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Traffic Operations Technical Memorandum

South Elden Street Corridor Plan

Existing and No Build Condition

Town of Herndon

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1. Introduction

To prepare for planned land use changes in the South Elden Street corridor, the Town of Herndon evaluated the corridor's current and projected transportation needs. This transportation study will identify and assess ways to include multi-modal design aspects that facilitates a more efficient use of existing right-of-way.

As part of these efforts, existing and future traffic conditions along South Elden Street corridor were evaluated. Current traffic condition was assessed using existing geometry, lane configuration and field collected vehicular traffic and pedestrian data at four intersections along the corridor between Herndon Parkway and Sterling Road. Future traffic volumes were then projected for year 2040 and were an input to the future analysis under the no build condition.

2. Roadway Network System

For traffic analysis purposes, the study corridor was defined as South Elden Street between Herndon Parkway to the south and Sterling Road to the north. The study intersections within the corridor are as follows:

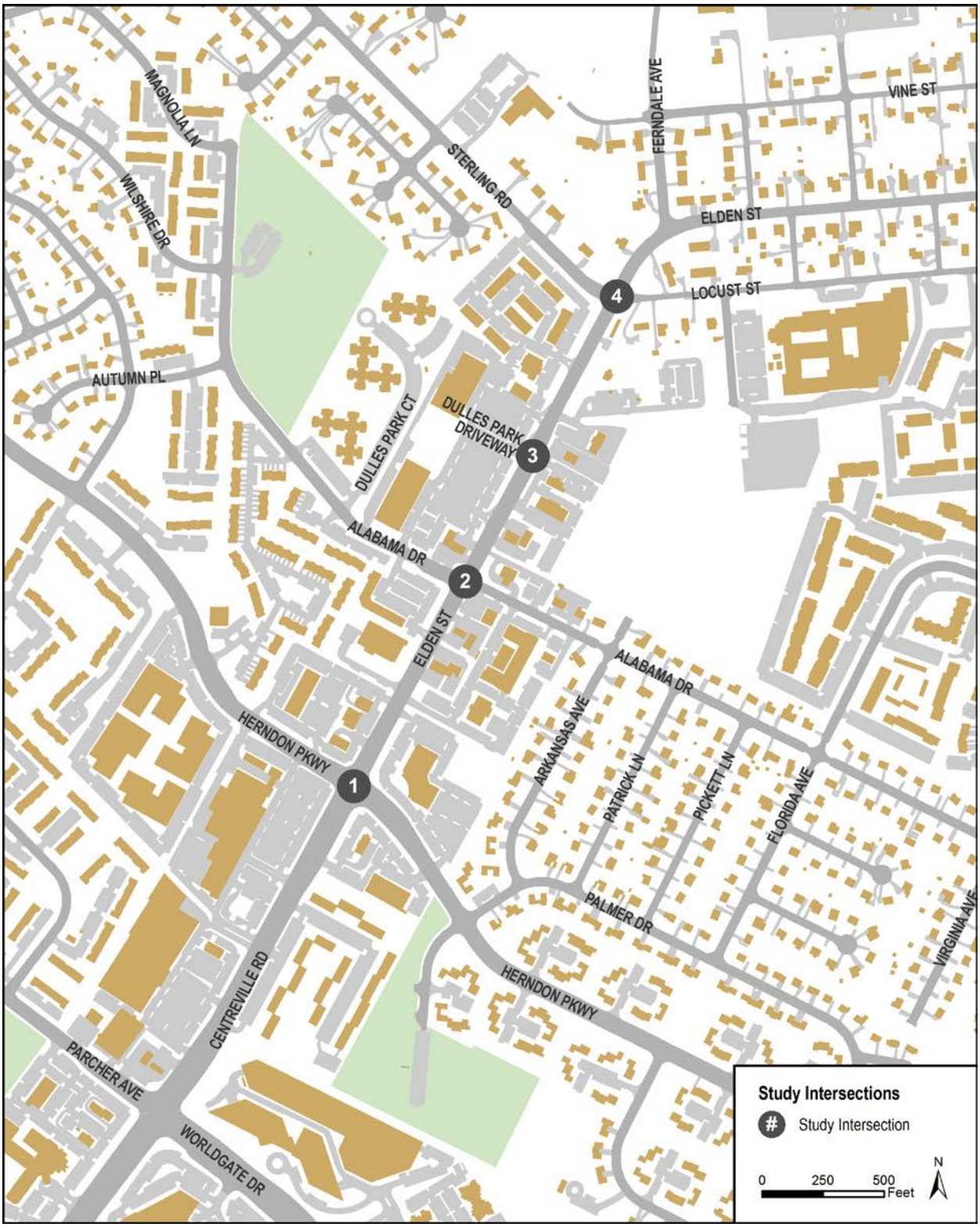
1. Herndon Parkway (Signalized)
2. Alabama Drive (Signalized)
3. Dulles Park Shopping Center (Stop-controlled)
4. Sterling Road/Locust Street (Signalized)

A schematic of the intersections is provided on **Figure 1.** A brief description of the studied roadways is provided below.

