3.0 TRANSPORTATION AND AIR QUALITY

This traffic study has been prepared to assess the traffic impacts and to evaluate the access requirements of the proposed Wayland Town Center project located on the north side of Route 20 (Boston Post Road) in Wayland, Massachusetts. This report identifies the existing traffic parameters and the impact of traffic generated by the proposed development, and evaluates it with regard to capacity and roadway requirements.

3.1 Project Description

The site is located on approximately 56.5 acres in Wayland on the north side of Route 20 (Boston Post Road). The site is generally bounded by areas of open and wooded space to the north, Route 20 to the south, Route 27 (Old Sudbury Road) to the east, and by the Sudbury River to the west. Currently, this site consists of approximately 410,500 square-foot of office space, which is vacant. Previously, the office space had been occupied by both Polaroid Corporation and Raytheon Company.

As proposed, the existing buildings on site will be razed and replaced with the following uses: up to 100 condominium units, 10,000 square feet of office space, a pad site for a 40,000 square-foot town facility, and approximately 155,000 square feet of retail/restaurant space[1]. For the pad site, a 40,000 square-foot library was chosen as a potential use. Based on available municipal land use data contained in the Institute of Transportation Engineers (ITE)[2] Trip Generation Manual, a library would be the most peak-hour intense generator of traffic, during the weekday evening and Saturday midday peak hours.

Access to and egress from the site are proposed to be provided by way of two full-access driveways: one on Route 27 and one on Route 20 (Access Alternative A). A second access scenario has also been reviewed where all access to the project will be from Route 20 (Access Alternative B). At this time, it is estimated that the project will include 1,256 parking spaces. A shared parking analysis has been performed to calculate the required parking for the project. Figure 3-1 shows the project's site location relative to the existing roadway network.

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[1] The original project (prior to the zone change) consisted of 100 apartment units, 40 ksf of office space, 40 ksf of municipal space and 308 ksf of retail space.

[2] *Trip Generation,* Sixth Edition; Institute of Transportation Engineers; Washington, DC; 1997.

Figure 3-1

Site Location Map

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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3.1.1 Study Methodology

Vanasse & Associates, Inc. (VAI) has analyzed the proposed project and its impacts upon the study area intersections in the north section of the town of Wayland. This report represents a study of future traffic demand as well as an assessment of traffic operation within the study area. Existing roadways are evaluated and measures to mitigate incremental project traffic impacts are presented.

The primary conditions evaluated in the traffic operations analysis include 2006 Existing, 2011 No-Build, and 2011 Build. The planned time frame is for the project to be built and fully operational prior to 2011. The 2011 No-Build scenario includes annual background growth, as well as specific developments independent of the proposed project. The 2011 Build condition addresses the cumulative impacts of background growth, specific development by others, and impacts of the proposed project.

3.1.2 Alternatives Studied

For the purpose of this report, three alternatives were evaluated for average month conditions and include the following:

- Existing – The Existing scenario represents the traffic operating conditions presently on the roadway system.

- No-Build – The No-Build alternative was examined to establish the 2011 Baseline traffic conditions. The incremental impacts of the proposed project may be determined by making comparisons to the No-Build alternative. The No-Build alternative includes identified background developments, as well as the in-fill of the existing office building and assumes that the project is not built.

- Build – The Build alternative includes the development of Wayland Town Center project. It is anticipated that the project will be constructed and occupied prior to the year 2011. Two access alternatives were reviewed. Under Access Alternative A, access to and egress from the site will be provided by way of two full access driveways, one to Route 20 and one to Route 27. Under Access Alternative B, all access will be from Route 20.

3.2 Existing Conditions

3.2.1 Study Area

The study area for this project was originally developed in consultation with the Town of Wayland. In February 2005 roadway geometry and traffic control information was collected for the following locations:

- Route 20 at Route 27/126
- Route 27 at Route 126
- Route 27/126 at Pelham Island Road and Millbrook Road
- Route 20 at Pelham Island Road
- Route 20 at Old County Road
- Route 20 at the Site Driveway
- Route 27 at the Site Driveway

In May and June 2006, roadway geometry and traffic volume data were collected at the following north Wayland neighborhood locations:

- Route 27 at River Road
- Route 27 at Glezen Lane
- Route 27 at Bow Road
- Route 27 at Route 126
- Route 27/Route 126 at Pelham Island Road and Millbrook Road
- Route 20 at Route 27/Route 126
- Route 27 at Winthrop Road
- Route 126 at Bow Road
- Route 126 at Plain Road
- Route 126 at Claypit Hill Road and Training Field Road
- Route 126 at Glezen Lane
- Route 126 at Moore Road
- Glezen Lane at Moore Road
- Glezen Lane at Training Field Road
- Plain Road at Claypit Hill Road

- Plain Road at Glen Road
- Route 20 at Winthrop Road
- Route 20 at Pelham Island Road
- Route 20 at Old County Road (River Road in Wayland)

Two additional intersections in Sudbury were added to the study area as a result of the ENF filing:

- Route 20 and Union Avenue
- Route 20 and Nobscot Road

3.2.2 Field Survey

A comprehensive field inventory of the project site was originally conducted in February 2005 and then again in May and June 2006 for the north Wayland neighborhood intersections. The inventory included collection of existing roadway geometrics, traffic volumes, and safety data for the existing study area intersections and proposed site access roadways. Traffic volumes were measured by means of ATR counts and substantiated by turning movement counts (TMC) conducted at the study area roadways and intersections.

In September 2006, additional data relative to intersection operations were collected for the Route 27 intersections with Bow Road and Glezen Lane, as well as for the intersection of Route 126 and Glezen Lane. Gap and delay data were collected at these three locations to quantify existing and projected intersection operations.

Lastly, to quantify trips that are local in nature and are destined to the Whole Foods supermarket in Wayland or to one of the two supermarkets on Route 20 in Sudbury, origin/destination data were also collected in October 2006, as well as TMCs at the two additional Sudbury study area intersections.

3.2.3 Geometrics

Primary study area roadways are described below. Other study area routes that provide connections with these roadways are examined at specific study area intersections.

3.2.3.1 Roadways

Route 20

Route 20 (Boston Post Road) is a two-lane arterial roadway, under state jurisdiction, which runs in a general east/west direction through eastern Massachusetts. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 11 to 12 feet. Additional turn lanes are provided at major signalized intersections. Land use along Route 20 in the vicinity of the site is primarily commercial. Within the study area, the speed limit is posted at 35 miles per hour (mph). West of the site, the posted speed limit for westbound traffic is 45 mph. East of the site, the posted speed limit for eastbound traffic is reduced to 25 mph.

Route 27 (Old Sudbury Road)

Route 27 (Old Sudbury Road) is a locally maintained collector roadway, which runs in a general north/south direction through the town of Wayland. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 10 to 12 feet. Additional turn lanes are provided at major signalized intersections. Land use along Route 27 in the vicinity of the site is primarily residential. Within the study area, the speed limit varies between 25 and 40 mph. In the vicinity of the site driveway, the posted speed limit is 40 mph.

Route 126 (Concord Road)

Route 126 (Concord Road) is a locally maintained collector roadway, which runs in a general north/south direction through the town of Wayland. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 10 to 12 feet. Land use along Route 126 in Wayland is primarily residential. The speed limit varies between 25 and 40 mph. Immediately north of Route 27, the speed limit on Route 126 is 25 mph in both directions. North of Plain Road, the speed limit is 40 mph.

Glezen Lane

Glezen Lane is a two-lane locally maintained street which runs in a general east/west direction from its western terminus at Route 27 to its eastern terminus at the Weston town line where the name changes to Sudbury Road (which eventually intersects Concord Road to Route 20). The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 10 to 12 feet. Land use along Glezen Lane is residential. The posted speed limit ranges from 25 to 30 mph.

Bow Road

Bow Road is a two-lane locally maintained street which runs in a general east/west direction from its western terminus at Route 27 to its eastern terminus at Route 126. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 8.5 to 11 feet. Land use along Bow Road is residential. The posted speed limit is 25 mph.

Training Field Road

Training Field Road is a two-lane locally maintained street which runs in a general north/south direction from its southern terminus at Route 27 to its northern terminus at Glezen Lane. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 8.5 to 11 feet. Land use along Training Field Road is residential. The posted speed limit is 25 mph.

Moore Road

Moore Road is a two-lane locally maintained street which runs in a general north/south direction from its southern terminus at Glezen Lane to its northern terminus at Route 126. The roadway provides one travel lane per direction, and travel lanes are approximately 11 to 11.5 feet wide. Land use along Training Field Road is residential. The posted speed limit is 30 mph.

Claypit Hill Road

Claypit Hill Road is a two-lane locally maintained street which runs in a general east/west direction from its western terminus at Route 126 to its eastern terminus at Plain Road. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 9.5 to 10 feet. Land use along Claypit Hill Road is residential. The posted speed limit is 25 mph.

Plain Road

Plain Road is a two-lane locally maintained street which runs in a general east/west direction from its western terminus at Route 126 to its eastern terminus at Route 20. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 10 to 11 feet. Land use along Plain Road is residential. The posted speed limit is 20 mph immediately east of Route 126. East of Glen Road, the posted speed limit is 25 mph.

Winthrop Road

Winthrop Road is a two-lane locally maintained street which runs in a general east/west direction from its eastern terminus at Route 20 to its western terminus at Route 27. At Route 20, Winthrop Road is one-way southbound (away from Route 20). The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 10 to 11 feet. Land use along Winthrop Road is residential.

Millbrook Road

Millbrook Road is a two-lane locally maintained street which runs in a general east/west direction from its western terminus at Route 27/Route126 to its eastern terminus at Glen Road. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 10 to 11 feet. Land use along Millbrook Road is primarily residential.

Glen Road

Glen Road is a two-lane locally maintained street which runs in a general north/south direction from its southern terminus at Route 20 to its northern terminus at Plain Road. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 10 to 11 feet. Land use along Glen Road is primarily residential.

Pelham Island Road

Pelham Island Road is a two-lane locally maintained street which runs in a general northeast/southwest direction from its northeastern terminus at Route 27/Route 126 to its southwestern terminus at Landham Road in Sudbury. The roadway provides one travel lane per direction, and travel lanes vary in width from approximately 10 to 11 feet. Land use along Pelham Island Road is primarily residential. The posted speed limit is 30 mph.

3.2.3.2 Intersections

Route 27 at River Road

River Road intersects Route 27 from the south to form this three-legged, unsignalized intersection. The Route 27 eastbound and westbound approaches each consist of single lanes, approximately 12 feet wide, permitting both left- and right-turn movements. Directional travel along Route 27 is separated by a double yellow centerline. River Road at Route 27 is 23.5 feet wide, allowing entering and exiting movements. The River Road approach is under STOP-like control. Land use in the vicinity of the intersection consists of wooded properties and the Sudbury River.

Route 27 at Glezen Lane

Glezen Lane intersects Route 27 from the east to form this three-legged, unsignalized intersection. The Route 27 northbound and southbound approaches each consist of single lanes, approximately 12.5 feet wide, permitting both left- and right-turn movements. Directional travel along Route 27 is separated by a double yellow centerline. Glezen Lane is 19.5-feet wide approaching Route 27 and widens to permit entering and exiting movements. A small island separates entering and exiting movements. The Glezen Lane approach is under STOP-sign control. Land use in the vicinity of the intersection consists of residential properties.

Route 27 at Bow Road

Bow Road intersects Route 27 from the east at a 60° angle to form this three-legged, unsignalized intersection. The Route 27 northbound and southbound approaches each consist of single lanes, approximately 12 feet wide, permitting both left- and right-turn movements. Directional travel along Route 27 is separated by a double yellow centerline. Bow Road is approximately 17 feet wide approaching Route 27. The Bow Road approach is under STOP-sign control. Land use in the vicinity of the intersection consists of residential properties and wooded land.

Route 27 at Existing Site Driveway

The existing site driveway intersects Route 27 from the west to form this three-legged, unsignalized intersection. The Route 27 northbound and southbound approaches each consist of single lanes, approximately 12 feet wide, permitting both left- and right-turn movements. Directional travel along Route 27 is separated by a double yellow centerline. The site driveway at Route 27 is 23 feet wide, allowing entering and exiting movements. The driveway approach is under STOP-like control. Land use in the vicinity of the intersection consists of wooded properties.

Route 27 at Route 126

Route 126 intersects Route 27 from the northeast to form this three-legged, unsignalized intersection. The Route 27 southbound approach consists of a single lane, approximately 12 feet wide, permitting both though and left-turn movements. The Route 27 northbound approach consists of a single though lane, approximately 9.5 feet wide, and a 10-foot wide right-turn lane. Directional travel along Route 27 is separated by a double yellow centerline. The Route 126 approach to Route 27 is 11 feet wide, permitting both left- and right-turns. Bituminous concrete sidewalks exist along the south side of Route 126 and the east and west sides of Route 27 (south of Route 126). The Route 126 approach is under STOP-sign control. Land use in the vicinity of the intersection consists of residential properties and the Wayland Depot.

Route 27/ Route 126 at Pelham Island Road and Millbrook Road

Route 27/Route 126 forms the north and south legs of this four-legged, unsignalized intersection with Pelham Island Road (west leg) and Millbrook Road (east leg). The Route 27 southbound approach consists of a single wide lane, approximately 18 feet wide, permitting all movements. The Route 27 northbound and southbound approaches each consist of a single though lane, approximately 9.5 feet wide, and a 10-foot wide right-turn lane. Directional travel along Route 27 is separated by a double yellow centerline. The Pelham Island Avenue approach is approximately 13 feet wide, permitting all movements. The Millbrook Road approach is approximately 13 feet wide, permitting all movements. Bituminous concrete sidewalks exist along the east and west sides of Route 27 (north of the intersection). The Pelham Island Road and Millbrook Road approaches are under STOP control. Land use in the vicinity of the intersection consists of residential properties, a park and commercial buildings.

Route 20 at Route 27/ Route 126

Route 27/Route 126 forms the north and south legs of this four-legged, signalized intersection with Route 20 (east and west legs). The Route 27/Route 126 approaches each consist of an exclusive left-turn lane and a shared through/right-turn lane, varying in width from 9.5 feet to 11 feet. Directional travel along Route 27/Route 126 and Route 20 is separated by a double yellow centerline. The Route 20 eastbound approach is approximately 12 feet wide, permitting all movements. The Route 20 westbound approach is approximately 21 feet wide, permitting all movements. Bituminous concrete sidewalks exist along the east side of Route 27 (north of the intersection) and along the south side of Route 20. The intersection is controlled by a two-phase traffic signal. Land use in the vicinity of the intersection consists of a park, commercial buildings and a church.

Route 27 at Winthrop Road

Winthrop Road intersects Route 27 from the east to form this three-legged, unsignalized intersection. The Route 27 northbound and southbound approaches each consist of single lanes, approximately 12 feet wide, permitting both left- and right-turn movements. Directional travel along Route 27 is separated by a double yellow centerline. Winthrop Road is approximately 22.5 feet wide approaching Route 27. The Winthrop Road approach is under STOP-like control. Land use in the vicinity of the intersection consists of residential properties and a church.

Route 126 at Bow Road

Bow Road intersects Route 126 from the west to form this three-legged, unsignalized intersection. The Route 126 northbound and southbound approaches each consist of single lanes, approximately 11 feet wide, permitting both left- and right-turn movements. Directional travel along Route 126 is separated by a double yellow centerline. Bow Road is approximately 20.5 feet wide, permitting both entering and exiting movements. The Bow Road approach is under STOP-sign control. Land use in the vicinity of the intersection consists of residential properties and wooded land.

Route 126 at Plain Road

Plain Road intersects Route 126 from the east to form this three-legged, unsignalized intersection. The Route 126 northbound and southbound approaches each consist of single lanes, approximately 11 feet wide, permitting both left- and right-turn movements. Directional travel along Route 126 is separated by a double yellow centerline. Plain Road is approximately 18.5 feet wide approaching the intersection. At the intersection, the Plain Road approach splits with right turn movements going to the right side of a central island and left-turn movements going to the left side of the island. Directional travel along Plain Road is separated by a single-yellow centerline. The Plain Road approach is under STOP-sign control. Along the east side of Route 126, there is a 5- to 5.5-foot wide bituminous concrete sidewalk. Land use in the vicinity of the intersection consists of residential properties.

Route 126 at Claypit Hill Road and Training Field Road

Claypit Hill Road intersects Route 126 from the east and Training Field Road intersects from the west to form this four-legged, unsignalized intersection. The Route 126 northbound and southbound approaches each consist of single lanes, approximately 11 to 11.5 feet wide, permitting all movements. Directional travel along Route 126 is separated by a double-yellow centerline. The Claypit Hill Road approach consists of a 10-foot wide shared left-, through and right-turn lane. Directional travel along Claypit Hill Road is separated by a single-yellow centerline at the intersection. Training Field Road is approximately 22.5 feet wide and permits both entering and exiting movements. The Claypit Hill Road and Training Field Road approaches are both under STOP-sign control. Along the east side of Route 126, there is a 5-foot wide bituminous concrete sidewalk. Land use in the vicinity of the intersection consists of wooded properties.

Route 126 at Glezen Lane

Glezen Lane intersects Route 126 from the east and west to form this four-legged, unsignalized intersection. The Route 126 northbound and southbound approaches each consist of single lanes, approximately 11.5 to 12 feet wide, permitting both left- and right-turn movements. Directional travel along Route 126 is separated by a double-yellow centerline. The Glezen Lane westbound approach consists of a single lane, approximately 10 feet wide and permits all movements. Directional travel along Glezen Lane (east of Route 126) is separated by a single-yellow centerline. Glezen Lane approaching Route 126 from the west is approximately 20.5 feet wide. As it approaches Route 126, the roadway splits around a large triangular shaped island. Along the east side of Route 126, there is a 4- to 4.5-foot wide bituminous concrete sidewalk. The Glezen Lane approaches are under

STOP-sign control. Land use in the vicinity of the intersection consists of residential properties.

Route 126 at Moore Road

Moore Road intersects Route 126 from the west to form this three-legged, unsignalized intersection. The Route 126 northbound and southbound approaches each consist of single lanes, approximately 11 to 11.5 feet wide, permitting both left- and right-turn movements. Directional travel along Route 126 is separated by a double yellow centerline. Moore Road is approximately 23 feet wide approaching Route 126, permitting entering and exiting movements. The Moore Road approach is under STOP-sign control. Along the east side of Route 126, there is a 5- to 5.5-foot wide bituminous concrete sidewalk. Land use in the vicinity of the intersection consists of residential properties and wooded land.

Glezen Lane at Moore Road

Moore Road intersects Glezen Lane from the west to form this three-legged, unsignalized intersection. The primary flow of traffic is from Glezen Lane eastbound to Moore Road, with the westbound Glezen Lane approach under STOP-sign control. The Glezen Lane approaches each consists of single lanes, approximately 10 to 12 feet wide, permitting all movements. The Moore Road approach consists of an 11-foot wide lane permitting all movements. Land use in the vicinity of the intersection consists of residential properties and wooded land.

Glezen Lane at Training Field Road

Training Field Road intersects Glezen Lane from the southeast to form this unsignalized intersection. The intersection is comprised of three separate unsignalized intersections, laid out at the points of a triangle, channelizing various movements. The Training Field Road westbound approach to Glezen Lane consists of a free-flow lane (to Glezen Lane eastbound or westbound) and an exclusive left-turn lane for westbound Training Field Road movements. All approaches are generally 8.5 to 10 feet wide.

To the west is the second unsignalized intersection formed by the eastbound and westbound approaches from Glezen Lane. All approaches to this intersection consist of single lanes. The Glezen Lane westbound approach accommodates right-turn movements to Training Field Road westbound and is under a free-flow condition. Both the Glezen Lane westbound and Training Field Road approaches are under STOP-sign control. To the north is the third unsignalized intersection. The leg from Training Field Road consists of a single lane approach, as well as the legs to and from Glezen Lane. The Glezen Lane eastbound approach is under STOP-sign control. Land use in the vicinity of the intersection consists of residential homes.

Plain Road at Claypit Hill Road

Plain Road intersects Claypit Hill Road from the south to form this unsignalized intersection. The Claypit Hill Road approaches each consist of single lanes, approximately 10 feet wide, permitting both left- and right-turn movements. Directional travel along Claypit Hill Road is separated by a single-yellow centerline. Plain Road approaching the intersection splits with right-turn movements to the right side of a triangle shaped island and left-turns to the left side of the island. Three separate intersections are formed as a result, with the minor legs under STOP-sign control. Land use in the vicinity of the intersection consists of residential properties.

Plain Road at Glen Road

Glen Road intersects Plain Road from the south to form this three-legged, unsignalized intersection. The Plain Road eastbound and westbound approaches each consist of single lanes, approximately 9 to 10.5 feet wide, permitting both left- and right-turn movements. Directional travel along Plain Road is separated by a single-yellow centerline. The Glen Road approach consists of a 10-foot wide shared left- and right-turn lane. Directional travel along Glen Road is separated by a single-yellow centerline. The Plain Road eastbound approach is under STOP-sign control. Land use in the vicinity of the intersection consists of residential properties.

Route 20 at Pelham Island Road

Route 20 forms the east and west legs of this four-legged, unsignalized intersection with Pelham Island Road (north and south legs). The Route 20 approaches consist of single wide lanes, approximately 12.5 to 16 feet wide, permitting all movements. The Pelham Island Avenue northbound approach is approximately 10-feet wide, permitting all movements. The Pelham Island Avenue southbound approach is approximately 13 feet wide, permitting all movements. Bituminous concrete sidewalks exist along the north and south sides of Route 20 and along the north side of Pelham Island Road (north of Route 20). The Pelham Island Road approaches operate under STOP control. Land use in the vicinity of the intersection consists primarily of commercial buildings.

Route 20 at Winthrop Road

Winthrop Road intersects Route 20 from the south to form this three-legged, unsignalized intersection. The Route 20 eastbound and westbound approaches each consist of single lanes, approximately 11 to 12.5 feet wide, permitting both left- and right-turn movements. Directional travel along Route 20 is separated by a double-yellow centerline. Winthrop Road is one-way away from Route 20 and is approximately 22 feet wide. Land use in the vicinity of the intersection consists of residential properties and wooded land.

Route 20 at Existing Site Driveway

The existing site driveway intersects Route 20 from the north to form this three-legged, unsignalized intersection. The Route 20 eastbound and westbound approaches each consist of single lanes, approximately 12 feet wide, permitting both left- and right-turn movements. Directional travel along Route 20 is separated by a double yellow centerline. The site driveway approach at Route 27 is approximately 21.5 feet wide, allowing left- and right-turn movements. Approximately 150 feet to the west is a second exit only driveway, approximately 21.5 feet wide. The driveway approach is under STOP-sign control. Land use in the vicinity of the intersection consists of wooded properties and the existing site.

Route 20 at Old County Road

Old County Road intersects Route 20 from the north to form this three-legged, unsignalized intersection. The Route 20 eastbound and westbound approaches each consist of single lanes, approximately 12 to 12.5 feet wide, permitting both left- and right-turn movements. Directional travel along Route 20 is separated by a double yellow centerline. The Old County Road approach consists of an 11.5-foot wide shared left- and right-turn lane. Directional travel along Old County Road is separated by a single-yellow centerline. The Old County Road approach is under STOP-sign control. Land use in the vicinity of the intersection consists of commercial properties.

Route 20 at Union Avenue and Sudbury Crossing Driveway

Route 20 forms the east and west legs of this four-legged signalized intersection with Union Avenue (north leg) and the Sudbury Crossing driveway (south leg). The Route 20 approaches each consist of an exclusive left-turn lane and a shared through/right-turn lane, varying in width from 10 feet to 14 feet. Directional travel along Route 20 is separated by a double yellow centerline. The Union Avenue southbound approach consists of a shared left-turn lane/through lane, approximately 10 feet wide, and a 10.5-foot wide exclusive right-turn lane. The Sudbury Crossing driveway approach consists of an exclusive left-turn lane and a shared through/right-turn lane. Bituminous concrete sidewalks exist along the north side of Route 20. The intersection is controlled by a two-phase traffic signal. Land use in the vicinity of the intersection consists of commercial properties.

Route 20 at Nobscot Road

Route 20 forms the east and west legs of this four-legged signalized intersection with Nobscot Road (south leg) and a driveway to Clappers House & Garden Shop (north leg). The Route 20 eastbound approach consists of an exclusive right-turn lane and a shared through/left-turn lane, varying in width from 11 feet to 15 feet. The Route 20 westbound approach consists of an exclusive left-turn lane and a shared through/right-turn lane, approximately 12 feet wide. Directional travel along Route 20 is separated by a double yellow centerline. The Nobscot Road northbound approach consists of a shared left-turn lane/through lane, approximately 13 feet wide, and a 14-foot wide exclusive right-turn lane. The Clappers driveway approach consists of a wide lane permitting all movements. Bituminous concrete sidewalks exist along the north side of Route 20 and the west side of Nobscot Road. The intersection is controlled by a two-phase traffic signal. Land use in the vicinity of the intersection consists of commercial properties.

3.2.4 Traffic Volumes

To establish base traffic conditions within the study area, manual turning movement and vehicle classification counts were obtained in February 2005 for the intersections immediately adjacent to the site and in May and June 2006 at the north Wayland neighborhood study area locations as shown on Figure 3-2. Daily traffic volumes were collected through use of automatic traffic recorders (ATR) at the following locations:

- Route 27, north of Bow Road
- Glezen Lane, east of Route 126
- Glezen Lane, west of Route 126
- Bow Road, east of Route 27
- Millbrook Road, east of Route 27
- Plain Road, west of Claypit Hill Road
- Claypit Hill Road, east of Route 126
- Training Field Road, west of Route 126
- Winthrop Road, east of Route 27
- Glen Road, north of Route 20
- Moore Road, west of Route 126

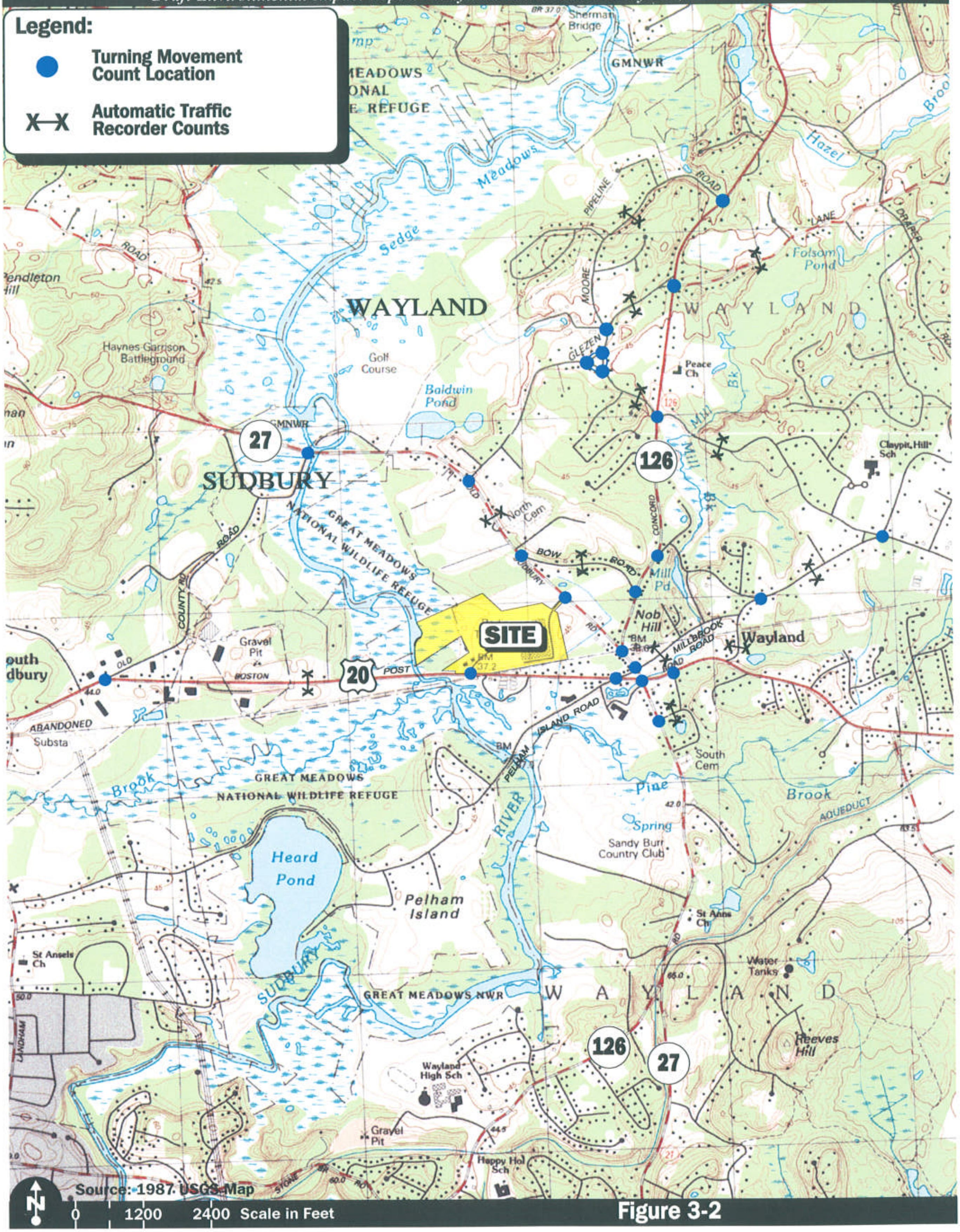

Figure 3-2

Traffic Count Locations

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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Peak-period manual turning movement counts were conducted during the weekday morning peak period (6:00 to 9:00 AM), during the weekday evening peak period (3:00 to 7:00 PM), during the Saturday midday period (10:30 AM to 1:30 PM) and the Sunday midday period (10:30 AM to 1:30 PM) at the following intersections:

- Route 27 at River Road
- Route 27 at Glezen Lane
- Route 27 at Bow Road
- Route 27 at Route 126
- Route 27/Route 126 at Pelham Island Road and Millbrook Road
- Route 20 at Route 27/Route 126
- Route 27 at Winthrop Road
- Route 126 at Bow Road
- Route 126 at Plain Road
- Route 126 at Claypit Hill Road and Training Field Road
- Route 126 at Glezen Lane
- Route 126 at Moore Road
- Glezen Lane at Moore Road
- Glezen Lane at Training Field Road
- Plain Road at Claypit Hill Road
- Plain Road at Glen Road
- Route 20 at Winthrop Road
- Route 20 at Pelham Island Road
- Route 20 at Old County Road (River Road in Wayland)

The counts were done on Thursday, May 25, 2006, Saturday June 3, 2006 and Sunday, June 4, 2006, when schools were in session. The two new Sudbury locations were counted in October 2006. Analysis of the peak-period traffic counts indicated that the weekday morning peak hour generally occurs between 8:00 and 9:00 AM, and the weekday evening peak hour occurs between 5:00 and 6:00 PM. The Saturday midday peak hour generally occurs between 12:30 and 1:30 PM, and the Sunday midday peak hour occurred between 12:30 and 1:30 PM.

It should be noted that during the preparation of the initial studies for this project, traffic counts were not conducted at the Route 20 intersections with Pelham Island Road, Routes 27/126 and Millbrook Road, as well as the Route 27 and Route 126 intersection during the Sunday peak hour. Traffic volume count data for these intersections were obtained for the Sunday peak hour and assessed in this report.

Of the neighborhood roadways studied, daily traffic volumes ranged from 200 to 2,300 vehicles per day (vpd). Route 20, east of the Sudbury Town Line experienced the largest daily weekday volume with approximately 19,500 vpd. Saturday volumes ranged from 150 to 1,200 vpd on the local neighborhood streets. Sunday volumes were similar, ranging from 150 to 1,100 vpd.

Route 20, east of the Sudbury town line experienced the highest peak hour volumes. During the weekday morning peak hour, 1,655 vehicles per hour (vph) were recorded, with 1,778 vph during the weekday evening peak hour, 1,469 vph during the Saturday midday peak hour and 1,123 vph during the Sunday midday peak hour.

A review of the count data indicates that during the weekday morning and evening peak hours, traffic is using several cut-through routes to avoid existing traffic on Route 20. These routes are the Old County Road/River Road corridor (between Route 20 in Sudbury and Route 126 in Wayland), Glezen Lane and Bow Road, as shown on Figure 3-3. During the weekday morning peak hour, approximately 90 to 100 vehicles are estimated to be cutting through from Route 20 in Sudbury to Route 27, approximately 400 vehicles are using Glezen Lane (from Route 27 to Route 126 and eventually back to Route 20 in Weston), and approximately 40 to 50 vehicles are using Bow Road (from Route 27 to Route 126). During the weekday evening peak hour, approximately 90 to 100 vehicles are estimated to be cutting through from Route 27 to Route 20, approximately 300 vehicles are using Glezen Lane (from Route 126 to Route 27), and approximately 40 vehicles are using Bow Road (from Route 126 to Route 27). During the Saturday midday peak hour, less traffic was observed using any of these corridors as a cut-through corridor.

Figure 3-3

Cut-Through Routes and Approximate Cut-Through Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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3.2.4.1 Seasonal Adjustment

The traffic-volume data gathered as part of this study was collected during the months of February 2005 and May and June 2006. Data from a nearby permanent count station maintained by MassHighway were reviewed to determine the monthly variations of the traffic volumes. The traffic data showed February to be lower than average month volumes. The traffic data showed May and June to be higher than average month volumes. Therefore, the February volumes were seasonally adjusted and balanced with the May and June traffic volumes to represent the 2006 baseline traffic volume conditions.

The 2006 existing daily and peak-hour traffic volumes for average-month conditions are summarized below in Table 3-1.

The 2006 Existing weekday morning and weekday evening peak hour traffic flow networks are shown graphically on Figures 3-4 and 3-5, respectively. The 2006 Existing Saturday and Sunday midday peak hour traffic flow networks are shown graphically on Figures 3-6 and 3-7, respectively. The traffic count worksheets are provided in the Appendix.

3.2.4.2 Existing Site Generated Traffic Volumes

Routes 20 and 27 currently provide access to the site. During the weekday morning peak hour, 17 vph were recorded (10 vehicles entering and 7 vehicles exiting), and during the weekday evening peak hour, 28 vph were recorded (2 vehicles entering and 26 vehicles exiting). During the Saturday midday peak hour, 10 vph were recorded (5 vehicles entering and 5 vehicles exiting).

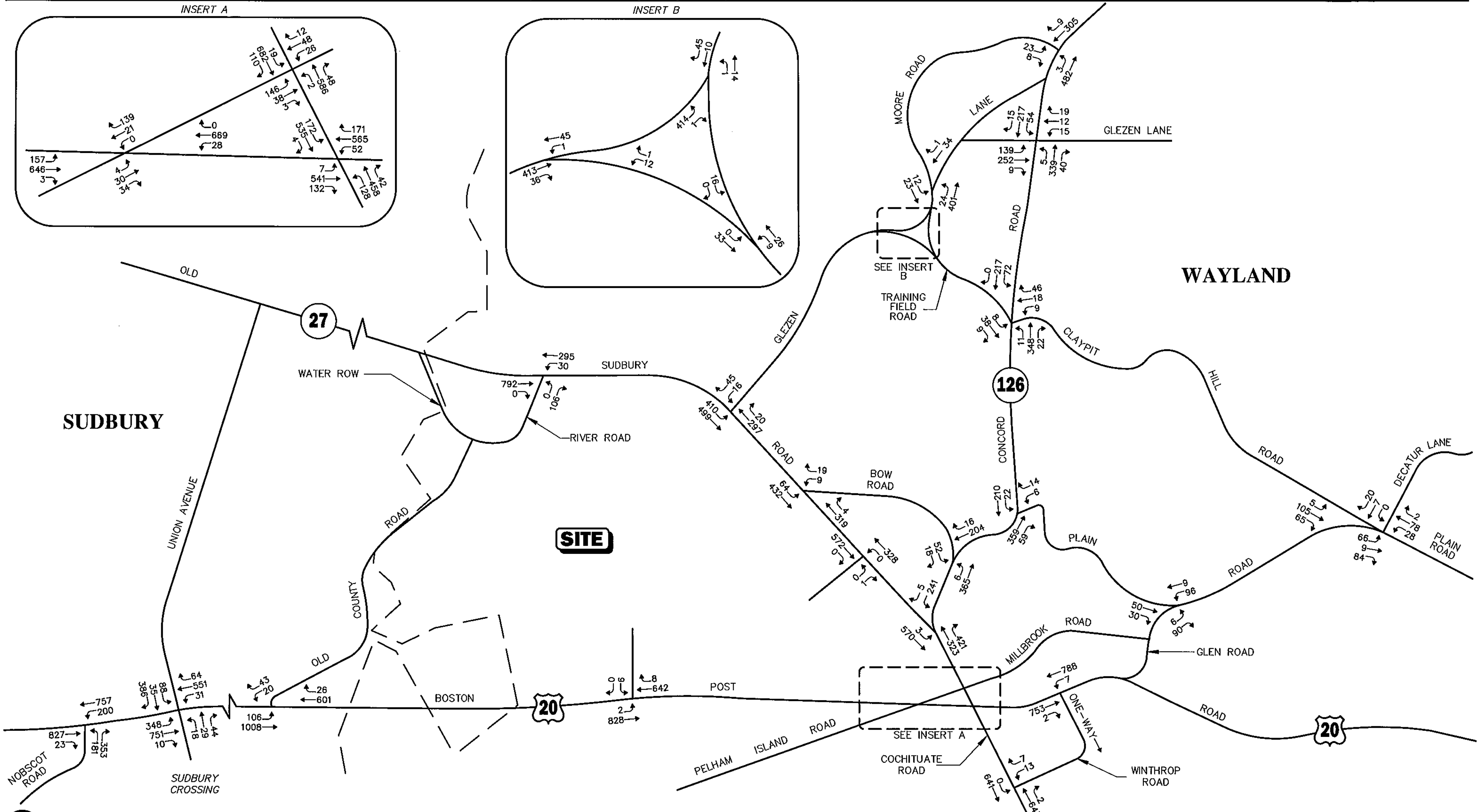
3.2.5 Gap Analysis

A gap analysis was requested along Route 27 in the vicinity of the Route 27 intersections with Bow Road and Glezen Lane, as well as the intersection of Route 126 and Glezen Lane. This analysis was performed to quantify existing intersection parameters with actual intersection operations. Concurrent with the gap analysis, actual delays for vehicles exiting the side streets (Bow Road and Glezen Lane) were recorded to also calibrate the capacity analysis model.

Table 3-1 Existing Roadway Traffic-Volume Summary

Location	Weekday Daily	Weekday Morning Peak Hour			Weekday Evening Peak Hour			Saturday Daily	Saturday Midday Peak Hour			Sunday Daily	Sunday Midday Peak Hour		
	Volume (vpd)[a]	Volume (vph)[b]	Percent of Daily Traffic[c]	Predominant Flow[d]	Volume (vph)	Percent of Daily Traffic	Predominant Flow	Volume (vpd)	Volume (vph)	Percent of Daily Traffic	Predominant Flow	Volume (vpd)	Volume (vph)	Percent of Daily Traffic	Predominant Flow
Route 27, north of Bow Road	12,300	834	6.8	59.5% SB	1,389	11.3	67.3% NB	8,400	632	7.5	50.2% NB	8,100	732	9.0	50.7% WB
Route 20, east of Sudbury Town Line	19,500	1,655	8.5	61.8% EB	1,778	9.1	54.0% WB	15,300	1,469	9.6	51.7% EB	10,650	1,123	10.5	52.2% WB
Glezen Road, east of Route 126	2,300	392	17.0	88.3% EB	287	12.5	80.5% WB	850	94	11.1	60.6% EB	750	81	10.8	54.3% WB
Glezen Road, west of Route 126	2,300	432	18.8	92.6% EB	380	16.5	87.9% WB	600	69	11.5	55.1% WB	450	57	12.7	56.1% WB
Bow Road, east of Route 27	900	96	10.7	70.8% EB	205	22.8	62.9% WB	200	15	7.5	53.3% WB	200	25	12.5	60.0% WB
Millbrook Road, east of Route 27	1,400	191	13.6	54.9% EB	103	7.4	57.3% EB	1,200	138	11.5	50.7% EB	1,100	205	18.6	58.5% WB
Plain Road, west of Claypit Hill Road	1,900	259	13.6	61.4% NB	204	10.7	50.0% NB/SB	1,100	99	9.0	52.5% NB	1,000	76	7.6	51.3% SB
Claypit Hill Road, east of Route 126	1,600	205	12.8	64.4% EB	201	12.6	56.2% EB	800	75	9.4	54.7% WB	800	75	9.4	53.3% EB
Training Field Road, west of Route 126	1,100	84	7.6	65.5% EB	88	8.0	57.9% EB	900	84	9.3	53.6% WB	800	73	9.1	58.9% WB
Winthrop Road, east of Route 27	200	22	11.0	90.9% WB	6	3.0	83.3% WB	150	14	9.3	71.4% WB	150	13	8.7	76.9% WB
Glen Road, north of Route 20	1,200	222	18.5	56.8% SB	183	15.3	68.9% SB	300	111	37.0	51.4% SB	300	96	32.0	58.3% NB
Moore Road, west of Route 126	500	44	8.8	72.3% EB	31	6.2	61.3% WB	350	19	5.4	68.4% WB	350	28	8.0	60.7% EB

Source: ATR Counts conducted in June 2006, rounded.
[a]Two-way daily traffic expressed in vehicles per day.
[b]Two-way peak-hour volume expressed in vehicles per hour.
[c]The percent of daily traffic that occurs during the peak hour.
[d]EB = eastbound; WB = westbound; NB = northbound; SB = southbound.



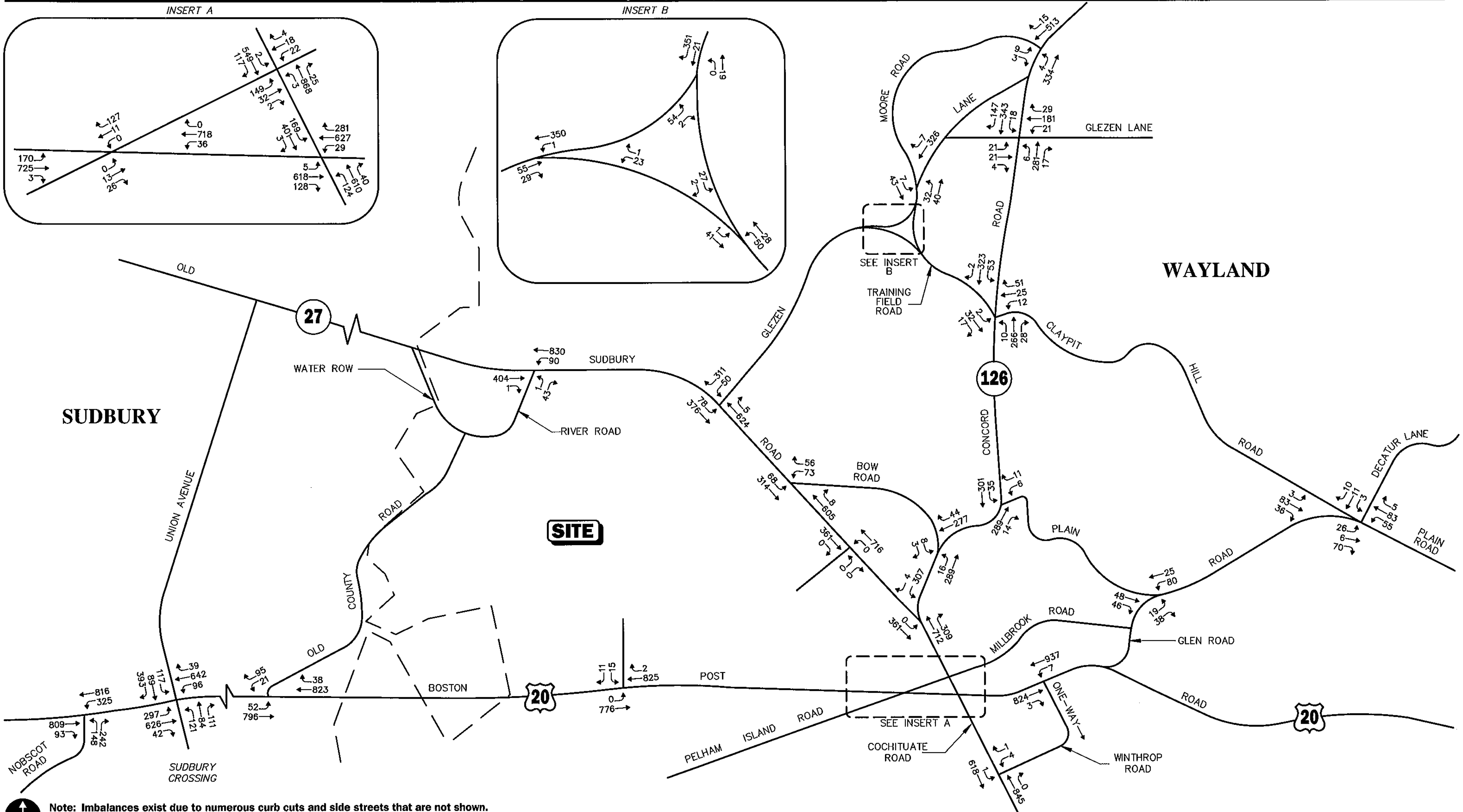
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 3-4

2006 Existing Weekday Morning Peak Hour Traffic Volumes

Vanasse & Associates, Inc.
Transportation Engineers & Planners



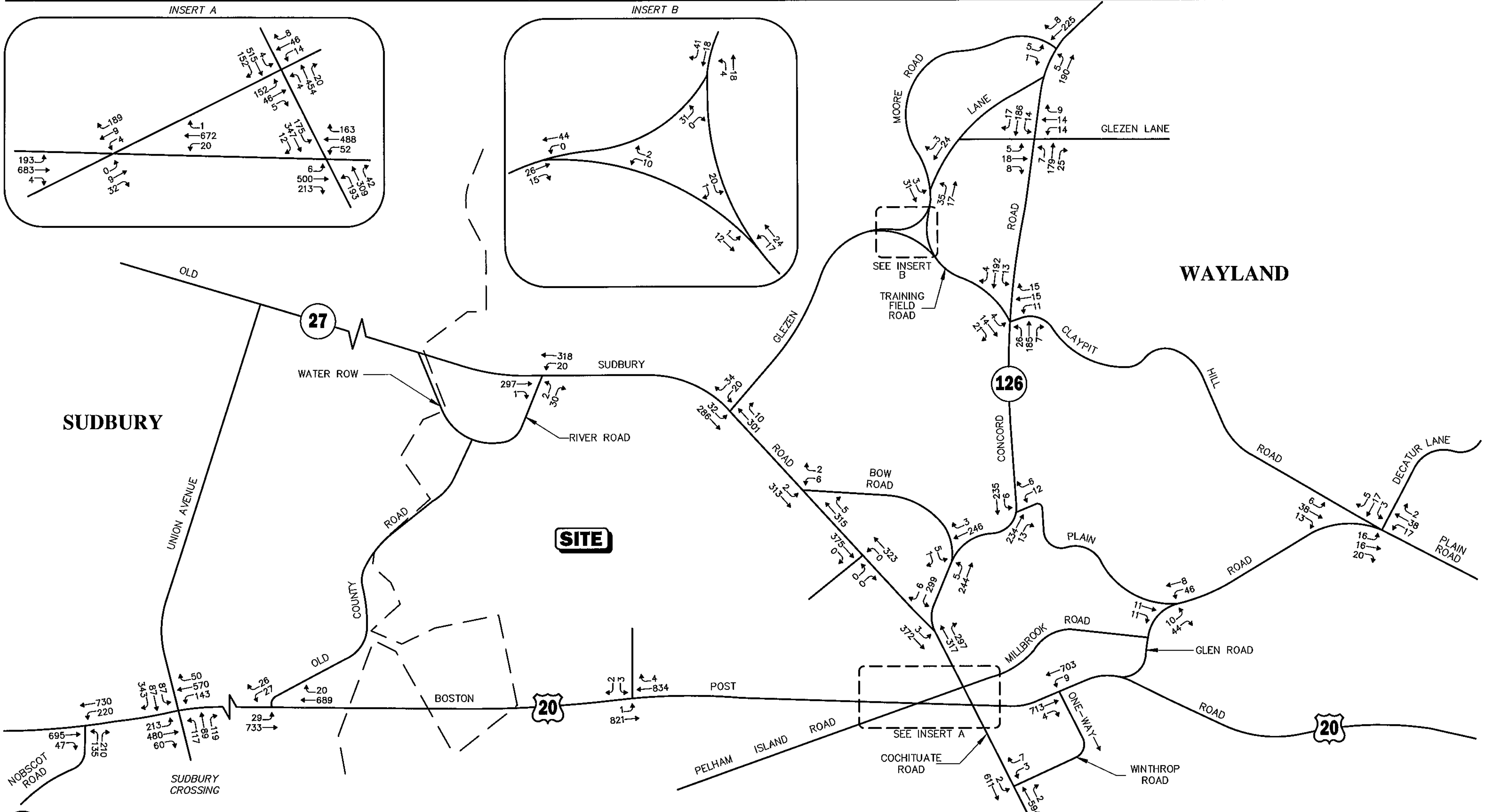
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 3-5

2006 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.

