TECHNICAL MEMORANDUM

To: Kumar Neppalli, Town of Chapel Hill Public Works

From: Kevin Smith, P.E.
Kimley-Horn and Associates, Inc.

Date: November 1, 2016

Subject: Variable Message Sign Design Project (U-5543) Progress Update

---

Introduction

This technical memorandum provides an update on the Town of Chapel Hill's Variable Message Sign Design Project (TIP U-5543). Kimley-Horn is contracted with the Town to provide engineering design services for the project.

Project Purpose

The Town of Chapel Hill is home to a dense collection of regional destinations and special events. To provide the best experience for visitors and residents alike, the Town seeks to design a system of permanent arterial Variable Message Signs (VMS). The real-time information displayed on these signs will help travelers make informed decisions as they travel through Chapel Hill.

This project consists of three primary phases:

- **System Design:** Identification and documentation of needs and priorities for a comprehensive VMS implementation plan that consists of ten sign installations including location, direction, and estimated cost **(completed)**
- **Preliminary Design:** Preliminary design for the VMS system to determine applicable sign technologies and size, electrical and communication connections for each location, and the operational components of managing the system **(current)**
- **Detailed Design:** Development of engineering plans, specifications, and estimate package (PS&E) for the VMS system that will be released for bid by the Town **(upcoming)**

Stakeholder Involvement

Stakeholder workshops and involvement of industry partners guided the high level design decisions documented in this memo. Representatives from the following agencies formed a stakeholder committee that provided feedback about each of the design decisions.

Stakeholders	
Chapel Hill Fire Department	NCDOT Traffic Systems Operations Unit
Chapel Hill Planning and Sustainability	UNC Facilities Services
Chapel Hill Police	UNC Health Care
Chapel Hill Traffic Engineering	UNC Parking
NCDOT Division 7	UNC Public Safety
NCDOT ITS Section	UNC Transportation

The project team conducted three stakeholder workshops with this committee.

- March 31, 2016: **System Goals**
- July 14, 2016: **Priority Locations**
- October 17, 2016: **Design Criteria**

System Goals

The System Goals workshop held in March vetted the needs and desires of each stakeholder group. At the conclusion of the workshop, the following goals were agreed to by all in attendance.

- **Provide real-time traveler information**
- **Provide an agile system for ease of integration and future enhancements**
- **Support traffic management during events around Town**
- **Eliminate the need for portable message signs and create a permanent solution that can be used throughout the year**
- **Support incident management**
- **Integrate with existing wayfinding and special event plans**

Priority Locations

The project team evaluated 27 potential VMS locations. This list included existing portable CMS locations and other potential VMS locations identified by stakeholders.

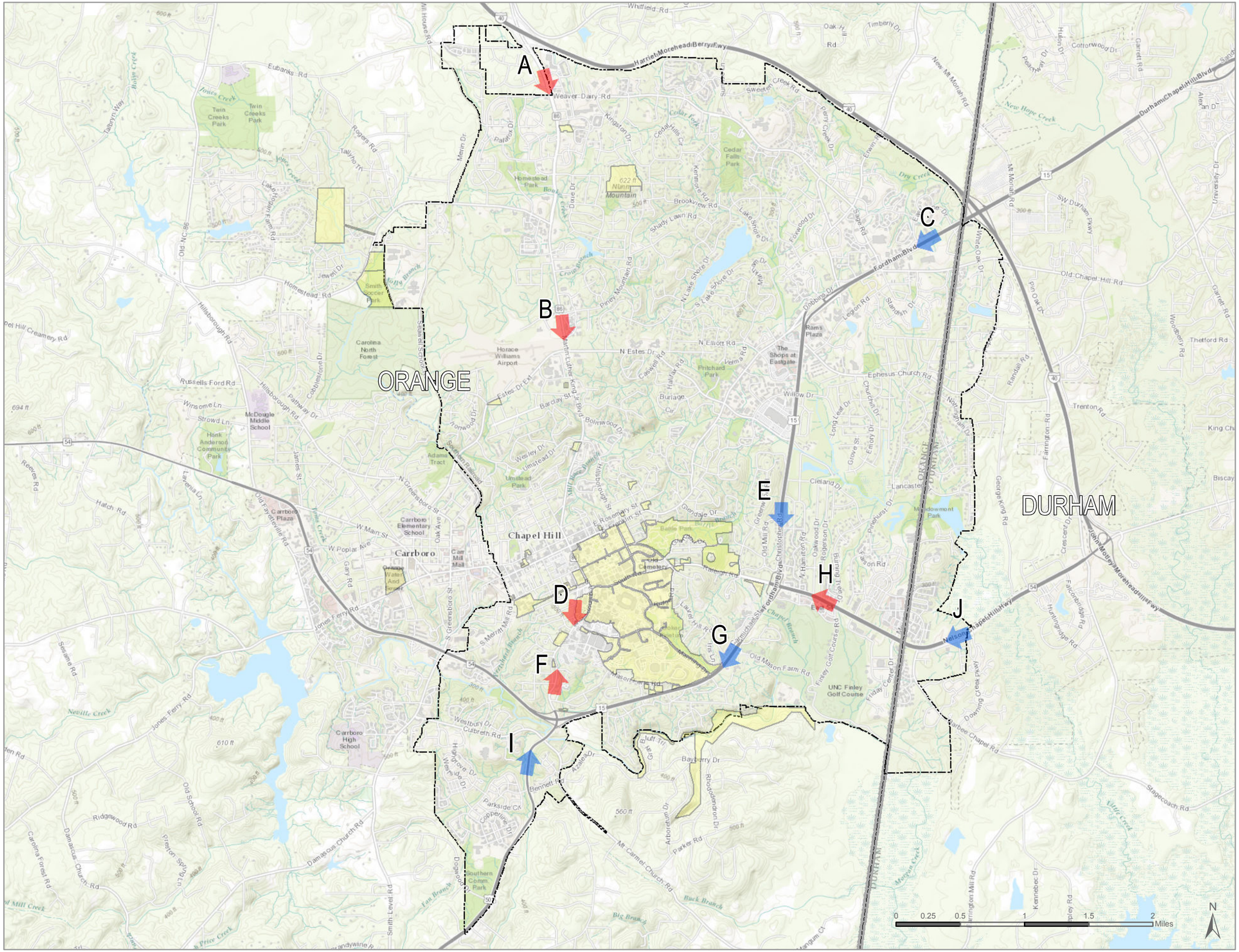
From this list the project team selected ten priority locations, which can be found in **Figure 1** on the following page. Selection of these locations was framed by the following criteria:

- Is this location a pertinent decision point for locals and visitors?
- Is there currently a portable message sign used at this location?
- Was this location identified and vetted by stakeholders as beneficial for traffic management?
- Does this location benefit from dynamic information?

