SOUTH HINGHAM TRANSPORTATION ASSESSMENT

Prepared for:

TOWN OF HINGHAM MASSACHUSETTS

December 2015

Prepared by:

VANASSE & ASSOCIATES, INC.
35 New England Business Center Drive, Suite 140
Andover, MA 01810
(978) 474-8800
www.rdva.com

CONTENTS

FIGURES

FIGURES (Continued)

TABLES

PREFACE

Vanasse & Associates, Inc. (VAI) has been retained by the Town of Hingham to conduct an assessment of the Derby Street corridor and its intersecting roadways and major driveways in order to ascertain the ability of the corridor to accommodate the potential build-out of vacant and underutilized properties in South Hingham. This assessment has been prepared in consultation with the South Hingham Study Group and the Massachusetts Department of Transportation (MassDOT), and incorporates the comments that have been received during the Study Group public meetings and in written correspondence.

South Hingham and the Derby Street corridor have been identified as areas where additional commercial and mixed-use development opportunities exist within the Town. The purpose of this assessment is to define the potential impact of these development opportunities on the transportation infrastructure and to develop a balanced approach of roadway improvements and traffic reduction strategies to accommodate future development while recognizing the potential impact that further development may have on already burdened residential roadways.

As a result of this assessment, specific improvements have been identified that expand upon those that are currently under design and for which funding has been committed or is being advanced. These expanded improvement measures should serve as guidance for future development projects in South Hingham with the goal of advancing elements of the improvements that may be commensurate with the impacts of a specific development proposal. In addition, suggested traffic management strategies have been offered to mitigate current and potential future traffic impacts along Gardner Street and Cushing Street.

INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted an assessment of the Derby Street corridor and its intersecting roadways and driveways to major commercial developments in support of the Town of Hingham's evaluation of the potential build-out of vacant and underutilized properties located in South Hingham. The purpose of this assessment is to: i) determine the ability of the Derby Street corridor to accommodate the additional traffic demands that will be associated with projected future development; and ii) identify specific improvements that may be necessary to facilitate the safe and efficient movement of vehicles, pedestrians and bicyclists.

The scope of this assessment was developed and refined through working meetings with the South Hingham Study Group and represents a collaborative effort between the Town of Hingham, its residents and property/business owners. As defined by the Study Group, five (5) specific development areas were identified within which four (4) potential build-out scenarios ranging from the approximately 605,000 square feet (sf) of new mixed-use space to 3.58 million sf of new development were evaluated with regard to their impacts on the Derby Street corridor and the following specific areas:

As a result of this evaluation, the location of capacity constraints along the Derby Street corridor have been identified and specific recommendations for improvements are provided that are designed to accommodate potential future development in South Hingham without overburdening neighborhood streets.

STUDY METHODOLOGY

This study was prepared in consultation with the Town of Hingham and the Massachusetts Department of Transportation (MassDOT); was performed in general accordance with methodologies outlined in MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports; and was conducted in three distinct stages.

The first stage involved an assessment of existing conditions in the study area and included an inventory of roadway geometrics; pedestrian and bicycle facilities; public transportation services; observations of traffic flow; and collection of daily and peak period traffic counts.

In the second stage of the study, traffic volumes were projected and analyzed for each of the potential build-out scenarios. Specific travel demand forecasts were developed for each scenario which were then added to the existing condition baseline traffic volumes. The traffic analysis conducted in stage two identifies projected roadway capacity, traffic safety, and access issues that should be considered for each of the defined development scenarios.

The third stage of the study presents and evaluates potential improvements to the transportation infrastructure that may be necessary to accommodate the potential build-out identified in stage two of the study.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in November 2015. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area for the Project was developed in consultation with the South Hingham Study Group and consisted of Derby Street and the following specific intersections which are listed below and depicted on Figure 1, with Figure 2 indicating roadway jurisdiction and functional classification:

1. Whiting Street (Route 53) at Derby Street and Gardner Street;
2. Whiting Street at Cushing Street;
3. Derby Street at Recreation Park Drive;
4. Derby Street at Cushing Street;
5. Derby Street at the Derby Street Shoppes Service Drive;
6. Derby Street at the Derby Street Shoppes Right-Turn Driveway;
7. Derby Street at the Derby Street Shoppes Main Driveway
8. Derby Street at Old Derby Street North
9. Derby Street at Old Derby Street South
10. Derby Street at the Route 3 Northbound Ramps
11. Derby Street at the Route 3 Southbound Ramps; and
12. Derby Street at Pond Park Road.

The following describes the study area roadways and intersections.

Roadways

Whiting Street (Route 53)

- Two to four lane urban minor arterial roadway under MassDOT jurisdiction
- Traverses study area in a general northwest-southeast direction
- Provides four 12-foot wide travel lanes separated by a double-yellow centerline with 2-foot wide marked shoulders south of Gardner Street and two 14 to 15-foot wide travel lanes with 2-foot wide marked shoulders to the north, and additional turning lanes provided at major intersections

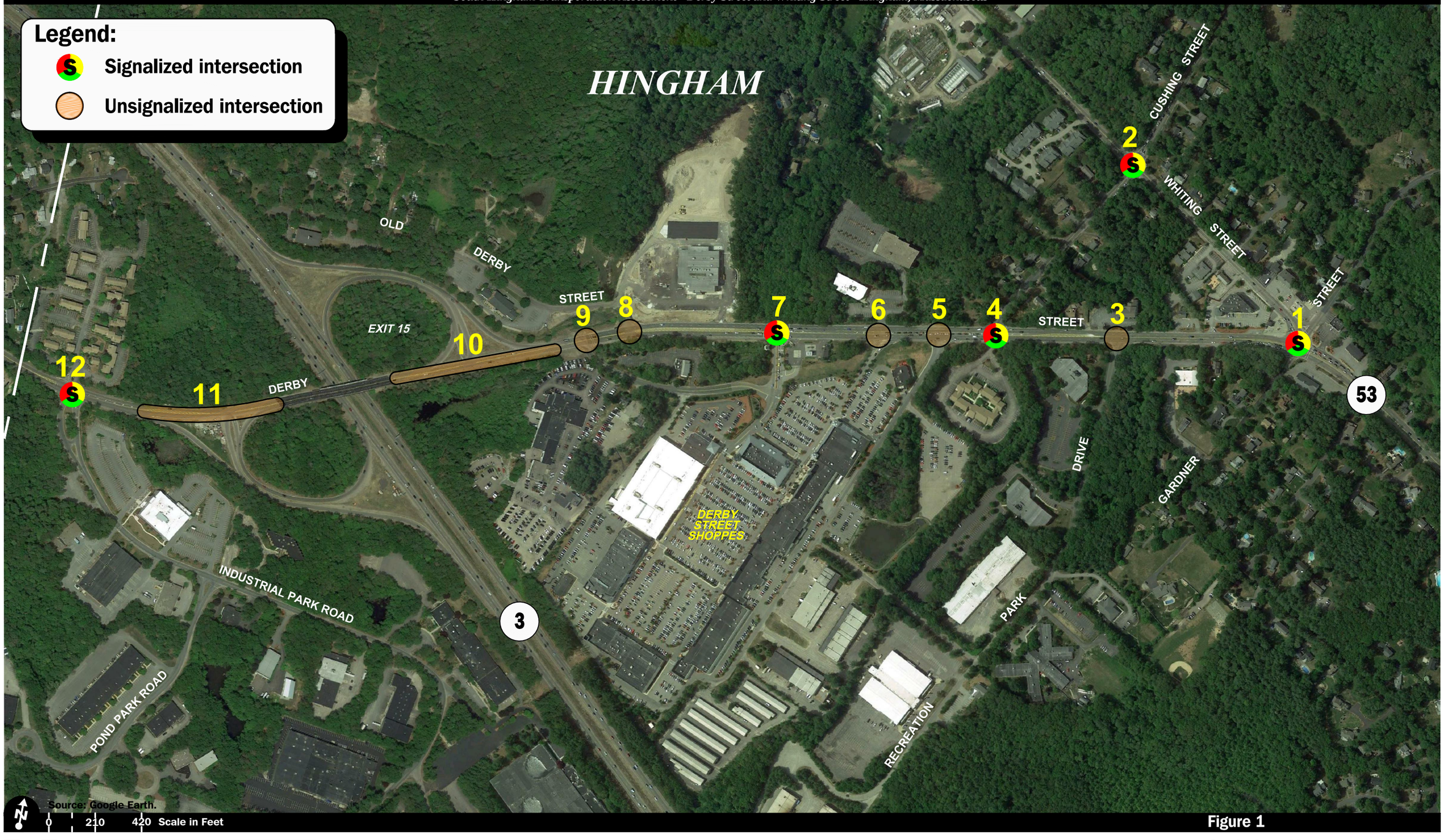
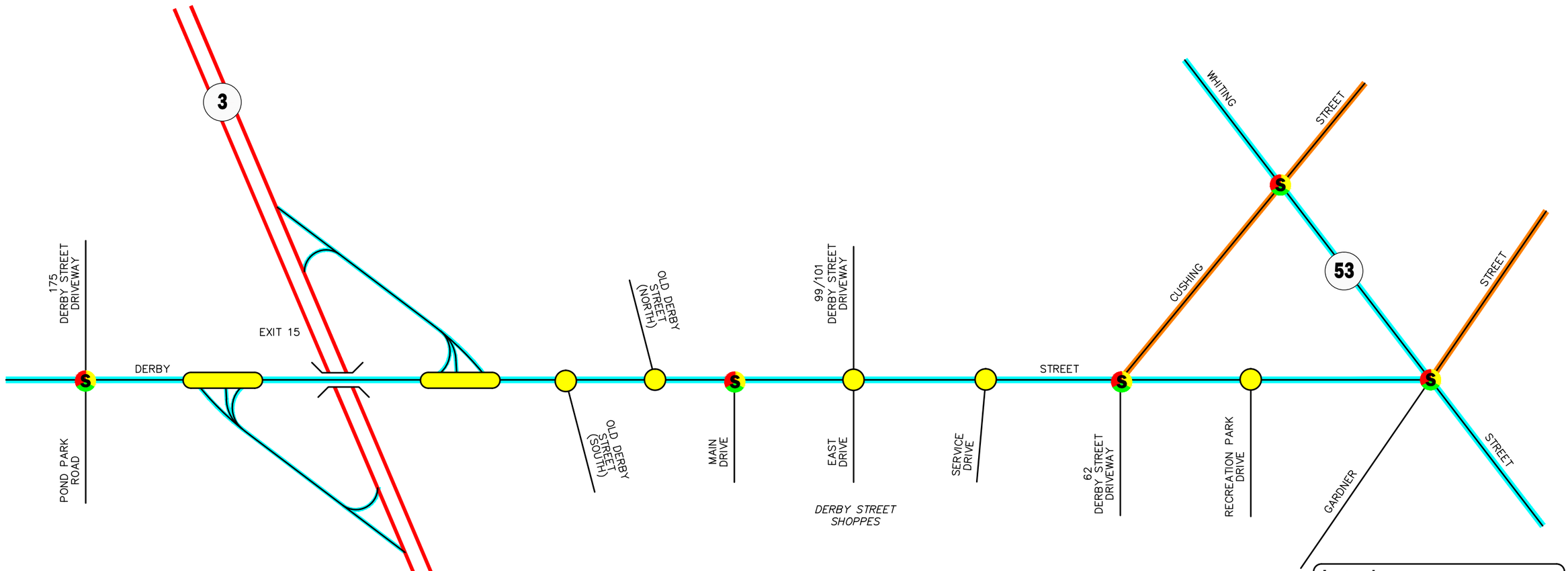


Figure 1

Study Area Map

Vanasse & Associates, Inc.
Transportation Engineers & Planners



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

N

Not To Scale

Figure 2

Roadway Jurisdiction and Functional Classification

Vanasse & Associates, Inc.
Transportation Engineers & Planners

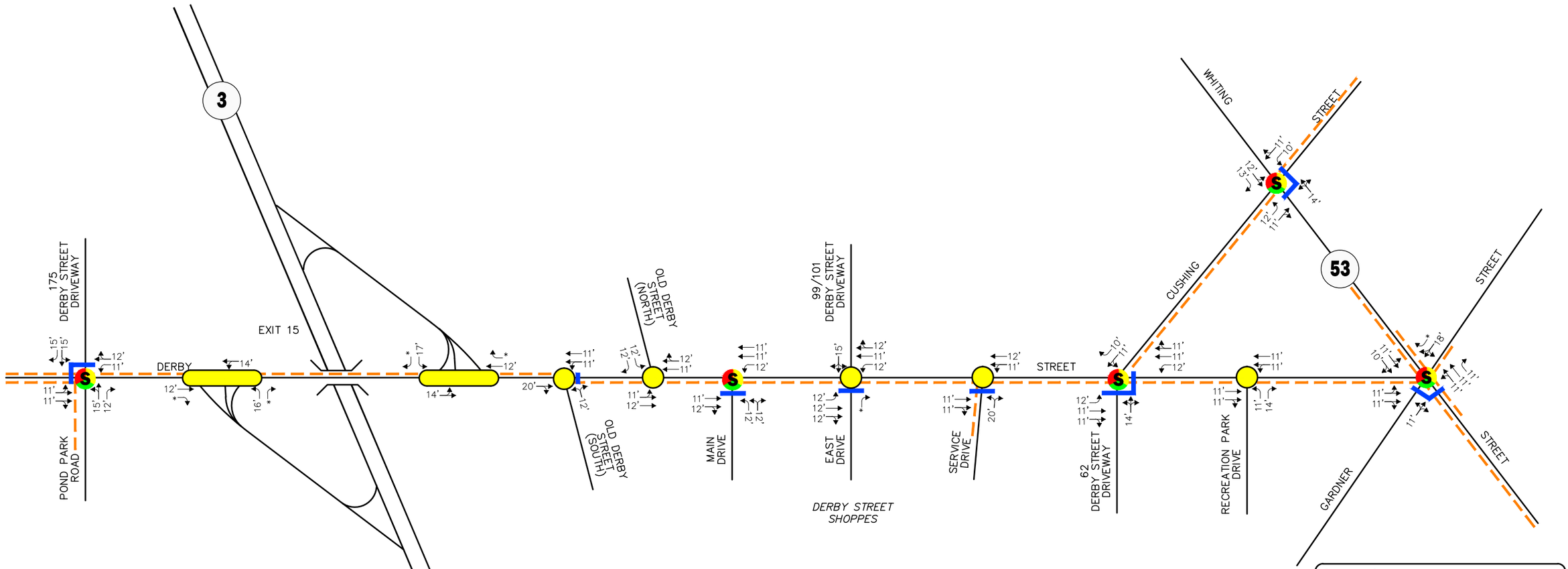
- A sidewalk is provided along one or both sides of the roadway with crossings provided at the Gardner Street and Cushing Street intersections, which are under traffic signal control
- Illumination is provided by way of street lights mounted on wood poles
- The posted speed limit varies between 30 and 35 miles per hour (mph) within the study area
- Land use consists of residential and commercial properties

Derby Street

- Two to four lane urban minor arterial roadway under MassDOT jurisdiction
- Traverses study area in a general east-west direction
- Provides a full access interchange with Route 3 (Exit 15)
- Provides four 11 to 12-foot wide travel lanes separated by a double-yellow centerline or center turn lane with 2-foot wide marked shoulders between Whiting Street and Old Derby Street, two 12-foot wide travel lanes with 3 to 10-foot wide marked shoulders between Old Derby Street and the Weymouth Town Line, and additional turning lanes provided at major intersections
- A sidewalk is provided along the south side of the roadway with crossings provided at Cushing Street (signalized intersection) and Old Derby Street South (unsignalized), where the sidewalk shifts to the north side.
- Illumination is provided by way of street lights mounted on wood poles
- The posted speed limit varies between 25 and 40 miles per hour (mph) within the study area
- Land use consists of commercial properties and areas of open and wooded space

Intersections

Table 1 and Figure 3 summarize lane use, traffic control, and pedestrian and bicycle accommodations at the study area intersections as observed in November 2015.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 3

Existing Intersection Lane Use, Travel Lane Width and Pedestrian Facilities

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Table 1
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Whiting St./Derby St./Gardner St.	TS	2 lanes on Whiting St. and Derby St.; 1 lane on Gardner St.	Yes; 2 feet on Whiting St. and Derby St.	Yes –both sides of Whiting St. and south side of Derby Street; crosswalks provided for crossing Whiting St. east leg and Gardner St. south leg	Yes - Shared travelled-way on Whiting St. and Derby St.[b]
Whiting St./Cushing St.	TS	1 lane on Whiting St. northbound; 1 through/left-turn lane and a right-turn lane on Whiting St. southbound; 1 left-turn lane and a through/right-turn lane on Cushing St.	Yes; 1 to 3 feet on all approaches	Yes – west side of Cushing St. north of intersection; east side of Cushing St. south of intersection; both sides of Whiting St. north of intersection; crosswalks provided for crossing Whiting St. west leg and Cushing St. south leg.	Yes - Shared travelled-way on all approaches
Derby St./Recreation Park Dr.	S	2 lanes on Derby St. and Recreation Park Dr.	Yes; 2 feet on Derby St.	Yes – south side of Derby St.	Yes - Shared travelled-way on Derby St.
Derby St./Cushing St.	TS	2 lanes on Derby St. with left-turn lanes provided;1 left-turn/through lane and 1 right-turn lane on Cushing St.; 1 lane on private dwy.	Yes; 2 feet on Derby St.	Yes – south side of Derby St. and east side of Cushing St.; traffic signal system includes pushbuttons, signal indications and phasing for crossing Derby St. west leg and private dwy.	Yes - Shared travelled-way on Derby St.
Derby St./Derby Street Shoppes Service Dr.	S	2 lanes on Derby St.; 1 lane on Service Dr.	Yes; 2 feet on Derby St.	Yes – south side of Derby St. and west side of Service Dr. with crosswalk across Service Dr.	Yes - Shared travelled-way on Derby St.
Derby St./Derby Street Shoppes Rt. Turn Dr.	S	2 lanes on Derby St. with center turn lane; 1 lane on Derby Street Shoppes Dr.	Yes; 2 feet on Derby St.	Yes – south side of Derby St. with crosswalk across Derby Street Shoppes Dr.	Yes - Shared travelled-way on Derby St.
Derby St./Derby Street Shoppes Main Dr.	TS	2 lanes on Derby St. with left-turn lane provided on westbound approach; 2 lanes on Derby Street Shoppes Dr.	Yes; 2 feet on Derby St.	Yes – south side of Derby St. with crosswalk across Derby Street Shoppes Dr.	Yes - Shared travelled-way on Derby St.
Derby St./Old Derby St. North	S	2 lanes on Derby St. and Old Derby St.	Yes; 2 feet on Derby St.	Yes – south side of Derby St. and north side west of Old Derby St.	Yes - Shared travelled-way on Derby St.
Derby St./Old Derby St. South	S	2 lanes on Derby St. westbound; 1 lane on Derby St. eastbound and Old Derby St.	Yes; 1-2 feet on Derby St.	Yes – south side of Derby St. east of Old Derby St. and north side to west; crosswalk across Derby St. east leg	Yes - Shared travelled-way on Derby St.

See notes at end of table.

Table 1 (Continued)
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Derby St./Rte. 3 Northbound Ramps	S/Y	1 lane on all approaches; right-turns to/from Rte. 3 are channelized	Yes; 2-10 feet on Derby St.; 1-2 feet on Rte. 3 ramps	Yes – north side of Derby St.	Yes - Shared travelled-way on Derby St.
Derby St./Rte. 3 Southbound Ramps	S/Y	1 lane on Derby St. westbound; 2 lanes on Derby St. eastbound; 1 lane on Rte. 3 ramps; right-turns to/from Rte. 3 are channelized	Yes; 2-10 feet on Derby St.; 1-2 feet on Rte. 3 ramps	Yes – north side of Derby St.	Yes - Shared travelled-way on Derby St.
Derby St./Pond Park Rd./175 Derby St.	TS	1 lane on Derby St. westbound with left-turn lane; 2 lanes on Derby St. eastbound Pond Park Rd. and 175 Derby St.	Yes; 2-4 feet on Derby St.; 1-2 feet on other approaches	Yes – north side of Derby St. east of intersection; both sides of Derby St. west of intersection; west side of Pond Park Rd.; traffic signal system includes pushbuttons, signal indications and phasing for crossing Derby St. west leg and 175 Derby St.	Yes - Shared travelled-way on Derby St.

