Attachment 1

Route 606 Corridor Study

Route 606 Widening Project

Route 606 Corridor Management Plan

Spotsylvania, Virginia

Baker

April 24, 2015

Route 606 Corridor Management Plan
Spotsylvania County

April 24, 2015

Prepared for:
Virginia Department of Transportation

Prepared by:
MICHAEL BAKER JR., INC.

Table of Contents

Chapter 1 INTRODUCTION 1

1.1 STUDY PURPOSE 1

1.2 STUDY AREA 1

Chapter 2 EXISTING CONDITIONS 3

2.1 EXISTING LAND USE 3

2.2 EXISTING INFRASTRUCTURE 5

2.3 EXISTING ACCESS POINTS 5

2.4 EXISTING TRAFFIC VOLUMES 7

2.5 EXISTING TRAFFIC OPERATIONS 7

Chapter 3 FUTURE CONDITIONS 11

3.1 FUTURE LAND USE 11

3.2 FUTURE INFRASTRUCTURE 17

3.3 FUTURE TRAFFIC VOLUMES AND OPERATIONS 18

Chapter 4 ALTERNATIVES 19

4.1 INITIAL ALTERNATIVES 19

4.2 ALTERNATIVE 3 OPTIONS 22

Chapter 5 RECOMMENDATIONS 28

5.1 RECOMMENDED IMPROVEMENTS (PHASE 1) 28

5.2 TRAFFIC VOLUMES AND OPERATIONS FOR RECOMMENDED IMPROVEMENTS (PHASE 1) 30

5.3 POTENTIAL FUTURE IMPROVEMENTS (PHASE 2) 34

5.4 NEXT STEPS 34

List of Tables

TABLE 1: EXISTING LAND USE IN THE ROUTE 606 STUDY AREA 3
TABLE 2: MINIMUM SPACING STANDARDS FOR COMMERCIAL ENTRANCES, INTERSECTIONS, AND MEDIAN CROSSOVERS 5
TABLE 3: HISTORIC DAILY TWO-WAY TRAFFIC VOLUMES ON ROUTE 606 AND ROUTE 1 7
TABLE 4: ASSUMED DENSITIES FOR THE ROUTE 606 CORRIDOR 12
TABLE 5: ASSUMED DEVELOPMENT FOR ROUTE 606 12
TABLE 6: AVERAGE TRIP GENERATION RATES 13
TABLE 7: FUTURE TOTAL TRIPS BY ZONE 14
TABLE 8: SUMMARY OF OPTIONS FOR ROUTE 1 / ROUTE 606 INTERSECTION 23
TABLE 9: SUMMARY OF OPTIONS FOR MIDDLE INTERSECTION 25
TABLE 10: SUMMARY OF OPTIONS FOR DAN BELL LANE INTERSECTION 27

List of Figures

FIGURE 1: STUDY AREA 2
FIGURE 2: EXISTING LAND USE 4
FIGURE 3: ACCESS POINTS ALONG ROUTE 606 6
FIGURE 4: 2013 PEAK HOUR TRAFFIC VOLUMES 8
FIGURE 5: 2013 AM PEAK HOUR DELAY AND LEVEL OF SERVICE 9
FIGURE 6: 2013 PM PEAK HOUR DELAY AND LEVEL OF SERVICE 10
FIGURE 7: ASSUMED FUTURE LAND USE 15
FIGURE 8: ADDITIONAL FUTURE TRIP GENERATION BY ZONE 16
FIGURE 9: POTENTIAL IMPROVEMENTS AT I-95 INTERCHANGE (EXIT 118) 17
FIGURE 10: PROPOSED TACO BELL TURN LANE IMPROVEMENTS 18
FIGURE 11: ALTERNATIVE 1: FOUR-LANE UNDIVIDED ROAD 19
FIGURE 12: ALTERNATIVE 2: FOUR-LANE ROAD WITH CENTER TWO WAY LEFT TURN LANE 20
FIGURE 13: ALTERNATIVE 3: FOUR-LANE DIVIDED WITH RAISED MEDIAN 21
FIGURE 14: ROUTE 1 / ROUTE 606 INTERSECTION OPTIONS 22
FIGURE 15: MIDDLE INTERSECTION OPTIONS 24
FIGURE 16: DAN BELL LANE INTERSECTION OPTIONS 26
FIGURE 17: RECOMMENDED TYPICAL SECTION FOR ROUTE 606 28
FIGURE 18: RECOMMENDED IMPROVEMENTS (PHASE 1) 29
FIGURE 19: 2038 PEAK HOUR TRAFFIC VOLUMES WITH RECOMMENDED PHASE 1 IMPROVEMENTS 31
FIGURE 20: 2038 AM PEAK HOUR DELAY AND LEVEL OF SERVICE WITH RECOMMENDED PHASE 1 IMPROVEMENTS 32
FIGURE 21: 2038 PM PEAK HOUR DELAY AND LEVEL OF SERVICE WITH RECOMMENDED PHASE 1 IMPROVEMENTS 33
FIGURE 22: POTENTIAL FUTURE IMPROVEMENTS (PHASE 2) ROUTE 1 / ROUTE 606 INTERSECTION CONFIGURATION 34
FIGURE 23: POTENTIAL FUTURE IMPROVEMENTS (PHASE 2) ROUNDABOUT CONFIGURATION 34

CHAPTER 1 INTRODUCTION

1.1 STUDY PURPOSE

Route 606 between I-95 and Route 1 in Spotsylvania County is a two-lane road that is experiencing increased vehicle congestion particularly at the intersection with Route 1 and at the I-95 interchange. Currently there are many closely spaced commercial entrances along the east and west ends of this section of Route 606. Turn movements and volumes affect the mobility and safety of vehicles traveling along Route 606. Future development projects are expected to further increase this congestion and worsen traffic flow. The location of the corridor that includes an interchange with I-95, along with the construction of the Dominion Raceway, will serve as a catalyst for more development and thus more traffic along the corridor. Improvements to the I-95 Interchange at Route 606 including a bridge replacement with additional through lanes on Route 606 is planned. Improvements at the Route 606/Route 1 intersection are under construction to add capacity to the intersection. Studies for those projects show the need for additional improvements along Route 606 but there are no improvements planned between I-95 and Route 1. The Route 606 corridor between I-95 and Route 1 is at risk of becoming another location in which commercial access points along a roadway directly adjacent to an I-95 interchange can greatly impede travel through the area and in turn impact the I-95 mainline. There is a need to develop a plan to widen Route 606 between I-95 and Route 1 and develop an access management plan to preserve the capacity and efficiency of the corridor once widened.

The following initial goals have been established by VDOT for the corridor management plan for Route 606:

- Maintain and protect the efficiency of the corridor through appropriate access management.
- Promote the safety of the corridor.
- Protect and preserve natural and cultural resources (wetlands, streams, Resource Protection Areas (RPAs), open space and buffers, etc.).
- Preserve and/or enhance the comprehensive plan for the area.
- Preserve quality of life within the corridor.

1.2 STUDY AREA

The Route 606 Corridor Management Plan consists of an approximate 0.75 mile corridor section of Route 606 from the I-95 interchange to approximately 800' west of Route 1. The corridor width studied was a ¼ mile on either side of the Route 606 centerline. Route 606 is called Mudd Tavern Road east of Route 1 and Morris Road west of Route 1. Figure 1 shows the study area. Intersections of key concern within the study area include:

1. SB I-95 Ramps with Route 606
2. Route 1 / Route 606
3. Dan Bell Lane (private road – not VDOT maintained) / Route 606
4. Commercial entrances at multiple gas stations, McDonald's, mini storage facility, hotel, etc.
5. Commercial entrances to Food Lion Site on Route 606

SB I-95 Ramps / Route 606 Intersection

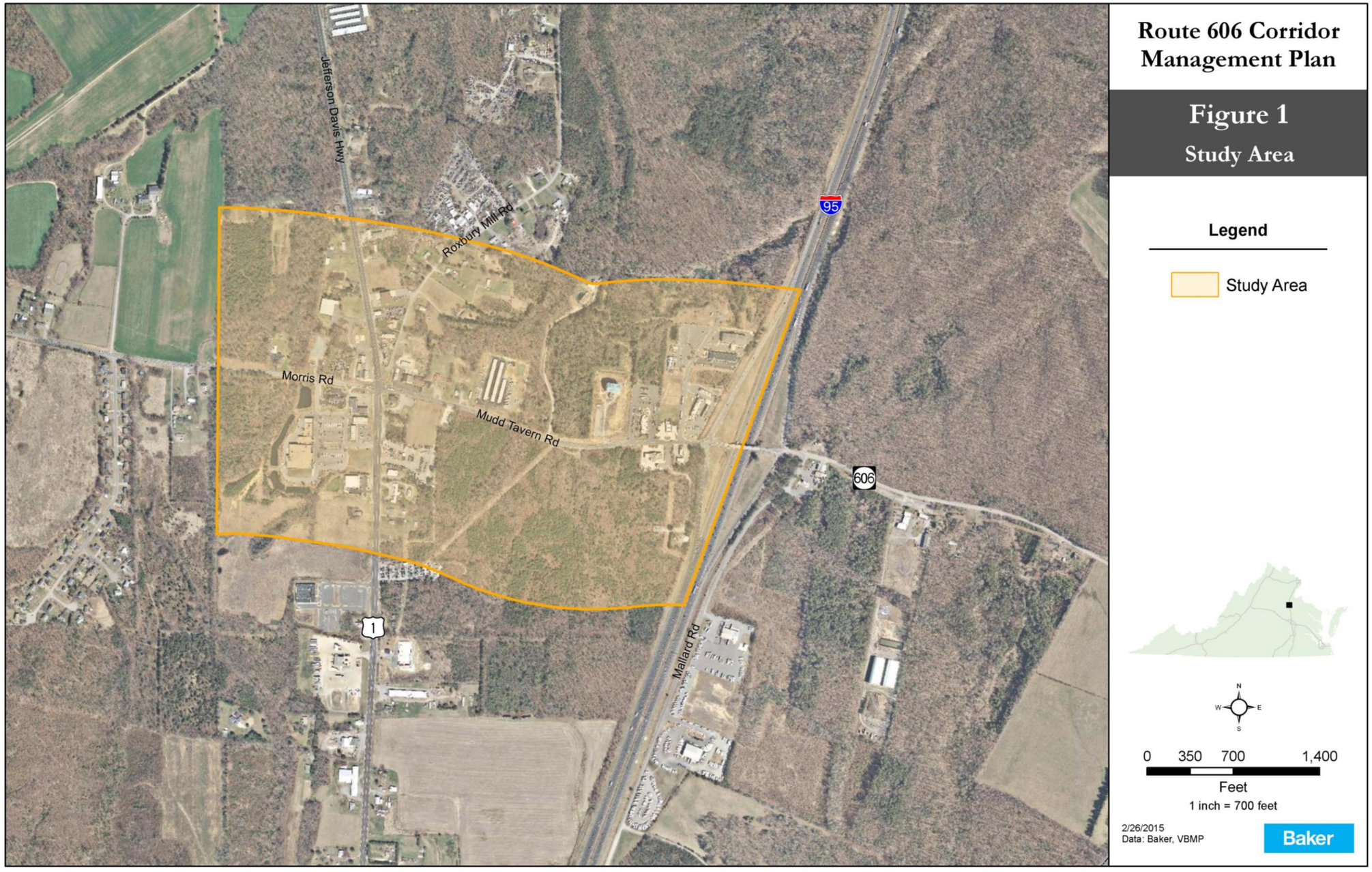
Route 1 / Route 606 Intersection

Dan Bell Lane / Route 606 Intersection

McDonald's Entrance

Food Lion Entrance

FIGURE 1: STUDY AREA



CHAPTER 2 EXISTING CONDITIONS

2.1 EXISTING LAND USE

The existing land use within the study area is almost entirely commercial, with the exception of one existing dwelling unit. There is no existing office or industrial use within the study area. Figure 2 shows the existing land uses along the corridor while Table 1 summarizes the square footage of land uses. Much of the existing commercial development is geared toward the needs of travelers on the Interstate 95 (I-95) corridor and varies from low to high turnover commercial uses. In the eastern area of the corridor, closest to I-95, land use primarily consists of fast food restaurants, gas stations, and hotels.

The land uses in the western part of the study area differ from the land uses in the eastern part of the study area as they are geared more towards community needs than for interstate travelers. The land use in the western area is low density commercial, and mostly consists of strip development. Businesses in this section of the corridor vary and include laundromats, restaurants, a grocery store, a bank, and multiple auto parts stores. There are no major big box retailers within the Route 606 study area.

While much of the study area is developed, there are a number of parcels across the study area that are not developed. Multiple parcels in the eastern half of the study area are not developed. Undeveloped parcels in the northeastern section of the study area do not have frontage with either Route 606 or US 1, and would require adding access roads. However, there are multiple large parcels in the southeast, northwest, and southwest that are developable, with frontage along Route 606.

Using GIS data obtained from the Virginia Fish and Wildlife Services, the study team identified two wetlands existing within the Route 606 study area. The largest areas of wetlands are at the western part of the corridor, both north and south of Route 606. There is a smaller area of wetlands east of US 1, in the central area of the corridor both north and south of Route 606.

TABLE 1: EXISTING LAND USE IN THE ROUTE 606 STUDY AREA

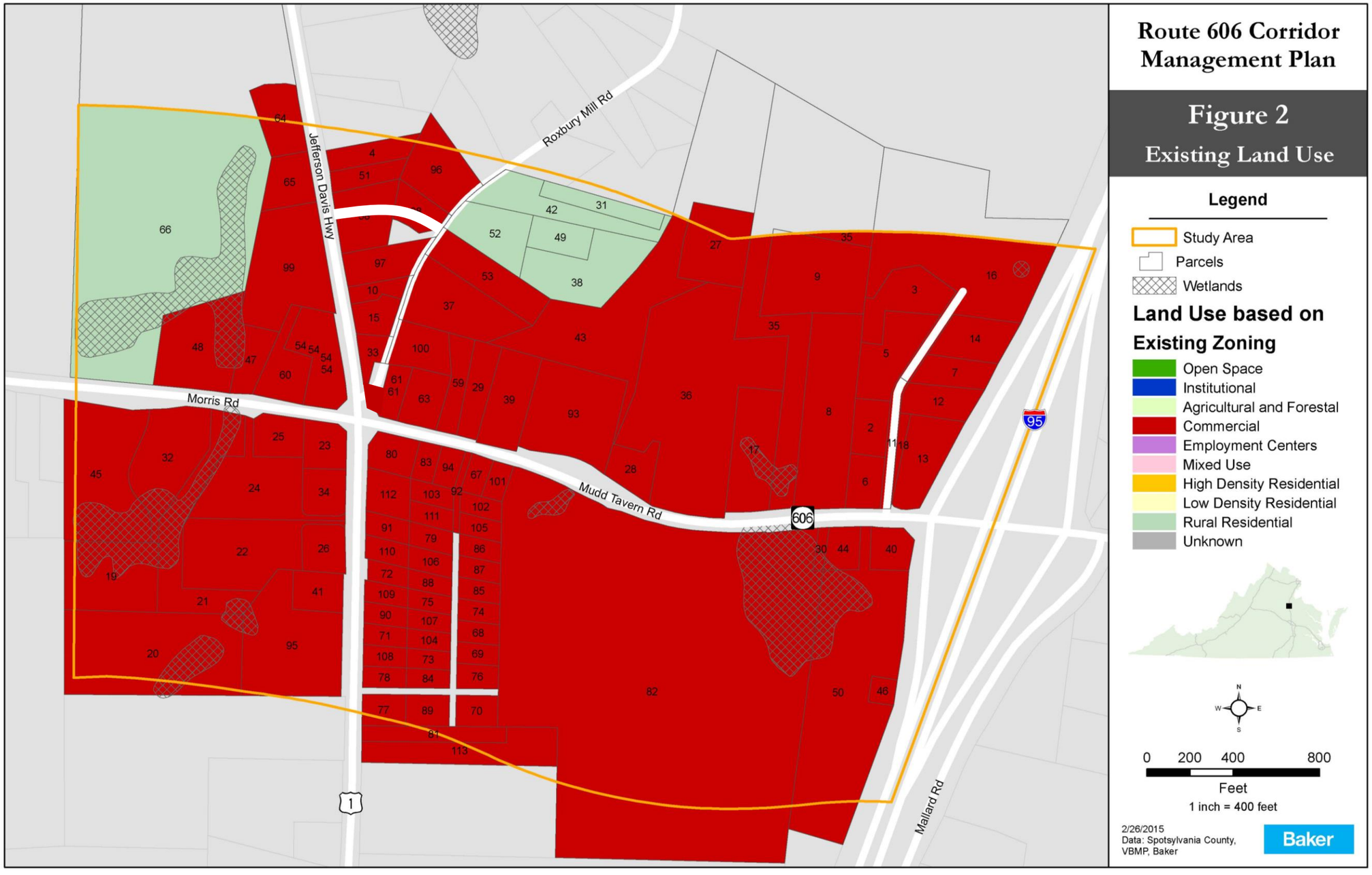
Total Commercial Floor Space		482.6 KSF
Total Employment Center Floor Space	Industrial	0 KSF
	Office	0 KSF
Total Dwelling Units		1 Dwelling Unit

Interstate-Oriented Commercial Land Use

Neighborhood-Oriented Commercial Land Use

Wetlands East of Route 1 and South of Route 606

FIGURE 2: EXISTING LAND USE



2.2 EXISTING INFRASTRUCTURE

Route 606 is predominately a two lane undivided road with limited to no paved shoulders and open ditches. The alignment follows the surrounding land with overlapping horizontal and vertical curves within the middle of the corridor. Route 606 is classified as a Rural Minor Arterial. There is a short section of Route 606 near I-95 that has curb and gutter and a continuous right turn lane in each direction.