- **South Elden Street** is a minor arterial that traverses historic Herndon Downtown area between Dulles Access Road and Fairfax County Parkway. Within the study limits, South Elden Street runs in the north-south direction with two continuous through lanes on each direction. Sidewalk is provided along both directions of travel and on-street parking is restricted. At major intersections, Elden Street widens to accommodate for left and right turn pockets, and two-way left-turn lane exists in the middle to provide turn access at mid-block driveways. The land use varies along the corridor, but is generally a mix of residential and retail. Traffic signals are present at multiple major intersections along the corridor, and driveway approaches are mostly stop-controlled.
- **Herndon Parkway** is a minor arterial making a loop around Town of Herndon. Herndon Parkway intersects Elden Street at two locations. The signalized intersection of Herndon Parkway and Elden Street north of Dulles Access Road is the southern end of the study area for this report. The land use along Herndon Parkway at the vicinity of this intersection is comprised of retail with major surface parking lots at all four quadrants of the intersection. All movements at this intersection are signal-controlled, and crosswalks are provided at all four legs of the intersection.

- **Alabama Drive** is a single-lane local street running in east-west direction between Herndon Parkway and Van Buren Street. At the vicinity of the intersection with Elden Street, the west leg of Alabama Drive widens to provide two approaching lanes and a right turn pocket. On the east leg, the lane use changes to provide a dedicated left and a shared right and thru lane at the intersection. All movements are signal-controlled, and pedestrian access is provided through crosswalks at all four legs of the intersection.
- **Dulles Park Shopping Center** is located on the west side of the Elden Street and includes multiple driveways along Elden Street corridor that provide access to surface lots in front of the shopping center. The main entrance to the parking lot is a two-way driveway with single lane on each direction. There are left and right turn pockets on the Elden Street for the northbound and southbound vehicles to access the driveway, while the through movement on Elden Street is uninterrupted at this location. Both driveways on the west and east side of the Elden Street are included in the traffic analysis.
- **Sterling Road** is a minor arterial running in east-west direction from Rock Hill Road to the Elden Street. Sterling Road has two lanes on the eastbound direction and a single lane on the westbound direction for the most part of the roadway, but its cross section widens to provide two through lanes on each direction between Herndon Parkway and Rock Hill Road. The land use surrounding Sterling Road is generally comprised of single family houses. Sterling Road connects to Elden Street from west with a dedicated left, a through, and a right turn pocket.
- **Locust Street** is a local roadway running in east-west direction with one lane on each direction. The land use along Locust Street is a mixed of commercial and residential with single family houses on the north side and Herndon Middle School facility on the south side of the street. Locust Street meets Elden Street from east with a widen cross section that includes a dedicated left, and a shared through and right pocket lane. All movements at the intersection of Elden Street and Sterling Road/Locust Street are controlled by traffic signals and crosswalks are provided at all four legs.

Figure 1 Study Intersections



3. Traffic Data Collection

Turning movement traffic counts were collected at the study area intersections during the hours of 6:30-10:30 a.m. and 3:30-7:30 p.m. on Tuesday, October 10, 2017. These hours were selected as they generally encompass the peak morning and evening peak traffic hours. The collected data includes vehicle classification, and contains pedestrian and bicycle volumes as well. The traffic counts were collected at the following study intersections:

1. Herndon Parkway and Elden Street
2. Alabama Drive and Elden Street
3. Dulles Park Shopping Center and Elden Street
4. Sterling Road/Locust Street and Elden Street

Copies of traffic counts are included in **Appendix A**.

4. Existing Condition Traffic Analysis

To determine the traffic impacts of future land use changes, potential new developments and roadway design improvements, it is necessary first to establish a baseline of existing conditions. A review of Google maps, and Google aerial photos were used to determine the current lane configuration and traffic control scheme at the study area intersections. Except for the Dulles Park Shopping Center drive, all other study intersections are signalized. **Figure 2** presents a summary of the lane use and traffic control at study intersections.