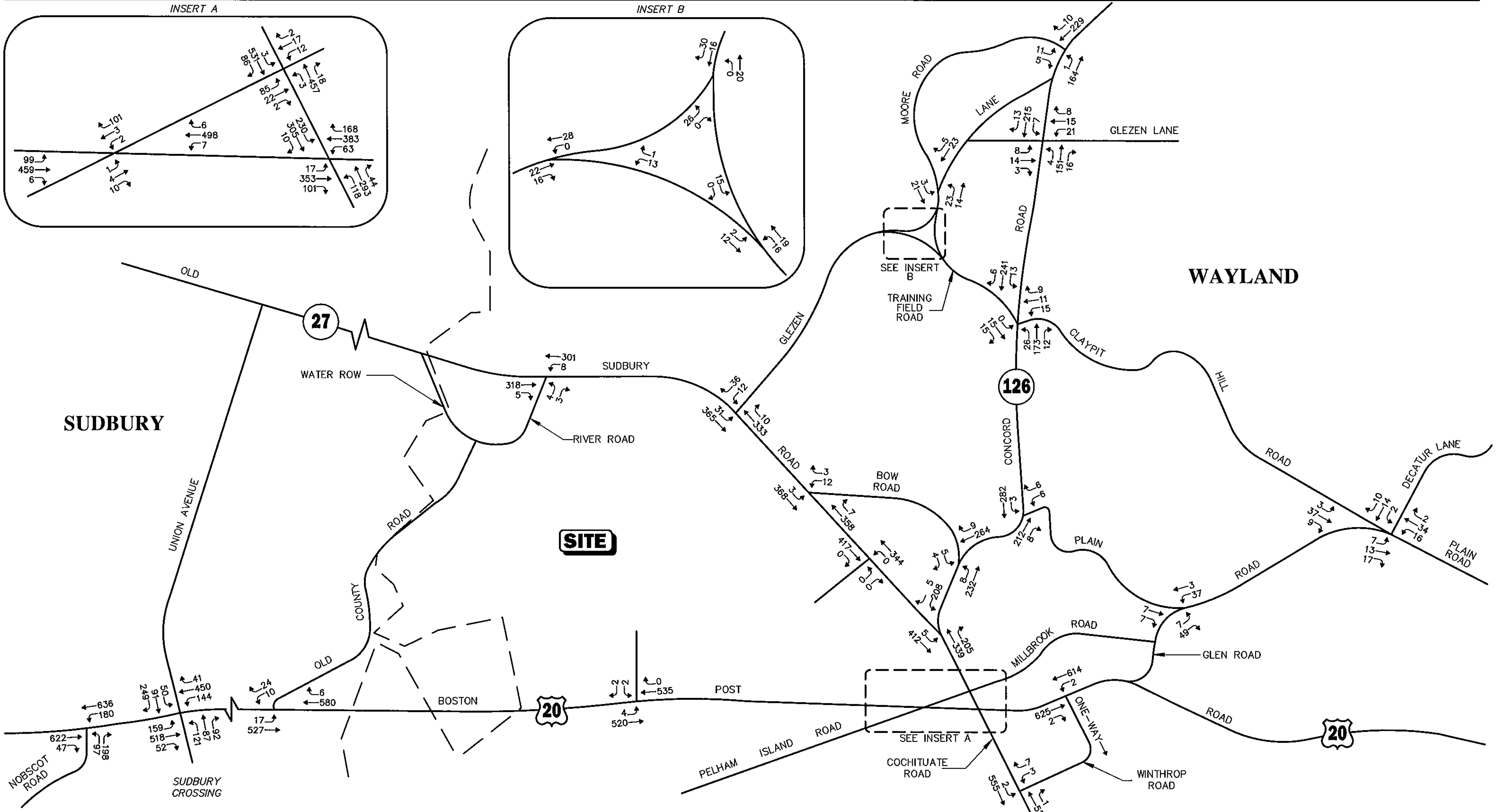
Not To Scale

Figure 3-6

2006 Existing Saturday Midday Peak Hour Traffic Volumes

Vanasse & Associates Inc
Transportation Engineers & Planners

R:\4888\DEIR\4888nt3.dwg 11/8/2006 3:13:17 PM EST



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

Not To Scale

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Figure 3-7

2006 Existing
Sunday Midday
Peak Hour Traffic Volumes

At each of the locations, gaps in the traffic stream were measured electronically through the use of a computerized count board and was supplemented by field measurements of gaps used by vehicles exiting the side streets. These gap counts were done during the weekday morning (6:00 to 9:00 AM) and weekday evening (3:00 to 6:00 PM) peak periods. The data are contained in the Appendix. The results are tabulated in Table 3-2.

Table 3-2 Gap Analysis

	Number of Gaps[a]	
Location	Peak Hour	Gaps
Route 27 at Bow Road	Weekday Morning Peak Hour	127
	Weekday Evening Peak Hour	304
Route 27 at Glezen Lane	Weekday Morning Peak Hour	158
	Weekday Evening Peak Hour	322
Route 126 at Glezen Lane	Weekday Morning Peak Hour	287
	Weekday Evening Peak Hour	338

[a]An acceptable gap was defined as a 6.0 second or longer timed gap between successive vehicles (eastbound and westbound).

As shown in Table 3-2, during the peak hours, there are at least 127 gaps that are 6.0 seconds or longer during the weekday morning peak hour and 304 gaps that are 6.0 seconds or longer during the weekday evening peak hour on Route 27 at the Bow Road and Glezen Lane intersections. On Route 126 at Glezen Lane, during the peak hours, there are at least 287 gaps that are 6.0 seconds or longer during the weekday morning peak hour and 338 gaps that are 6.0 seconds or longer during the weekday evening peak hour. This gap analysis is important as it shows that there are adequate gaps in the Route 27 flow for the volume of traffic on Glezen Lane and Bow Road to enter the traffic stream.

3.2.6 Delay Analysis

The September 2006 gap counts were supplemented by peak hour delay measurements at the Route 27 intersections with Bow Road and Glezen Lane, as well as the intersection of Route 126 and Glezen Lane. At the same time the gaps were recorded, the amount of time required for vehicles exiting Bow Road and Glezen Lane were recorded. These delays were recorded to assess baseline intersection delays, which are used to evaluate an intersection's level-of-service. The June and September counts were found to be comparable. Summarized in Table 3-3 is the observed delay information.

Table 3-3 Summary of Observed Delays[a]

Delay[a]	Route 27 and Bow Road		Route 27 and Glezen Lane		Route 126 and Glezen Lane	
	Weekday Morning Peak Hour (8:00 to 9:00 AM)		Weekday Morning Peak Hour (8:00 to 9:00 AM)		Weekday Morning Peak Hour (8:00 to 9:00 AM)	
	All Movements from Bow Road		All Movements from Glezen Lane		All Movements from Glezen Lane	
	Observed Delay	LOS[c]	Observed Delay	LOS	Observed Delay	LOS
Average	23.1	C	16.1	C	24.9	C
Minimum	0	A	4	A	0	A
Maximum	131	F	135	F	107	F
	Weekday Evening Peak Hour (5:00 to 6:00 PM)		Weekday Evening Peak Hour (5:00 to 6:00 PM)		Weekday Evening Peak Hour (5:00 to 6:00 PM)	
	All Movements from Bow Road		All Movements from Glezen Lane		All Movements from Glezen Lane	
	Observed Delay	LOS	Observed Delay	LOS	Observed Delay	LOS
Average	15.8	C	14.9	B	40.0	E
Minimum	0	A	1	A	0	A
Maximum	180	F	73	F	125	F

[a]Delays in seconds.
[c]Level of Service.

As shown in Table 3-3, peak hour delays ranged from 0 to 180 seconds for vehicles exiting the side streets to Route 27 or Route 126 during the respective weekday morning and evening peak hours. Average delays ranged from 14.9 to 40.0 seconds. This data, along with the gap data was used to calibrate the level of service results later on in this report for these three intersections.

3.2.7 Motor Vehicle Crash Data

Motor vehicle crash data for the study area intersections and roadways were obtained from the MassHighway Department database and research periods 2002 through 2004, the most recent three-year period for which MassHighway data are available. Crash data was also requested and obtained from the Wayland Police Department. Motor vehicle crash data were reviewed to determine crash trends in the study area. A summary of the MassHighway data is provided in Table 3-4.

Table 3-4 Motor Vehicle Crash Summary[a]

Scenario	Route 27 at River Road	Route 27 at Glezen Lane	Route 27 at Bow Road	Route 126 at Bow Road	Route 126 at Claypit Hill Road and Training Field Road	Route 126 at Glezen Lane	Glezen Lane at Training Field Road	Route 20 at Winthrop Roa d	Route 20 at Old County Road	Route 20 at Route 27 and Route 126	Route 27 at Route 126	Route 27 at Route 126 and Pelham Island Road	Route 20 at Pelham Island Road	Route 20 at Union Avenue	Route 20 at Nobscot Road
	Location														
Year:															
2002	1	0	1	1	0	5	1	0	1	12	3	6	4	13	9
2003	4	1	1	0	0	3	0	0	3	9	5	8	6	9	3
2004	1	2	0	0	1	4	1	1	2	21	6	4	2	2	1
Total	6	3	2	1	1	12	2	1	6	42	14	18	12	24	13
Average[b]	2.00	1.00	0.67	0.33	0.33	4.00	0.67	0.33	2.00	14.00	4.67	6.00	4.00	8.00	4.33
Crash Rate[c]	0.36	0.17	0.15	0.13	0.10	0.91	NA	0.05	0.26	1.14	0.68	0.83	0.54	0.74	0.44
Significant[d]	No	No	No	No	No	Yes	NA	No	No	Yes	No	Yes	No	No	No
Type:															
Angle	1	1	1	0	0	10	0	0	4	20	4	12	5	15	3
Rear-End	4	2	1	0	1	1	0	1	1	17	5	4	7	5	10
Head-On	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Sideswipe	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Run off Road/Hit Fixed Object	0	0	0	1	0	0	2	0	0	2	2	1	0	0	0
Pedestrian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	1	0	0	0	0	0	0	0	1	3	1	1	0	3	0
Total	6	3	2	1	1	12	2	1	6	42	14	18	12	24	13
Time of Day:															
Weekday (7:00 to 9:00 AM)	1	0	1	1	1	5	1	0	1	4	2	1	4	1	1
Weekday (4:00 to 6:00 PM)	0	2	0	0	0	3	0	0	1	4	2	4	0	4	2
Remainder of Day	5	1	1	0	0	4	1	1	4	34	10	13	8	19	10
Total	6	3	2	1	1	12	2	1	6	42	14	18	12	24	13
Pavement Conditions:															
Dry	4	3	2	0	0	7	1	0	4	31	8	13	9	12	8
Wet	2	0	0	1	1	3	0	0	2	8	5	5	1	9	5
Snow	0	0	0	0	0	0	1	1	0	1	0	0	1	2	0
Icy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	1	0	0	0	2	1	0	1	1	0
Total	6	3	2	1	1	12	2	1	6	42	14	18	12	24	13
Day of Week:															
Monday through Friday	5	3	2	1	1	11	1	1	5	32	13	15	10	20	10
Saturday and Sunday	1	0	0	0	0	1	1	0	1	10	1	3	2	4	3
Total	6	3	2	1	1	12	2	1	6	42	14	18	12	24	13
Severity:															
Property Damage Only	3	2	2	0	1	11	2	1	5	33	8	10	11	19	9
Personal Injury	2	1	0	1	0	1	0	0	1	7	5	7	1	4	4
Fatal Accident	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hit and Run	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	1	0	0	0	0	0	0	0	0	2	1	1	0	1	0
Total	6	3	2	1	1	12	2	1	6	42	14	18	12	24	13

[a]Source: MassHighway.
[b]Average crashes over three-year period.
[c]Crash rate per million entering vehicles (mev).
[d]Yes if rate > 0.84 for signalized intersections, > 0.79 for unsignalized intersections.
NA = Not available.

As shown in Table 3-4, a total of 120 motor vehicle crashes were recorded at the study area intersections within the three-year analysis period (77 in Wayland). No fatalities were reported during the three-year analysis period. Based on MassHighway standards, the calculated crash rates for the majority study area intersections are below the District 3 significant crash rates. Three intersections experienced crash rates higher than the significant crash rate: Route 126 and Glezen Lane, Routes 27/126 at Pelham Island Road/Millbrook Road (near the library) and Route 20 at Routes 27/126.

Motor vehicle crash data for the study area intersections and roadways were also obtained from the Wayland Police Department (WPD) database and research periods 2003 through 2005, the most recent three-year period for which crash data was available. A summary of the WPD data is provided in Table 3-5.

As shown in Table 3-5, a total of 83 motor vehicle crashes were recorded at the Wayland study area intersections within the three-year analysis period. No fatalities were reported during the three-year analysis period. Based on MassHighway standards, the calculated crash rates for the majority study area intersections are below the District 3 significant crash rates. Two intersections experienced crash rates higher than the significant crash rate: Route 126 and Glezen Lane and Routes 27/126 at Pelham Island Road/Millbrook Road (near the library). At the intersection of Route 20 at Routes 27/126, there were less reported crashes from 2004 to 2006 than from 2002 to 2004 and the crash rate dropped to below the significant rate.

3.2.8 Vehicle Speeds

Vehicle speeds were recorded along the study area roadways. These speed measurements were recorded by use of the automatic traffic recorder. The observations are summarized in Table 3-6.

The 85th percentile speeds (those which are normally used for establishing speed limits) for the local neighborhood streets were found to generally range between 19 and 36 mph. The official posed speed limits ranged from 25 to 40 mph.

3.2.9 Sight Distances

To identify potential safety concerns associated with site access and egress, stopping sight distance (SSD) measurements were conducted at the proposed site access/egress roadway intersections with Route 20 and Route 27. SSD is the minimum distance required for an approaching driver to perceive and react accordingly to an exiting vehicle. These values are based on a perception and reaction time of 2.5 seconds and a braking distance calculated for wet, level pavement. When the roadway is either on an upgrade or downgrade, grade correction factors are applied. Intersection Sight Distance (ISD) is the minimum distance required for drivers on the minor roadway approach to perceive oncoming traffic and make the turning maneuver.

Table 3-5 WPD Motor Vehicle Crash Summary[a]

	Location														
Scenario	Route 27 at River Road	Route 27 at Glezen Lane	Route 27 at Bow Road	Route 126 at Bow Road	Route 126 at Claypit Hill Road and Training Field Road	Route 126 at Glezen Lane	Glezen Lane at Training Field Road	Route 20 at Winthrop Road	Route 20 at Old County Road	Route 20 at Route 27 and Route 126	Route 27 at Route 126	Route 27 at Route 126 and Pelham Island Road	Route 20 at Pelham Island Road	Route 20 at Union Avenue	Route 20 at Nobscot Road
Year:															
2004	0	2	0	0	0	3	0	0	--[b]	9	1	3	1	--[b]	--[b]
2005	1	2	1	0	0	5	0	0	--	13	2	8	2	--	--
2006	1	1	1	1	1	5	0	0	--	7	3	10	0	--	--
Total	2	5	2	1	1	13	0	0	--	29	6	21	3	--	--
Average[c]	0.67	1.67	0.67	0.33	0.33	4.33	0.00	0.00	--	9.67	2.00	7.00	1.00	--	--
Crash Rate[d]	0.12	0.28	0.15	0.13	0.10	0.98	NA	NA	--	0.79	0.29	0.96	0.13	--	--
Significant[e]	No	No	No	No	No	Yes	NA	NA	--	No	No	Yes	No	--	--
Type:															
Angle	0	3	1	0	1	9	0	0	--	13	3	20	1	--	--
Rear-End	2	2	1	0	0	3	0	0	--	11	2	1	2	--	--
Head-On	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--
Sideswipe	0	0	0	0	0	1	0	0	--	4	0	0	0	--	--
Run off Road/Hit Fixed Object	0	0	0	1	0	0	0	0	--	1	1	0	0	--	--
Pedestrian	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--
Unknown	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--
Total	2	5	2	1	1	13	0	0	--	29	6	21	3	--	--
Time of Day:															
Weekday (7:00 to 9:00 AM)	0	3	0	0	0	7	0	0	--	2	0	2	0	--	--
Weekday (4:00 to 6:00 PM)	1	2	1	0	0	2	0	0	--	4	1	6	0	--	--
Remainder of Day	1	0	1	1	1	4	0	0	--	23	5	13	3	--	--
Total	2	5	2	1	1	13	0	0	--	29	6	21	3	--	--
Pavement Conditions:															
Dry	1	4	2	1	0	9	0	0	--	23	4	19	3	--	--
Wet	1	0	0	0	1	4	0	0	--	3	2	2	0	--	--
Snow	0	1	0	0	0	0	0	0	--	2	0	0	0	--	--
Icy	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--
Other	0	0	0	0	0	0	0	0	--	1	0	0	0	--	--
Unknown	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--
Total	2	5	2	1	1	13	0	0	--	29	6	21	3	--	--
Day of Week:															
Monday through Friday	1	5	2	1	1	13	0	0	--	22	6	16	2	--	--
Saturday and Sunday	1	0	0	0	0	0	0	0	--	7	0	5	1	--	--
Total	2	5	2	1	1	13	0	0	--	29	6	21	3	--	--
Severity:															
Property Damage Only	1	4	1	0	1	13	0	0	--	29	6	19	2	--	--
Personal Injury	1	1	1	1	0	0	0	0	--	0	0		1	--	--
Fatal Accident	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--
Hit and Run	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--
Other	0	0	0	0	0	0	0	0	--	0	0	0	0	--	--
Total	2	5	2	1	1	13	0	0	--	29	6	21	3	--	--

[a]Source: Wayland Police Department.
[b]Crash rate data for this location has been requested from the Sudbury Police Department, but not yet received.
[c]Average crashes over three-year period.
[d]Crash rate per million entering vehicles (mev).
[e]Yes if rate > 0.84 for signalized intersections, > 0.79 for unsignalized intersections.
NA = Not available.

Table 3-6 Observed Vehicle Speed Summary

Location/ Direction of Travel	Range of Observed Speeds (mph[a])	Average Observed Speed (mph)	85th Percentile Observed Speed (mph)	Speed Limit (mph)
Route 27, north of Bow Road:				
Traveling northbound	14 to 65	38	43	40
Traveling southbound	14 to 59	38	43	40
Glezen Lane, east of Route 126:				
Traveling eastbound	14 to 44	28	33	25
Traveling westbound	14 to 49	29	34	25
Glezen Lane, west of Route 126:				
Traveling eastbound	14 to 39	26	32	25
Traveling westbound	14 to 39	26	30	25
Bow Road, east of Route 27:				
Traveling eastbound	14 to 39	23	28	25
Traveling westbound	14 to 44	24	30	25
Claypit Hill Road, east of Route 126:				
Traveling eastbound	14 to 39	29	33	25
Traveling westbound	14 to 49	31	35	25
Millbrook Road, east of Route 27:				
Traveling eastbound	14 to 39	26	31	NP
Traveling westbound	14 to 39	27	32	NP
Plain Road, west of Claypit Hill Road:				
Traveling eastbound	14 to 54	31	36	25
Traveling westbound	14 to 49	32	36	25
Training Field Road, west of Route 126:				
Traveling eastbound	14 to 39	24	29	25
Traveling westbound	14 to 39	25	29	25
Winthrop Road, east of Route 27:				
Traveling eastbound	14 to 44	22	29	NP
Traveling westbound	14 to 24	15	19	NP
Glen Road, north of Route 20:				
Traveling northbound	14 to 39	24	29	NP
Traveling southbound	14 to 39	22	27	NP
Moore Road, west of Route 126:				
Traveling eastbound	14 to 39	23	31	30
Traveling westbound	14 to 54	28	35	30

[a]Miles per hour.
NP = Not posted.

The available sight distances at the locations of the site access intersections with Route 20 and Route 27 were compared to minimum requirements, as established by the American Association of State Highway and Transportation Officials (AASHTO)[3]. The available and required sight distances for the site access locations are summarized in Table 3-7.

As indicated in Table 3-6, the observed SSD exceeds the minimum requirement to safely allow vehicles on Route 20 to exit the site driveways, as well as for vehicles entering the site to see adequately when approaching the site driveways. Any vegetation or plantings at the proposed access roadway intersections with Route 20 and Route 27 should be set back and not exceed 3.0 feet so as not to inhibit sight distances.

Available sight distances at the existing study area intersections were also recorded and compared to minimum requirements, as established by the AASHTO[4]. The available and required sight distances for the site access locations are summarized in Table 3-8.

3.2.10 Origin/Destination Analysis

To determine if any of the new trips expected to be generated by the Wayland Town Center project were existing trips traveling to the existing Whole Foods market, Sudbury Farms or Shaw's supermarkets, an origin/destination analysis was performed. To perform this study, license plate data was recorded during the weekday morning, weekday evening and Saturday midday peak periods. License plates were recorded of vehicles entering and exiting the following roadways:

- Bow Road
- Glezen Lane
- River Road
- Old County Road
- Whole Foods driveway
- Sudbury Farms driveways
- Shaw's driveways

[3] *A Policy on Geometric Design of Highways and Streets*; American Association of State Highway and Transportation Officials (AASHTO); 1990.

[4] *Ibid.*

Table 3-7 Site Driveway Sight Distance Analysis Summary

	Required Minimum (Feet)[a]	Measured (Feet)
Route 20 at the Proposed Site Driveway		
Stopping Sight Distance:		
Route 20 approaching from the west	360	500+
Route 20 approaching from the east	360	500+
Intersection Sight Distance:		
Looking to the west from the site driveway	500[b]/430[c]	500+
Looking to the east from the site driveway	500[b]/430[c]	500+
Route 27 at the Proposed Site Driveway		
Stopping Sight Distance:		
Route 27 approaching from the north	305	500+
Route 27 approaching from the south	305	500+
Intersection Sight Distance:		
Looking to the north from the site driveway	445[b]/385[c]	500+
Looking to the south from the site driveway	445[b]/385[c]	500+

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*; American Association of State Highway and Transportation Officials (AASHTO); 2001, and based on a 45 speed on Route 20 and a 40 mph speed limit on Route 27.
[b]Recommended minimum value for vehicles turning right exiting a roadway under STOP-sign control.
[c]Recommended minimum value for vehicles turning left exiting a roadway under STOP-sign control.

Table 3-8 Study Area Intersection Sight Distance Analysis Summary

	Speed (mph)	Required Minimum (Feet)[a]	Measured (Feet)
River Road at Route 27			
Stopping Sight Distance:			
Route 27 approaching from the north	43	335	500+
Route 27 approaching from the south	43	335	500+
Intersection Sight Distance:			
Looking to the north from River Road	–	474[b]	500+
Looking to the south from River Road	–	411[c]	207
Glezen Lane at Route 27			
Stopping Sight Distance:			
Route 27 approaching from the north	43	335	500+
Route 27 approaching from the south	42	324	500+
Intersection Sight Distance:			
Looking to the north from Glezen Lane	–	463[b]	500+
Looking to the south from Glezen Lane	–	411[c]	500+
Bow Road at Route 27			
Stopping Sight Distance:			
Route 27 approaching from the north	44	348	500+
Route 27 approaching from the south	46	372	500+
Intersection Sight Distance:			
Looking to the north from Bow Road	–	485[b]	500+
Looking to the south from Bow Road	–	440[c]	344
Route 126 at Route 27			
Stopping Sight Distance:			
Route 27 approaching from the north	41	312	500+
Route 27 approaching from the south	40	301	500+
Intersection Sight Distance:			
Looking to the north from Route 126	–	452[b]	500+
Looking to the south from Route 126	–	382[c]	500+
Bow Road at Route 126			
Stopping Sight Distance:			
Route 126 approaching from the north	35	246	500+
Route 126 approaching from the south	31	206	253
Intersection Sight Distance:			
Looking to the south from Bow Road	–	386[b]	500+
Looking to the north from Bow Road	–	296[c]	233

Table 3-8 (Continued) Study Area Intersection Sight Distance Analysis Summary

	Speed (mph)	Required Minimum (Feet)[a]	Measured (Feet)
Plain Road at Route 126			
Stopping Sight Distance:			
Route 126 approaching from the north	39	289	500+
Route 126 approaching from the south	39	289	500+
Intersection Sight Distance:			
Looking to the south from Plain Road	–	386[b]	500+
Looking to the north from Plain Road	–	296[c]	500+
Training Field Road/Claypit Hill Road at Route 126			
Stopping Sight Distance:			
Route 126 approaching from the north	44	348	500+
Route 126 approaching from the south	40	301	500+
Intersection Sight Distance:			
Looking to the south from Training Field Road	–	485[b]	500+
Looking to the north from Training Field Road	–	382[c]	500+
Intersection Sight Distance:			
Looking to the north from Claypit Hill Road	–	485[b]	500+
Looking to the south from Claypit Hill Road	–	382[c]	500+
Glezen Lane at Route 126			
Stopping Sight Distance:			
Route 126 approaching from the north	41	312	500+
Route 126 approaching from the south	44	348	500+
Intersection Sight Distance:			
Looking to the south from Glezen Lane	–	485[b]	500+
Looking to the north from Glezen Lane	–	485[c]	500+
Moore Road at Route 126			
Stopping Sight Distance:			
Route 126 approaching from the north	40	301	500+
Route 126 approaching from the south	42	324	500+
Intersection Sight Distance:			
Looking to the south from Moore Road	–	463[b]	500+
Looking to the north from Moore Road	–	382[c]	363
Millbrook Road/Pelham Island Road at Route 27/Route 126			
Stopping Sight Distance:			
Route 27 approaching from the north	30	200	500+
Route 27 approaching from the south	30	200	500+
Intersection Sight Distance:			
Looking to the north from Millbrook Road	–	331[b]	500+
Looking to the south from Millbrook Road	–	287[c]	500+
Intersection Sight Distance:			
Looking to the south from Pelham Island Rd.	–	331[b]	500+
Looking to the north from Pelham Island Rd.	–	287[c]	500+

Table 3-8 (Continued) Study Area Intersection Sight Distance Analysis Summary

	Speed (mph)	Required Minimum (Feet)[a]	Measured (Feet)
Route 20 at Route 27/Route 126			
Stopping Sight Distance:			
Route 27 approaching from the north	30	200	500+
Route 27 approaching from the south	30	200	500+
Intersection Sight Distance:			
Looking to the north from Route 27	–	331[b]	500+
Looking to the south from Route 27	–	287[c]	500+
Winthrop Road at Route 27			
Stopping Sight Distance:			
Route 27 approaching from the north	35	246	500+
Route 27 approaching from the south	35	246	500+
Intersection Sight Distance:			
Looking to the north from Winthrop Road	–	386[b]	500+
Looking to the south from Winthrop Road	–	334[c]	241
Winthrop Road at Route 20			
Stopping Sight Distance:			
Route 20 approaching from the east	40	301	500+
Route 20 approaching from the west	40	301	500+
Intersection Sight Distance:			
Looking to the east from Winthrop Road	–	Not Applicable. Winthrop Road is one-way	
Looking to the west from Winthrop Road	–	southbound away from Route 20	
Training Field Road at Glezen Lane (North)			
Stopping Sight Distance:			
Training Field Rd. approaching from the north	31	206	232
Glezen Lane approaching from the south	31	206	314
Intersection Sight Distance:			
Looking to the south from Glezen Lane	–	342[b]	365
Looking to the north from Glezen Lane	–	296[c]	206
Training Field Road at Glezen Lane (Southwest)			
Stopping Sight Distance:			
Glezen Lane approaching from the east	33	226	417
Glezen Lane approaching from the west	33	226	500+
Intersection Sight Distance:			
Looking to the west from Glezen Lane	–	364[b]	419
Looking to the east from Glezen Lane	–	315[c]	500+
Training Field Road at Glezen Lane (Southeast)			
Stopping Sight Distance:			
Training Field Rd. approaching from the east	34	236	435
Glezen Lane approaching from the west	34	236	315
Intersection Sight Distance:			
Looking to the east from Plain Road	–	375[b]	447
Looking to the west from Plain Road	–	325[c]	366

Table 3-8 (Continued) Study Area Intersection Sight Distance Analysis Summary

	Speed (mph)	Required Minimum (Feet)[a]	Measured (Feet)
Glezen Lane at Moore Road			
Stopping Sight Distance:			
Glezen Lane approaching from the south	32	216	495
Moore Road approaching from the north	32	216	500+
Intersection Sight Distance:			
Looking to the south from Moore Road	–	353[b]	166
Looking to the north from Moore Road	–	306[c]	293
Glen Road at Plain Road			
Stopping Sight Distance:			
Plain Road approaching from the east	25	152	470
Glen Road approaching from the west	25	153	340
Intersection Sight Distance:			
Looking to the east from Plain Road	–	276[b]	166
Looking to the west from Plain Road	–	239[c]	293
Claypit Hill Road at Plain Road			
Stopping Sight Distance:			
Plain Road approaching from the east	35	246	492
Claypit Hill Road approaching from the west	35	246	460
Intersection Sight Distance:			
Looking to the east from Plain Road	–	386[b]	374
Looking to the west from Plain Road	–	334[c]	500+
Intersection Sight Distance:			
Looking to the east from Decatur Lane	–	386[b]	240
Looking to the west from Decatur Lane	–	334[c]	166

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*; American Association of State Highway and Transportation Officials (AASHTO); 2001, and based on the prevailing speed.
[b]Recommended minimum value for vehicles turning left exiting a roadway under STOP-sign control.
[c]Recommended minimum value for vehicles turning right exiting a roadway under STOP-sign control.

During the weekday morning peak period, 3,023 license plates were recorded, during the weekday evening peak hour, 6,993 license plates were recorded and during the Saturday midday peak period, 6,435 license plates were recorded. The license plate data is contained in the Appendix.

The license plate data was then sorted and matches analyzed to determine the purpose of the observed trips from Glezen Lane and Bow Road. The results of the analysis are summarized in Table 3-9.

Table 3-9 License Plate Summary

Time Period	Number of License Plates Recorded[a]	Identified Cut-Through Trips[b]	Identified Supermarket Trips[c]
Weekday Morning Peak Period	3,023	220	22
Weekday Evening Peak Period	6,993	301	17
Saturday Midday Peak Period	6,435	98	15

[a]All locations.
[b]Trips originating or terminating at Glezen Lane or Bow Road by way of Old County Road, River Road and Route 27.
[c]Trips originating or terminating at Glezen Lane or Bow Road utilizing Whole Foods, Sudbury Farms or Shaw's.

Based on the license plate data gathered, most of the trips traveling to and from Route 20 from Glezen Lane and Bow Road are cut-through trips. There were only 15 to 22 trips that were identified as originating or terminating at Glezen Lane or Bow Road that were related to a shopping or supermarket trip.

3.2.11 Planned Roadway Improvements

Officials for MassHighway and the Town of Wayland were contacted regarding roadway improvements planned for the study area intersections. One intersection improvement project was identified:

- ***Route 20 & Route 27/126*** – MassHighway, in conjunction with the Town of Wayland, is reconstructing the intersection of Route 20 (Boston Post Road) with Route 27/126 (Cochituate Road), and providing improvements to the traffic signal system. The Route 20 eastbound and westbound approaches will each provide an exclusive left-turn lane, a through travel lane, and an exclusive right-turn lane. The Route 27/126 northbound and southbound approaches will each provide an exclusive left-turn lane and a shared through/right-turn lane. Associated improvements also include a short section of work on Route 126 (Concord Road), east of Route 27, and modifications to the section of Pelham Island Road west of its intersection with Route 27/126 and north of its intersection with Route 20. As a result, traffic flow on Pelham Island Road between Route 27/126 and Route 20 will now be one-way in a southwesterly direction; vehicles now turning left from Route 20 onto Pelham Island Road will be forced to utilize the intersection of Route 20 at Route 27/126. It is anticipated that these roadway improvements will help to alleviate crash rates in the immediate study area, particularly at those locations that have experienced crash rates higher than the District 3 significant rate (Route 27 at Route 27/126 and Route 27/126 at Pelham Island Road and Millbrook Road). This improvement is nearly complete.

It should be noted that if the existing 410,500+ square feet of office space on the site were to be re-occupied, this intersection would operate at level-of-service F, even with these improvements.

No additional intersection improvements have been identified for this area that will improve intersection capacity.

3.3 Probable Impacts of the Project

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to the year 2011. Traffic volumes on the roadway network at that time, in the absence of the project (that is, the No-Build condition), would include existing site traffic, new traffic due to general background traffic growth, and traffic related to specific development by others, expected to be completed by 2011. Consideration of these factors resulted in the development of 2011 No-Build traffic volumes. Anticipated site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop 2011 Build conditions. Roadway improvements independent of the project are also reviewed in this section.

3.3.1 No-Build Traffic Volumes

Traffic growth on area roadways is a function of the expected land development in the immediate area as well as the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This produces a more realistic estimate of growth for local traffic. However, the drawback of this procedure is that the potential growth in population and development external to the study area would not be accounted for in the traffic projections.

To provide a conservative analysis framework, both procedures were used.

3.3.1.1 *Specific Development by Others*

Traffic volumes expected to be generated by specific local developments by others were included in the No-Build condition. The Towns of Wayland and Sudbury were contacted to identify specific planned developments. Based on these discussions, the following projects have been identified that would impact future traffic volumes beyond the general background traffic growth rate:

- ***Proposed Wayland Commons Condominiums, Wayland, Massachusetts*** – This 48 unit residential development will be located on the west side of Route 27, north of Route 126 and south of Bow Road. Trip generation estimates for this project were determined based on data published by the Institute of Transportation Engineers (ITE)[5]. Specifically, Land Use Code 230 (Residential Condominium/Town House) was utilized.

- ***Proposed Age-Restricted Condominiums, Sudbury, Massachusetts*** – This 23 unit age-restricted (55+) residential development will be located on Route 20 near its intersection with Edgell Road. Trip generation estimates for this project were determined based on data published by the ITE[6]. Specifically, Land Use Code 230 (Residential Condominium/Town House) was utilized.

- ***Proposed Condominiums, Sudbury, Massachusetts*** – This 37 unit residential development will be located on Old County Road. Trip generation estimates for this project were determined based on data published by the ITE[7]. Specifically, Land Use Code 230 (Residential Condominium/Town House) was utilized.

- ***Proposed BMW Dealership, Sudbury, Massachusetts*** – This 69,000 square foot automobile dealership will be located on Old County Road. Trip generation estimates for this project were determined based on data published by the ITE[8]. Specifically, Land Use Code 841 (New Car Sales) was utilized.

- ***Proposed Condominiums, Sudbury, Massachusetts*** – This 66 unit residential development will be located at 295 Boston Post Road. Trip generation estimates for this project were determined based on data published by the ITE[9]. Specifically, Land Use Code 230 (Residential Condominium/Town House) was utilized.

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[5] *Trip Generation,* Seventh Edition; Institute of Transportation Engineers; Washington, DC; 2003.

[6] Ibid 3.

[7] Ibid 3.

[8] Ibid 3.

[9] Ibid 3.

- ***Proposed Subdivision, Sudbury, Massachusetts*** – This 10-unit residential development will be located on Landham Road. Trip generation estimates for this project were determined based on data published by the ITE[10]. Specifically, Land Use Code 210 (Single-Family Homes) was utilized.

- ***Infill of Existing Office Building*** – If the project is not built, then the existing 410,500± square foot office building on the site could also be occupied. Trip generation estimates for the office infill were determined based on the ITE[11] data, Land Use Code 710, General Office. Based on the existing 410,500 square feet, it is anticipated that the site would generate 3,958 daily vehicle trips, with 581 vph (511 vehicles entering and 70 vehicles exiting) during the weekday morning peak hour and 539 vph (92 vehicles entering and 447 vehicles exiting) during the weekday evening peak hour. On a Saturday it is anticipated that the site would generate 974 vehicle trips, with 168 vph (91 vehicles entering and 77 vehicles exiting) during the Saturday midday peak hour. On a Sunday it is anticipated that the site would generate 404 vehicle trips, with 57 vph (33 vehicles entering and 24 vehicles exiting) during the Sunday midday peak hour.

3.3.1.2 Background Traffic Growth

Traffic-volume data compiled by MassHighway for the Town of Wayland and surrounding towns from permanent count stations and historic traffic counts in the area were reviewed to determine traffic growth trends. Based on a review of this data, it was determined that traffic volumes within the study area have generally increased by approximately one percent per year over the past several years. Accordingly, a one percent per year compounded annual background traffic growth rate was used to account for potential future traffic growth external to the study area and presently unforeseen development.

3.3.1.3 No-Build Condition Traffic Volumes

The 2011 No-Build weekday morning and evening peak-hour traffic volumes were developed by applying a compounded one percent annual growth rate to the 2006 Existing peak-hour through movement traffic volumes and by subsequently adding the traffic generated by the site-specific development. Figures 3-8 and 3-9 shows the projected 2011 No-Build peak-hour traffic for the weekday morning and weekday evening peak hour conditions. Figures 3-10 and 3-11 show the projected 2011 No-Build peak hour traffic for the Saturday and peak hour.

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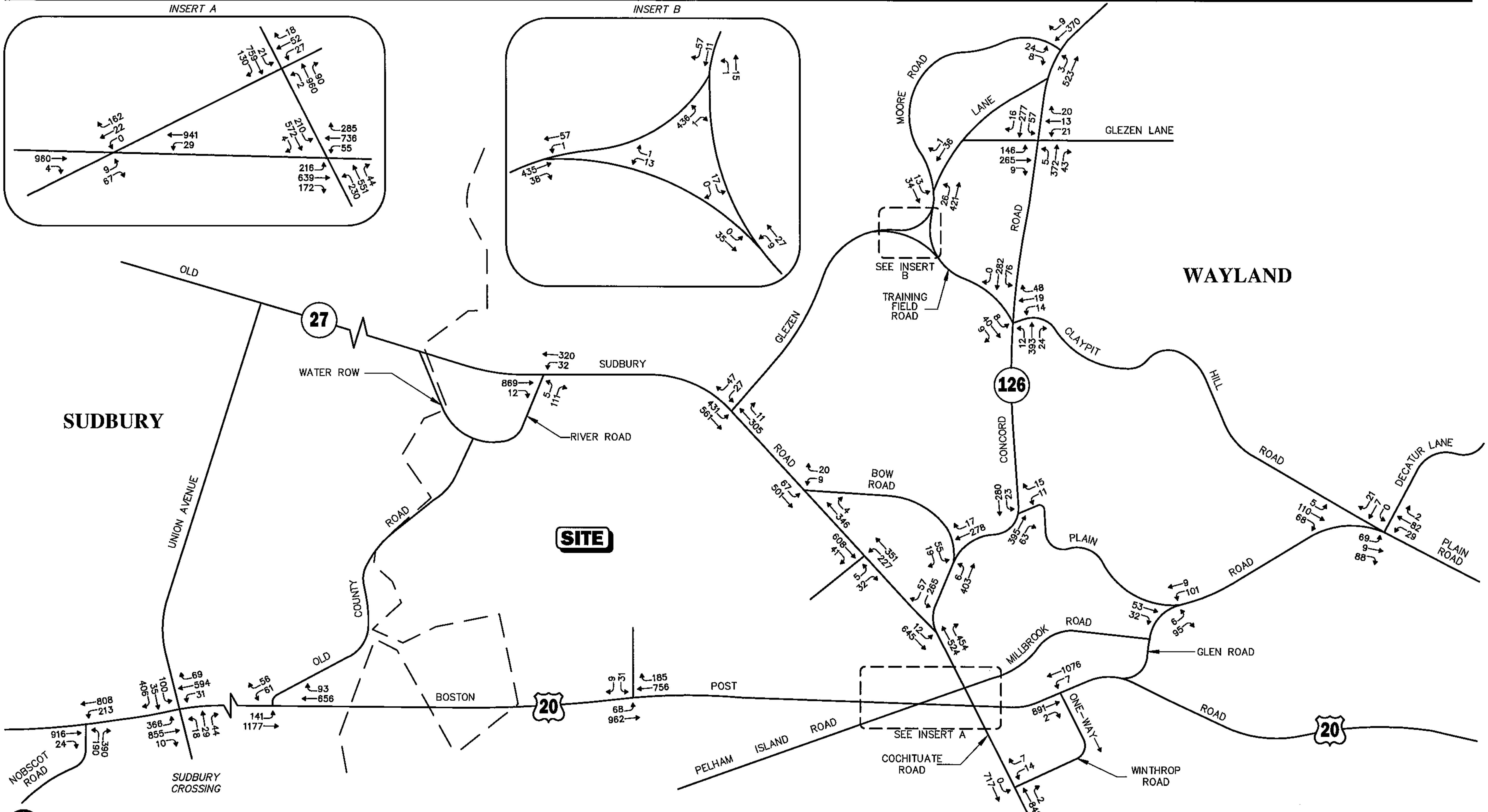
[10] Ibid 3.

[11] Ibid 3.



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

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Figure 3-8
2011 No-Build Weekday Morning Peak Hour Traffic Volumes

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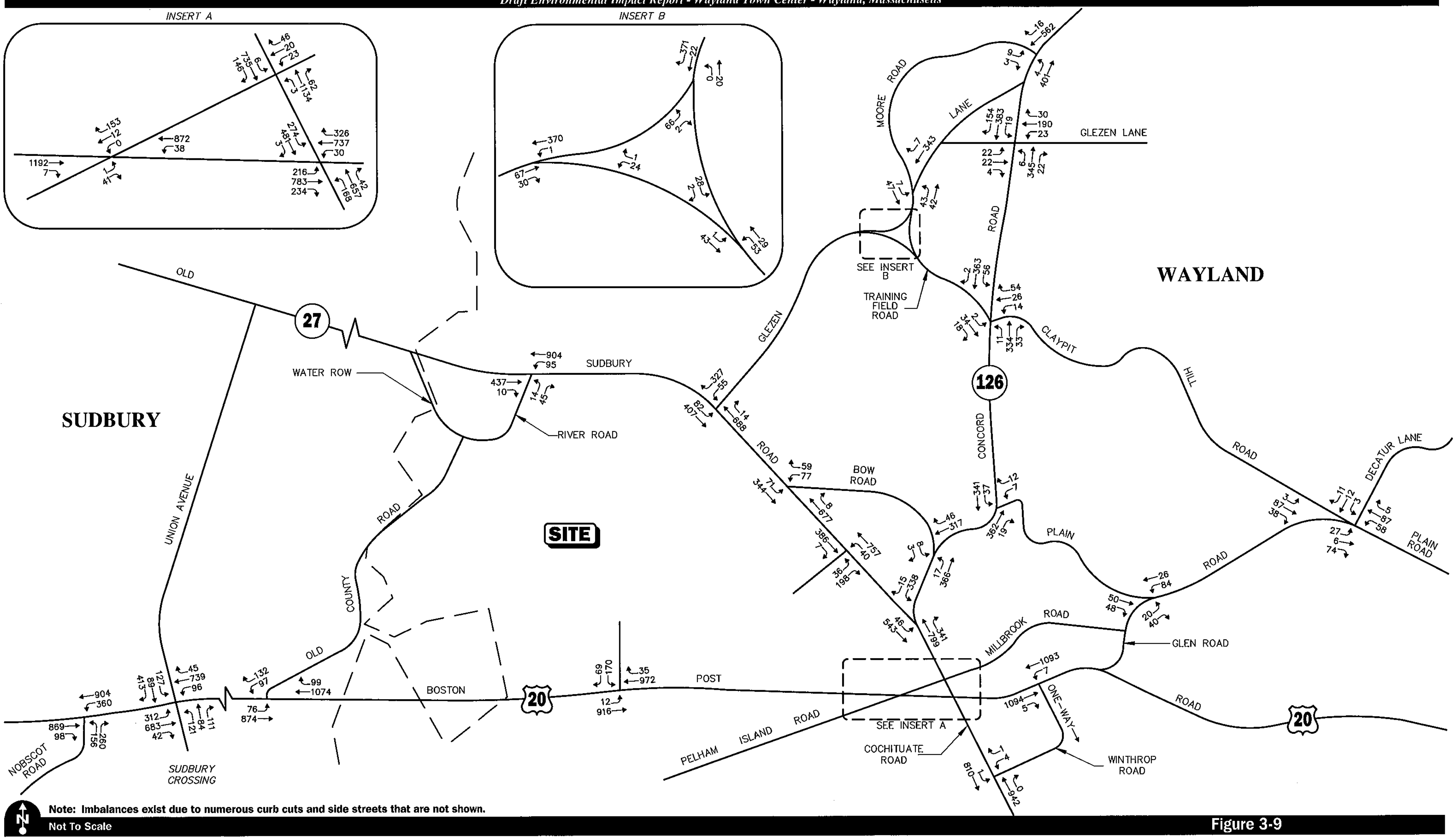

Figure 3-9

2011 No-Build Weekday Evening Peak Hour Traffic Volumes

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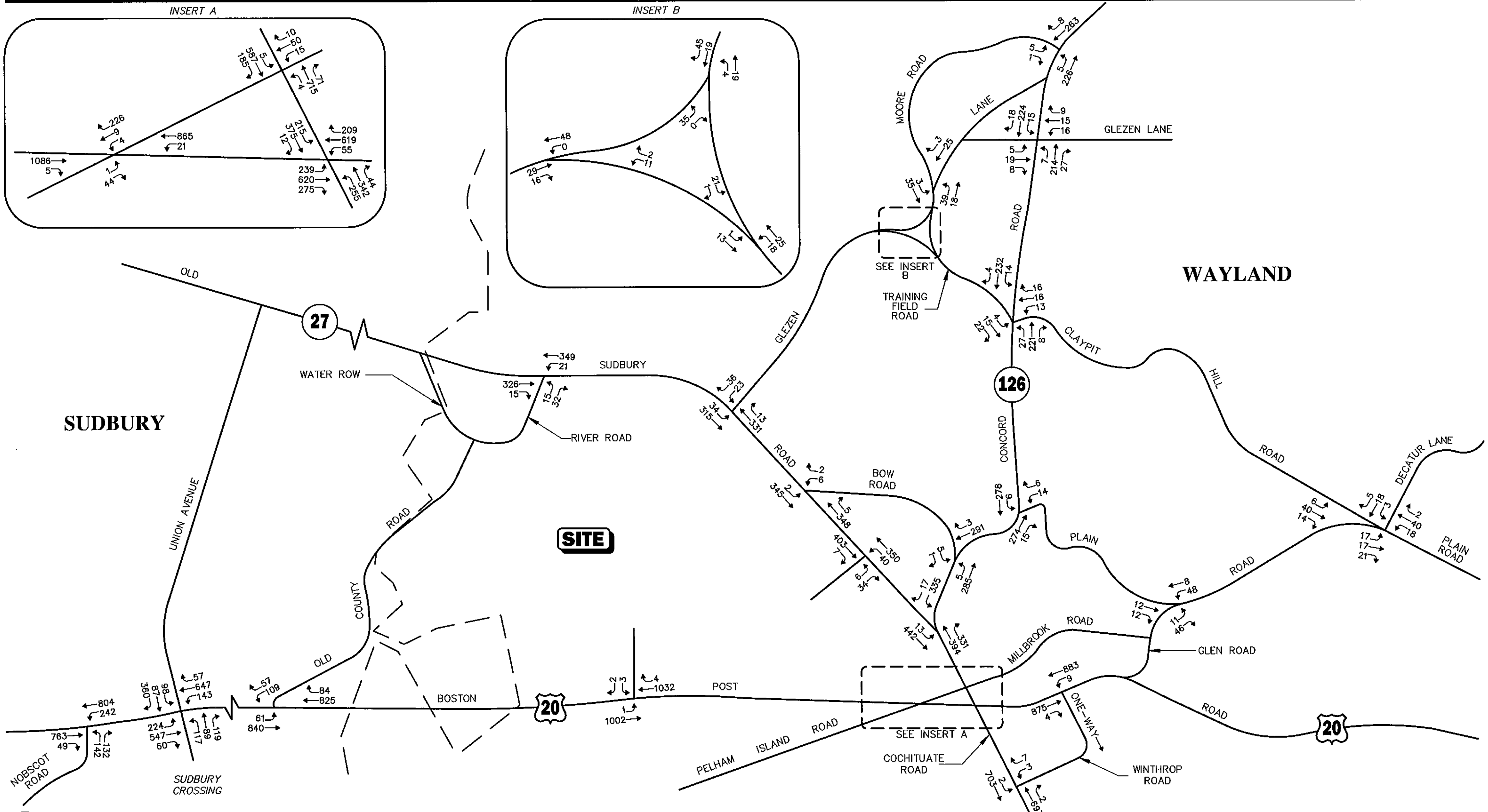

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

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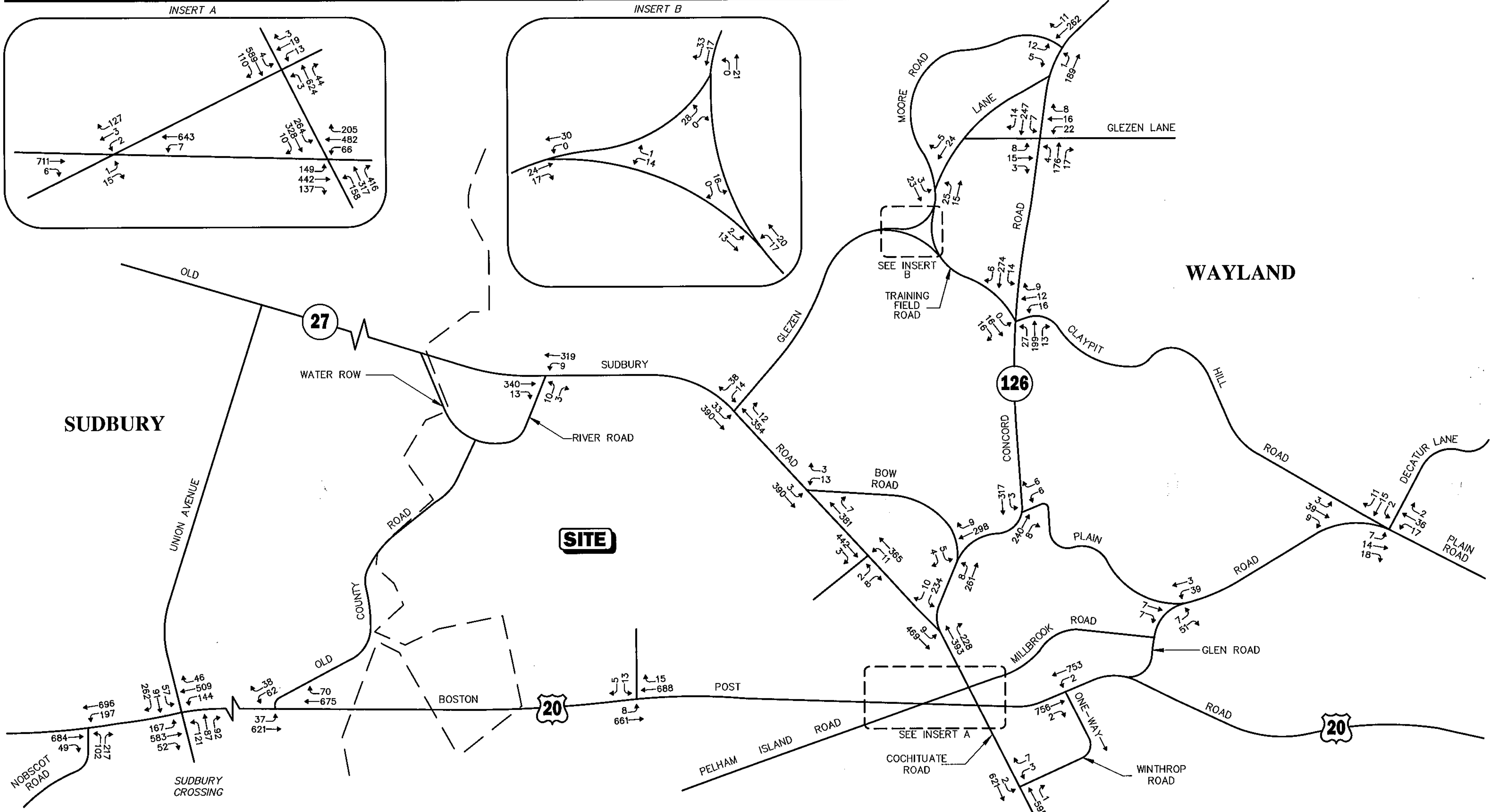
Figure 3-10

2011 No-Build Saturday Midday Peak Hour Traffic Volumes



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

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Figure 3-11

2011 No-Build Sunday Midday Peak Hour Traffic Volumes

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3.3.2 Future Build Conditions With The Project

3.3.2.1 Proposed Site Traffic Generation

Trip-generation data published by the Institute of Transportation Engineers (ITE) Trip Generation manual[12] was reviewed. Trip generation data for ITE Land Use Code (LUC) 230 (Residential Condominium/Townhouse), ITE LUC 710 (General Office), ITE LUC 590 (Library) and ITE LUC 820 (Shopping Center) were used to determine the expected trip generation for the proposed project. The expected trip generation for the proposed Wayland Town Center project is summarized Table 3-10.