The Route 1/Route 606 intersection is located approximately 0.5 miles west of the I-95 interchange and is signalized with turn lanes for some movements. This intersection is currently under construction (as of March 2015) to include separate left and right turn lanes for the northbound and southbound directions on Route 1. Some curb and gutter is present at three of the four intersection corners. Sidewalks exist in the southwest corner of the intersection and proceed in both directions from the intersection. No other pedestrian or bicycle facilities exist along the corridor. The posted speed limit on Route 606 is 35 mph through the study area. The posted speed on Route 1 near Route 606 is 45 mph.

The I-95 Interchange at Route 606 (Exit 118) is a traditional diamond configuration with diagonal ramps serving both northbound and southbound directions. The ramps' intersections with Route 606 are unsignalized. Dan Bell Lane is a two-lane undivided private roadway that provides access to commercial properties on the northwest corner of the I-95 interchange. The Dan Bell Lane intersection with Route 606 is unsignalized.

2.3 EXISTING ACCESS POINTS

Figure 3 shows the spacing between existing access points. Appendix F of the *VDOT Road Design Manual* contains access management design standards for entrances and intersections. Table 2 shows the minimum spacing standards between intersections, commercial entrances, and median crossovers. As a minor arterial with a 35 mph speed limit, the spacing between full access commercial entrances on Route 606 should be 470 feet. As seen in Figure 3, there are many entrances along Route 606 that violate these standards. Dan Bell Lane's intersection with Route 606 is located only 224 feet from the I-95 Southbound off-ramp/Route 606 intersection well short of the 1320 foot spacing standard for a full access intersection from an interchange ramp.

TABLE 2: MINIMUM SPACING STANDARDS FOR COMMERCIAL ENTRANCES, INTERSECTIONS, AND MEDIAN CROSSOVERS

Highway Functional Classification	Legal Speed Limit (mph)①	Minimum Centerline to Centerline Spacing (Distance) in Feet			
		Spacing from Signalized Intersections to Other Signalized Intersections ②	Spacing from Unsignalized Intersections & Full Median Crossovers to Signalized or Unsignalized Intersections& Full Median Crossovers ③	Spacing from Full Access Entrances & Directional Median to Other Full Access Entrances and Any Intersection or Median Crossover ④	Spacing from Partial Access One or Two Way Entrances to Any Type of Entrance, Intersection or Median Crossover ⑤
Principal Arterial	≤ 30 mph 35 to 45 mph ≥ 50 mph	1,050 1,320 2,640	880 1,050 1,320	440 565 750	250 305 495
Minor Arterial	≤ 30 mph 35 to 45 mph ≥ 50 mph	880 1,050 1,320	660 660 1,050	355 470 555	200 250 425
Collector	≤ 30 mph 35 to 45 mph ≥ 50 mph	660 660 1,050	440 440 660	225 335 445	200 250 360
Local Street⑥	Commercial entrance spacing: See Figure 4-11.				

FIGURE 3: ACCESS POINTS ALONG ROUTE 606

2.4 EXISTING TRAFFIC VOLUMES

Existing peak hour traffic volumes were taken from the *I-95/VA Route 606 Interchange Bridge Replacement Interchange Modification Report*. Existing volumes are for year 2013. These intersection counts were supplemented by driveway counts collected in the summer of 2014. Volumes between intersections and driveways were balanced. The AM and PM peak hour turn movement volumes are shown in Figure 4. The AM peak hour is from represents a weekday morning peak hour while the PM peak hour is for a typical Friday afternoon/evening peak hour. Truck percentages along Route 606 west of I-95 are 8% for the AM peak hour and 5% for the PM peak hour.

Table 3 shows the two-way historic annual average daily traffic (AADT) on Route 606 and Route 1 from 2008 through 2013. Daily traffic volumes on Route 606 are 12,000 vehicles. *The I-95/VA Route 606 Interchange Bridge Replacement Interchange Modification Report* shows a 2013 AADT of 12,400. Limited to no growth has occurred along Route 606 in the last six years. The annual average daily traffic AADT on Route 1 is 14,000 north of Route 606 and 9,700 south of Route 606. Traffic has grown approximately 1.5% per year on Route 1 since 2008.

2.5 EXISTING TRAFFIC OPERATIONS

Existing traffic volumes were analyzed in Synchro for both the AM and PM peak hours. Delay and level of service (LOS) results are shown in Figure 5 for the AM peak hour and Figure 6 for the PM peak hour. During the AM peak hour, traffic along Route 606 operates at LOS A or LOS B except at the intersection with Route 1, at which the westbound direction operates at a LOS C along with the eastbound left turn. However, turning onto Route 606 near the east end of the corridor can be difficult. Level of service for turns out of the Exxon and Valero gas stations is LOS D while the McDonald's entrance is LOS E. Delay is slightly higher during the PM peak hour but the only operational problems exist at the Route 1/Route 606 intersection where some turn movements operate at LOS D and the turns out of the Exxon and Valero gas stations which also operate at LOS D.

TABLE 3: HISTORIC DAILY TWO-WAY TRAFFIC VOLUMES ON ROUTE 606 AND ROUTE 1

	From	To	2008	2009	2010	2011	2012	2013	Annual Growth Rate
Route 606	88-617 Hams Ford Road	US 1 Jefferson Davis Hwy	9,800	10,000	10,000	8,800	8,700	8,800	-2.0%
	US 1 Jefferson Davis Hwy	I-95	12,000	12,000	12,000	12,000	12,000	12,000	0.0%
	I-95	Caroline County Line	2,000	2,000	2,000	1,900	1,800	1,900	-1.0%
Route 1	Caroline County Line	Route 606	9,000	9,100	9,200	9,600	9,600	9,700	1.6%
	Route 606	Rte 608 - Massaponax Church Rd	13,000	13,000	13,000	14,000	14,000	14,000	1.5%

Source: VDOT Traffic Engineering on-line counts. Volumes shown are annual average daily traffic (AADT).

FIGURE 4: 2013 PEAK HOUR TRAFFIC VOLUMES

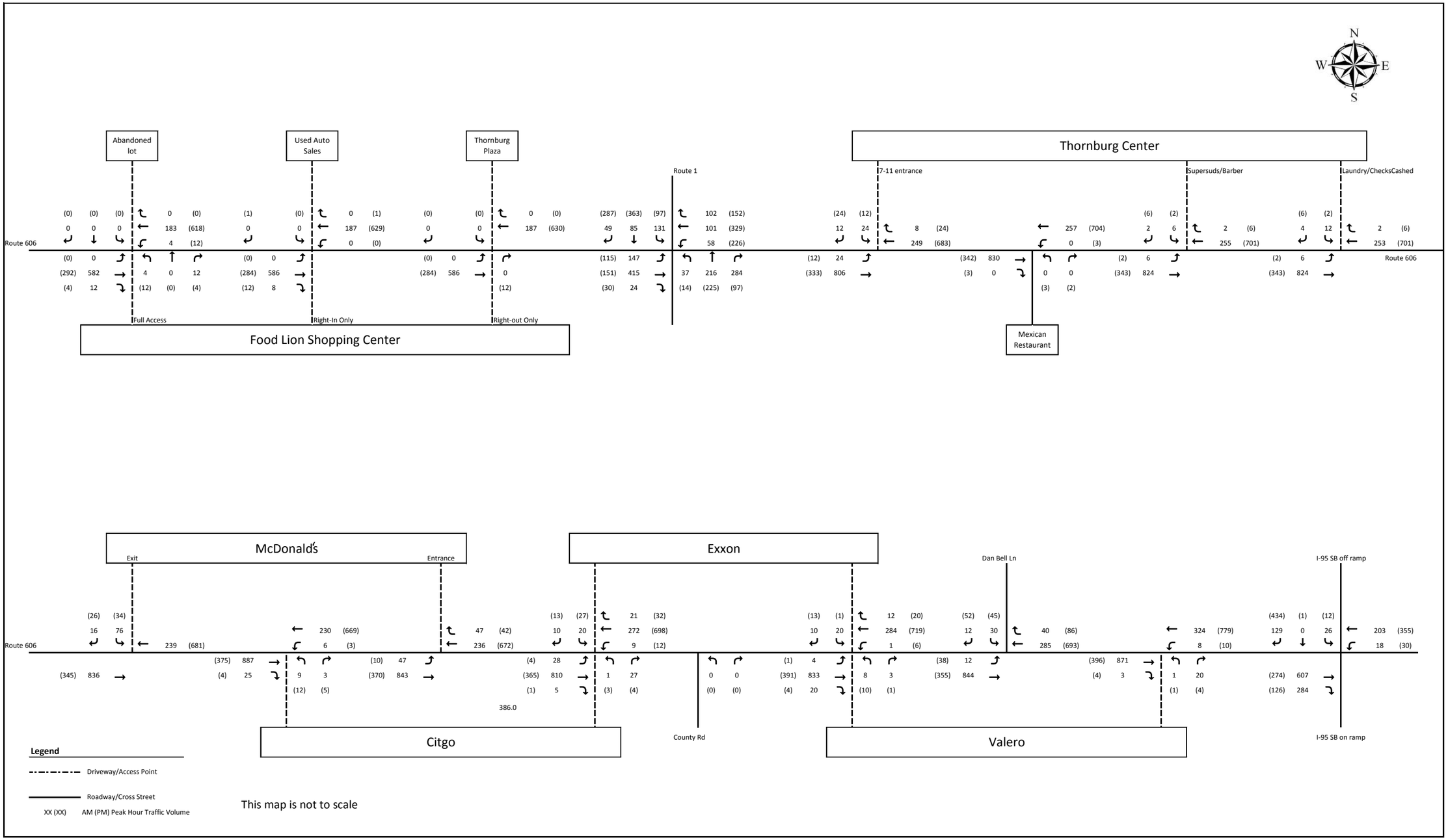


FIGURE 5: 2013 AM PEAK HOUR DELAY AND LEVEL OF SERVICE

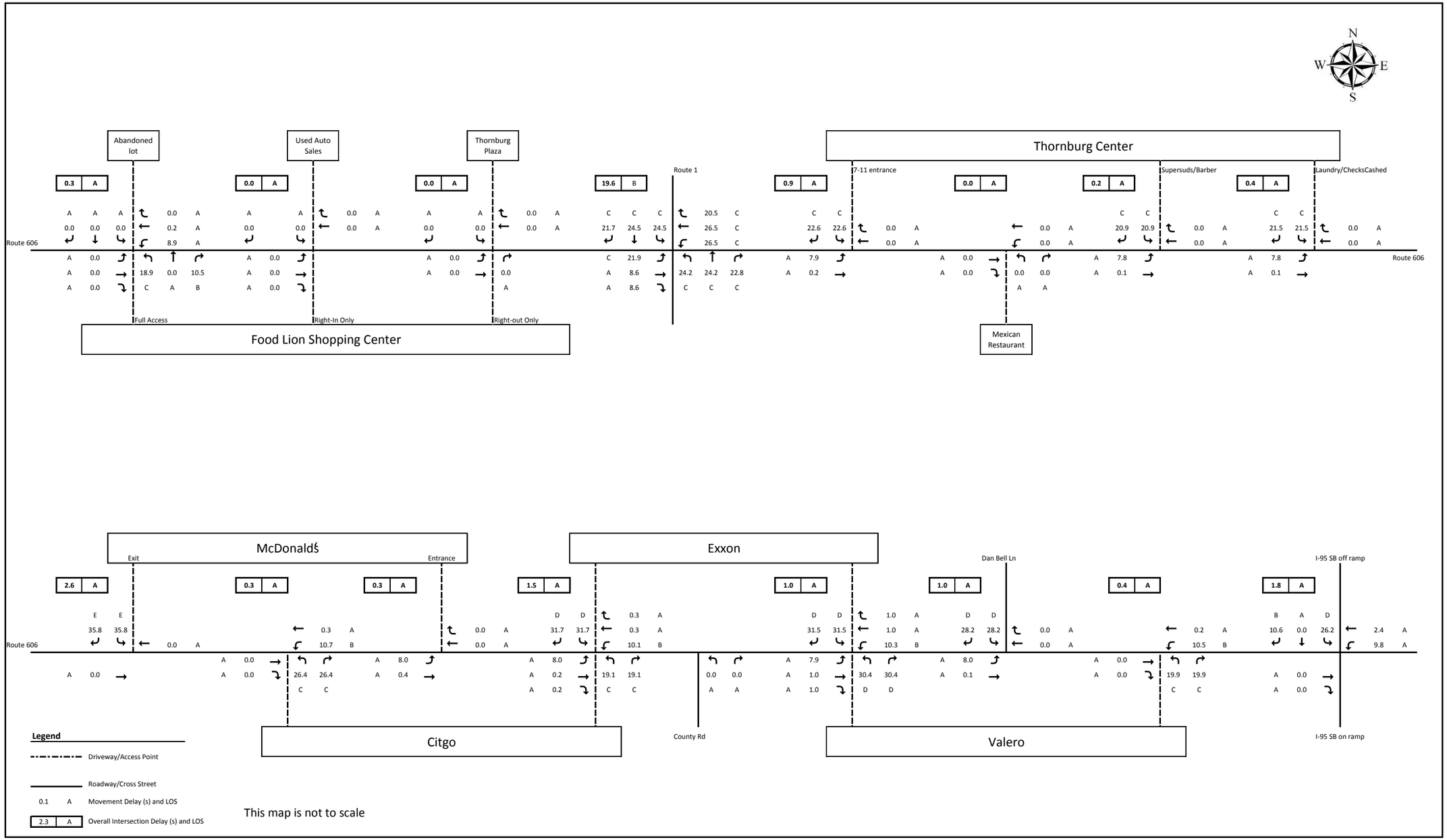
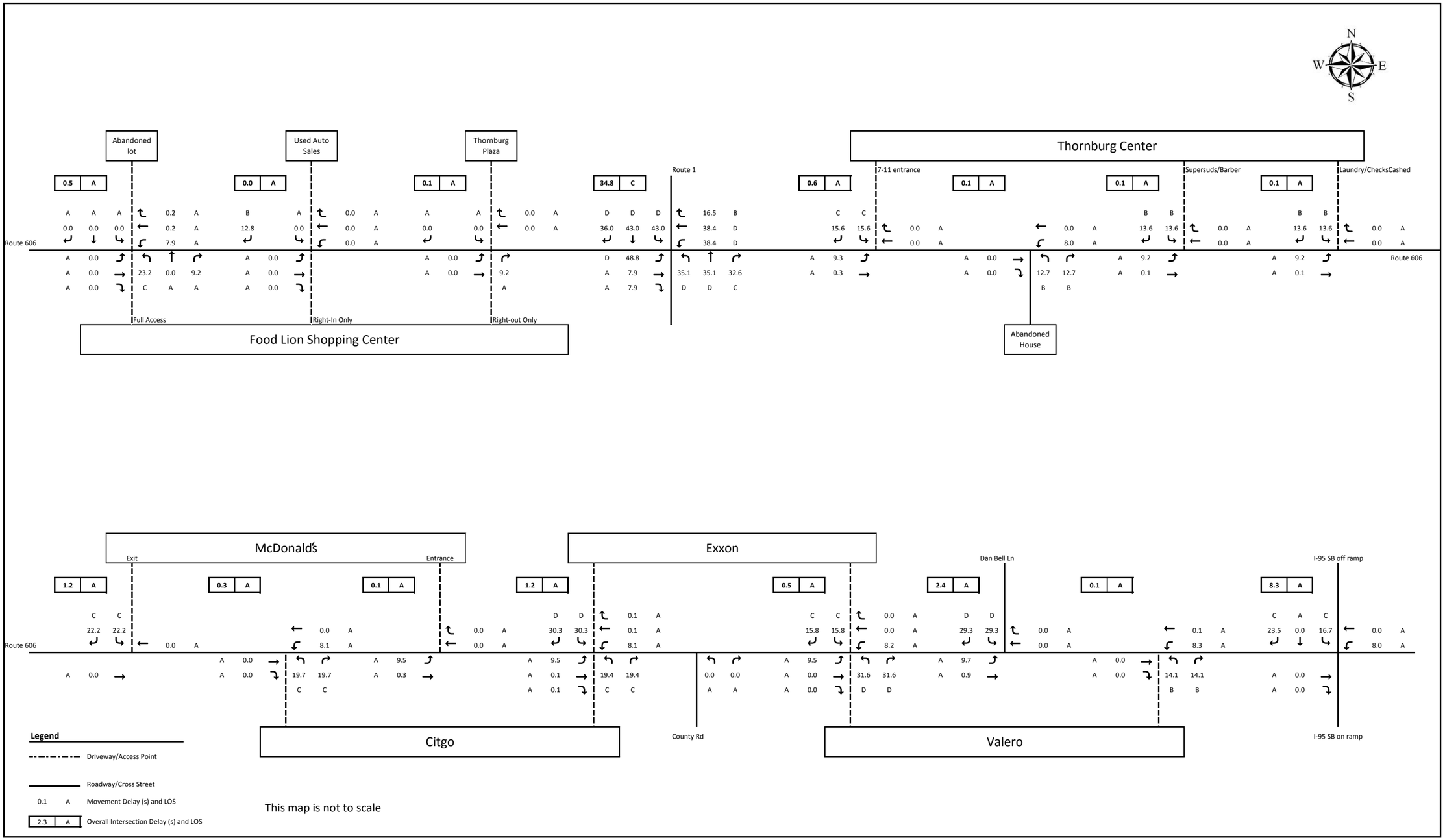


FIGURE 6: 2013 PM PEAK HOUR DELAY AND LEVEL OF SERVICE



CHAPTER 3 2038 FUTURE CONDITIONS

3.1 FUTURE LAND USE

In order to estimate 2038 future traffic in the Route 606 Corridor Study, the study team made a series of assumptions and decisions on future land use and trip generation. This section outlines the methodology, level of analysis, assumptions, and trip generation rates used by the study team to estimate future trip generation within the Route 606 Corridor.