Existing traffic signal timings were obtained from Town of Herndon Department of Traffic Control. System-wide peak hours of 8:30-9:30 a.m. and 5:00-6:00 p.m. were identified by comparing the individual intersection peak traffic hours. The system-wide peak hour traffic volumes were then used for intersection capacity analysis. **Figure 3** shows the turning movement volumes for the morning and afternoon peak hours.

Intersection capacity analysis was performed using Synchro, based on the procedures and methodologies contained in the Highway Capacity Manual (HCM). Based on HCM methodology, levels of service (LOS) for roadway segments and intersections range from A to F, with the following brief descriptions of each level.

<u>Signalized Intersections</u>

The level of service criteria for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. Control delay includes intersection deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

- LOS A indicates traffic operations with very low average delay (less than 10 seconds per vehicle). Typically the volume-to-capacity ratio is low, progression is favorable or the cycle length is short. With favorable progression, most vehicles arrive during the green phase of the signal and do not stop.

- LOS B indicates operations with delay between 10 and 20 seconds per vehicle, and is generally assigned with low volume-to-capacity ratios, and either favorable progression or short cycle lengths. More vehicles stop than under LOS A.
- LOS C describes operations with delay between 20 and 35 seconds per vehicle. Typically progression is favorable or the cycle length is moderate. Individual cycle failures (not all queued vehicles are able to traverse the intersection during the cycle) may begin to appear. The number of vehicles stopping is significant, but many still pass through without stopping.
- LOS D indicates operations with delay between 35 and 55 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level generally indicates high volume-to-capacity ratios and either long cycle lengths or ineffective progression. Many vehicles stop and individual cycle failures are noticeable.
- LOS E describes operations with delay from 55 to 80 seconds per vehicle and volume-to-capacity less than 1.0. Generally volume-to-capacity is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.
- LOS F indicates operations with delay exceeding 80 seconds per vehicle or a volume-to-capacity greater than 1.0. This is generally assigned with very high volume-to-capacity ratios, poor progression, and long cycle length. During most cycles the vehicle queue does not clear.

Unsignalized Intersections

Level of service for intersections with two-way stop control is determined by control delay. The LOS is determined for each minor-street movement or shared movement, and for major-street left turns. LOS is not defined for the overall intersection or for major-street through vehicles, since those are assumed to experience no delay and would disproportionately skew the weighted average of all movements.

The thresholds of LOS criteria for unsignalized intersections differ from those for signalized intersections due to driver perceptions. The expectation is that a signalized intersection is designed to carry higher traffic volumes and experience greater delay than an unsignalized intersection. The unsignalized LOS descriptions are as follows:

- LOS A indicates traffic operations with delay of less than 10 seconds per vehicle. There is little conflicting traffic for the minor-street movements.
- LOS B indicates operations with delay between 10 and 15 seconds per vehicle.
- LOS C describes operations with delay between 15 and 25 seconds per vehicle.
- LOS D indicates operations with delay between 25 and 35 seconds per vehicle.
- LOS E describes operations with delay from 35 to 50 seconds per vehicle.
- LOS F describes operations with delay greater than 50 seconds per vehicles or volume-to-capacity ratio greater than 1.0.

Figure 2 Existing Lane Configuration at Study Intersections

Figure 3 Existing (2017) Traffic Volumes

As stated previously, intersection capacity analysis performed using Synchro and with system peak traffic volumes, existing lane configuration and existing traffic signal timings as input. The results of the existing condition analysis for the study area intersections are shown on **Table 1** in terms of both LOS and delay. For signalized intersections, the LOS and delay are reported for the overall intersection, while at unsignalized intersections the highest-delay approach is indicated.

Table 1 Existing Condition Synchro Results

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (seconds)	LOS	Delay (seconds)
Signalized Intersections				
Herndon Parkway / Elden Street	D	47.0	D	52.9
Alabama Drive / Elden Street	B	19.4	D	41.0
Sterling Road/Locust Street and Elden Street	D	52.5	D	39.9
Unsignalized Intersections (worst LOS/Delay approach shown)				
Dulles Park Shopping Center / Elden Street*	C	16.0	D	28.0

*Minor Street approach Delay and LOS are reported.

More detailed information, including LOS and delay for each individual approach, is provided on **Figure 4** for the AM peak hour and on **Figure 5** for the PM peak hour. Copies of the existing condition Synchro reports are included in **Appendix B**.