Figure 1: Priority VMS Locations

Chapel Hill

Variable Message Sign Project



- VMS Approach (Medium Sign)
- VMS Approach (Small Sign)
- UNC Chapel Hill Campus
- Chapel Hill Municipal Limits
- County Boundaries

October 2016

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Design Standards and Guidelines

There are a few of governing agencies and industry standards that regulate where, what, and how information should be disseminated to drivers. The Manual on Uniform Traffic Control Devices (MUTCD) is a national standard published by the Federal Highway Administration (FHWA) for governing all traffic control devices. There are sign, text, font, and color standards for use in varying instances and conditions. Additionally, for signs within the North Carolina Department of Transportation (NCDOT) right-of-way, there are NCDOT VMS regulations to follow.

Current MUTCD and NCDOT publications tend to be targeted at VMS installed on high-speed freeways. Given that the intended use of the VMS in Chapel Hill is on lower-speed arterials where they can be integrated with the surrounding environment, the project team approached the MUTCD advisors and NCDOT representatives to seek further clarification and guidance. The following feedback was received.

MUTCD

The MUTCD standard for conventional road guide signs is to allow the names of places and streets to use a combination of uppercase and lowercase letters. This practice improves the legibility of the words and allows motorists to recognize them more quickly. The current MUTCD standards for VMS calls for all uppercase letters, except when the VMS can accurately display a representation of another type of roadway sign (such as a guide sign) as specified in the MUTCD. In addition, the MUTCD has standards for letter heights that distinguish between only two different use cases: locations with speeds greater than 45 mph, and locations with speeds less than 45 mph.

Since many of the VMS in Chapel Hill will be used in a wayfinding and guide sign manner and on roads with speeds well below freeway speeds, further input was solicited from the National Committee on Uniform Traffic Control Devices (NCUTCD, or National Committee). The National Committee is an organization of transportation professionals that assists FHWA with the development of standards, guidelines, and warrants for the MUTCD. Informal discussions with the National Committee revealed support for using the guide sign regulations to govern the use of the signs when wayfinding drivers to parking and events. These regulations allow for the use of a text size that is smaller than traditional VMS incident management messages. When using the VMS as a guide sign, a green sign background must be used to mimic static guide signs. When the VMS are used for incident management, the traditional black background and larger font size would be required. The ability to use the signs in both manners necessitates that the sign be full matrix and full color.

NCDOT

Current NCDOT VMS regulations state that ALL messages (regardless of purpose) on a VMS shall be displayed in all uppercase letters. Given that the mix of uppercase and lowercase letters improves reading comprehension, the project team is pursuing an exception from NCDOT to allow a mix of uppercase and lowercase letters for guide sign messages. Initial discussions with NCDOT suggest that seeking an exception to have these signs evaluated as wayfinding or guide signs would be a straightforward process. It is recommended that Kimley-Horn assist the Town in pursuing an exception to allow for the deployment of messages containing lowercase letters.

Stakeholder Concept

In keeping with the guidelines provided by governing agencies and publications, the project team moved forward with the VMS design concepts. Two sign sizes that align with NCDOT and MUTCD standards were selected by stakeholders:

- Medium size signs will be used for 45 mph approaches. These signs are approximately 5½ ft. by 11 ft. and have a viewing range of 600 ft.
- Small signs will be used for 35 and 25 mph approaches. These signs are approximately 4½ ft. by 10 ft. and have a viewing range of 450 ft.

The ten priority locations are shown categorized by size in **Figure 1** on page 4.

The primary sign structure selected by stakeholders is a centered single-post "butterfly" mount on the roadway shoulder. In some cases, the sign can be offset from the center of the pole as needed in a cantilevered configuration. The structure material and color are typically a galvanized steel, however, having the structure powder-coated is also common. Stakeholders have stated that their preference will be either a powder-coated black or green material.

The pole diameter for each sign size is expected to be approximately 20 inches. This diameter is subject to change based on the final weight and wind load of the signs. The bottom of the sign will be 8 ft. above the roadway. The design team is striving to locate the signs in a manner that guardrail will not be required at any of the locations, but each site will be confirmed based on safety guidelines during the detailed design. Guardrail requirements for specific locations will be determined during the detailed design phase.

UNC campus agencies indicated a strong preference to have decorative panels around the VMS. The design of such panels is not within the scope of this project; however, the project team will design the structure to accommodate up to an additional 12-inch panel around the outside of the VMS. The additional weight and wind load created by this panel will be calculated in the design of the foundation and pole structure. These panels can easily be added post-installation so as not to delay the design and construction of the signs.

It is recommended that the Town install full-matrix, full-color VMS for maximum flexibility regarding the message types that can be displayed. In addition to text messages, this will give the Town the ability to replicate MUTCD approved signage include multiple background and text colors along with symbols and arrows. A thorough review of the messages used on the portable message signs was conducted in determining the sign sizes recommended for the permanent installations. With the feedback from the National Committee and NCDOT regarding the dual-purpose use of the VMS for both special event wayfinding and incident management, there is a minimum of four text display options.

The images below provide a visual representation of how messages can be displayed for each of the sign uses and how they will fit on each of the different sign sizes and uses. The MUTCD requires the use of a green background when the sign is providing a wayfinding or guide sign message (i.e. parking and/or special event messages). Alternately, a black background is required when the sign is providing incident management messages. The use of the signs for wayfinding or guide signs permits use of smaller text than is allowed for incident management messages. For example, on a 45 mph

road, an incident management sign would be required to use a text height of 16” whereas a guide sign is permitted to use text height of 12”.

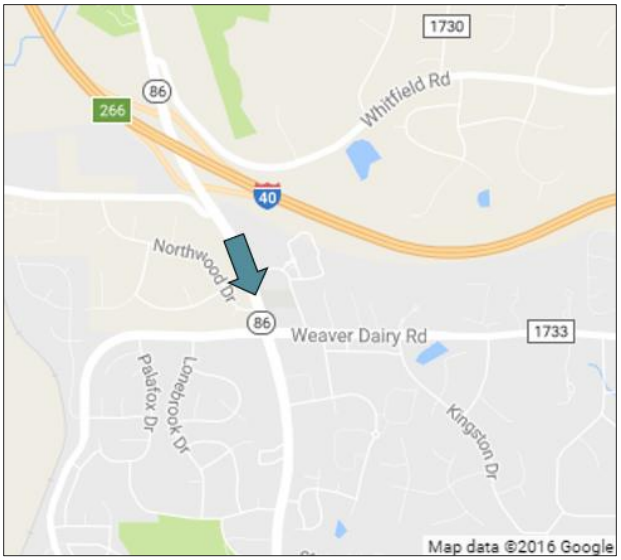
Medium Size Sign with Wayfinding/Guide and Incident Management Messages

Small Size Sign with Wayfinding/Guide and Incident Management Messages

Concept Renderings

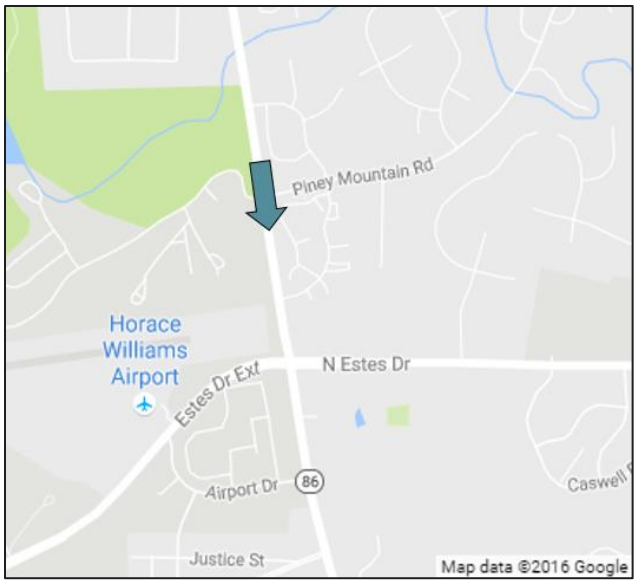
This section contains high level descriptions and concept renderings for each priority VMS location. Full page renderings can be found in the **Appendix**.