STEP 1: DETERMINE FUTURE DEVELOPMENT TYPE AND DENSITIES

In order to project future trip generation for the Route 606 Corridor, the study team determined the likely type of land uses that will develop along the corridor, how much of the available land is already developed, and how much of the undeveloped land is developable. In order to simplify the future land use analysis, the study team divided the study area for the Route 606 Corridor Study into analysis zones. With the use of analysis zones, the study team can make future land use assumptions for small sections of the corridor without making specific assumptions for each parcel. Zones for the Route 606 Corridor Study area are based on the street grid. The project study area consists of a ¾-mile section of Route 606, for which the study team designated seven analysis zones. Zones north of Route 606 are numbered starting with an "N" while zones south of Route 606 are numbered starting with an "S". The zones are shown on Figure 7 later in the chapter.

Using the 2013 Spotsylvania County Comprehensive Plan, the study team made assumptions on the future land use in the Route 606 study area. For the Route 606 Corridor, assumed land uses are Commercial, Employment Center, Institutional, and Open Space. The study team identified parcels that were currently undeveloped or where there was an expectation that a change in future land use would occur based on the 2013 Spotsylvania County Comprehensive Plan. Developable land is defined as the amount of land that is suitable for construction and development. For these parcels, the study team calculated the total developable area, based on the identified constraints. The study team estimated the amount of developable land based on three constraints:

- Wetlands
  - As discussed in Section 2.1 – Existing Land Use, the study team identified wetlands by a GIS shapefile retrieved from the Virginia Fish and Wildlife Services. Wetlands and land within 100 feet of the wetlands were eliminated from developable land due to environmental regulations, preservation, and unsuitability for construction.
- Slope
  - For this analysis, slope is based on GIS calculations. It is assumed that the land with a slope above 15% were unsuitable for development without major earthwork effort or retaining walls. Therefore, the study team eliminated land with slopes that were greater than 15% from the total developable land.
- Historic Designation
  - The study team identified historic parcels by the listed owner in the parcel file provided by Spotsylvania County. Parcels identified as historic properties were eliminated as developable land due to their historic status and the assumption that these properties will be preserved in the future. Parcels with the following owners listed were eliminated from developable land:
    - U.S. Department of the Interior
    - Central Virginia Battlefield Trust
    - The Civil War Preservation
  - There are no historic properties in the Route 606 project study area.

The Route 606 study area is completely inside Spotsylvania County's designated Primary Settlement District boundary, and assumed densities were based on those in the county zoning code for within the Primary Settlement District. These densities assume public utilities are present. Maximum allowable densities are available in the Data Packet accompanying this document. The allowable densities within the Primary Settlement District are too high to consider for the whole zones and would result in overestimating future traffic, therefore assumed densities were developed for the Route 606 Corridor and are shown in Table 4.

TABLE 4: ASSUMED DENSITIES FOR THE ROUTE 606 CORRIDOR

Assumed Land Use	Assumed Density
Agricultural and Forestal Land Use	0.1
Rural Residential Land Use	0.2
Low Density Residential	0.5
High Density Residential	8
Employment Centers	0.2
Commercial Land Use	0.06
Institutional	0.2

The assumed densities in Table 4 were applied to the developable land acreage for each zone to determine the amount of future development within the corridor. Table 5 summarizes the amount of future development in a complete build out scenario. In regards to the amount of growth in the study area, the study team calculated trips based on a complete build out rather than allocating growth to only certain areas of the corridor.

STEP 2: DETERMINE FUTURE DEVELOPMENT TRIP GENERATION CHARACTERISTICS

The study team estimated the number of trips generated by the land use, for both the existing land use and the future land use. In order to estimate the number of trips generated, the study team selected representative trip generation rates as shown in Table 6 for each assumed land use from the ITE Trip Generation Manual Version 9. Since many different land uses with varying trip generation characteristics can occur within a given land use category, average generic trip generation rates were calculated for each land use. Different trip generation rates were used for rural/low density residential and high density residential.

In order to accurately estimate the total number of trips, two land uses were broken into subcategories, Employment Center and Commercial. These subcategories were applied to account for the different types of employment and commercial services that could occur. Employment centers were divided into Industrial and Office while Commercial was divided into low, medium, and high vehicle turnover facilities. Again, blended rates of several specific land uses were used to calculate trip generation rates for each subcategory of land use.

The specific land uses generally used are ones that are mentioned in the Comprehensive Plan. For example, the average trip generation rate for a medium vehicle turnover commercial land use was calculated from trip generation rates for supermarkets, sit-down restaurants, and pharmacies.

TABLE 5: ASSUMED DEVELOPMENT FOR ROUTE 606

Zone	Commercial		0 KSF
N1	Employment Centers	Industrial	0 KSF
		Office	43.6 KSF
	Dwelling Units		40 DU
Zone	Commercial		5.1 KSF
N2	Employment Centers	Industrial	0 KSF
		Office	56.6 KSF
	Dwelling Units		0 DU
Zone	Commercial		17.1 KSF
N3	Employment Centers	Industrial	0 KSF
		Office	95.8 KSF
	Dwelling Units		0 DU
Zone	Commercial		63.1 KSF
N4	Employment Centers	Industrial	0 KSF
		Office	0 KSF
	Dwelling Units		0 DU
Zone	Commercial		2.7 KSF
S1	Employment Centers	Industrial	0 KSF
		Office	39.2 KSF
	Dwelling Units		36 DU
Zone	Commercial		0 KSF
S2	Employment Centers	Industrial	0 KSF
		Office	78.4 KSF
	Dwelling Units		0 DU
Zone	Commercial		124.7 KSF
S3	Employment Centers	Industrial	0 KSF
		Office	0 KSF
	Dwelling Units		0 DU
GRAND TOTAL	Commercial		212.7 KSF
	Employment Centers	Industrial	0 KSF
		Office	313.6 KSF
	Dwelling Units		76 DU

TABLE 6: AVERAGE TRIP GENERATION RATES

Trip Generation Category (Future Land Use)	ITE Description	ITE Land Use Code	Units	Daily	AM Peak Hour	PM Peak Hour	AM Ingress	AM Egress	PM Ingress	PM Egress
Agriculture	Agriculture (Open Space)	-	Acres	2.00	0.20	0.02	-	-	-	-
Commercial - High Turnover	Convenience Marts/ Gas Stations/ Fast-food/ Coffee/Donuts	851/ 853/ 934/ 937/ 945	1000 SF GFA	774.60	67.22	55.25	51%	49%	51%	49%
Commercial - Low Turnover	Shopping Center/ Neighborhood Retail/ Medical Office/ Auto Sales/ Tire	720/ 820 /826/ 841/ 848	1000 SF GFA	36.06	2.04	3.35	70%	30%	41%	59%
Commercial - Medium Turnover	Supermarket/ Restaurant/ Pharmacy	881/932/850	1000 SF GFA	108.77	5.89	9.75	56%	44%	54%	46%
Employment Center - Industrial	General Light Industrial/ Industrial Park	110/130	1000 SF GFA	6.90	0.87	91%	85%	15%	17%	84%
Employment Center - Office	General Office Building/Single Tenant/Office Park	710/715/750	1000 SF GFA	11.37	1.69	1.57	0.89	0.11	0.15	0.85
High Density Residential	Apartment/Residential Condo/Townhouse	220/230	Dwelling Units (DU)	6.23	0.48	0.57	19%	82%	66%	34%
Institutional - Church	Church	560	1000 SF GFA	9.11	0.56	0.55	62%	38%	48%	87%
Institutional - Elementary School	Elementary School	520	Students	1.29	0.45	0.15	55%	45%	49%	51%
Institutional - High School	High School	530	Students	1.71	0.43	0.13	68%	32%	47%	60%
Rural & Low Density Residential	Single-Family Detached Housing	210	Dwelling Units (DU)	9.52	0.75	1.00	25%	75%	63%	37%

STEP 3: CALCULATE FUTURE TRIP GENERATION

The third and final step is to calculate the future trip generation for each analysis zone. The amount of future development by land use calculated in Step 1 was multiplied by the respective trip generation rates determined in Step 2. The total future trips generated for each analysis zone are summarized in Table 7. Daily, AM and PM peak hour trips were estimated as well as zone ingress and egress trips for each peak period. Note that the trip generation does include pass-by trips, internal corridor capture between analysis zones, and trips diverted by access roads to Route 1. Therefore, not all of the trips shown in Table 7 will be added to Route 606, but distributed to both Route 606 and surrounding network. Future development within the study area is expected to generate an additional 30,000 daily trips. The new additional trips by zone were distributed to the study area roads based on the roads proximity to each zone and the existing ingress and egress travel patterns for those zones. The existing travel patterns are shown in the embedded table in the bottom right corner of Figure 8. Figure 8 shows the distribution of trips to the roadway network from the zones. The distributed trips were added to existing driveway volumes to get future turn movements along the corridor. New driveways were also assumed at several locations along the corridor for the new development. Volumes between intersections and driveways were balanced.

TABLE 7: FUTURE TOTAL TRIPS BY ZONE

Zone	Daily Trips			AM Peak Hour Trips			PM Peak Hour Trips		
	Daily Total	Ingress	Egress	AM Total	Ingress	Egress	PM Total	Ingress	Egress
N1	746	373	373	93	70	23	91	25	66
N2	2,306	1,153	1,153	210	125	85	191	80	111
N3	5,808	2,904	2,904	548	343	205	501	200	301
N4	9,013	4,905	4,108	750	397	353	761	382	380
S1	1,668	834	834	166	104	61	156	61	95
S2	892	446	446	132	117	15	123	19	104
S3	9,394	4,697	4,697	658	373	284	774	392	382
TOTAL	29,827	15,312	14,515	2,557	1,529	1,026	2,597	1,159	1,439

FIGURE 7: ASSUMED FUTURE LAND USE

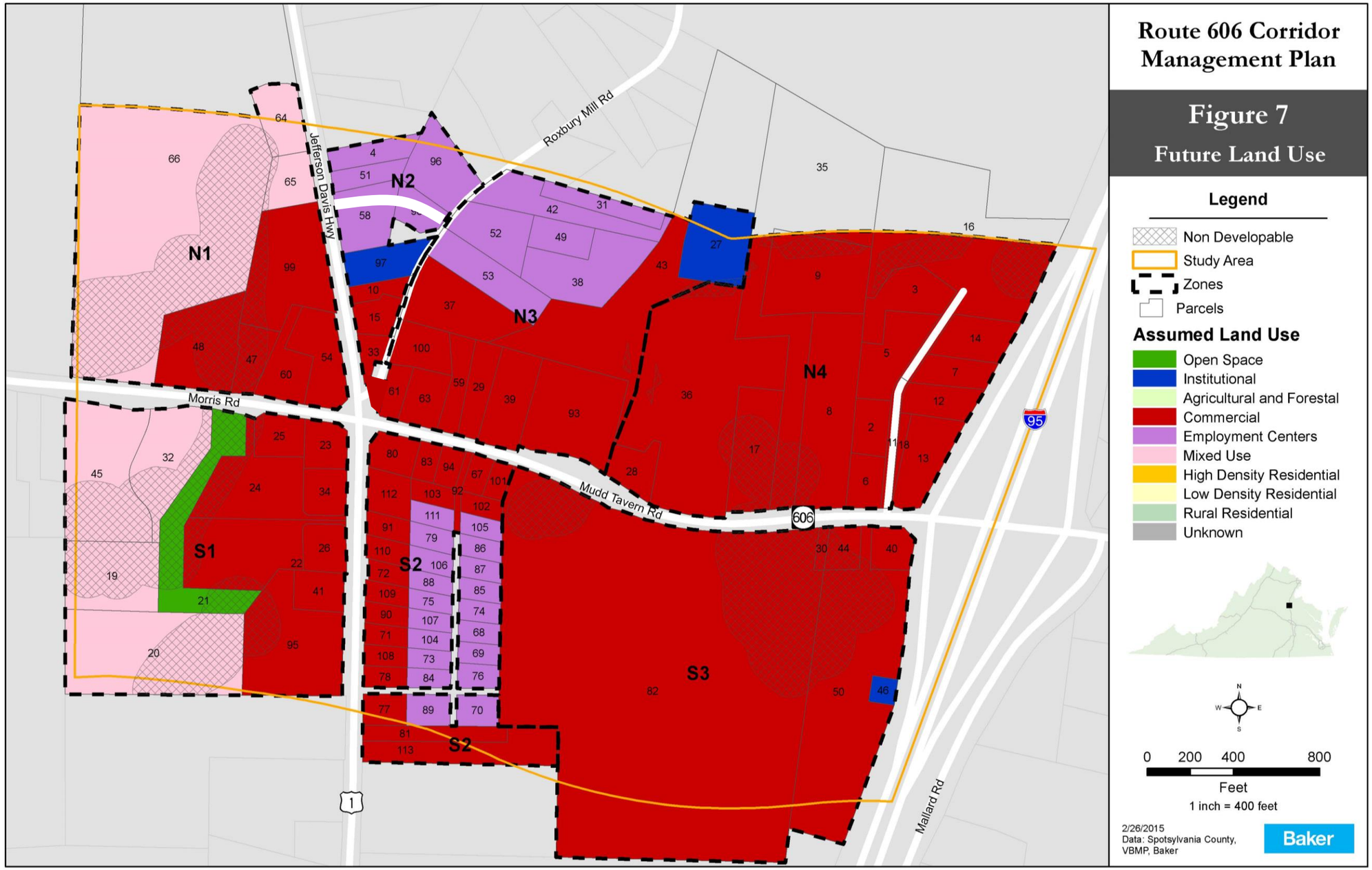
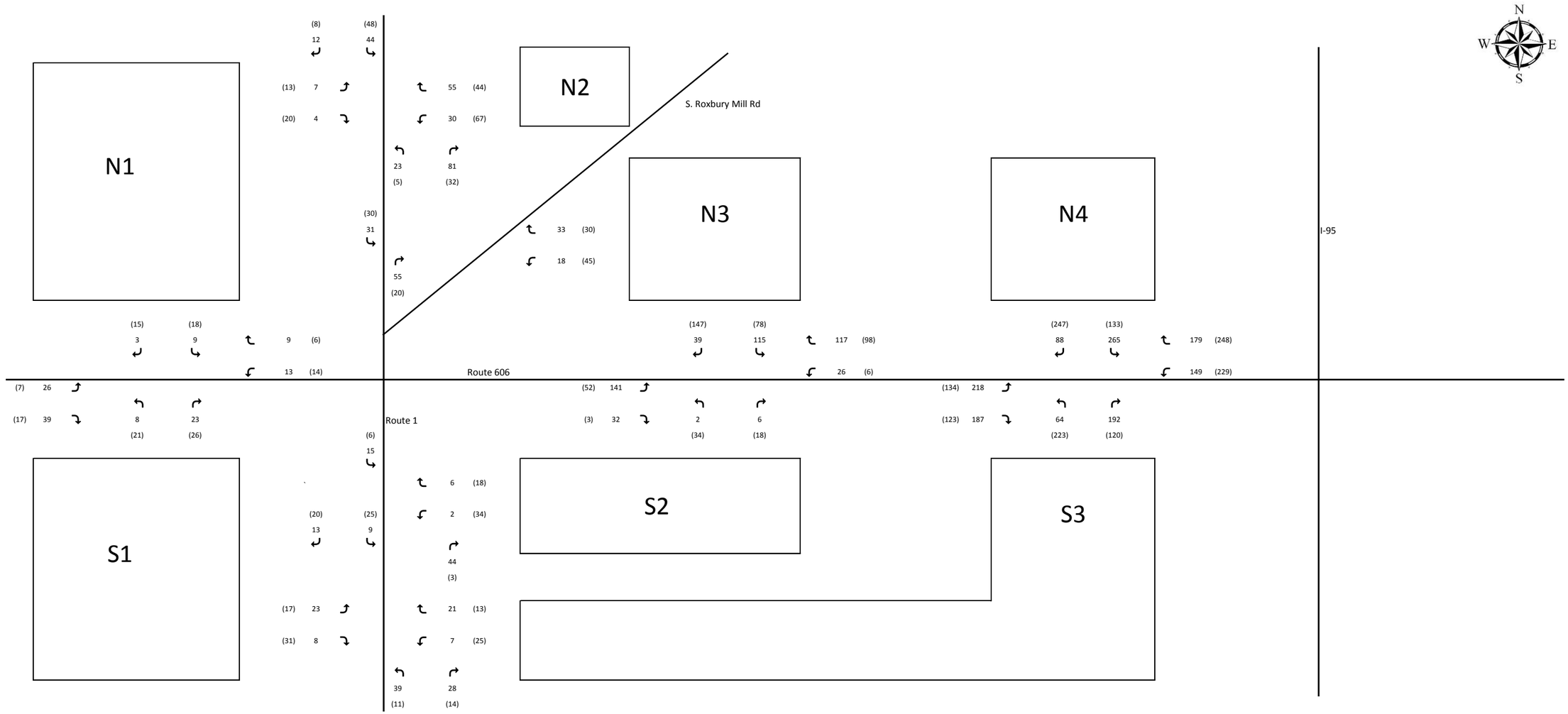


