stone will be identified as those which meet the following criteria:
  - a. Stone unit(s) damaged beyond reasonable repair and which no longer serve the intended purpose of providing structure and integrity to the masonry structure they serve.
  - b. Stone units that are fractured throughout and without sufficient strength of compression to be reliable in forthcoming demands of the larger masonry structure.
  - c. Stone units that deemed critical in function or appearance that warrant replacement to restore said function or appearance to the structure.
- 2) Stone units to be replaced shall be carefully removed in whole or in part to facilitate installation of new matching stone. Removal of faulty stone shall not damage in any fashion adjacent substrates including adjacent stone. Stones which are removed will be assessed for reuse for replacement of smaller stones in need of replacement.
- 3) New stone shall be fabricated to match original stone as closely as possible in type, color, shape, dimension, contour, texture, and finish.
- 4) Substrates and backup masonry to receive the new stone will be inspected and repaired as required to ensure sound conditions exist to install new anchors and to install new bed mortar.
- 5) Stone will be reset in full bed of mortar and filled solid on all four sides with mortar in accordance with ASTM C1713 Standard Specification for Mortar for Repair of Historic Masonry. Mortar will be matched to existing/original mortar consistent with mortar formulated for tuckpointing repairs.

#### Alleé Small Area & Large Area Stone Dismantle & Reconstruction –

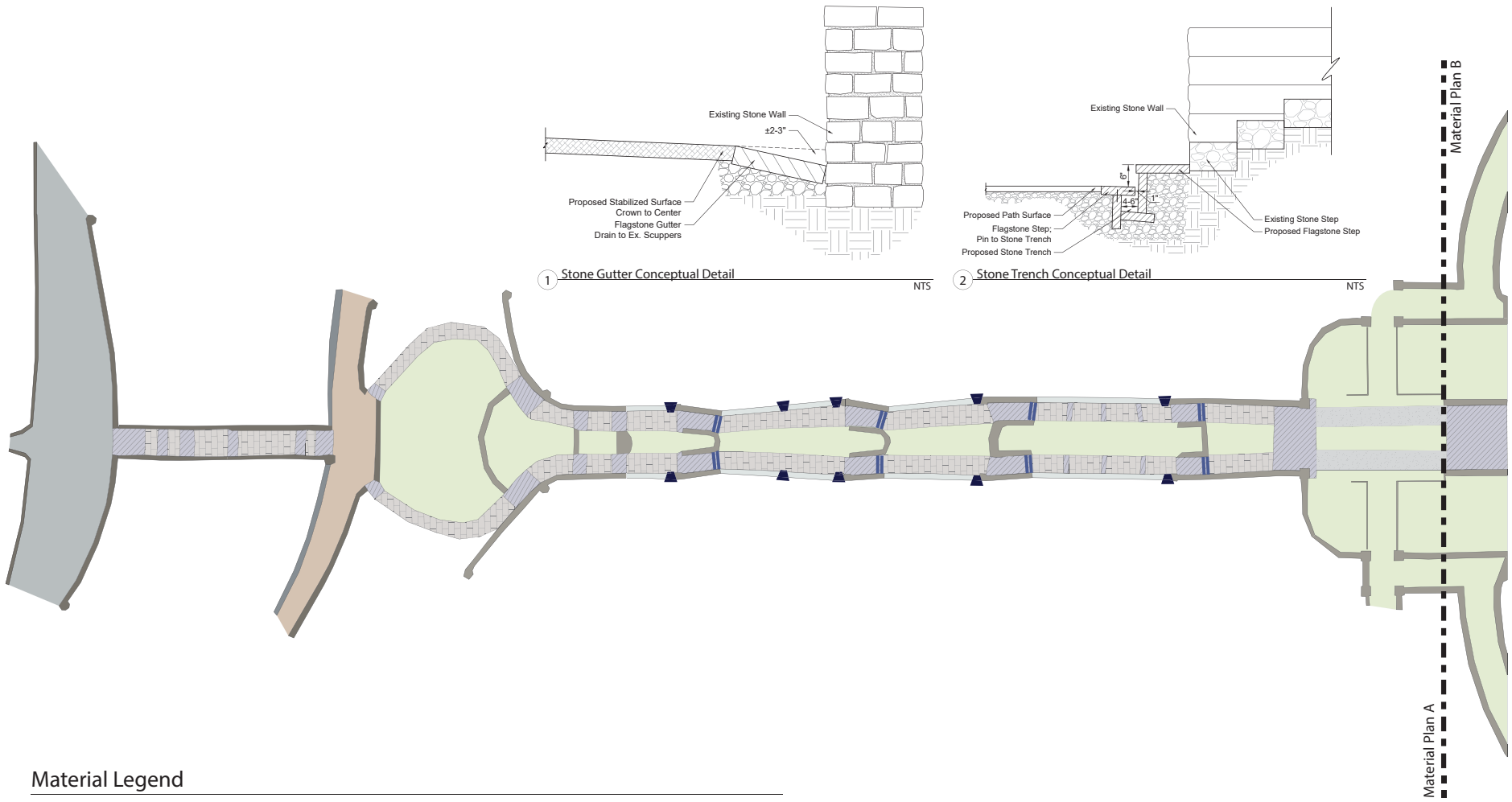
TTG proposes the following methods to reset stone on the Alleé structures. Resetting of stone units shall be consistent with industry standards. Objective of resetting individual stones or areas of failing walls is to reset stone that is displaced due to substrate conditions which are deleterious to the longevity of the wall.

- 1) Individual stone units will be assessed in the field to determine which units require resetting. Stones identified for resetting will meet the following criteria:
  - a. Stones are displaced more than 3 inches out of the wall.
  - b. Stones are loose and in danger of dislodging from the wall.



- 2) Areas of the wall will be assessed in the field to determine what extent of the wall requires resetting. Portions of wall identified for resetting will meet the following criteria:
  - a. Walls are displaced more than 3 inches out of plane from top to bottom.
  - b. The wall assembly is fragmented, loose and in danger of dislodging from the rest of the wall.
  - c. Portions of the wall have already collapsed.
- 3) Stone units to be reset shall be carefully disassembled from the wall in whole or in part to facilitate reconstruction of the wall. Removal of the stones shall not damage in any fashion adjacent substrates including adjacent stones. Stones which are removed will be cleaned and assessed for reuse.
- 4) Substrates will be inspected for stability. Repairs will be performed as required to ensure sound conditions exist to reassemble walls and steps.
- 5) Stone will be reset in full bed of mortar and filled solid on all sides with mortar in accordance with ASTM C1713 Standard Specification for Mortar for Repair of Historic Masonry. Mortar will be matched to existing/original mortar consistent with mortar formulated for tuckpointing repairs.





**Material Legend**

Existing Asphalt Road	Existing Grass	Existing Stone Stairs	Existing Scuppers
Existing Horse Trail	Existing Stone Wall	Flagstone Pavers	Stone Gutter
	Existing Stone	Stabilized Limestone Fines	Stone Trench