Note: The sign locations shown in these renderings are approximate. Exact locations will be determined during the detailed design phase of the project. The structures shown in the renderings are also concepts only, and are not intended to portray exact dimensions.



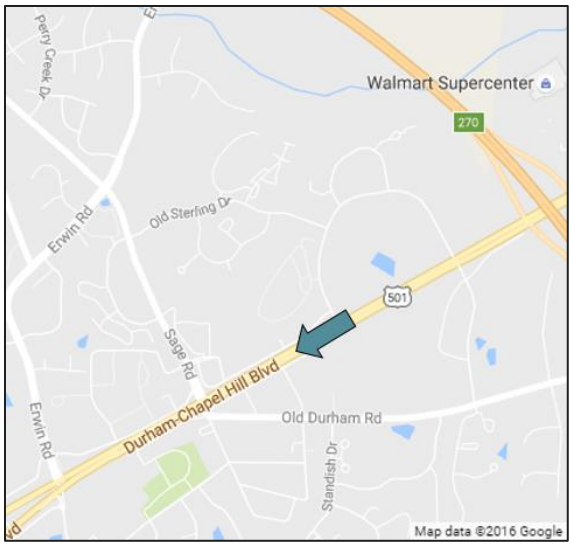
Location A: NC 86 (Martin Luther King Jr. Blvd) approaching Weaver Dairy Road	
Purpose and Need	This is a major decision point for travelers diverted from I-40 in the event of an incident.
Event Use	A sign at this approach could direct travelers to turn left onto Weaver Dairy Road to return to I-40 in the event of an incident that diverted them from I-40.
Daily Use	Provide information about special events, congestion, or alternate routes.
Target Traffic	Ingress traffic from I-40 and north of Chapel Hill
Sign Size	Approximately 4½ ft. by 10 ft. (mounted 8ft above roadway)

Location A: Concept Renderings

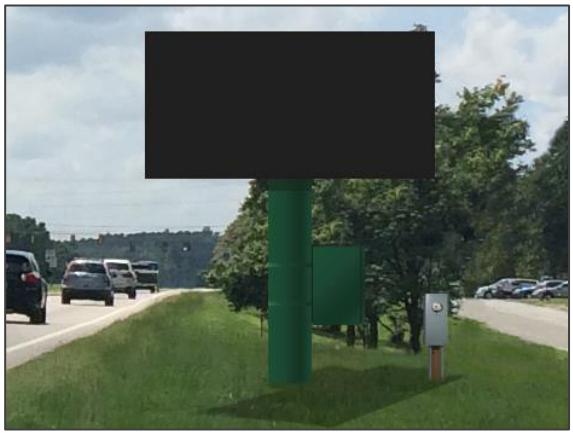


Location B: NC 86 (Martin Luther King Jr. Boulevard) approaching N. Estes Drive	
Purpose and Need	This is a major entrance to the downtown and campus areas of Chapel Hill.
Event Use	A sign at this approach could provide information to travelers entering Chapel Hill from the north.
Daily Use	Provide information about special events, congestion, or alternate routes.
Target Traffic	Ingress traffic from I-40 and north of Chapel Hill
Sign Size	Approximately 4½ ft. by 10 ft. (mounted 8ft above roadway)

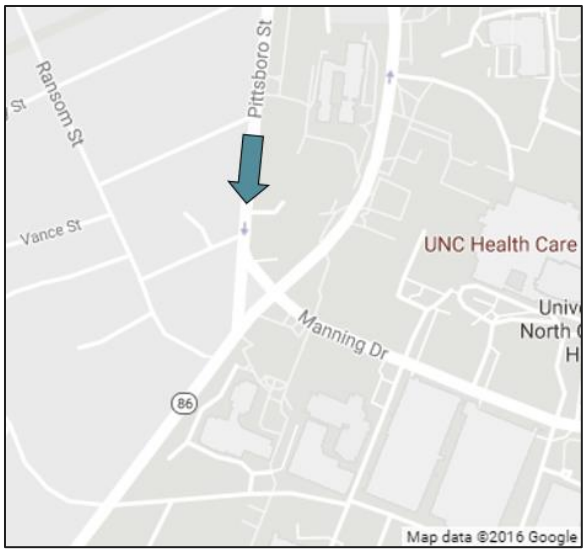
Location B: Concept Renderings



Location C: US 15-501 approaching Franklin Street	
Purpose and Need	This is a major decision point and entrance to campus. VMS could provide information about the best route into campus, parking availability, and/or street closures.
Event Use	A sign at this approach could provide information about the best route into campus, parking availability, and/or street closures. It could also direct travelers to turn right onto Sage Road to return to I-40 in the event of an incident that diverted them from I-40.
Daily Use	Provide information about congestion or alternate routes.
Target Traffic	Ingress traffic from I-40 and north/east of Chapel Hill
Sign Size	Approximately 5½ ft. by 11 ft. (mounted 8ft above roadway)