FIGURE 8: ADDITIONAL FUTURE TRIP GENERATION BY ZONE



Zone	Daily Trips			AM Peak Hour Trips			PM Peak Hour Trips		
	Daily Total	Ingress	Egress	AM Total	Ingress	Egress	PM Total	Ingress	Egress
N1	746	373	373	93	70	23	91	25	66
N2	2,306	1,153	1,153	210	125	85	191	80	111
N3	5,808	2,904	2,904	548	343	205	501	200	301
N4	9,013	4,905	4,108	750	397	353	761	382	380
S1	1,668	834	834	166	104	61	156	61	95
S2	892	446	446	132	117	15	123	19	104
S3	9,394	4,697	4,697	658	373	284	774	392	382
TOTAL	29,827	15,312	14,515	2,557	1,529	1,026	2,597	1,159	1,439

Zone	AM Ingress				AM Egress				PM Ingress				PM Egress			
	% EB Rte 606	% WB Rte 606	% NB Rte 1	% SB Rte 1	% EB Rte 606	% WB Rte 606	% NB Rte 1	% SB Rte 1	% EB Rte 606	% WB Rte 606	% NB Rte 1	% SB Rte 1	% EB Rte 606	% WB Rte 606	% NB Rte 1	% SB Rte 1
N1	37.5%	12.5%	32.5%	17.5%	37.5%	12.5%	32.5%	17.5%	27.5%	22.5%	20.0%	30.0%	27.5%	22.5%	20.0%	30.0%
N2	-	-	65.0%	35.0%	-	-	65.0%	35.0%	-	-	40.0%	60.0%	-	-	40.0%	60.0%
N3	41.0%	34.0%	16.0%	9.0%	56.0%	19.0%	16.0%	9.0%	26.0%	49.0%	10.0%	15.0%	26.0%	49.0%	10.0%	15.0%
N4	55.0%	45.0%	-	-	75.0%	25.0%	-	-	35.0%	65.0%	-	-	35.0%	65.0%	-	-
S1	37.5%	12.5%	37.5%	12.5%	37.5%	12.5%	37.5%	12.5%	27.5%	22.5%	17.5%	32.5%	27.5%	22.5%	17.5%	32.5%
S2	27.5%	22.5%	37.5%	12.5%	37.5%	12.5%	37.5%	12.5%	17.5%	32.5%	17.5%	32.5%	17.5%	32.5%	17.5%	32.5%
S3	50.0%	40.0%	7.5%	2.5%	67.5%	22.5%	7.5%	2.5%	31.5%	58.5%	3.5%	6.5%	31.5%	58.5%	3.5%	6.5%

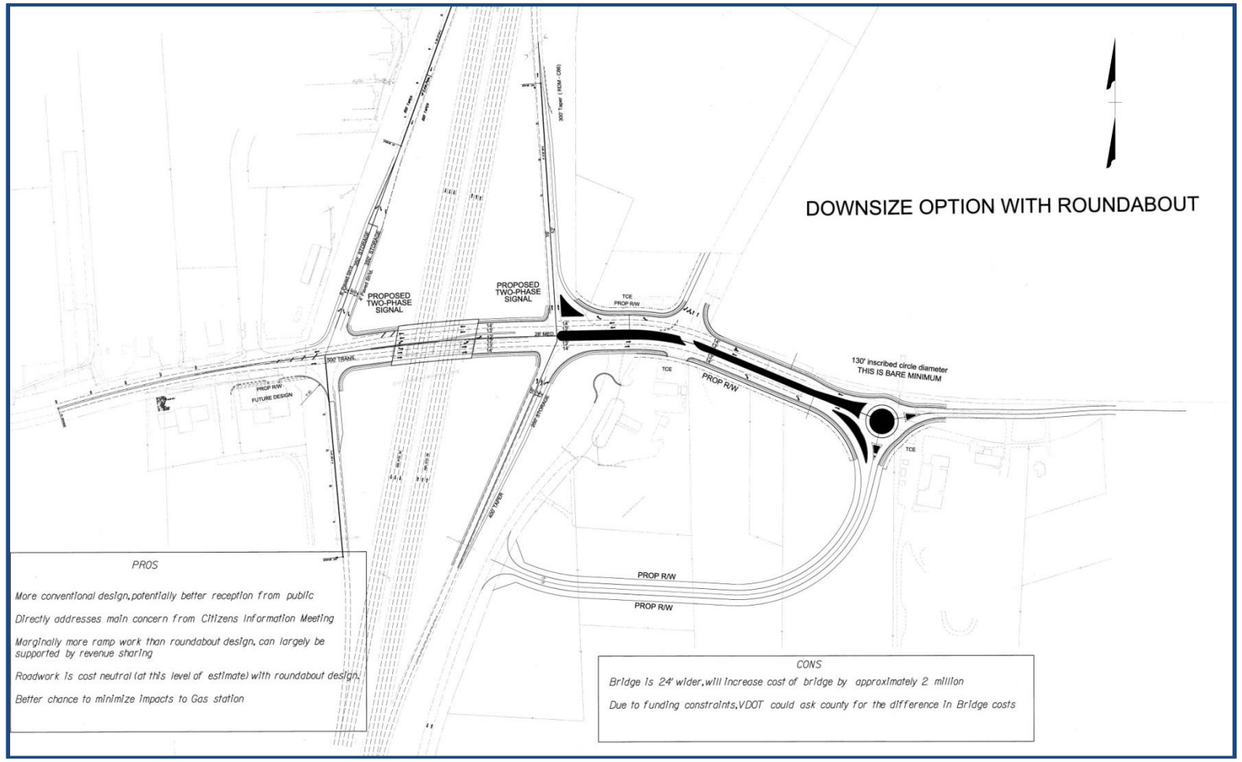
3.2 FUTURE INFRASTRUCTURE

There are several improvements planned along the Route 606 Corridor. These include improvements under construction at the Route 1 / Route 606 Intersection, improvements at the I-95 Interchange, improvements east of I-95 associated with the Dominion Raceway under construction, and turn lanes associated with the planned Taco Bell west of I-95.

ROUTE I-95 INTERCHANGE (EXIT 118)

Improvements to the I-95 Interchange at Route 606 (Exit 118) are being analyzed as part of an Interchange Modification Report (IMR) being prepared by VDOT. The IMR is ongoing at the time of this report and the most recent graphic showing improvements is provided below in Figure 9. The interchange is proposed to remain a tight-diamond configuration. The existing bridge will be replaced with a new six-lane bridge with two through lanes and a left turn lane in each direction. At the end of each off-ramp dual left turn lanes and an exclusive right turn lane will be provided at Route 606. Both ramp termini intersection will likely be signalized in the future. Just east of the interchange, Mallard Road will be relocated further to the east and intersect Route 606 at roundabout. The design shown in Figure 9 may change as the IMR progresses. Any proposed improvements west of the interchange will need to tie into the proposed interchange improvements. VDOT has elected to apply urban design standards to the design of Route 606 within the interchange area. Urban standards include the use of curb and gutter and raised medians.

FIGURE 9: POTENTIAL IMPROVEMENTS AT I-95 INTERCHANGE (EXIT 118)



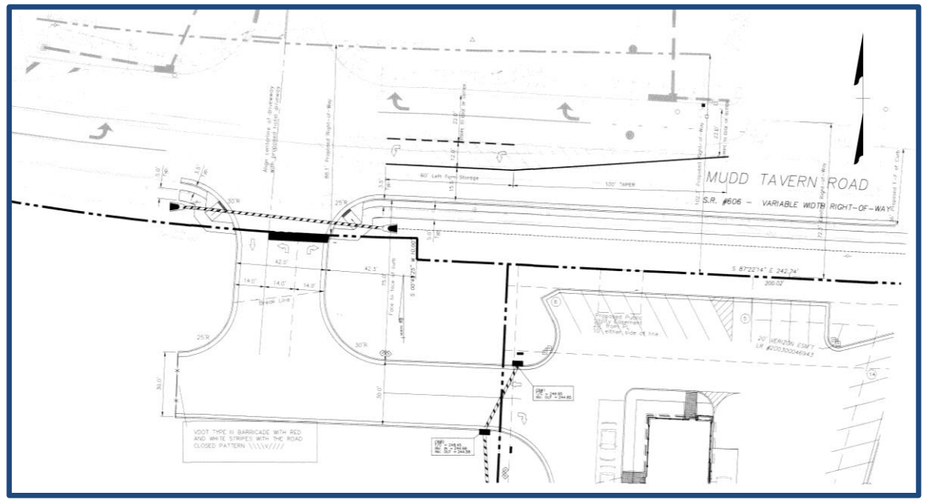
ROUTE 1 / ROUTE 606 INTERSECTION

The Route 1 / Route 606 Intersection is currently under construction. Improvements are being made under VDOT project UPC 93136. The project is adding a southbound left turn lane and a northbound left turn lane on Route 1 to the intersection. The westbound approach will be reconfigured from a shared left-through lane and a right-turn lane to a left turn lane and a shared through-right lane. Signal equipment will also be replaced to provide fully-actuated 8-phase operation. The South Roxbury Mill Road intersection with Route 1 just north of Route 606 is being closed. The construction of a new connector road between Route 1 and South Roxbury Mill Road was recently completed approximately 850 feet north of Route 606 and just north of the fire station. Any proposed improvements will need to accommodate the improvements currently under construction.

TACO BELL TURN LANES

A Taco Bell Restaurant has been approved along the south side of Route 606 across from the unfinished Hotel and approximately 850 feet west of I-95. As part of the site plan, the developer has proposed widening out Route 606 to provide a westbound left turn into the property. An eastbound left turn lane to the hotel property will also be constructed. Figure 10 shows the proposed turn lanes.

FIGURE 10: PROPOSED TACO BELL TURN LANE IMPROVEMENTS



3.3 FUTURE TRAFFIC VOLUMES AND OPERATIONS

No future no-build analysis was completed as part of this Corridor Management Plan. Future 2038 no-build peak hour traffic volumes and level of service were taken from the *I-95/VA Route 606 Interchange Bridge Replacement Interchange Modification Report* for the intersections of Route 1/Route 606 and the I-95 SB ramp termini. The average daily traffic on Route 606 is projected to increase by over 50 percent to 19,500 vehicles.

During the 2038 AM and PM peak hours, all three intersections listed above are expected to operate at LOS F. It is also expected that most left turns out of properties along Route 606 will also operate at LOS F as it will be more difficult to find acceptable gaps in traffic to make the turn movement. Intersection volume, delay and level of service for the 2038 no-build conditions can be seen in Table 8 in Chapter 4 for the Route 1/Route 606 intersection. Table 10 in Chapter 4 shows the intersection volumes, delay and level of service for the Dan Bell Lane intersection and I-95 SB ramp termini intersection for the 2038 no-build condition.

CHAPTER 4 ALTERNATIVES

4.1 INITIAL ALTERNATIVES

Future traffic volumes and operating conditions show that Route 606 needs to be widened to four lanes between I-95 and Route 1 to accommodate the future traffic volumes associated with the planned developments along Route 606. Three alternatives were developed on how Route 606 could be widened to four lanes. These include:

ALTERNATIVE 1: FOUR-LANE UNDIVIDED ROAD

Alternative would widen Route 606 to four lanes with no separation between directions of travel with the exception of a striped centerline. Figure 11 shows the plan layout of the four-lane undivided highway with a typical section included. This alternative would require the least amount of right-of-way but would not provide any access management along the corridor. At times, the inside lanes in each direction would become left turn lanes while the outside lanes would be right-turn lanes. Vehicles could stop or slow down in these lanes to wait for gaps in opposing traffic to make the appropriate turns. This alternative would have a lower capacity than the other alternatives. Parallel access roads north and south of Route 606 were also considered as part of this alternative. A new intersection would be constructed in the middle of the corridor to provide access to undeveloped parcels north and south of the corridor. Ultimately, the intersection is likely to warrant a traffic signal. Due to the lack of access management opportunities and potential safety issues between speed differentials in the inside and outside lanes, and lower capacity, it was decided by the study team that this alternative would not be advanced for further study.

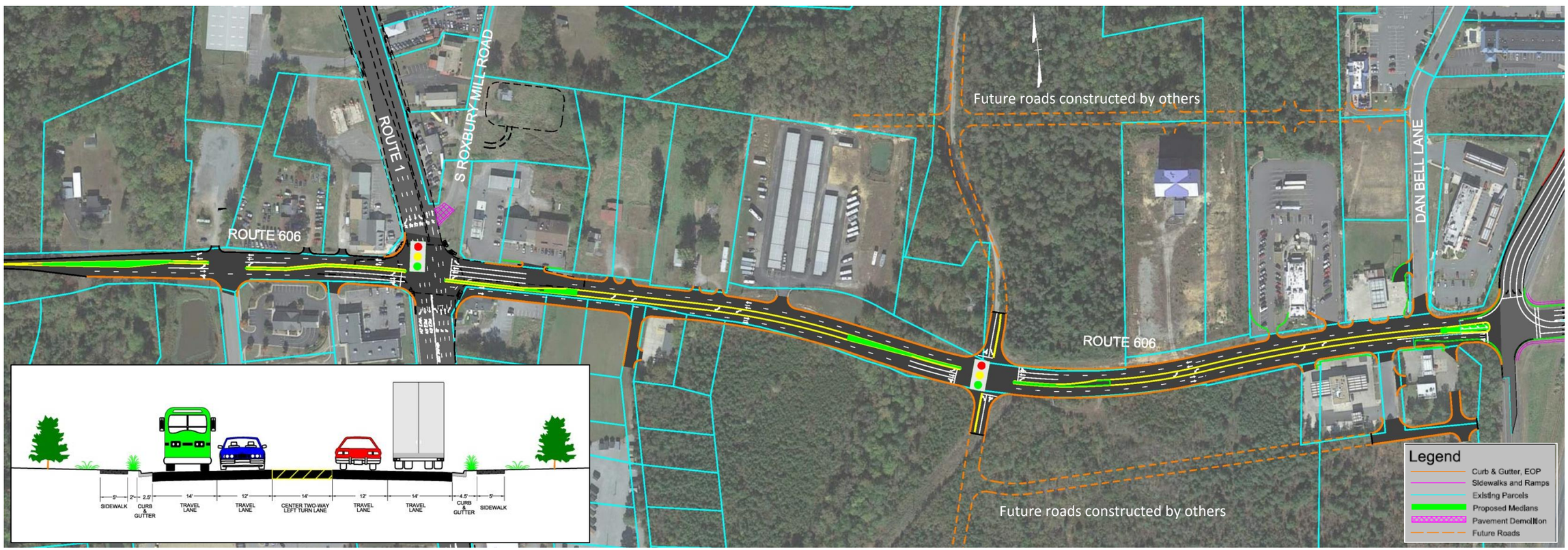
FIGURE 11: ALTERNATIVE 1: FOUR-LANE UNDIVIDED ROAD

ALTERNATIVE 2: FOUR-LANE ROAD WITH CENTER TWO-WAY LEFT TURN LANE

Alternative 2 would widen Route 606 to four lanes with a 14-foot flush median separating directions of travel. Figure 12 shows the plan layout of the four-lane divided highway with a typical section included. The flush median would serve as two-way left turn lane requiring vehicles turn left into and out of properties along Route 606 to share the lane. Vehicles turning left onto Route 606 will also use the lane as an acceleration lane or a spot to wait for gaps in opposing traffic. Because of all the conflicting traffic using the lane, flush medians typically are not as safe as raised medians. This alternative would require more right-of-way than Alternative 1.