Table 3-10 Trip Generation

Time Period/Direction	100 Condominiums[a] (Trips)	10,000 sf Office[b] (Trips)	40,000 sf Library[c] (Trips)	155,000 sf Retail[d] (Trips)	Total Trips
Average Weekday Daily Traffic	642	112	1,898	9,030	11,682
Weekday Morning Peak Hour:					
Entering	9	14	34	98	155
Exiting	43	2	13	62	120
Total	52	16	47	160	275
Weekday Evening Peak Hour:					
Entering	40	3	136	401	580
Exiting	20	12	148	435	615
Total	60	15	284	836	1,195
Saturday Daily Traffic	790	24	1,862	12,178	14,854
Saturday Midday Peak Hour:					
Entering	39	2	143	599	783
Exiting	33	2	127	552	714
Total	72	4	270	1,151	1,497
Sunday Daily Traffic	670	10	1,020	3,914	5,614
Sunday Midday Peak Hour:					
Entering	36	1	109	237	383
Exiting	37	0	97	247	381
Total	73	1	206	484	764

[a]Based on ITE LUC 230, Residential Condominium/Townhouse; 100 Units.
[b]Based on ITE LUC 710, General Office; 10,000 sf.
[c]Based on ITE LUC 590, Library; 40,000 sf.
[d]Based on ITE LUC 820, Shopping Center; 155,000 sf.

[12] *Trip Generation,* Seventh Edition; Institute of Transportation Engineers; Washington, DC; 2003.

For the municipal component, a library was chosen for trip generation purposes because it generated the highest peak hour traffic volumes among the ITE appropriate comparable municipal uses, as compared in Table 3-11.

Table 3-11 Municipal Trip Generation Comparison

Time Period/Direction	40,000 sf Library[c] (Trips)	40,000 sf Government Office[b] (Trips)	40,000 sf Government Office Complex[c] (Trips)
Average Weekday Daily Traffic	1,898	2,758	1,118
Weekday Morning Peak Hour:			
Entering	34	197	78
Exiting	13	38	10
Total	47	235[d]	88
Weekday Evening Peak Hour:			
Entering	136	15	35
Exiting	148	33	79
Total	284	48	114
Saturday Daily Traffic	1,862	ND	ND
Saturday Midday Peak Hour:			
Entering	143		
Exiting	127		
Total	270	ND	ND
Sunday Daily Traffic	1,020	ND	ND
Sunday Midday Peak Hour:			
Entering	109		
Exiting	97		
Total	206	ND	ND

[a]Based on ITE LUC 590, Library; 40,000 sf.
[b]Based on ITE LUC 730, Government Office Building; 40,000 sf.
[c]Based on ITE LUC 733, Government Office Complex; 40,000 sf.
[d]Based on only one study of an 18,000 square foot facility.
ND = No trip generation data available.

3.3.2.2 Pass-By Trips/Internal Trips

Not all of the vehicle trips expected to be generated by the project will consist of new trips on the adjacent roadway network. A significant portion of these trips will consist of impulse or pass-by trips. Statistics published by ITE[13] indicate that on average, up to 34 percent of the trips associated with retail uses (shopping center) consist of pass-by trips.

[13] *Trip Generation Handbook, An ITE Recommended Practice;* Institute of Transportation Engineers; Washington, DC; March 2001.

Pass-by trips consist of motorists already traveling on the adjacent roadway network for other purposes that will patronize the proposed project and then continue on to their original destination. Pass-by trips are not new trips on the roadway system as a result of the proposed project. To provide conservative (high) traffic volumes from which to assess the impacts of the planned development on the adjacent roadway network and in accordance with state standards for the preparation of Traffic Impact Assessments (TIAs), a 25 percent pass-by trip rate was applied to the project related traffic volumes.

Due to the multi-use nature of the development, the potential exists for overall vehicle-trip reductions from the basic trip-generation calculations for each land use category, as these calculations are intended for facilities on a stand-alone basis. The proximity of the on-site uses to each other as well as the respective component sizes result in reductions possible through on-site vehicle circulation or alternative transportation modes, such as pedestrian activity or shuttle bus usage. To account for this interaction, ITE data for determining mixed-use trip percentages were reviewed. Based on the analysis, a 3 percent internal trip capture rate was applied to non-retail/commercial components of the project.

The ITE Trip Generation Handbook[14] states several characteristics of multi-use development, at which internal trip-making behavior could be expected. Chief among these characteristics is the presence of two or more significantly sized land uses, each of which consists of a separate ITE land use that can be categorized into office, retail, or residential land use groups. Use of an internal capture rate is justified with development based upon this ITE methodology and the comparative sizes of respective land uses, since the potential and quantity of multi-use trip increase as the proportion of office/retail/residential land uses increase. Table 3-12 summarizes the anticipated traffic characteristics of the development program.

On a typical weekday, the proposed development is expected to generate 9,404 new vehicle trips (4,702 new vehicles entering and 4,702 new vehicles exiting). During the weekday morning peak hour, 233 new vehicle trips (134 new vehicles entering and 99 new vehicles exiting) are expected. During the weekday evening peak hour, 983 new vehicle trips (474 new vehicles entering and 509 new vehicles exiting) are expected. A graphical representation of the daily trips is shown on Figure 3-12.

On a Saturday, the proposed development is expected to generate 11,786 new vehicle trips (5,893 new vehicles entering and 5,893 new vehicles exiting). During the Saturday midday peak hour, 1,207 new vehicle trips (638 new vehicles entering and 569 new vehicles exiting) are expected. A graphical representation of the Saturday trips is shown on Figure 3-13.

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[14] *Trip Generation Handbook*; Institute of Transportation Engineers; Washington, DC; 2003.

Hourly Site Traffic Generation

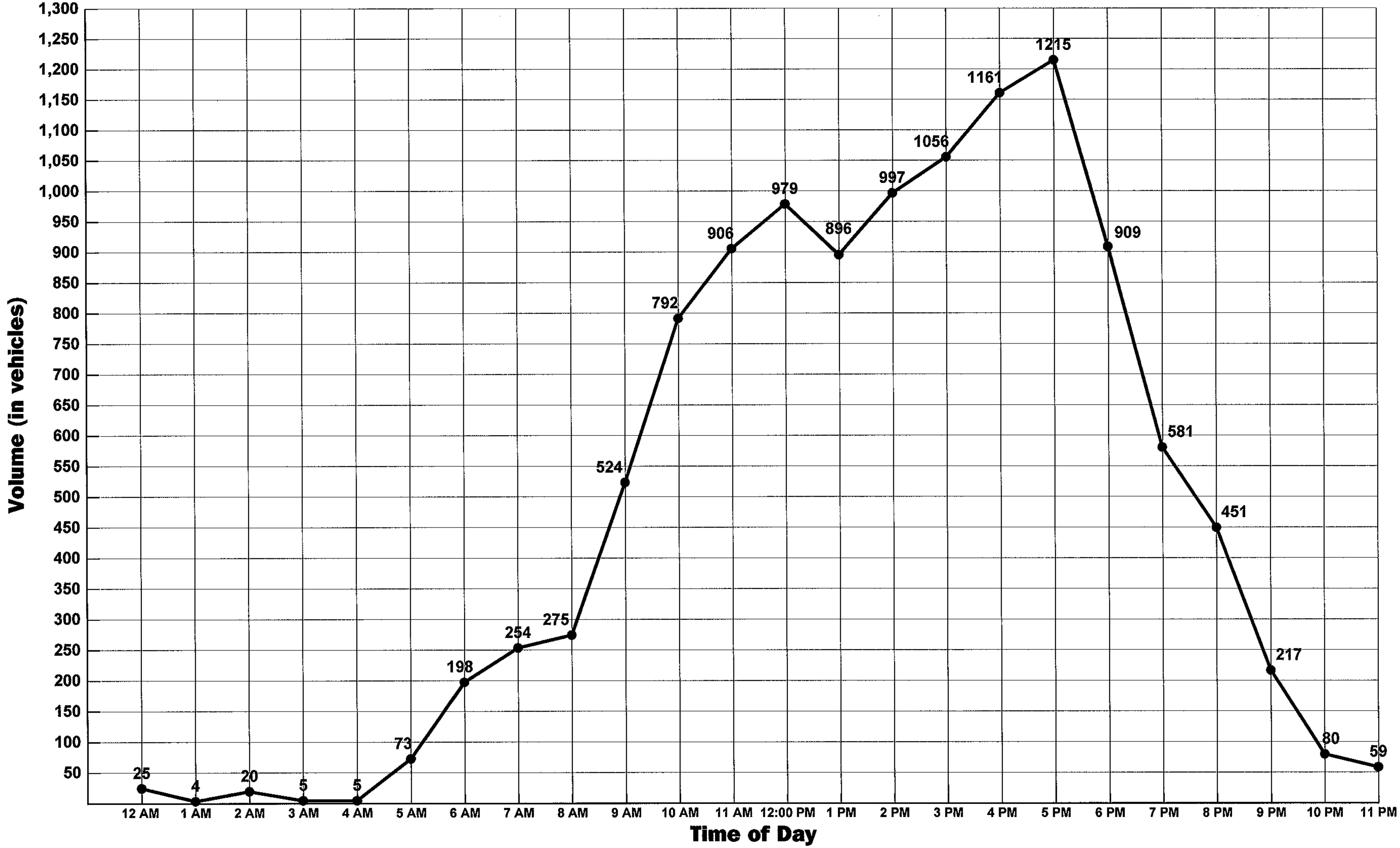

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Figure 3-12

Daily Trip Generation Distribution

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Hourly Site Traffic Generation

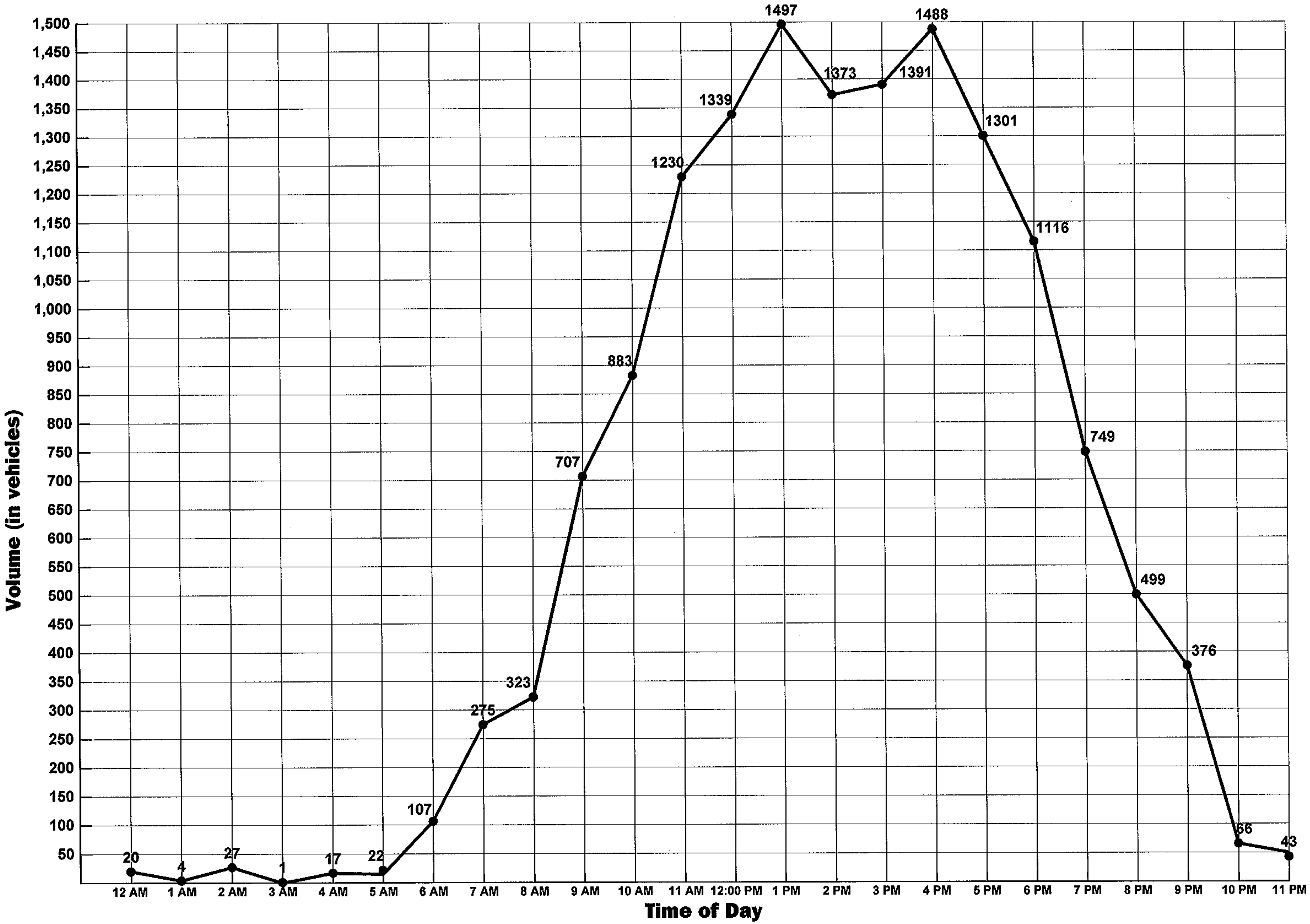

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Figure 3-13

Saturday Trip Generation Distribution

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Table 3-12 Trip Generation Summary

Time Period/Direction	100 Condominiums[a] (Trips)	10,000 sf Office[b] (Trips)	40,000 sf Library[c] (Trips)	155,000 sf Retail[d] (Trips)	Pass-by Trips[e]	Internal Trips[f]	New Trips
Average Weekday Daily Traffic	642	112	1,898	9,030	2,258	20	9,404
Weekday Morning Peak Hour:							
Entering	9	14	34	98	20	1	134
Exiting	43	2	13	62	20	1	99
Total	52	16	47	160	40	2	233
Weekday Evening Peak Hour:							
Entering	40	3	136	401	105	2	474
Exiting	20	12	148	435	105	2	509
Total	60	15	284	836	210	4	983
Saturday Daily Traffic	790	24	1,862	12,178	3,044	20	11,786
Saturday Midday Peak Hour:							
Entering	39	2	143	599	144	2	638
Exiting	33	2	127	552	144	2	569
Total	72	4	270	1,151	288	4	1,207
Sunday Daily Traffic	670	10	1,020	3,914	978	28	4,616
Sunday Midday Peak Hour:							
Entering	36	1	109	237	61	1	321
Exiting	37	0	97	237	61	1	309
Total	73	1	206	484	122	2	640

[a]Based on ITE LUC 230, Residential Condominium/Townhouse; 100 Units.
[c]Based on ITE LUC 590, Library; 40,000 sf.
[d]Based on ITE LUC 820, Shopping Center; 155,000 sf.
[e]Based on 25% pass-by rate, applied to retail component only.
[f]Based on 3% internal capture rate, applied to residential component.

On a Sunday, the proposed development is expected to generate 4,616 new vehicle trips (2,308 new vehicles entering and 2,308 new vehicles exiting). During the Sunday midday peak hour, 640 new vehicle trips (321 new vehicles entering and 309 new vehicles exiting) are expected. A graphical representation of the Saturday trips is shown on Figure 3-14.

3.3.2.3 By-Pass Trips

The internal site access roadway will connect the Route 20 and Route 27 driveways, which will provide an attractive alternative for vehicles traveling between Route 20 and Route 27. The project Proponent is committed to providing an internal connector road through the site that will provide a more direct route for travel between these locations. It is anticipated that this internal connection through the site will alleviate some of the congestion in the vicinity of the Route 20 at Route 27/126 intersection. Based on existing travel patterns and the potential for by-pass traffic between the two locations, it is anticipated that the site will accommodate an additional 316 vehicle trips (158 vehicles entering and 158 vehicles exiting) during the weekday morning peak hour, 320 vehicle trips (160 vehicles entering

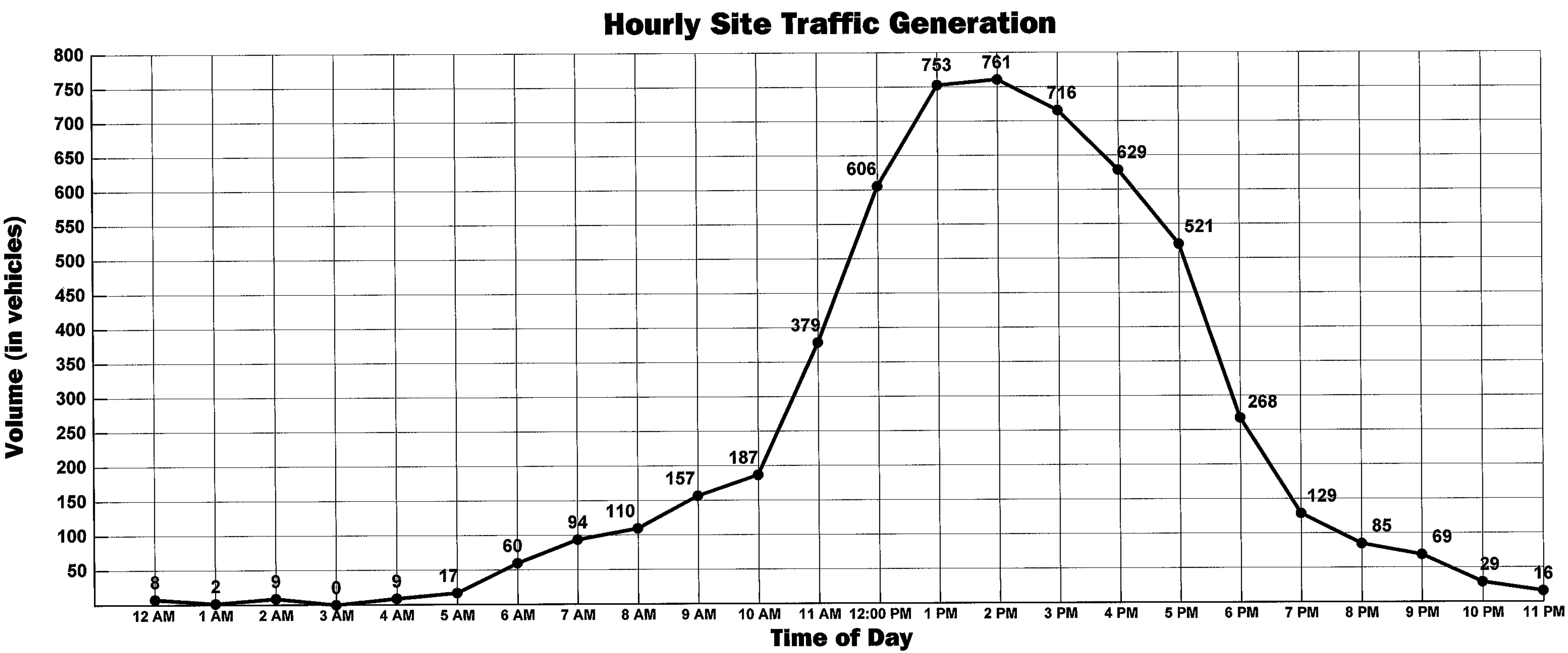

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Figure 3-14

Sunday Trip Generation Distribution

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and 160 vehicles exiting) during the weekday evening peak hour, and 378 vehicle trips (189 vehicles entering and 189 vehicles exiting) during the Saturday midday peak hour.

3.3.2.4 Additional Trips

It is important to note, that for planning purposes, it has been assumed that the site traffic associated with the 48-unit Wayland Commons condominium development (previously noted as background development) will use the proposed Wayland Town Center driveway on Route 27 under Build conditions. As currently proposed, the 48-unit development will have two curb-cuts onto Route 27; one north of the proposed Wayland Town Center driveway on Route 27, and one south of the proposed Wayland Town Center driveway on Route 27. Preliminary discussions with the Town have indicated that it is highly undesirable to have three curb cuts in such proximity on Route 27, and that some driveway consolidation in this area would be beneficial. Accordingly, under 2011 Build conditions, it has been assumed that the site traffic associated with the 48-unit development will use the proposed Wayland Town Center driveway on Route 27 (Access Alternative A). Under Access Alternative B, there would be no driveway consolidation.

3.3.2.5 Trip Generation Comparison

The new trips expected to be generated by the Wayland Town Center were also compared to traffic that would be generated by the re-occupancy of the existing office space on the site. This comparison is summarized in Table 3-13.

As shown in Table 3-13, there would be substantially fewer trips during the weekday morning peak hour with the proposed Wayland Town Center project. The largest differential in site generated traffic would occur on a Saturday (when reported daily volumes for Route 20 and Route 27 are approximately 8,100 vpd lower on a Saturday than on a weekday).

Table 3-13 Trip Generation Comparison

Time Period/Direction	Wayland Town Center New Trips	Re-Occupancy of Existing Office Space[a]	Difference
Average Weekday Daily Traffic	9,404	3,958	5,446
Weekday Morning Peak Hour:			
Entering	134	511	(377)
Exiting	99	70	29
Total	233	581	(348)
Weekday Evening Peak Hour:			
Entering	474	92	382
Exiting	509	447	62
Total	983	539	444
Saturday Daily Traffic	11,786	974	10,812
Saturday Midday Peak Hour:			
Entering	638	91	547
Exiting	569	77	492
Total	1,207	168	1,039
Sunday Daily Traffic	4,616	404	4,212
Sunday Midday Peak Hour:			
Entering	321	33	288
Exiting	309	24	285
Total	640	57	583

[a] *Based on ITE LUC 710, General Office; 410,500 sf.*

3.3.2.6 Trip Distribution and Assignment

The directional distribution of site-generated traffic on the study area roadways was based on the following: existing travel patterns within the study area, routes to major arterials and Journey to Work data published by the U.S. Census Bureau. Graphical representations of the anticipated trip distribution patterns for the retail, residential, and office/library components of the project are shown in Figure 3-15 Figure 3-16, and Figure 3-17, respectively, and are summarized in Table 3-14.

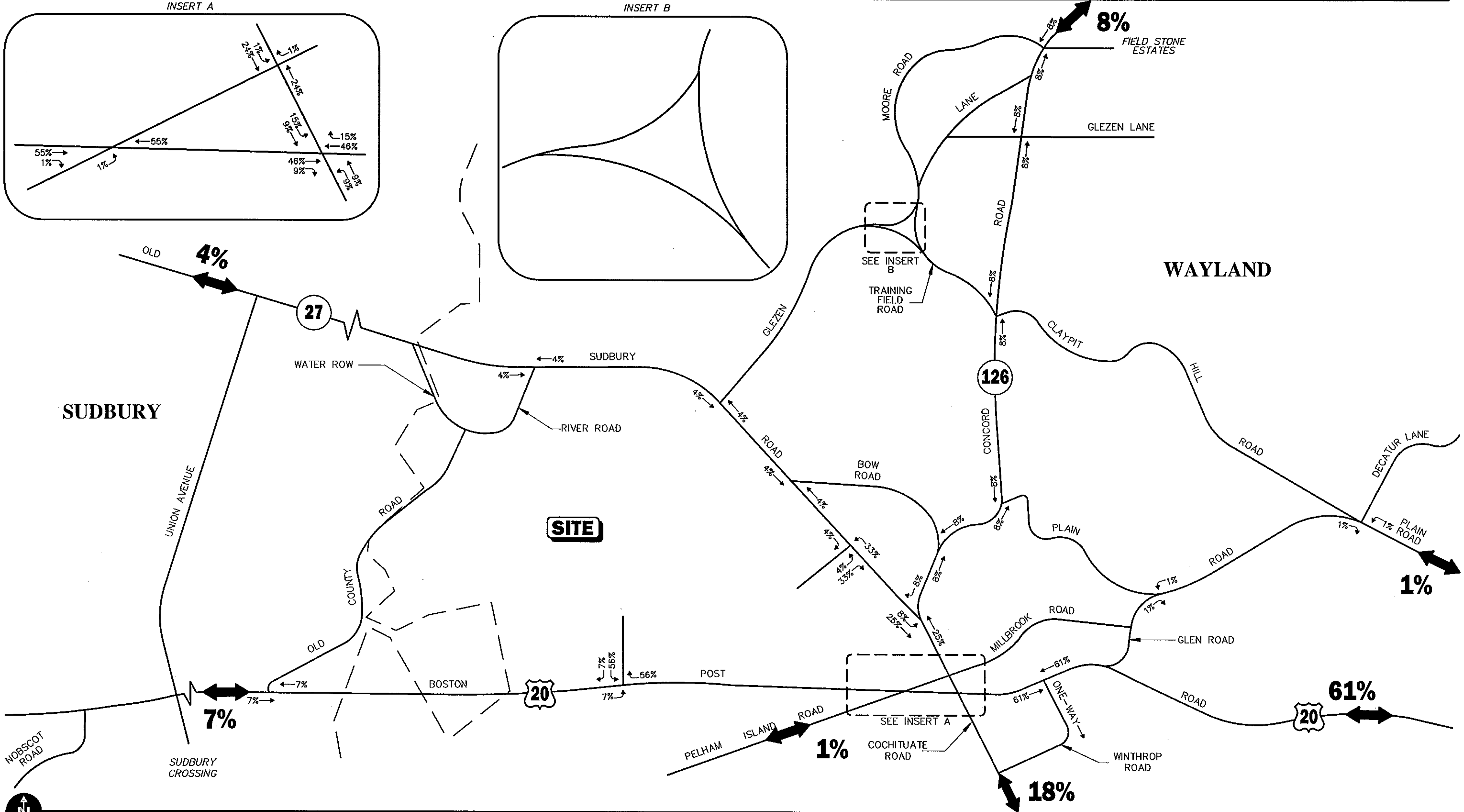

Figure 3-15

Residential Trip Distribution

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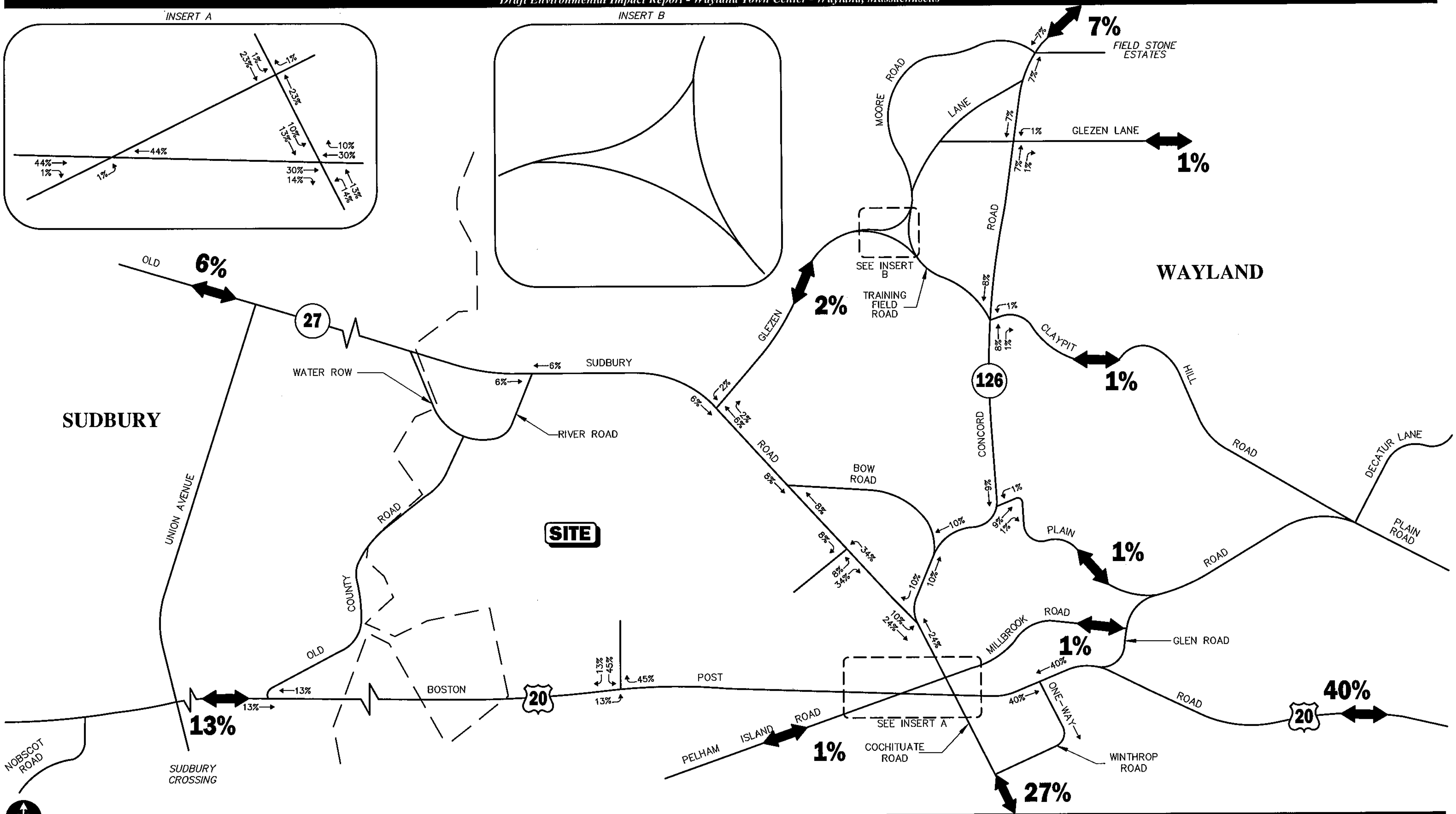

Figure 3-16

Office/Library Trip Distribution

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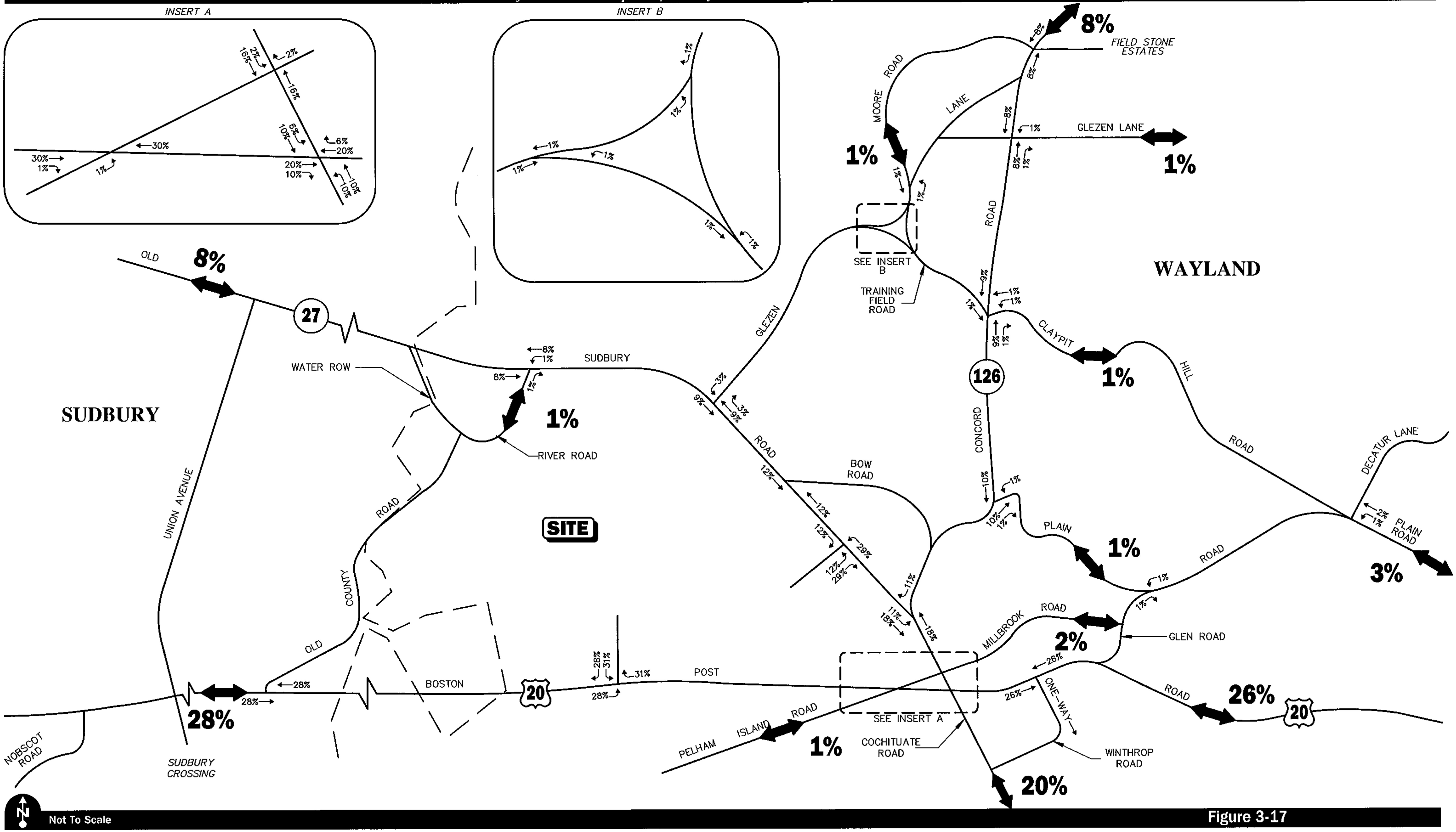

Figure 3-17

Retail Trip Distribution

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Transportation Engineers & Planners

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Table 3-14 Trip Distribution Summary

Route	Direction To or From	Percent of Retail Trips	Percent of Residential Trips	Percent of Office/ Library Trips
Route 20	West	28	7	13
Route 20	East	26	61	40
Route 27	South	20	18	27
Route 27	North	12[a]	4	8[d]
Route 126	East	11[b]	8	10[e]
Millbrook Road	East	2[c]	1	1
Pelham Island Road	South	1	1	1
TOTAL		100	100	100

[a]Three percent is expected to come from the north Wayland neighborhood by way of Glezen Lane and 1 percent is expected from River Road.
[b]Four percent is expected to come from the north Wayland neighborhood by way of Glezen Lane, Plain Road and Claypit Hill Road.
[c]One percent is expected to come from the north Wayland neighborhood by way of Mill Brook Road.
[d]Two percent is expected to come from the north Wayland neighborhood by way of Glezen Lane.
[e]Three percent is expected to come from the north Wayland neighborhood by way of Glezen Lane, Plain Road and Claypit Hill Road.

The resulting project-generated peak hour traffic flow networks for the weekday morning, weekday evening, Saturday midday, and Sunday midday conditions are shown on Figures 3-18 through 3-21, respectively for Access Alternative A. For Access Alternative B, the resulting project-generated peak hour traffic flow networks are shown on Figures 3-22 through 3-25 for the respective weekday morning, weekday evening, Saturday midday and Sunday midday peak hours. Shown on Figures 3-26 through 3-29 are the internal site flows for the respective weekday morning, weekday evening, Saturday midday and Sunday midday peak hours.

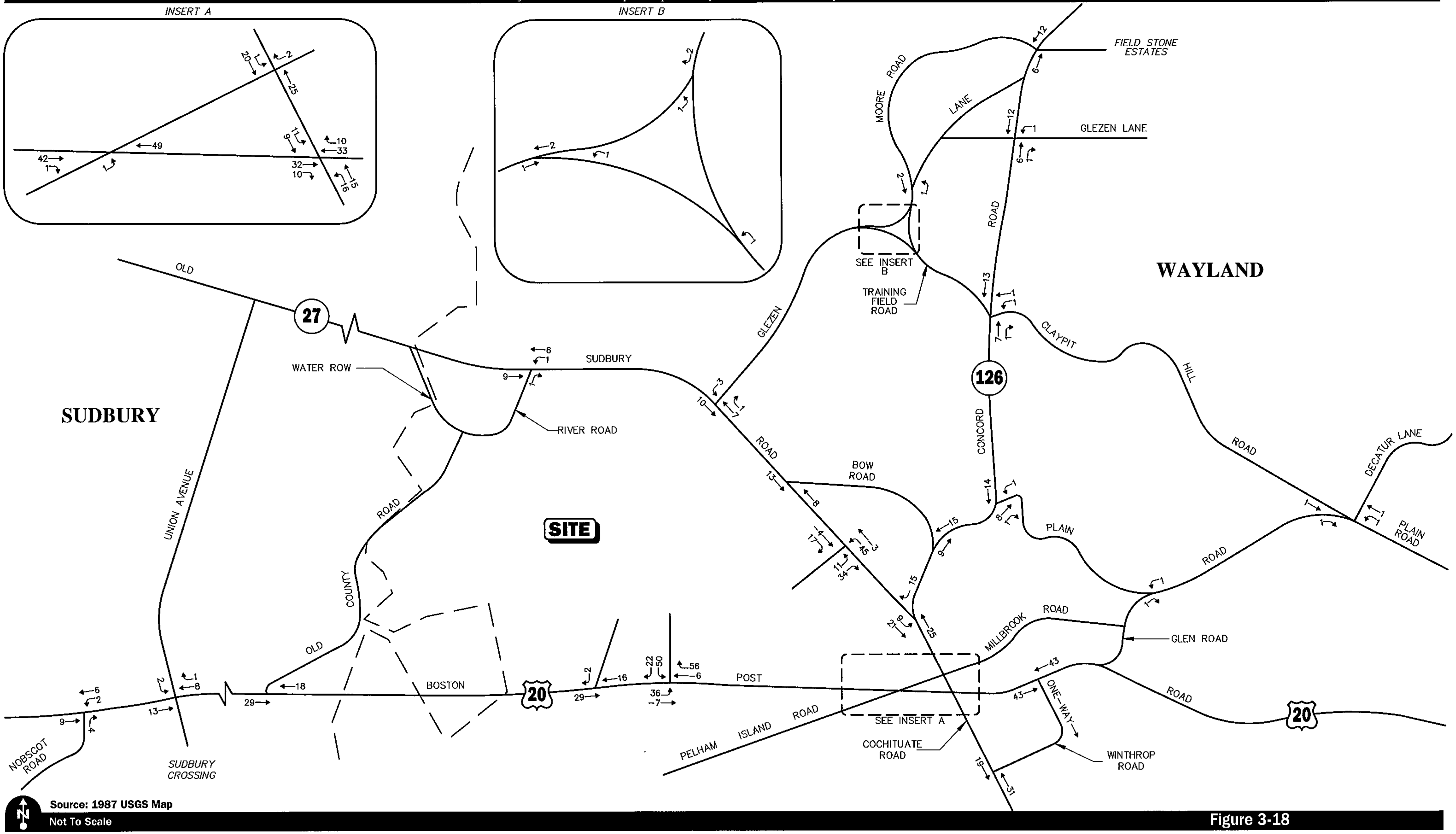

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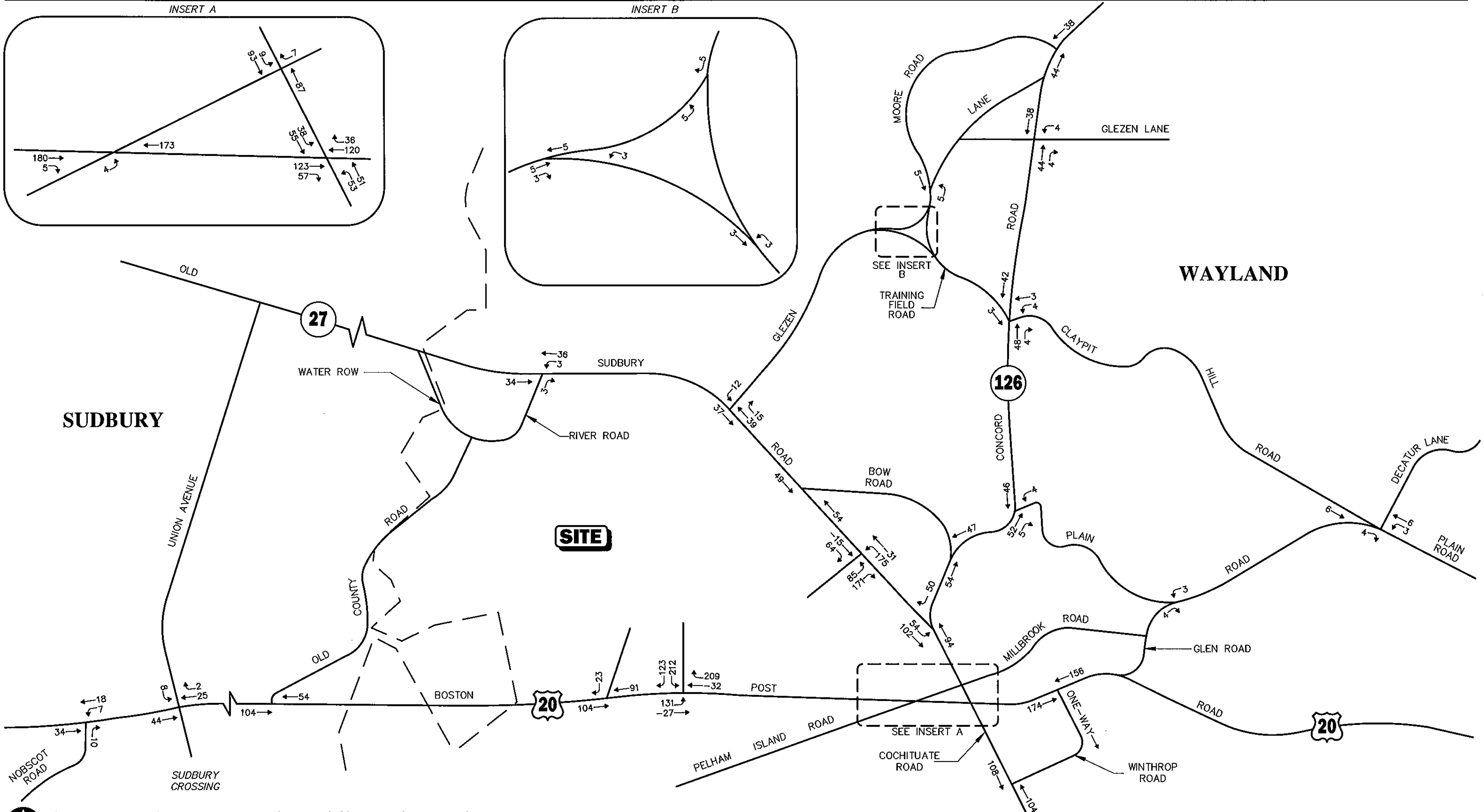
Figure 3-18