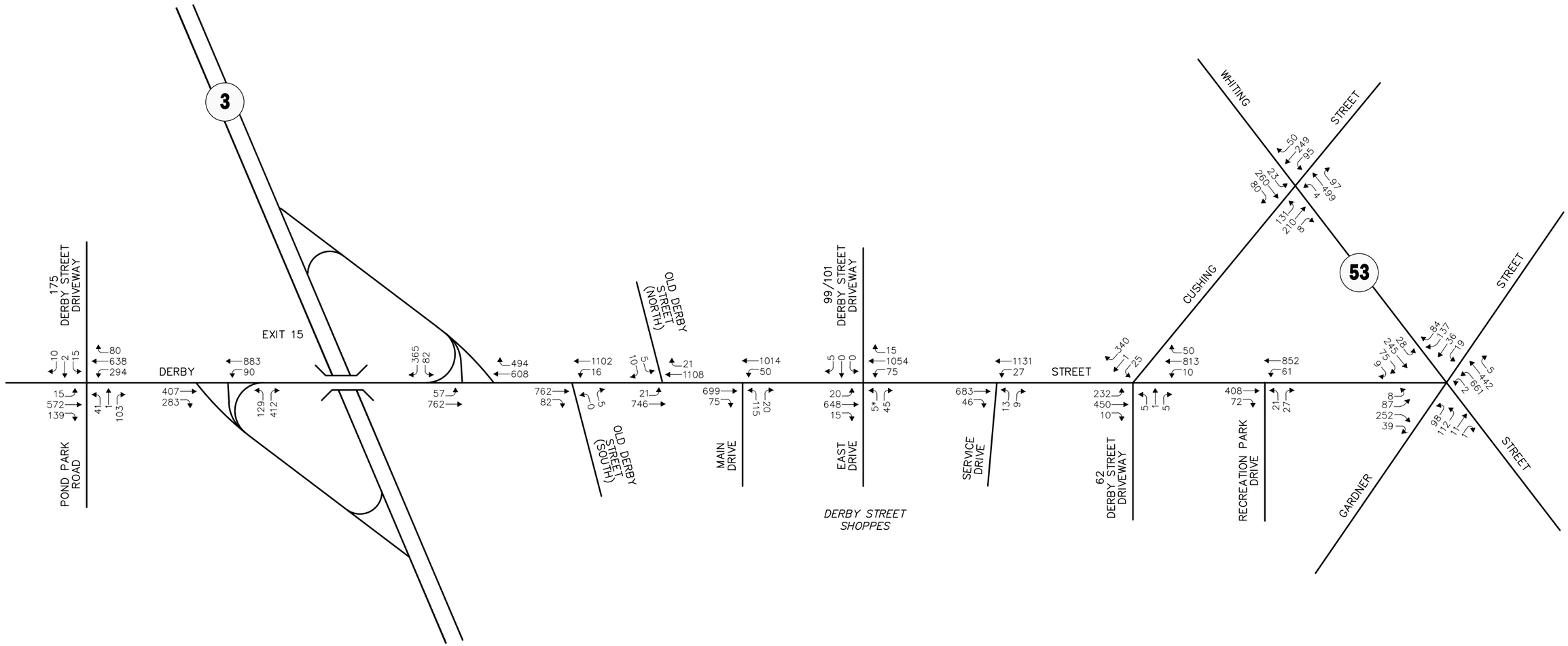
[a]TS = traffic signal control; S = STOP-sign control; Y = YIELD-sign control; R = rotary/roundabout control; NC = no control present.
[b]Combined shoulder and travel lane width equal to or exceed 14 feet.

EXISTING TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, manual turning movement counts (TMCs) and vehicle classification counts were obtained from traffic studies prepared by others within the study area[1,2] and were supplemented by spot counts conducted as a part of this assessment on Old Derby Street (72-hour automatic traffic recorder count) and at the Whiting Street/Cushing Street, Whiting Street/Derby Street/Gardner Street and Derby Street/Recreation Park Drive intersections in November 2015. The critical periods for which the traffic count data was obtained consisted of the weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) commuter periods, and the Saturday midday (11:00 AM to 2:00 PM) peak shopping period. These time periods were selected for analysis purposes as they are representative of the peak traffic volume hours for study area roadway network. The 2015 supplemental traffic count data was used to adjust and normalize the traffic counts to a common 2015 baseline condition.

The 2015 Existing peak-hour traffic volumes are graphically depicted on Figures 4, 5 and 6, respectively.

[1]*Transportation Study*, Avalon Hingham; Howard/Stein-Hudson Associates, Inc.; May 17, 2012.
[2]*Functional Design Report*, Derby Street Corridor Improvements; Clough Harbour & Associates LLP; 2012.



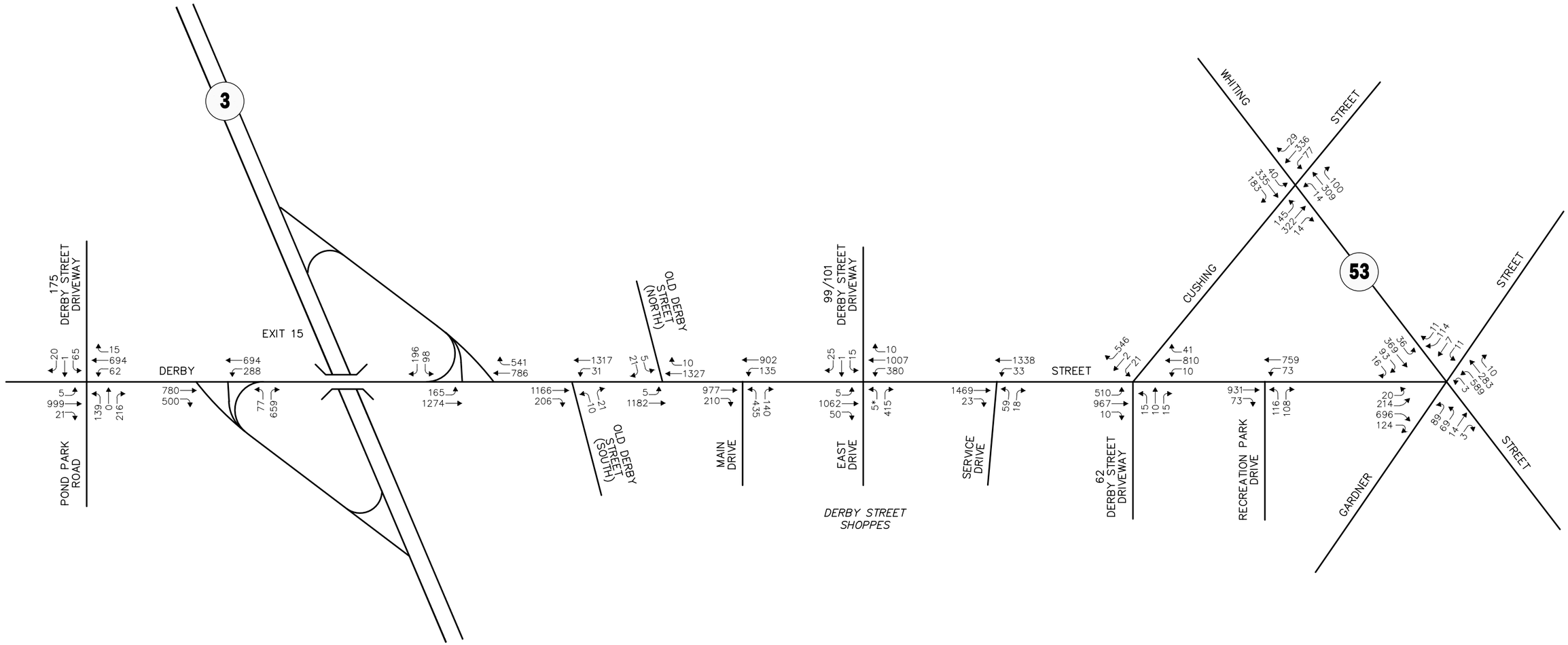
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 4

2015 Existing
Weekday Morning
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



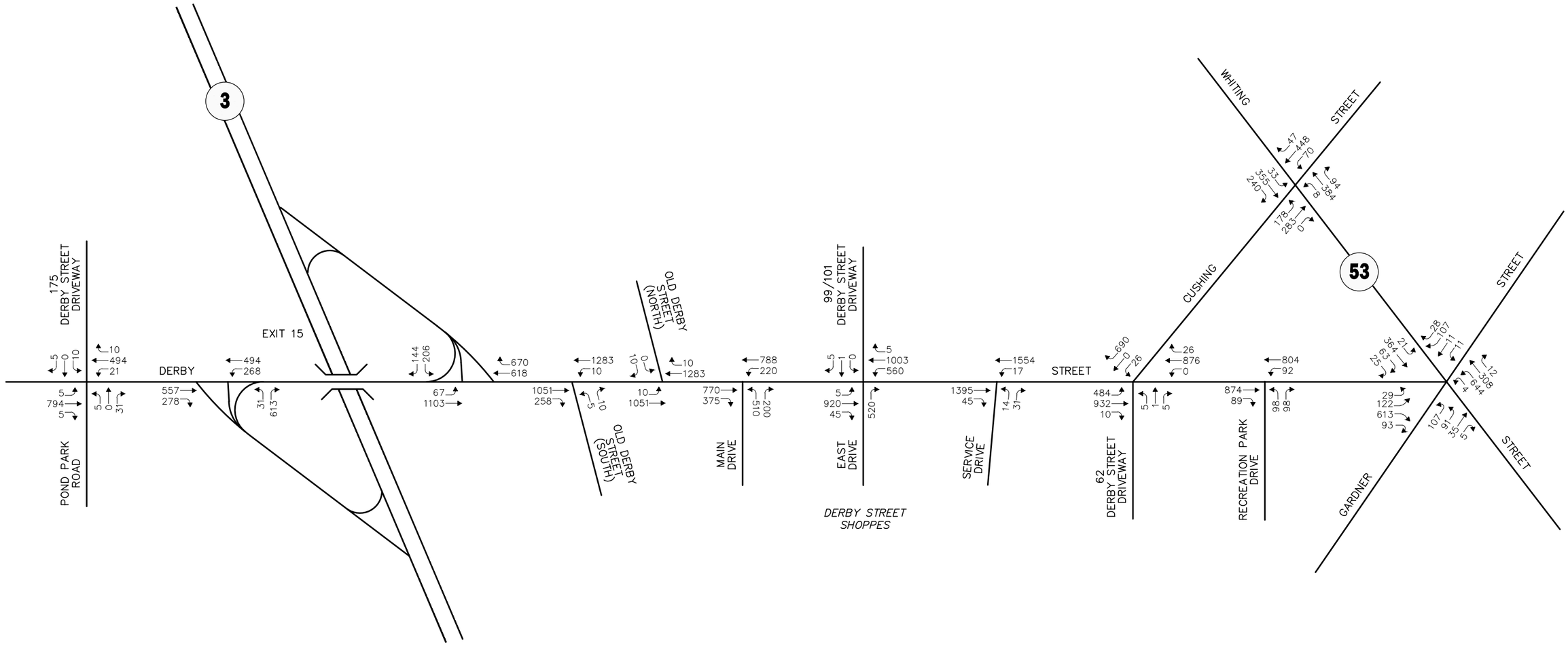
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 5

2015 Existing
Weekday Evening
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 6

2015 Existing
Saturday Midday
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

PEDESTRIAN AND BICYCLE FACILITIES

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in November 2015. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways and at the study intersections, as well as the location of existing and planned future bicycle facilities. As detailed in Table 1 and depicted on Figure 3, sidewalks are provided along one or both sides of Derby Street and Whiting Street, with marked crosswalks provided at the majority of the study intersections. The signalized intersections within the study area include pedestrian traffic signal equipment and phasing where crosswalks are provided.

Formal bicycle facilities were not identified within the study area; however, in general, Derby Street and Whiting Street provide sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared travelled-way configuration.[3]

PUBLIC TRANSPORTATION

Public transportation services are not currently provided within the study area. The Massachusetts Bay Transportation Authority (MBTA) provides public transportation services to the Town of Hingham by way of fixed-route bus service to Hingham Center (Route 220), and Ward Street/French Street (Route 222), as well as Commuter Boat service from the Hingham Shipyard and Commuter Rail service on the Greenbush Line from West Hingham Station. These services are located to the north of Derby Street and would not be accessible to development within the study area.

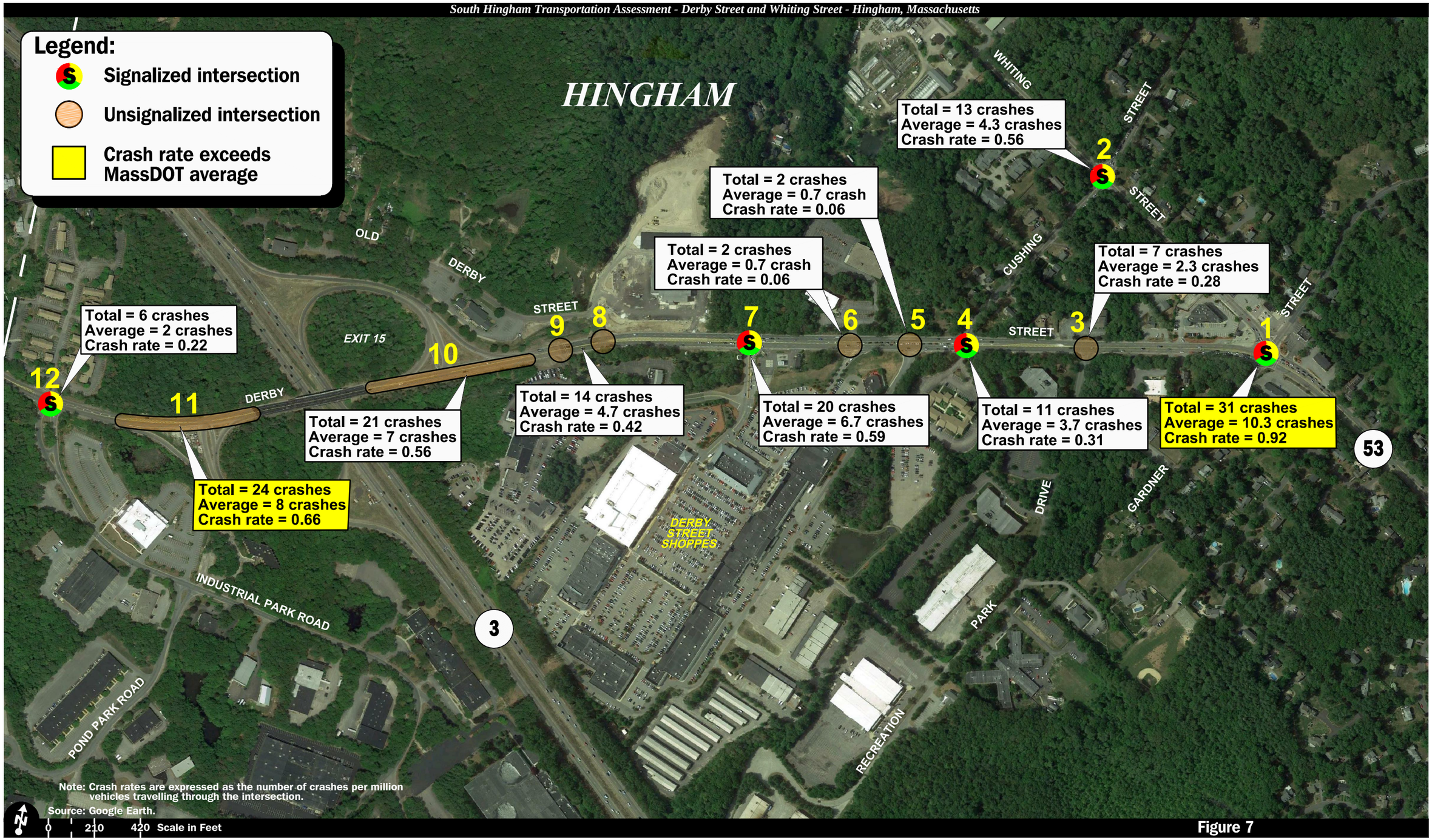
Expansion of the public transportation system to serve the development area will be an important component of the future transportation plan for South Hingham. This will likely take the form of an extension or modification of existing bus service in Hingham and Weymouth, or the addition of new service, ideally with connections to Commuter Rail system (East Weymouth Station) and subway service on the Red Line (Braintree Station).

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent three-year period available (2011 through 2013, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized on Figure 7 with the detailed crash summary tables and calculations provided in the Appendix.

A total of 158 motor vehicles crashes were reported to have occurred within the study area between 2011 and 2013 based on data available from the Registry of Motor Vehicles and provided by the MassDOT Highway Division, 151 of which were reported to have occurred at or within the influence area of an intersection and seven (7) were classified as occurring at a mid-block location (i.e., between intersections).

[3] A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared travelled-way condition.



Note: Crash rates are expressed as the number of crashes per million vehicles travelling through the intersection.

Source: Google Earth.

0 210 420 Scale in Feet

Figure 7

Motor Vehicle Crash Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Focusing on the study area intersections, the majority of crashes occurring within the study area were reported at four intersections:

1. Route 53/Derby Street/Gardner Street (31 crashes)
2. Derby Street/Route 3 Southbound Ramps (24 crashes)
3. Derby Street/Route 3 Northbound Ramps (21 crashes)
4. Derby Street/Derby Street Shoppes Main Driveway (20 crashes)

These four intersections account for approximately 60 percent of the crashes occurring within the study area. The Route 53/Derby Street/Gardner Street and Derby Street/Route 3 Southbound Ramps intersections were also found to have a motor vehicle crash rate above both the MassDOT statewide and District averages for a signalized or unsignalized intersection, as appropriate, for the MassDOT Highway Division District in which the intersections are located (District 5). In addition, the Route 53/Derby Street/Gardner Street intersection and the Route 3/Derby Street interchange are included on MassDOT's Highway Safety Improvement Program (HSIP) listing for funding to implement safety-related improvements, with improvements to the Route 53/Derby Street/Gardner Street intersection scheduled to commence in 2018.

No fatal motor vehicle crashes were reported to have occurred within the study area over the three-year review period.

DEVELOPMENT SCENARIOS

Traffic volume projections were developed for four (4) potential build-out scenarios within five (5) development areas. The build-out scenarios were identified by the South Hingham Study Group based on a review of land use and development patterns in the South Hingham market area, and refined to reflect input received as a part of the Study Group meetings. The five (5) development areas are defined below and shown on Figure 8:

1. *Office Park* – Generally located in the northeast quadrant of the Route 3/Derby Street interchange with frontage along Derby Street, Old Derby Street (north) and Whiting Street (Route 53); accessible from Derby Street, Old Derby Street (north) and Whiting Street, with potential to access to Pleasant Street in Weymouth.
2. *Industrial Park* – Generally located in the southeast quadrant of the Route 3/Derby Street interchange and includes The Derby Street Shoppes and the commercial area along Recreation Park Drive; accessible from Derby Street, Old Derby Street (south) and Recreation Park Drive
3. *South Shore Park* – Generally located in the southwest quadrant of the Route 3/ Derby Street interchange and extending to Abington Street and the Rockland Town Line; accessible from Derby Street and Industrial Park Road.
4. *Abington Street Corridor* – Bounded by Abington Street, Sharp Street and the Weymouth City Line; accessible from Abington Street and Sharp Street.
5. *Sharp Street Corridor* – Bounded by Sharp Street, the Weymouth City Line and the Rockland Town Line; accessible from Sharps Street/Weymouth Street.

Within each development area, the four (4) build-out scenarios that were assessed are as follows:

Figure 8

Development Areas

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Build-Out Scenario 1
605,000 sf of Additional Development

		Land Use/Percent of Added Development					
Development Area	**Projected Build-Out (sf)**	**Office**	**Medical Office**	**Retail**	**Hotel**	**Residential**	**Research & Development**
Office Park	400,000	100	--	--	--	--	--
Industrial Park	0	--	--	100*	--	--	--
South Shore Park	205,000	27	27	--	--	--	46**
Abington Street Corridor	0	--	--	--	--	--	--
Sharp Street Corridor	0	--	--	--	--	--	--
TOTAL:	**605,000 sf**	**59**	**12**	**8**	**--**	**--**	**21**

*70,000 sf of existing industrial space converted to retail space.
**180,000 sf of existing industrial space converted to research & development space.

Build-Out Scenario 2
1,500,000 sf of Additional Development

		Land Use/Percent of Added Development					
Development Area	**Projected Build-Out (sf)**	**Office**	**Medical Office**	**Retail**	**Hotel**	**Residential**	**Research & Development**
Office Park	1,500,000	30	17	28	7	18	--
Industrial Park	0	--	--	--	--	--	--
South Shore Park	0	50*	50*	--	--	--	--
Abington Street Corridor	0	--	--	--	--	--	--
Sharp Street Corridor	0	--	--	--	--	--	--
TOTAL:	**1,500,000 sf**	**34**	**24**	**23**	**5**	**14**	**--**

*400,000 sf of existing industrial space converted to office and medical office space.

Build-Out Scenario 3
2,450,000 sf of Additional Development

		Land Use/Percent of Added Development					
Development Area	**Projected Build-Out (sf)**	**Office**	**Medical Office**	**Retail**	**Hotel**	**Residential**	**Research & Development**
Office Park	1,500,000	30	17	28	7	18	--
Industrial Park	0	--	--	--	--	--	--
South Shore Park	950,000	3	4	59*	10	24	--
Abington Street Corridor	0	--	--	--	--	--	--
Sharp Street Corridor	0	--	--	--	--	--	--
TOTAL:	**2,450,000 sf**	**18**	**10**	**43**	**8**	**21**	**--**

*250,000 sf of existing industrial space converted to retail space.