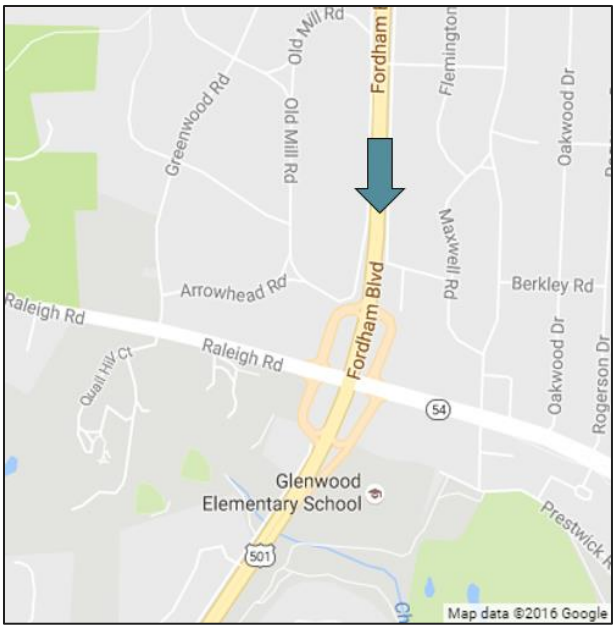


Location C: Concept Renderings

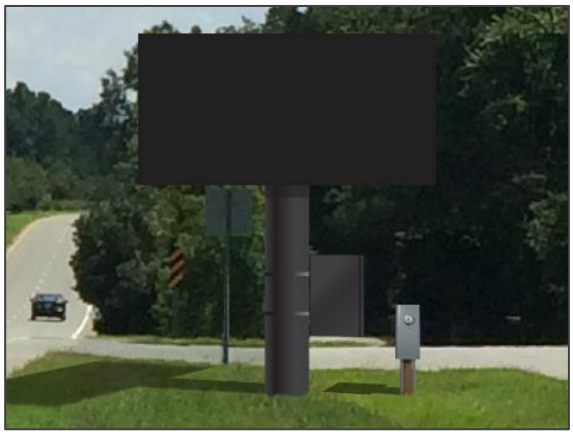


Location D: Pittsboro Street approaching Manning Drive/South Columbia Street	
Purpose and Need	This is a major decision point and entrance to campus. There is currently a portable CMS used at this location and stakeholders identified it as a location in need of dynamic capability. VMS could provide information about parking availability, wayfinding to the hospital and parking facilities, and/or street closures for campus events.
Event Use	A sign at this approach could provide information about parking availability and/or street closures for campus events.
Daily Use	Provide information about congestion or alternate routes.
Target Traffic	All ingress traffic
Sign Size	Approximately 4½ ft. by 10 ft. (mounted 8ft above roadway)

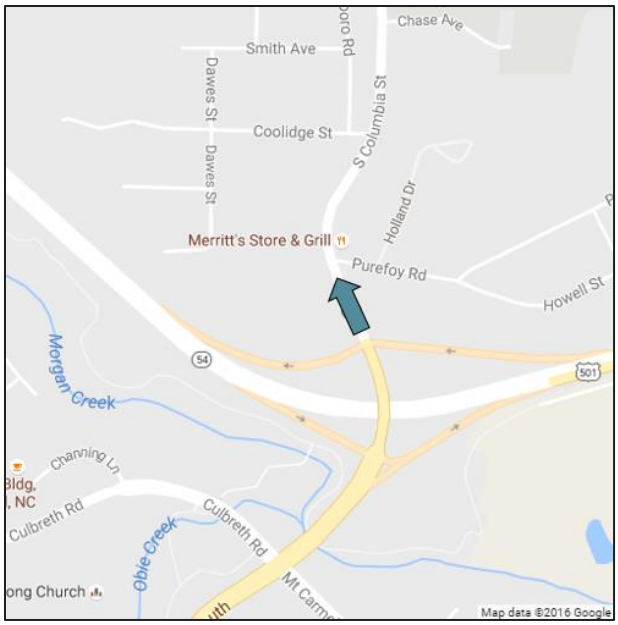
Location D: Concept Renderings



Location E: US 15-501 approaching NC 54/Raleigh Road	
Purpose and Need	This is a major decision point and entrance to campus. There is currently a portable CMS used at this location. VMS could provide information about parking availability and/or street closures.
Event Use	A sign at this approach could provide information about parking availability and/or street closures.
Daily Use	Provide information about congestion or alternate routes.
Target Traffic	Ingress traffic from I-40 and north of Chapel Hill
Sign Size	Approximately 5½ ft. by 11 ft. (mounted 8ft above roadway)

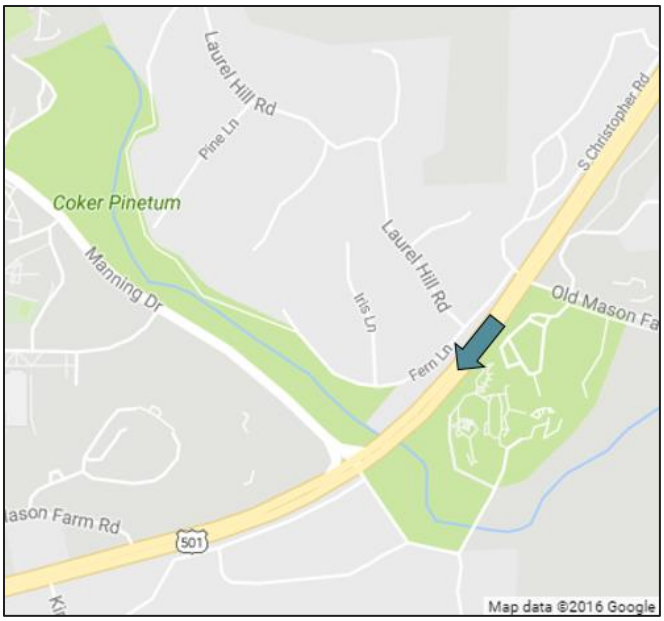


Location E: Concept Renderings



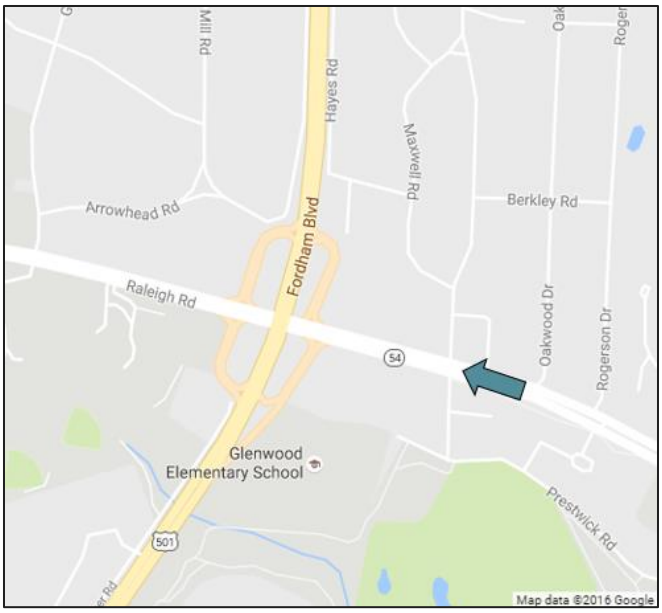
Location F: South Columbia Street after US 15-501/NC 54	
Purpose and Need	This is a major decision point and entrance to campus. This was identified by stakeholders as a location in need of dynamic messaging capabilities. VMS on South Columbia Street (where a portable CMS is being used) could provide parking information for campus events.
Event Use	A sign at this approach could provide information about parking availability and/or street closures.
Daily Use	Provide information about congestion or alternate routes.
Target Traffic	Ingress traffic from I-40 and east of Chapel Hill
Sign Size	Approximately 4½ ft. by 10 ft. (mounted 8ft above roadway)