Site Generated Weekday Morning Peak Hour Traffic Volumes Access Alternative A



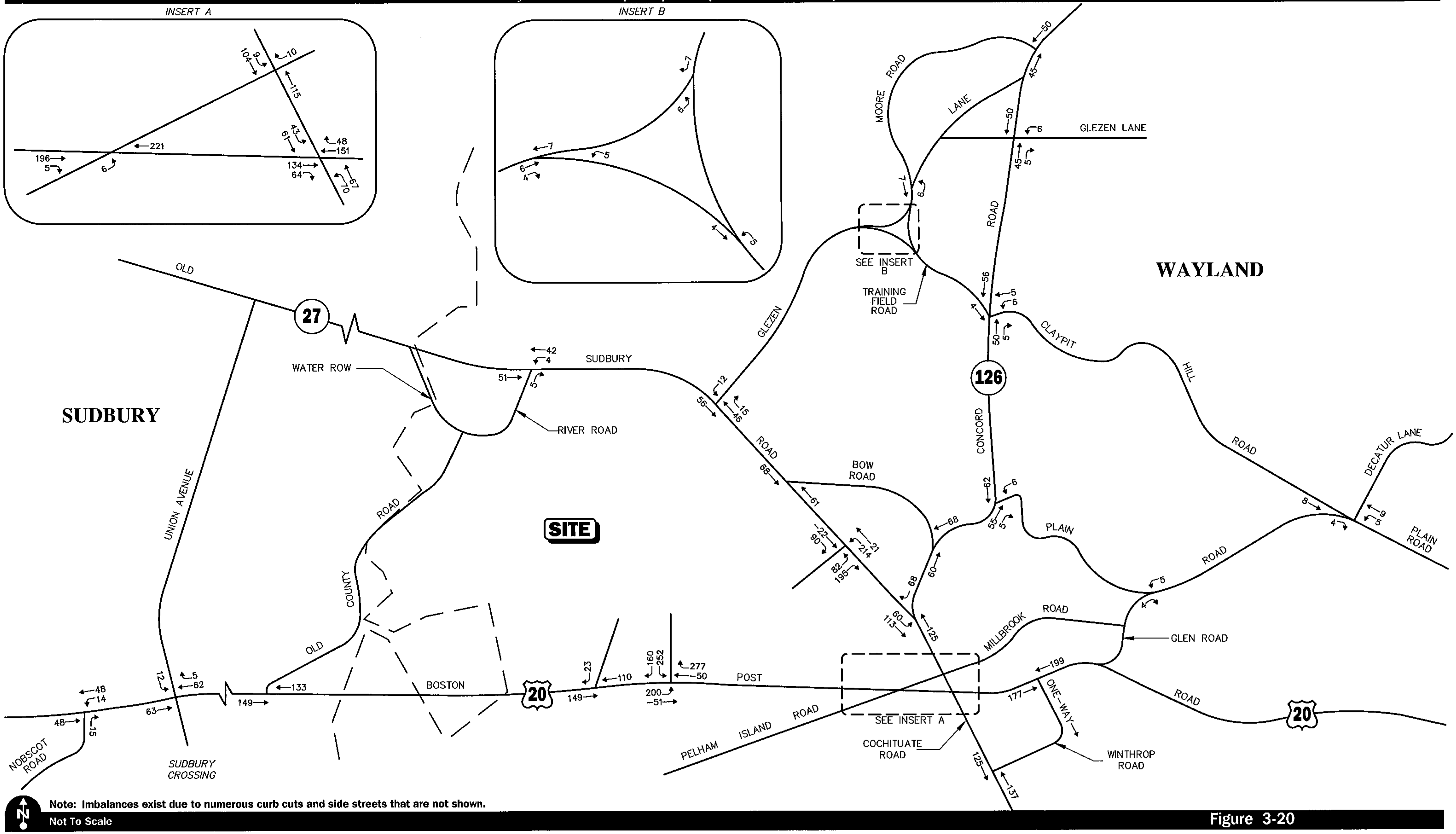
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Vanasse & Associates, Inc. Transportation Engineers & Planners

Figure 3-19

Site Generated Weekday Evening Peak Hour Traffic Volumes Access Alternative A



Vanasse & Associates, Inc
Transportation Engineers & Planners

Figure 3-20

Site Generated Saturday Midday Peak Hour Traffic Volumes Access Alternative A

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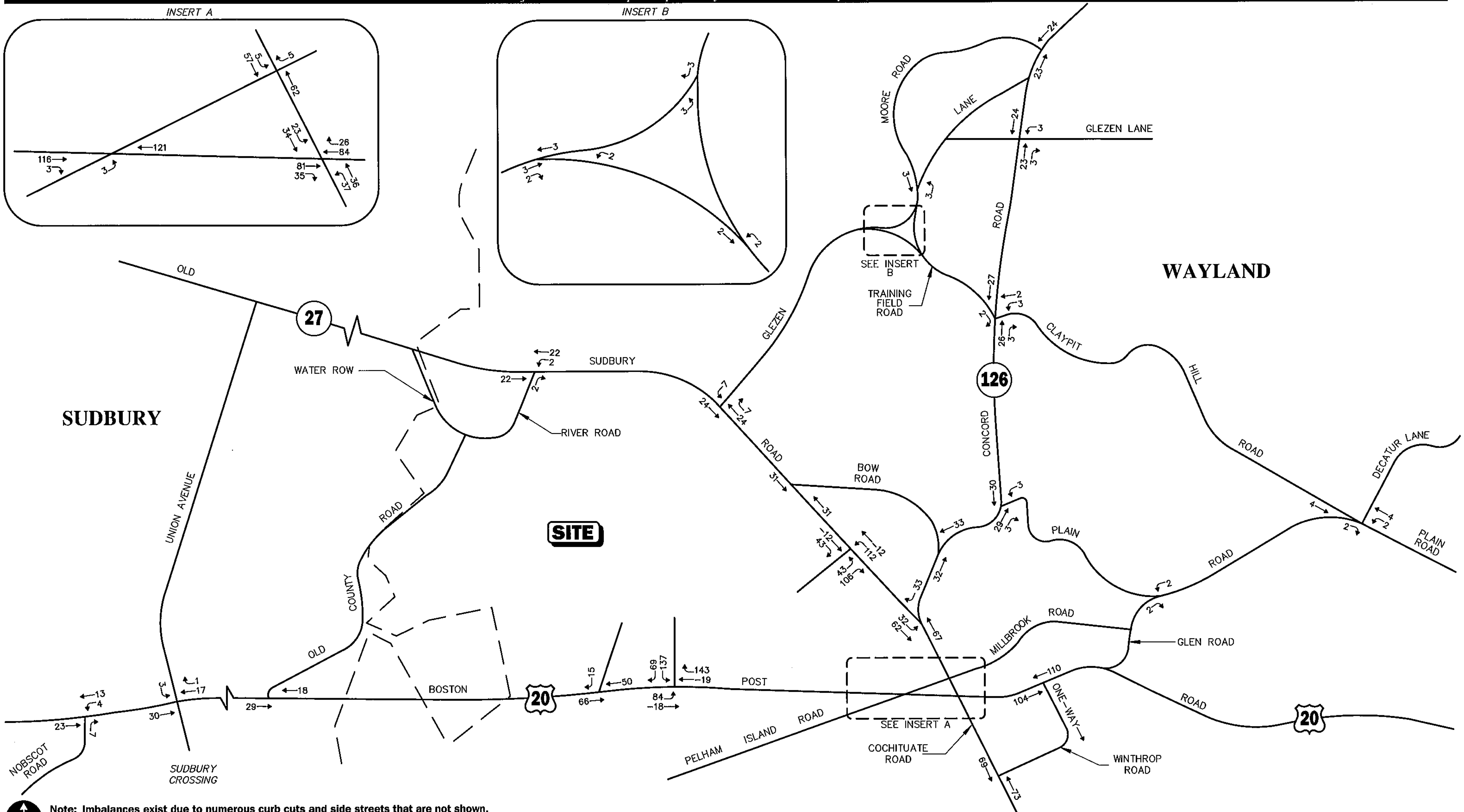

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Figure 3-21

Site Generated Sunday Midday Peak Hour Traffic Volumes Access Alternative A

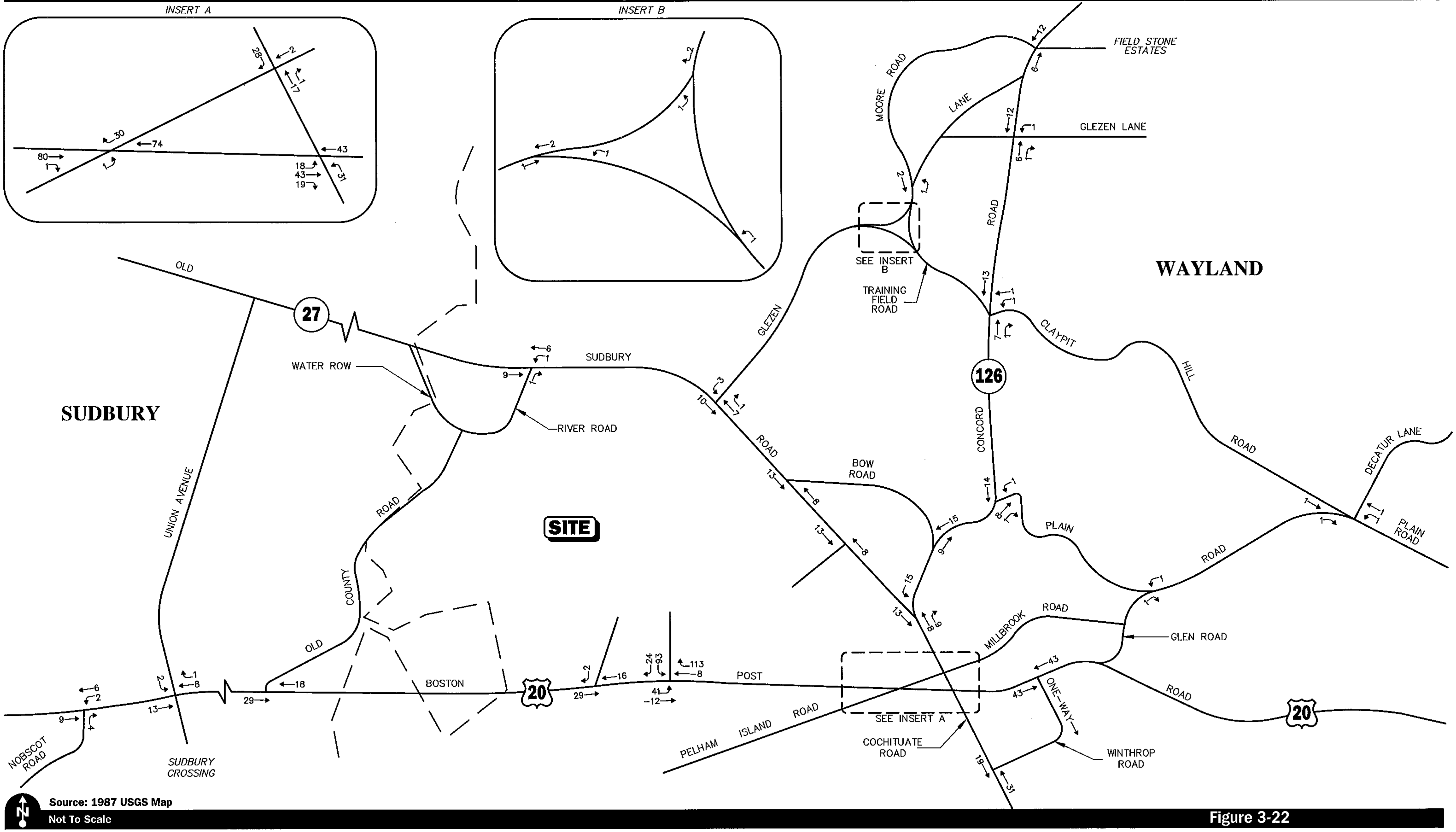

Figure 3-22

Site Generated Weekday Morning Peak Hour Traffic Volumes Access Alternative B

Vanasse & Associates, Inc. Transportation Engineers & Planners

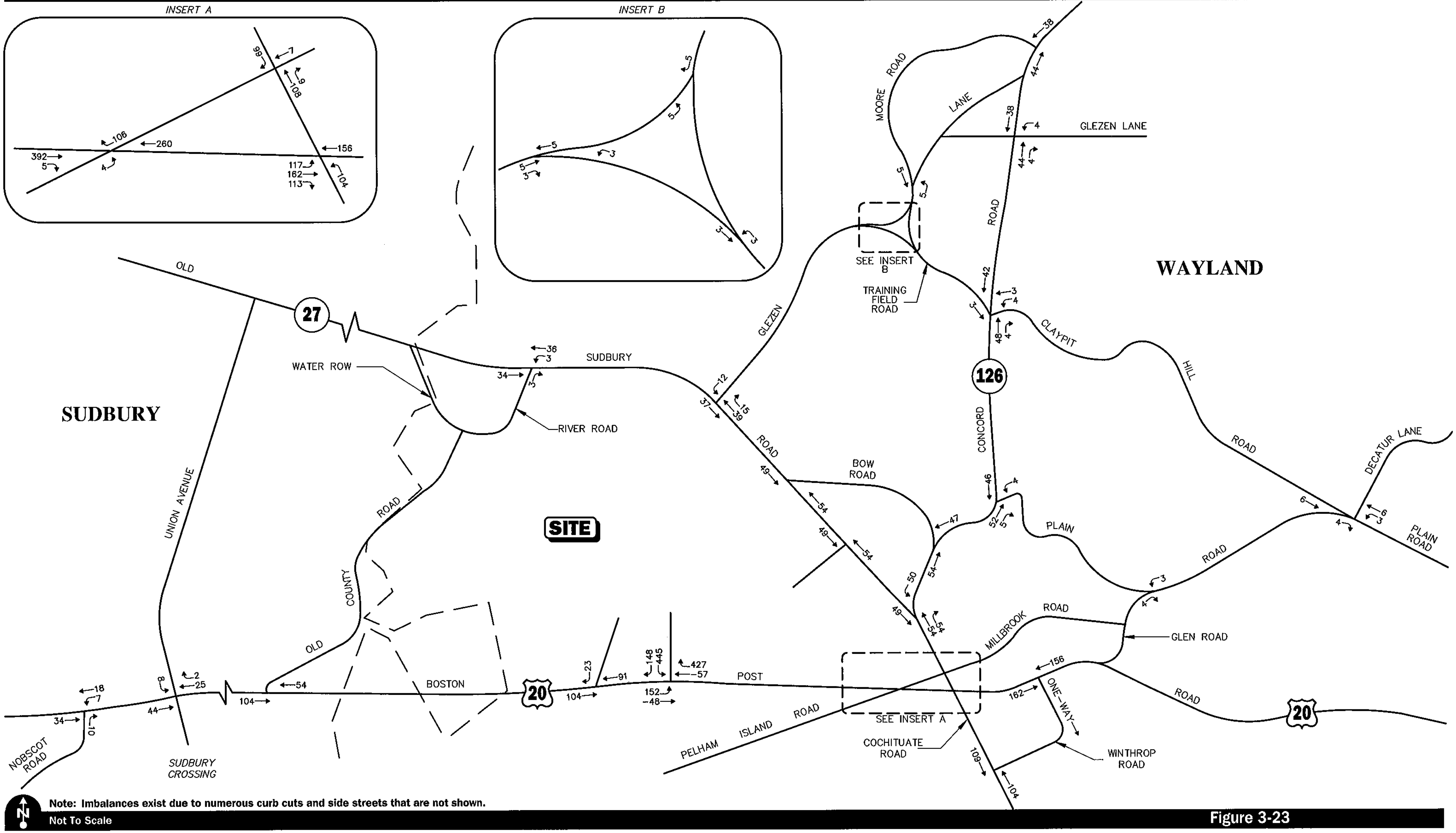

Figure 3-23

Site Generated Weekday Evening Peak Hour Traffic Volumes Access Alternative B

Vanasse & Associates, Inc. Transportation Engineers & Planners

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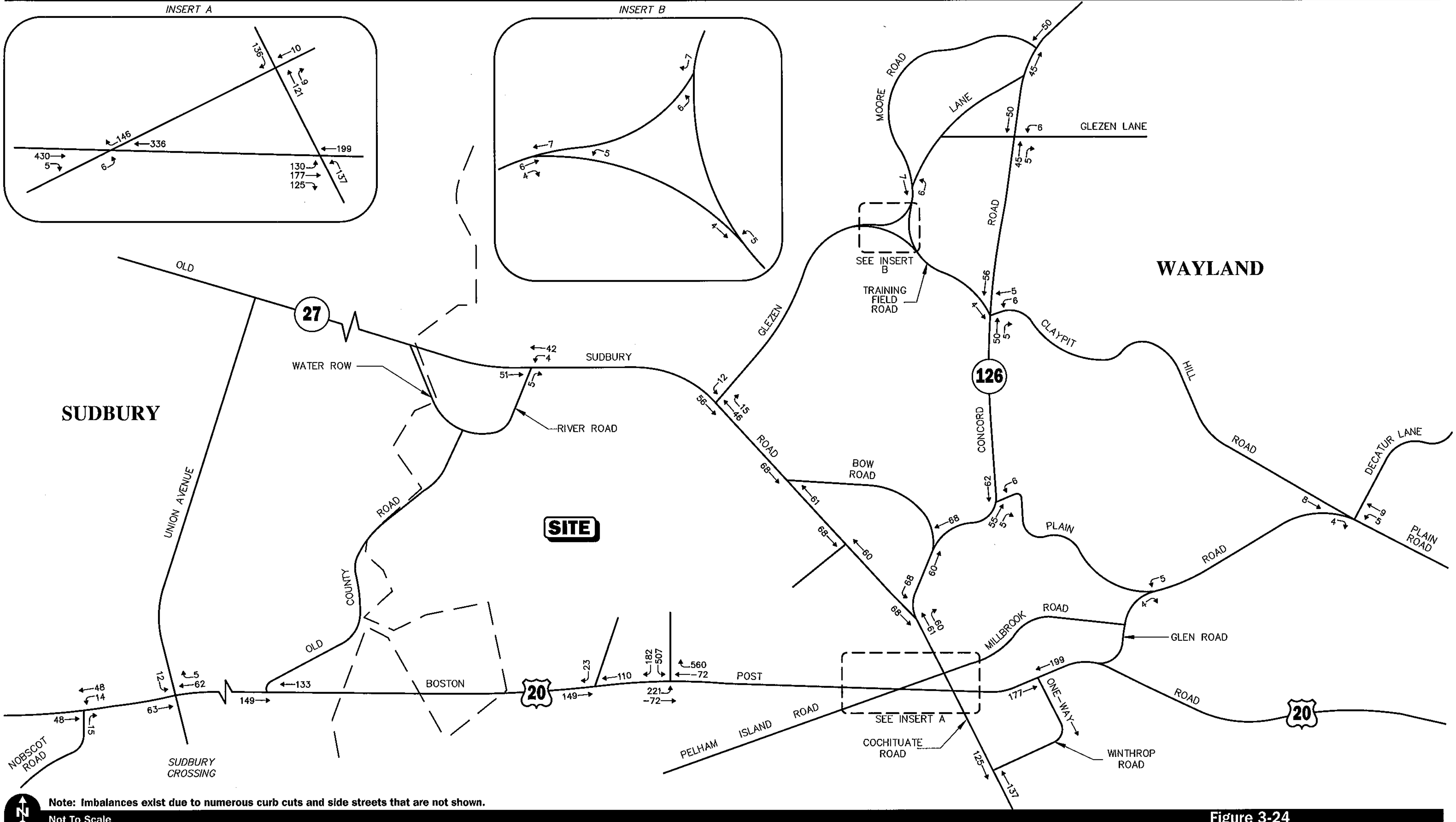

Figure 3-24

Site Generated Saturday Midday Peak Hour Traffic Volumes Access Alternative B

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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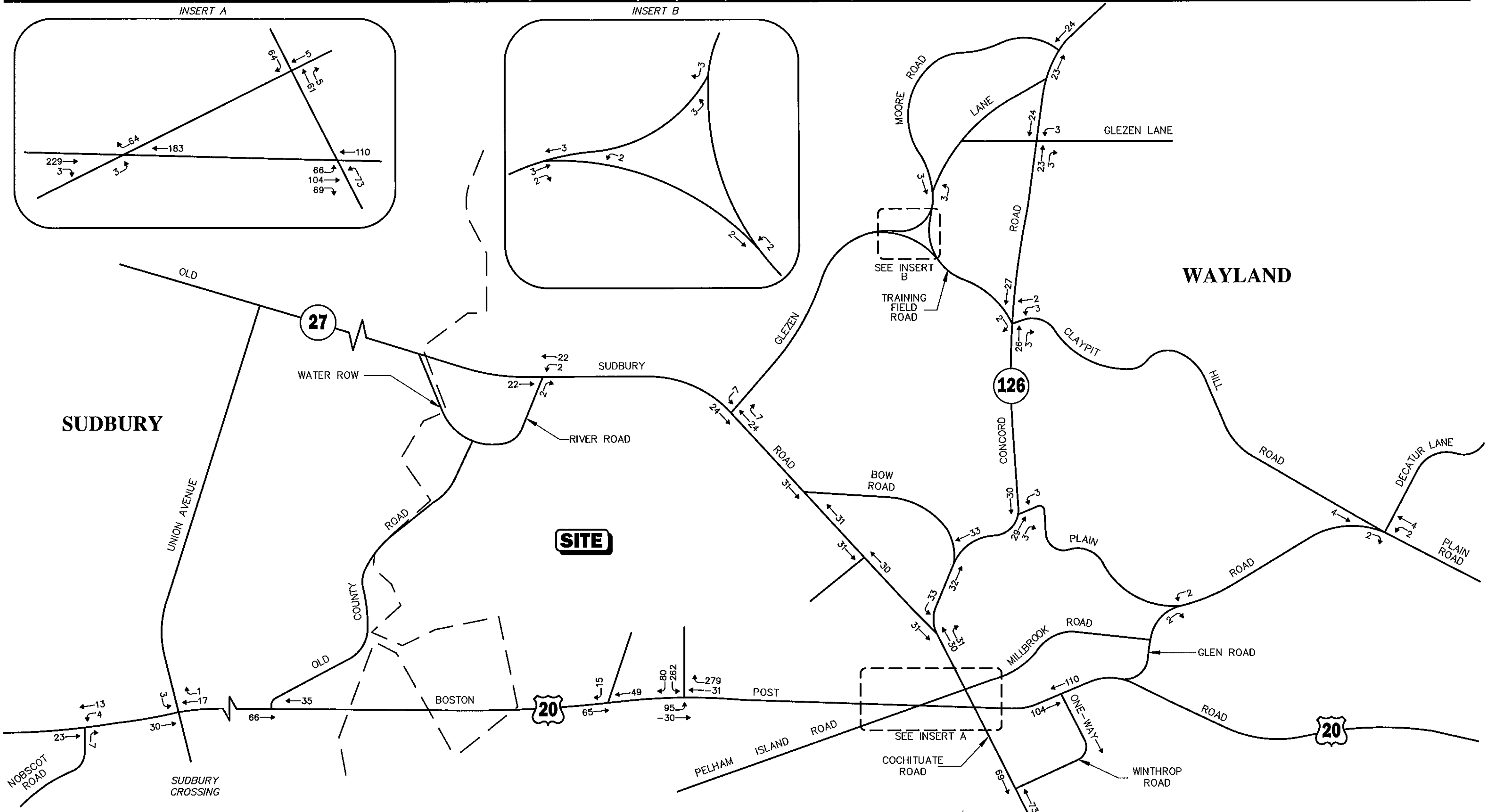

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Figure 3-25

**Site Generated
Sunday Midday
Peak Hour Traffic Volumes
Access Alternative B**

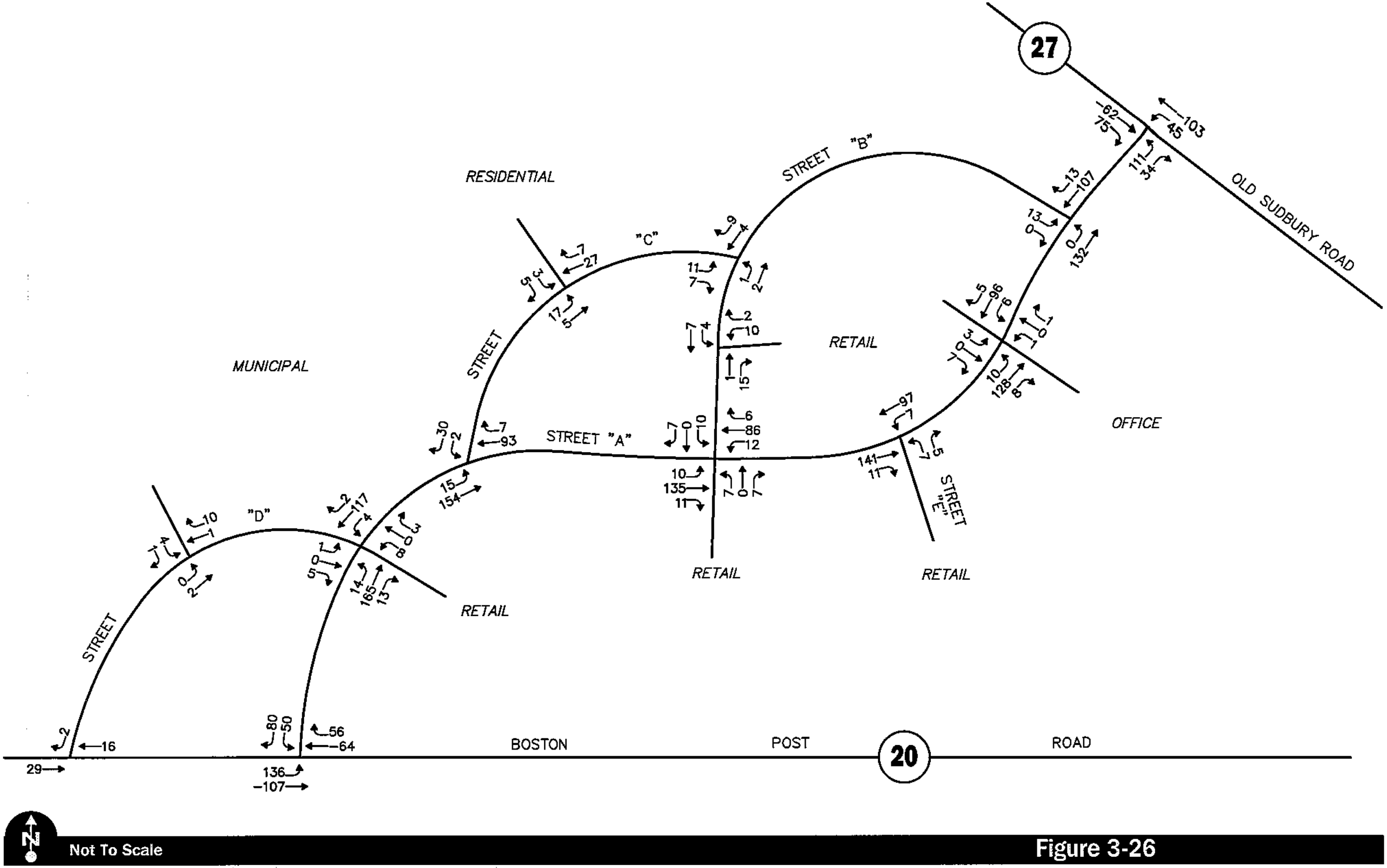

Figure 3-26

Internal Traffic Volumes
Weekday Morning
Peak Hour

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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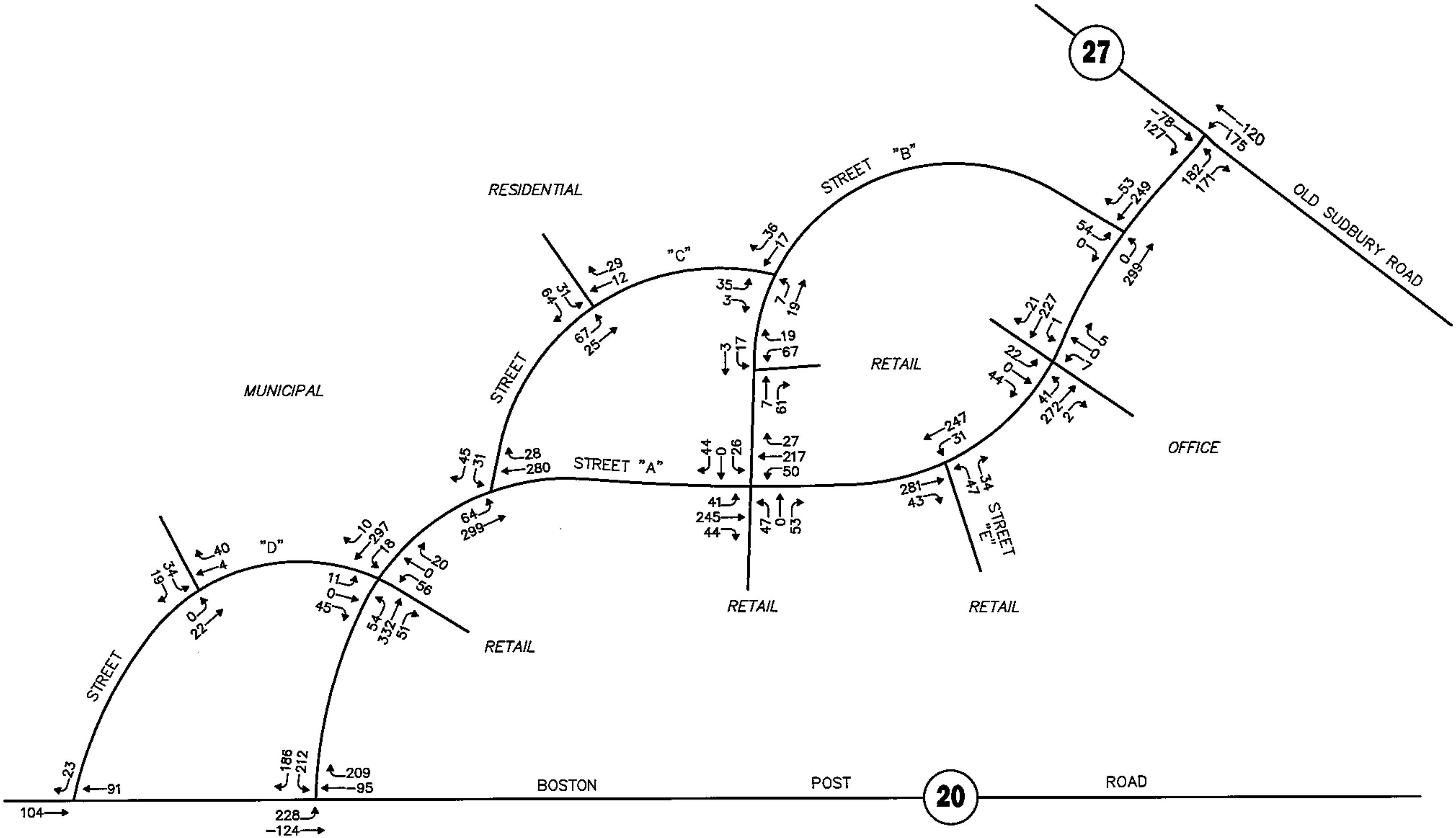

Not To Scale

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Figure 3-27

**Internal Traffic Volumes
Weekday Evening
Peak Hour**

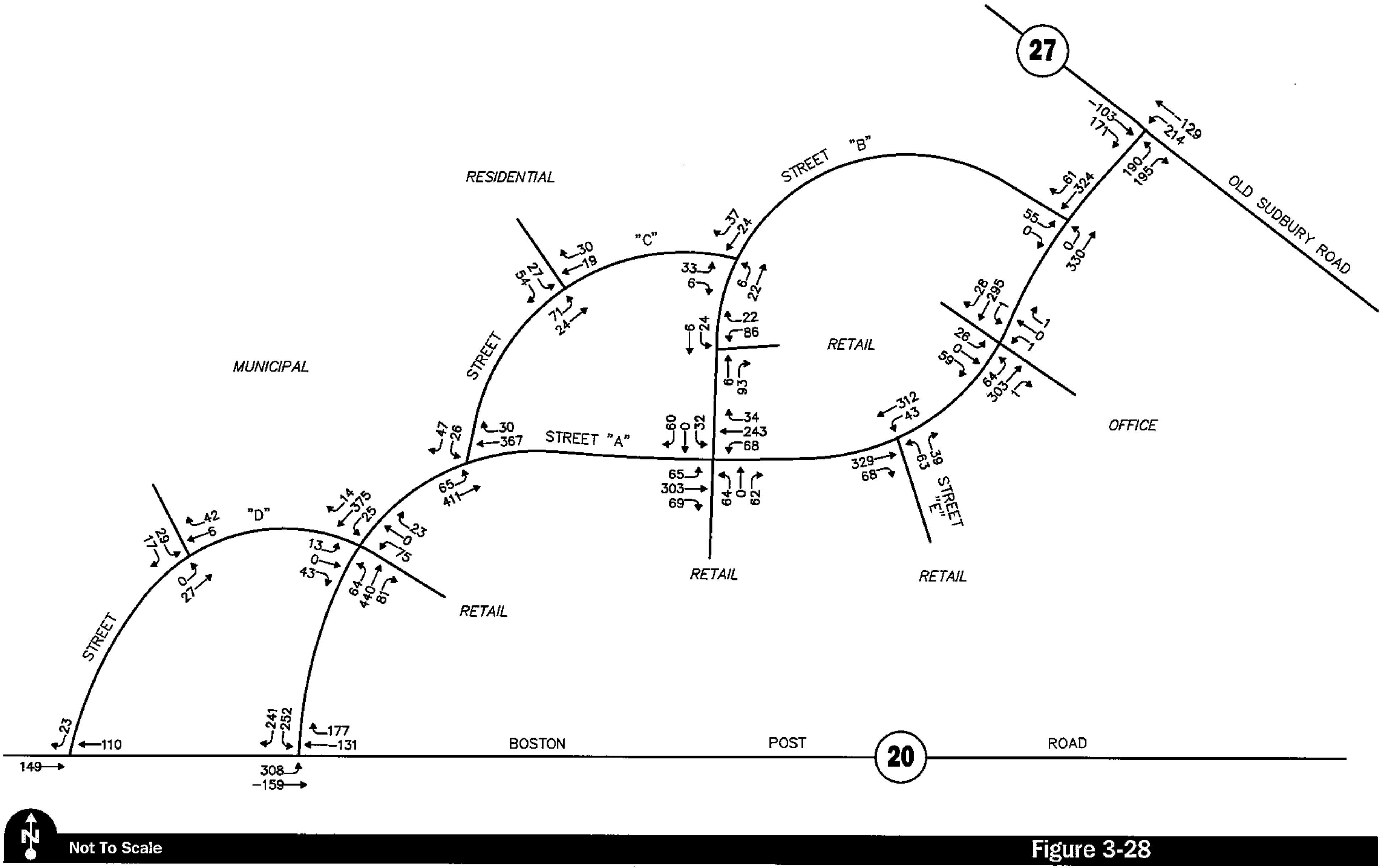

Figure 3-28

Internal Traffic Volumes
Saturday Midday
Peak Hour

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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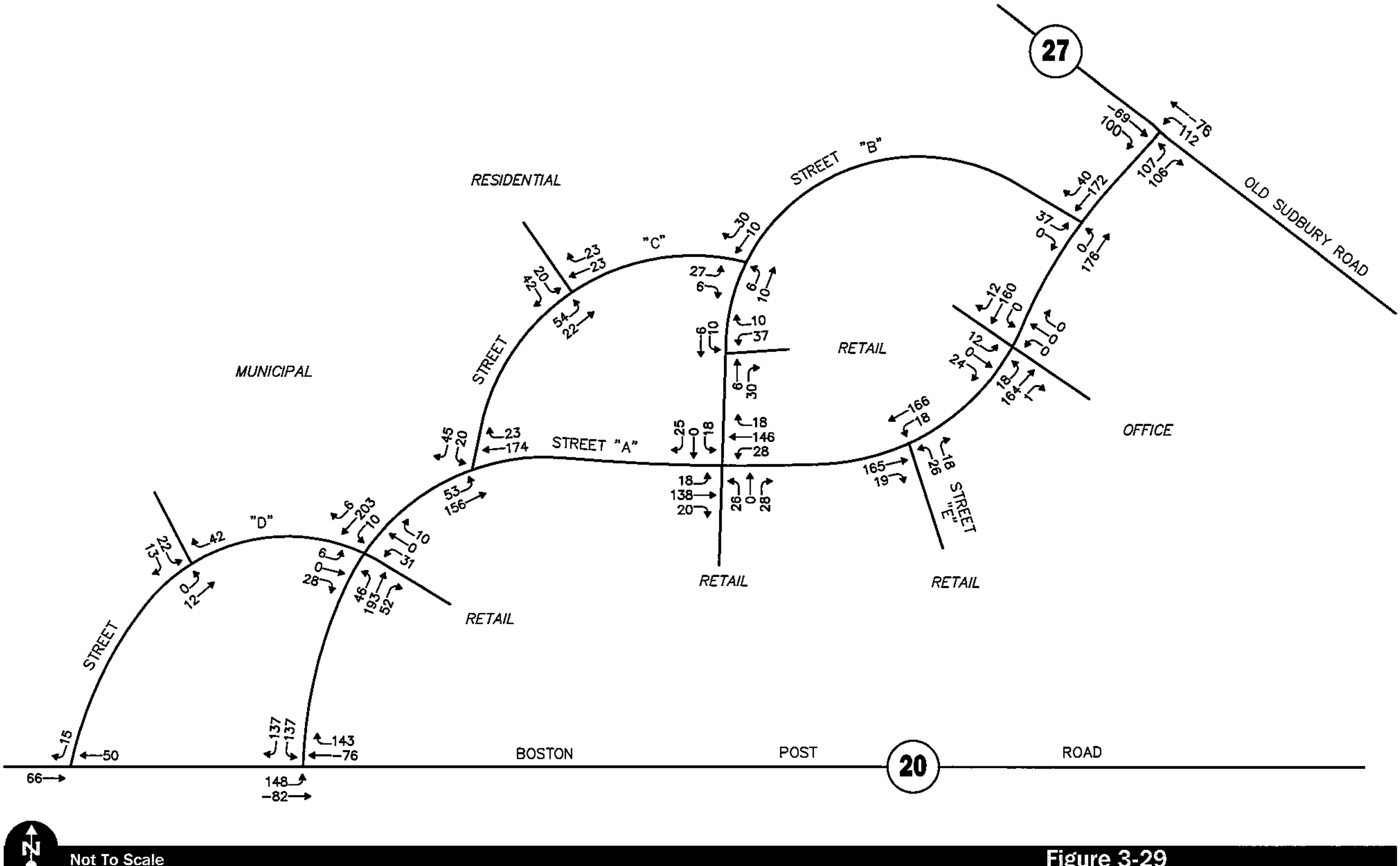

Figure 3-29

Internal Traffic Volumes
Sunday Midday
Peak Hour

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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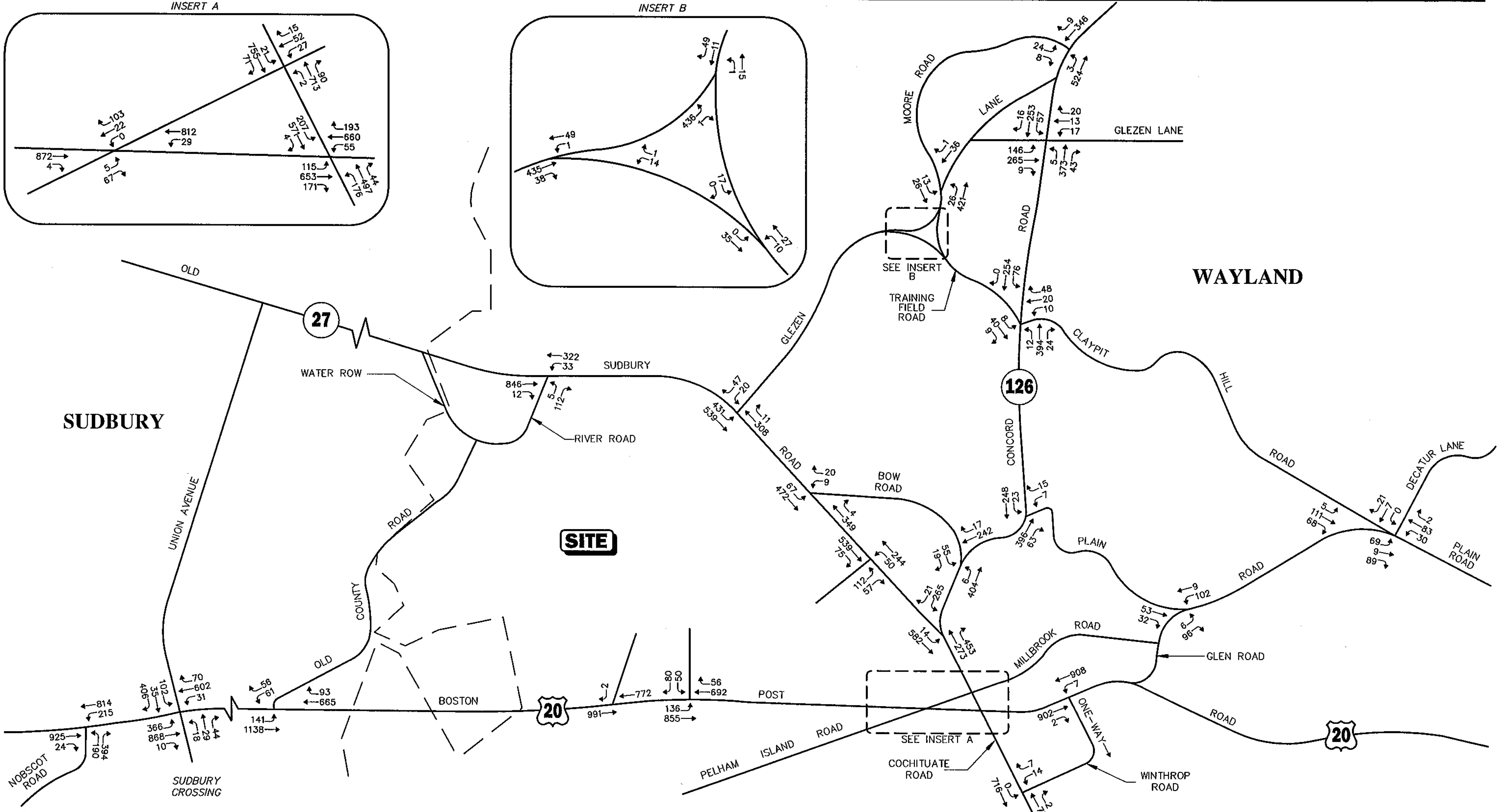
3.3.2.7 Future Traffic Volumes - Build Condition

The site-generated traffic presented in Table 3-9 has been distributed within the study area according to the percentages shown in Table 3-11. The site-generated weekday morning, weekday evening, Saturday midday and Sunday midday peak-hour traffic were then superimposed onto the 2011 No-Build traffic volumes to represent the 2011 Build traffic-volume conditions. The anticipated 2011 Build weekday morning, weekday evening, Saturday midday and Sunday midday peak-hour traffic-volume networks are graphically presented on Figures 3-30 through 3-33, respectively for Access Alternative A and on Figures 3-34 through 3-37 for Access Alternative B. These volumes were used as the basis for all analysis as well as to identify potential mitigation measures to ameliorate the project's impacts and/or anticipation of future operational deficiencies.

A summary of peak-hour projected traffic-volume changes in the site vicinity are shown in Table 3-15. These volumes are based on the expected increases from the site traffic generation.