Build-Out Scenario 4
3,580,000 sf of Additional Development

		Land Use/Percent of Added Development					
Development Area	**Projected Build-Out (sf)**	**Office**	**Medical Office**	**Retail**	**Hotel**	**Residential**	**Research & Development**
Office Park	1,500,000	30	17	28	7	18	--
Industrial Park	0	50*	50*	--	--	--	--
South Shore Park	1,650,000	28	9	47**	5	11	--
Abington Street Corridor	0	--	--	--	--	--	--
Sharp Street Corridor	430,000	50***	31***	19***	--	--	--
TOTAL:	**3,580,000 sf**	**24**	**22**	**38**	**5**	**11**	--

*313,000 sf of existing industrial and recreational space converted to office and medical office space.
**750,000 sf of existing industrial space converted to retail space.
***340,000 sf of existing industrial space converted to office, medical office and retail space.

TRAFFIC VOLUME PROJECTIONS

In order to determine the traffic characteristics for the identified build-out scenarios, trip-generation methodologies established by the Institute of Transportation Engineers (ITE)[4] were used. The ITE provides trip-generation information for various types of land uses developed as a result of scientific studies that have been conducted over the past 50 plus years, the most recent update of which was published in 2012. This data includes trip estimates for land uses that are similar to those identified for the each of the build-out scenarios. The following ITE Land Use Codes (LUCs) were used:

- 130, *Industrial Park*
- 220, *Apartment*
- 230, *Residential Condominium/Townhouse*
- 284, *Assisted Living*
- 310, *Hotel*
- 710, *General Office Building*
- 760, *Research and Development Center*
- 820, *Shopping Center*

Pass-By Trips

Not all of the trips expected to be generated by the retail component of identified development programs will be new trips on the roadway network. A significant portion of these trips will consist of pass-by trips or vehicles already traveling along Derby Street for other purposes that will patronize the individual (or multiple) development sites in conjunction with their trip and then continue on to their original destination. These trips are not new trips on the roadway

[4] *Trip Generation*, 9th Edition; Institute of Transportation Engineers; Washington, DC; 2012.

network. Statistics published by the ITE[5] indicate that on average, up to 34 percent of the trips generated by retail uses may consist of pass-by trips. As such and pursuant to MassDOT guidelines,[6] a pass-by trip rate of up to 34 percent was applied to the trip-generation calculations for the retail component of the identified development programs.

Figures 9 through 12 summarize the build-out scenarios for each development area and the associated daily and peak-hour traffic volumes, with the detailed trip-generation calculations and summary tables provided in the Appendix.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of the additional traffic that is expected to result from the identified build-out of the development areas was determined based on a review of journey-to-work data obtained from the 2010 U.S. Census and was then refined based on existing traffic patterns within the study area and a review of the regional transportation system. Given the differing nature and directionality of trips associated with the residential and commercial uses, separate trip distribution patterns were developed for each use. The general trip distribution pattern is summarized in Table 2 and graphically depicted on Figures 13 and 14.

Table 2
TRIP-DISTRIBUTION SUMMARY

		Commercial	Residential
Roadway	Direction To/From	Percent (To/From)	Percent (To/From)
Route 3	North	20	45
Route 3	South	20	15
Route 53	North	10	10
Route 53	South	15	10
Derby Street/Ralph Talbot Street	West	15	5
Gardner Street	East	5	5
Cushing Street	North	5	5
Hingham Street/Pond Street	South	10	5
TOTAL		100	100

Within each development area, trips were assigned to a specific access roadway based on the trip origin/destination, the roadway frontage available to the development area, and any existing access points. For the purpose of this analysis, the following specific access points (locations

[5] *Trip Generation Handbook*, 3rd Edition, An ITE Proposed Recommended Practice; Institute of Transportation Engineers; Washington, D.C.; August 2014.

[6] MassDOT limits pass-by trip rates to the lower of 15 percent of the adjacent roadway traffic volume or the average pass-by trip rate obtained from the most recent edition of the ITE *Trip Generation Handbook.*

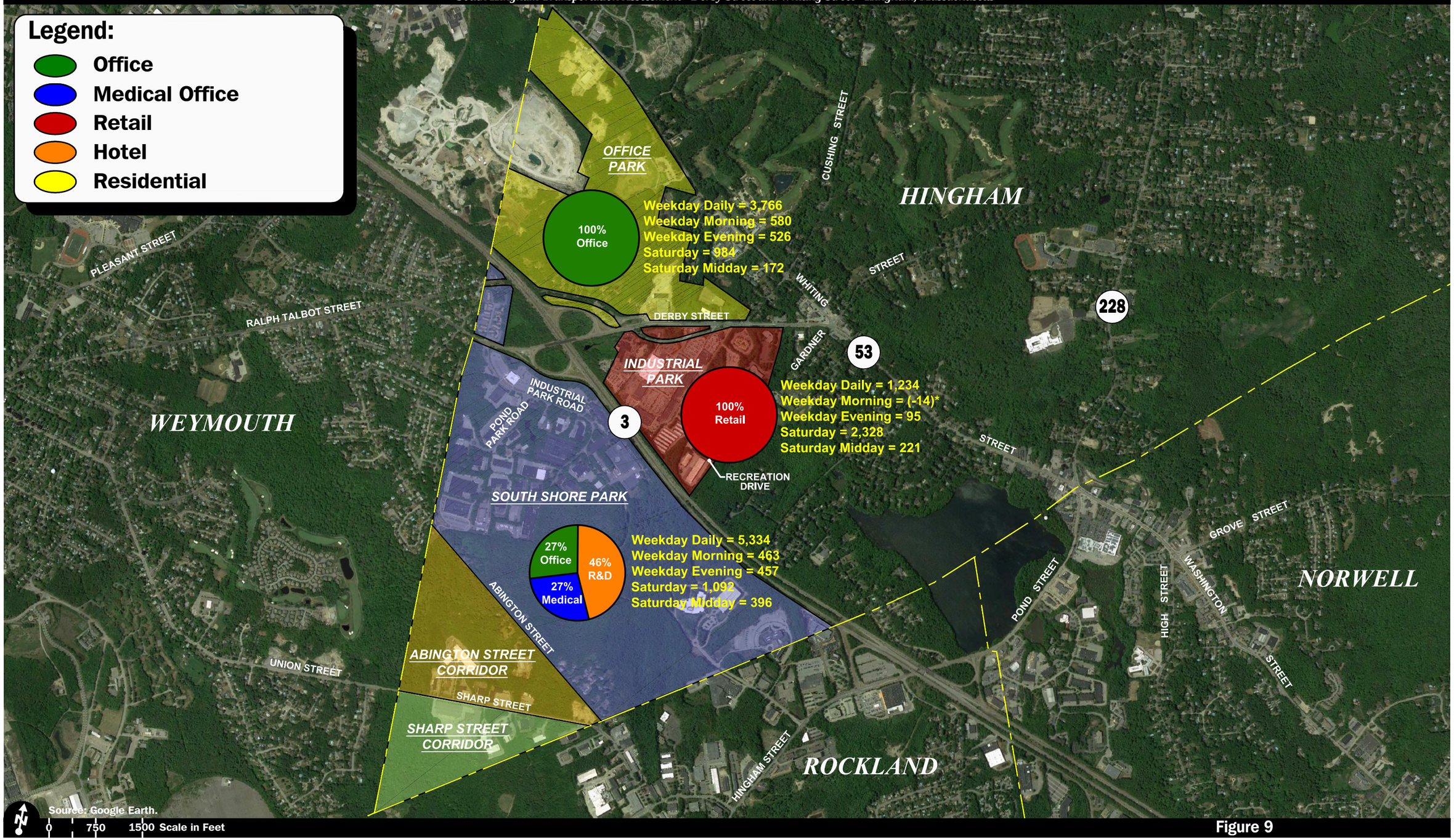


Figure 9

Build-Out Scenario 1 Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Legend:

- Office
- Medical Office
- Retail
- Hotel
- Residential

OFFICE PARK

18% Residential
30% Office
7% Hotel
17% Medical
28% Retail

Weekday Daily = 25,572
Weekday Morning = 1,710
Weekday Evening = 2,300
Saturday = 18,800
Saturday Midday = 2,632

INDUSTRIAL PARK

50% Office
50% Medical

Weekday Daily = 7,456
Weekday Morning = 483
Weekday Evening = 506
Saturday = 1,342
Saturday Midday = 672

SOUTH SHORE PARK

ABINGTON STREET CORRIDOR

SHARP STREET CORRIDOR

HINGHAM

WEYMOUTH

ROCKLAND

NORWELL

PLEASANT STREET
RALPH TALBOT STREET
CUSHING STREET
WHITING STREET
DERBY STREET
GARDNER STREET
INDUSTRIAL PARK ROAD
POND PARK ROAD
RECREATION DRIVE
ABINGTON STREET
SHARP STREET
UNION STREET
HINGHAM STREET
POND STREET
HIGH STREET
WASHINGTON STREET
GROVE STREET

53
228
3

Source: Google Earth.

0 750 1500 Scale in Feet

Figure 10

Build-Out Scenario 2 Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Legend:

- Office
- Medical Office
- Retail
- Hotel
- Residential

OFFICE PARK

18% Residential
30% Office
7% Hotel
17% Medical
28% Retail

Weekday Daily = 25,572
Weekday Morning = 1,710
Weekday Evening = 2,300
Saturday = 18,800
Saturday Midday = 2,632

INDUSTRIAL PARK

4% Medical office
3% Office
24% Residential
59% Retail
10% Hotel

Weekday Daily = 18,292
Weekday Morning = 521
Weekday Evening = 1,611
Saturday = 27,242
Saturday Midday = 2,619

SOUTH SHORE PARK

ABINGTON STREET CORRIDOR

SHARP STREET CORRIDOR

HINGHAM

WEYMOUTH

ROCKLAND

NORWELL

PLEASANT STREET
RALPH TALBOT STREET
UNION STREET
CUSHING STREET
WHITING STREET
DERBY STREET
GARDNER STREET
INDUSTRIAL PARK ROAD
POND PARK ROAD
RECREATION DRIVE
ABINGTON STREET
SHARP STREET
HINGHAM STREET
POND STREET
HIGH STREET
WASHINGTON STREET
GROVE STREET

3
53
228

Source: Google Earth.

0 750 1500 Scale in Feet

Figure 11

Build-Out Scenario 3 Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Legend:

- Office
- Medical Office
- Retail
- Hotel
- Residential

OFFICE PARK

18% Residential
30% Office
7% Hotel
17% Medical
28% Retail

Weekday Daily = 25,572
Weekday Morning = 1,710
Weekday Evening = 2,300
Saturday = 18,880
Saturday Midday = 2,632

INDUSTRIAL PARK

50% Office
50% Medical

Weekday Daily = 5,006
Weekday Morning = 343
Weekday Evening = 361
Saturday = 1,978
Saturday Midday = 437

SOUTH SHORE PARK

11% Residential
5% Hotel
9% Medical
28% Office
47% Retail

Weekday Daily = 36,004
Weekday Morning = 2,002
Weekday Evening = 3,168
Saturday = 39,048
Saturday Midday = 4,555

ABINGTON STREET CORRIDOR

Weekday Daily = 16,612
Weekday Morning = 943
Weekday Evening = 1,371
Saturday = 11,028
Saturday Midday = 1,746

SHARP STREET CORRIDOR

50% Office
31% Medical
19% Retail

HINGHAM
WEYMOUTH
ROCKLAND
NORWELL

PLEASANT STREET
RALPH TALBOT STREET
CUSHING STREET
WHITING STREET
DERBY STREET
GARDNER STREET
INDUSTRIAL PARK ROAD
POND PARK ROAD
RECREATION DRIVE
ABINGTON STREET
SHARP STREET
HINGHAM STREET
UNION STREET
POND STREET
HIGH STREET
WASHINGTON STREET
GROVE STREET

53
3
228

Source: Google Earth.

0 800 1600 Scale in Feet

Figure 12

Build-Out Scenario 4 Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Figure 13

Trip Distribution Map
Commercial Uses

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Figure 14

Trip Distribution Map
Residential Uses

Vanasse & Associates, Inc.
Transportation Engineers & Planners

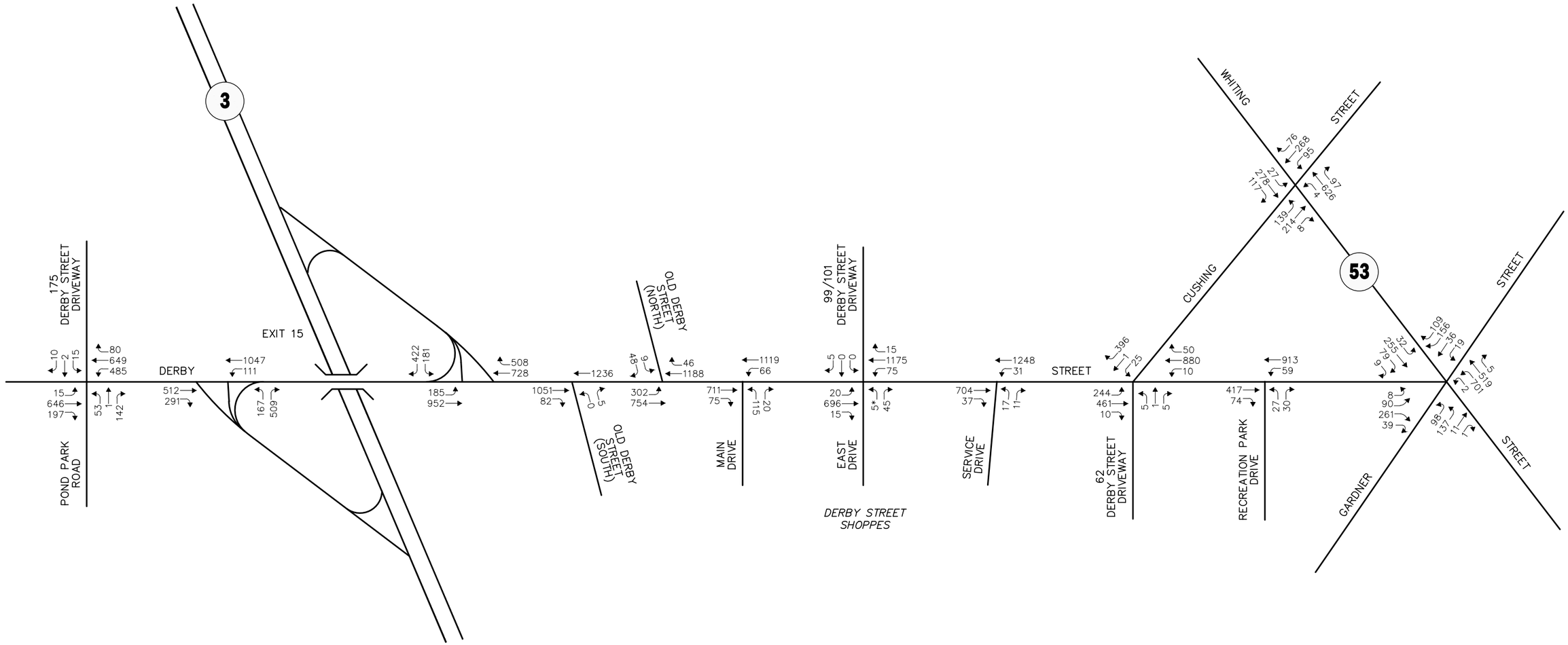
where driveways or roadways would be provided to serve the development area) were assumed for each development area:

- *Office Park* – Derby Street, Old Derby Street (north), Whiting Street (Route 53)
- *Industrial Park* – Derby Street, Old Derby Street (south), Recreation Park Drive
- *South Shore Park* – Pond Park Road
- *Abington Street Corridor* – Abington Street and Sharp Street
- *Sharp Street Corridor* – Sharp Street

BUILD-OUT TRAFFIC VOLUMES

Using the trip distribution patterns and access configurations defined above, the traffic volume projections for each of the identified build-out scenarios were added to the 2015 Existing condition peak-hour traffic volumes. The resulting peak-hour traffic volumes for each build-out scenario are graphically depicted on Figures 15 through 26. The trip assignments for each build-out scenario and development area are provided in the Appendix.

A summary of peak-hour projected traffic-volume increases external to the study area that is the subject of this assessment is shown in Table 3 for each build-out scenario.



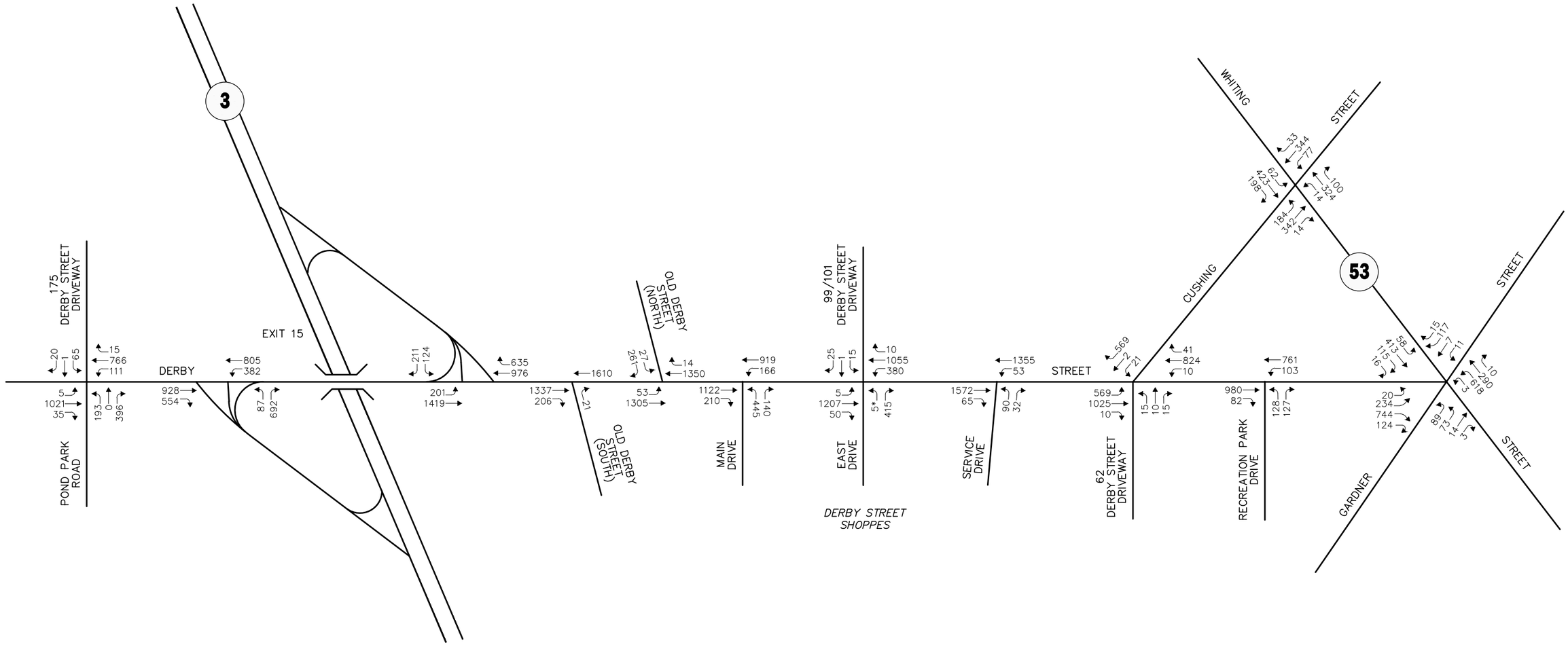
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 15