Parallel access roads north and south of Route 606 were also considered as part of this alternative. A new intersection would be constructed in the middle of the corridor to provide access to undeveloped parcels north and south of the corridor. Ultimately, the intersection is likely to warrant a traffic signal. Due to the lack of access management opportunities and potential safety issues with the center two-way left turn lane, it was decided by the study team that this alternative would not be advanced for further study.

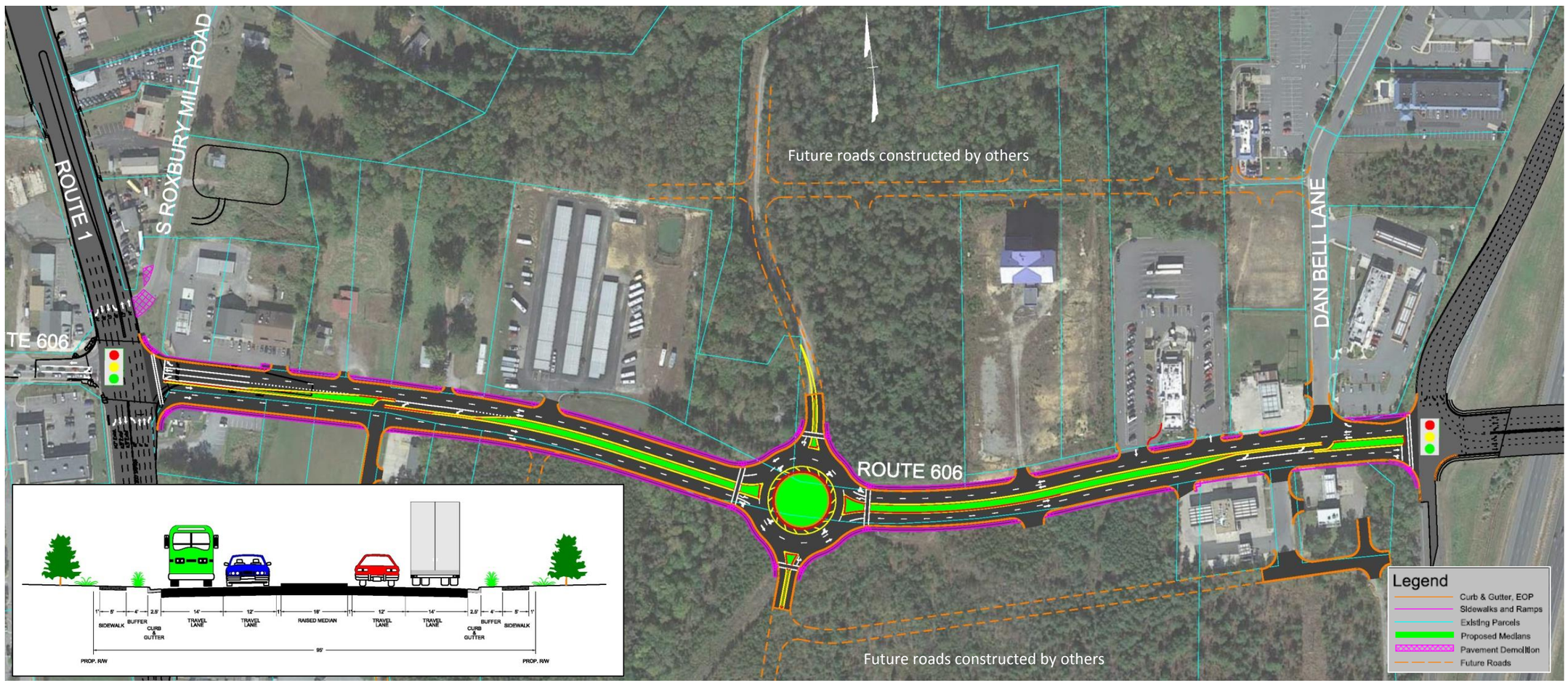
FIGURE 12: ALTERNATIVE 2: FOUR-LANE ROAD WITH CENTER TWO WAY LEFT TURN LANE



ALTERNATIVE 3: FOUR-LANE ROAD WITH RAISED MEDIAN AND ACCESS MANAGEMENT

The alternative would widen Route 606 to four lanes with a 16-foot raised median separating directions of travel. Figure 13 shows the plan layout of the four-lane divided highway with a typical section included. This alternative would require more right-of-way than Alternative 1 and would provide additional access management along the corridor. The raised median would prevent left turns into and out of properties along Route 606 unless a median break is provided. Median breaks would be provided at Dan Bell Lane and at the Post Office to allow left turns in and U-turns. A new intersection would be constructed in the middle of the corridor to provide access to undeveloped parcels north and south of the corridor. The intersection could be a typical four-legged intersection with U-turns allowed or a roundabout. This alternative would provide the most mobility along the corridor and have the highest capacity. Parallel access roads north and south of Route 606 were also considered as part of this alternative. Due to the access management opportunities and potential increased safety provided with a raised median this alternative was advanced for further study.

FIGURE 13: ALTERNATIVE 3: FOUR-LANE DIVIDED WITH RAISED MEDIAN



4.2 ALTERNATIVE 3 OPTIONS

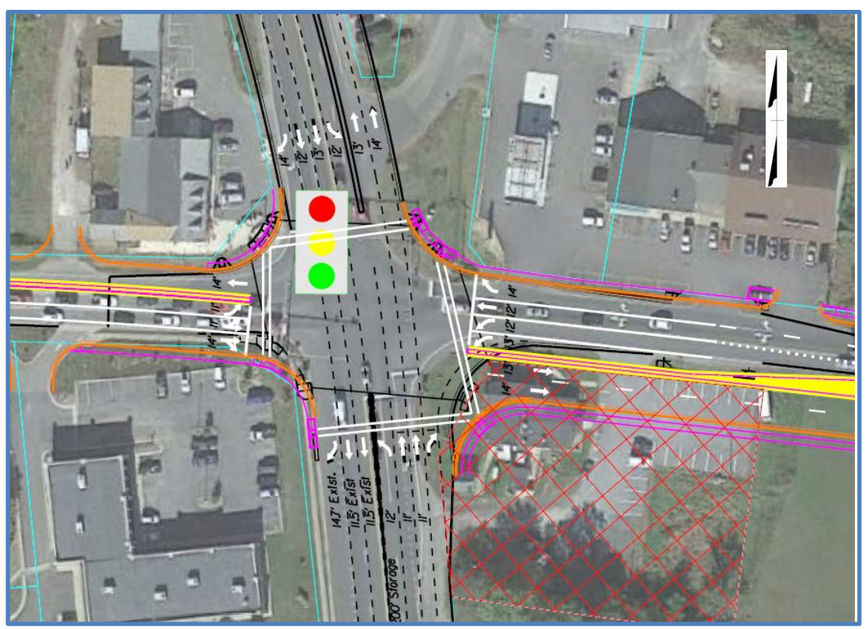
Based on discussions with VDOT and County Staff, Alternative 3 was selected as the alternative to advance for more study. Alternative 3 provides the most opportunity for maintaining mobility along the corridor and for providing opportunities for access management. There are three major areas along the corridor where different options exist. The options were developed and evaluated based on traffic operations. Matrices summarizing the differences between options are provided for each study location. All alternatives include the widening of Route 606 to 4 lanes with a raised median with limited openings for left turns from Route 606. All alternatives also include sidewalks on both sides of Route 606 from I-95 to Route 1.

ROUTE 1 / ROUTE 606 INTERSECTION

To handle future traffic volumes, additional turn lanes from those currently under construction (UPC 93136) are required. The proposed design volumes for the intersection are taken from the *I-95/VA Route 606 Interchange Bridge Replacement Interchange Modification Report* and are shown in Table 8. Without additional improvements beyond UPC 93136, the intersection is expected to operate at LOS F during both peak periods in 2038. Under Option 1, the proposed improvements require purchasing the Mexican Restaurant (Poco Loco) property, parcel number 80 (Figure 7), but only allows for one westbound through lane at the intersection. With the improvements under Option 1, the delay at the intersection is expected to drop 45% in 2038 when compared to the No-Build condition but still operate at LOS F during both peak periods. To get a second westbound through lane (see Option 2) requires acquiring the building on the northwest corner of the intersection, parcel number 54. With the improvements under Option 2, the delay at the intersection is expected to drop 65% in 2038 when compared to the No-Build condition and operate at LOS D during both peak periods. This additional project cost could be deferred for another project if it does not fit within the project budget. Only the westbound departure leg is affected by this decision, as the westbound approach could just be restriped to get the second through lane. Figure 14 shows the two options for the Route 1/Route 606 intersection.

FIGURE 14: ROUTE 1 / ROUTE 606 INTERSECTION OPTIONS

OPTION 1 - SINGLE WESTBOUND THROUGH LANE



OPTION 2 - TWO WESTBOUND THROUGH LANES

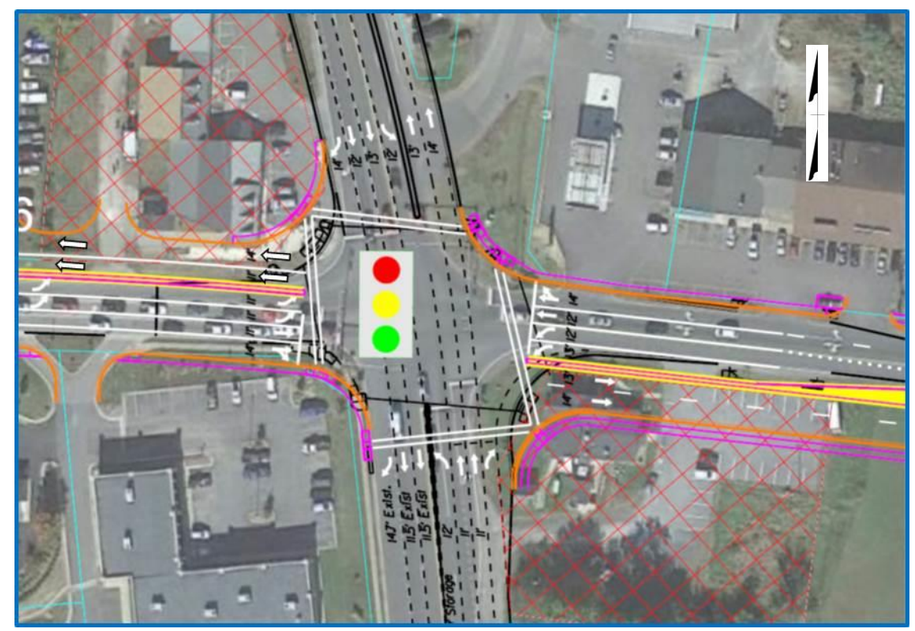
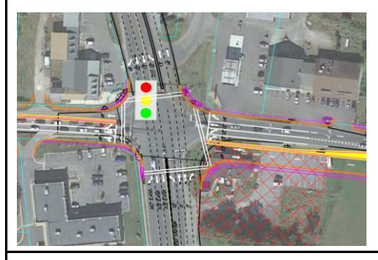
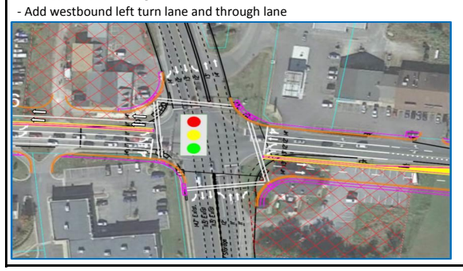


TABLE 8: SUMMARY OF OPTIONS FOR ROUTE 1 / ROUTE 606 INTERSECTION

Option	Pros	Cons	Traffic Operations		
			2013 Traffic Volumes*	2013 AM Peak Hour - Delay and LOS	2013 PM Peak Hour - Delay and LOS
EXISTING - without improvements under construction	None	None	Route 1 (287) (363) (97) ↰ 102 (152) 49 85 131 ← 101 (329) Route 606 ↲ ↓ ↳ ↶ 58 (226) (115) 147 ↱ ↰ ↑ ↱ (151) 415 → 37 216 284 (30) 24 ↴ (14) (225) (97) *Volumes from I-95/Route 606 Interchange Improvements IJR	Route 1 C C C ↰ 20.5 C 21.7 24.5 24.5 ← 26.5 C Route 606 ↲ ↓ ↳ ↶ 26.5 C C 21.9 ↱ ↰ ↑ ↱ A 8.6 → 24.2 24.2 22.8 A 8.6 ↴ C C C Overall Intersection 19.6 B	Route 1 D D D ↰ 16.5 B 36.0 43.0 43.0 ← 38.4 D Route 606 ↲ ↓ ↳ ↶ 38.4 D D 48.8 ↱ ↰ ↑ ↱ A 7.9 → 35.1 35.1 32.6 A 7.9 ↴ D D C Overall Intersection 34.8 C
			2038 Traffic Volumes*	2038 AM Peak Hour - Delay and LOS**	2038 PM Peak Hour - Delay and LOS**
NO-BUILD Includes improvements under construction (VDOT UPC 93136) such as - Add a southbound left turn lane - Add a northbound left turn lane	Improved operations when compared to existing conditions.	Failing Level of Service during both peak hours in 2038.	Route 1 (790) (1120) (150) ↰ 150 (249) 155 415 200 ← 220 (545) Route 606 ↲ ↓ ↳ ↶ 170 (430) (275) 470 ↱ ↰ ↑ ↱ (255) 725 → 135 610 440 (105) 155 ↴ (60) (735) (230) *Volumes from I-95/Route 606 Interchange Improvements IJR	Route 1 E E F ↰ 215.8 F 63.0 66.8 245.1 ← 215.8 F Route 606 ↲ ↓ ↳ ↶ 56.2 E D 42.7 ↱ ↰ ↑ ↱ F 230.2 → 106.6 121.3 173.8 F 230.2 ↴ F F F Overall Intersection 145.8 F **Results from I-95/Route 606 Interchange Improvements IJR	Route 1 F F F ↰ 231.2 F 269.3 164.7 284.4 ← 231.2 F Route 606 ↲ ↓ ↳ ↶ 44.7 D F 105.2 ↱ ↰ ↑ ↱ F 221.6 → 220.7 70.9 46.9 F 221.6 ↴ F E D Overall Intersection 166.1 F **Results from I-95/Route 606 Interchange Improvements IJR
			2038 Traffic Volumes*	2038 AM Peak Hour - Delay and LOS**	2038 PM Peak Hour - Delay and LOS**
OPTION 1 - (Single westbound through lane) Includes improvements under construction (VDOT UPC 93136) plus - Add eastbound through lane - Add westbound left turn lane 	Improved operations when compared to No-Build conditions.	LOS F during both peak hours in 2038. Requires acquisition of Mexican Restaurant (parcel 80) on southeast corner of the intersection. Provides only a single westbound through lane on Route 606.	Route 1 (790) (1120) (150) ↰ 150 (249) 155 415 200 ← 220 (545) Route 606 ↲ ↓ ↳ ↶ 170 (430) (275) 470 ↱ ↰ ↑ ↱ (255) 725 → 135 610 440 (105) 155 ↴ (60) (735) (230) *Volumes from I-95/Route 606 Interchange Improvements IJR	Route 1 D E E ↰ 38.3 D 38.5 56.1 64.5 ← 82.0 F Route 606 ↲ ↓ ↳ ↶ 40.0 D F 90.5 ↱ ↰ ↑ ↱ F 110.6 → 43.6 109.5 58.1 F 110.6 ↴ D F E Overall Intersection 81.1 F **Results from Baker - 2000 HCM using Synchro	Route 1 F E E ↰ 42.2 D 167.7 64.8 62.1 ← 141.2 F Route 606 ↲ ↓ ↳ ↶ 44.2 D F 108.1 ↱ ↰ ↑ ↱ F 87.5 → 129.8 69.8 46.9 F 87.5 ↴ F E D Overall Intersection 91.1 F **Results from Baker - 2000 HCM using Synchro
			2038 Traffic Volumes*	2038 AM Peak Hour - Delay and LOS**	2038 PM Peak Hour - Delay and LOS**
OPTION 2 - (Two westbound through lanes) Includes improvements under construction (VDOT UPC 93136) plus - Add eastbound through lane - Add westbound left turn lane and through lane 	Intersection expected to operate at LOS D during both peak periods in 2038. Alternative with most improved operations when compared to No-Build conditions. Allows for simultaneous left turn movements for eastbound/westbound approaches.	Requires acquisition of Mexican Restaurant (parcel 80) on southeast corner of the intersection. Most capital intensive option. Requires acquisition of building (parcel 54) on northwest corner of the intersection.	Route 1 (790) (1120) (150) ↰ 150 (249) 155 415 200 ← 220 (545) Route 606 ↲ ↓ ↳ ↶ 170 (430) (275) 470 ↱ ↰ ↑ ↱ (255) 725 → 135 610 440 (105) 155 ↴ (60) (735) (230) *Volumes from I-95/Route 606 Interchange Improvements IJR	Route 1 D D E ↰ 38.0 D 47.4 47.4 64.5 ← 38.0 D Route 606 ↲ ↓ ↳ ↶ 52.4 D D 44.8 ↱ ↰ ↑ ↱ E 63.2 → 40.4 54.3 62.0 E 63.2 ↴ D D E Overall Intersection 52.4 D **Results from Baker - 2000 HCM using Synchro	Route 1 D D D ↰ 66.5 E 38.9 38.9 40.3 ← 66.5 E Route 606 ↲ ↓ ↳ ↶ 63.9 E F 89.5 ↱ ↰ ↑ ↱ D 44.2 → 87.5 50.8 31.0 D 44.2 ↴ F D C Overall Intersection 50.5 D **Results from Baker - 2000 HCM using Synchro

MIDDLE INTERSECTION BETWEEN I-95 AND ROUTE 1

A new intersection would be constructed in the middle of the corridor to provide access to undeveloped parcels north and south of the corridor. The project team analyzed three options for this middle intersection. The options are shown in Figure 15. Table 9 summarizes the design traffic volumes and operations of each option.