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

Not To Scale

Figure 3-30

2011 Build
Weekday Morning
Peak Hour Traffic Volumes
Access Alternative A

Vanasse & Associates, Inc.
Transportation Engineers & Planners

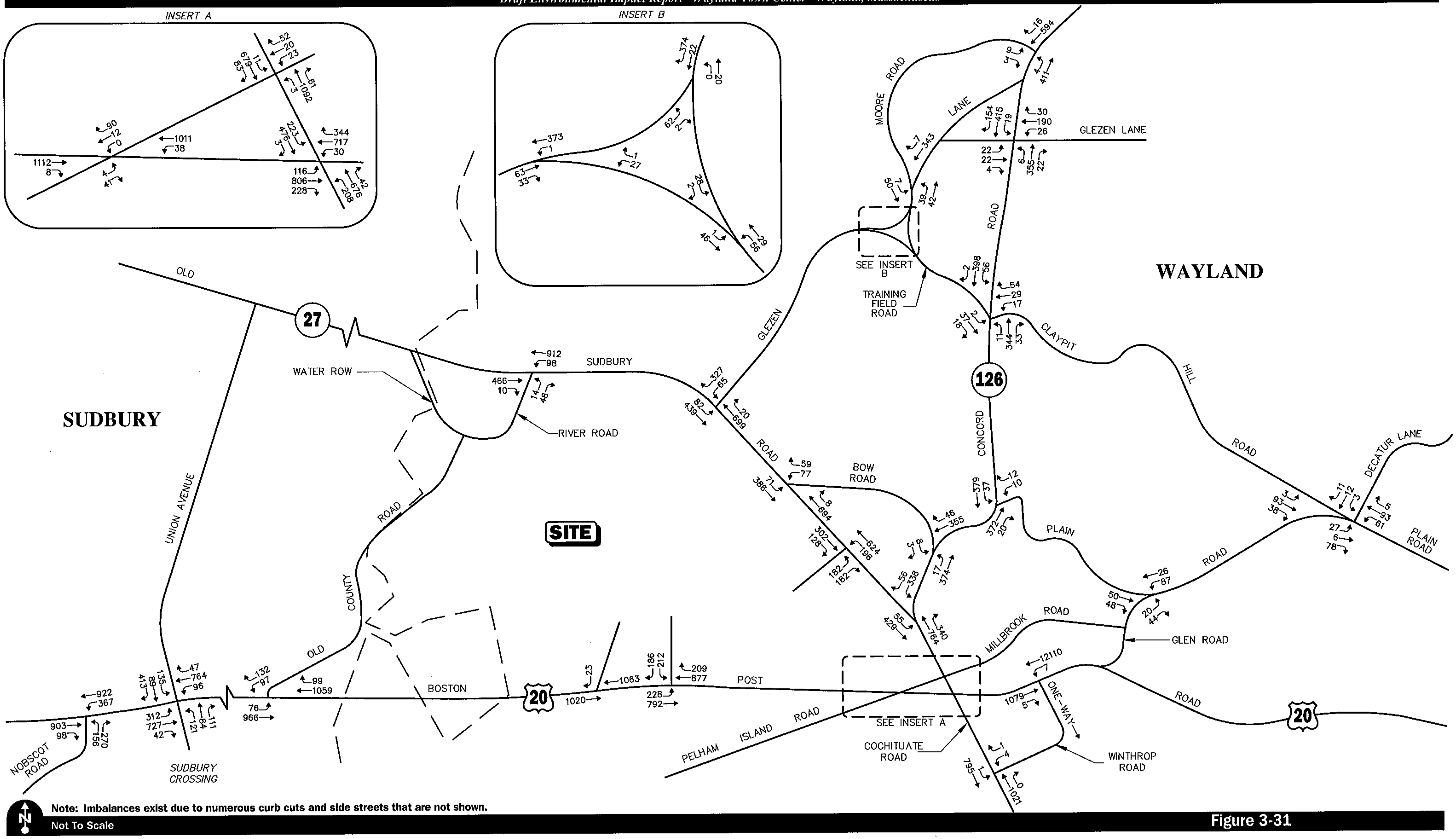


Figure 3-31

2011 Build
Weekday Evening
Peak Hour Traffic Volumes
Access Alternative A

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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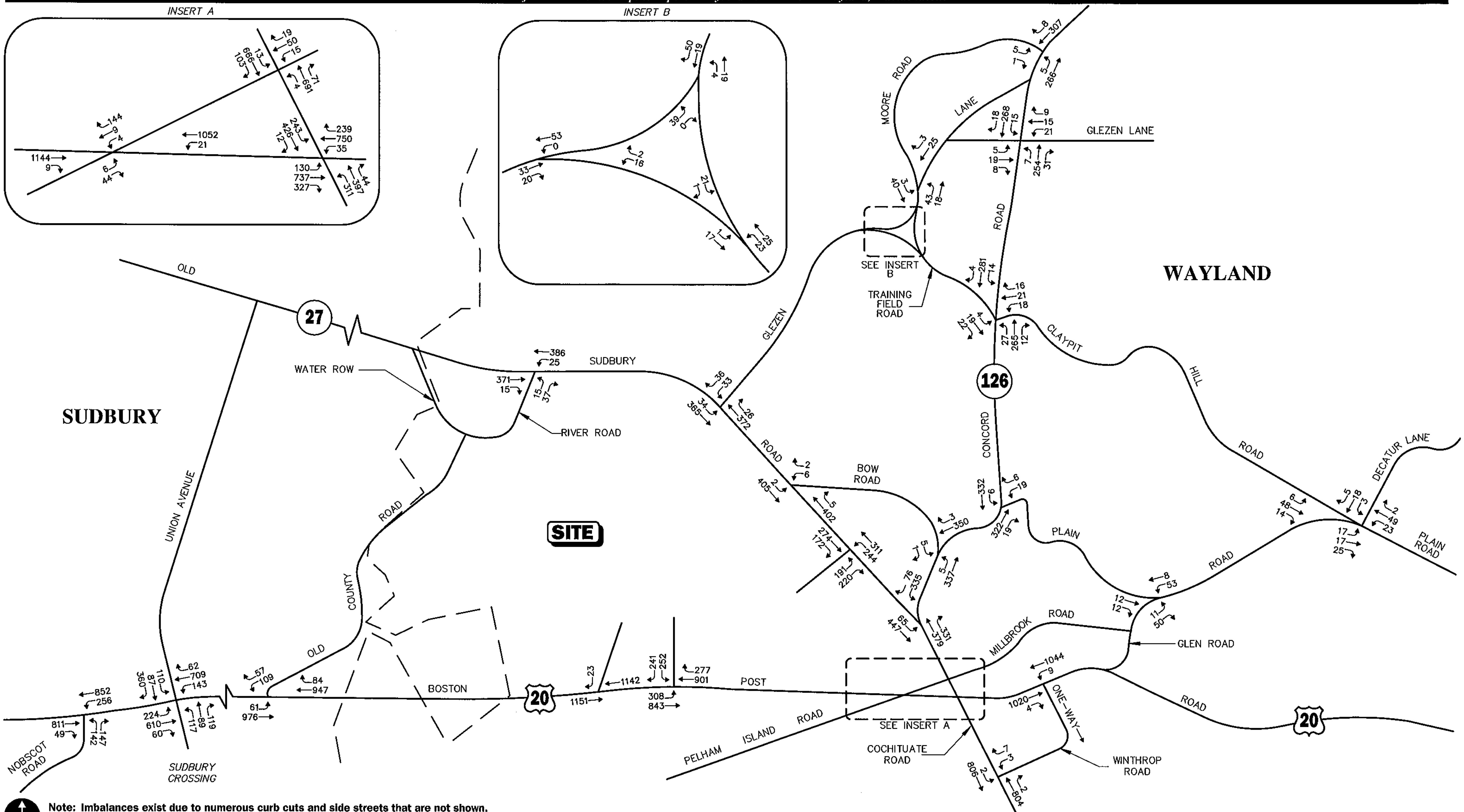

Figure 3-32

2011 Build
Saturday Midday
Peak Hour Traffic Volumes
Access Alternative A

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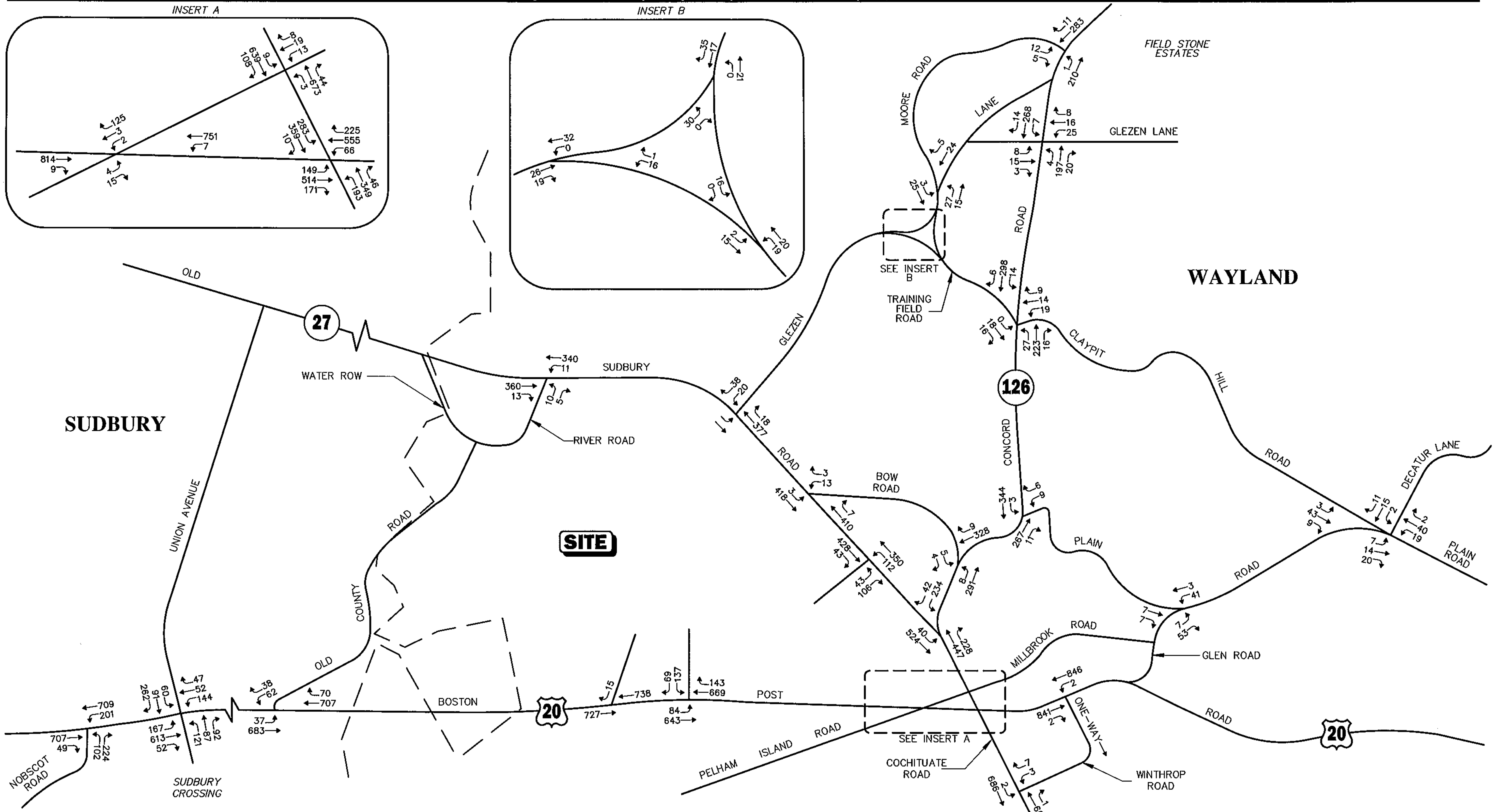
Transportation Engineers & Planners



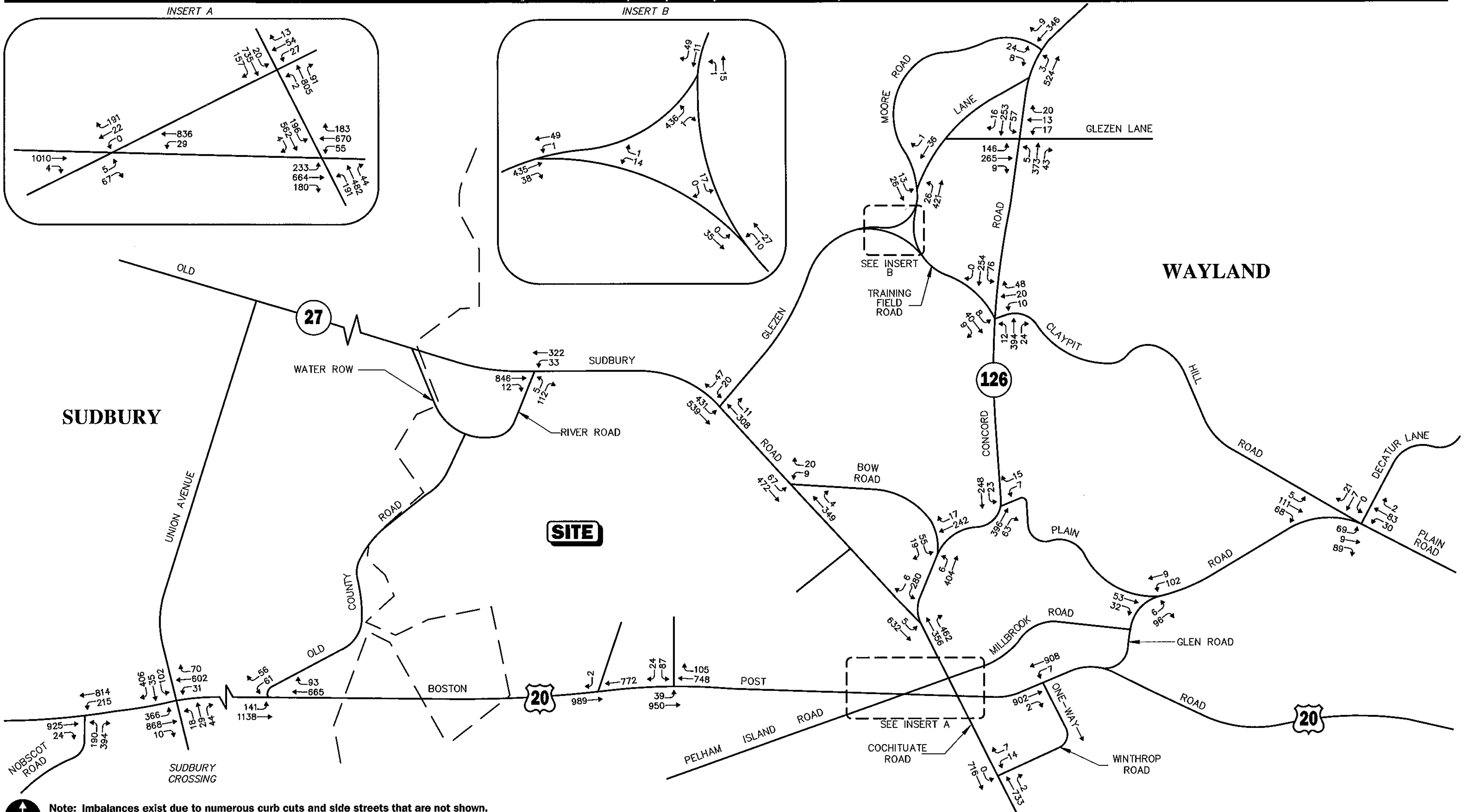
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 3-33

2011 Build
Sunday Midday
Peak Hour Traffic Volumes
Access Alternative A

Vanasse & Associates, Inc
Transportation Engineers & Planners



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

Not To Scale

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Figure 3-34

2011 Build
Weekday Morning
Peak Hour Traffic Volumes
Access Alternative B

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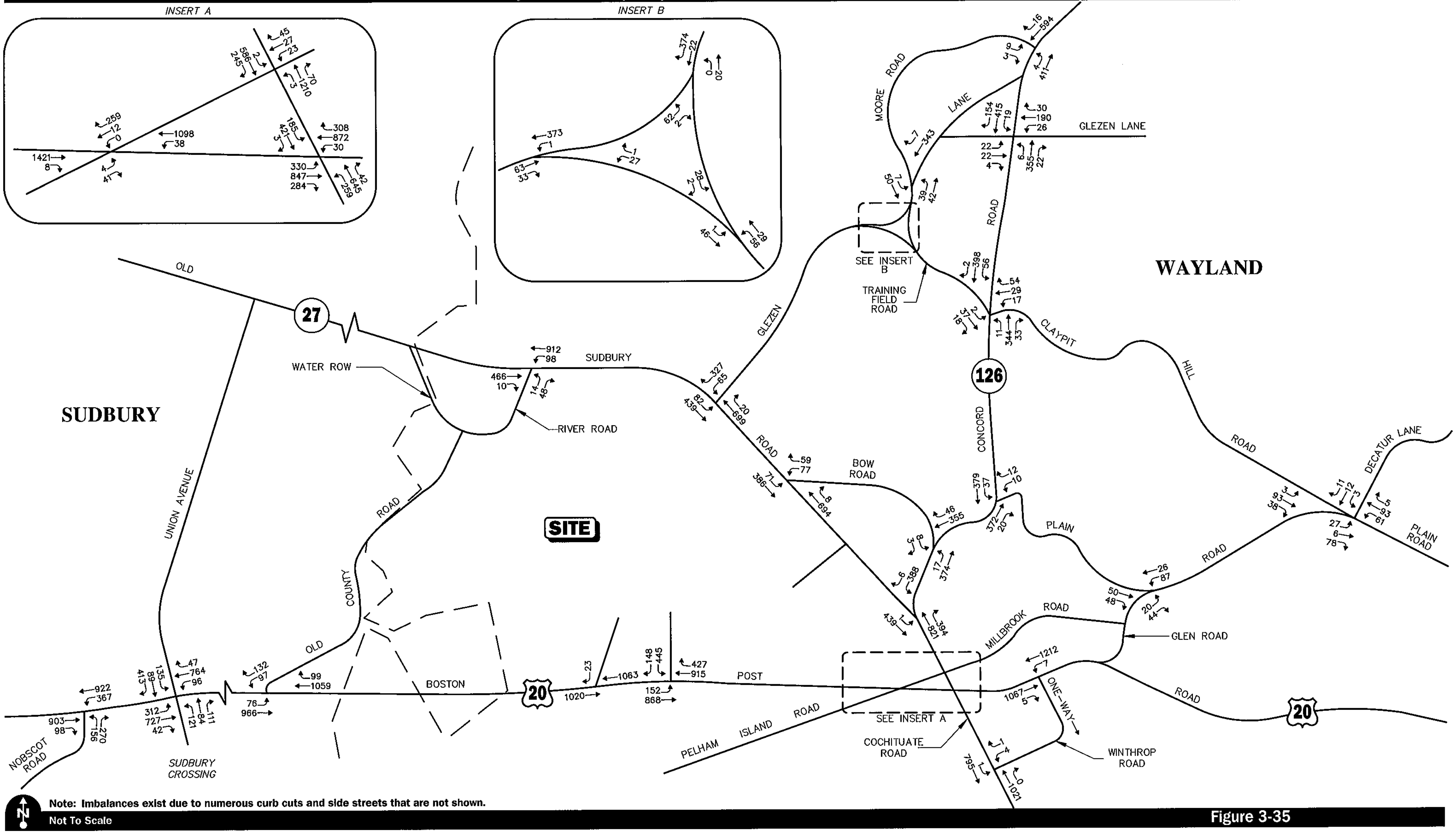

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Figure 3-35

2011 Build
Weekday Evening
Peak Hour Traffic Volumes
Access Alternative B

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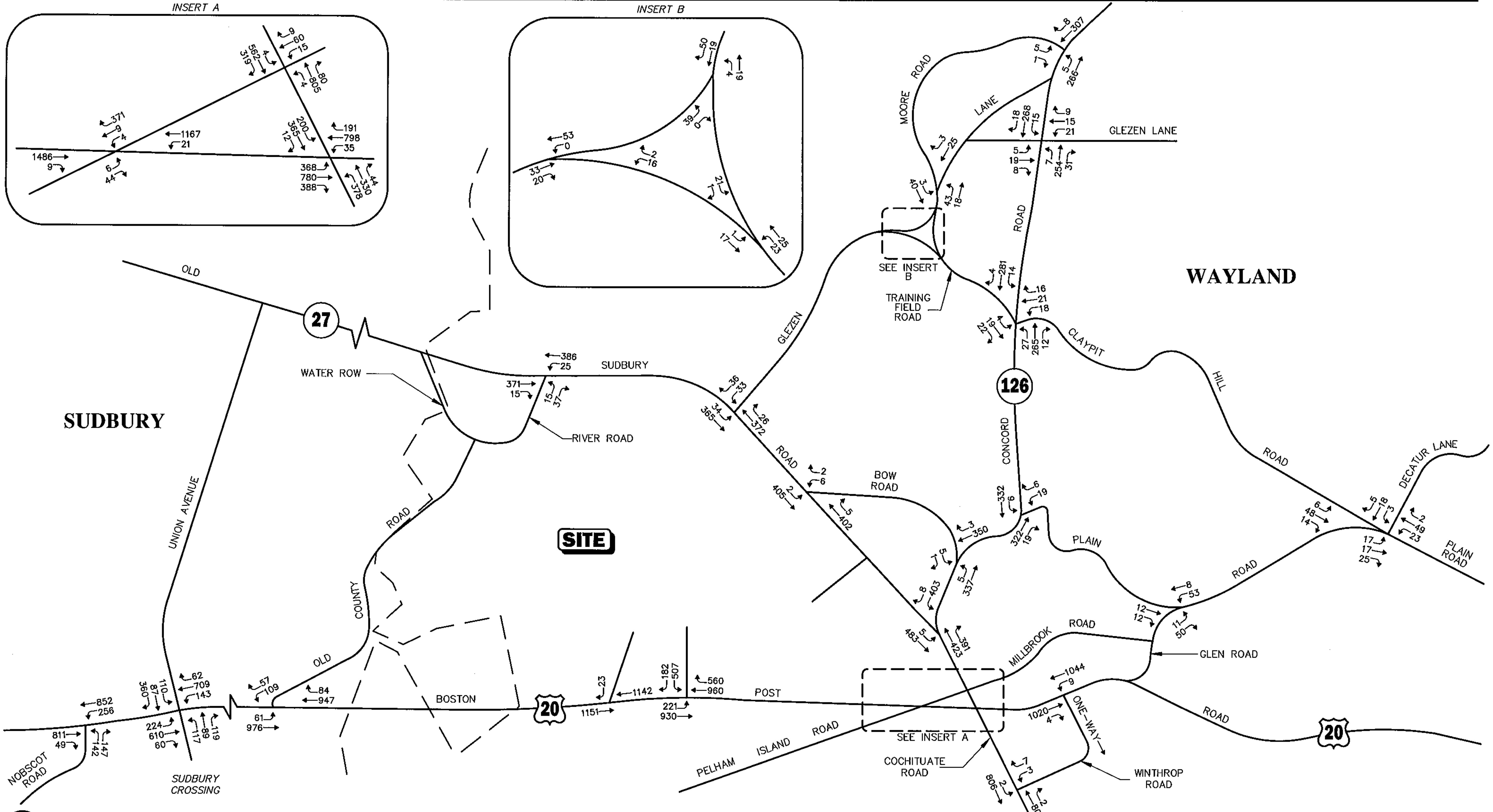

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

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Figure 3-36

2011 Build
Saturday Midday
Peak Hour Traffic Volumes
Access Alternative B

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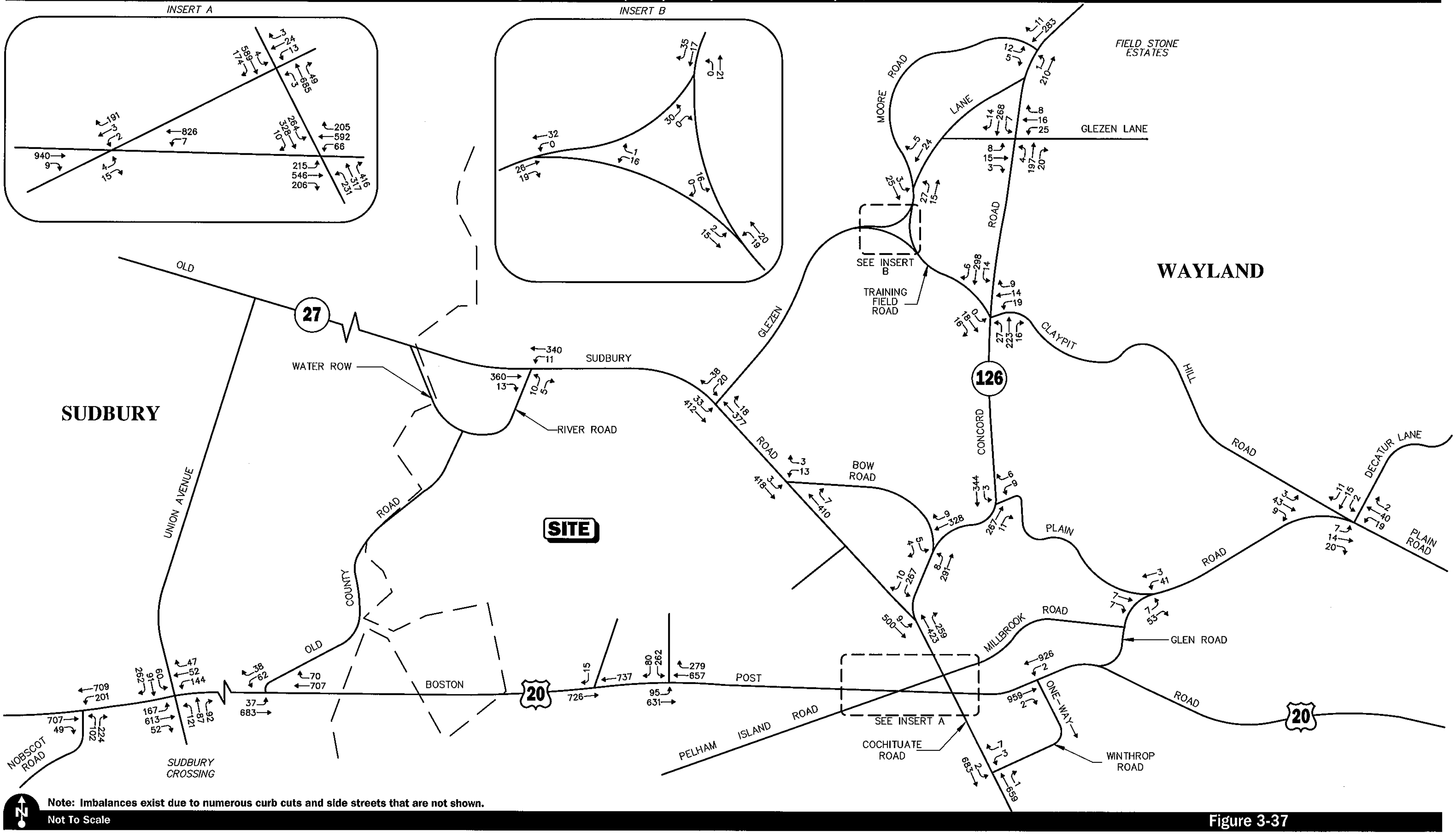

Figure 3-37

**2011 Build
Sunday Midday
Peak Hour Traffic Volumes
Access Alternative B**

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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Table 3-15 Traffic Volume Increases[a]

Location/Peak Hour	2011 No-Build	Access Alternative A 2011 Build	Access Alternative B 2011 Build	Access Alternative A Volume Increase Over No-Build	Access Alternative B Volume Increase Over No-Build
Route 20, west of Old County Road:					
Weekday Morning	2,030	2,000	2,000	-30	-30
Weekday Evening	2,156	2,233	2,233	17	17
Saturday Midday	1,783	2,041	2,041	258	258
Sunday Midday	1,371	1,465	1,465	94	94
Route 20, east of Glen Road:					
Weekday Morning	1,974	1,817	1,817	-157	-157
Weekday Evening	2,194	2,296	2,296	102	102
Saturday Midday	1,767	2,073	2,073	306	306
Sunday Midday	1,727	1,887	1,887	160	160
Route 27, south of Winthrop Road:					
Weekday Morning	1,574	1,465	1,465	-109	-109
Weekday Evening	1,756	1,820	1,820	64	64
Saturday Midday	1,401	1,615	1,615	214	214
Sunday Midday	1,220	1,346	1,346	126	126
Route 126, north of Moore Road:					
Weekday Morning	926	903	903	-23	-23
Weekday Evening	988	1,030	1,030	42	42
Saturday Midday	502	586	586	84	84
Sunday Midday	474	516	516	42	42
Millbrook Road, east of Route 27/126:					
Weekday Morning	208	205	205	-3	-3
Weekday Evening	157	167	167	10	10
Saturday Midday	151	168	168	17	17
Sunday Midday	93	93	93	0	0
Pelham Island Road, south of Route 20:					
Weekday Morning	131	127	127	-4	-4
Weekday Evening	99	103	103	4	4
Saturday Midday	80	89	89	9	9
Sunday Midday	32	38	38	6	6
Route 20, east of the site driveway:					
Weekday Morning	1,934	1,653	1,890	-281	-44
Weekday Evening	2,093	2,090	2,655	-3	562
Saturday Midday	2,041	2,273	2,957	232	913
Sunday Midday	1,377	1,592	1,829	215	452

[a]All volumes are vehicles per hour, total of both directions.

Table 3-15 (Continued) Traffic Volume Increases[a]

Location/Peak Hour	2011 No-Build	Access Alternative A 2011 Build	Access Alternative B 2011 Build	Access Alternative A Volume Increase Over No-Build	Access Alternative B Volume Increase Over No-Build
Route 20, west of the site driveway:					
Weekday Morning	1,795	1,763	1,763	-32	-32
Weekday Evening	1,969	2,083	2,106	114	137
Saturday Midday	2,037	2,293	2,316	256	279
Sunday Midday	1,362	1,480	1,478	118	116
Route 27, north of the site driveway:					
Weekday Morning	1,005	970	--	-35	--
Weekday Evening	1,186	1,236	--	50	--
Saturday Midday	766	948	--	182	--
Sunday Midday	812	864	--	52	--
Route 27, south of the site driveway:					
Weekday Morning	1,218	890	--	-328	--
Weekday Evening	1,381	1,304	--	-77	--
Saturday Midday	827	1,049	--	222	--
Sunday Midday	826	996	--	170	--
Route 27, west of River Road:					
Weekday Morning	1,206	1,185	1,206	-21	0
Weekday Evening	1,450	1,402	1,402	-48	-48
Saturday Midday	705	787	787	82	82
Sunday Midday	682	723	723	41	41

[a]All volumes are vehicles per hour, total of both directions.

3.4 Capacity 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.

3.4.1 Methodology

3.4.1.1 Levels of Service

A primary result of capacity analyses is the assignment of level-of-service to traffic facilities under various traffic-flow conditions[15]. 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 LOS A representing the best operating conditions and LOS F representing the worst.

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.

3.4.1.2 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 control delays resulting.

[15] The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual;* Transportation Research Board; Washington, DC; 2000.

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2000 Highway Capacity Manual[16]. 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 affects 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 2000 Highway Capacity Manual. Table 3-16 summarizes the relationship between level-of-service and average control delay.

Table 3-16 Level-of-Service Criteria For Unsignalized Intersections[a]

Level-of-Service	Average Control Delay (Seconds Per Vehicle)
A	$\leq$ 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	> 50.0

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000; page 17-2.

3.4.1.3 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.

[16] *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000.

- 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 are calculated using the operational analysis methodology of the 2000 Highway Capacity Manual. This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. Level-of-service designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. Table 3-17 summarizes the relationship between level-of-service and control delay. The tabulated control delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 3-17 Level-of-Service Criteria For Signalized Intersections[a]

Level-of-Service	Control (Signal) Delay Per Vehicle (Seconds)
A	$\leq$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

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000; page 16-2.

3.4.2 Analysis Results

Level-of-service analyses were conducted for 2006 Existing, 2011 No-Build, and 2011 Build conditions for the intersections within the study area. The results of the capacity analyses are summarized in Table 3-18 for Access Alternative A and in Table 3-19 for Access Alternative B. Table 3-20 summarizes the levels of service for the internal site intersections. Detailed analysis sheets are presented in the Appendix.

The following is a summary of level-of-service operation for all the study area locations. The capacity analysis results are summarized within this report and generally indicate no change in level of service. Several unsignalized intersections are projected to operate at a poor level of service; however this is believed to be a result of the conservative nature of the procedures and gap values identified in the Highway Capacity Manual (HCS). Unsignalized intersection capacity analyses often provide conservative analysis results resulting from conservative gap values used in the methodology when actual gap values are not available.

3.4.2.1 Route 27 at River Road

Under 2006 Existing conditions, the critical movements (left and right turns from River Road) currently operate at LOS C during the weekday morning peak hour, and at LOS B during the weekday evening, Saturday and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to operate at LOS D during the weekday morning peak hour, at LOS C during the weekday evening peak hour, and at LOS B during the Saturday and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to continue to operate at LOS D during the weekday morning peak hour, at LOS C during the weekday evening peak hour, and at LOS B during the Saturday and Sunday midday peak hours.

3.4.2.2 Route 27 at Glezen Lane

Under 2006 Existing conditions, the critical movements (left and right turns from Glezen Lane) currently operate at LOS F during the weekday morning and weekday evening peak hours, and at LOS B during the Saturday and Sunday midday peak hours. Based on the observed gaps and delay observations conducted, during the weekday morning peak hour, the critical movements out of Glezen Lane currently operate at LOS C (average delay of 16.1 seconds) and during the weekday evening peak hour, the critical movements out of Glezen Lane currently operate at LOS B (average delay of 14.9 seconds). This is significantly better than the HCM model indicates.

Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS F during the weekday morning and weekday evening peak hours, and at LOS B during the Saturday and Sunday midday peak hours. Utilizing the observed gaps and delay measurements, the HCM default value gaps were adjusted to reflect existing conditions. With this adjustment, under 2011 No-Build conditions, the critical movements are projected to operate at LOS C during the weekday morning peak hour and at LOS C during the weekday evening peak hour.

Table 3-18 Level-of-Service Summary – Access Alternative A

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 27 at River Road												
All movements from River Road:												
Weekday Morning	106	0.37	20.6	C	116	0.48	26.8	D	117	0.47	25.7	D
Weekday Evening	44	0.09	11.9	B	69	0.25	22.4	C	62	0.27	23.5	C
Saturday Midday	32	0.07	11.1	B	47	0.13	13.7	B	52	0.16	14.8	B
Sunday Midday	7	0.03	12.4	B	13	0.07	14.0	B	15	0.08	14.2	B
Route 27 at Glezen Lane												
All movements from Glezen Lane:												
Weekday Morning	61	0.54	50.5	F	74	1.03	171.8	F	67	0.70	76.1	F
Weekday Evening	361	1.16	133.3	F	382	1.41	237.4	F	392	1.56	303.3	F
Saturday Midday	54	0.16	13.0	B	59	0.19	14.1	B	69	0.27	17.2	C
Sunday Midday	48	0.11	12.7	B	52	0.13	13.5	B	58	0.17	15.0	C
Route 27 at Glezen Lane												
All movements from Glezen Lane:												
Weekday Morning	61	0.22	16.6	C	64	0.27	19.2	C	67	0.29	20.0	C
Weekday Evening	361	0.53	15.2	C	380	0.61	18.2	C	392	0.72	25.7	D
Route 27 at the Site Driveway												
Left turns from Site Driveway:												
Weekday Morning	--	--	--	--	--	--	--	--	112	0.47	30.9	D
Weekday Evening	--	--	--	--	--	--	--	--	182	1.83	474.3	F
Saturday Midday	--	--	--	--	--	--	--	--	191	1.31	233.2	F
Sunday Midday	--	--	--	--	--	--	--	--	149	0.46	23.5	C
Route 27 at Bow Road												
All movements from Bow Road:												
Weekday Morning	28	0.08	13.5	B	29	0.09	14.4	B	29	0.09	14.2	B
Weekday Evening	129	0.57	35.6	E	136	0.71	52.3	F	136	0.77	63.0	F
Saturday Midday	8	0.03	13.5	B	8	0.03	14.3	B	8	0.04	16.0	C
Sunday Midday	15	0.06	14.8	B	16	0.07	15.6	C	16	0.07	16.5	C
Route 27 at Bow Road												
All movements from Bow Road:												
Weekday Morning	28	0.15	23.2	C	29	0.16	24.0	C	29	0.17	24.4	C
Weekday Evening	129	0.30	15.3	C	136	0.35	17.2	C	136	0.41	20.4	C
Route 27 at Route 126												
All movements from Route 126:												
Weekday Morning	246	1.09	121.9	F	322	2.04	524.0	F	286	1.23	166.0	F
Weekday Evening	311	2.19	594.3	F	353	8.21	>999.9	F	394	6.41	>999.9	F
Saturday Midday	305	0.88	53.7	F	352	1.29	187.0	F	411	1.69	357.9	F
Sunday Midday	213	0.74	40.3	E	244	1.01	94.5	F	276	1.42	253.8	F

See notes at end of table.

Table 3-18 (Continued) Level-of-Service Summary – Access Alternative A

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 27/Route 126 at Pelham Island Road/ Millbrook Road												
All movements from Millbrook Road:												
Weekday Morning	86	3.34	>999.9	F	97	15.80	>999.9	F	94	4.74	>999.9	F
Weekday Evening	44	NC	>999.9	F	89	11.13	>999.9	F	95	5.82	>999.9	F
Saturday Midday	68	0.71	76.9	F	75	2.15	701.2	F	84	2.11	664.8	F
Sunday Midday	31	0.25	36.1	E	35	0.49	80.0	F	40	0.67	122.8	F
Route 27 at Winthrop Road												
All movements from Winthrop Road:												
Weekday Morning	20	0.16	25.9	D	21	0.25	40.1	E	21	0.21	33.6	D
Weekday Evening	5	0.11	33.6	D	5	0.17	51.5	F	5	0.19	57.4	F
Saturday Midday	10	0.07	18.9	C	10	0.09	23.1	C	10	0.12	29.7	D
Sunday Midday	10	0.05	15.0	B	10	0.06	16.7	C	10	0.07	18.6	C
Route 126 at Bow Road												
All movements from Bow Road:												
Weekday Morning	70	0.20	14.6	B	74	0.26	17.4	C	74	0.24	16.4	C
Weekday Evening	11	0.03	13.1	B	11	0.04	14.6	B	11	0.04	15.3	C
Saturday Midday	6	0.03	12.5	B	6	0.04	13.5	B	6	0.04	15.2	C
Sunday Midday	9	0.03	11.4	B	9	0.03	11.9	B	9	0.03	12.5	B
Route 126 at Plain Road												
All movements from Plain Road:												
Weekday Morning	20	0.06	12.6	B	26	0.09	14.6	B	22	0.07	13.5	B
Weekday Evening	17	0.04	12.0	B	19	0.06	13.3	B	22	0.08	14.5	B
Saturday Midday	18	0.04	12.0	B	20	0.06	13.1	B	25	0.09	15.1	C
Sunday Midday	12	0.03	11.2	B	12	0.03	11.7	B	15	0.04	12.7	B
Route 126 at Claypit Hill Road and Training Field Road												
All movements from Training Field Road:												
Weekday Morning	55	0.47	29.7	D	57	0.61	44.8	E	57	0.58	40.7	E
Weekday Evening	51	0.16	17.5	C	54	0.21	20.7	C	57	0.24	22.7	C
Saturday Midday	41	0.11	13.4	B	45	0.14	15.0	B	55	0.21	18.5	C
Sunday Midday	35	0.13	13.5	B	36	0.15	14.7	B	42	0.18	16.2	C
Route 126 at Glezen Lane												
All movements from Glezen Lane:												
Weekday Morning	46	NC	>999.9	F	54	NC	>999.9	F	50	NC	>999.9	F
Weekday Evening	231	0.88	64.1	F	243	1.10	129.4	F	246	1.19	162.1	F
Saturday Midday	37	0.12	13.3	B	40	0.15	14.8	B	45	0.20	17.2	C
Sunday Midday	44	0.11	12.7	B	46	0.12	13.7	B	49	0.14	14.6	B

See notes at end of table.

Table 3-18 (Continued) Level-of-Service Summary – Access Alternative A

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 126 at Glezen Lane												
All movements from Glezen Lane:												
Weekday Morning	46	0.25	24.0	C	49	0.32	30.1	D	50	0.35	33.0	D
Weekday Evening	231	0.74	39.5	E	242	0.87	61.1	F	246	1.02	100.0	F
Route 126 at Moore Road												
All movements from Moore Road:												
Weekday Morning	31	0.15	17.4	C	32	0.18	20.4	C	32	0.17	19.6	C
Weekday Evening	12	0.05	16.1	C	12	0.05	18.0	C	12	0.06	18.9	C
Saturday Midday	6	0.01	11.4	B	6	0.02	12.2	B	6	0.02	13.2	B
Sunday Midday	16	0.04	11.1	B	17	0.05	11.7	B	17	0.05	12.1	B
Glezen Lane at Moore Road												
All movements from Moore Road:												
Weekday Morning	35	0.09	11.0	B	37	0.10	11.3	B	37	0.10	11.2	B
Weekday Evening	333	0.67	17.5	C	344	0.72	19.5	C	350	0.73	19.9	C
Saturday Midday	27	0.05	9.2	A	28	0.05	9.3	A	28	0.05	9.3	A
Sunday Midday	28	0.05	9.0	A	29	0.05	9.0	A	29	0.05	9.1	A
Glezen Lane at Training Field Road												
All movements from Glezen Lane:												
Weekday Morning	449	0.58	12.4	B	471	0.61	13.2	B	473	0.62	13.3	B
Weekday Evening	351	0.42	10.0	A	371	0.64	14.3	B	374	0.45	10.4	B
Saturday Midday	44	0.07	7.3	A	48	0.08	7.4	A	53	0.08	7.4	A
Sunday Midday	14	0.02	7.3	A	15	0.15	7.4	A	17	0.03	7.4	A
Training Field Road at Glezen Lane south												
All movements from Glezen Lane:												
Weekday Morning	33	0.06	8.6	A	35	0.06	8.7	A	35	0.06	8.7	A
Weekday Evening	42	0.10	8.9	A	44	0.10	8.9	A	47	0.11	8.9	A
Saturday Midday	13	0.03	8.6	A	14	0.03	8.6	A	18	0.04	8.6	A
Sunday Midday	14	0.02	8.5	A	15	0.02	8.5	A	17	0.02	8.6	A
Glezen Lane at Training Field Road												
All movements from Glezen Lane:												
Weekday Morning	415	0.51	12.9	B	437	0.55	13.6	B	437	0.55	13.5	B
Weekday Evening	56	0.08	10.2	B	68	0.13	11.7	B	64	0.09	10.4	B
Saturday Midday	31	0.04	9.1	A	36	0.05	9.2	A	39	0.04	9.2	A
Sunday Midday	26	0.04	9.0	A	28	0.04	9.1	A	30	0.05	9.1	A

See notes at end of table.

Table 3-18 (Continued) Level-of-Service Summary – Access Alternative A

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Plain Road at Claypit Hill Road												
All movements from Plain Road:												
Weekday Morning	159	0.42	15.9	C	166	0.45	16.8	C	167	0.46	17.0	C
Weekday Evening	24	0.06	11.1	B	26	0.06	11.3	B	26	0.07	11.5	B
Saturday Midday	25	0.05	10.0	A	26	0.05	10.1	B	26	0.05	10.3	B
Sunday Midday	26	0.04	9.5	A	28	0.05	9.6	A	28	0.05	9.7	A
Plain Road at Glen Road												
All movements from Glen Road:												
Weekday Morning	96	0.16	9.8	A	101	0.17	9.9	A	102	0.18	9.9	A
Weekday Evening	57	0.10	9.8	A	60	0.11	9.9	A	64	0.11	9.9	A
Saturday Midday	54	0.07	8.9	A	57	0.08	8.9	A	61	0.08	8.9	A
Sunday Midday	56	0.06	8.7	A	58	0.06	8.7	A	60	0.07	8.7	A
Route 20 at Winthrop Road												
All westbound movements from Route 20:												
Weekday Morning	795	0.01	0.3	A	1,083	0.01	0.6	A	915	0.01	0.4	A
Weekday Evening	944	0.01	0.3	A	1,100	0.01	0.5	A	1,217	0.01	0.5	A
Saturday Midday	712	0.01	0.3	A	892	0.01	0.4	A	1,053	0.02	0.6	A
Sunday Midday	616	0.00	0.1	A	755	0.00	0.1	A	848	0.00	0.1	A
Route 20 at Pelham Island Road												
All movements from Pelham Island Road:												
Weekday Morning	160	1.57	355.1	F	184	1.55	336.8	F	125	0.72	58.7	F
Weekday Evening	138	1.78	472.6	F	165	0.96	104.2	F	102	0.87	109.4	F
Saturday Midday	202	NC	>999.9	F	239	2.54	789.2	F	157	4.46	>999.9	F
Sunday Midday	106	0.43	21.8	C	132	0.43	24.1	C	130	0.61	42.5	E
Route 20 at Pelham Island Road (South)												
All westbound movements from Pelham Island Road:												
Weekday Morning	--	--	--	--	76	2.56	926.2	F	72	0.75	88.6	F
Weekday Evening	--	--	--	--	42	0.58	74.8	F	45	1.68	547.5	F
Saturday Midday	--	--	--	--	45	0.11	243.5	F	50	10.92	>999.9	F
Sunday Midday	--	--	--	--	16	0.06	19.2	C	19	0.26	66.3	F
Route 20 at Old County Road												
All movements from Old County Road:												
Weekday Morning	63	0.55	55.9	F	117	2.54	848.2	F	117	2.43	796.1	F
Weekday Evening	116	0.88	98.8	F	229	4.49	>999.9	F	229	4.93	>999.9	F
Saturday Midday	53	0.44	40.5	E	166	2.74	889.2	F	166	4.06	>999.9	F
Sunday Midday	34	0.11	17.6	C	100	0.67	64.0	F	100	0.76	85.9	F

[a]Demand (in vehicles per hour) for the critical movements.
[b]Volume-to-capacity ratio.
[c]Average control delay per vehicle (in seconds) for the critical movements. As the v/c ratio approaches 1.00, the calculated delay is not representative of actual conditions.
[d]Level-of-service. NC = Not calculated

Table 3-18 (Continued) Level-of-Service Summary – Access Alternative A

Signalized Intersection/Peak Hour	2006 Existing			2011 No-Build			2011 Build		
	V/C[a]	Delay[b]	LOS[c]	V/C	Delay	LOS	V/C	Delay	LOS
Route 20 at Route 27/Route 126									
Weekday Morning	0.97	38.8	D	1.13	101.2	F	0.94	80.5	F
Weekday Evening	1.48	71.2	E	1.22	129.3	F	1.16	118.0	F
Saturday Midday	0.81	26.4	C	0.99	64.0	E	1.12	105.1	F
Sunday Midday	0.80	24.9	C	0.81	39.8	D	0.91	48.8	D
Route 20 at Union Avenue									
Weekday Morning	0.79	29.2	C	0.86	34.0	C	0.87	34.7	C
Weekday Evening	0.96	38.1	D	1.07	54.7	D	1.11	60.4	E
Saturday Midday	0.79	24.6	C	0.89	31.6	C	0.96	40.2	D
Sunday Midday	0.59	17.7	B	0.64	19.2	B	0.65	19.6	B
Route 20 at Nobscot Road									
Weekday Morning	0.74	20.3	C	0.85	24.8	C	0.87	25.7	C
Weekday Evening	1.00	36.5	D	1.18	50.1	D	1.22	53.9	D
Saturday Midday	0.65	17.1	B	0.75	21.3	C	0.83	25.3	C
Sunday Midday	0.57	13.9	B	0.60	14.7	B	0.61	15.0	B
Route 20 at the Site Driveway									
Weekday Morning	–	–	–	–	–	–	0.71	12.5	B
Weekday Evening	–	–	–	–	–	–	0.84	21.7	C
Saturday Midday	–	–	–	–	–	–	0.92	32.9	C
Sunday Midday	–	–	–	–	–	–	0.68	13.3	B

[a]Volume-to-capacity ratio without 410,500 sf office included No-Build.
[b]Average control (signal) delay per vehicle (in seconds).
[c]Level-of-service.

Table 3-19 Level-of-Service Summary – Access Alternative B

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 27 at River Road												
All movements from River Road:												
Weekday Morning	106	0.37	20.6	C	116	0.48	26.8	D	117	0.47	25.7	D
Weekday Evening	44	0.09	11.9	B	69	0.25	22.4	C	62	0.27	23.5	C
Saturday Midday	32	0.07	11.1	B	47	0.13	13.7	B	52	0.16	14.8	B
Sunday Midday	7	0.03	12.4	B	13	0.07	14.0	B	15	0.08	14.2	B
Route 27 at Glezen Lane												
All movements from Glezen Lane:												
Weekday Morning	61	0.54	50.5	F	74	1.03	171.8	F	67	0.70	76.1	F
Weekday Evening	361	1.16	133.3	F	382	1.41	237.4	F	392	1.56	303.3	F
Saturday Midday	54	0.16	13.0	B	59	0.19	14.1	B	69	0.27	17.2	C
Sunday Midday	48	0.11	12.7	B	52	0.13	13.5	B	58	0.17	15.0	C
Route 27 at Glezen Lane												
All movements from Glezen Lane:												
Weekday Morning	61	0.22	16.6	C	64	0.27	19.2	C	67	0.29	20.0	C
Weekday Evening	361	0.53	15.2	C	380	0.61	18.2	C	392	0.72	25.7	D
Route 27 at the Site Driveway												
Left turns from Site Driveway:												
Weekday Morning					No Intersection Under Access Alternative B							
Weekday Evening												
Saturday Midday												
Sunday Midday												
Route 27 at Bow Road												
All movements from Bow Road:												
Weekday Morning	28	0.08	13.5	B	29	0.09	14.4	B	29	0.09	14.2	B
Weekday Evening	129	0.57	35.6	E	136	0.71	52.3	F	136	0.77	63.0	F
Saturday Midday	8	0.03	13.5	B	8	0.03	14.3	B	8	0.04	16.0	C
Sunday Midday	15	0.06	14.8	B	16	0.07	15.6	C	16	0.07	16.5	C
Route 27 at Bow Road												
All movements from Bow Road:												
Weekday Morning	28	0.15	23.2	C	29	0.16	24.0	C	29	0.17	24.4	C
Weekday Evening	129	0.30	15.3	C	136	0.35	17.2	C	136	0.41	20.4	C
Route 27 at Route 126												
All movements from Route 126:												
Weekday Morning	246	1.09	121.9	F	322	2.04	524.0	F	286	1.48	275.8	F
Weekday Evening	311	2.19	594.3	F	353	8.21	>999.9	F	394	5.08	>999.9	F
Saturday Midday	305	0.88	53.7	F	352	1.29	187.0	F	411	1.64	334.7	F
Sunday Midday	213	0.74	40.3	E	244	1.01	94.5	F	277	1.26	181.8	F

See notes at end of table.

Table 3-19 (Continued) Level-of-Service Summary – Access Alternative B

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 27/Route 126 at Pelham Island Road/ Millbrook Road												
All movements from Millbrook Road:												
Weekday Morning	86	3.34	>999.9	F	97	15.80	>999.9	F	94	8.57	>999.9	F
Weekday Evening	44	NC	>999.9	F	89	11.13	>999.9	F	95	24.31	>999.9	F
Saturday Midday	68	0.71	76.9	F	75	2.15	701.2	F	84	4.99	>999.9	F
Sunday Midday	31	0.25	36.1	E	35	0.49	80.0	F	40	0.87	197.6	F
Route 27 at Winthrop Road												
All movements from Winthrop Road:												
Weekday Morning	20	0.16	25.9	D	21	0.25	40.1	E	21	0.21	33.6	D
Weekday Evening	5	0.11	33.6	D	5	0.17	51.5	F	5	0.19	57.4	F
Saturday Midday	10	0.07	18.9	C	10	0.09	23.1	C	10	0.12	29.7	D
Sunday Midday	10	0.05	15.0	B	10	0.06	16.7	C	10	0.07	18.5	C
Route 126 at Bow Road												
All movements from Bow Road:												
Weekday Morning	70	0.20	14.6	B	74	0.26	17.4	C	74	0.24	16.4	C
Weekday Evening	11	0.03	13.1	B	11	0.04	14.6	B	11	0.04	15.3	C
Saturday Midday	6	0.03	12.5	B	6	0.04	13.5	B	6	0.04	15.2	C
Sunday Midday	9	0.03	11.4	B	9	0.03	11.9	B	9	0.03	12.5	B
Route 126 at Plain Road												
All movements from Plain Road:												
Weekday Morning	20	0.06	12.6	B	26	0.09	14.6	B	22	0.07	13.5	B
Weekday Evening	17	0.04	12.0	B	19	0.06	13.3	B	22	0.08	14.5	B
Saturday Midday	18	0.04	12.0	B	20	0.06	13.1	B	25	0.09	15.1	C
Sunday Midday	12	0.03	11.2	B	12	0.03	11.7	B	15	0.04	12.7	B
Route 126 at Claypit Hill Road and Training Field Road												
All movements from Training Field Road/ Claypit Hill Road:	55	0.47	29.7	D	57	0.61	44.8	E	57	0.58	40.7	E
Weekday Morning	51	0.16	17.5	C	54	0.21	20.7	C	57	0.24	22.7	C
Weekday Evening	41	0.11	13.4	B	45	0.14	15.0	B	55	0.21	18.5	C
Saturday Midday	35	0.13	13.5	B	37	0.15	14.7	B	42	0.18	16.2	C
Sunday Midday												
Route 126 at Glezen Lane												
All movements from Glezen Lane:												
Weekday Morning	46	NC	>999.9	F	54	NC	>999.9	F	50	NC	>999.9	F
Weekday Evening	231	0.88	64.1	F	243	1.10	129.4	F	246	1.19	162.1	F
Saturday Midday	37	0.12	13.3	B	40	0.15	14.8	B	45	0.20	17.2	C
Sunday Midday	44	0.11	12.7	B	46	0.12	13.7	B	49	0.14	14.6	B

See notes at end of table.