2015 Build-Out
Scenario 1
Weekday Morning
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



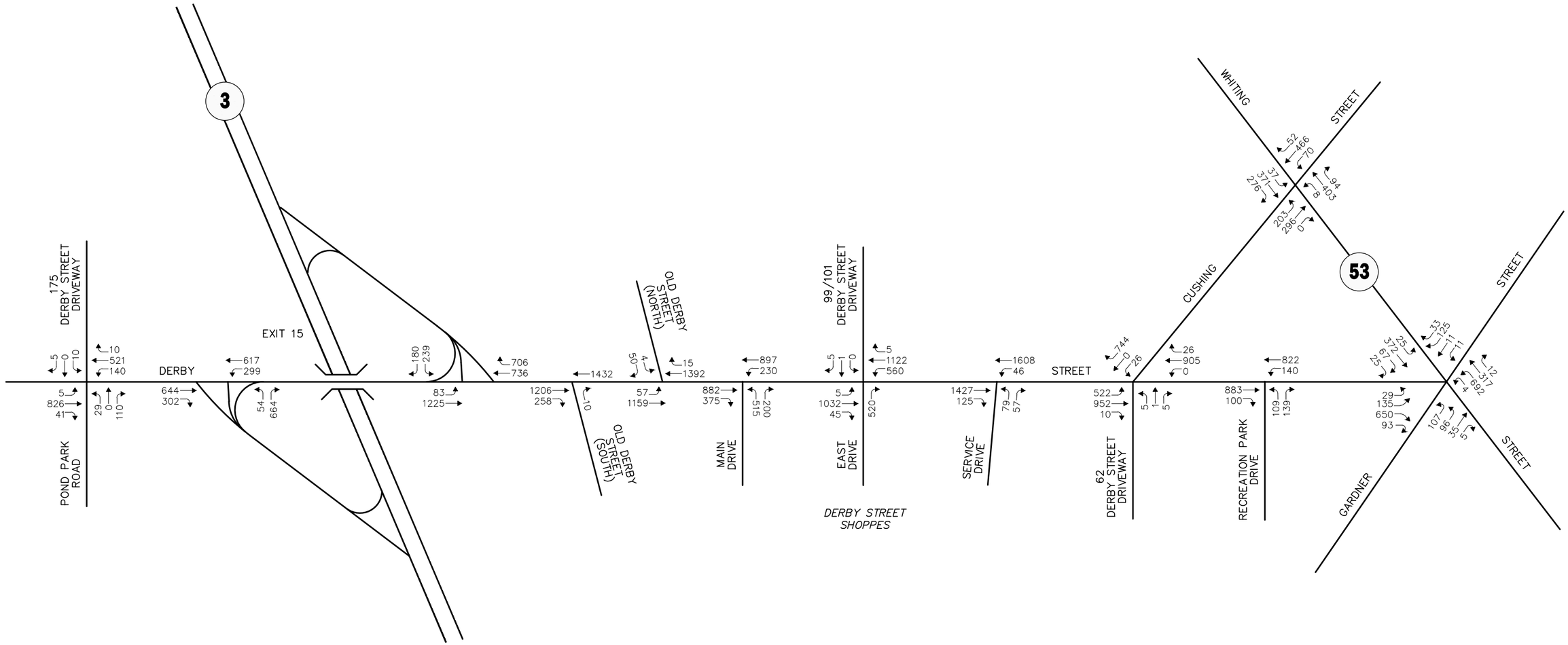
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 16

2015 Build-Out
Scenario 1
Weekday Evening
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



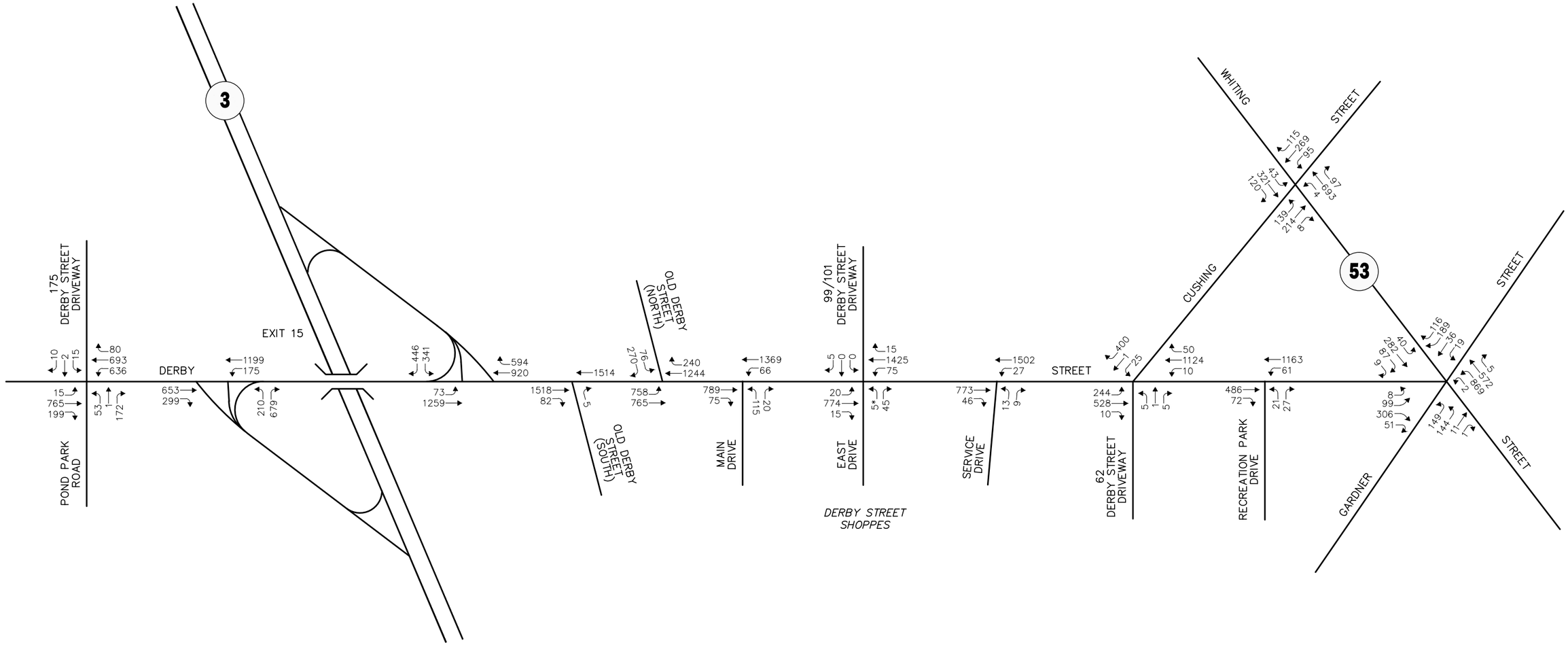
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
* Illegal movement.

Not To Scale

Figure 17

2015 Build-Out
Scenario 1
Saturday Midday
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



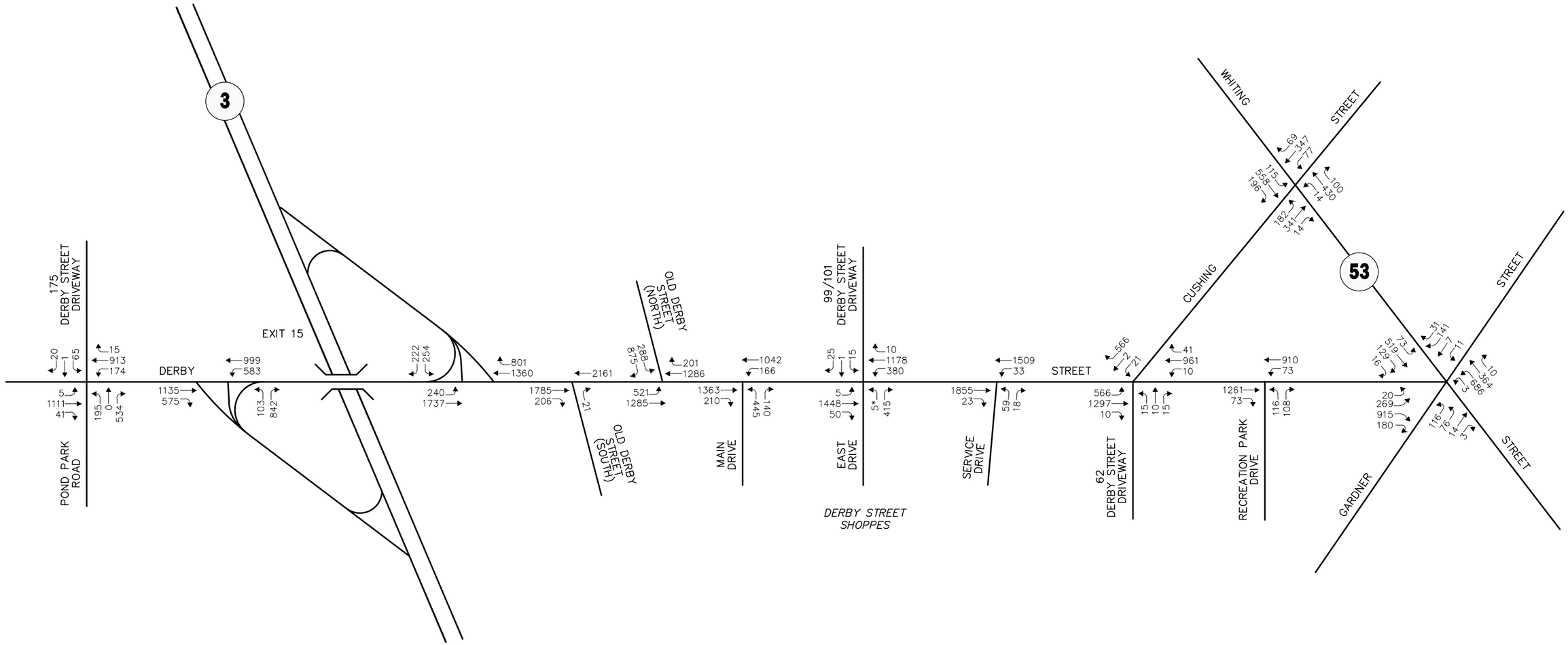
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 18

2015 Build-Out
Scenario 2
Weekday Morning
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



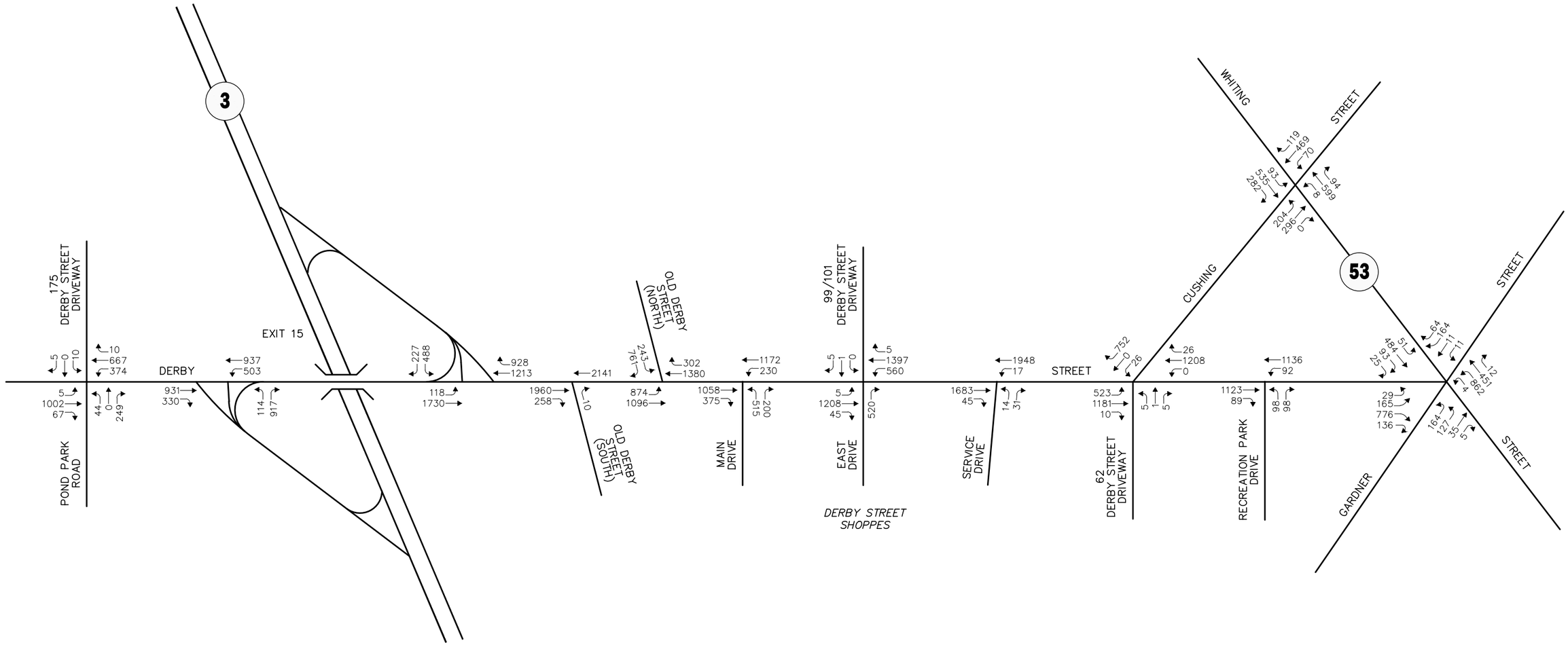
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 19

2015 Build-Out
Scenario 2
Weekday Evening
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



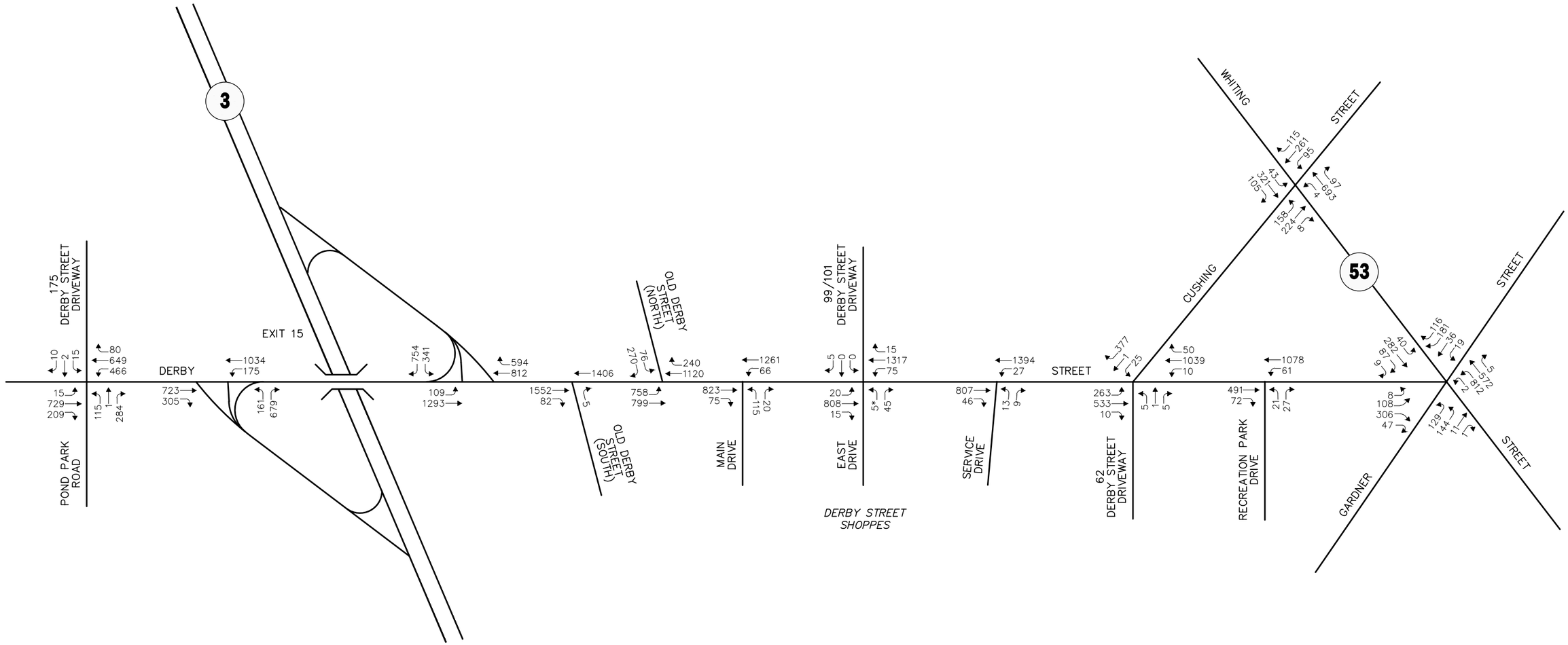
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 20

2015 Build-Out
Scenario 2
Saturday Midday
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



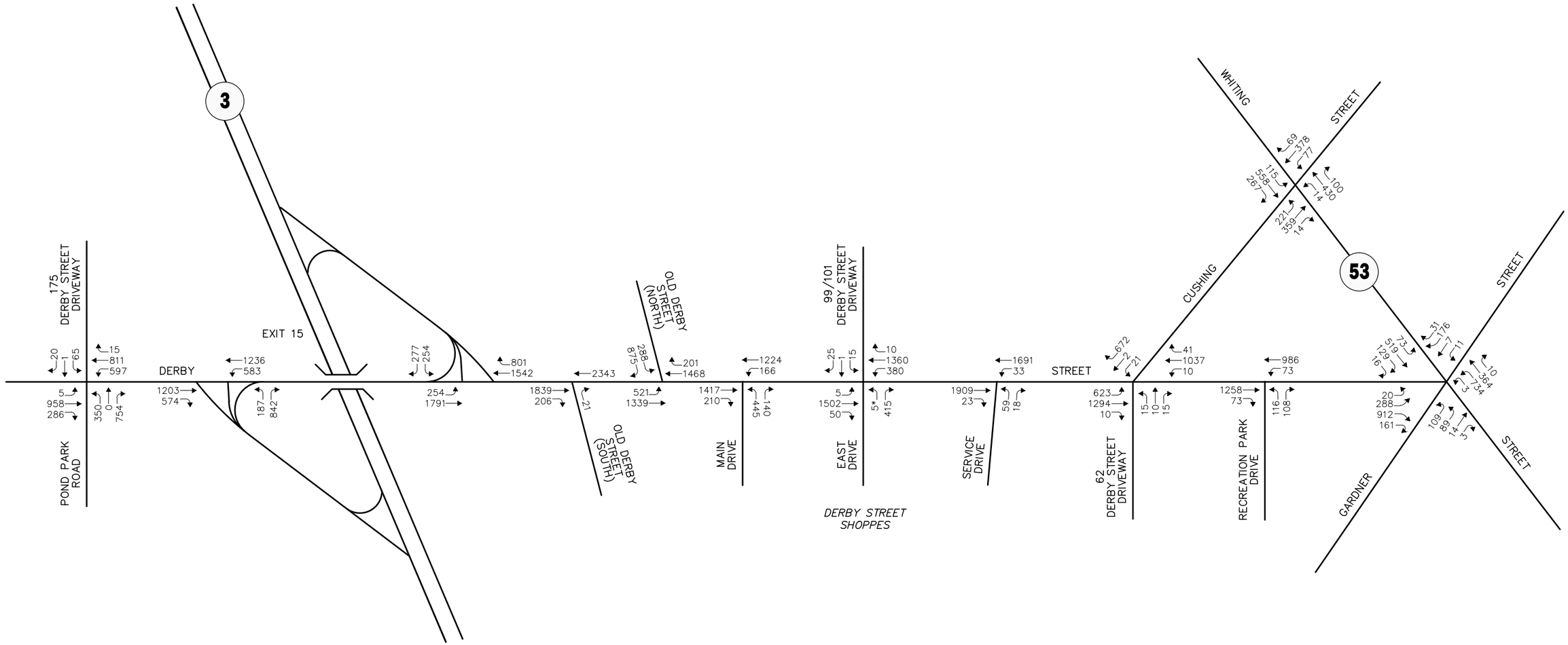
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 21

2015 Build-Out
Scenario 3
Weekday Morning
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



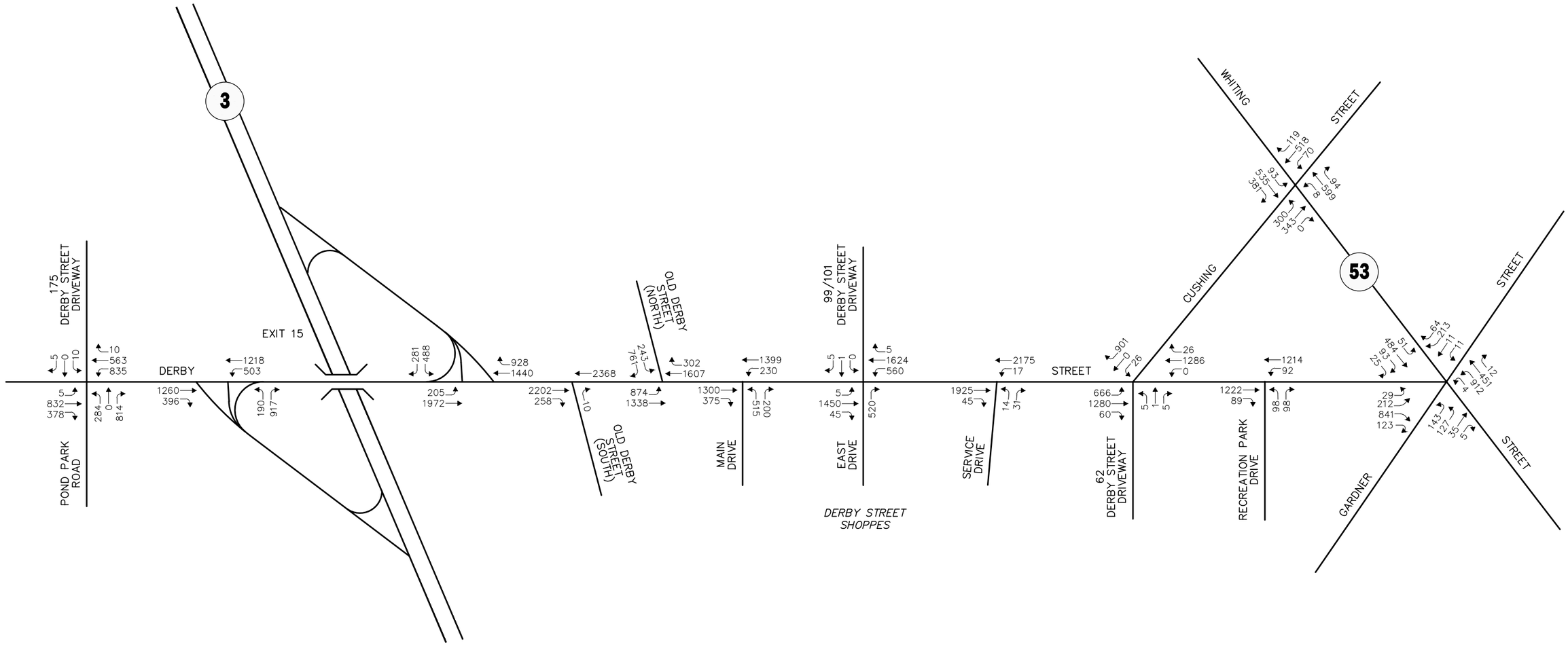
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 22