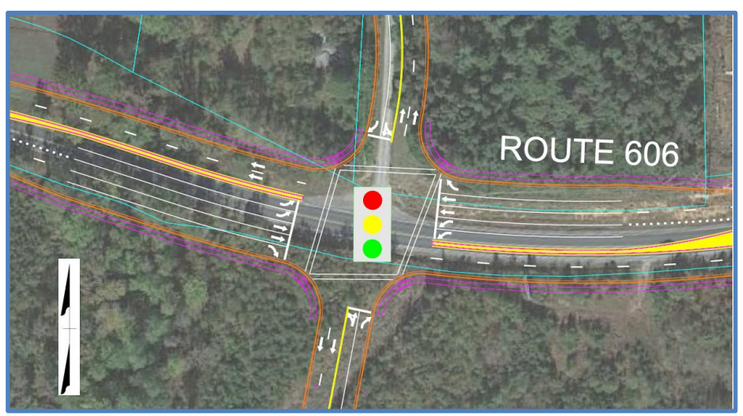
Option 1 – Signalized intersection mid-way between I-95 and Route 1 with parallel interparcel roads. This option requires the addition of parallel interparcel roads north and south of Route 606 to accommodate trucks needing to make U-turns. Under the full buildout of land use assumed in Chapter 3, the intersection is expected to operate at LOS D during both peak periods. This option is the most capital intensive option due to the required interparcel roads.

Option 2 – Two-lane roundabout mid-way between I-95 and Route 1. This option includes a "Turbo" roundabout that has two lanes in the major direction (east/west) and only one circulating lane for the minor direction (north/south). This option does not require the parallel interparcel roads as trucks will be able to make U-turns at the roundabout. The roundabout cannot handle all the U-turn traffic if all the land use assumed in Chapter 3 is built out. Under the build out scenario, the roundabout would operate at LOS E during the AM peak hour. Allowing left turns out at Dan Bell Lane with a signal reduces enough of the U-turn traffic that the roundabout would operate at LOS C during the AM peak hour and LOS B during the PM peak hour. This signal would not be needed unless significant development occurs along Dan Bell Lane and would not be installed until the roundabout began experiencing congestion. A signal at Dan Bell Lane would need to be coordinated with the I-95 SB ramp termini intersection signal.

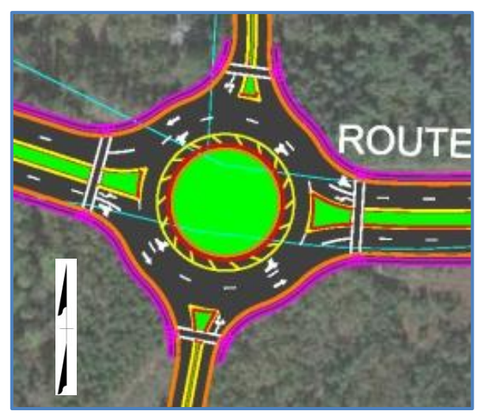
Option 3 – Median U-turn Crossovers. A third option was developed that did not require signalizing Dan Bell Lane or constructing the parallel interparcel roads. This option provides two signalized U-turn crossovers mid-way between I-95 and Route 1 to handle all the U-turns because of the raised median. Both median U-turn crossovers would be signalized. The easternmost intersection is expected to operate at LOS C during both peak periods under 2038 traffic conditions. The westernmost intersection is expected to operate at LOS B during both peak periods. This option requires a wider median for Route 606. It also results in separate entrances with different restricted movements for the large undeveloped parcel south of Route 606.

FIGURE 15: MIDDLE INTERSECTION OPTIONS

OPTION 1 – SIGNALIZED INTERSECTION WITH PARALLEL INTERPARCEL ROADS (see figure 12)



OPTION 2 – TWO LANE TURBO ROUNDABOUT



OPTION 3 – MEDIAN U-TURN CROSSOVERS

TABLE 9: SUMMARY OF OPTIONS FOR MIDDLE INTERSECTION

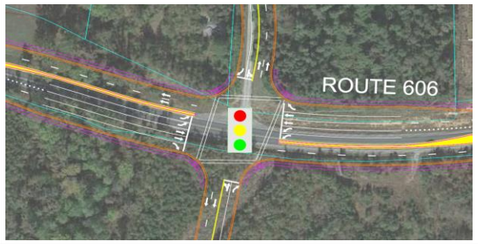
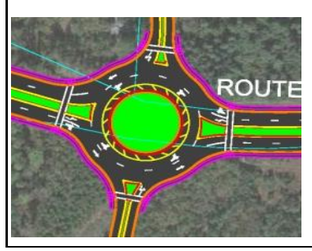
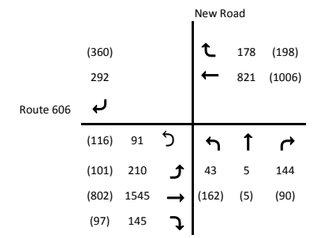
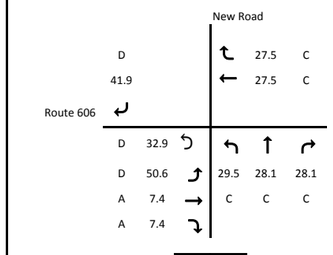
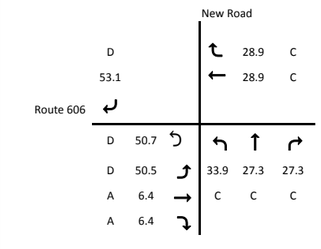
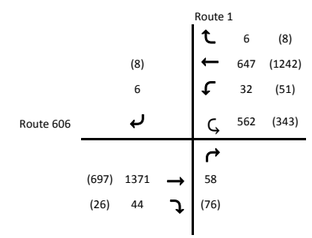
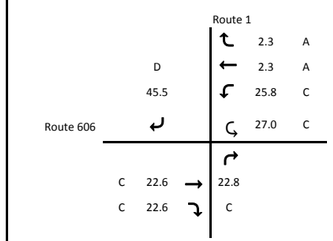
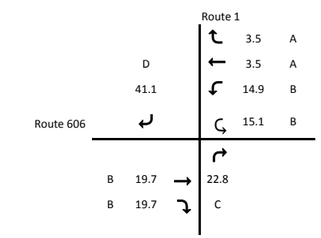
Option	Pros	Cons	Traffic Operations		
			2038 Traffic Volumes*	2038 AM Peak Hour - Delay and LOS**	2038 PM Peak Hour - Delay and LOS**
OPTION 1 - SIGNALIZED INTERSECTION with PARALLEL INTERPARCEL ROADS Construct signalized intersection. Construct parallel interparcel roads between Dan Bell Lane and new intersection. Parallel interparcel roads are north and south of Route 606 to accommodate truck U-turns. Includes widening of Route 606 to four lanes with a raised median and access management.  	Conventional Design All U-turns can be accommodated along the corridor.	Requires construction of parallel interparcel roads north and south of Route 606. Additional challenges in funding the parallel interparcel roads. Most capital intensive option. Trucks must use the parallel interparcel roads in lieu of left turn movements to/from Route 606.	New Road 178 (198) (229) (5) (262) 460 (756) 73 5 453 152 (224) Route 606 84 (51) (116) 91 (133) 292 61 5 144 (432) 906 (200) (5) (90) (92) 140 * Volumes calculated by Baker	New Road 10.8 B C E E 35.9 D Route 606 22.6 56.3 56.3 92.0 F 48.7 D C 33.6 F 83.6 44.5 44.5 38.1 D 37.4 D D D B 15.8 Overall Intersection 44.7 D **Results from Baker - 2000 HCM using Synchro	New Road 12.1 B C E E 31.1 C Route 606 28.4 61.1 61.1 73.1 E 29.4 C E 58.7 F 98.4 63.4 63.4 29.3 C 28.6 E E C B 16.3 Overall Intersection 41.5 D **Results from Baker - 2000 HCM using Synchro
OPTION 2A - TWO LANE TURBO ROUNDABOUT Construct two-lane roundabout. No parallel interparcel roads. Includes widening of Route 606 to four lanes with a raised median and access management. 	Does not require parallel interparcel roads. Safer than a conventional traffic signal.	Roundabout operates at LOS E in 2038 without a signal at Dan Bell Lane.	New Road 178 (198) (229) (5) (126) 478 (794) 73 5 214 112 (172) Route 606 363 (239) (116) 91 (101) 210 43 5 144 (464) 988 (162) (5) (90) (92) 140 * Volumes calculated by Baker	New Road 7.5 A B B B 7.3 A 13.3 13.2 19.7 14.7 B Route 606 17.3 B F 125.6 F 122.9 36.7 30.1 30.2 F 113.9 D C C F 112.9 Overall Intersection 62.3 E **Results from Sidra	New Road 11.2 B B B B 11.4 B 11.2 11.1 17.6 19.0 B Route 606 21.6 C B 18.6 B 15.9 104.1 97.6 97.7 A 8.5 F F F A 8.4 Overall Intersection 24.4 C **Results from Sidra
OPTION 2B - TWO-LANE TURBO ROUNDABOUT PLUS DAN BELL LANE SIGNAL Construct two-lane roundabout. Signalized intersection at Dan Bell Lane. No parallel interparcel roads. Includes widening of Route 606 to four lanes with a raised median and access management.  	Does not require parallel interparcel roads. Roundabout is expected to operate at LOS C or better for both peak periods in 2038. All U-turns can be accommodated along the corridor. Signal at Dan Bell Lane can be delayed until warranted. Results in significant operational improvements at the middle intersection over Option 2A.	Adds a closely spaced signal adjacent to the I-95 interchange which will require coordination.	New Road 178 (198) (229) (5) (126) 478 (794) 73 5 214 112 (172) Route 606 200 (127) (116) 91 (101) 210 43 5 144 (464) 988 (162) (5) (90) (92) 140 * Volumes calculated by Baker	New Road 7.3 A A A B 7.3 A 8.6 6.9 13.4 14.6 B Route 606 17.2 B D 41.2 C 38.5 36.1 29.6 29.7 C 29.7 D C C C 28.7 Overall Intersection 22.4 C **Results from Sidra	New Road 9.5 A B B B 9.8 A 11.0 11.5 18.0 17.1 B Route 606 19.7 B B 16.3 B 13.7 16.1 9.6 9.7 A 6.7 B A A A 6.7 Overall Intersection 11.4 B **Results from Sidra

TABLE 9: SUMMARY OF OPTIONS FOR MIDDLE INTERSECTION (CONT.)

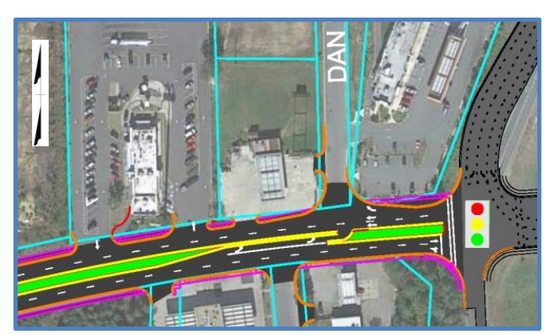
Option	Pros	Cons	Traffic Operations		
			2038 Traffic Volumes (Easternmost Intersection)*	2038 AM Peak Hour - Delay and LOS (Easternmost Intersection)**	2038 PM Peak Hour - Delay and LOS (Easternmost Intersection)**
OPTION 3 - MEDIAN U-TURN CROSSOVERS Median U-Turn Crossovers. Construct a pair of signalized intersections providing median two-lane U-turn crossovers. The westernmost intersection also provides ingress access to new access south of Route 606. The easternmost intersection provides left turn ingress access to new access north of Route 606 and left turn egress to new access south of Route 606. No parallel interparcel roads. Includes widening of Route 606 to four lanes with a raised median and access management. Includes ingress left turn lane into Taco Bell entrance to improve property access. 	All U-turns can be accommodated along the corridor. Both intersections are expected to operate at LOS C or better for both peak periods in 2038.	Wide median required along Route 606. Access to large parcel south of Route 606 is divided among multiple entrances with different restrictive movements.	 * Volumes calculated by Baker	 **Results from Baker - 2000 HCM using Synchro	 **Results from Baker - 2000 HCM using Synchro
			2038 Traffic Volumes (Westernmost Intersection)*	2038 AM Peak Hour - Delay and LOS (Westernmost Intersection)**	2038 PM Peak Hour - Delay and LOS (Westernmost Intersection)**
			 * Volumes calculated by Baker	 **Results from Baker - 2000 HCM using Synchro	 **Results from Baker - 2000 HCM using Synchro

DAN BELL LANE INTERSECTION

The proposed design volumes for the intersection are shown in Table 10. Allowing full access at the intersection is expected to result in the intersection operating at LOS F during both peak periods in 2038 if the level of development assumed in Chapter 3 occurs. Two options were looked at to mitigate the congestion. Option 1 involves adding a raised median that prohibits left turns from Dan Bell Lane to Route 606. There would be a median break that allows eastbound left turns onto Dan Bell Lane. Under Option, 1 the intersection would operate at LOS A during both peak periods. Option 2 involves adding a raised median but providing a median break that maintains full access to Dan Bell Lane. The intersection would need to be signalized. Under Option 2, the intersection would operate at LOS B during both peak periods. Queuing would be expected between the I-95 southbound ramp termini intersection and the Dan Bell Lane signalized intersection.