In general, within urban built-up areas, LOS D is considered acceptable. As **Table 1** shows, all of the study area intersections operate with overall LOS D or better during morning and evening peak hours under existing conditions. Synchro analysis results suggest that except for the stop-controlled approaches at Dulles Park Shopping Center, all intersections have individual approaches operating with LOS E during morning and/or evening peak hour.

In the AM peak hour, both northbound and southbound approaches on Elden Street at Herndon Parkway operate at LOS E, while both Herndon Parkway approaches operate at LOS C with approximate delays of 30.0 seconds, suggesting an imbalance of delay between north-south and east-west approaches. The higher delays on Elden Street could be associated to the coordinated system along Herndon Parkway that prevents more green time to be allocated to Elden Street approaches. At Sterling Road/Locust Street intersection, the heavy left turn demand on Sterling Road is the main contributing factor to the eastbound approach operating at LOS E and with 80.0 seconds of delay.

In the PM peak hour, the southbound approach on Elden Street operates at LOS E with 63.7 seconds of delay at Herndon Parkway. Comparing to the morning operation, delays are better balanced between all approaches at this intersection during evening peak hour. The second highest delays are experienced on Locust Street approach during evening peak hour where westbound approach operates at LOS E with 58.0 seconds of delay. Nonetheless, the overall delay experienced at this intersection during PM peak is lower than the AM peak hour.

Figure 4 Existing (2017) AM Peak Hour LOS and Delay

Figure 5 Existing (2017) PM Peak Hour LOS and Delay

5. Future No-Build Condition Traffic Analysis

Projected traffic volumes for year 2040, as well as existing lane configuration and traffic signal timings, were the inputs to the future no-build condition traffic analysis. Similar to existing condition, Synchro was used to perform the capacity analysis using HCM methodologies. Future traffic volumes were developed for year 2040 using Metropolitan Washington Council of Government's Round 9 Cooperative Forecast model. **Figure 6** show projected morning and evening traffic volumes at study intersections. Summary of the Synchro results are shown on **Table 2**. More detailed information, including LOS and delay for each individual approach, is provided on **Figure 7** for the AM peak hour and on **Figure 8** for the PM peak hour. Copies of the 2040 no-build Synchro reports are included in **Appendix C**.

Table 2 2040 No-Build Synchro Results

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (seconds)	LOS	Delay (seconds)
Signalized Intersections				
Herndon Parkway / Elden Street	D	48.9	F	81.8
Alabama Drive / Elden Street	C	21.1	E	63.9
Sterling Road/Locust Street and Elden Street	F	98.9	F	112.3
Unsignalized Intersections (worst LOS/Delay approach shown)				
Dulles Park Shopping Center / Elden Street*	F	85.0	E	52.3

*Minor Street approach Delay and LOS are reported.

As indicated in the analysis results, with existing lane use and traffic control assumed for the future year no-build analysis, all intersections are expected to operate with higher delays in 2040 comparing to the existing condition. The delay increase is more significant during PM peak hour.

The Dulles Shopping Center drive operation degrades to LOS F in the morning peak hour and LOS E in the evening peak hour, mainly due to significant increase of Elden Street traffic that makes driveway traffic incur more delays before they can find a gap on the main street traffic to make a turn.

Synchro result suggests that the signalized intersection of Sterling Road/Locust Street/Elden Street will operate unfavorably in 2040 at LOS F with overall intersection delay of about 100 seconds during both morning and evening peak hours. In AM peak hour, significant delay increase observed on the side street approaches with eastbound approach delay increased from 80.0 seconds to 185.5 seconds. In the evening peak hour, all approaches operate with LOS E or LOS F with overall intersection delay of 112.3 seconds.

At Alabama Drive intersection, the overall intersection level of service is changed to C from B in the morning peak hour, with the delay increase on side street approaches. The main street approach (Elden Street) continues to operate efficiently with LOS A and

LOS B on the northbound and southbound approaches, respectively, during the morning peak hour. Delay increases in the afternoon peak are more significant with westbound approach operation degraded to LOS F, and northbound approach operates at LOS E with 66 seconds of delay.

The Herndon Parkway/Elden Street continues to operate acceptably at LOS D with 50 seconds of delay in the morning peak hour with delays almost evenly balanced between all approaches. Similar to other intersections, the intersection operation during evening peak hour is expected to be unfavorable with overall intersection LOS degraded to F from D comparing 2040 with the existing condition.