2015 Build-Out
Scenario 3
Weekday Evening
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



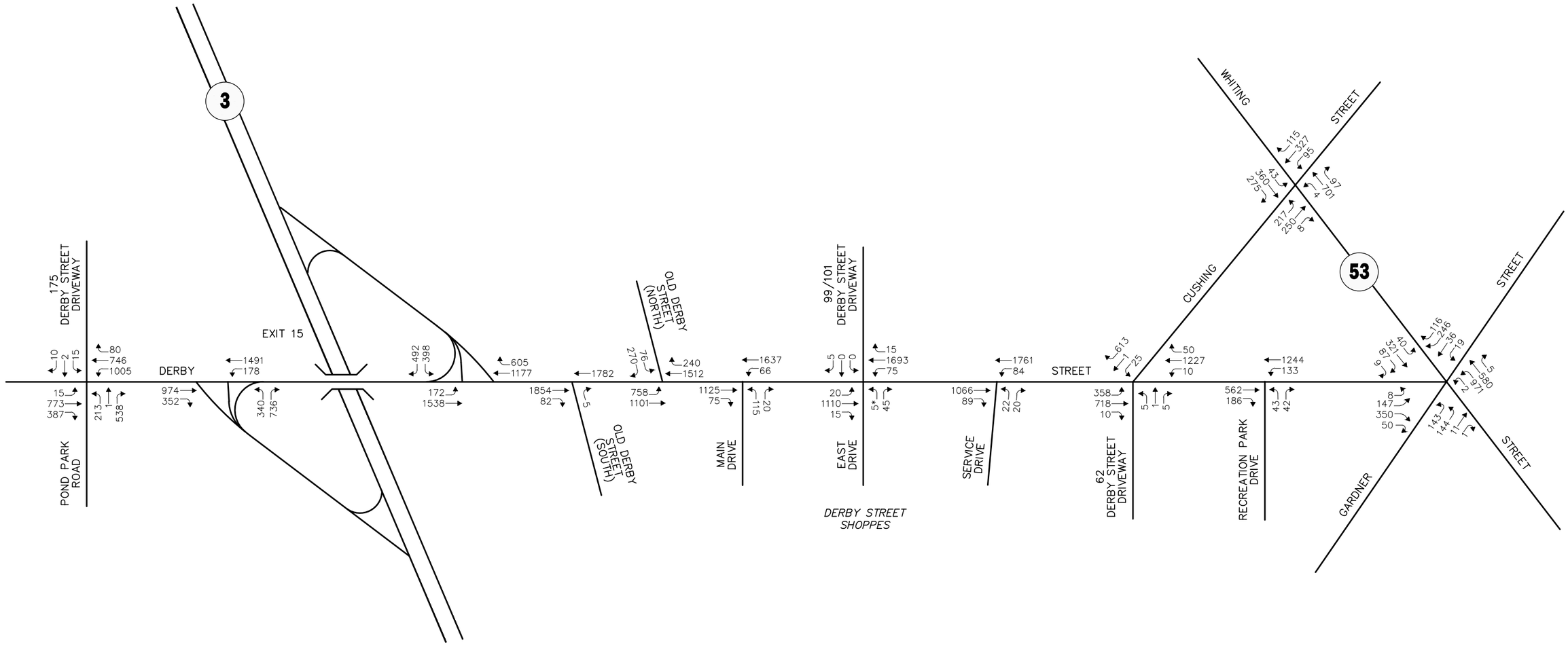
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 23

2015 Build-Out
Scenario 3
Saturday Midday
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



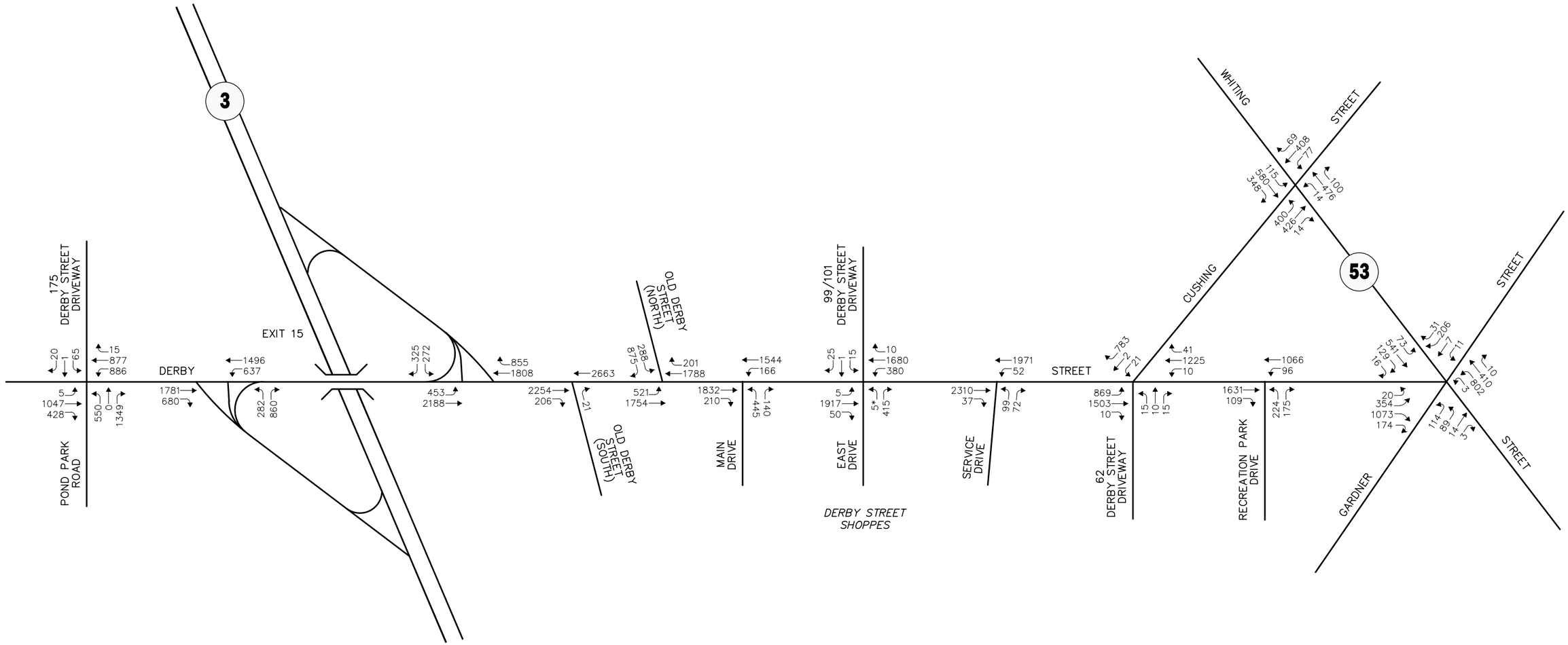
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 24

2015 Build-Out
Scenario 4
Weekday Morning
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



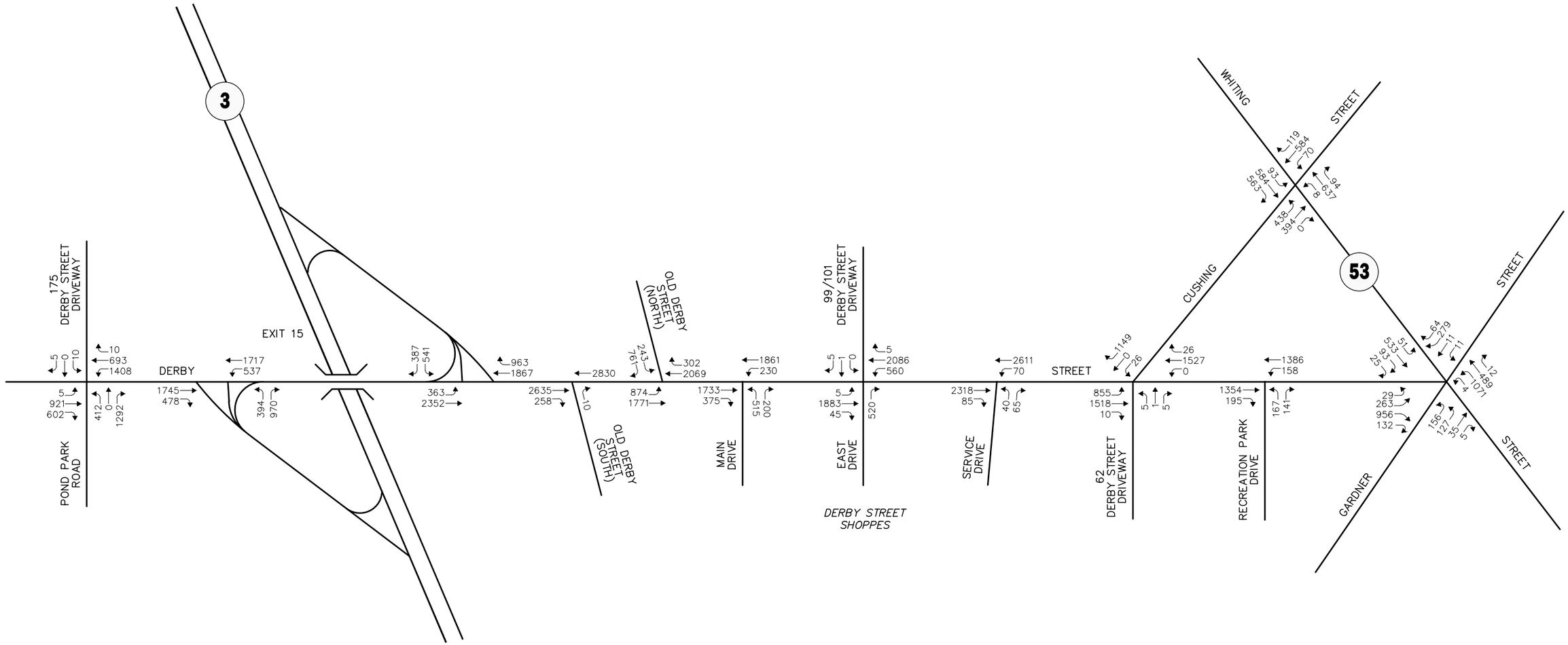
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 25

2015 Build-Out
Scenario 4
Weekday Evening
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
*** Illegal movement.**

Not To Scale

Figure 26

2015 Build-Out
Scenario 4
Saturday Midday
Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Table 3
PEAK-HOUR TRAFFIC-VOLUME INCREASES

Location/Peak Hour	2015 Existing	Traffic Volume Increases			
		Scenario 1	Scenario 2	Scenario 3	Scenario 4
Route 53, south of Gardner Street:					
Weekday Morning	1,627	136	429	372	622
Weekday Evening	1,964	128	547	592	889
Saturday Midday	1,961	102	644	759	1,120
Route 53, north of Cushing Street:					
Weekday Morning	1,043	220	388	392	668
Weekday Evening	1,041	183	509	619	947
Saturday Midday	1,237	105	595	790	1,197
Gardner Street, north of Route 53:					
Weekday Morning	407	51	108	109	213
Weekday Evening	381	49	139	193	289
Saturday Midday	347	40	166	262	379
Gardner Street, south of Route 53:					
Weekday Morning	374	29	107	83	100
Weekday Evening	402	26	126	113	131
Saturday Midday	409	9	166	132	154
Cushing Street, north of Route 53:					
Weekday Morning	724	53	109	111	203
Weekday Evening	904	54	141	194	291
Saturday Midday	975	40	166	262	379
Derby Street, west of Pond Park Road:					
Weekday Morning	1,415	155	320	312	729
Weekday Evening	1,878	162	407	552	1,049
Saturday Midday	1,308	119	482	759	1,330

As shown in Table 3, traffic volume increases external to the study area that is the subject of this assessment were shown to range from 9 to 1,330 vehicles. Focusing on Gardner Street and Cushing Street, the following potential traffic volume increases were noted:

Gardner Street:

Potential peak-hour traffic volume impacts on Gardner Street between Hingham Street and Route 53 are projected to range 9 vehicle trips during the Saturday midday peak-hour under Build-Out Scenario 1 (605,000 sf of additional/modified building area) to 166 vehicle trips during the same peak-hour under Build-Out Scenario 4 (3,580,000 sf of additional/modified building area). The Section of Gardner Street between Route 53 and Main Street (Route 228) is projected to experience potential peak-hour traffic volume increases ranging from 40 vehicle trips during the Saturday midday peak-hour under Build-Out Scenario 1 to 379 vehicle trips during the same peak-hour under Build-Out Scenario 4.

Cushing Street:

Potential peak-hour traffic volume impacts on Cushing Street north of Route 53 are projected to range 40 vehicle trips during the Saturday midday peak-hour under Build-Out Scenario 1 to 379 vehicle trips during the same peak-hour under Build-Out Scenario 4.

For context, peak-hour traffic volume increases of in excess of 100 net new vehicle trips on a roadway have been defined as having the potential to result in a material impact on motorist delays and vehicle queuing at intersecting driveways and side streets. A review of Table 3 indicates that only Build-Out Scenario 1 would result in potential traffic volume increases that would fall below this threshold.

TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, and Build traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.[7] The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions.

Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

[7]The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual;* Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersections

The six levels of service for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[8] Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the 2010 *Highway Capacity Manual*. Table 4 summarizes the relationship between level of service and average control delay for two-way stop controlled and all-way stop controlled intersections.

Table 4
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[a]

Level-Of-Service by Volume-to-Capacity Ratio		Average Control Delay
v/c ≤ 1.0	v/c > 1.0	(Seconds Per Vehicle)
A	F	≤10.0
B	F	10.1 to 15.0
C	F	15.1 to 25.0
D	F	25.1 to 35.0
E	F	35.1 to 50.0
F	F	>50.0

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010; page 19-2.

[8]*Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010.

Signalized Intersections

The six levels of service for signalized intersections may be described as follows:

- *LOS A* describes operations with very low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Levels of service for signalized intersections were calculated using the Percentile Delay Method implemented as a part of the Synchro™ 8 software as suggested by MassDOT in order to compensate for errors found when employing the 2010 *Highway Capacity Manual* methodology as a part of the software. The Percentile Delay Method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on "percentile" delay. Level-of-service designations are based on the criterion of percentile delay per vehicle and is a measure of: i) driver discomfort; ii) motorist frustration; and iii) fuel consumption; and includes a uniform delay based on percentile volumes using a Poisson arrival pattern, an initial queue move-up time, and a queue interaction delay that accounts for delays resulting from queues extending from adjacent intersections. Table 5 summarizes the relationship between level-of-service and percentile delay, and uses the same numerical delay thresholds as the HCM method. The tabulated percentile delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 5
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS[a]

Level of Service	Percentile Delay Per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

Vehicle Queue Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements. The vehicle queue analysis was performed using the Synchro™ intersection capacity analysis software which is based upon the methodology and procedures presented in the 2010 *Highway Capacity Manual*. The Synchro™ vehicle queue analysis methodology is a simulation based model which reports the number of vehicles that experience a delay of six seconds or more at an intersection. For signalized intersections, Synchro™ reports both the average (50^{th} percentile) the 95^{th} percentile vehicle queue. For unsignalized intersections, Synchro™ reports the 95^{th} percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95^{th} percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time, or approximately three minutes out of 60 minutes during the peak one hour of the day (during the remaining 57 minutes, the vehicle queue length will be less than the 95^{th} percentile queue length).

ANALYSIS RESULTS

Level-of-service analyses were conducted for the study area intersections under 2015 Existing traffic volume and roadway conditions, and for each of the identified build-out scenarios. The results of the intersection capacity analyses are summarized on Figures 27 through 31, with the detailed analysis results and summary tables presented in the Appendix.

With regard to the build-out scenarios, the following roadway, intersection and traffic control improvements were assumed to be complete under the base condition (prior to the development of suggested improvement measures) for each build-out scenario and represent improvements that are currently under design and for which funding by the Town and/or State is pending or currently allocated:

- ***Derby Street/Pond Park Road*** – Integration of the traffic signal into the Derby Street coordinated traffic signal system.

- ***Derby Street/Route 3 Southbound Ramps*** – Installation of a traffic control signal and modifications to Derby Street to provide two through travel lanes eastbound and a left-turn lane westbound, with the Route 3 southbound off-ramp widened to provide two right-turn lanes under traffic signal control.

- ***Derby Street Bridge*** – Restriping the bridge deck to provide two eastbound travel lanes and a single westbound lane.

- ***Derby Street/Route 3 Northbound Ramps*** - Installation of a traffic control signal and modifications to Derby Street to provide two through travel lanes both east and westbound and a left-turn lane eastbound, with the Route 3 northbound off-ramp widened to provide two left-turn lanes under traffic signal control.

- ***Derby Street/Old Derby Street (South)*** – Reconfigure the intersection to prohibit left turns entering or exiting from Old Derby Street.

- ***Derby Street/Old Derby Street (North)*** – Modifications to Derby Street to provide an eastbound left-turn lane with Old Derby Street providing separate left and right-turn lanes.

- ***Derby Street/Derby Street Shoppes Main Driveway*** - Integration of the traffic signal into the Derby Street coordinated traffic signal system.

- ***Derby Street/Cushing Street*** - Integration of the traffic signal into the Derby Street coordinated traffic signal system.

- ***Whiting Street/Derby Street/Gardner Street*** – Modifications to Derby Street to provide an eastbound left-turn lane and to Gardner Street southbound to provide two approach lanes, and replacement of the traffic signal system.

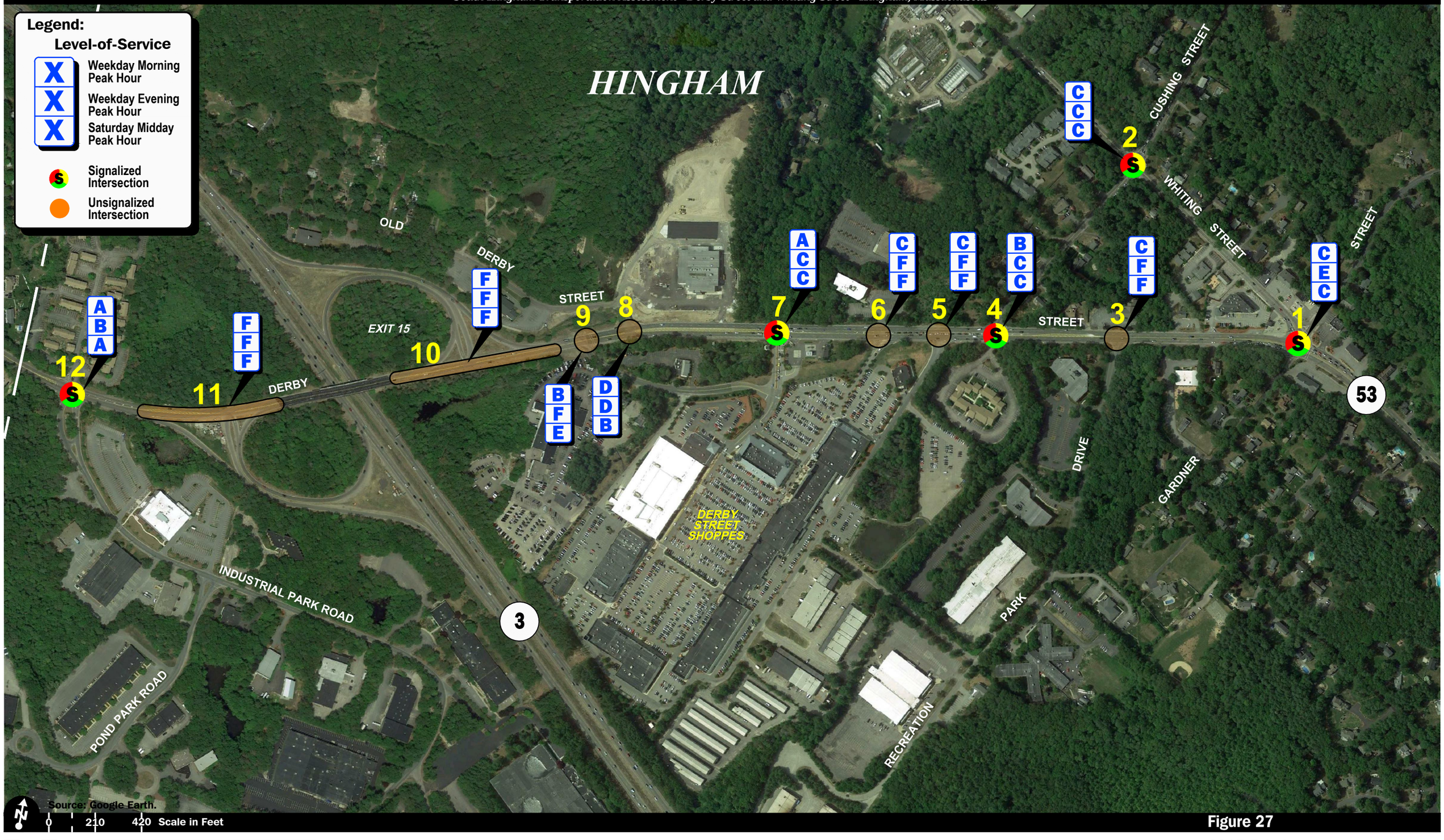
The following is a summary of level-of-service analyses for the intersections within the study area for each build-out scenario.