Location F: Concept Renderings



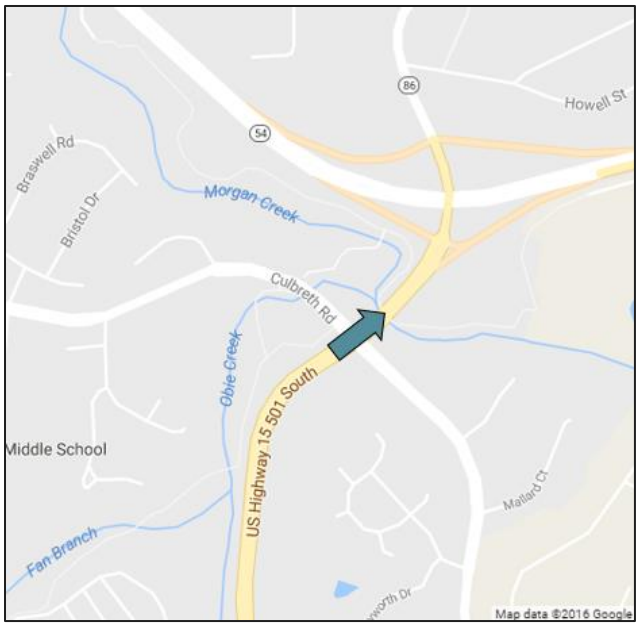
Location G: US 15-501 approaching Manning Drive	
Purpose and Need	This is a major decision point and entrance to campus. There is currently a portable CMS used at this location and stakeholders identified it as a location in need of dynamic capability. VMS could provide information about parking availability and/or street closures.
Event Use	Provide information about parking availability and/or street closures.
Daily Use	Provide information about congestion or alternate routes.
Target Traffic	Ingress traffic from I-40 and east of Chapel Hill
Sign Size	Approximately 5½ ft. by 11 ft. (mounted 8ft above roadway)

Location G: Concept Renderings

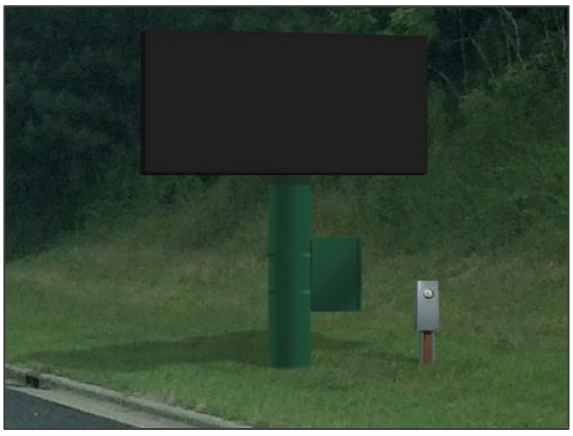


Location H: Raleigh Road approaching US 15-501/NC 54	
Purpose and Need	This is a major decision point and entrance to campus. There is currently a portable CMS used at this location. VMS could provide information about street closures and/or parking information for campus events.
Event Use	A sign at this approach could provide parking information for campus events.
Daily Use	Provide information about congestion or alternate routes.
Target Traffic	All ingress traffic
Sign Size	Approximately 4½ ft. by 10 ft. (mounted 8ft above roadway)

Location H: Concept Renderings



Location I: US 15-501 approaching NC 54/South Columbia Street	
Purpose and Need	This is a major decision point and entrance to campus. This was identified by stakeholders as a location in need of dynamic messaging capabilities. VMS could provide information about parking availability and/or street closures.
Event Use	A sign at this approach could provide information about parking availability and/or street closures.
Daily Use	Provide information about congestion or alternate routes.
Target Traffic	Ingress traffic from south of Chapel Hill
Sign Size	Approximately 5½ ft. by 11 ft. (mounted 8ft above roadway)



Location I: Concept Renderings

Location J: NC 54 approaching Friday Center Drive	
Purpose and Need	This is a major decision point and entrance to the park-n-ride lot. There is currently a portable CMS used at this location and stakeholders identified it as a location in need of dynamic capability. VMS could provide information about the park-n-ride lot. Unless there is automation in determining parking availability, static signing may be sufficient at this location. However, this location could also inform motorists of the best route into campus.
Event Use	A sign at this approach could provide information about the park-n-ride lot. Unless there is automation in determining parking availability, static signing may be sufficient at this location. However, this location could also inform motorists of the best route into campus.
Daily Use	Provide information about congestion or alternate routes.
Target Traffic	Park-n-Ride traffic and ingress traffic from I-40 and east of Chapel Hill
Sign Size	Approximately 5½ ft. by 11 ft.