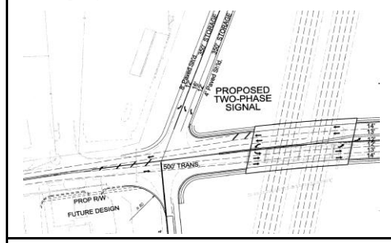
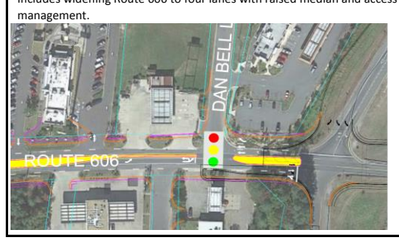
FIGURE 16: DAN BELL LANE INTERSECTION OPTIONS

OPTION 1 – LEFT IN ONLY & UNSIGNALIZED



OPTION 2 – FULL ACCESS & SIGNAL

TABLE 10: SUMMARY OF OPTIONS FOR DAN BELL LANE INTERSECTION

Options	Pros	Cons	Traffic Operations		
			2013 Traffic Volumes*	2013 AM Peak Hour - Delay and LOS**	2013 PM Peak Hour - Delay and LOS
EXISTING CONDITION	None	None	Dan Bell Ln: (52) (45) / 12 30 ↰ ↳; ← 40 (86); ← 285 (693) I-95 SB Ramp: (434) (1) (12) / ↲ ↓ ↳; ← 203 (355); ↶ 18 (30) Route 606: (38) 12 ↱; (355) 844 →; (274) 607 →; (126) 284 ↴ *Volumes from I-95/Route 606 Interchange Improvements IJR	Dan Bell Ln: C C / 24.4 24.4 ↰ ↳; ← 0.0 C; ← 0.0 C I-95 SB Ramp: B F F / ↲ ↓ ↳; ← 3.1 A; ↶ 3.1 A Route 606: A 0.3 ↱; A 0.0 →; A 0.0 →; A 0.0 ↴ 1.0 A Overall Intersection 2.5 A **Results from Baker - 2000 HCM using Synchro	Dan Bell Ln: C C / 27.3 27.3 ↰ ↳; ← 0.0 A; ← 0.0 A I-95 SB Ramp: C C C / ↲ ↓ ↳; ← 1.4 A; ↶ 1.4 A Route 606: A 1.6 ↱; A 0.0 →; A 0.0 →; A 0.0 ↴ 2.6 A Overall Intersection 8.5 A **Results from Baker - 2000 HCM using Synchro
			2038 Traffic Volumes	2038 AM Peak Hour - Delay and LOS**	2038 PM Peak Hour - Delay and LOS**
NO-BUILD OPTION No additional improvements than the proposed I-95/Rout 606 Interchange Improvements from the IJR.  	Improved operations over existing conditions.	Dan Bell Intersection is expected to operate at LOS F as an unsignalized intersection in 2038. I-95 SB ramps intersection is expected to operate at LOS F with only one westbound through lane.	Dan Bell Ln: (176) (112) / 56 163 ↰ ↳; ← 130 (210); ← 776 (1065) I-95 SB Ramp: (595) (5) (315) / ↲ ↓ ↳; ← 440 (680); ↶ 260 (340) Route 606: (95) 115 ↱; (739) 1467 →; (520) 1025 →; (209) 451 ↴ *Volumes from I-95/Route 606 Interchange Improvements IJR with some modifications to balance volumes	Dan Bell Ln: F F / >900 >900 ↰ ↳; ← 0.0 A; ← 0.0 A I-95 SB Ramp: F F F / ↲ ↓ ↳; ← 3.8 A; ↶ 456.8 F Route 606: B 11.4 ↱; B 11.4 →; F 342.0 →; F 342.0 ↴ 815.6 F Overall Intersection 317.0 F **Results from Baker - 2000 HCM using Synchro	Dan Bell Ln: F F / >900 >900 ↰ ↳; ← 0.0 A; ← 0.0 A I-95 SB Ramp: F E E / ↲ ↓ ↳; ← 7.1 A; ↶ 387.4 F Route 606: A 6.9 ↱; A 6.9 →; F 224.0 →; F 224.0 ↴ 1203.0 F Overall Intersection 297.8 F **Results from Baker - 2000 HCM using Synchro
			2038 Traffic Volumes*	2038 AM Peak Hour - Delay and LOS**	2038 PM Peak Hour - Delay and LOS**
OPTION 1 - IJR Design and Unsignalized intersection with Dan Bell Ln Includes widening Route 606 to four lanes with raised median and access management. 	Intersections expected to operate at LOS D or better during both peak periods in 2038. Least capital intensive option.	The lack of a left turn egress at Dan Bell Lane requires a large number of vehicles to make a U-turn at the middle intersection. These additional U-turn vehicles cause the Roundabout Option to fail by 2038.	Dan Bell Ln: (288) / 219 ↰ ↳; ← 130 (210); ← 776 (1065) I-95 SB Ramp: (595) (5) (315) / ↲ ↓ ↳; ← 440 (680); ↶ 260 (340) Route 606: (87) 115 ↰; (95) 115 ↱; (739) 1467 →; (520) 1025 →; (209) 451 ↴ *Volumes from I-95/Route 606 Interchange Improvements IJR with some modifications to balance volumes	Dan Bell Ln: C / 15.4 ↰ ↳; ← 0.0 A; ← 0.0 A I-95 SB Ramp: D E E / ↲ ↓ ↳; ← 5.0 A; ↶ 123.2 F Route 606: B 11.6 ↰; B 11.6 ↱; A 0.0 →; C 33.1 →; C 33.1 ↴ 1.7 A Overall Intersection 45.3 D **Results from Baker - 2000 HCM using Synchro	Dan Bell Ln: D / 28.1 ↰ ↳; ← 0.0 A; ← 0.0 A I-95 SB Ramp: E C C / ↲ ↓ ↳; ← 15.2 B; ↶ 67.1 E Route 606: B 14.7 ↰; B 14.7 ↱; A 0.0 →; D 54.4 →; D 54.4 ↴ 4.0 A Overall Intersection 44.9 D **Results from Baker - 2000 HCM using Synchro
			2038 Traffic Volumes*	2038 AM Peak Hour - Delay and LOS**	2038 PM Peak Hour - Delay and LOS**
OPTION 2 - IJR Design with combined Signal with Dan Bell Ln Includes widening Route 606 to four lanes with raised median and access management.  	Signal can be delayed until warranted by roundabout congestion. Results in signifiant operational improvements at the middle intersection over the unsignalized alternative.	Adds a closely spaced signal adjacent to the I-95 interchange which will require coordination. Intersection spacing violates VDOT Access Management Guidelines.	Dan Bell Ln: (176) (112) / 56 163 ↰ ↳; ← 130 (210); ← 776 (1065) I-95 SB Ramp: (595) (5) (315) / ↲ ↓ ↳; ← 440 (680); ↶ 260 (340) Route 606: (87) 115 ↰; (95) 115 ↱; (617) 1296 →; (520) 1025 →; (209) 451 ↴ *Volumes from I-95/Route 606 Interchange Improvements IJR with some modifications to balance volumes	Dan Bell Ln: C C / 25.0 31.3 ↰ ↳; ← 15.5 C; ← 22.0 C I-95 SB Ramp: D E E / ↲ ↓ ↳; ← 5.0 A; ↶ 123.2 F Route 606: C 31.2 ↰; C 31.2 ↱; A 7.8 →; C 33.1 →; C 33.1 ↴ 16.2 B Overall Intersection 45.3 D **Results from Baker - 2000 HCM using Synchro	Dan Bell Ln: D D / 35.0 39.2 ↰ ↳; ← 11.8 B; ← 17.2 B I-95 SB Ramp: E C C / ↲ ↓ ↳; ← 15.2 B; ↶ 67.1 E Route 606: D 43.3 ↰; D 43.3 ↱; A 4.1 →; D 54.4 →; D 54.4 ↴ 17.7 B Overall Intersection 44.9 D **Results from Baker - 2000 HCM using Synchro

CHAPTER 5 RECOMMENDATIONS

5.1 RECOMMENDED IMPROVEMENTS (PHASE 1)

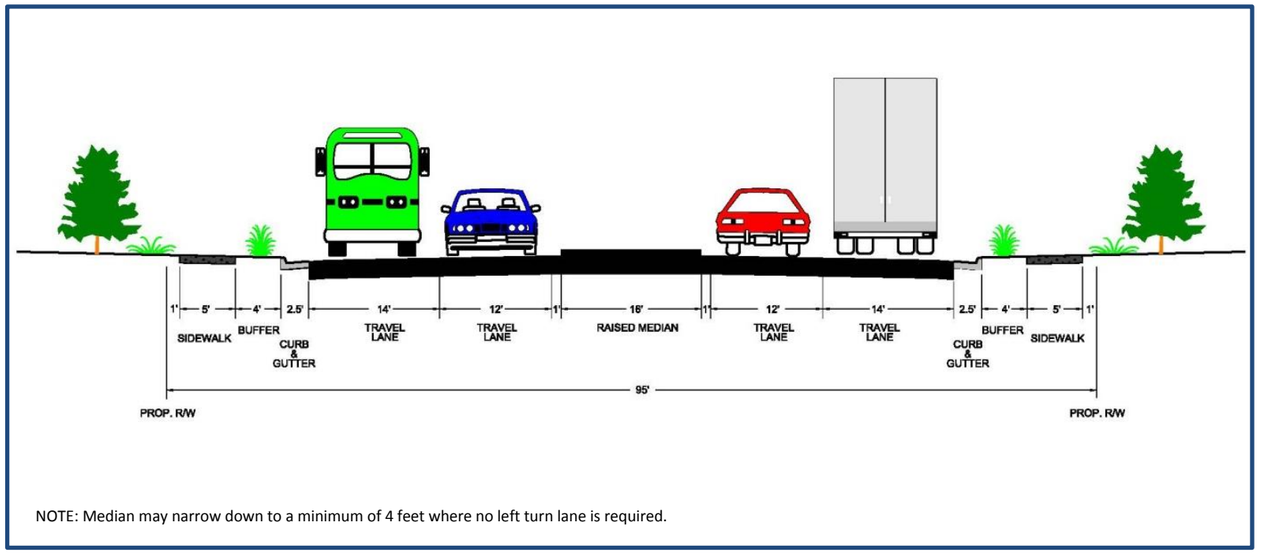
The first phase of improvements is based on the evaluation of options in Chapter 4. The project team chose the options that provided the best operating conditions, met the goals of the corridor, and could be implemented in the short-term based on budget and feasibility. The chosen options were combined to develop the Corridor Management Plan for Route 606 west of I-95. The proposed improvements will tie into the planned improvements at the I-95 Interchange which include widening the bridge over the interstate to six lanes.

The Phase 1 recommended improvements include widening Route 606 to four lanes with a 16-foot raised median separating directions of travel. The proposed typical section includes 14-foot outside lanes to accommodate bicycle travel and five foot sidewalks for pedestrians. Figure 17 shows the proposed typical section and required 95 foot right-of-way. In areas where no future left turn lane is needed the raised median could be reduced to a minimum of 4 feet. Figure 18 shows the plan layout of the four-lane divided highway. The raised median would prevent left turns into and out of properties along Route 606 unless a median break is provided. Median breaks should be provided at Dan Bell Lane and at the Post Office to allow left turns in and U-turns. A minimum 100 feet of storage should be provided for these left turn lanes. A "turbo" roundabout with two lanes in the major direction (east/west) and only one circulating lane for the minor direction (north/south) is recommended as a new intersection in the middle of the corridor to provide access to undeveloped parcels north and south of the corridor and opportunities for U-turns.

Option 1 for the Route 1/Route 606 intersection shown in Chapter 4 was modified for Phase 1 to meet short term budget goals by removing the improvements to the west leg of the intersection and one of the recommended westbound left turn lanes. The recommended option is shown in Figure 18 and now includes three westbound lanes; a left turn lane, a through lane and a right turn lane. Two eastbound departure lanes would also be provided. To account for the ultimate Phase 2 configuration shown in Figure 22, space for a fourth westbound lane should be provided for future use when additional improvements to the west leg of the intersection can be made. The extra pavement would be built with this project as it would set the south side curb and gutter and storm water system for the ultimate intersection improvements but would be initially striped out. The single westbound left turn lane requires approximately 600 feet of storage. However, the ultimate configuration will include two westbound left turn lanes so 300 feet of storage should be provided as part of the Route 606 widening. The Poco Loco Restaurant, parcel number 80 (Figure 7), would potentially need to be acquired as part of the intersection improvements. Decisions on property acquisition will be made during final design of the recommended improvements.

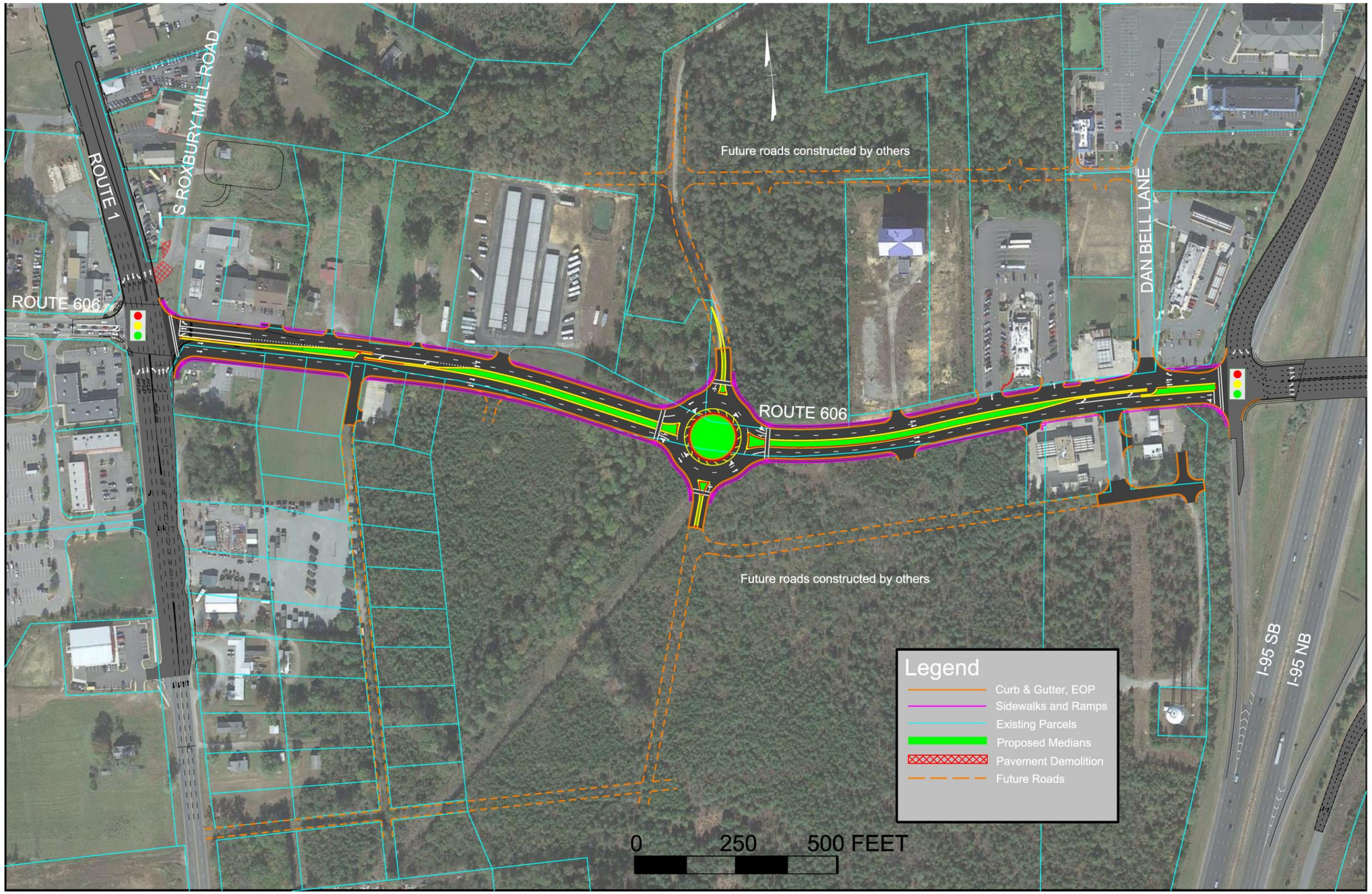
Access management should be implemented along the corridor as part of the Phase 1 improvements. Entrances to the Valero Gas Station would be relocated to the adjacent existing access road to water tower. One of the entrances to the Citgo Gas Station would also be relocated to the adjacent access road. These access changes are necessary due to providing proper curb radii at the access road once Route 606 is widened and to better meet VDOT access management guidelines. Multiple driveways to residential parcels should also be consolidated to single entrances. The three driveways at the 7-Eleven should be consolidated into a single driveway to minimize conflicting traffic at the Route 1/Route 606 intersection. Additional access changes may be considered during final design of the roadway. A new entrance to the post office is needed off a new access road due to impacts from the widening of Route 606. This new access road can also provide access for future development.

FIGURE 17: RECOMMENDED TYPICAL SECTION FOR ROUTE 606



NOTE: Median may narrow down to a minimum of 4 feet where no left turn lane is required.

FIGURE 18: RECOMMENDED IMPROVEMENTS (PHASE 1)



5.2 TRAFFIC VOLUMES AND OPERATIONS FOR RECOMMENDED IMPROVEMENTS (PHASE 1)

For the analysis of the Phase 1 recommendations, future 2038 peak hour traffic volumes and level of service were taken from the *I-95/VA Route 606 Interchange Bridge Replacement Interchange Modification Report* for the intersections of Route 1/Route 606 and the I-95 SB ramp termini. The trips generated in Chapter 3 for the assumed land use were added to existing driveway volumes to get turn movements along the corridor. New driveways were also assumed at several locations along the corridor for the new development. Volumes between intersections and driveways were balanced. The 2038 AM and PM peak hour turn movement volumes are shown in Figure 19. Truck percentages along Route 606 west of I-95 are expected to remain 8% for the AM peak hour and 5% for the PM peak hour. The average daily traffic on Route 606 is projected to increase to 21,000 vehicles while Dan Bell Lane is expected to carry 5,600 vehicles per day.