2015 Existing Conditions (Figure 27):

Operating conditions within the study area under 2015 Existing traffic volume, roadway and intersection conditions were shown to range from LOS "A" to LOS "F", with the majority of the intersections shown to operate at or over capacity (defined as LOS "E" or "F') during one or more peak hour.

Weekday Morning Peak-Hour – With the exception of the Route 3 ramps, operating conditions at the study area intersections were shown to be acceptable (defined as a level-of-service "D" or better). Left-turn movements from the Route 3 ramps (north and southbound) were shown to be operating under constrained conditions (LOS "F") as a result of the relatively large volume of conflicting traffic on Derby Street.

Weekday Evening Peak-Hour – Motorist delays were shown to increase during the weekday evening peak-hour at all of the study intersections, resulting in constrained operating conditions along the Derby Street corridor with the exception of the Derby Street/Cushing Street, Derby Street/Derby Street Shoppes Main Driveway, Derby Street/Old Derby Street (north) and Derby Street/Pond Park Road intersections, where overall operating conditions were shown to be maintained at acceptable levels. The Cushing Street/Whiting Street intersection was also shown



Source: Google Earth.

0 210 420 Scale in Feet

Figure 27

2015 Existing Intersection Level-of-Service Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

to operate under acceptable conditions, with the Whiting Street/Derby Street/Gardner Street intersection shown to be operating at its design capacity.

Saturday Midday Peak-Hour – Operating conditions during the Saturday midday peak-hour were shown to be similar to those experienced during the weekday evening peak-hour and reflect the fact that traffic volumes along the corridor are similar during both peak periods due to the presence and success of the Derby Street Shoppes. We note that the reduction in commuter traffic volumes at the Whiting Street/Derby Street/Gardner Street intersection results in an improvement in overall intersection operations from LOS "E" during the weekday evening peak-hour to LOS "C" during the Saturday midday peak-hour.

Build-Out Scenario 1 (Figure 28):

The planned roadway, intersection and traffic control improvements that are currently under design for the Derby Street corridor and at the Whiting Street/Derby Street/Gardner Street intersection are expected to result in an overall improvement in operating conditions that will afford sufficient capacity to accommodate the projected development associated with Build-Out Scenario 1 (605,000 sf of additional/modified building area).

Weekday Morning Peak-Hour – With the exception of left-turn movements from Old Derby Street (north) (LOS "F"), the study area intersections were shown to operate at an overall LOS "D" or better during the weekday morning peak-hour.

Weekday Evening Peak-Hour – The signalized intersections within the study area, including those that are to be installed at the Route 3 ramps, were shown to continue to operate under acceptable conditions. Increased delay was noted for critical movements at the unsignalized intersections within the study area and primarily confined to left-turn movements; however, these delays and the impacted traffic volumes were not found to warrant the installation of a traffic control signal.

Saturday Midday Peak-Hour – Operating conditions during the Saturday midday peak-hour were shown to be similar to those reported during the weekday evening peak-hour.

Build-Out Scenario 2 (Figure 29):

In general, the planned roadway, intersection and traffic control improvements that are currently contemplated for the Derby Street corridor will afford sufficient capacity to accommodate the potential development identified for Build-Out Scenario 2 (1,500,000 sf of additional/modified building area), with minor enhancements required (discussed later in this assessment).

Weekday Morning Peak-Hour – With the exception of left-turn movements from Old Derby Street (north) (LOS "F") and right-turn movements exiting the Derby Street Shoppes right-turn driveway (LOS "E"), the study area intersections were shown to operate at an overall LOS "D" or better during the weekday morning peak-hour.

Weekday Evening Peak-Hour – Similar to Build-Out Scenario 1, the signalized intersections within the study area were shown to continue to operate under acceptable conditions with the exception of the Whiting Street/Cushing Street intersection where operating conditions were shown to degrade to LOS "F" due to the projected increased traffic on Whiting Street. With the exception of the Derby Street/Old Derby Street (south) intersection (right-turn only), critical movements at the unsignalized intersections within the study area were shown to be constrained.

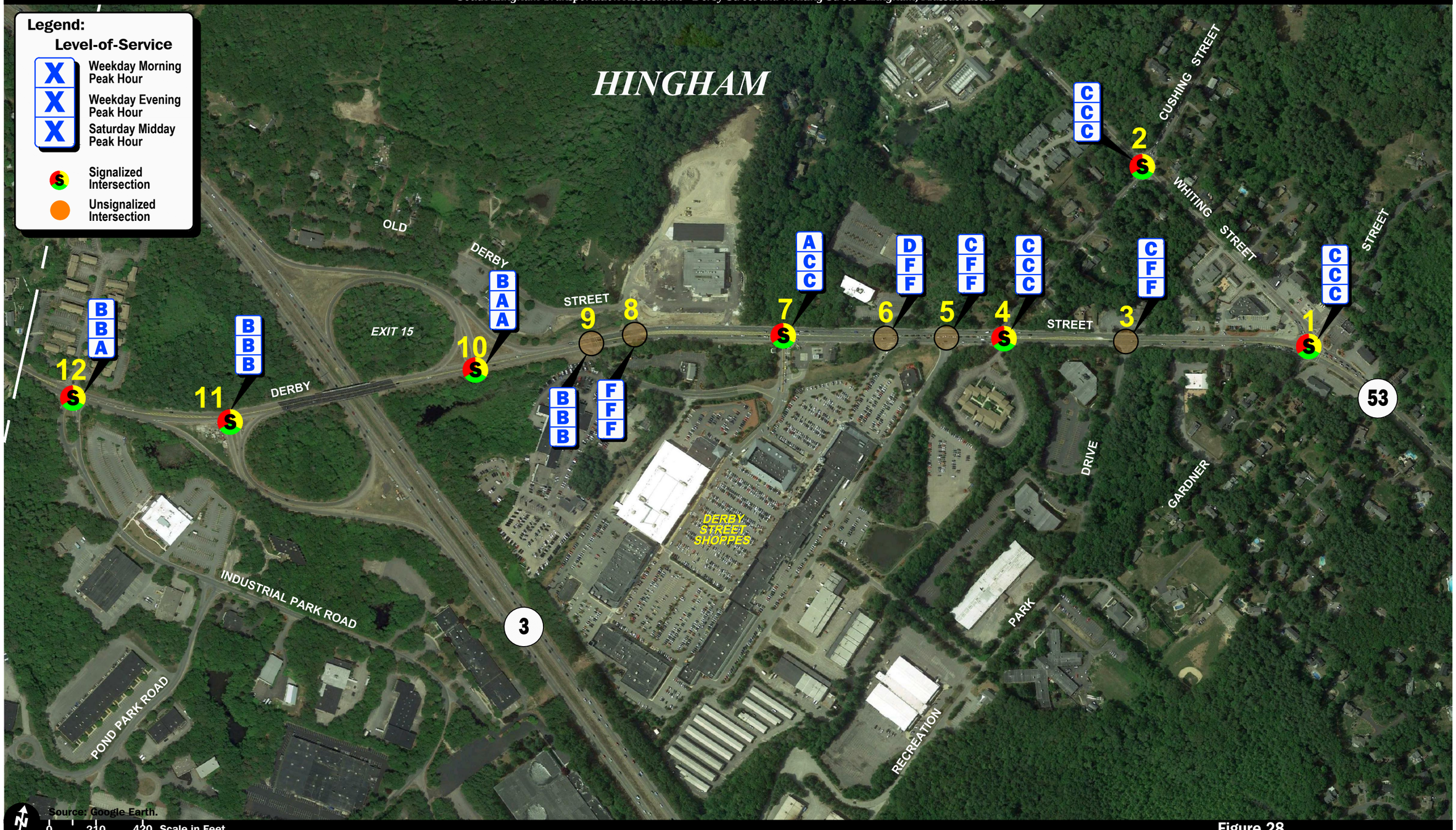


Figure 28

2015 Build-Out
Scenario 1
Intersection Level-of-Service Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

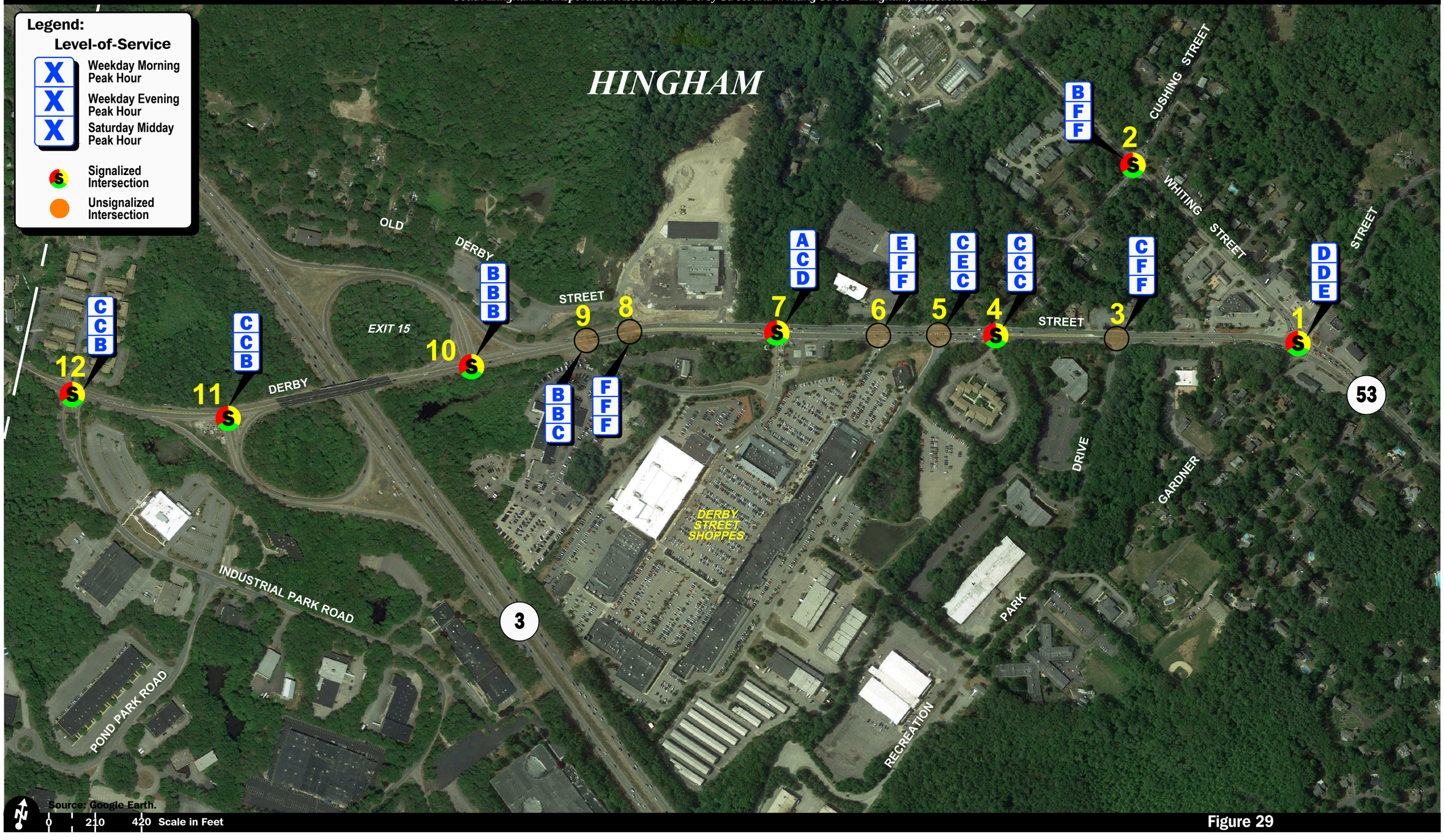


Figure 29

2015 Build-Out
Scenario 2
Intersection Level-of-Service Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Saturday Midday Peak-Hour – Operating conditions during the Saturday midday peak-hour were shown to be similar to or improved over those reported during the weekday evening peak-hour, with the exception of the Whiting Street/Derby Street/Gardner Street intersection, where operating conditions were shown to degrade from LOS "D" to LOS "E".

Build-Out Scenario 3 (Figure 30):

Impacts associated with the contemplated development defined for Build-Out Scenario 3 (2,450,000 sf of additional/modified building area) were shown to be most pronounced during the weekday evening and Saturday midday peak hours when compared to Build-Out Scenario 2, with more robust improvements required to the corridor to support this level of development, particularly at the Derby Street/Pond Park Road and Whiting Street/Cushing Street intersections.

Weekday Morning Peak-Hour – With the exception of left-turn movements from Old Derby Street (north) (LOS "F"), the study area intersections were shown to operate at an overall LOS "D" or better during the weekday morning peak-hour.

Weekday Evening Peak-Hour – With the exception of the Derby Street/Pond Park Road, Whiting Street/Cushing Street and Whiting Street/Derby Street/Gardner Street intersections, the signalized intersections within the study area were shown to continue to operate under acceptable conditions. Operating conditions at the aforementioned intersections were shown to be at or over the design capacity of the intersection. With the exception of the Derby Street/Old Derby Street (south) intersection (right-turn only), critical movements at the unsignalized intersections within the study area were shown to be constrained.

Saturday Midday Peak-Hour – Operating conditions during the Saturday midday peak-hour were shown to be similar to or improved over those reported during the weekday evening peak-hour, with the exception of the Derby Street/Derby Street Shoppes Main Driveway and Derby Street/Cushing Street intersections, where operating conditions were shown to degrade from LOS "C" to LOS "E".

Build-Out Scenario 4 (Figure 31):

Build-Out Scenario 4 represents the most robust development scenario for South Hingham, with 3,580,000 sf of additional/modified building area to be added resulting in a potential increase in traffic volumes of over 80,000 vehicle trips on a weekday and over 70,000 vehicle trips on a Saturday. This level of development would require major infrastructure investments to maintain acceptable operating conditions along the Derby Street and Whiting Street corridors, most notably at the Route 3/Derby Street interchange.

Weekday Morning Peak-Hour – With the exception of the Derby Street/Pond Park Road and Derby Street/Route 3 southbound ramps intersections, the signalized intersections within the study area were shown to operate at an overall LOS "D" or better during the weekday morning peak-hour. Critical movements at the Derby Street/Old Derby Street (north) (left-turn movements exiting Old Derby Street) and Derby Street/Derby Street Shoppes right-turn driveway (right turns exiting the Derby Street Shoppes) were shown to operate at or over capacity.

Weekday Evening Peak-Hour – With the exception of the Derby Street/Route 3 northbound ramps intersection, the signalized intersections within the study area were shown to operate at or over capacity, with significant delays and residual vehicle queuing predicted. With the exception

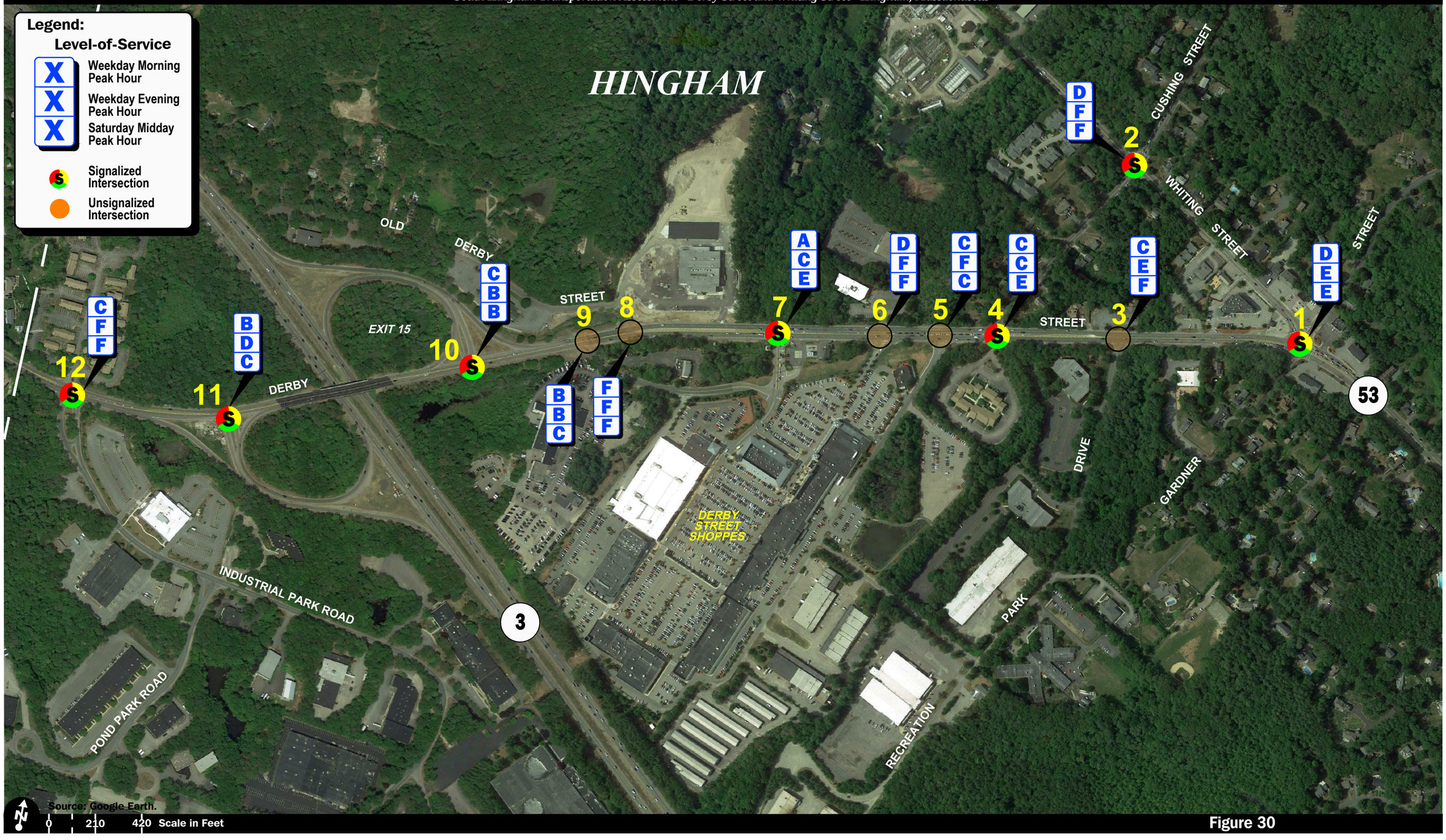


Figure 30

2015 Build-Out
Scenario 3
Intersection Level-of-Service
Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

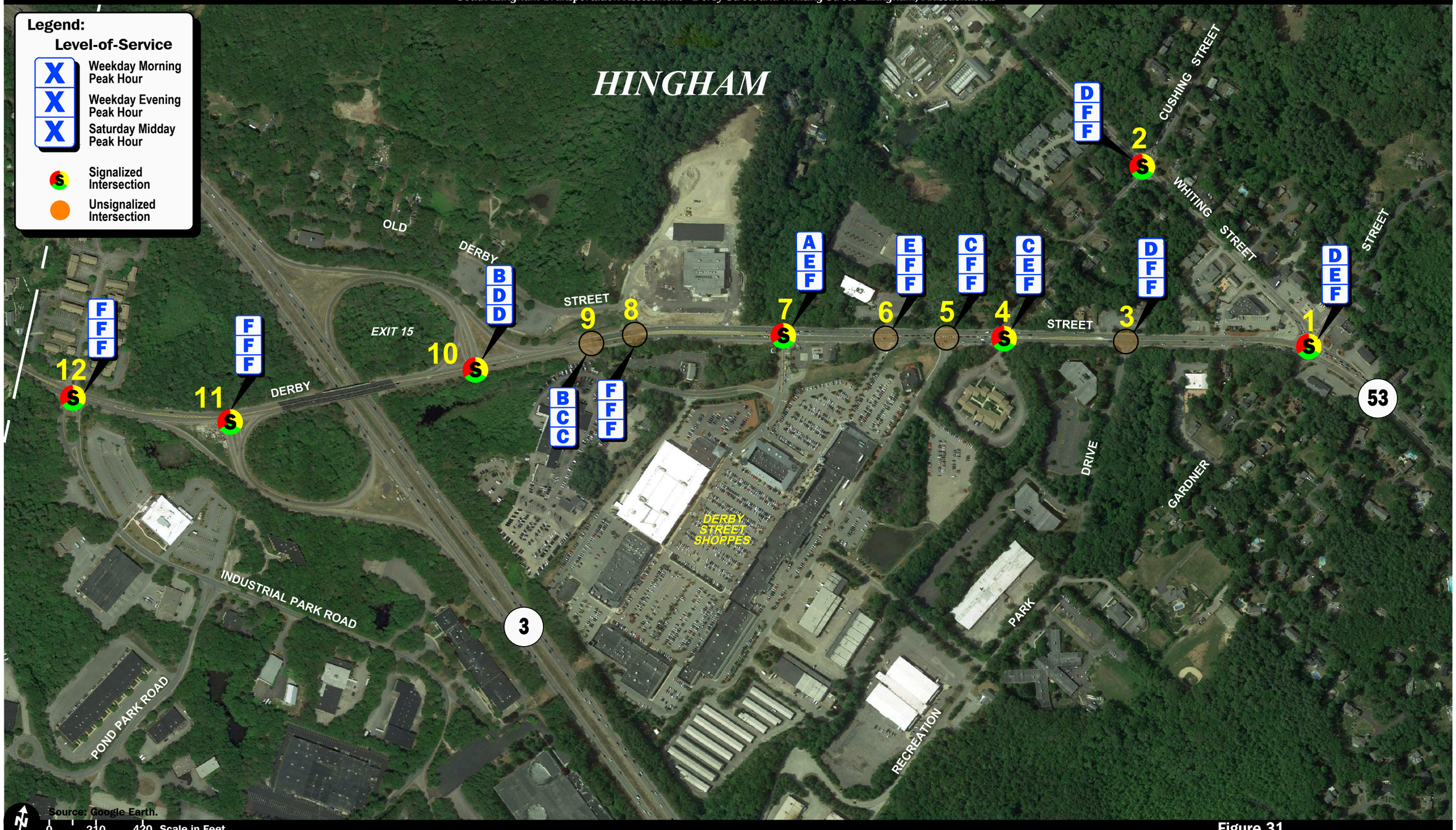


Figure 31

2015 Build-Out
Scenario 4
Intersection Level-of-Service Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

of the Derby Street/Old Derby Street (south) intersection (right-turn only), critical movements at the unsignalized intersections within the study area were also shown to be constrained.