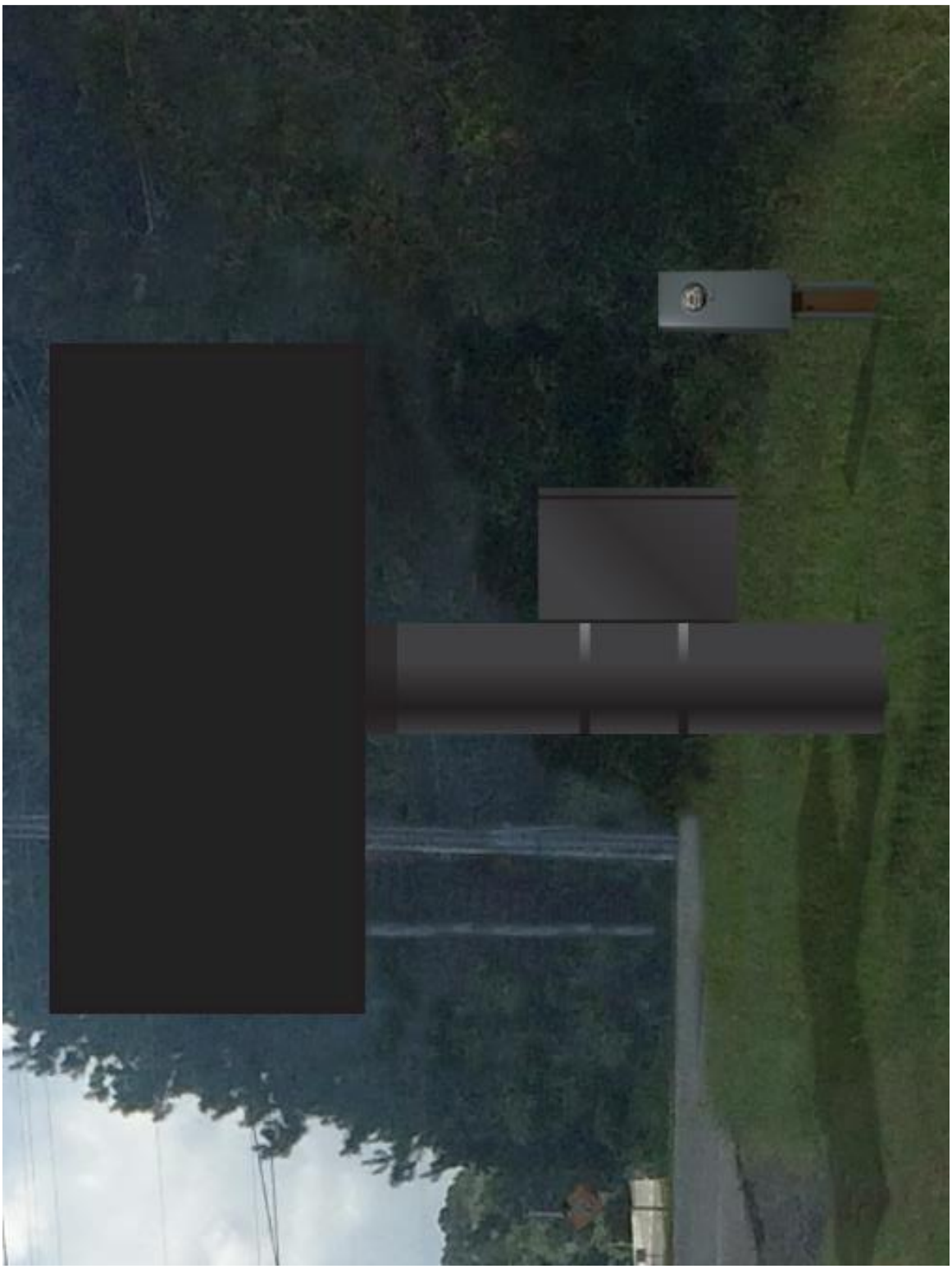
Location J: Concept Renderings

Next Steps

The purpose of this technical memorandum is to document the decisions made by the stakeholder committee and the VMS design recommendations for moving forward. We anticipate that each stakeholder will share this memorandum with their respective agency leaders to reach a consensus that the project is moving forward with recommendations that meet all expectations. If these expectations are not being met, the concerns will be addressed by the stakeholder committee and necessary modifications will be made by Kimley-Horn as they start the detailed design and preparation of engineering plans and specifications.