The review of 2040 no-build traffic analysis results suggest that increased vehicular traffic demand due to the future growth is the main contributing factor for degrading level of service at all the study intersections. The significant delay increase observed for individual movements or approaches suggests a need for mitigations in form of traffic signal phasing and/or potential lane configuration or roadway improvements.

Figure 6 Future No-Build (2040) Traffic Volumes

Figure 7 Future No Build (2040) AM Peak Hour LOS and Delay

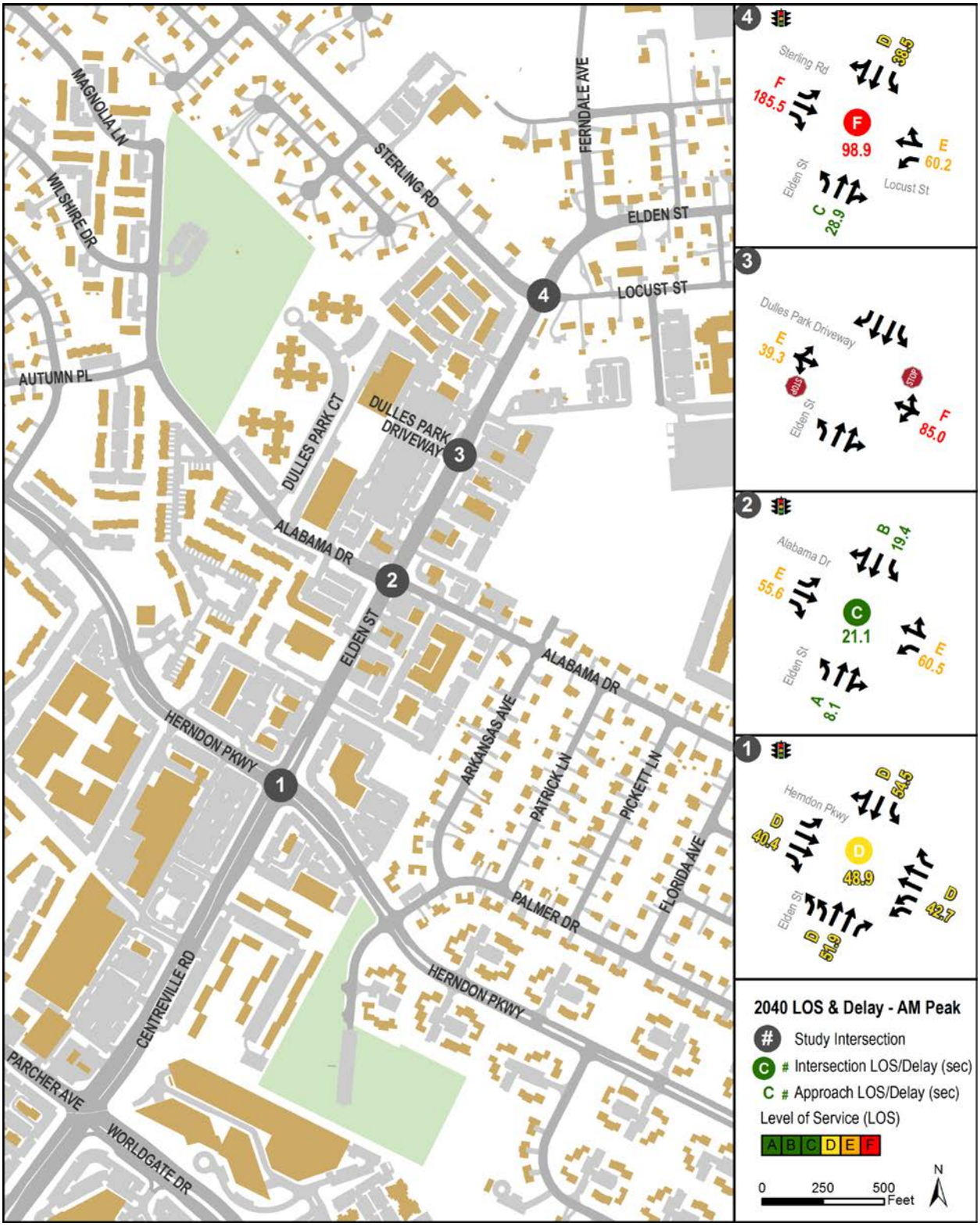


Figure 8 Future No Build (2040) PM Peak Hour LOS and Delay