Saturday Midday Peak-Hour – Operating conditions during the Saturday midday peak-hour were shown to be similar to those reported during the weekday evening peak-hour, with significant delays and vehicle queuing noted at the majority of the study intersections.

CUSHING STREET/GARNDER STREET IMPACT ASSESSMENT

Cushing Street and Gardner Street are both functionally classified as collector roadways, whose primary function is local access to residential properties. As traffic volumes have increased in South Hingham, both Cushing Street and Gardner Street have experienced an increase in traffic as motorists seek alternate travel routes to avoid delays at the Route 53/Route 228 intersection (Whiting Street/Washington Street/Pond Street/Main Street, a.k.a. Queen Anne's Corner) and along Main Street (Route 228), primarily during the weekday commuter peak hours and most pronounced during the evening peak-hour. The southern section of Gardner Street links Hingham Street (Route 228) and Whiting Street (Route 53) and, at times, serves as a cut-through roadway for traffic exiting Route 3 at Exit 14 destined to either Route 53 or Main Street and seeking to avoid traffic congestion at Queen Anne's Corner. The northern section of Gardner Street links Whiting Street to Main Street and accommodates traffic that is destined to Main Street north of Queen Anne's Corner from Derby Street, Route 53 and the southern section of Gardner Street. With the additional development that has occurred along Derby Street, these roadways have also seen increased traffic during the Saturday shopping period, as well as during the summer months when traffic associated with the many recreation opportunities in the area increases.

Both Cushing Street and Gardner Street are approximately 24-feet in width and traverse a circuitous northeast-southwest alignment, with Cushing Street linking Derby Street, Route 53 and Main Street, and Gardner Street linking Pond Street, Derby Street, Route 53 and Main Street. Both roadways feature horizontal and vertical curves that limit both safe travel speeds and lines of sight for motorists, pedestrians and bicyclists, and only Cushing Street provides a continuous sidewalk along its alignment. These features along with the predominantly residential setting of the land use along both Cushing Street and Gardner Street are not conducive to the conveyance of large volumes of non-local traffic between major arterials such as Route 53 and Route 228. At moderate traffic volume levels (100 or fewer vehicles per hour), sustainable operating conditions and a reasonable balance between roadway connectivity and residential access can be maintained (excepting that non-local truck access should be limited or restricted as allowed per State regulations).

EXISTING CONDITIONS

At present, hourly volumes along Cushing Street range from 724 vehicles per hour (vph) during the weekday morning peak-hour to 975 vph during the Saturday midday peak-hour, with the peak directional flow found to be southbound in the morning and northbound in the evening and on a Saturday. The section of Gardner Street south of Route 53 accommodates between 374 vph and 409 vph, with the higher traffic volumes found to occur during the Saturday midday peak-hour and are oriented toward Route 53 (i.e., travelling between Hingham Street and Route 53). Traffic volumes on the section of Gardner Street north of Route 53 range from 381 vph during the weekday evening peak-hour to 407 vph during the weekday morning peak-hour, with the peak direction flow found to be toward Route 53 in the morning and toward Main Street in the evening and on a Saturday.

Traffic operations at the Route 53/Cushing Street and Route 53/Derby Street/Gardner Street intersections were found to be generally acceptable (defined as a level-of-service of "D" or better) during the peak hours due to the presence of a traffic control signal at both intersections, with operating conditions for the Cushing Street and Gardner Street approaches at the Main Street/ Cushing Street, Main Street/Gardner Street and Hingham Street/Gardner Street intersections (unsignalized) observed to be constrained (defined by excessive delay and pronounced vehicle queuing) during one or more peak periods and most pronounced during the weekday evening peak commuter period.

POTENTIAL BUILD-OUT IMPACTS

Cushing Street

As defined in Table 3 and described previously, potential peak-hour traffic volume impacts on Cushing Street north of Route 53 are projected to range 40 vehicle trips during the Saturday midday peak-hour under Build-Out Scenario 1 (605,000 sf of additional/modified building area) to 379 vehicle trips during the same peak-hour under Build-Out Scenario 4 (3,580,000 sf of additional/modified building area). On average, the projected peak-hour traffic volume increases on this segment of Cushing Street associated with each Build-Out Scenario are as follows:

- Scenario 1: 6 percent
- Scenario 2: 16 percent
- Scenario 3: 21 percent
- Scenario 4: 33 percent

Gardner Street

Potential peak-hour traffic volume impacts on Gardner Street between Hingham Street and Route 53 are projected to range 9 vehicle trips during the Saturday midday peak-hour under Build-Out Scenario 1 to 166 vehicle trips during the same peak-hour under Build-Out Scenario 4. On average, the projected peak-hour traffic volume increases on this segment of Gardner Street associated with each Build-Out Scenario are as follows:

- Scenario 1: 5 percent
- Scenario 2: 34 percent
- Scenario 3: 27 percent

- Scenario 4: 33 percent

The Section of Gardner Street between Route 53 and Main Street (Route 228) is projected to experience potential peak-hour traffic volume increases ranging from 40 vehicle trips during the Saturday midday peak-hour under Build-Out Scenario 1 to 379 vehicle trips during the same peak-hour under Build-Out Scenario 4. On average, the projected peak-hour traffic volume increases on this segment of Gardner Street associated with each Build-Out Scenario are as follows:

- Scenario 1: 13 percent
- Scenario 2: 37 percent
- Scenario 3: 51 percent
- Scenario 4: 79 percent

Peak-hour traffic volume increases of in excess of 100 net new vehicle trips or an increase in baseline traffic volumes of 10 percent or more have been generally defined as having the potential to result in a material impact on motorist delays and vehicle queuing at intersecting driveways and side streets. Such increases exceed normal daily and seasonal traffic volume fluctuations. Only Build-Out Scenario 1 would result in potential traffic volume increases that would fall below these thresholds, indicating that Build-Out Scenarios 2, 3 and 4 would result in traffic volume increases that may necessitate specific improvements or actions to limit potential traffic volume increases on Gardner Street and Cushing Street, particularly any potential increase in through-trucking activities. A review of the traffic operations analysis confirms that the projected traffic demands associated with Build-Out Scenarios 2, 3 and 4 would result in increased use of Cushing Street and Gardner Street to access Derby Street, Route 53 and Route 228 to an extent that operating conditions would degrade at the Derby Street/ Cushing Street and Whiting Street/Derby Street/Gardner Street intersections.

Additionally, by definition, "cut-through" traffic does not have a destination on the roadway over which it travels and, as a result, often travels at higher rates of speed then local traffic (which has a destination on the roadway). Such speeds may not be conducive to the current roadway geometry that is afforded by Cushing Street and Gardner Street, particularly given the absence of sidewalks along Garner Street and the primarily residential nature of both roadways. These conditions are not reflected in the traffic operations analysis cited above and often pose more significant issues relative to safety and the quality of life of the residents along these roadways.

TRAFFIC MANAGEMENT STRATEGIES

In an effort to reduce the volume and speed of cut-through traffic using Cushing Street and Gardner Street, the following traffic management strategies could be pursued, alone or in combination, to achieve the desired result:

- ***Traffic Calming*** - Consider the use of traffic calming measures such as speed humps (elongated speed bumps), raised intersections, median installation (to reduce roadway width), textured pavement, pavement markings and other such features that are designed to reduce travel speeds and increase travel times. Both Cushing Street and Gardner Street north of Whiting Street are functionally classified as collector roadways, which require that the use of raised roadway features within the travelled-way (i.e., speed humps or raised intersections) be carefully considered.

- ***Turn Restrictions*** – Consider implementing peak period restrictions at the Hingham Street/Gardner Street intersection (requires MassDOT approval) and at select intersections along Gardner Street south of Whiting Street that provide access to/from Whiting Street.

- ***Truck Restrictions*** – Conduct a *Heavy Commercial Vehicle Exclusion Study* for Gardner Street north and south of Whiting Street and Cushing Street north of Whiting Street. This study is required by MassDOT to justify the exclusion of heavy commercial vehicles (i.e., trucks) on any roadway within the Commonwealth where the restriction of truck activity is proposed and not related to a physical roadway defect, such as a bridge or tunnel where the trucks cannot physically be accommodated due to height, weight or width restrictions.

- ***Education and Enforcement*** – Install radar speed signs at select locations along Gardner Street and Cushing Street to provide motorist feedback as to their travel speed in relation to the posted speed limit. The information obtained from these signs can then be used for targeted enforcement by police focused on those periods when the majority of motorists are observed to exceed the posted speed limit.

With the exception of the implementation of turn restrictions and approval by MassDOT of a truck exclusion, the above measures are designed to discourage but not prohibit the use of Gardner Street and Cushing Street by non-local traffic; however, effectively designed, located, and constructed, these strategies can achieve a balance between maintaining accessibility and the safety and quality of life of the residents that reside along these roadways.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

VAI has conducted an assessment of the Derby Street corridor and its intersecting roadways and driveways to major commercial developments in support of the Town of Hingham's evaluation of the potential build-out of vacant and underutilized properties located in South Hingham. The purpose of this assessment was to: i) determine the ability of the Derby Street corridor to accommodate the additional traffic demands that will be associated with projected future development; and ii) identify specific improvements that may be necessary to facilitate the safe and efficient movement of vehicles, pedestrians and bicyclists. For the purpose of this evaluation, five (5) specific development areas were identified within which four (4) potential build-out scenarios ranging from the approximately 605,000 sf of new mixed-use space to 3.58 million sf of new development were evaluated.

As a result of this evaluation, the location of capacity constraints along the Derby Street corridor have been identified and specific recommendations for improvements are provided that are designed to accommodate potential future development in South Hingham without overburdening neighborhood streets.

RECOMMENDATIONS

A review of the transportation system serving the South Hingham area indicates that specific improvements will be required to accommodate future development along the Derby Street and Whiting Street corridors. These improvements range from traffic signal timing adjustments, the widening of roadways and intersections, and the addition of a new highway ramp to manage traffic volumes and maintain acceptable operating conditions. The specific improvement measures and the timing of their implementation will be dependent on the location, type and size of a specific development or redevelopment project; however, these recommendations should serve as a guide for future improvements along the Derby Street and Whiting Street corridors.

The following improvements have been developed for each of the four (4) identified Build-Out Scenarios, and are preceded by specific Transportation Demand Management (TDM) strategies that are designed to reduce the overall amount of new traffic that may result from future development in the area. It is important to note that a determination as to the availability of public right-of-way to accommodate the recommended improvements (i.e., no permanent private

property impacts) was beyond the scope of this assessment and will need to be reviewed when a formal design is advanced for a specific improvement measure.

Build-Out Scenario 1

As discussed previously, the planned roadway, intersection and traffic control improvements that are currently under design for the Derby Street corridor and at the Whiting Street/ Derby Street/Gardner Street intersection are expected to result in an overall improvement in operating conditions that will afford sufficient capacity to accommodate the projected development associated with Build-Out Scenario 1 (605,000 sf of additional/modified building area).

It is expected that adjustments to the traffic signal timing and coordination patterns along Derby Street and at the Whiting Street/Derby Street/Gardner Street intersection would be required; however, no major roadway infrastructure investments are predicted to be required outside of those necessary to access a specific development parcel where access is not presently afforded.

Build-Out Scenario 2

The additional traffic demands associated with Build-Out Scenario 2 (1,500,000 sf of additional/modified building area) will require targeted improvements at two (2) specific intersections beyond those currently being advanced for the corridor. These locations and the identified improvements are depicted on Figure 32 and are as follows:

- ***Whiting Street/Cushing Street*** – Convert the Whiting Street southeastbound right-turn lane into a through/right-turn lane; widen Whiting Street southeast of intersection to receive the added through travel lane; and optimize the traffic signal timing and phasing.

- ***Derby Street/Old Derby Street (north)*** – Widen Old Derby Street to provide two (2) left-turn lanes and a right-turn lane (3-lane approach); widen Derby Street eastbound to provide a second left-turn lane; widen Derby Street westbound to provide a right-turn lane; and install a traffic control signal to be integrated into the Derby Street traffic signal system.

In addition and similar to Build-Out Option 1, it is expected that adjustments to the traffic signal timing and coordination patterns along Derby Street and at the Whiting Street/ Derby Street/Gardner Street intersection would be required.

Figure 33 depicts the improved operating conditions that would be achieved with the implementation of the aforementioned improvements, with all of the signalized intersections within the study area predicted to operate under acceptable conditions (defined as an overall LOS "D" or better) during the weekday morning, weekday evening and Saturday midday peak hours.

Build-Out Scenario 3

Build-Out Scenario 3 (2,450,000 sf of additional/modified building area) represents a significant increase in buildable area and the associated traffic impacts from those associated with Build-Out Scenario 2. Further, the projected increased development within South Shore Park on the west side of the Route 3/Derby Street interchange results in competing traffic demands on either side

Legend:
Level-of-Service
- Signalized Intersection
- Unsignalized Intersection

HINGHAM

- CONVERT WHITING STREET SOUTHBOUND APPROACH RIGHT-TURN LANE TO A THROUGH/RIGHT LANE (REQUIRES WIDENING SOUTH OF INTERSECTION TO RECEIVE ADDITIONAL THROUGH LANE).
- OPTIMIZE TRAFFIC SIGNAL TIMING AND PHASING.

- WIDEN OLD DERBY STREET APPROACH TO PROVIDE AN ADDITIONAL LEFT-TURN LANE AND A RIGHT-TURN LANE.
- WIDEN DERBY STREET EASTBOUND APPROACH TO PROVIDE AN ADDITIONAL LEFT-TURN LANE.
- WIDEN DERBY STREET WESTBOUND APPROACH TO PROVIDE A RIGHT-TURN LANE.
- INSTALL TRAFFIC SIGNAL.

OPTIMIZE TRAFFIC SIGNAL TIMING, PHASING AND COORDINATION.

OPTIMIZE TRAFFIC SIGNAL TIMING, PHASING AND COORDINATION.

OPTIMIZE TRAFFIC SIGNAL TIMING, PHASING AND COORDINATION.

OPTIMIZE TRAFFIC SIGNAL TIMING, PHASING AND COORDINATION.

OPTIMIZE TRAFFIC SIGNAL TIMING AND PHASING.

OPTIMIZE TRAFFIC SIGNAL TIMING, PHASING AND COORDINATION.

Source: Google Earth.

0 210 420 Scale in Feet

Figure 32

Build-Out - Scenario 2 Recommended Improvement Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

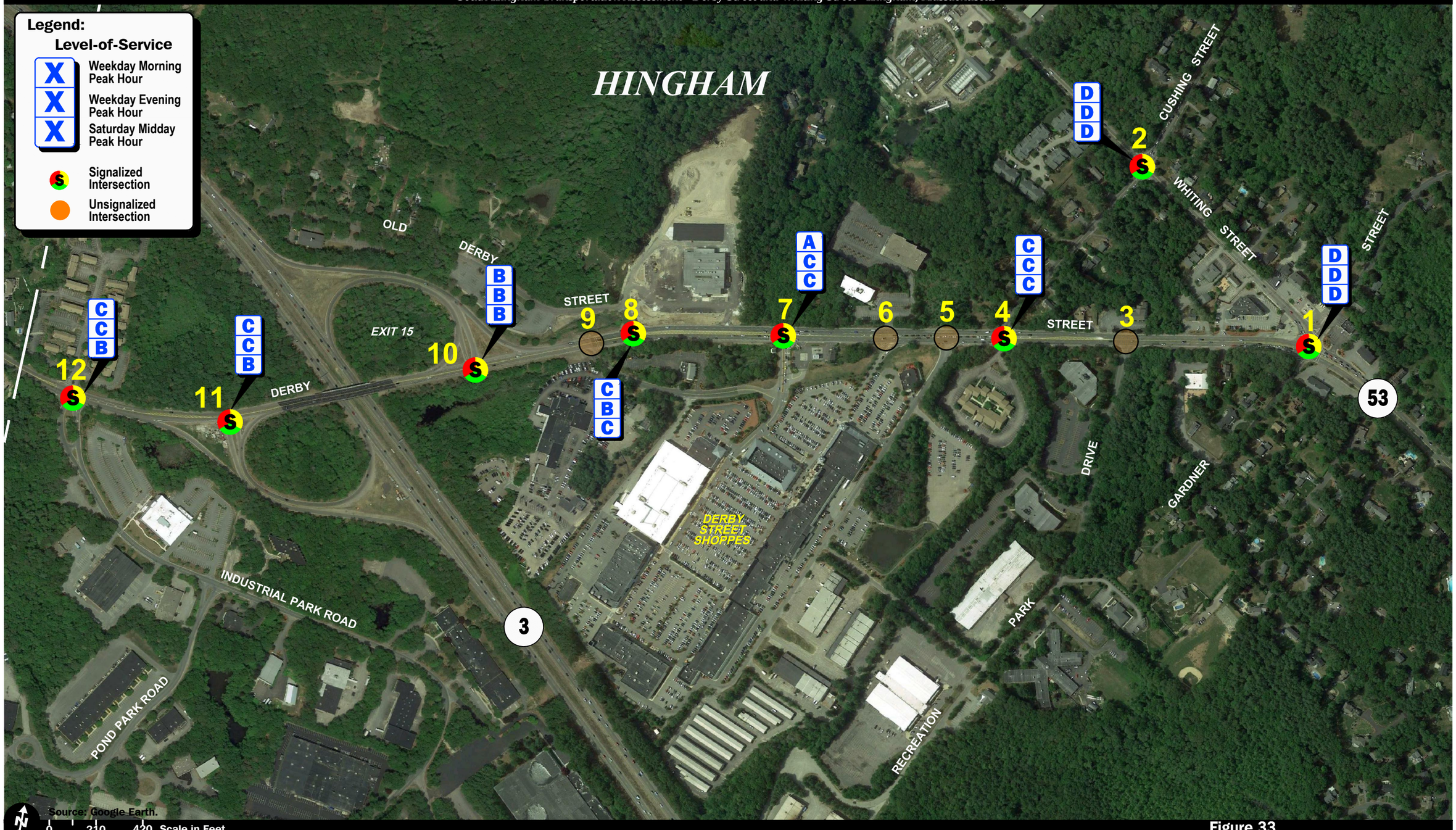


Figure 33

2015 Build-Out
Scenario 2 with Improvements
Intersection Level-of-Service Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

of the interchange. As a result, an expansion of the improvements that were associated with Build-Out Scenario 2 are required to support Build-Out Scenario 3. The expanded improvements are depicted on Figure 34 and are as follows, with the additional improvements beyond those identified for Build-Out Scenario 2 highlighted for reference:

- ***Whiting Street/Cushing Street*** – Widen the Whiting Street southeastbound approach to provide an additional through travel lane (3-lane approach which includes maintaining a right-turn lane); widen Whiting Street southeast of intersection to receive the added through travel lane; widen the Cushing Street southwestbound approach to provide a right-turn lane; and replace the existing traffic signal system to accommodate the recommended intersection geometry.