Appendix

Location A: Approach Rendering

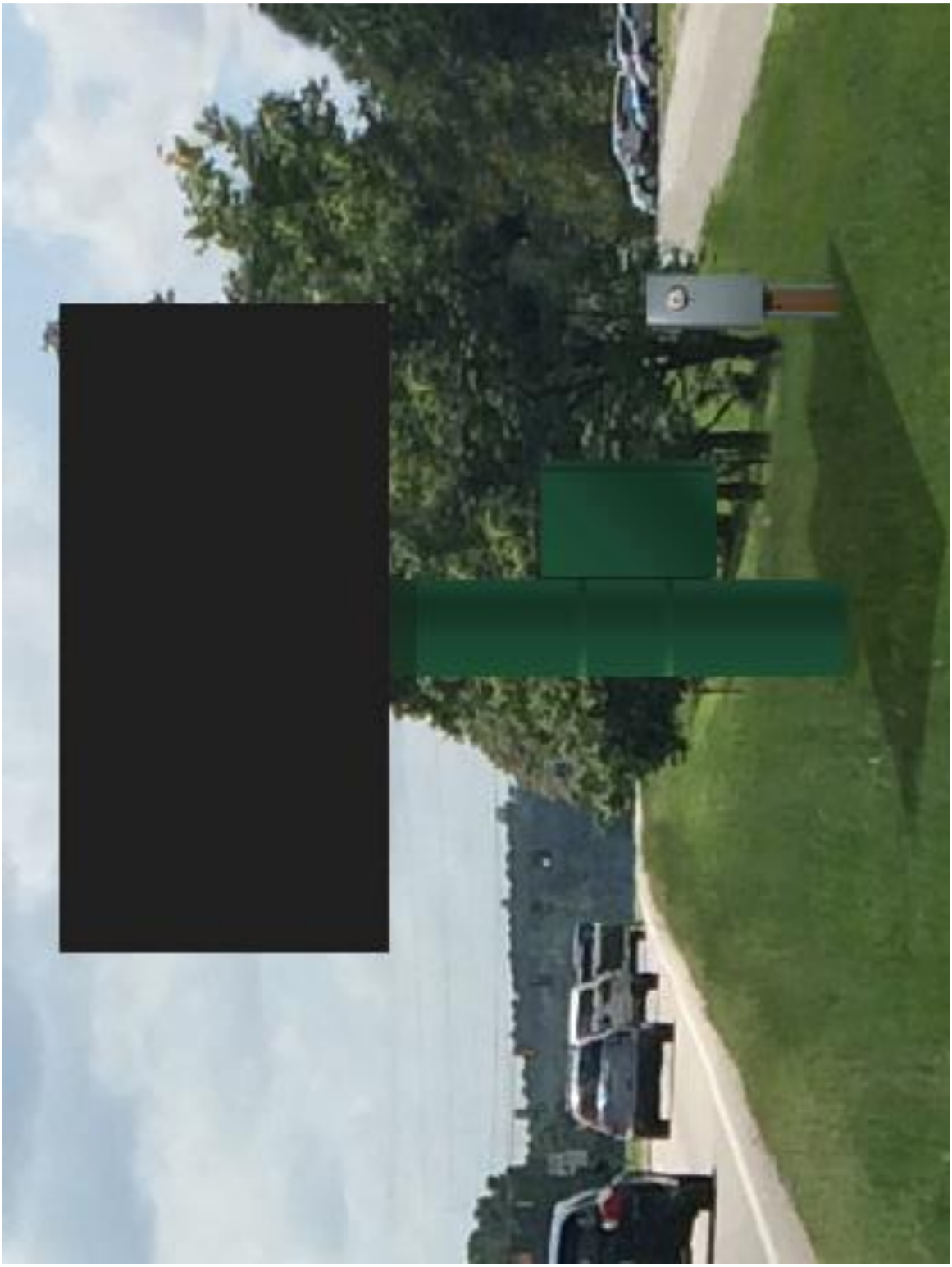


Location A: Sign Rendering

Location B: Approach Rendering

Location B: Sign Rendering

Location C: Approach Rendering

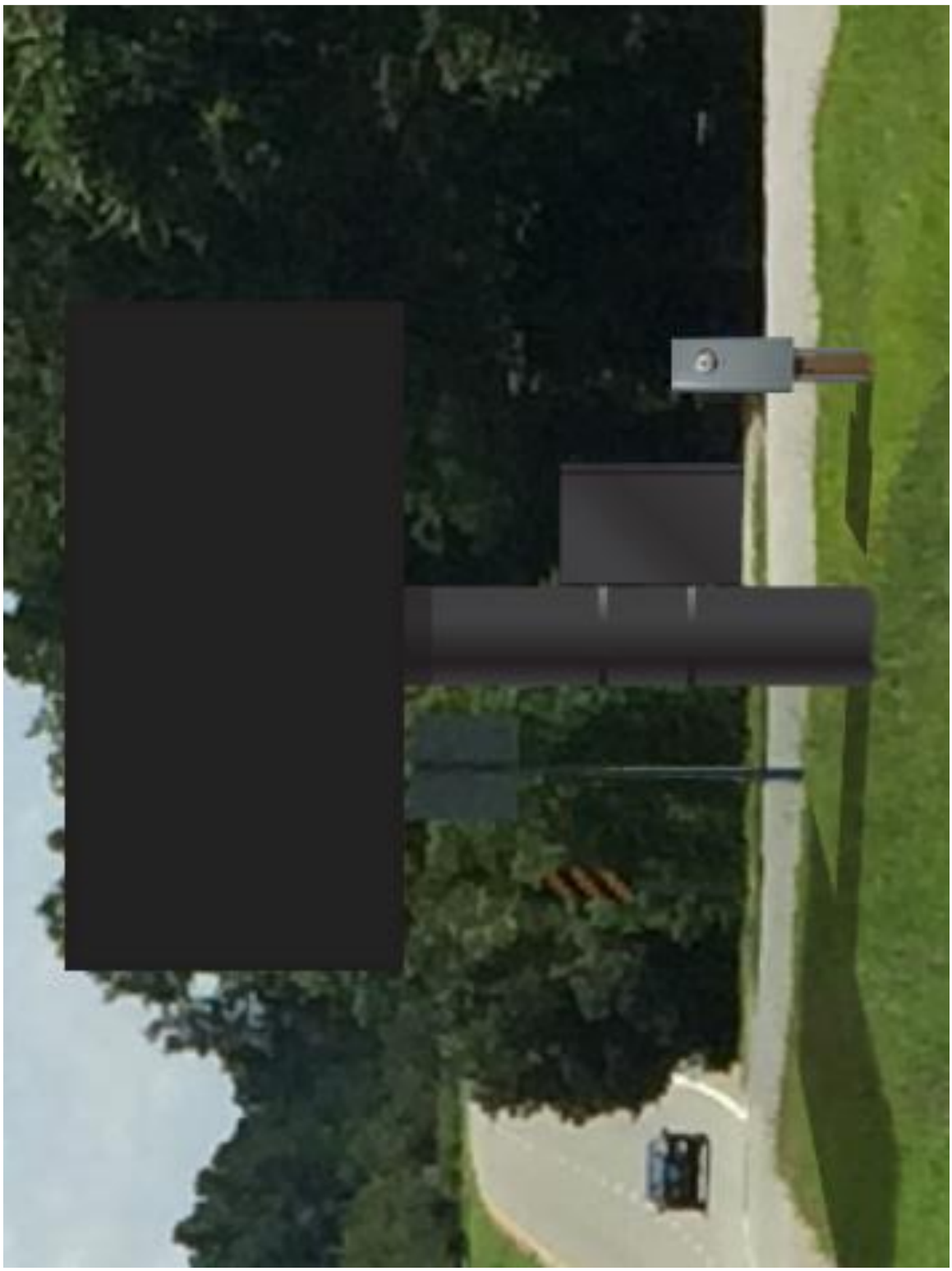


Location C: Sign Rendering

Location D: Approach Rendering

Location D: Sign Rendering

Location E: Approach Rendering

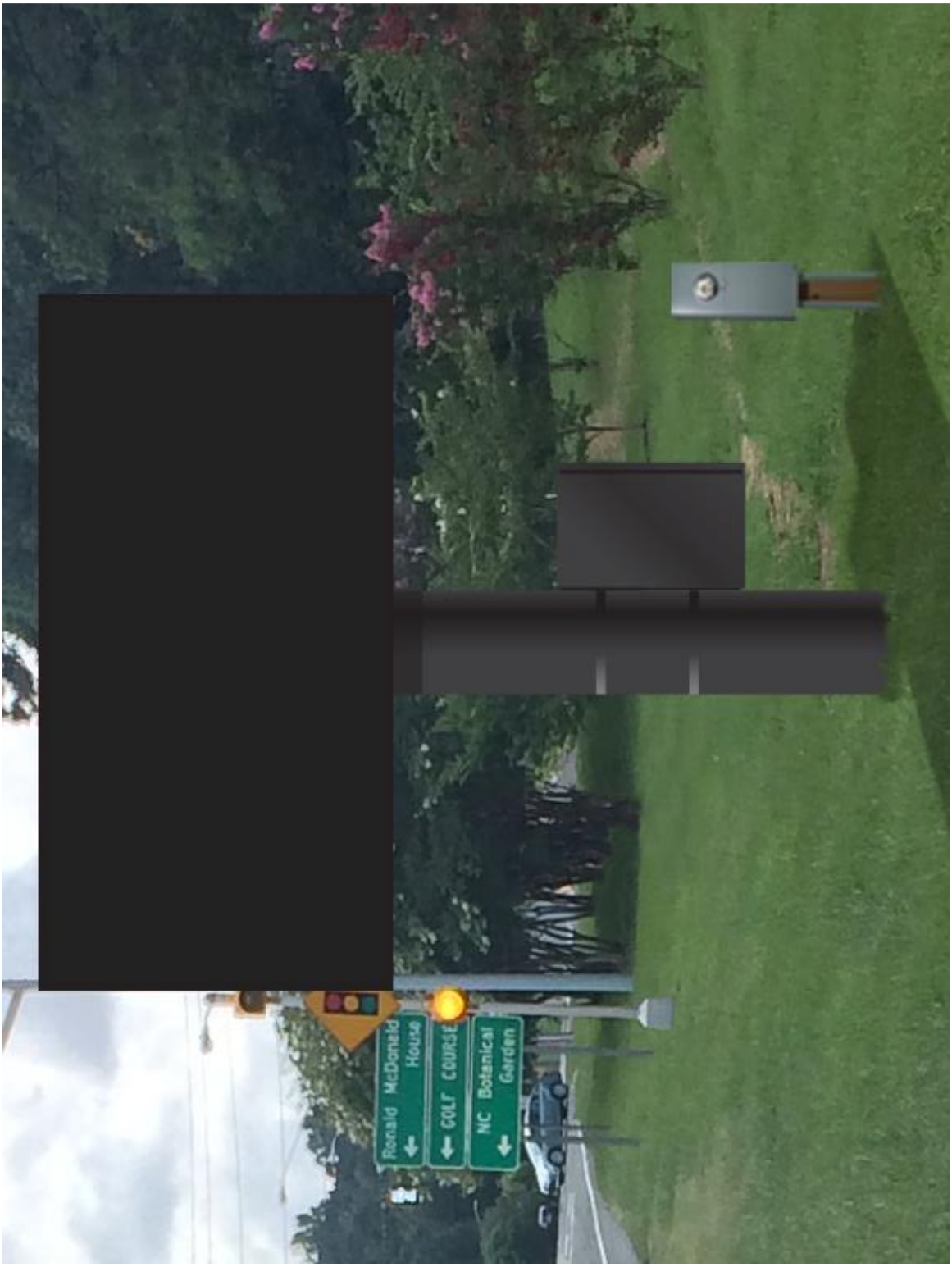