Future traffic volumes with the recommended Phase 1 improvements were analyzed in Synchro using the HCM module for both the AM and PM peak hours. Delay and level of service (LOS) results for the Phase 1 improvements are shown in Figure 20 for the 2038 AM peak hour and Figure 21 for the 2038 PM peak hour. During the AM peak hour, traffic operates at LOS A on the 606 mainline at all locations except the Route 1 signalized intersection and the I-95 southbound ramps. The Phase 1 recommendations consolidate many existing access points and eliminate most of the left turn movements from developments or residential properties. These improvements will cause all of the entrances/exits to these developments to operate at a LOS C or better during the AM peak hour.

The signalized intersection of Route 1 is expected to operate with an overall LOS of F with all movements operating at LOS D or worse even with the recommended improvements as part of this project. The recommendations in this report do allow for future improvements at this location. The proposed roundabout in the center of the corridor is projected to operate with an overall LOS E during the AM peak hour with all of the movements of the eastbound approach operating at LOS F and a queue length projected to extend back to the Route 1 intersection. This is due the high number of vehicles from the southbound leg generated by the expected development north of Route 606 that cause the westbound approach to yield. The northbound left turn movement is expected to operate at a LOS D with the remaining movements expected to operate at a LOS C or better. During the AM peak hour, the intersection of Route 606 with Dan Bell Lane is expected to operate at an overall LOS A with all movements operating with a LOS B or better.

During the PM peak hour, operations are similar to the AM peak hour; traffic is expected to operate at LOS A on the Route 606 mainline at all locations except the Route 1 signalized intersection, the roundabout and at the I-95 southbound ramps. All minor movements from driveways or development access points are expected to operate at a LOS C or better. The signalized intersection at Route 1 is projected to operate at an overall LOS F with all of the left turn movements operating at LOS E or worse. The westbound and southbound through movements are projected to operate at a LOS D while the remaining movements are expected to operate at LOS C or better. The proposed roundabout is projected to operate with an overall LOS C during the PM peak hour with all of the movements of the northbound approach operating at LOS D. The remaining movements are projected to operate at LOS B or better. During the PM peak hour, the Dan Bell Lane intersection is expected to operate at an overall LOS A with all movements operating with a LOS B or better.

FIGURE 19: 2038 PEAK HOUR TRAFFIC VOLUMES WITH RECOMMENDED PHASE 1 IMPROVEMENTS

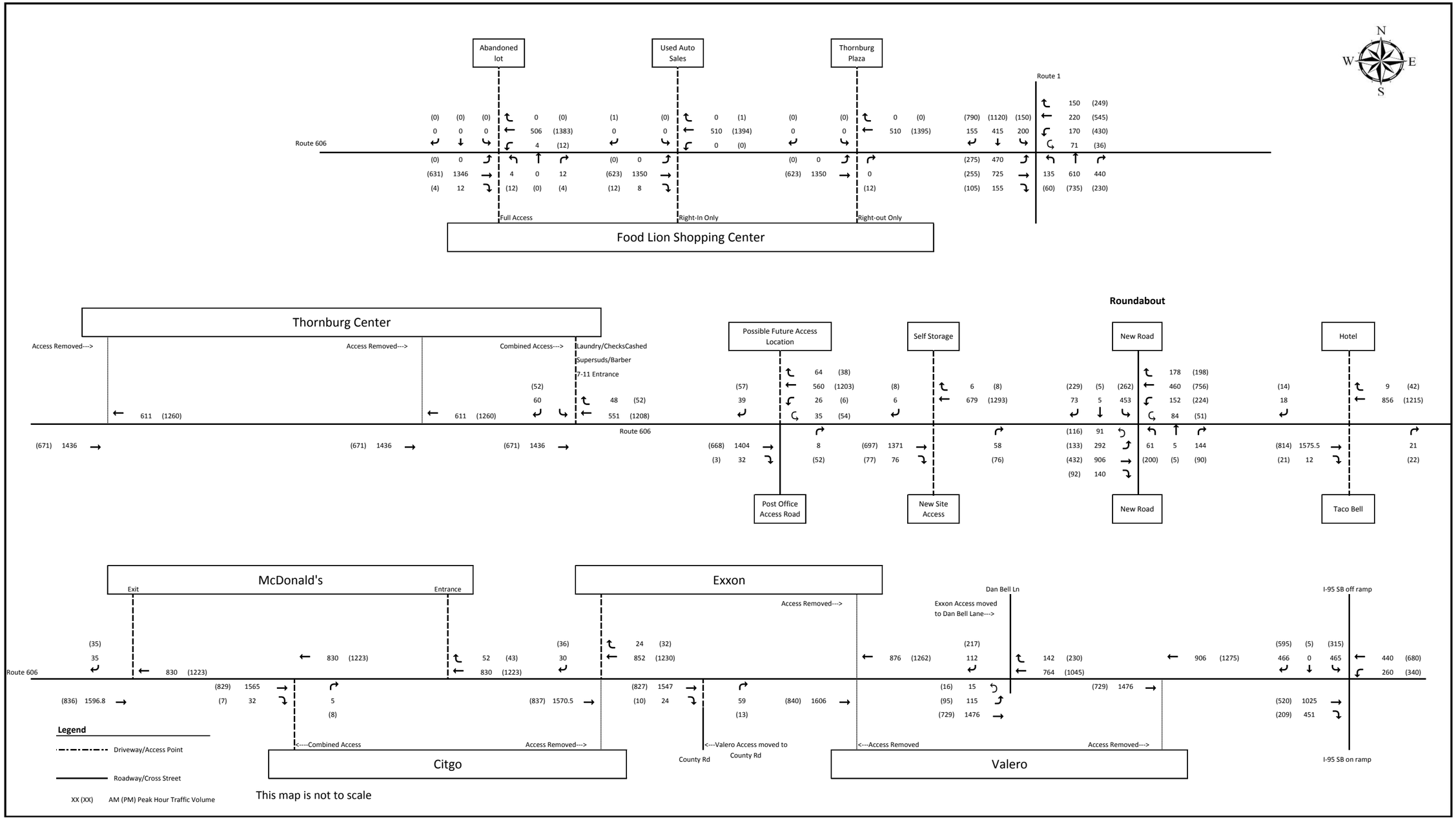


FIGURE 20: 2038 AM PEAK HOUR DELAY AND LEVEL OF SERVICE WITH RECOMMENDED PHASE 1 IMPROVEMENTS

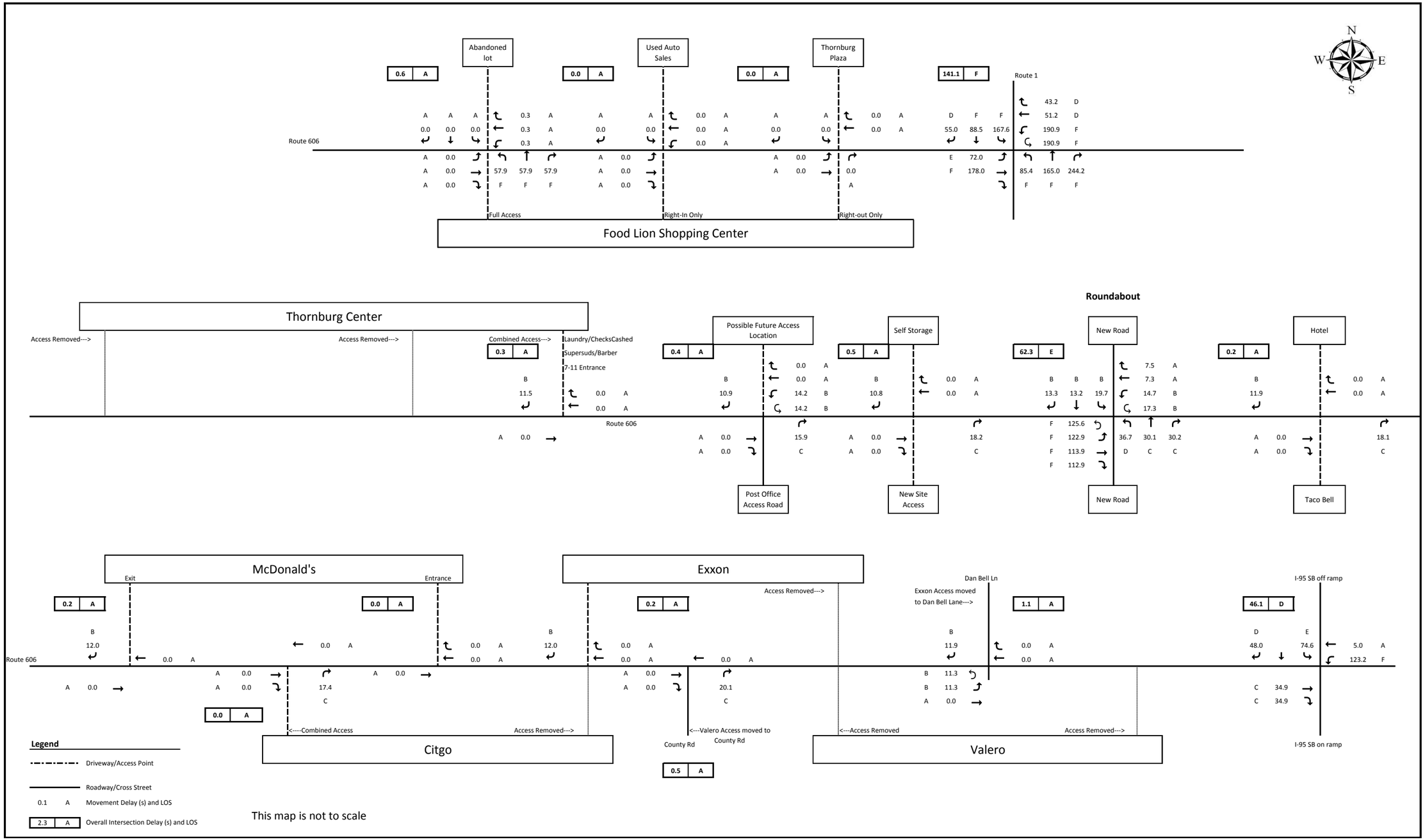
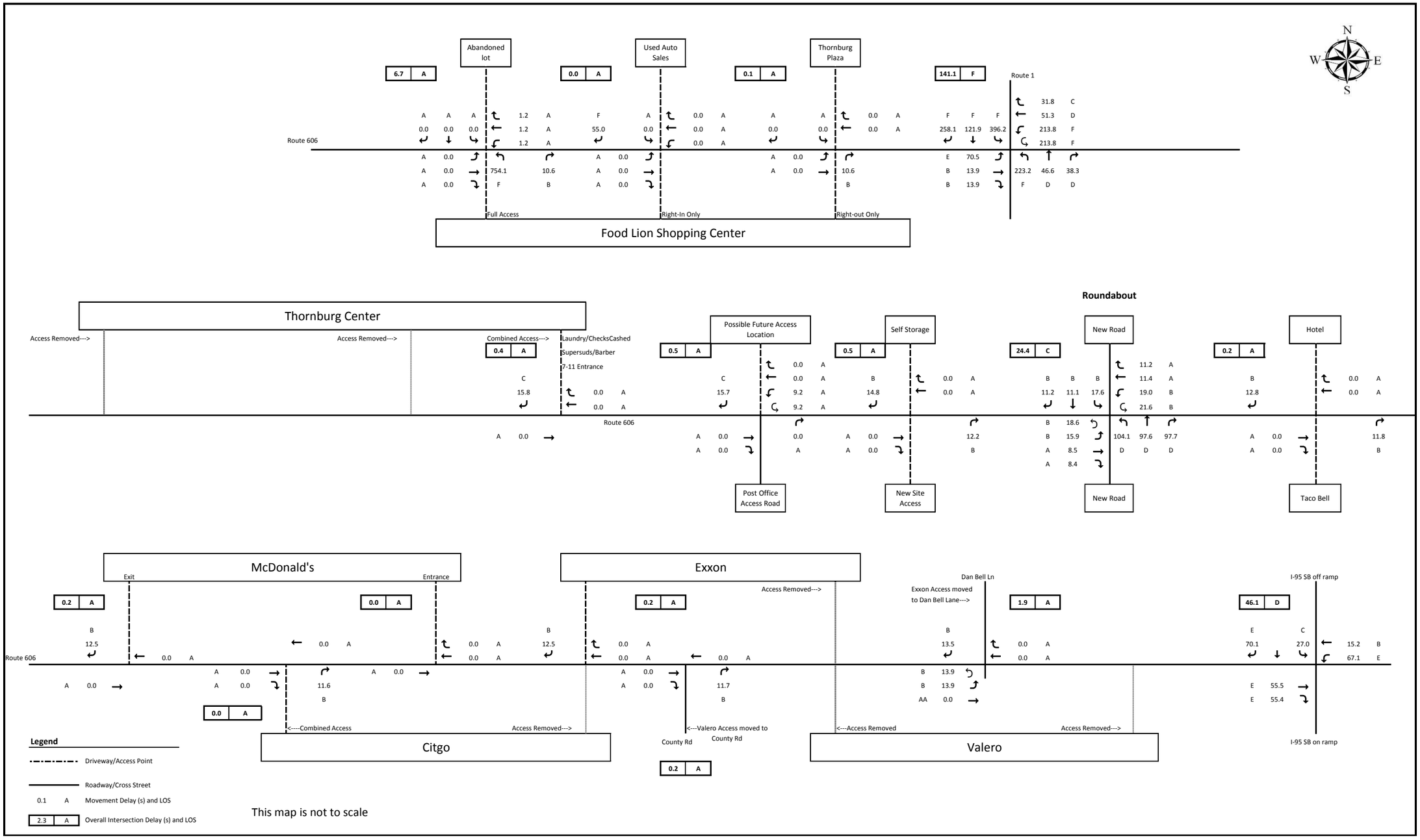


FIGURE 21: 2038 PM PEAK HOUR DELAY AND LEVEL OF SERVICE WITH RECOMMENDED PHASE 1 IMPROVEMENTS



5.3 POTENTIAL FUTURE IMPROVEMENTS (PHASE 2)

If future development occurs at the level assumed in Chapter 3 and result in the traffic volumes shown in Figure 19, then additional improvements are going to be needed to Route 606. Potential Phase 2 future improvements include widening the west leg of the Route 1/ Route 606 intersection. The ultimate intersection improvement is shown in Figure 22. Additional property acquisitions will be required to widen the intersection. Operations at the roundabout, particularly the western leg, could be improved in Phase 2 by adding an eastbound through lane through the roundabout that would taper down to the two lane cross section just east of the roundabout as shown in Figure 23. Operations could also be improved by allowing full signalized access at Dan Bell Lane. The signal at Dan Bell Lane would need to be coordinated with the I-95 SB ramp termini intersection signal. These Phase 2 improvements should be implemented when the LOS at these locations degrades to LOS E.

FIGURE 22: POTENTIAL FUTURE IMPROVEMENTS (PHASE 2)
ROUTE 1 / ROUTE 606 INTERSECTION CONFIGURATION

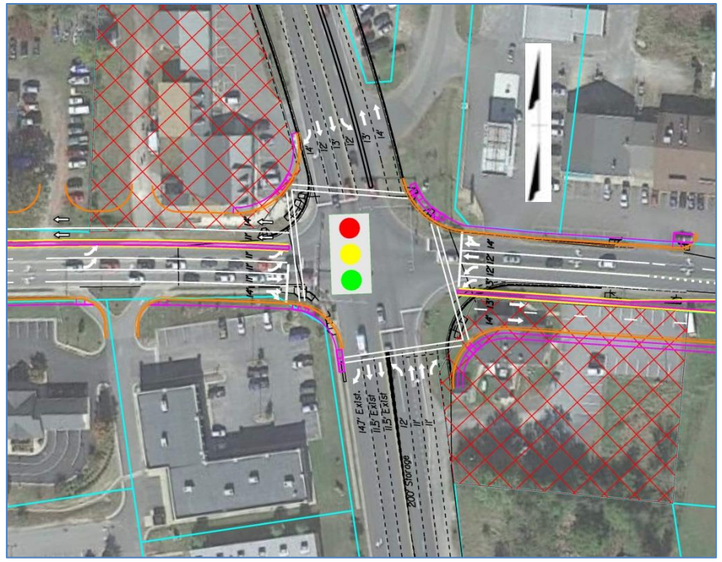


FIGURE 23: POTENTIAL FUTURE IMPROVEMENTS (PHASE 2)
ROUNDABOUT CONFIGURATION

5.4 NEXT STEPS

The next steps for the Corridor include:

1). Present the Route 606 Corridor Study recommendations to the Spotsylvania Transportation Committee and seek concurrence with the recommendations. Concurrence with the recommendations was received by VDOT from the committee on March 12, 2015.

2). Continue development of Interchange Modification Report for I-95 Interchange improvements.

3). Continue the development of preliminary bridge plans for I-95 Bridge widening.

4). Develop preliminary engineering plans for Route 606 widening.

5). Coordinate with the county and local developers to implement the access management recommendations for the corridor as development occurs.