- ***Derby Street/Old Derby Street (north)*** – Widen Old Derby Street to provide two (2) left-turn lanes and a right-turn lane (3-lane approach); widen Derby Street eastbound to provide a second left-turn lane; widen Derby Street westbound to provide a right-turn lane; and install a traffic control signal to be integrated into the Derby Street traffic signal system.

- ***Derby Street/Pond Park Road*** – Widen the Derby Street eastbound approach to provide a right-turn lane; widen the Derby Street westbound approach to provide a second left-turn lane; widen Pond Park Road to provide an additional right-turn lane; and replace the existing traffic signal system to accommodate the recommended intersection geometry.

In addition, it is expected that adjustments to the traffic signal timing and coordination patterns along Derby Street and at the Whiting Street/Derby Street/Gardner Street intersection would be required.

Figure 35 depicts the improved operating conditions that would be achieved with the implementation of the aforementioned improvements, with all of the signalized intersections within the study area predicted to operate under acceptable conditions (defined as an overall LOS "D" or better) during the weekday morning, weekday evening and Saturday midday peak hours.

Build-Out Scenario 4

Build-Out Scenario 4 (3,580,000 sf of additional/modified building area) represents an increase in development that is approximately 6 times larger than Build-Out Scenario 1 (605,000 sf of additional/modified building area) and for which the planned roadway, intersection and traffic control improvements that are currently under design for the Derby Street corridor and at the Whiting Street/Derby Street/Gardner Street intersection are expected to afford sufficient capacity to accommodate. Accordingly, the improvements required to support Build-Out Scenario 4 require a significant investment in transportation infrastructure improvements, the elements of which are depicted on Figure 36 and are summarized below, with the additional improvements beyond those identified for Build-Out Scenario 3 highlighted for reference:

- ***Whiting Street/Derby Street/Gardner Street*** – Widen the Gardner Street northeastbound approach to provide two (2) travel lanes.

- ***Whiting Street/Cushing Street*** – Widen the Whiting Street southeastbound approach to provide an additional through travel lane (3-lane approach which includes maintaining a right-turn lane); widen Whiting Street southeast of intersection to receive the added

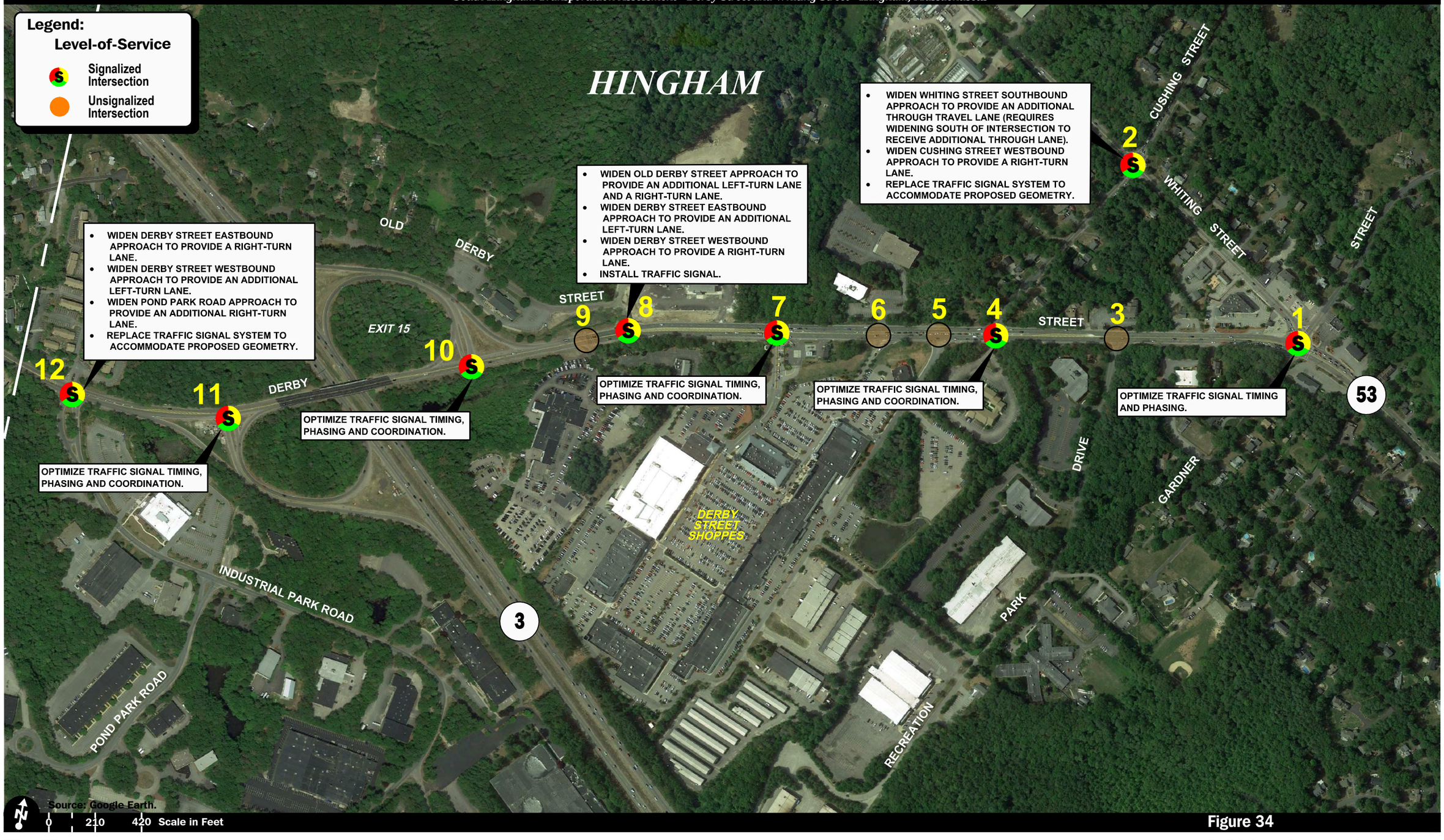


Figure 34

Build-Out - Scenario 3
Recommended Improvemet Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

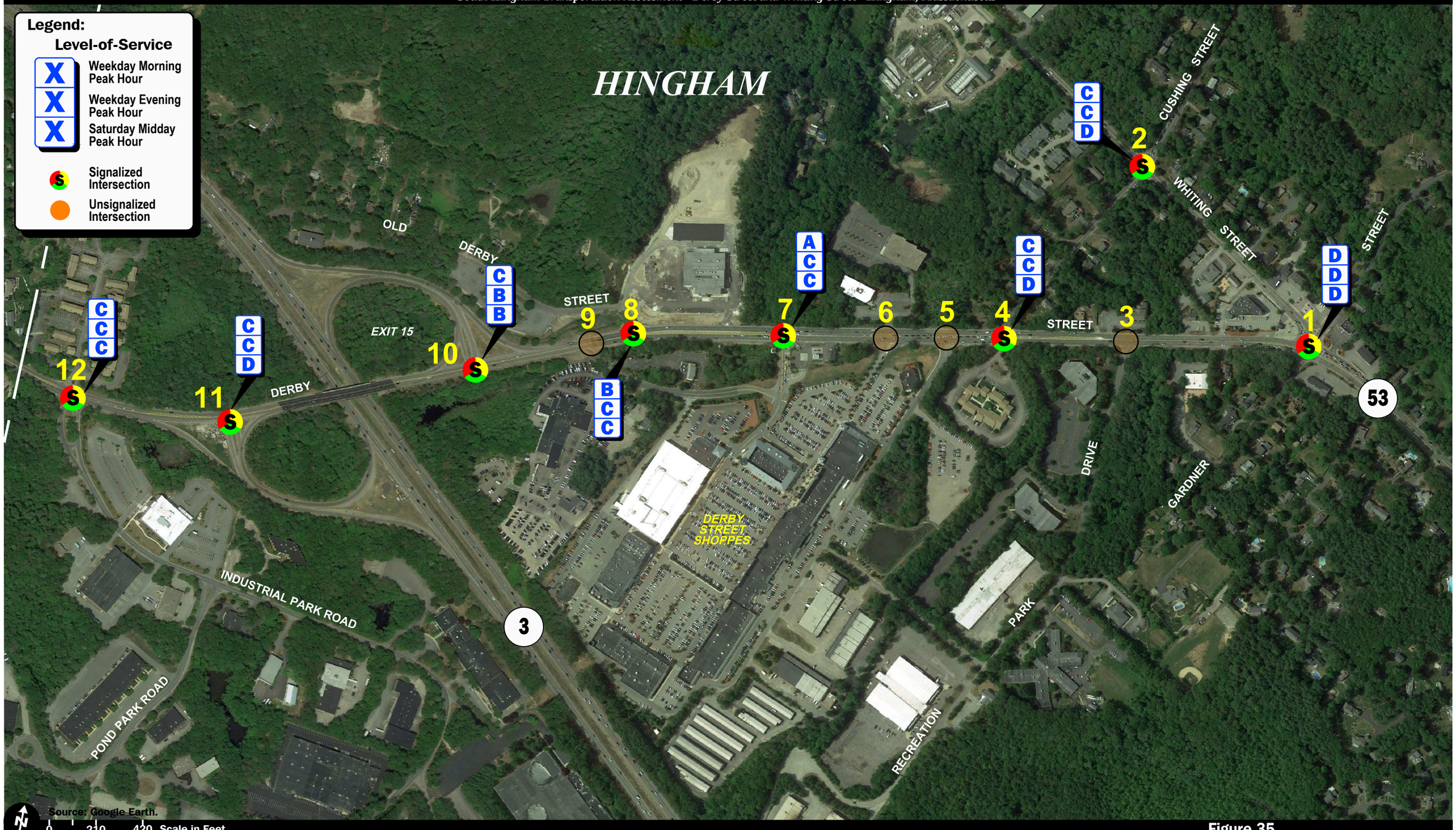


Figure 35

2015 Build-Out
Scenario 3 with Improvements
Intersection Level-of-Service Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Legend:
Level-of-Service
- Signalized Intersection
- Unsignalized Intersection

HINGHAM

- WIDEN DERBY STREET EASTBOUND APPROACH TO PROVIDE A LEFT-TURN LANE AND A RIGHT-TURN LANE.
- WIDEN DERBY STREET WESTBOUND APPROACH TO PROVIDE AN ADDITIONAL LEFT-TURN LANE.
- WIDEN POND PARK ROAD APPROACH TO PROVIDE A LEFT-TURN LANE AND AN ADDITIONAL RIGHT-TURN LANE.
- REPLACE TRAFFIC SIGNAL SYSTEM TO ACCOMMODATE PROPOSED GEOMETRY.

- WIDEN DERBY STREET BRIDGE OVER ROUTE 3 TO PROVIDE TWO TRAVEL LANES PER DIRECTION (4 LANE SECTION).

- WIDEN OLD DERBY STREET APPROACH TO PROVIDE AN ADDITIONAL LEFT-TURN LANE AND A RIGHT-TURN LANE.
- WIDEN DERBY STREET EASTBOUND APPROACH TO PROVIDE AN ADDITIONAL LEFT-TURN LANE.
- WIDEN DERBY STREET WESTBOUND APPROACH TO PROVIDE A RIGHT-TURN LANE.
- INSTALL TRAFFIC SIGNAL.

- WIDEN WHITING STREET SOUTHBOUND APPROACH TO PROVIDE AN ADDITIONAL THROUGH TRAVEL LANE (REQUIRES WIDENING SOUTH OF INTERSECTION TO RECEIVE ADDITIONAL THROUGH LANE).
- WIDEN CUSHING STREET EASTBOUND APPROACH TO PROVIDE AN ADDITIONAL LEFT-TURN LANE.
- WIDEN CUSHING STREET WESTBOUND APPROACH TO PROVIDE A RIGHT-TURN LANE.
- REPLACE TRAFFIC SIGNAL SYSTEM TO ACCOMMODATE PROPOSED GEOMETRY.

- CONSTRUCT AN ON-RAMP TO ROUTE 3 SOUTHBOUND FROM DERBY STREET WESTBOUND.
- CONVERT DERBY STREET WESTBOUND APPROACH LEFT-TURN LANE TO A THROUGH LANE.
- REPLACE TRAFFIC SIGNAL SYSTEM TO ACCOMMODATE PROPOSED GEOMETRY.

OPTIMIZE TRAFFIC SIGNAL TIMING, PHASING AND COORDINATION.

OPTIMIZE TRAFFIC SIGNAL TIMING, PHASING AND COORDINATION.

- WIDEN CUSHING STREET SOUTHBOUND APPROACH TO PROVIDE AN ADDITIONAL RIGHT-TURN LANE.
- OPTIMIZE TRAFFIC SIGNAL TIMING, PHASING AND COORDINATION.

- WIDEN GARDNER STREET NORTHEASTBOUND APPROACH TO PROVIDE TWO TRAVEL LANES.
- OPTIMIZE TRAFFIC SIGNAL TIMING AND PHASING

OLD DERBY STREET
DERBY STREET
EXIT 15
CUSHING STREET
WHITING STREET
STREET
DRIVE
GARDNER
DERBY STREET SHOPPES
INDUSTRIAL PARK ROAD
POND PARK ROAD
PARK
RECREATION
53
3

Source: Google Earth.
0 210 420 Scale in Feet

Figure 36

Build-Out - Scenario 4 Recommended Improvement Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

through travel lane; widen the Cushing Street southwestbound approach to provide a right-turn lane; widen the Cushing Street northeastbound approach to provide an additional left-turn lane; and replace the existing traffic signal system to accommodate the recommended intersection geometry.

- ***Derby Street/Cushing Street*** – Widen the Cushing Street southwestbound approach to provide an additional right-turn lane.

- ***Derby Street/Old Derby Street (north)*** – Widen Old Derby Street to provide two (2) left-turn lanes and a right-turn lane (3-lane approach); widen Derby Street eastbound to provide a second left-turn lane; widen Derby Street westbound to provide a right-turn lane; and install a traffic control signal to be integrated into the Derby Street traffic signal system.

- ***Derby Street Bridge*** – Replace/widen the Derby Street Bridge over Route 3 to accommodate four (4) travel lanes with shoulders and sidewalks along both sides.

- ***Derby Street/Route 3 Southbound Ramps*** – Construct a new on-ramp to Route 3 southbound from Derby Street westbound in the northwest quadrant of the interchange; convert the Derby Street westbound left-turn lane to a through travel lane; and replace the existing traffic signal system to accommodate the recommended intersection geometry.

- ***Derby Street/Pond Park Road*** – Widen the Derby Street eastbound approach to provide a left-turn lane and a right-turn lane; widen the Derby Street westbound approach to provide a second left-turn lane; widen Pond Park Road to provide an additional left-turn lane and an additional right-turn lane; and replace the existing traffic signal system to accommodate the recommended intersection geometry.

In addition, adjustments to the traffic signal timing and coordination patterns along Derby Street and at the Whiting Street/Derby Street/Gardner Street intersection would be required.

Figure 37 depicts the improved operating conditions that would be achieved with the implementation of the aforementioned improvements, with all of the signalized intersections within the study area predicted to operate under acceptable conditions (defined as an overall LOS "D" or better) during the weekday morning, weekday evening and Saturday midday peak hours, with the exception of the Whiting Street/Derby Street/Gardner Street intersection which is predicted to operate at an overall LOS "E" during the Saturday midday peak-hour.

Transportation Demand Management Strategies

Given the level of existing and planned future development in South Hingham, it is important that a robust Transportation Demand Management (TDM) program be developed in order to reduce the overall volume of new traffic in the area and afford opportunities for the use of alternative modes of transportation to single-occupant vehicles. The following general TDM strategies should be considered and advanced by the Town and area developers in a public-private partnership:

- Establish a regional Transportation Management Association (TMA) similar to the Route 28 Business Council (www.128bc.org), the Neponset Valley TMA (www.neponsetvalleytma.org) or similar TMA, to manage transportation alternatives, provide resources and coordinate shuttle bus services for area residential and commercial

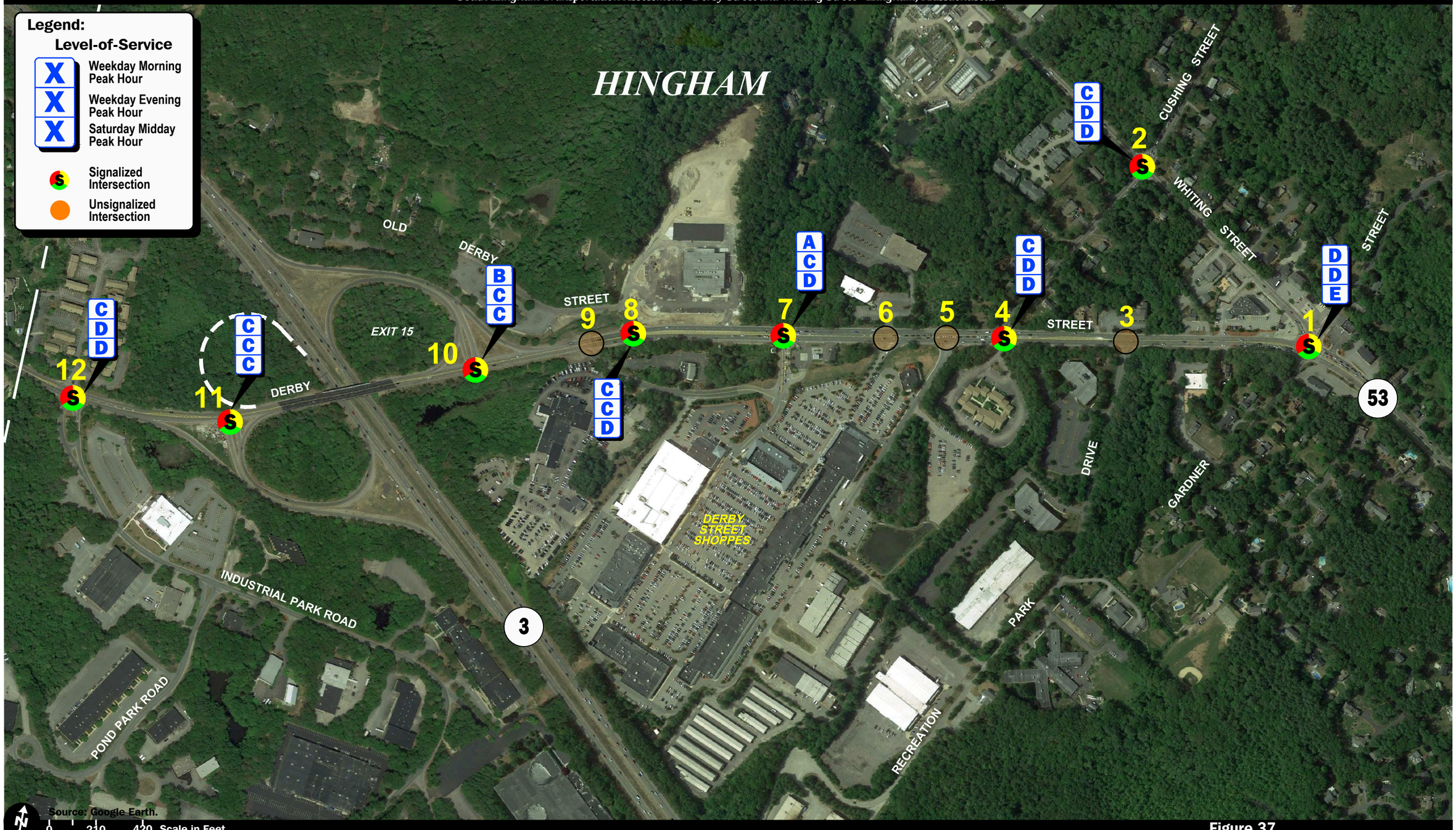


Figure 37

2015 Build-Out
Scenario 4 with Improvements
Intersection Level-of-Service Summary

Vanasse & Associates, Inc.
Transportation Engineers & Planners

development. The TMA could be funded through fees provided by members of the TMA with opportunities for state and Federal TMA grants.

- Coordinate with MassDOT, the MBTA and the Metropolitan Area Planning Council (MAPC) to establish fixed-route bus service to South Hingham, with connections to the Greenbush Commuter Rail and Red Line subway system.

- Improve pedestrian and bicycle access and accommodations along the Derby Street corridor, with links to and between properties to provide connectivity.

- Consider the establishment of off-road pathways and connections between Derby Street and Whiting Street that accommodate pedestrians and bicycles, potentially through the Office Park Development Area.

- Development and redevelopment projects should be designed to include secure bicycle parking, including exterior bicycle racks proximate to building entrances and interior or covered parking where parking garages are proposed.

- Development and redevelopment projects should include a TDM program that is designed to inform employees, residents and patrons of available public transportation options, car/vanpool services and pedestrian and bicycle amenities, and to encourage their use.

- Development and redevelopment projects should be required to coordinate with MassDOT and MassRIDES, MassDOT's rideshare coordinator, to develop and implement a TDM program.

- Development and redevelopment projects should not provide more parking than required by Town Zoning unless justified for the proposed use, with the use of "land banked" or reduced parking encouraged.