Table 3-19 (Continued) Level-of-Service Summary – Access Alternative B

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 126 at Glezen Lane												
All movements from Glezen Lane:												
Weekday Morning	46	0.25	24.0	C	49	0.32	30.1	D	50	0.35	33.0	D
Weekday Evening	231	0.74	39.5	E	242	0.87	61.1	F	246	1.02	100.0	F
Route 126 at Moore Road												
All movements from Moore Road:												
Weekday Morning	31	0.15	17.4	C	32	0.18	20.4	C	32	0.17	19.6	C
Weekday Evening	12	0.05	16.1	C	12	0.05	18.0	C	12	0.06	18.9	C
Saturday Midday	6	0.01	11.4	B	6	0.02	12.2	B	6	0.02	13.2	B
Sunday Midday	16	0.04	11.1	B	17	0.05	11.7	B	17	0.05	12.1	B
Glezen Lane at Moore Road												
All movements from Moore Road:												
Weekday Morning	35	0.09	11.0	B	37	0.10	11.3	B	37	0.10	11.2	B
Weekday Evening	333	0.67	17.5	C	344	0.72	19.5	C	350	0.73	19.9	C
Saturday Midday	27	0.05	9.2	A	28	0.05	9.3	A	28	0.05	9.3	A
Sunday Midday	28	0.05	9.0	A	29	0.05	9.0	A	29	0.05	9.1	A
Glezen Lane at Training Field Road												
All movements from Glezen Lane:												
Weekday Morning	449	0.58	12.4	B	471	0.61	13.2	B	473	0.62	13.3	B
Weekday Evening	351	0.42	10.0	A	371	0.64	14.3	B	374	0.45	10.4	B
Saturday Midday	44	0.07	7.3	A	48	0.08	7.4	A	53	0.08	7.4	A
Sunday Midday	14	0.02	7.3	A	15	0.15	7.4	A	17	0.03	7.4	A
Training Field Road at Glezen Lane south												
All movements from Glezen Lane:												
Weekday Morning	33	0.06	8.6	A	35	0.06	8.7	A	35	0.06	8.7	A
Weekday Evening	42	0.10	8.9	A	44	0.10	8.9	A	47	0.11	8.9	A
Saturday Midday	13	0.03	8.6	A	14	0.03	8.6	A	18	0.04	8.6	A
Sunday Midday	14	0.02	8.5	A	15	0.09	8.5	A	17	0.02	8.6	A
Glezen Lane at Training Field Road												
All movements from Glezen Lane:												
Weekday Morning	415	0.51	12.9	B	437	0.55	13.6	B	437	0.55	13.5	B
Weekday Evening	56	0.08	10.2	B	68	0.13	11.7	B	64	0.09	10.4	B
Saturday Midday	31	0.04	9.1	A	36	0.05	9.2	A	39	0.04	9.2	A
Sunday Midday	26	0.04	9.0	A	28	0.04	9.1	A	30	0.05	9.1	A

See notes at end of table.

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Plain Road at Claypit Hill Road												
All movements from Plain Road:												
Weekday Morning	159	0.42	15.9	C	166	0.45	16.8	C	167	0.46	17.0	C
Weekday Evening	24	0.06	11.1	B	26	0.06	11.3	B	26	0.07	11.5	B
Saturday Midday	25	0.05	10.0	A	26	0.05	10.1	B	26	0.05	10.3	B
Sunday Midday	26	0.04	9.5	A	28	0.05	9.6	A	28	0.05	9.7	A
Plain Road at Glen Road												
All movements from Glen Road:												
Weekday Morning	96	0.16	9.8	A	101	0.17	9.9	A	102	0.18	9.9	A
Weekday Evening	57	0.10	9.8	A	60	0.11	9.9	A	64	0.11	9.9	A
Saturday Midday	54	0.07	8.9	A	57	0.08	8.9	A	61	0.08	8.9	A
Sunday Midday	56	0.06	8.7	A	58	0.06	8.7	A	60	0.07	8.7	A
Route 20 at Winthrop Road												
All westbound movements from Route 20:												
Weekday Morning	795	0.01	0.3	A	1,083	0.01	0.6	A	915	0.01	0.4	A
Weekday Evening	944	0.01	0.3	A	1,100	0.01	0.5	A	1,217	0.01	0.5	A
Saturday Midday	712	0.01	0.3	A	892	0.01	0.4	A	1,053	0.02	0.6	A
Sunday Midday	616	0.00	0.1	A	755	0.00	0.1	A	848	0.00	0.1	A
Route 20 at Pelham Island Road												
All movements from Pelham Island Road:												
Weekday Morning	160	1.57	355.1	F	184	1.55	336.8	F	213	1.32	225.9	F
Weekday Evening	138	1.78	472.6	F	165	0.96	104.2	F	271	3.12	>999.9	F
Saturday Midday	202	NC	>999.9	F	239	2.54	789.2	F	384	36.03	>999.9	F
Sunday Midday	106	0.43	21.8	C	132	0.43	24.1	C	196	1.13	156.0	F
Route 20 at Pelham Island Road (South)												
All westbound movements from Pelham Island Road:												
Weekday Morning	--	--	--	--	76	2.56	926.2	F	72	1.31	306.9	F
Weekday Evening	--	--	--	--	42	0.58	74.8	F	45	10.58	>999.9	F
Saturday Midday	--	--	--	--	45	0.11	243.5	F	50	319.40	>999.9	F
Sunday Midday	--	--	--	--	16	0.06	19.2	C	19	0.53	174.7	F

See notes at end of table.

Table 3-19 (Continued) Level-of-Service Summary – Access Alternative B

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 20 at Old County Road												
All movements from Old County Road:												
Weekday Morning	63	0.55	55.9	F	117	2.54	848.2	F	117	2.43	796.1	F
Weekday Evening	116	0.88	98.8	F	229	4.49	>999.9	F	229	4.93	>999.9	F
Saturday Midday	53	0.44	40.5	E	166	2.74	889.2	F	166	6.06	>999.9	F
Sunday Midday	34	0.11	17.6	C	100	0.67	64.0	F	100	0.76	85.9	F

[a]Demand (in vehicles per hour) for the critical movements.
[b]Volume-to-capacity ratio.
[c]Average control delay per vehicle (in seconds) for the critical movements. As the v/c ratio approaches 1.00, the calculated delay is not representative of actual conditions.
[d]Level-of-service.
[e]Based on observed delay measurements.
NC = Not calculated.

Signalized Intersection/Peak Hour	2006 Existing			2011 No-Build			2011 Build		
	V/C[a]	Delay[b]	LOS[c]	V/C	Delay	LOS	V/C	Delay	LOS
Route 20 at Route 27/Route 126									
Weekday Morning	0.97	38.8	D	1.13	101.2	F	1.02	89.4	F
Weekday Evening	1.48	71.2	E	1.22	129.3	F	1.46	172.8	F
Saturday Midday	0.81	26.4	C	0.99	64.0	E	1.41	149.3	F
Sunday Midday	0.80	24.9	C	0.81	39.8	D	1.24	110.6	F
Route 20 at Union Avenue									
Weekday Morning	0.79	29.2	C	0.86	34.0	C	0.87	34.7	C
Weekday Evening	0.96	38.1	D	1.07	54.7	D	1.11	60.4	E
Saturday Midday	0.79	24.6	C	0.89	31.6	C	0.96	40.2	D
Sunday Midday	0.59	17.7	B	0.64	19.2	B	0.65	19.6	B
Route 20 at Nobscot Road									
Weekday Morning	0.74	20.3	C	0.85	24.8	C	0.87	25.7	C
Weekday Evening	1.00	36.5	D	1.18	50.1	D	1.22	53.9	D
Saturday Midday	0.65	17.1	B	0.75	21.3	C	0.83	25.3	C
Sunday Midday	0.57	13.9	B	0.60	14.7	B	0.61	15.0	B
Route 20 at the Site Driveway									
Weekday Morning	--	--	--	--	--	--	0.73	14.5	B
Weekday Evening	--	--	--	--	--	--	0.99	34.5	C
Saturday Midday	--	--	--	--	--	--	1.11	56.0	E
Sunday Midday	--	--	--	--	--	--	1.09	60.9	E

[a]Volume-to-capacity ratio.
[b]Average control (signal) delay per vehicle (in seconds).
[c]Level-of-service.

Table 3-20 Level-of-Service Summary – Internal Intersections Access Alternative A

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Street "D" at Municipal Drive 1												
All movements from Municipal Drive 1:												
Weekday Morning	--	--	--	--	--	--	--	--	5	0.01	8.5	A
Weekday Evening	--	--	--	--	--	--	--	--	53	0.06	8.9	A
Saturday Midday	--	--	--	--	--	--	--	--	46	0.05	8.9	A
Sunday Midday	--	--	--	--	--	--	--	--	35	0.04	8.8	A
Street "C" at Residential Drive 1												
All movements from Residential Drive 1:												
Weekday Morning	--	--	--	--	--	--	--	--	8	0.01	8.7	A
Weekday Evening	--	--	--	--	--	--	--	--	95	0.11	9.4	A
Saturday Midday	--	--	--	--	--	--	--	--	81	0.10	9.4	A
Sunday Midday	--	--	--	--	--	--	--	--	62	0.07	9.1	A
Street "A" at Retail Drive 1												
All westbound movements from Retail Drive 1:												
Weekday Morning	--	--	--	--	--	--	--	--	11	0.02	10.7	B
Weekday Evening	--	--	--	--	--	--	--	--	76	0.29	23.1	C
Saturday Midday	--	--	--	--	--	--	--	--	98	0.57	46.6	E
Sunday Midday	--	--	--	--	--	--	--	--	41	0.10	13.9	B
Street "B" at Street "A"												
All movements from Street "B" southbound:												
Weekday Morning	--	--	--	--	--	--	--	--	17	0.03	10.0	B
Weekday Evening	--	--	--	--	--	--	--	--	70	0.17	14.5	B
Saturday Midday	--	--	--	--	--	--	--	--	126	0.48	28.6	D
Sunday Midday	--	--	--	--	--	--	--	--	54	0.09	11.3	B
Street "E" at Street "A"												
All movements from Street "E":												
Weekday Morning	--	--	--	--	--	--	--	--	12	0.02	9.7	A
Weekday Evening	--	--	--	--	--	--	--	--	81	0.18	13.7	B
Saturday Midday	--	--	--	--	--	--	--	--	102	0.27	17.2	C
Sunday Midday	--	--	--	--	--	--	--	--	44	0.07	10.7	B
Retail Drive 2 at Street "B"												
All movements from Retail Drive 2:												
Weekday Morning	--	--	--	--	--	--	--	--	12	0.01	8.6	A
Weekday Evening	--	--	--	--	--	--	--	--	86	0.10	9.3	A
Saturday Midday	--	--	--	--	--	--	--	--	108	0.13	9.7	A
Sunday Midday	--	--	--	--	--	--	--	--	47	0.05	8.9	A

See notes at end of table.

Unsignalized Intersection/ Critical Movement/Peak Hour	2006 Existing				2011 No-Build				2011 Build			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Street "A" at Retail Drive 3												
All movements from Retail Drive 3:												
Weekday Morning	–	–	–	–	–	–	–	–	2	0.00	9.8	A
Weekday Evening	–	–	–	–	–	–	–	–	12	0.03	13.7	B
Saturday Midday	–	–	–	–	–	–	–	–	2	0.01	15.2	C
Sunday Midday	–	–	–	–	–	–	–	–	36	0.05	10.2	B
Street "C" at Street "A"												
All movements from Street "C":												
Weekday Morning	–	–	–	–	–	–	–	–	32	0.04	9.0	A
Weekday Evening	–	–	–	–	–	–	–	–	76	0.17	13.7	B
Saturday Midday	–	–	–	–	–	–	–	–	73	0.19	15.8	C
Sunday Midday	–	–	–	–	–	–	–	–	65	0.10	10.7	B
Street "C" at Street "B"												
All movements Street "C":												
Weekday Morning	–	–	–	–	–	–	–	–	18	0.02	8.6	A
Weekday Evening	–	–	–	–	–	–	–	–	38	0.04	9.0	A
Saturday Midday	–	–	–	–	–	–	–	–	39	0.05	9.1	A
Sunday Midday	–	–	–	–	–	–	–	–	33	0.04	8.9	A
Street "B" at Street "A"												
All movements from Street "B":												
Weekday Morning	–	–	–	–	–	–	–	–	13	0.02	10.1	B
Weekday Evening	–	–	–	–	–	–	–	–	54	0.13	14.2	B
Saturday Midday	–	–	–	–	–	–	–	–	55	0.16	16.2	C
Sunday Midday	–	–	–	–	–	–	–	–	37	0.07	11.4	B

[a]Demand (in vehicles per hour) for the critical movements.
[b]Volume-to-capacity ratio.
[c]Average control delay per vehicle (in seconds) for the critical movements. As the v/c ratio approaches 1.00, the calculated delay is not representative of actual conditions.
[d]Level-of-service.
NC = Not calculated.

Under 2011 Build conditions, without any gap adjustments, the critical movements are projected to continue to operate at LOS F during the weekday morning and weekday evening peak hours, and at LOS C during the Saturday and Sunday midday peak hours. Utilizing the observed gaps and delay measurements, under 2011 No-Build conditions, the critical movements are projected to operate at LOS C during the weekday morning peak hour and at LOS D during the weekday evening peak hour.

3.4.2.3 Route 27 at Bow Road

Under 2006 Existing conditions, the critical movements (left and right turns from Bow Road) currently operate at LOS B during the weekday morning peak hour, at LOS E during the weekday evening peak hour, at LOS B during the Saturday and Sunday midday peak hours. Based on the observed gaps and delay observations conducted, during the weekday morning peak hour, the critical movements out of Bow Road currently operate at LOS C (average delay of 23.1 seconds) and during the weekday evening peak hour, the critical movements out of Bow Road currently operate at LOS C (average delay of 15.8 seconds). During the morning peak hour, the observed delays are close to the modeled delay and are significantly better than the HCM model indicates during the weekday evening peak hour.

Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS B during the weekday morning peak hour, at LOS F during the weekday evening peak hour, at LOS B during the Saturday midday peak hour and at LOS C during the Sunday midday peak hour. Utilizing the observed gaps and delay measurements, the HCM default value gaps were adjusted to reflect existing conditions. With this adjustment, under 2011 No-Build conditions, the critical movements are projected to operate at LOS C during the weekday morning peak hour and at LOS C during the weekday evening peak hour.

Under 2011 Build conditions, the critical movements are projected to operate at LOS B during the weekday morning peak hour, at LOS F during the weekday evening peak hour, and at LOS C during the Saturday and Sunday midday peak hours. Utilizing the observed gaps and delay measurements, under 2011 No-Build conditions, the critical movements are projected to operate at LOS C during the weekday morning peak hour and at LOS C during the weekday evening peak hour.

3.4.2.4 Route 27 at Site Driveway

Under 2011 Build conditions, Access Alternative A, the critical movements are projected to operate at LOS D during the weekday morning peak hour, and at LOS F during the weekday evening and Saturday midday peak hours and at LOS C during the Sunday midday peak hour. Under Access Alternative B, this location would not exist. Actual operations are expected to be better based on the delay observations recorded at the Route 27 intersections with Glezen Lane and Bow Road.

3.4.2.5 Route 27 at Route 126

Under 2006 Existing conditions, the critical movements (all movements from Route 126) currently operate at LOS F during the weekday morning, weekday evening, and Saturday midday peak hours and at LOS E during the Sunday midday peak hour. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS F during the weekday morning, weekday evening, Saturday midday and Sunday midday peak hours. Under 2011 Build conditions, under both access alternatives, the critical movements are projected to operate at LOS F during the weekday morning, weekday evening, Saturday midday and Sunday midday peak hours.

3.4.2.6 Route 27/Route 126 at Pelham Island Road/Millbrook Road

Under 2006 Existing conditions, the critical movements (all movements from Millbrook Road) currently operate at LOS F during the weekday morning, weekday evening, and Saturday midday peak hours and at LOS E during the Sunday midday peak hour. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS F during the weekday morning, weekday evening, Saturday midday and Sunday midday peak hours. Under 2011 Build conditions, under both access alternatives, the critical movements are projected to operate at LOS F during the weekday morning, weekday evening, Saturday midday and Sunday midday peak hours.

3.4.2.7 Route 20 at Route 27/126

Under 2006 Existing conditions, this signalized intersection is modeled to currently operate at LOS D during the weekday morning peak hour, at LOS E during the weekday evening peak hour, and at LOS C during the Saturday and Sunday midday peak hours. This intersection was analyzed without an exclusive pedestrian phase per cycle, as identified in the signal plans for this location. Under 2011 No-Build conditions, the intersection is projected to operate at LOS F during the weekday morning peak hour, at LOS F during the weekday evening peak hour, at LOS E during the Saturday midday peak hour and LOS D during the Sunday midday peak hour. Under 2011 Build conditions, under both access alternatives, the intersection is projected to operate at LOS F during the weekday morning, weekday evening, and Saturday midday peak hours and at LOS D during the Sunday midday peak hour.

3.4.2.8 Route 27 at Winthrop Road

Under 2006 Existing conditions, the critical movements (left and right turns from Winthrop Road) currently operate at LOS D during the weekday morning peak hour, at LOS D during the weekday evening peak hour, at LOS C during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour. Under 2011 No-Build conditions, the critical movements are projected to operate at LOS E during the weekday morning peak hour, at LOS F during the weekday evening peak hour, at LOS C during the Saturday midday peak hour and at LOS C during the Sunday midday peak hour. Under 2011 Build conditions, the critical movements are projected to operate at LOS D during the weekday morning peak hour, at LOS F during the weekday evening peak hour, at LOS D during the Saturday midday peak hour and at LOS C during the Sunday midday peak hour.

3.4.2.9 Route 126 at Bow Road

Under 2006 Existing conditions, the critical movements (left and right turns from Bow Road) currently operate at LOS B during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to operate at LOS C during the weekday morning peak hour and at LOS B during the weekday evening, Saturday midday, and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to operate at LOS C during the weekday morning, weekday evening, and Saturday midday peak hours and at LOS B during the Sunday midday peak hour.

3.4.2.10 Route 126 at Plain Road

Under 2006 Existing conditions, the critical movements (left and right turns from Plain Road) currently operate at LOS B during the weekday morning, weekday evening, Saturday midday and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS B during the weekday morning, weekday evening, Saturday and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to operate at LOS B during the weekday morning peak hour, at LOS B during the weekday evening peak hour, at LOS C during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour.

3.4.2.11 Route 126 at Claypit Hill Road and Training Field Road

Under 2006 Existing conditions, the critical movements (all movements from Training Field Road) currently operate at LOS D during the weekday morning peak hour, at LOS C during the weekday evening peak hour, and at LOS B during the Saturday and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to operate at LOS E during the weekday morning peak hour, at LOS C during the weekday evening peak hour, at LOS B during the Saturday midday and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to operate at LOS E during the weekday morning peak hour, at LOS C during the weekday evening peak hour, Saturday midday and Sunday midday peak hours.

3.4.2.12 Route 126 at Glezen Lane

Under 2006 Existing conditions, the critical movements (left, through and right turns from Glezen Lane eastbound during the morning peak hour and westbound during the weekday evening peak hour) currently operate at LOS F during the weekday morning and weekday evening peak hours, and at LOS B during the Saturday and Sunday midday peak hours. Based on the observed gaps and delay observations conducted, during the weekday morning peak hour, the critical movements out of Glezen Lane currently operate at LOS C/D (average delay of 24.9 seconds) and during the weekday evening peak hour, the critical movements out of Glezen Lane currently operate at LOS E (average delay of 40.1 seconds). This is better than the HCM model indicates.

Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS F during the weekday morning and weekday evening peak hours, and at LOS B during the Saturday and Sunday midday peak hours. Utilizing the observed gaps and delay measurements, the HCM default value gaps were adjusted to reflect existing conditions. With this adjustment, under 2011 No-Build conditions, the critical movements are projected to operate at LOS D during the weekday morning peak hour and at LOS F during the weekday evening peak hour (better than the unadjusted LOS).

Under 2011 Build conditions, without any gap adjustments, the critical movements are projected to continue to operate at LOS F during the weekday morning and weekday evening peak hours, and at LOS C during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour. Utilizing the observed gaps and delay measurements, under 2011 No-Build conditions, the critical movements are projected to operate at LOS D during the weekday morning peak hour and at LOS F during the weekday evening peak hour (which is also better than the unadjusted LOS.

3.4.2.13 Route 126 at Moore Road

Under 2006 Existing conditions, the critical movements (left and right turns from Moore Road) currently operate at LOS C during the weekday morning and weekday evening peak hours, and at LOS B during the Saturday and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS C during the weekday morning and weekday evening peak hours, and at LOS B during the Saturday and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to continue to operate at LOS C during the weekday morning and weekday evening peak hours, and at LOS B during the Saturday and Sunday midday peak hours.

3.4.2.14 Glezen Lane at Moore Road

Under 2006 Existing conditions, the critical movements (left and right turns from Moore Road) currently operate at LOS B during the weekday morning peak hour, at LOS C during the weekday evening peak hour, and at LOS A during the Saturday and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS B during the weekday morning peak hour and at LOS C during the weekday evening peak hour, and at LOS A during the Saturday and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to continue to operate at LOS B during the weekday morning peak hour, at LOS C during the weekday evening peak hour, and at LOS A during the Saturday and Sunday midday peak hours.

3.4.2.15 Glezen Lane at Training Field Road

Under 2006 Existing conditions, the critical movements currently operate at LOS B or better during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS B or better during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to continue to operate at LOS B or better during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours.

3.4.2.16 Plain Road at Claypit Hill Road

Under 2006 Existing conditions, the critical movements (left and right turn movements from Claypit Hill Road) currently operate at LOS C during the weekday morning peak hour, at LOS B during the weekday evening peak hour, and at LOS A during the Saturday and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to operate at LOS C during the weekday morning peak hour, at LOS B during the weekday evening peak hour, at LOS B during the Saturday midday peak hour and at LOS A during the Sunday midday peak hour. Under 2011 Build conditions, the critical movements are projected to continue to operate at LOS C during the weekday morning peak hour, at LOS B during the weekday evening peak hour, at LOS B during the Saturday midday peak hour and at LOS A during the Sunday midday peak hour.

3.4.2.17 Plain Road at Glen Road

Under 2006 Existing conditions, the critical movements (left and right turn movements from Glen Road) currently operate at LOS A during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS A during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours. Under

2011 Build conditions, the critical movements are projected to operate at LOS A during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours.

3.4.2.18 Route 20 at Winthrop Road

Under 2006 Existing conditions, the critical movements (all movements from Route 20) currently operate at LOS A during the weekday morning, weekday evening peak hour, Saturday midday peak hour and Sunday midday peak hours. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS A during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to continue to operate at LOS A during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours.

3.4.2.19 Route 20 at Pelham Island Road (North)

Under 2006 Existing conditions, the critical movements (all movements from Pelham Island Road) currently operate at LOS F during the weekday morning, weekday evening, and Saturday midday peak hours and at LOS C during the Sunday midday peak hour. Under 2011 No-Build conditions, the critical movements are projected to continue to operate at LOS F during the weekday morning, weekday evening, and Saturday midday peak hours and at LOS C during the Sunday midday peak hour. Under 2011 Build conditions, under both access alternatives, the critical movements are projected to operate at LOS F during the weekday morning, weekday evening, and Saturday midday peak hours and at LOS E during the Sunday midday peak hour.

3.4.2.20 Route 20 at Pelham Island Road (South)

Under 2011 No-Build conditions, the critical movements are projected to operate at LOS F during the weekday morning peak hour, LOS C during weekday evening peak hour, and at LOS D during the Saturday midday peak hours. Under 2011 Build conditions, under both access alternatives, the critical movements are projected to operate at LOS F during the weekday morning, weekday evening, Saturday midday and Sunday midday peak hours.

3.4.2.21 Route 20 at the Site Driveway

Under 2011 Build traffic-volume conditions, Access Alternative A with the installation of a fully-actuated, demand-responsive traffic signal system, this intersection is projected to operate at LOS B during the weekday morning peak hour, and at LOS C during the weekday evening and Saturday midday peak hours and at LOS B during the Sunday midday peak hour. Under Access Alternative B, with the installation of a fully-actuated traffic signal system, this intersection is projected to operate at LOS E or better during the peak hours.

3.4.2.22 Route 20 at Old County Road

Under 2006 Existing conditions, the critical movements (left and right turn movements from Old County Road) currently operate at LOS F during the weekday morning peak hour, at LOS F during the weekday evening peak hour, at LOS E during the Saturday midday peak hour and at LOS C during the Sunday midday peak hour. Under 2011 No-Build conditions, the critical movements are projected to operate at LOS F during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours. Under 2011 Build conditions, the critical movements are projected to continue to operate at LOS F during the weekday morning, weekday evening, Saturday midday, and Sunday midday peak hours.

3.4.2.23 Route 20 at Union Avenue

Under 2006 Existing conditions, this signalized intersection is modeled to currently operate at LOS C during the weekday morning peak hour, at LOS D during the weekday evening peak hour, and at LOS C during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour. Under 2011 No-Build conditions, the intersection is projected to continue to operate at LOS C during the weekday morning peak hour, at LOS D during the weekday evening peak hour, at LOS C during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour. Under 2011 Build conditions, the intersection is projected to operate at LOS C during the weekday morning peak hour, at LOS E during the weekday evening peak hour, at LOS D during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour.

3.4.2.24 Route 20 at Nobscot Road

Under 2006 Existing conditions, this signalized intersection is modeled to currently operate at LOS C during the weekday morning peak hour, at LOS D during the weekday evening peak hour, and at LOS B during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour. Under 2011 No-Build conditions, the intersection is projected to operate at LOS C during the weekday morning peak hour, at LOS D during the weekday evening peak hour, at LOS C during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour. Under 2011 Build conditions, the intersection is projected to continue to operate at LOS C during the weekday morning peak hour, at LOS D during the weekday evening peak hour, at LOS C during the Saturday midday peak hour and at LOS B during the Sunday midday peak hour.

3.4.3 Parking and Loading Analysis

3.4.3.1 Parking

A shared parking analysis was performed to determine if the number of proposed parking spaces, 1,256 parking spaces, would be sufficient for the proposed mixed-use development. Parking data compiled by the Urban Land Institute (ULI) Shared Parking[17] and parking data compiled by the Institute of Transportation Engineers (ITE) Parking Generation 3rd Edition[18] were reviewed.

Shared parking consists where there are differing land uses that over the course of a day share the same parking space. This is because the sharing uses either operate at totally different times, or if they do operate at the same time, the uses do not peak at the same time. For the residential component of up to 100 units, 200 parking spaces have been identified solely for the residential units.

Analyses were performed reviewing the peak characteristics of the proposed uses, as well as an analysis during December conditions (typical peak time for a retail development). Included in the Appendix are the worksheets.

For the non-December conditions, the analysis of parking based on the ITE and ULI data for weekday and Saturdays shows a range of parking requirements ranging from 1,013 spaces to 1,101 spaces (without shared parking). With shared parking, the range of required spaces is from 826 spaces to 912 spaces, less than 1,256 spaces that will be provided.

The second analysis of parking was based on the ITE and ULI data for weekday and Saturdays December conditions. This data shows a range of parking requirements ranging from 1,129 spaces to 1,437 spaces (without shared parking). With shared parking, the range of required spaces is from 937 spaces to 1,208 spaces, less than the 1,256 spaces that will be provided.

3.4.3.2 Loading

All truck access will by way of the Route 20 site driveway. The project Proponent will work with the retail tenants to restrict deliveries to off-peak hours. For the smaller retail uses, loading will be from the parking field associated with each retail use. For the potential supermarket tenant, trucks will enter from Route 20 and use the first retail driveway to access the supermarket along the external roadway at the southerly edge of the site. These trucks would egress the site by the reverse route.

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[17]Shared Parking, Urban Land Institute, Washington D.C.; 1983.

[18]Parking Generation, Institute of Transportation Engineers, Washington D.C.; 2004.

3.5 Mitigation Measures and Conclusions

3.5.1 Mitigation Measures

The final phase of the analysis process is to identify the mitigation measures necessary to minimize the impacts of the project on the transportation system. The mitigation measures consist of improvements required to correct existing deficiencies and project related impacts.

The most challenging transportation related issue that must be addressed for the Glezen Lane and Bow Road neighborhoods is the “cut through” traffic volumes. Currently many drivers find it more convenient to utilize sections of Glezen Lane and Bow Road either to avoid the Route 20, Route 27 and Route 126 intersection or to avoid Route 20 in the Wayland area. The Route 20, Route 27 and Route 126 intersection re-construction is almost complete. Unfortunately, when the construction is complete and the site is re-occupied as an office building, the intersection will continue to operate at LOS F. Therefore, it is anticipated that drivers will continue to avoid that intersection and continue to use neighborhood streets as a “cut through” The best traffic management technique to reduce the “cut through” traffic and increase road safety is to make the use of the neighborhood streets in-convenient or impossible for use by commuters.

Tables 3-21 and 3-22 provide a summary of the potential improvements for Glezen Lane and Bow Road and the recommendations. Tables 3-23 and 3-24 provide a summary of the potential improvements for the Route 20 and Route 27 site driveway intersections.

Table 3-21 Summary of Traffic Related Issues – Glezen Lane

Glezen Lane

Existing Issues

- Cut through traffic (Approximately 400 vehicles per hour during commuter periods)
- Excessive speeds (up to 49 mph)
- Excessive commercial truck traffic

Possible Mitigation:

Improvement	Impact	Effect
Prohibit left turns from Route 27 southbound	Eliminate 400 vehicles per hour during morning commute	Improved level of service Route 27 and Glezen Lane from F to B during morning peak hour. Reduction of traffic on Glezen Lane from Route 27.
Increase police enforcement of speed limit	Reduce speed	Safer street
Install speed humps	Reduce speed	Safer street
Install stop signs at side streets	Reduce speed	Safer street
Narrow sections of Glezen Lane at Route 27 and at Route 126	Reduce speed	Safer street
Make section of Moore Road, Glezen Lane, and Training Field Road one way	More difficult access for "cut through commuter" traffic	Reduce traffic volume on street. Increase safety
Prohibit commercial truck traffic	Reduce traffic	Safer street

Developer's Recommendations

- Prohibit left turns From Route 27 South to Glezen Lane during the morning peak period (6:00 – 9:00 AM)
- Make sections of Moore Road, Glezen Lane, and Training Field Road one way
- Increase police enforcement and install stop signs
- Install speed humps

Table 3-22 Summary of Traffic Related Issues – Bow Road

Bow Road

Existing Issues

- Cut through traffic (> 50 vehicles per hour during commuter time)
- Excessive speed (Up to 44MPH)
- Excessive commercial truck traffic

Possible Mitigation:

Improvement	Impact	Effect
Prohibit left turns from Route 27 southbound	Eliminate 50 Vehicles per hour during morning commute	Increased level of service
Increase police enforcement of speed limit	Reduce speed	Safer street
Install speed humps	Reduce speed	Safer street
Make Bow Road dead end	Eliminate cut through traffic	Safer street
Narrow sections of Bow Road at Route 27 and at Route 126	Reduce speed	Safer street
Prohibit commercial truck traffic	Reduce traffic	Safer street

Developer's Recommendations

- Make Bow Road dead end
- Increase police enforcement
- Install speed humps

Table 3-23 Summary of Traffic Related Issues – Route 20 and Site Driveway

Route 20 at Proposed Site Driveway

Issues

- Increase traffic generation during some peak periods
- Need to consider existing Russell Garden Center Route 20 Curb Cuts

Possible Mitigation:

Improvement	Impact	Effect
Install traffic light with turn lanes on Route 20	Traffic management – level of service	Acceptable traffic flow
Incorporate entrance with Russell's Garden Center	Reduce existing Route 20 curb cuts	Decrease accidents

Developer's Recommendations

- Install traffic light and turn lanes
- Combine main entrance with Russell's Garden Center entrance

Table 3-24 Summary of Traffic Related Issues – Route 27 and Site Driveway

Route 27 at Proposed Site Driveway

Issues

- Increase traffic generation during some peak periods
- Multiple Route 27 curb cuts with Wayland Commons residential project

Possible Mitigation:

Improvement	Impact	Effect
Install traffic light with turn lanes on Route 27	Traffic management – level of service	Acceptable traffic flow
Incorporate Wayland Commons curb cuts to Wayland Town Center Route 27 driveway	Reduce Route 27 curb cuts	Increased safety
Prohibit commercial truck traffic from using Route 27 driveway	Reduce tendency of truck traffic to use Route 27 area.	Increase safety.

Developer's Recommendations

- Install traffic signal infrastructure but do not install lights until after project is open and equipment is warranted (Town's transportation consultant recommendation).
- Incorporate Wayland Commons curb cuts into Route 27 driveway
- Prohibit commercial trucks from using Route 27 driveway

Table 3-25 summarizes the improvements that are expected to be realized at the Route 20, Route 27 and Route 126 and at the Route 27 and Route 126 intersections.

Table 3-25 Summary of Future No-Build Condition Against Future Build Conditions With Mitigation

Route 20, Route 27 and Route 126 (Public Safety Building)

Weekday Morning Peak Hour Summary

Level of service improves from LOS F to LOS D
Calculated delay time decreases by approximately 47 seconds
Queue length (vehicles lined up waiting to go through intersection) – Projected to decrease by 816 Feet (33 Car Lengths) for Route 20 westbound

Weekday Evening Peak Hour Summary

Level of service stays at LOS F
Calculated delay time increases by approximately 14 seconds
Queue length (vehicles lined up waiting to go through intersection) – Projected to decrease by 547 Feet (22 Car Lengths) for Route 20 eastbound

Saturday Midday Peak Hour Summary

Level of service declines from LOS E to LOS F
Calculated delay time increases by approximately 26 seconds
Queue length (vehicles lined up waiting to go through intersection) – Projected to decrease by 735 Feet (29 Car Lengths) for Route 20 westbound

Route 27/Route 126 (Library Area)

Weekday Morning Peak Hour Summary

Level of service improves from LOS F to LOS B
Calculated delay time decreases by approximately 155 Seconds
Queue length (vehicles lined up waiting to go through intersection) – Projected to decrease by 620 Feet (25 Car Lengths) for Route 126 approach

Weekday Evening Peak Hour Summary

Level of service changes from LOS F to LOS C
Calculated delay time decreases by approximately 625 seconds
Queue length (vehicles lined up waiting to go through intersection) – Projected to decrease by 625 Feet (25 Car Lengths) for Route 126 approach

Saturday Midday Peak Hour Summary

Level of service changes from LOS F to LOS B
Calculated delay wait time decreases by approximately 108 seconds
Queue length (vehicles lined up waiting to go through intersection) – Projected to decrease by 195 Feet (8 Car Lengths) for Route 126 approach

3.5.2 Improvements – Existing Deficiencies

The following intersections have been analyzed without the proposed project and have been determined to require potential modifications and improvements. It should be noted that these improvements are precipitated by existing conditions and are not required solely due to the project's impacts. Intersection capacity deficiencies either exist without the project or are expected to exist at the following locations:

- Route 27 at Glezen Lane
- Route 27 at Bow Road
- Route 126 at Glezen Lane
- Route 20, Route 27 and Route 126
- Route 27 and Route 126
- Route 20 at Old County Road

Mitigation measures at these locations have been identified so that the community and local planning agencies have the tools to identify needed improvements.

3.5.2.1 Route 27 at Glezen Lane

Review of the existing traffic volumes and the existing gap analysis and delay measurements indicates that this intersection currently does not operate as poorly as the HCM analysis indicates (LOS C vs LOS F). With the project, the critical movements at the intersection are projected to operate at LOS D or better during the peak hours. Several measures were reviewed in an attempt to improve operations and reduce the potential for cut-through traffic. Analyses indicate that a traffic signal would not meet the criteria established in Warrant No. 1, Eight-Hour Vehicular Volume, as established in the Manual on Uniform Traffic Control Devices[19] (MUTCD). MassHighway uses this warrant to determine the need for signalization. Measures were reviewed that would improve operating conditions. A signal could be installed along with a peak hour left-turn prohibition (no left-turns from Route 27 to Glezen Lane during the 7:00 to 9:00 AM hours). This would force traffic to stay on Route 27, or to stay on Route 20 (if using Old County Road and River Road as a cut-through) or to stay further to the north on Route 117 in Concord, Sudbury and Lincoln. These measures are shown conceptually on Figure 3-38.

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[19] *Manual on Uniform Traffic Control Devices* (MUTCD); Federal Highway Administration; Washington, DC; 2003.

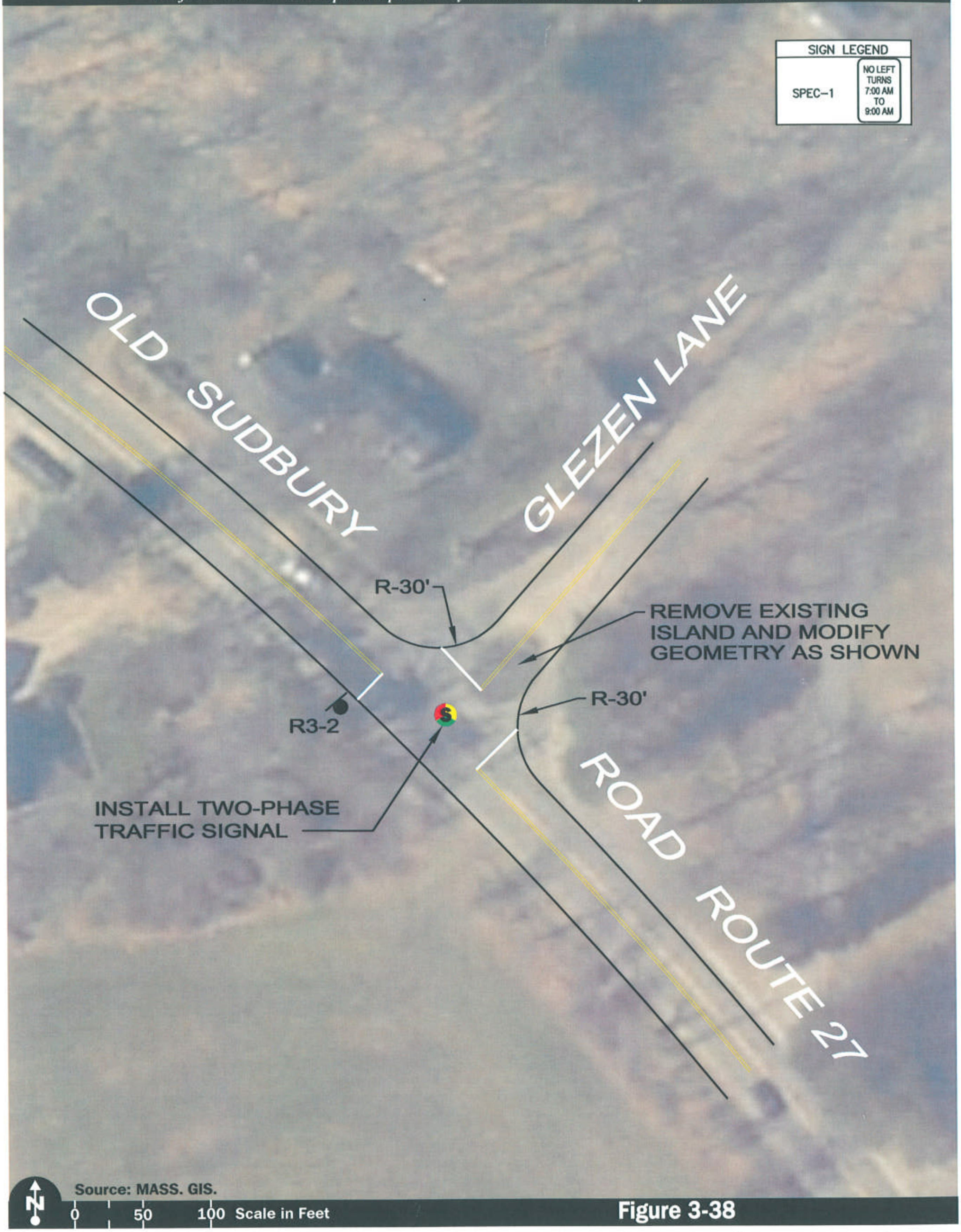

Figure 3-38

Conceptual Improvements Glezen Lane at Route 27

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Prohibition of left turns out of Glezen Lane during peak periods (16 vph during the existing morning peak hour and 50 vph during the weekday evening peak hour) would reduce vehicular conflicts and increase capacity. Additional measures to calm traffic and reduce cut-through traffic are discussed below in Traffic Calming Measures.

3.5.2.2 Route 27 at Bow Road

Review of the existing traffic volumes and the existing gap analysis and delay measurements indicates that this intersection currently does not operate as poorly as the HCM analysis indicates (LOS E vs LOS C during the weekday evening peak hour). A weekday morning peak hour left-turn prohibition into Bow Road would force traffic to stay on Route 27.

Review of the existing traffic volumes indicate that a traffic signal would not meet the criteria established in the MUTCD for Warrant No. 1, Eight-Hour vehicular volumes. Again, prohibiting left turns out of Bow Road during peak weekday periods (9 vph during the existing weekday morning peak hour and 73 vph during the weekday evening peak hour) will reduce vehicular conflicts and increase capacity.

Another measure would be to make Bow Road a dead end. This would eliminate cut-through traffic.

3.5.2.3 Route 126 at Glezen Lane

Review of existing traffic volumes indicates that a traffic signal would not meet the criteria established in the MUTCD for Warrant No. 1, Eight-Hour Vehicular Volume. Again, the HCS model indicates poor levels of service. Review of the existing traffic volumes and the existing gap analysis and delay measurements indicates that this intersection currently does not operate as poorly as the HCM analysis indicates (LOS E vs LOS C during the weekday evening peak hour). Measures are described in the Traffic Calming section to address concerns at this location.

3.5.2.4 Route 20 at Old County Road

The critical movements at this unsignalized intersection, all movements from Old County Road, currently operate at LOS F during the weekday peak hours. These critical movements will continue to operate at LOS F with or without the development of the proposed project under future No-Build and Build conditions. The Wayland Town Center project is not expected to increase the critical movements, left and right turns out of Old County Road. There are several proposed developments on Old County Road which will impact this intersection and should be responsible for any future mitigation.

3.5.2.5 Route 20, Route 27 and Route 126

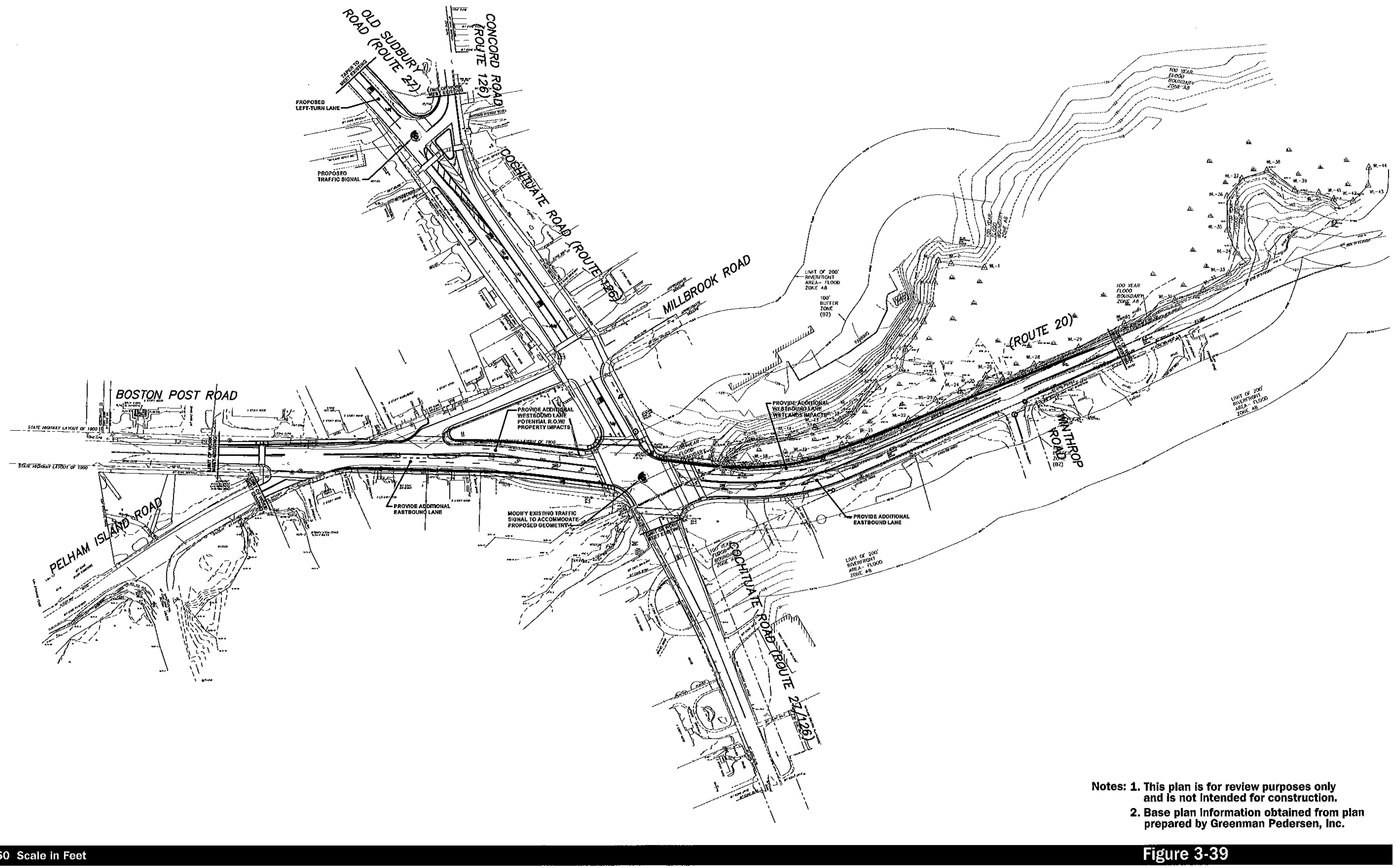
For each Access Alternative, appropriate mitigation measures have been identified and are discussed in the following paragraphs. It should be noted that Access Alternative A provides better access (two points of access/egress to Route20 and Route 27) than Access Alternative B (single access to Route 20). With Access Alternative A, traffic to and from the site is dispersed over the two driveways and provides better directionality for site traffic. With the single access alternative, all traffic is loaded onto Route 20, which will further exacerbate the Route 20, Route 27/Route 126 intersection, as well as require additional roadway widening for mitigation. The project Proponent is committed to working with the Town of Wayland and MassHighway to implement these measures.