Location E: Sign Rendering

Location F: Approach Rendering

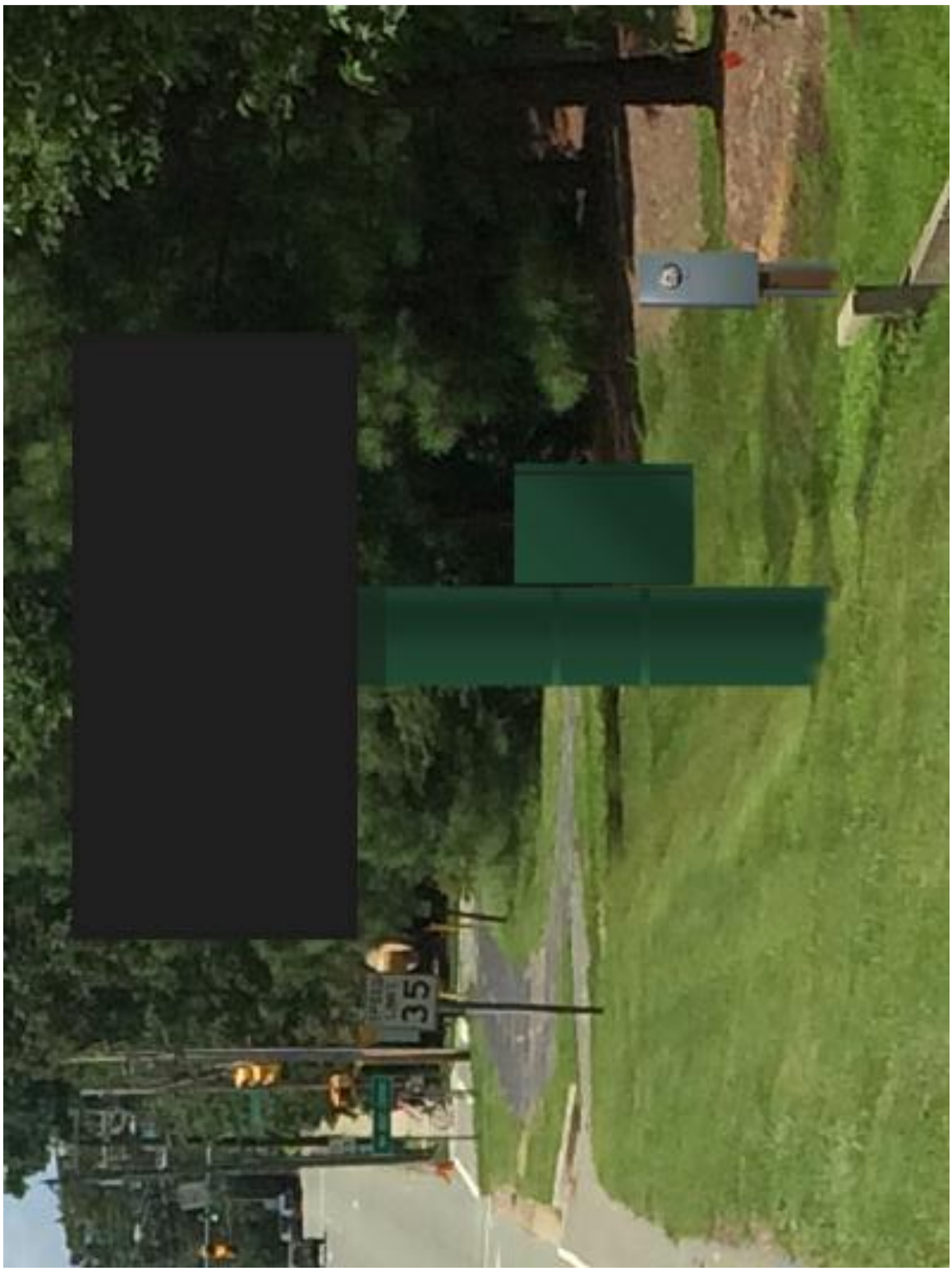
Location F: Sign Rendering

Location G: Approach Rendering



Location G: Sign Rendering

Location H: Approach Rendering

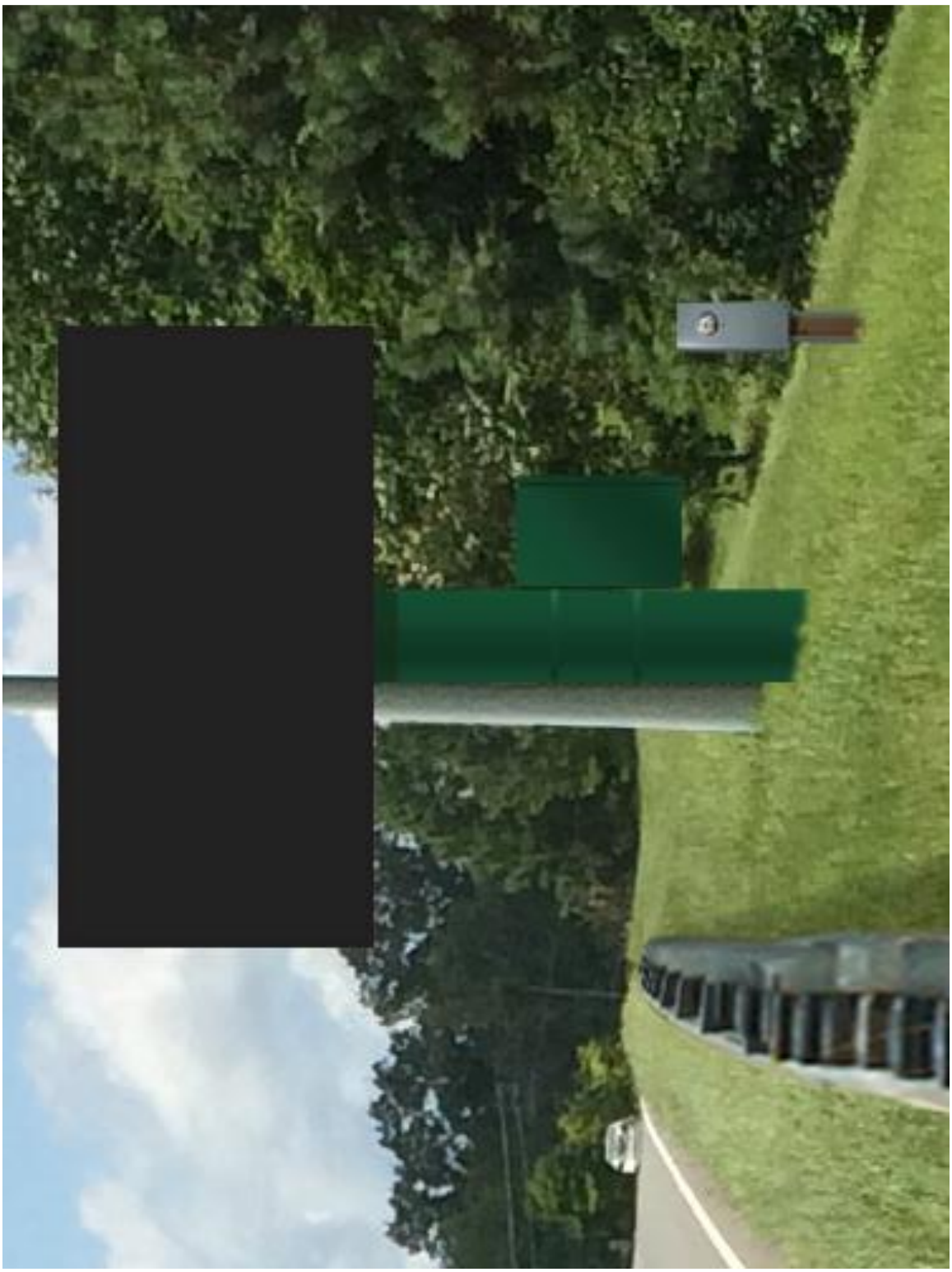


Location H: Sign Rendering

Location I: Approach Rendering

Location I: Sign Rendering

Location J: Approach Rendering



Location J: Sign Rendering