Access Alternative A

Route 20 at Route 27/126 – It is recommended that the existing five-lane cross-section at Routes 27/126 on Route 20 be replaced with a four-lane cross section. With the four-lane cross section, the lane uses on the Route 20 eastbound and westbound approaches should be designated as shared through/left-turn lane and a shared through/right-turn lane. Signal equipment modifications would also be necessary to accommodate the revised intersection geometry. Any potential mitigation measure would require the review and approval of the Massachusetts Highway Department (MassHighway), as this location is under their jurisdiction. A preliminary Conceptual Improvement Plan, showing the basic four-lane cross section, is shown on Figure 3-39.

Route 27/126 at Pelham Island Road/Millbrook Road – As a result of the signalization of Route 27 and Route 126, and the interconnection with the signal at Route 20, operations at this intersection are projected to improve. This is a result of gaps created by the two signals to allow vehicles to exit Millbrook Road. Do Not Block Intersection signs should be installed on the Routes 27/126 approaches. These measures are shown on the preliminary Conceptual Improvement Plan, Figure 3-39.

Route 27 at Route 126 – Independent of the proposed Wayland Town Center project, a traffic signal at this intersection can be justified, based on criteria set forth by the MUTCD. Analysis has demonstrated that with traffic signal control at this location, projected levels-of-service will greatly improve. Due to its proximity to the intersection of Route 20 at Route 27/126, any future efforts to signalize the Route 27 at Route 126 intersection should provide for a coordinated traffic signal system between the two locations. Vehicle queue detectors should be installed on the Route 27 approaches to Route 126 such that vehicular queues do not extend back to and block Millbrook Road or the proposed Route 27 site driveway. These measures are shown on the preliminary Conceptual Improvement Plan, Figure 3-39.



Notes: 1. This plan is for review purposes only and is not intended for construction.
2. Base plan information obtained from plan prepared by Greenman Pedersen, Inc.

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Figure 3-39
Preliminary Conceptual Improvement Plan Route 20 at Routes 27/126 Access Alternative A

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Access Alternative B

Under this access alternative, no access would be provided to Route 27. However, the mitigation measures described above for Access Alternative A would still be recommended, with additional measures needed at the Route 20 and Routes 27/126 intersection. Specifically, the current five-lane cross section at Route 20 would be replaced with a similar four lane cross section, with two through lanes per direction with an exclusive left turn lane on each approach. The existing signal would also need to be upgraded to reflect the revised intersection geometry. With these measures, operations will improve and will be better than the No-Build conditions with the in-fill of the existing site during the weekday morning and evening peak hours. These measures are also shown on the preliminary Conceptual Improvement Plan, Figure 3-40.

3.5.3 Improvements – Site Access

Route 20 at the Site Driveway – The existing intersection geometry will need to be modified to safely and efficiently accommodate the projected site-generated traffic and cut-through traffic associated with the internal connector road. A roundabout was assessed to determine if implementation at the intersection of Route 20 and the proposed site driveway with and without a potential relocated Russell's Garden Center driveway would be feasible. A roundabout was discounted because there is not sufficient right-of-way to construct (Route 20 right-of way is fifty (50) feet wide in the vicinity of the proposed site driveway. Analyses performed for the Build conditions indicate that the roundabout would fail, with lengthy queues on Route 20. Further analyses indicate that Route 20 would need to be widened to provide two lanes per direction entering the roundabout, which would require property beyond the Proponent's control. The roundabout analyses are contained in Appendix A.

Conventional improvement measures were then reviewed. Based on the analyses performed, the Route 20 eastbound approach should be widened to accommodate a single exclusive left-turn lane and a through travel lane. A review of the projected traffic volumes indicate an exclusive left-turn lane is warranted. The Route 20 westbound approach should be widened to accommodate a through travel lane and an exclusive right-turn lane. The site driveway approach to Route 20 should provide separate left- and right-turn lanes. Based on projected traffic volumes, a signal is warranted at this intersection (Warrant analysis in Appendix A) and should be installed. Approximately 400 feet east of the site driveway, there will be a right-turn out only driveway to Route 20 westbound. This driveway should be placed under STOP-sign control. These measures are shown on the preliminary Conceptual Improvement Plan, Figure 3-41.

Further, a second option has been reviewed. It is recommended that the proposed site driveway intersection be aligned opposite a new driveway to Russell's Garden Center which would be brought under traffic signal control. By constructing a new driveway to serve Russell's Garden Center, the existing wide and uncontrolled curb cut along the south

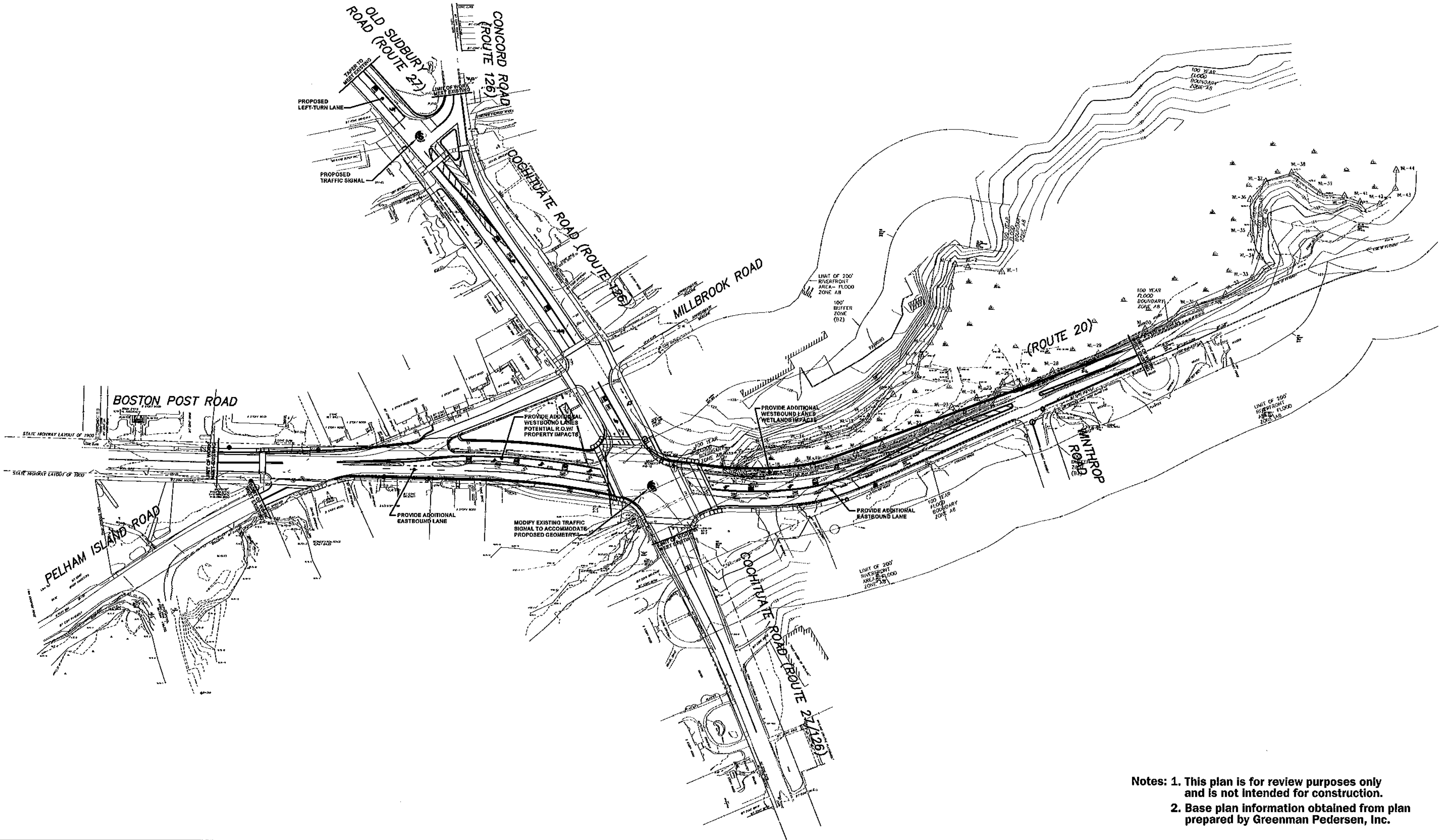

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Figure 3-40

Preliminary Conceptual Improvement Plan Route 20 at Routes 27/126 Access Alternative B

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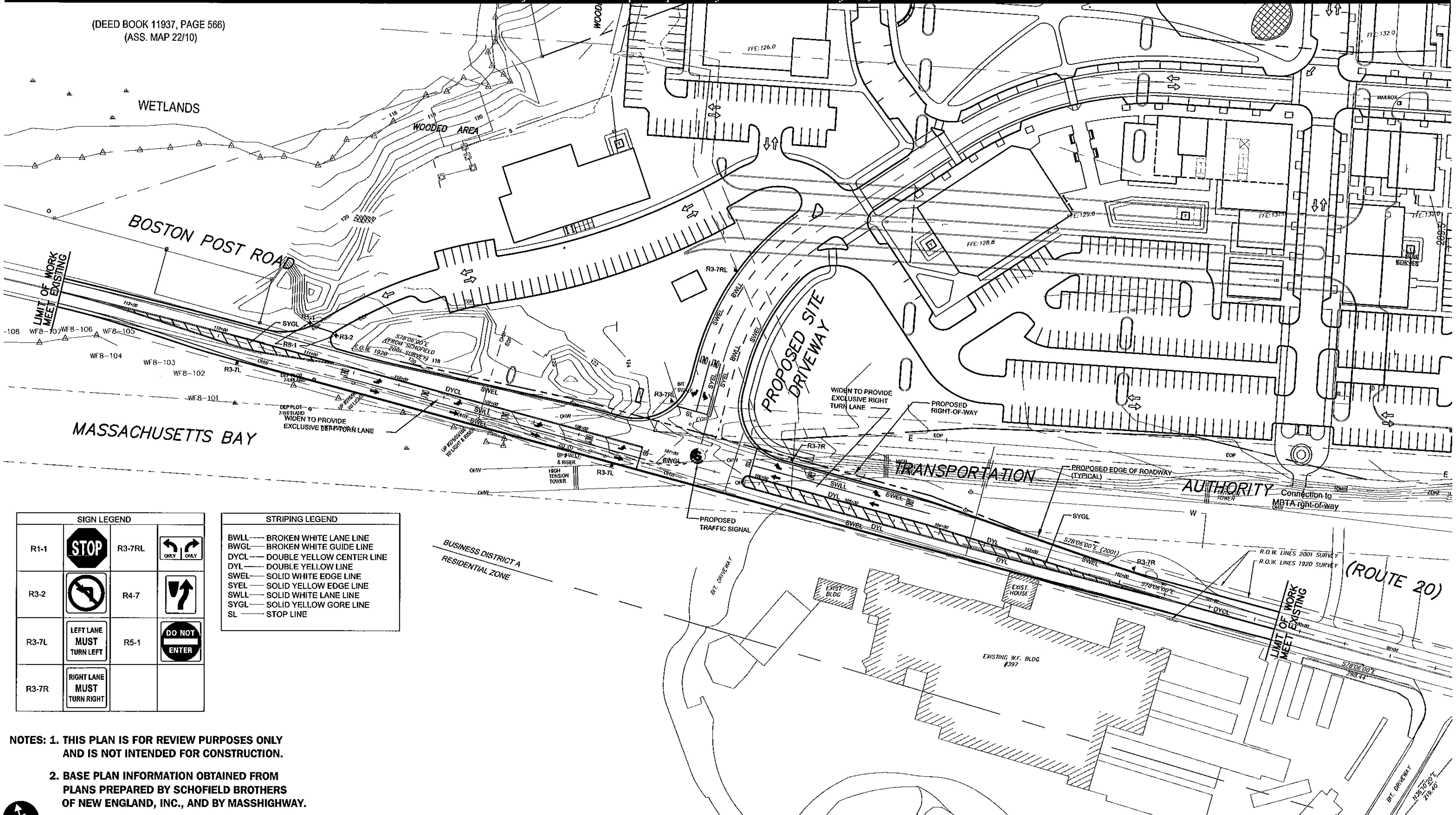

SIGN LEGEND			
R1-1	STOP	R3-7RL	ONLY ONLY
R3-2		R4-7	
R3-7L	LEFT LANE MUST TURN LEFT	R5-1	DO NOT ENTER
R3-7R	RIGHT LANE MUST TURN RIGHT		

STRIPING LEGEND	
BWLL	BROKEN WHITE LANE LINE
BWGL	BROKEN WHITE GUIDE LINE
DYCL	DOUBLE YELLOW CENTER LINE
DYL	DOUBLE YELLOW LINE
SWEL	SOLID WHITE EDGE LINE
SYEL	SOLID YELLOW EDGE LINE
SWLL	SOLID WHITE LANE LINE
SYGL	SOLID YELLOW GORE LINE
SL	STOP LINE

NOTES: 1. THIS PLAN IS FOR REVIEW PURPOSES ONLY AND IS NOT INTENDED FOR CONSTRUCTION.

2. BASE PLAN INFORMATION OBTAINED FROM PLANS PREPARED BY SCHOFIELD BROTHERS OF NEW ENGLAND, INC., AND BY MASSHIGHWAY.

N 0 50 100 Scale in Feet

Figure 3-41

Preliminary Conceptual Improvement Plan Route 20 at Proposed Site Driveway

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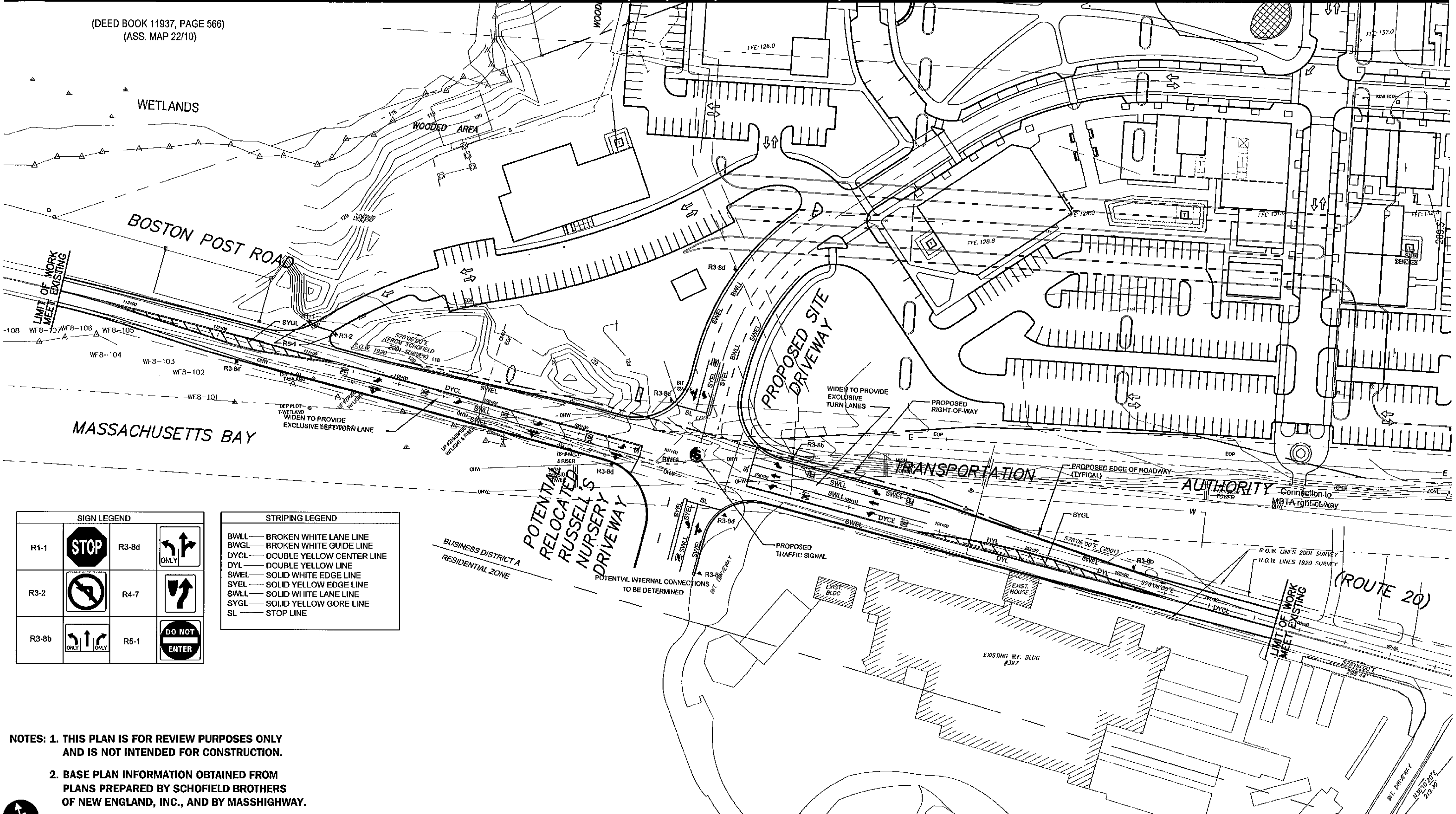
side of Route 20 (for Russell's Garden Center) can be closed, significantly reducing vehicular conflicts along this section of Route 20. A preliminary conceptual improvement plan, showing modifications at this driveway location, is also included at the end of this report. These measures are shown on the preliminary Conceptual Improvement Plan, Figure 3-42.

Route 27 at the Site Driveway – The existing intersection geometry will need to be modified to safely and efficiently accommodate the projected site-generated traffic and by-pass traffic associated with the internal connector road. Specifically, the Route 27 northbound approach should be widened to accommodate an exclusive left-turn lane and a through travel lane. A review of the projected traffic volumes indicate an exclusive left-turn lane is warranted. The Route 27 southbound approach should be widened to accommodate a through travel lane permitting right-turns. The site driveway approach to Route 27 should provide separate left–and right-turn lanes. Further, it is recommended that signal conduit and foundations be installed at this intersection such that when warranted, the intersection would be brought under traffic signal control. A preliminary Conceptual Improvement Plan is shown on Figure 3-43. This plan also shows potential driveway locations of the site driveways for the neighboring Wayland Commons condominium development. By providing these connections, there will be fewer driveways to Route 27 which will reduce the potential for vehicular conflicts.

The results of the mitigation capacity analyses are summarized in Table 3-26 for Access Alternative A and in Table 3-27 for Access Alternative B.



SIGN LEGEND			
R1-1	STOP	R3-8d	ONLY
R3-2		R4-7	
R3-8b	ONLY ONLY	R5-1	DO NOT ENTER

STRIPING LEGEND	
BWLL	BROKEN WHITE LANE LINE
BWGL	BROKEN WHITE GUIDE LINE
DYCL	DOUBLE YELLOW CENTER LINE
DYL	DOUBLE YELLOW LINE
SWEL	SOLID WHITE EDGE LINE
SYEL	SOLID YELLOW EDGE LINE
SWLL	SOLID WHITE LANE LINE
SYGL	SOLID YELLOW GORE LINE
SL	STOP LINE

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2. BASE PLAN INFORMATION OBTAINED FROM PLANS PREPARED BY SCHOFIELD BROTHERS OF NEW ENGLAND, INC., AND BY MASSHIGHWAY.

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Figure 3-42

Preliminary Conceptual Improvement Plan Route 20 at Proposed Site Driveway/Relocated Russell's Garden Center Driveway

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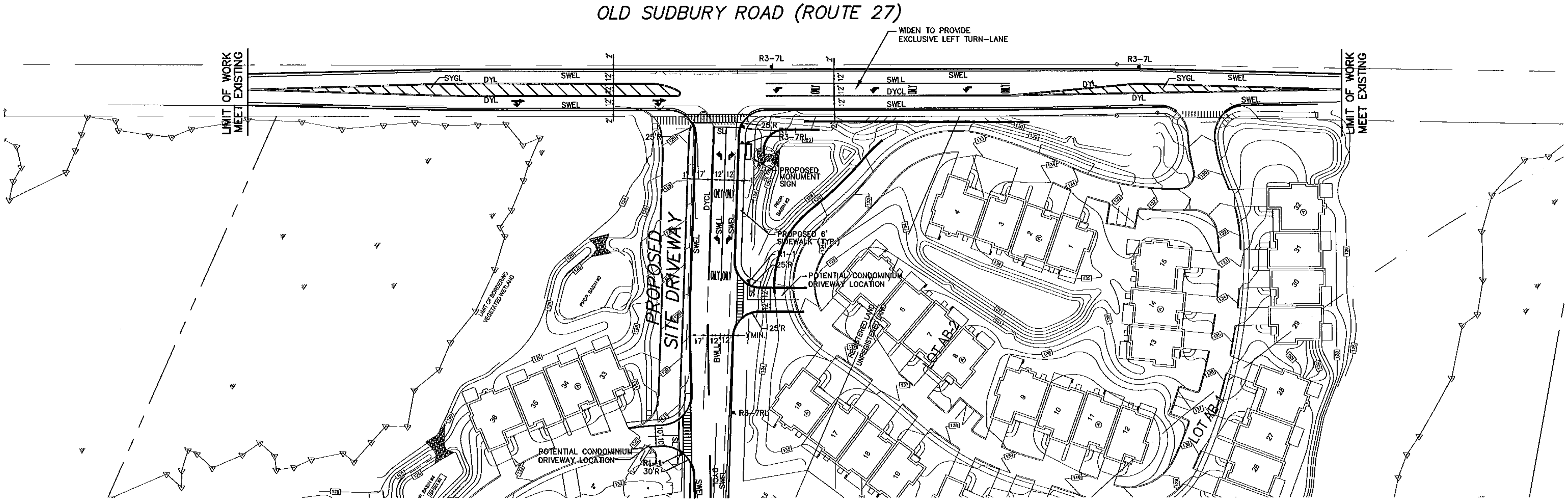

STRIPING LEGEND
BWLL — BROKEN WHITE LANE LINE
BWGL — BROKEN WHITE GUIDE LINE
DYCL — DOUBLE YELLOW CENTER LINE
DYL — DOUBLE YELLOW LINE
SWEL — SOLID WHITE EDGE LINE
SYEL — SOLID YELLOW EDGE LINE
SWLL — SOLID WHITE LANE LINE
SYGL — SOLID YELLOW GORE LINE
SL — STOP LINE

SIGN LEGEND	
R1-1	STOP
R3-7L	LEFT LANE MUST TURN LEFT
R3-7RL	ONLY ONLY

Note: 1. This plan is for review purposes only and is not intended for construction.

Source: 1987 USGS Map

0 50 100 Scale in Feet

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Figure 3-43

Preliminary Conceptual Improvement Plan Route 27 at Proposed Site Driveway

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Table 3-26 Level-of-Service Summary With Mitigation – Access Alternative A

Unsignalized Intersection/ Critical Movement/Peak Hour	2011 No-Build				2011 Build				2011 Build with Mitigation			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 27 at the Site Driveway												
Left turns from Site Driveway:												
Weekday Morning	–	–	–	–	112	0.47	30.9	D	–	0.49	7.6	A
Weekday Evening	–	–	–	–	182	1.83	474.3	F	–	0.83	17.4	B
Saturday Midday	–	–	–	–	191	1.31	233.2	F	–	0.73	13.2	B
Sunday Midday	–	–	–	–	149	0.46	23.5	C	–	0.41	6.9	A
Route 27 at Route 126												
All movements from Route 126												
Weekday Morning	322	2.04	524.0	F	286	1.23	166.0	F	–	0.66	11.3	B
Weekday Evening	353	8.21	>999.9	F	394	6.41	>999.9	F	–	0.80	20.4	C
Saturday Midday	352	1.29	187.0	F	411	1.69	357.9	F	–	0.58	17.2	B
Sunday Midday	244	1.01	94.5	F	276	1.42	253.8	F	–	0.55	10.3	B
Route 27/Route 126 at Pelham Island Road/ Millbrook Road												
All movements from Millbrook Road:												
Weekday Morning	97	15.80	>999.9	F	94	4.74	>999.9	F	94	1.49	339.4	F
Weekday Evening	89	11.13	>999.9	F	95	5.82	>999.9	F	95	2.43	801.0	F
Saturday Midday	75	2.15	701.2	F	84	2.11	664.8	F	84	1.04	164.2	F
Sunday Midday	35	0.49	80.0	F	40	0.67	122.8	F	40	0.33	40.4	E

See notes at end of table.

Table 3-26 (Continued) Level-of-Service Summary With Mitigation – Access Alternative A

Signalized Intersection/Peak Hour	2011 No-Build			2011 Build			2011 Build with Mitigation		
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Route 20 at Route 27/Route 126									
Weekday Morning	1.13	101.2	F	0.94	80.5	F	1.02	53.9	D
Weekday Evening	1.22	129.3	F	1.16	118.0	F	1.23	111.1	F
Saturday Midday	0.99	64.0	E	1.12	105.1	F	1.23	89.2	F
Sunday Midday	0.81	39.8	D	0.91	48.8	D	0.98	38.2	D

[a]Demand (in vehicles per hour) for the critical movements.
[b]Volume-to-capacity ratio.
[c]Average delay per vehicle (in seconds).
[d]Level-of-service.

Table 3-27 Level-of-Service Summary With Mitigation – Access Alternative B

Unsignalized Intersection/ Critical Movement/Peak Hour	2011 No-Build				2011 Build				2011 Build with Mitigation			
	Demand[a]	V/C[b]	Delay[c]	LOS[d]	Demand	V/C	Delay	LOS	Demand	V/C	Delay	LOS
Route 27 at Route 126												
All movements from Route 126:												
Weekday Morning	322	2.04	524.0	F	286	1.48	275.8	F	–	0.68	10.8	B
Weekday Evening	353	8.21	>999.9	F	394	5.08	>999.9	F	–	0.96	29.0	C
Saturday Midday	352	1.29	187.0	F	411	1.64	334.7	F	–	0.65	11.7	B
Sunday Midday	244	1.01	94.5	F	277	1.26	181.8	F	–	0.53	11.9	B
Route 27/Route 126 at Pelham Island Road/ Millbrook Road												
All movements from Millbrook Road:												
Weekday Morning	97	15.80	>999.9	F	94	8.57	>999.9	F	94	1.98	574.6	F
Weekday Evening	89	11.13	>999.9	F	95	24.3	>999.9	F	95	5.45	>999.9	F
Saturday Midday	75	2.15	701.2	F	84	4.99	>999.9	F	84	1.86	541.6	F
Sunday Midday	35	0.49	80.0	F	40	0.87	197.6	F	40	0.34	42.8	E

See notes at end of table.

Table 3-27 (Continued) Level-of-Service Summary With Mitigation – Access Alternative B

Signalized Intersection/Peak Hour	2011 No-Build			2011 Build			2011 Build with Mitigation		
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Route 20 at Route 27/Route 126									
Weekday Morning	1.13	101.2	F	1.02	89.4	F	0.90	45.0	D
Weekday Evening	1.22	129.3	F	1.46	172.8	F	1.21	97.6	F
Saturday Midday	0.99	64.0	E	1.41	149.3	F	1.09	65.3	E
Sunday Midday	0.81	39.8	D	1.24	110.6	F	1.05	68.0	E

[a]Demand (in vehicles per hour) for the critical movements.
[b]Volume-to-capacity ratio.
[c]Average delay per vehicle (in seconds).
[d]Level-of-service.

3.5.3.1 *Traffic Calming Measures*

Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users20. Four types of measures are generally used and include vertical deflections, horizontal shifts in alignment, roadway narrowings and roadway closures. Vertical deflections, horizontal shifts in alignment and roadway narrowings are intended to reduce speed and enhance the street environment for non-motorists. Closures (diagonal diverters, half closures, full closures, and median barriers) are intended to reduce cut-through traffic by obstructing traffic movements in one or more directions.

To reduce the use of Glezen Lane, Bow Road and other local streets by residents of the Wayland Town Center project, and to slow travel speeds through these residential areas, appropriate traffic calming measures should be implemented. Suggested measures include:

- Reducing the width of the Glezen Lane between Route 27 and Training Field Road to 18 to 20 feet over a distance of approximately 100 feet to slow vehicle travel speeds.
- Modify flow through the Glezen Lane and Training Field Road intersection into a triangular shaped round-a-bout, as shown on Figure 3-44.
- Reducing the width of the Glezen Lane between Route 126 and Moore Road to 18 to 20 feet over a distance of approximately 100 feet to slow vehicle travel speeds.
- Making a portion of Glezen Lane at Route 126 one-way, as well as a section of Moore Road one-way to reduce cut-through potential, as shown on Figure 3-45.
- Reducing the width of the Bow Road between Route 27 and Route 126 to 16 to 18 feet over a distance of approximately 100 feet to slow vehicle travel speeds.
- Potential consideration of round-a-bouts, depending on availability of right-of-way.

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[20] I. M. Lockwood, "ITE Traffic Calming Definition," *ITE Journal*, Vol. 67, July 1997, pp. 22-24.

Figure 3-44

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Conceptual Improvements Glezen Lane and Training Field Road

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Figure 3-45

Conceptual Improvements Glezen Lane and Moore Road

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- Speed tables to slow down vehicles.

- Peak hour turn restrictions.

- Selective speed enforcement on troublesome road sections.

- Decorative side friction devices to reduce speeds (fences, stone walls, etc.).

Shown on Figures 3-44 and 3-45 are suggestions for measures to assist in the reduction of cut-through traffic. Shown on Figure 3-44 is the intersection of Glezen Lane and Training Field Road which could be modified into a triangular shaped roundabout. This would have a minor impact on several residential driveways, bur would force cut-through traffic in a roundabout fashion and take more time to cut-through. Shown on Figure 3-45 is a suggestion of making Glezen Lane and a portion of Moore Road one-way in an easterly direction at Route 126. This would eliminate cut-through traffic during the weekday evening peak hour.

These restrictions should be designed in a location where appropriate lines of sight are available to allow motorists approaching the restriction to have clear lines of sight. Appropriate warning signs (for example, ROAD NARROWS, YIELD TO ONCOMING TRAFFIC, and DO NOT BLOCK INTERSECTION) and pavement markings should be installed in advance of the restriction.

Additional suggested measures include:

- Terminating one end of Bow Road such that Bow Road becomes a dead-end roadway.

- Make Bow Road a one-way roadway.

These suggested traffic calming measures can be combined or selected individually to produce the desired effect of reducing travel speeds on Glezen Lane and diverting traffic from the usage of local residential streets to the main collector roadways. All traffic calming measures should be reviewed by the Town of Wayland Fire Department to ensure that timely and efficient emergency vehicle response is maintained to the residents of Glezen Lane and Bow Road.

In addition, several minor street intersection approaches to either Routes 27 or 126 do not have STOP signs. This includes River Road and Winthrop Road. STOP signs should be installed on these roadways.

3.5.3.2 Pedestrian Measures

The project Proponent is also committed to provide pedestrian access to the site. The project Proponent will donate $250,000 to the Town of Wayland for the purpose of constructing a walkway/bikeway along the existing MBTA right-of-way south of the site. The project Proponent is also committed to provide access to the site from this walkway/bikeway, as well as to work with property owners south of the MBTA right-of-way to provide pedestrian access to Route 20.

3.5.3.3 Transportation Demand Management

To reduce single occupant vehicles (SOV) traveling to and from the site, and to encourage the use of alternative modes of transportation to reach the site, the project Proponent has committed to implement a Transportation Demand Management (TDM) program as an integral part of the proposed project. A TDM program also encourages the use of alternative modes of transportation to reach the site. The Proponent will assign responsibility for implementing the TDM program to a Transportation Manager. The core of successful TDM strategies are ridesharing, public transportation, bicycling, and pedestrian travel, and are discussed below.

Ridesharing Programs – Ridesharing refers to encouraging commuters to ride in vehicles with other commuters rather than drive alone to work. The most common forms of ridesharing are carpool and vanpools. The benefits of such programs include less congestion, reduced fuel consumption, and better air quality. The program will include:

- Newsletters about the program;
- Coordination with MassRides, which leases commuter vans and provides administrative and organizational assistance; and
- In addition, the Proponent will evaluate the demand for a shared car service, such as ZipCar, to lessen the need for residents to own cars.
- Participation with MassRides, the region's commute management program, in ridesharing program, promotion of transit, and other "commuter choice" programs.
- Join the Metro West/495 Transportation Management Agency (TMA)

Shuttle Service –The Proponent is committed to implement ridesharing programs and to coordinate ridesharing efforts with other local businesses. The Proponent will also promote the use of and consider providing shuttle bus service for a nominal fee (to be determined subject to appropriate approvals). The route could run from the site to the MBTA's Lincoln station (Fitchburg Line) or the MBTA's Natick station (Framingham/Worcester Line), the closest two MBTA commuter rail stations. The shuttle service would solely be for the residents and employees of Wayland Town Center. The shuttle could also provide service to Wayland, including the downtown, shopping opportunities and medical offices. It is expected that the shuttle could loop from the site to the MBTA commuter rail stations primarily during the morning and evening peak periods. During midday hours, the shuttle could either have a fixed schedule, making trips to the other retail opportunities along Route 20, or could be as an on-call service for residents for specific purposes, such as doctors visits off-site. A schedule for the shuttle bus would to be determined, as it will largely be determined by the expressed demand of residents and employees. However, at a minimum, it is anticipated that there will be regularly scheduled pick-ups and drop-offs at either of the two MBTA commuter stations during the hours of 6:00 to 9:00 AM and 4:00 to 7:00 PM, so as to coincide with the anticipated shift changes for employees. Scheduling beyond this will be determined by resident and employee need.

Bicycle Facilities -- To encourage bicycle commuting to and from the site, the Proponent will install bicycle racks as a part of the project. Connections to the rail trail will also be explored.

3.5.4 Projected Vehicle Queues

At the Route 20, Route 27 and Route 126 intersections, the projected vehicular queues were determined and are tabulated in Tables 3-28 through 3-31. The projected queues are also shown graphically on Figures 3-46 through 3-51.

Table 3-28 Vehicle Queue Analysis – Access Alternative A, Route 27 at Route 126

	Queue Length in Feet				
	2006 Existing	2011 No-Build	2011 Build	2011 Build w/Mitigation	
Peak Hour/Approach/Lane Group	95th Percentile	95th Percentile	95th Percentile	Average	95th Percentile
Weekday Morning Peak Hour:					
Route 27 Southbound:					
All movements	0	2	2	--	--
Left turns	--	--	--	2	9
Through movements	--	--	--	123	218
Route 27 Northbound:					
Through movements	0	0	0	32	66
Right turns	0	0	0	0	42
All movements	--	--	--	--	--
Route 126 Westbound:					
All movements	311	756	407	85	136
Weekday Evening Peak Hour:					
Route 27 Southbound:					
All movements	0	12	14	--	--
Left turns	--	--	--	20	34
Through movements	--	--	--	218	237
Route 27 Northbound:					
Through movements	0	0	0	232	220
Right turns	0	0	0	0	0
All movements	--	--	--	--	--
Route 126 Westbound:					
All movements	777	NC	NC	310	375
Saturday Midday Peak Hour:					
Route 27 Southbound:					
All movements	0	1	7	--	--
Left turns	--	--	--	15	38
Through movements	--	--	--	134	246
Route 27 Northbound:					
Through movements	0	0	0	92	166
Right turns	0	0	0	0	36
All movements	--	--	--	--	--
Route 126 Westbound:					
All movements	216	465	722	195	270

Table 3-29 Vehicle Queue Analysis – Access Alternative A, Route 20 at Route 27/126

	Queue Length in Feet							
	2006 Existing		2011 No-Build		2011 Build		2011 Build w/Mitigation	
Peak Hour/Approach/ Lane Group	Average	95th Percentile	Average	95th Percentile	Average	95th Percentile	Average	95th Percentile
Weekday Morning Peak Hour:								
Route 20 Eastbound:								
Left turns	–	–	177	356	66	125	–	–
Through movements	–	–	718	981	730	1,011	–	–
Right turns	–	–	53	102	56	103	–	–
All movements	274	423	–	–	–	–	353	482
Route 20 Westbound:								
Left turns	–	–	30	59	30	59	–	–
Through movements	–	–	904	1,151	740	996	–	–
Right turns	–	–	127	195	76	127	–	–
All movements	329	564	–	–	–	–	249	335
Route 27/126 Southbound:								
Left turns	112	235	140	231	131	227	93	220
Through/right turns	260	444	619	855	549	849	419	644
Route 27/126 Northbound:								
Left turns	79	188	156	256	106	183	69	172
Through/right turns	227	365	611	866	500	749	349	565
Weekday Evening Peak Hour:								
Route 20 Eastbound:								
Left turns	–	–	219	397	69	153	–	–
Through movements	–	–	989	1,264	1,034	1,309	–	–
Right turns	–	–	89	143	83	141	–	–
All movements	326	562	–	–	–	–	580	717
Route 20 Westbound:								
Left turns	–	–	16	37	16	37	–	–
Through movements	–	–	900	1,147	860	1,108	–	–
Right turns	–	–	152	231	157	239	–	–
All movements	432	716	–	–	–	–	326	426
Route 27/126 Southbound:								
Left turns	165	239	230	378	171	257	174	280
Through/right turns	195	281	474	672	485	661	304	510
Route 27/126 Northbound:								
Left turns	54	141	103	176	138	228	108	267
Through/right turns	351	586	850	1,101	888	1,141	673	910
Saturday Midday Peak Hour:								
Route 20 Eastbound:								
Left turns	–	–	205	423	78	149	–	–
Through movements	–	–	635	975	929	1,215	–	–
Right turns	–	–	83	163	124	209	–	–
All movements	310	545	–	–	–	–	424	554
Route 20 Westbound:								
Left turns	–	–	29	63	20	44	–	–
Through movements	–	–	696	999	1,042	1,285	–	–
Right turns	–	–	85	147	113	175	–	–
All movements	313	491	–	–	–	–	198	264
Route 27/126 Southbound:								
Left turns	77	180	112	167	134	232	86	201
Through/right turns	146	232	319	447	381	519	256	416
Route 27/126 Northbound:								
Left turns	91	210	140	203	197	362	162	325
Through/right turns	143	230	316	457	391	549	278	461

Table 3-30 Vehicle Queue Analysis – Access Alternative B, Route 27 at Route 126

Peak Hour/Approach/ Lane Group	2006 Existing	2011 No-Build	2011 Build	2011 Build w/Mitigation	
	Queue Length in Feet				
	95th Percentile	95th Percentile	95th Percentile	Average	95th Percentile
Weekday Morning Peak Hour:					
Route 27 Southbound:					
All movements	0	2	1	–	–
Left turns	–	–	–	1	5
Through movements	–	–	–	166	267
Route 27 Northbound:					
Through movements	0	0	0	86	132
Left turns	0	0	0	0	0
Through movements	–	–	–	–	–
Route 126 Westbound:					
All movements	311	756	518	91	147
Weekday Evening Peak Hour:					
Route 27 Southbound:					
All movements	0	12	0	–	–
Left turns	–	–	–	0	2
Through movements	–	–	–	116	145
Route 27 Northbound:					
Through movements	0	0	0	206	545
Right turns	0	0	0	0	12
All movements	–	–	–	–	–
Route 126 Westbound:					
All movements	777	NC	NC	122	274
Saturday Midday Peak Hour:					
Route 27 Southbound:					
All movements	0	1	1	–	–
Left turns	–	–	–	1	5
Through movements	–	–	–	123	200
Route 27 Northbound:					
Through movements	0	0	0	90	218
Right turns	0	0	0	0	12
All movements	–	–	–	–	–
Route 126 Westbound:					
All movements	216	465	700	97	265

Table 3-31 Vehicle Queue Analysis – Access Alternative B, Route 20 at Route 27/126

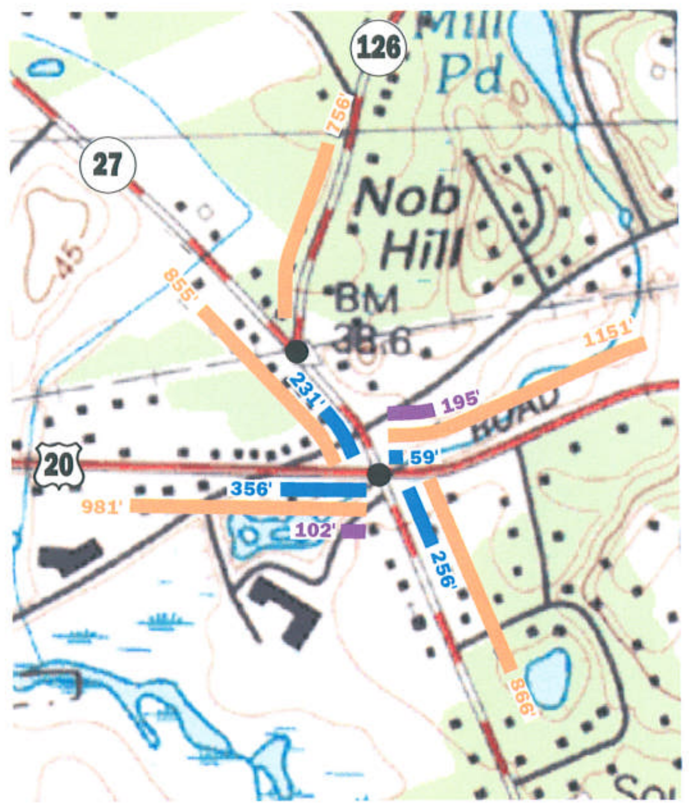
Peak Hour/Approach/Lane Group	Queue Length in Feet							
	2006 Existing		2011 No-Build		2011 Build		2011 Build w/Mitigation	
	Average	95th Percentile	Average	95th Percentile	Average	95th Percentile	Average	95th Percentile
Weekday Morning Peak Hour:								
Route 20 Eastbound:								
Left turns	–	–	177	356	203	394	123	275
Through movements	–	–	718	981	741	1,032	284	362
Right turns	–	–	53	102	57	107	–	–
All movements	274	423	–	–	–	–	–	–
Route 20 Westbound:								
Left turns	–	–	30	59	29	59	23	48
Through movements	–	–	904	1,151	749	1,015	307	421
Right turns	–	–	127	195	72	121	–	–
All movements	329	564	–	–	–	–	–	–
Route 27/126 Southbound:								
Left turns	112	235	140	231	124	213	89	199
Through/Right turns	260	444	619	855	574	832	398	633
Route 27/126 Northbound:								
Left turns	79	188	156	256	118	203	90	221
Through/Right turns	227	365	611	866	474	717	351	535
Weekday Evening Peak Hour:								
Route 20 Eastbound:								
Left turns	–	–	219	297	451	655	298	490
Through movements	–	–	989	1,264	1,117	1,394	421	516
Right turns	–	–	89	143	108	179	–	–
All movements	326	562	–	–	–	–	–	–
Route 20 Westbound:								
Left turns	–	–	16	37	16	37	12	29
Through movements	–	–	900	1,147	1,164	1,420	566	706
Right turns	–	–	152	231	150	221	–	–
All movements	432	716	–	–	–	–	–	–
Route 27/126 Southbound:								
Left turns	165	239	230	378	132	204	129	266
Through/Right turns	195	281	474	672	416	526	375	540
Route 27/126 Northbound:								
Left turns	54	141	103	176	162	278	166	347
Through/Right turns	351	586	850	1,101	801	1,074	699	940
Saturday Midday Peak Hour:								
Route 20 Eastbound:								
Left turns	–	–	205	423	78	149	236	423
Through movements	–	–	635	975	929	1,215	365	506
Right turns	–	–	83	163	124	209	–	–
All movements	310	545	–	–	–	–	–	–
Route 20 Westbound:								
Left turns	–	–	29	69	20	44	12	28
Through movements	–	–	696	999	1,042	1,285	404	525
Right turns	–	–	85	147	113	175	–	–
All movements	313	491	–	–	–	–	–	–
Route 27/126 Southbound:								
Left turns	77	180	112	167	134	232	89	184
Through/Right turns	146	232	319	447	381	519	278	466
Route 27/126 Northbound:								
Left turns	91	210	140	203	197	362	247	437
Through/Right turns	143	230	316	457	391	549	235	383

95th Percentile Queue

- Left-Turn Lane
- Through Lane
- Right-Turn Lane

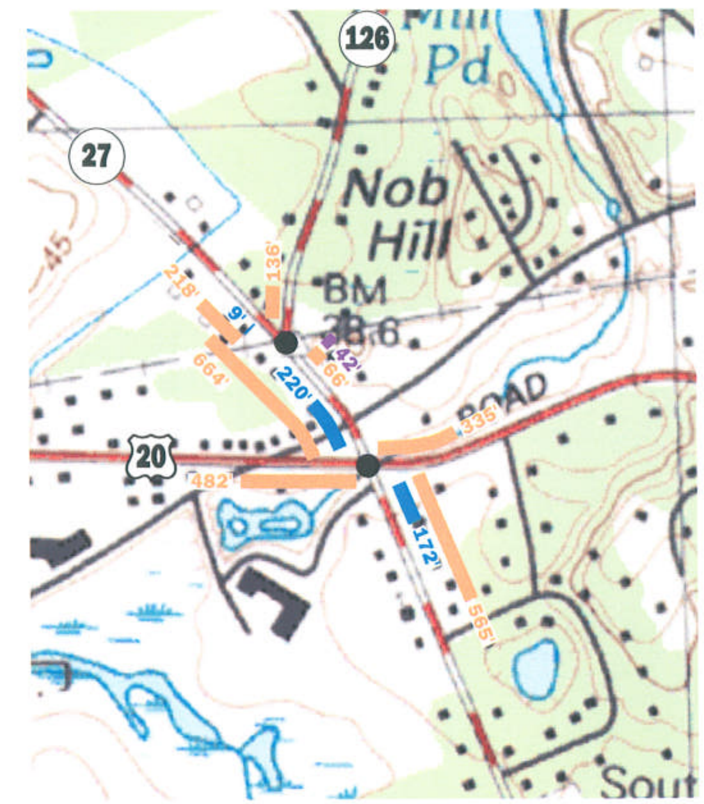
2006 EXISTING

2011 NO-BUILD



2011 BUILD
ACCESS ALTERNATIVE NO. 1

2011 BUILD WITH MITIGATION
ACCESS ALTERNATIVE NO. 1



Source: 1987 USGS Map

0 400 800 Scale in Feet

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Figure 3-46

**Projected Vehicular Queues
Weekday Morning Peak Hour
Access Alternative A**

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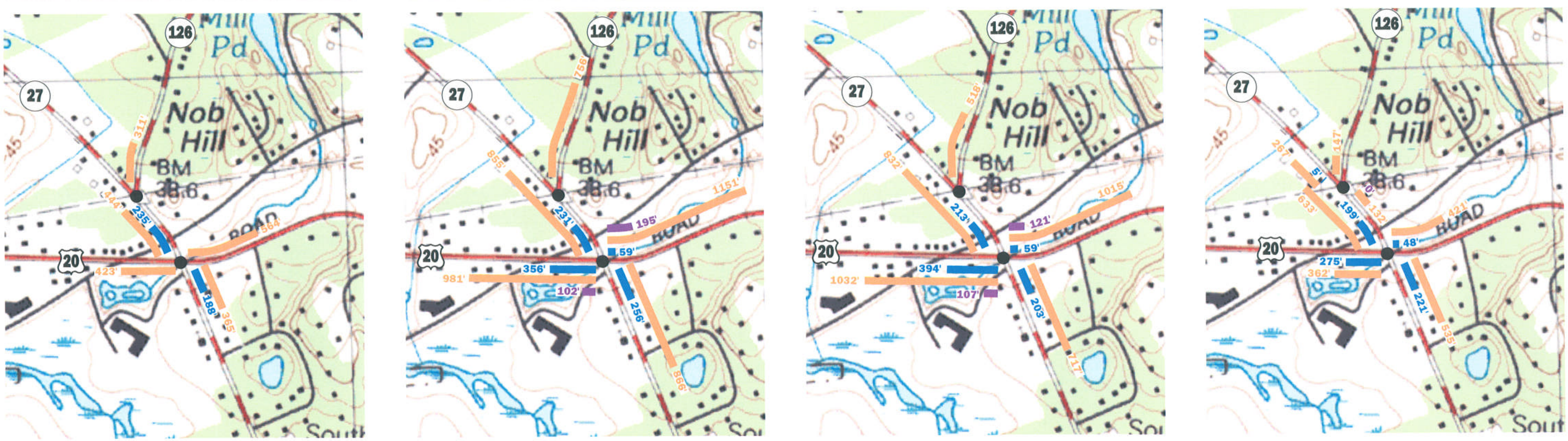
95th Percentile Queue

- Left-Turn Lane
- Through Lane
- Right-Turn Lane

2006 EXISTING | 2011 NO-BUILD | 2011 BUILD ACCESS ALTERNATIVE NO. 2 | 2011 BUILD WITH MITIGATION ACCESS ALTERNATIVE NO. 2



Source: 1987 USGS Map

0 400 800 Scale in Feet

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Figure 3-47

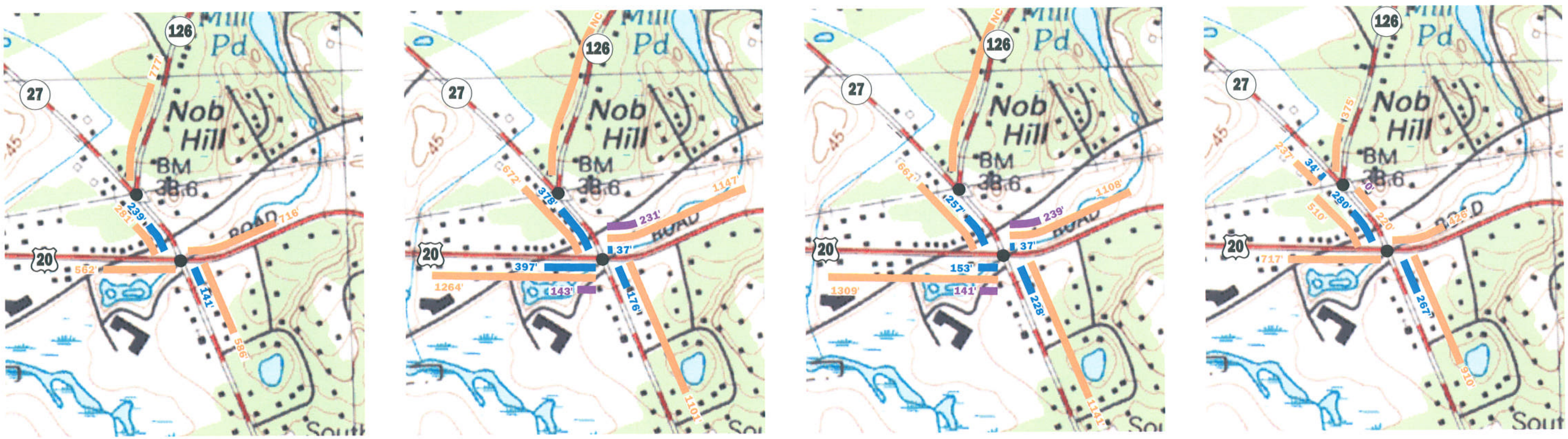
Projected Vehicular Queues Weekday Morning Peak Hour Access Alternative B

R:\4886\DEIR\4886queue2.dwg 11/22/2006 2:54:01 PM EST

95th Percentile Queue

- Left-Turn Lane
- Through Lane
- Right-Turn Lane
- NC: Not Caculated.

2006 EXISTING | 2011 NO-BUILD | 2011 BUILD ACCESS ALTERNATIVE NO. 1 | 2011 BUILD WITH MITIGATION ACCESS ALTERNATIVE NO. 1



Note: NC = Not calculated
Source: 1987 USGS Map

0 400 800 Scale in Feet

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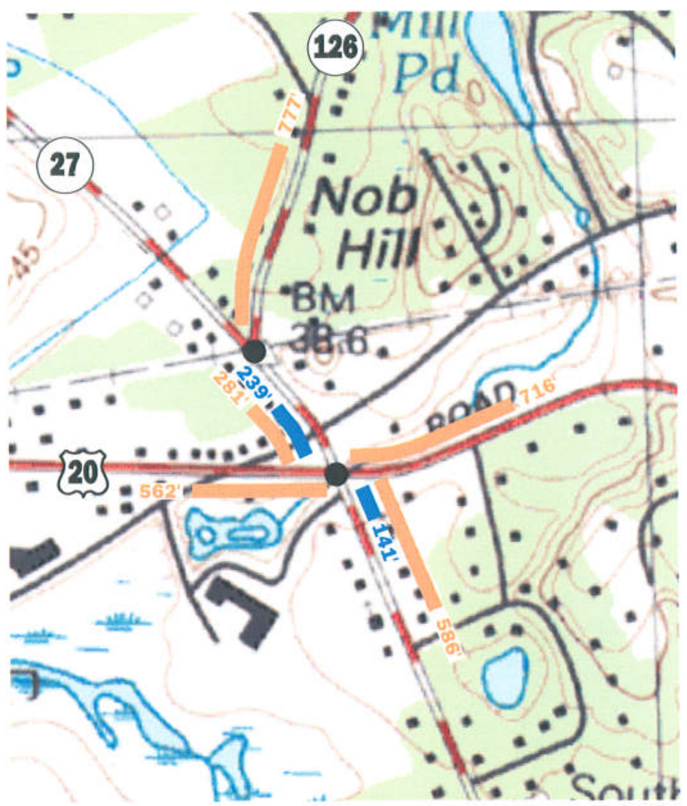
Figure 3-48

Projected Vehicular Queues
Weekday Evening Peak Hour
Access Alternative A

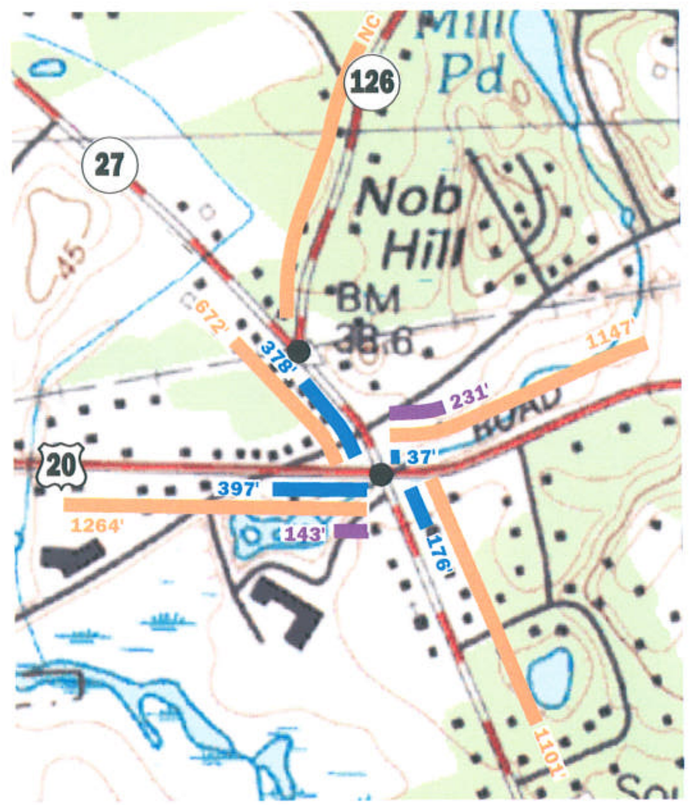
95th Percentile Queue

- Left-Turn Lane
- Through Lane
- Right-Turn Lane
- NC: Not Caculated.

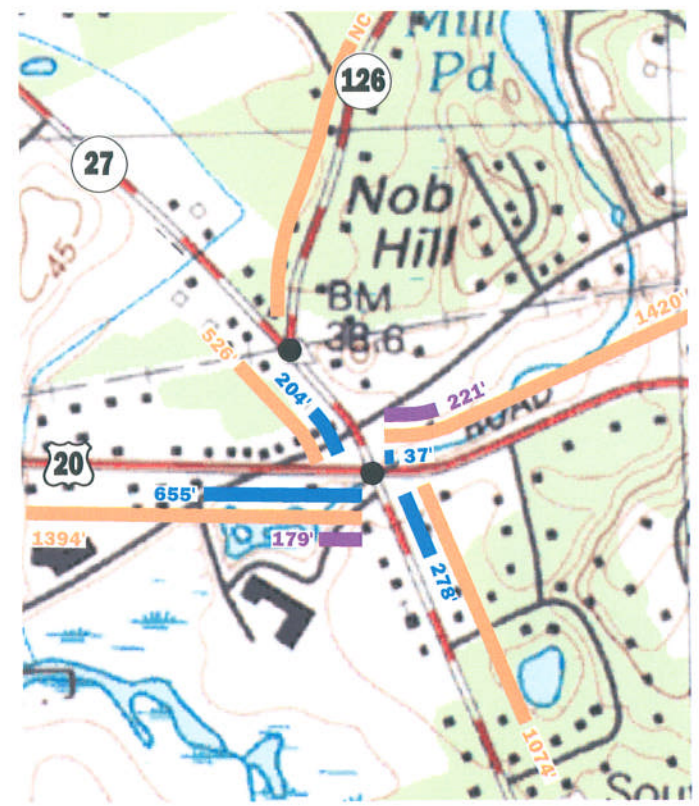
2006 EXISTING



2011 NO-BUILD



2011 BUILD ACCESS ALTERNATIVE NO. 2



2011 BUILD WITH MITIGATION ACCESS ALTERNATIVE NO. 2

Note: NC = Not calculated
Source: 1987 USGS Map

0 400 800 Scale in Feet

Figure 3-49

Projected Vehicular Queues
Weekday Evening Peak Hour
Access Alternative B

Vanasse & Associates, Inc.
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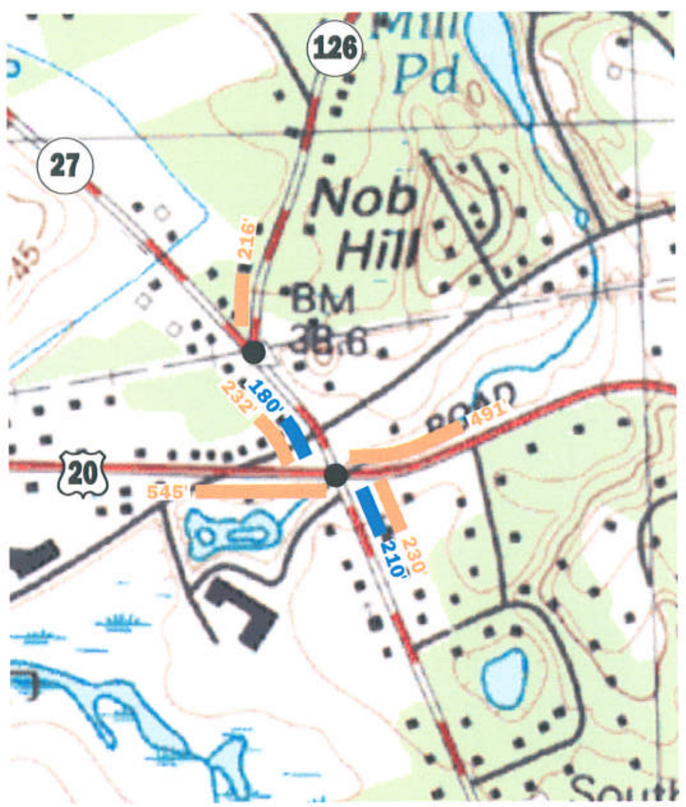
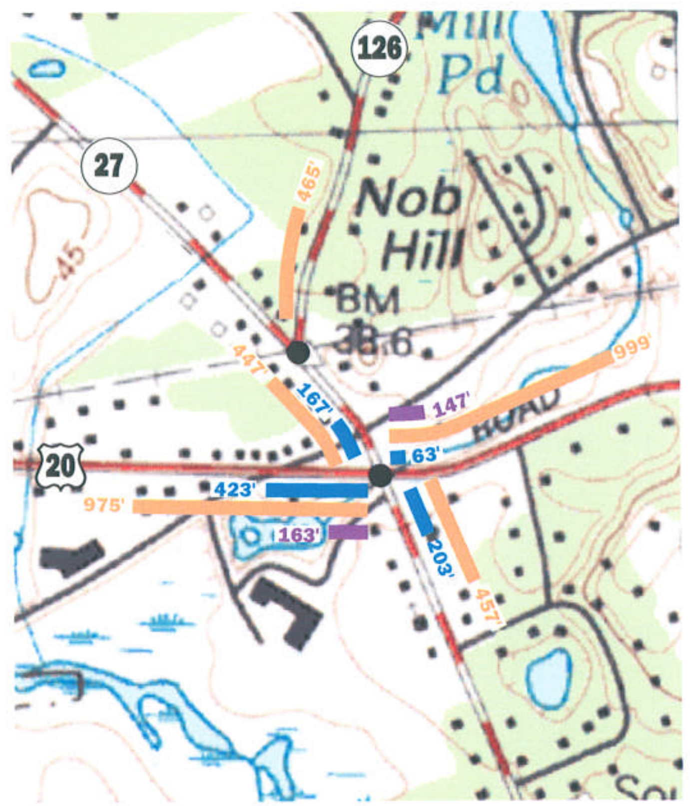
95th Percentile Queue

- Left-Turn Lane
- Through Lane
- Right-Turn Lane

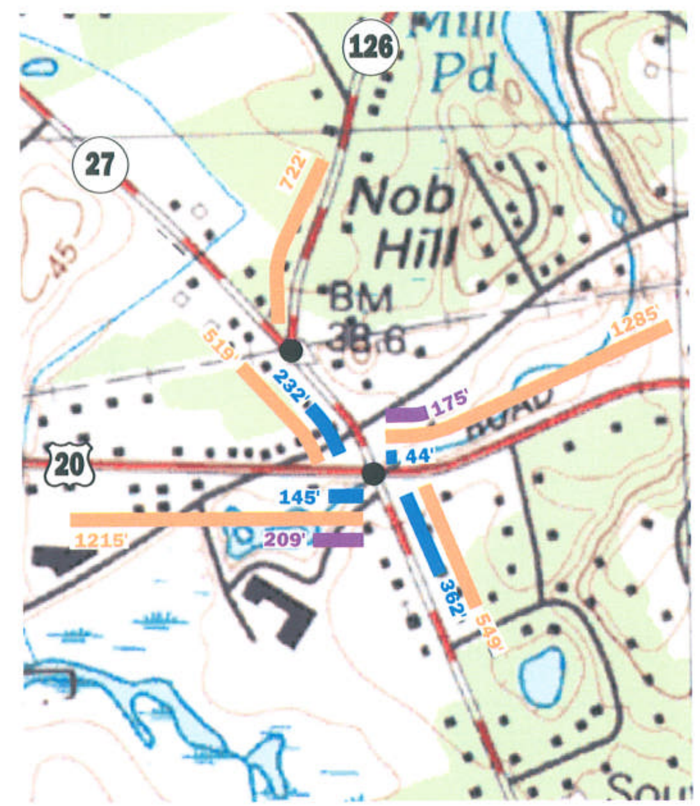
2006 EXISTING



2011 NO-BUILD



2011 BUILD ACCESS ALTERNATIVE NO. 1



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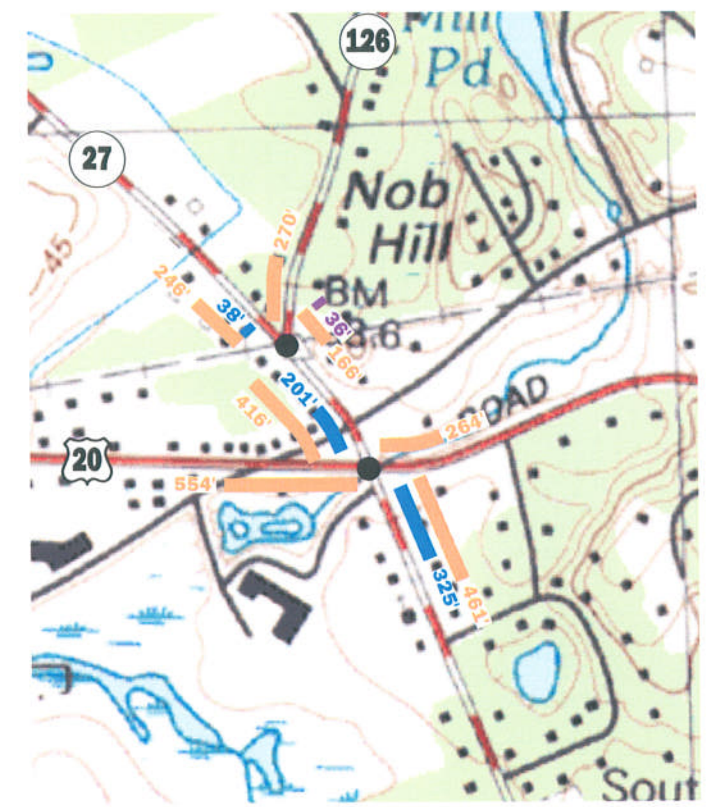

Source: 1987 USGS Map

0 400 800 Scale in Feet

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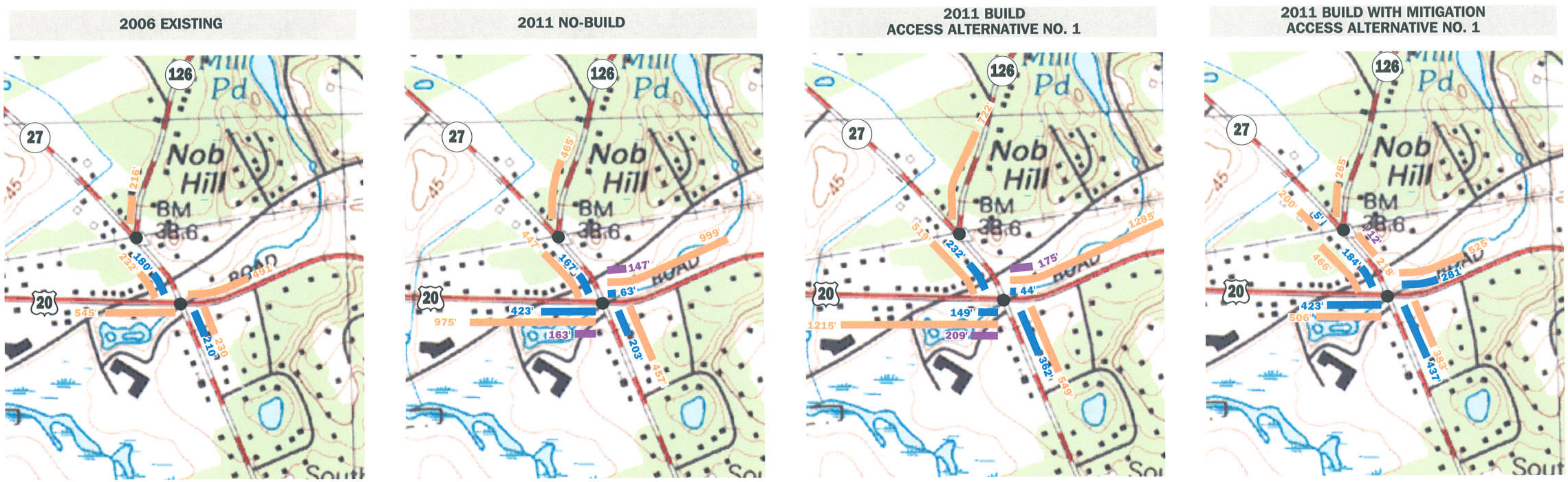
Figure 3-50

Projected Vehicular Queues
Saturday Midday Peak Hour
Access Alternative A

95th Percentile Queue

- Left-Turn Lane
- Through Lane
- Right-Turn Lane



Source: 1987 USGS Map

0 400 800 Scale in Feet

Vanasse & Associates, Inc.
Transportation Engineers & Planners

Figure 3-51

Projected Vehicular Queues
Saturday Midday Peak Hour
Access Alternative B

R:\4886\DEIR\4886queue6.dwg 11/22/2006 2:56:00 PM EST

3.5.5 Construction

3.5.5.1 Construction Period

The construction period will generate truck traffic and construction employee traffic. The construction of the project will involve the use of designated routes, defined in coordination with Town of Wayland staff, prior to the start of construction. The project Proponent will require all contractors to access the site from Route 20. The use of local residential streets will be prohibited. The contractor will establish site trailers and staging areas to minimize impacts on traffic. Trucks will be required to wait in on-site staging areas and will be prohibited from waiting on Route 20.

The project Proponent is also committed to working with Town of Wayland and MassHighway officials to help ensure appropriate maintenance and protection measures are in place during the project's construction. Appropriate traffic maintenance plans will be developed during the off-site improvement design phase.

The off-site construction of the associated transportation improvements and utility relocations will be performed during off-peak travel periods. It is anticipated that traffic patterns would be maintained on any affected roadways at all times and that there would not be a need for a full road closure or detours during the construction period.

3.5.5.2 Environmental Impacts

The proposed improvements to Route 20 at the Route 27 intersection may result in the disturbance of up to 300 feet of bank and between 500 and 3,400 square feet of bordering vegetated wetlands associated with Mill Brook, depending upon the access alternative selected and associated grading and retaining wall requirements. The disturbance area will be comprised of a narrow band of wetland located at the toe of slope of the current roadway bank.

All bordering vegetated wetlands impacted by the proposed roadway improvements will be replicated at a ratio of 1.5 to 1 in an area hydrologically connected to the area of the impact. Per the Development Agreement with the Town of Wayland, the proposed replication area will also be located on town-owned land.

The final need for and identification of a replication area will be determined in coordination with the Town of Wayland Natural Resources department and the Conservation Commission during the Notice of Intent process. In the meantime, a preliminary area meeting the above conditions and the regulatory standards and performance criteria for wetland replication has been identified immediately west of the area proposed for roadway widening (see Section 4.1). This area is located in the same hydrologic environment as the anticipated encroachment area and at a common elevation relative to flood storage mitigation. The replacement area would be constructed near the impacted wetland and along the same elevation to ensure that the functions and values presumed significant under both the state and local wetland regulations are not impaired. Ultimately, the area would be designed so as to enhance site conditions by diversifying the wetland as compared to the impact area through the use of shrub and tree species native to and compatible with those portions of this wetland system that are more removed from the roadway.

3.5.5.3 Land Taking

The identified mitigation does not require land from private landowners to implement. The only land that will be used is located within existing rights of way, or land from the Town of Wayland or the MBTA.

3.5.5.4 Schedule

It is anticipated that the Wayland Town Center project may be constructed in two phases. The identified off-site improvements for the site access, Route 20 and Route 27/Route 126 intersection, and north Wayland intersections will be implemented prior to the occupancy of the project. Occupancy is currently targeted for 2009.

3.5.6 Mitigation Commitment

Following is a summary of the mitigation that has been developed by the project Proponent. These measures have been specifically geared towards mitigating the impacts of the project. These measures will be completed prior to project occupancy. The measures are as follows:

Route 20, Route 27 and Route 126

Replace the existing five lane cross-section on Route 20 at Route 27 and Route 126 with a four-lane cross section. With the four-lane cross section, the lane uses on the Route 20 eastbound and westbound approaches should be designated as a shared through/left-turn lane and a shared through/right-turn lane. Signal equipment modifications would also be necessary to accommodate the revised intersection geometry.

Route 27 and Route 126

Signalize the Route 27 at Route 126 intersection and provide for a coordinated traffic signal system with the signal at Route 20. Vehicle queue detectors should be installed on the Route 27 approaches to Route 126 such that vehicular queues do not extend back to and block Millbrook Road or the proposed Route 27 site driveway.

Route 27, Route 126, and Millbrook Road

As a result of the signalization of Route 27 and Route 126 intersection, and the interconnection with the signal at Route 20, operations at this intersection are projected to improve. This is a result of gaps created by the two signals to allow vehicles to exit Millbrook Road. Do Not Block Intersection signs should be installed on the Routes 27/126 approaches.

Route 20 and Proposed Site Driveway

The existing intersection geometry will need to be modified to safely and efficiently accommodate the projected site-generated traffic and cut-through traffic associated with the internal connector road. Specifically, the Route 20 eastbound approach should be widened to accommodate a single exclusive left-turn lane and a through travel lane. The Route 20 westbound approach should be widened to accommodate a through travel lane and an exclusive right-turn lane. The site driveway approach to Route 20 should provide separate left- and right-turn lanes. Approximately 400 feet east of the site driveway, there will be a right-turn out only driveway to Route 20 westbound. This driveway should be placed under STOP-sign control.

Further, a second option has been reviewed. It is recommended that the proposed site driveway intersection be aligned opposite a new driveway to Russell's Garden Center which would be brought under traffic signal control. By constructing a new driveway to serve Russell's Garden Center, the existing wide and uncontrolled curb cut along the south side of Route 20 (for Russell's Garden Center) can be closed, significantly reducing vehicular conflicts along this section of Route 20. This driveway would be constructed with assistance and approval from Russell's Garden Center.

Route 27 and Proposed Site Driveway

The Route 27 northbound approach should be widened to accommodate an exclusive left-turn lane and a through travel lane. The Route 27 southbound approach should be widened to accommodate a through travel lane permitting right-turns. The site driveway approach to Route 27 should provide separate left- and right-turn lanes. Further, it is recommended that signal conduit and foundations be installed at this intersection such that when warranted, the intersection would be brought under traffic signal control.

Traffic Calming Measures

To reduce the use of Glezen Lane, Bow Road and other local streets by residents of the Wayland Town Center project, and to slow travel speeds through these residential areas, appropriate traffic calming measures should be implemented. These measures have been identified above and with the approval of the Town of Wayland, will be installed.

Traffic Demand Management

The program will include:

- Newsletters about the program;
- Coordination with MassRides which leases commuter vans and provides administrative and organizational assistance; and
- In addition, the Proponent will evaluate the demand for a shared car service, such as ZipCar, to lessen the need for residents to own cars.
- Participation with MassRides, the region's commute management program, in ridesharing program, promotion of transit, and other "commuter choice" programs.
- Join the Metro West/495 Transportation Management Agency (TMA)

The Proponent is committed to providing TDM measures. To this end, the Proponent will assign the Transportation Demand Management responsibilities to the campus transportation manager, who will oversee the various TDM programs.

Shuttle Service

The Proponent will promote the use of and consider providing shuttle bus service. A schedule for the shuttle bus would to be determined, as it will largely be determined by the expressed demand of residents and employees.

Bicycle Facilities

To encourage bicycle commuting to and from the site, the Proponent will install bicycle racks as a part of the project. Connections to the rail trail will also be explored.

Pedestrian Measures

The project Proponent is also committed to provide pedestrian access to the site. The project Proponent will donate $250,000 to the Town of Wayland for the purpose of constructing a walkway/bikeway along the existing MBTA right-of-way south of the site. The project Proponent is also committed to provide access to the site from this walkway/bikeway, as well as to work with property owners south of the MBTA right-of way to provide pedestrian access to Route 20.

3.6 Air Quality Analysis

3.6.1 Introduction

As required by the MEPA Certificate, a mesoscale analysis was performed for the project based on the number of vehicle trips per day ("vtd") generated, which will exceed the 3,000 vtd threshold for a mesoscale analysis. The analysis includes both an estimate of the volatile organic carbon ("VOC") emissions associated with all project-related vehicle trips and a demonstration that the VOC emissions associated with the build condition will be less than those from the existing condition in both the short and long term. In the case where hydrocarbon emissions from the build condition are expected to be greater than the future No-build, the analysis includes identification and review of reasonable and feasible reduction and mitigation measures.

The analysis was conducted consistent with the Massachusetts Department of Environmental Protection ("DEP") mesoscale guidance and other similar projects. The Secretary's Certificate required that the Draft EIR include an air quality analysis to demonstrate compliance with the State Implementation Plan ("SIP").

A mesoscale analysis was performed to assess the total VOCs/nitrogen oxides (NOx) associated with motor vehicle emissions related to the project. Transportation demand management ("TDM") and other mitigation strategies to reduce air quality impacts are described in Section 3.5 of this Draft EIR.

3.6.1.1 Mesoscale Analysis

A mesoscale analysis predicts the change in regional emissions due to the project. The total vehicle pollutant burden was estimated for the no-build and build conditions for the future year 2011 based on the traffic analysis performed by Vanasse & Associates, Inc. The conditions are described in more detail in the Transportation Section 3.4.

For each condition modeled, the EPA MOBILE6.2 computer program was used to estimate motor vehicle emissions of VOC/NOx on the roadway network. Emission estimates derived from MOBILE6.2 for VOCs/NOx are based on the worst case of either wintertime or summertime conditions.

Intersection Selection

Intersection selection criteria for a mesoscale analysis is typically based on the area where the project will affect the surrounding intersections and traffic patterns. For this analysis, twenty seven intersections were included in the analysis based on the traffic study. The intersections are identified in Table 3-18 in Section 3.4.2.

The traffic volumes calculations provided in Section 3.2 and 3.3, and Appendix F form the basis of the air quality study.

Emissions Calculations (MOBILE6.2)

For each case modeled, the EPA MOBILE6.2[21] computer program was used to estimate motor vehicle emissions on the roadway network. Emissions data calculated by the MOBILE6.2 model are based on motor vehicle operations typical of peak periods. The Commonwealth's statewide annual Inspection and Maintenance ("I&M") Program was included, as well as state specific vehicle age registration distribution. The MOBILE6.2 inputs are based on the latest guidance issued by DEP[22] regarding updated inputs to the model. MOBILE6.2 input parameters are provided in the air quality appendix, Appendix F. In addition, emission calculations are presented for the VOC build and no-build scenarios.

The mesoscale analysis predicts the change in regional emissions due to the project. This is accomplished by multiplying changes in traffic flow (in vehicle miles traveled[23]) by an emission factor (grams per vehicle mile traveled). An average vehicle speed of 30 miles per hour ("mph") was used to estimate emissions for all links.

3.6.1.2 Conclusion

Results of the mesoscale analysis are presented in Table 3-32 for the 2011 buildout condition. The results show an increase in daily VOC and NOx emissions for the 2011 build conditions versus the no-build condition for most conditions except the morning time period, where a slight reduction is observed. This could be attributed to higher volumes in the AM associated with the industrial park related traffic at the site for the No-build condition compared to the project.

The 2011 build condition results in a slight decrease in morning VOC/NOx emissions of 6.4 percent, while the evening peak hourly VOC/NOx emissions show an increase of 31 percent. The Saturday and Sunday peak condition results in an increase of 15 percent and 5.3 percent, respectively.

The 2011 build condition results in a decrease of VOC/NOx emissions for all peak periods when compared to the existing conditions due to cleaner, more efficient vehicles.

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21 MOBILE6.2 is an EPA computer model that calculates emission factors for hydrocarbons, carbon monoxide, and oxides of nitrogen form gasoline and diesel fueled highway motor vehicles

22 MADEP: February 12, 2003 memorandum for MOBILE6 inputs for performing microscale and mesoscale analysis. Inputs are based on the latest MOBILE6 inputs from MADEP dated 7/7/2004.

23 Vehicle Miles Traveled (VMT) – the average daily traffic multiplied by the roadway link length.

3.6.1.3 Mitigation Measures and Conclusions

As is required when the mesoscale results show an increase in emissions from the no-build to build conditions, the Proponent has identified and reviewed reasonable and feasible reduction and mitigation measures to address the increase in emissions associated with the 2011 build scenario. Proposed traffic mitigation measures are described in detail in Section 3.5 of this Draft EIR.

Table 3-32 2011 Buildout Mesoscale Analysis Summary

Pollutant	Time	Units	Existing	Full Build	No-Build	BD-NB	% Difference (BD-NB)	BD-Existing	% Difference (BD-existing)
VOC	AM Peak	grams/hr	9,399.5	6,200.3	6,623.0	-422.8	-6.4%	-3199.3	-51.6%
		tons/hr	0.01036	0.00683	0.00730	-0.00047	-6.4%		
		tons/day*	0.104	0.068	0.073	-0.005	-6.4%		
	PM Peak	grams/hr	9977.001	9269.910	7077.310	2,192.6	31.0%	-707.1	-7.6%
		tons/hr	0.01100	0.01022	0.00780	0.00242	31.0%		
		tons/day*	0.110	0.102	0.078	0.024	31.0%		
	SAT Peak	grams/hr	7,276.7	5,943.6	5,179.8	763.8	14.8%	-1333.2	-22.4%
		tons/hr	0.00802	0.00655	0.00571	0.00084	14.8%		
		tons/day*	0.080	0.066	0.057	0.008	14.8%		
	SUN Peak	grams/hr	6,448.6	4,584.1	4,353.7	230.5	5.3%	-1864.4	-40.7%
		tons/hr	0.00711	0.00505	0.00480	0.00025	5.3%		
		tons/day*	0.071	0.051	0.048	0.003	5.3%		

BD = Full Build
NB = No-build
* Tons/day estimated by assuming hourly peak is 10 percent of total volume.

Table 3-32 (Continued) 2011 Buildout Mesoscale Analysis Summary

Pollutant	Time	Units	Existing	Full Build	No-Build	BD-NB	% Difference (BD-NB)	BD-Existing	% Difference (BD-existing)
NOx	AM Peak	grams/hr	22,840.0	13,934.3	14,884.4	-950.1	-6.4%	-8905.67	-63.9%
		tons/hr	0.02518	0.01536	0.01641	-0.00105	-6.4%		
		tons/day*	0.252	0.154	0.164	-0.010	-6.4%		
	PM Peak	grams/hr	24,243.2	20,832.9	15,905.3	4,927.6	31.0%	-3410.28	-16.4%
		tons/hr	0.02672	0.02296	0.01753	0.00543	31.0%		
		tons/day*	0.267	0.230	0.175	0.054	31.0%		
	SAT Peak	grams/hr	17,681.8	13,357.4	11,640.9	1,716.5	14.8%	-4324.41	-32.4%
		tons/hr	0.01949	0.01472	0.01283	0.00189	14.8%		
		tons/day*	0.195	0.147	0.128	0.019	14.8%		
	SUN Peak	grams/hr	15,669.4	10,302.2	9,784.3	518.0	5.3%	-5367.19	-52.1%
		tons/hr	0.01727	0.01136	0.01079	0.00057	5.3%		
		tons/day*	0.173	0.114	0.108	0.006	5.3%		

BD = Full Build
NB = No-build
* Tons/day estimated by assuming hourly peak is 10 percent of total volume.

4.0 Wetlands and Drainage

65 Glenn Street | Lawrence, MA 01843
tel 978.794.1792 | fax 978.794.1793
www.tecmass.com

Mr. Joseph Laydon
Wayland Town Planner
Town Offices
41 Cochituate Road
Wayland, MA 01778

January 8, 2007

Ref: T0124.02

RE: Traffic Engineering Peer Review – Proposed Town Center Project
Mixed Use Overlay District *Traffic Forum / MEPA Filing* Review

Dear Mr. Laydon:

We understand that the Town of Wayland has been working with the project proponent, Twenty Wayland, LLC, ("Proponent") to relay comments on the recently filed Environmental Impact Report submitted to the Executive Office of Environmental Affairs (EOEA) - Massachusetts Environmental Policy Act (MEPA) office. We further understand that the Proponent desires to address many of the traffic issues prior to filing the Master Special Permit (MSP) with the Town's Planning Board. At the Town's request, TEC, Inc. is providing this comment letter as a summary of observations and issues compiled following our review of the following documents for this project:

- Traffic Impact and Access Study – Wayland Town Center – Wayland, MA prepared by Vanasse & Associates, Inc. (VAI) – Received at TEC 12/8/06
- Memorandum from Kenneth P. Cram, P.E. (VAI) to Mr. Frank Doherty (Travel Time Assessment) – 12/8/06

As part of our preliminary review of the above-referenced documents, we have compiled the following comments based on a review of the Planning Board's adopted "Guidelines for the Preparation of a Traffic Impact and Access Study[1]" and general traffic engineering practice.

Conformance to the Traffic Guidelines for Master Special Permit Submission:

In general, the reports submitted satisfy the types of information suggested for a thorough analysis of traffic and parking associated with the proposed project. However, some of the information provided within the report should be expanded and there are

[1] Issued as Attachment D within the Wayland Planning Board's Findings and Determination for the Application of Twenty Wayland, LLC for Concept Plan Determination for Mixed-Use Overlay District Project known as the Wayland Town Center Project (11/8/06)

technical questions surrounding the analysis and conclusions of some of the recently collected data.

The following items from the guidelines should be included as elements of study within the formal MSP submission to the Town:

- Item a: The Parking and Loading Study should detail the parking needs for each specific use with a table and the reference to specific rates and and shared parking recommendations within the referenced publications.
- Item f: The source of data for the estimated hourly distribution of site-generated traffic should be noted and provided within the appendix.
- Item i: The retail traffic distribution should include a gravity model assessment of competing retail opportunities in the area. This will confirm the previous distribution estimate based on the traffic volumes on the adjacent roadways.
- Item j: The report should provide supporting information for the site's occupancy within the past five years prior to filing the MSP.
- Item r: The report should provide projected construction cost estimates for the proposed mitigation items.

Travel Time Assessment:

The travel time assessment was performed by VAI following a scoping discussion with TEC. The following comments should be considered by VAI and the Town as part of the MSP submission:

1. The dates of the travel time runs for Routes 4 and 4A should be noted on the data forms provided within the appendix.
2. The report notes that all routes had a minimum of seven travel time runs. However, it appears that Route 4 had only three runs during the weekday evening peak period. This does not present a concern because this represents an eastbound movement, which is contrary to the primary (westbound) commuter flow during this time period. However, the report should be revised to correct this minor discrepancy.
3. The average duration of the Route 4 runs will be higher than what was depicted within the report summary because four of the seven evening runs were taken only to the intersection of Route 126 / Glezen Lane rather than ending at the intersection of Route 20 / School Street in Weston. This will present data that should present Route 4 as a slightly less desirable route than what was summarized.
4. The report does not adequately summarize the comparison of travel times for common points between the various routes. After significant data review, TEC interpreted the travel times for Route 2, 2A, 3, 3A, 4, and 4A from the intersection of Route 126 / Glezen Lane to assess the risk of cut-through traffic along Glezen Lane and Bow Road (see Table 1 on the following page). The weekday morning peak hour has a limited risk of cut-through traffic associated with traffic generated by the proposed development and therefore was not compiled. The potential for

cut-through traffic during the morning peak hour is related to the delays for commuter traffic on Route 20 eastbound, which is summarized within the report.

Table 1: Travel Times To and From Site Driveway and Route 126 / Glezen Lane

Weekday Evening	(Exiting)		(Entering)	
	Northbound	Time (sec)	Southbound	Time (sec)
	Route 2	241	Route 2A	247
	Route 3	247	Route 3A	277
	Route 4	220	Route 4A	257
Saturday Midday	(Exiting)		(Entering)	
	Northbound	Time (sec)	Southbound	Time (sec)
	Route 2	208	Route 2A	217
	Route 3	169	Route 3A	176
	Route 4	217	Route 4A	149

Route 2 represents travel from the site to the northeast via Bow Road and Route 126; Route 3 represents travel from the site via Library Lane and Route 126; Route 4 represents travel via Glezen Lane. The "A" Route suffix represents the reverse flow of the numbered route.

During the weekday evening peak period, travel both to and from the site is quickest via Glezen Lane and Bow Road (Routes 2 and 4) instead of staying of Route 126. Travel to the site during the Saturday midday peak period is slightly quicker by using Glezen Lane (Route 4). The travel time via Route 126 will be reduced following the installation of the proposed traffic signal at the intersection of Routes 27/126 and the suggested change in one-way operation of Library Lane. However, there is a distinct possibility of cut-through traffic for traffic originating from or destined for the northeast.

Some of the options to discourage the cut-through traffic are discussed within the VAI report and other options are presented later within this letter.

5. The travel time summary provided within the VAI report shows that travel to the east (further along Route 20 closer to Route 128) from the site's easterly driveway is quicker via several local roadways instead of traveling south on Routes 27/126 and then turning left onto Route 20 eastbound during the weekday morning peak period. The reverse is true for westbound traffic destined for the site during the weekday evening peak period. However, the report concludes that there is no need to change the original traffic distribution estimates submitted a few days prior even though the local streets can save as much as 2 to 3 minutes for commuters.

   Although there is a limit to the amount of traffic that would actually benefit from the use of the potential cut-through routes, TEC has provided a preliminary estimate of a range for traffic volumes based on the data supplied to date:

Table 2: Estimated Cut-Through Trips from Town Center Project
Using Glezen Lane or Bow Road

Proposed Land Use	Morning	Evening	Saturday / Sunday
Residential	15-20	20-25	5-10
Retail	10-15	50-75	50-75
Municipal / Office	5-10	25-30	25-30
Total	30-45	95-130	60-115

The totals listed above consider both trips to and from the proposed development; it assumes approximately 25% of the traffic on Route 20 from the east as well as traffic from Route 126 (North) will be attracted to the cut-through routes. This level of traffic is certainly higher than exists today, but it does not appear to be an insurmountable level of traffic to mitigate, especially when considering that they could be distributed via several roadways. VAI proposed several traffic-calming or trip diversionary measures within the TIAS and several are discussed in latter sections of this letter.

Traffic Impact and Access Study (TIAS)

6. *The TIAS presents a thorough compilation of traffic data from MassHighway and the Town of Wayland Police Department as previously requested.*
7. *The reference to sight distance for the proposed site driveway intersections with Routes 20 and 27 suggest the need to keep established set-backs for landscaping. There should be no other features such as walls or signs located to impair sight distance.*
8. *There are noted deficiencies in Intersection Sight Distance (ISD) at the following intersections:*
    - *Route 27 / River Road*
    - *Route 27 / Bow Road*
    - *Route 126 / Moore Road*
    - *Route 27 / Winthrop Road*
    - *Glezen Lane (w) / Training Field Road*
    - *Glezen Lane / Moore Road*
    - *Glen Road / Plain Road*
    - *Plain Road / Decator Road*

    The TIAS should document the source of the sight distance obstruction and any recommendations for correction.
9. A summary of the Route 126 speed data should be included within Table 3-6.
10. The data for the intersections of Route 27 / Bow Road and Route 126 / Bow Road do not balance well. This discrepancy will affect the analysis and traffic operations for one of the intersections.

11. The description of the existing conditions at the intersection of Routes 20/27/126 is inaccurate, as the reconstruction of this intersection is now substantially complete. However, it is not a critical element requiring edits to the report because the impacts and subsequent mitigation are based on the difference in traffic operations between the future No-Build and Build conditions.
12. The No-Build condition within the TIAS assumes full access to and from the Route 27 access point. This is not consistent with the current permits for the site and prior local approvals. The MSP study should reflect primary access to and from Route 20 for the re-occupancy of the existing site based on a recent opinion letter issued by the Wayland Town Council.
13. Figure A-6, which pertains to the weekday evening distribution of trips associated with the No-Build Re-Occupancy, is missing from the TIAS Appendix.
14. The origin-destination study data was provided within the TIAS Appendix. However, there was very little description of the methodology of the data collection and the associated analysis. The TIAS attempts to quantify the trips originating / destined for Glezen Lane and Bow Road, but it does not appear to take into account a data point at Route 126 to ascertain the number motorists may travel to/from points further to the northeast. This section should be expanded within the formal MSP submission or addressed within a written response to comments.
15. The TIAS assumes a low percentage of traffic that will “cut through” Glezen Lane and Bow Road based on the recently submitted Travel Time Assessment. The traffic volumes should be reevaluated to more appropriately weigh the paths of lower travel time.
16. VAI should provide the reasoning why the number of site-generated trips using Glezen Lane and Bow Road do not change within the traffic volume networks for Access Alternatives A and B.
17. The new “main” street is expected to accommodate approximately 100 diverted (northbound) vehicles that would otherwise turn left from Route 20 eastbound to Routes 27/126 northbound. Most of these motorists are likely bound for Route 126 North or other roadways to the northeast rather than Route 27 North because motorists on Route 20 eastbound have the option of using Old County Road to access Route 27 North. The credit described above may be lower because many of the significant trip generators along Route 20 between the Site Driveway and Routes 27/126 are on the south side of Route 20 and would require a left-turn movement across Route 20 traffic to access the proposed “main” street.
18. The traffic volumes shown within Figures 3-26 through 3-29 (internal site volumes) do not match the traffic volumes shown for Route 27 / Site Driveway and Route 20 / Site Driveway as shown within Figures 3-30 through 3-33 (study area volumes). VAI should confirm the correct turning movement numbers and correct the appropriate figures.
19. The report includes several suggestions for traffic calming along Glezen Lane and Bow Road. However, it should also include an analysis of the impacts of the diverted traffic associated with changes such as the prohibition of left-turns on Route 27 southbound (onto both Glezen Lane and Bow Road) during the morning peak hour. These suggestions will have a significant impact on the intersections of Routes 27/126 and Routes 20/27/126.

Discussion of Site Access and Proposed Mitigation

20. TEC generally concurs with the proposed geometry and traffic control for the intersection of Route 20 / Site Driveway (Street 'A'), whereby the Proponent will realign and channelize the driveway for Russell's Garden Center Driveway in cooperation with the property owner. It appears, however, that the Russell's Driveway should be designed with a single entrance lane. The analysis shows excessive through queues for the westbound movement on Route 20. The Proponent should consider a left-turn lane, one through lane, and one shared through-right lane on the westbound approach to improve the through capacity and reduce the risk of these queues blocking commercial driveways just east of the site driveway.
21. The sidewalks proposed near the intersection of Route 20 / Street "A" should be extended to the existing sidewalk network on the north side of Route 20, located near the proposed limit of work. The design should consider a signalized crosswalk across Route 20 between the site and the Russell's Garden Center property.
22. TEC concurs with the proposed lane geometry for the intersection of Old Sudbury Road (Route 27) / Street 'A'. VAI has appropriately noted that the consolidation of the driveway(s) for Wayland Commons Residential Development is a critical component of the design for this location. As mentioned in previous review letters, the design for this access point should include sidewalk construction along Route 27 between the site driveway and Route 126. The concept mitigation plans should be revised to address this important pedestrian connection.
23. The Town can consider a condition of approval that gives the Planning Board the option to require the Proponent to convert the site exit onto Route 27 to a right-turn-only driveway if the level of cut-through traffic exceeds
24. During the time that the intersection of Route 27/ Site Driveway is unsignalized, the striped island in front of the southerly Wayland Commons driveway should be broken to allow left turns from the driveway.
25. The intersection of Route 27/126 meets the thresholds for the installation of a traffic signal. The Concord Road (Route 126) approach will receive the greatest benefit from this traffic control change. Once signalized, there will be newly introduced delays for Route 27/126 northbound. The analyses currently assume an additional right-turn lane for this approach all the way south to Millbrook Road. This lane use is not currently shown on Figure 3-40. TEC recommends that the Proponent investigate a northbound right-turn lane at this location that allows Route 126 northbound vehicles to bypass the queued vehicles bound for Route 27 northbound in the through lane.
26. Section 3.5.2.5 describes the need for queue detection at the intersection of Route 27/126. TEC concurs with this recommendation, but the signal should not be designed to keep the Route 27 / Site Driveway intersection clear. The pre-emption should be focused on maintaining flow along the relatively short Route 27/126 link between Route 27 and Route 20. The coordination will likely be controlled by MassHighway because they maintain jurisdiction over the intersection of Route 20 / 27 / 126.

27. VAI should present calibrated simulations of the traffic operations at Routes 20 / 27 / 126 that compare the existing cross-section with the proposed four-lane section for Route 20. This can be accomplished easily based on the Synchro/ SimTraffic analysis files already completed for the project. The two through lanes in each direction will be required to merge to one lane immediately after the intersection. The traffic operations at the intersection will be significantly limited by the 150-200 foot segment to process two westbound through lanes on the west side of the intersection. This analysis will require additional coordination between TEC and VAI.
28. The Route 27/126 northbound approach to Route 20 has one short left-turn lane that is often blocked by a high volume of through and right-turning vehicles. There are excessive queues on this approach under existing conditions, especially during the weekday evening peak hour. TEC recommends that VAI investigate the feasibility of extending the northbound left-turn lane.
29. VAI recommends that the intersection of Old Sudbury Road (Route 27) / Glezen Lane be modified to remove the traffic island and install a new traffic signal. TEC does not recommend a traffic signal at this location because it will not likely exceed the minimum thresholds mandated within the Manual on Uniform Traffic Control Devices (MUTCD). Furthermore, the introduction of a traffic signal at this location would likely encourage additional cut-through traffic along Glezen Lane. Although it was not discussed within the TIAS, the volume of traffic turning left from Route 27 southbound (onto Glezen Lane) far exceeds the thresholds for the introduction of an exclusive left-turn lane. This should be considered by the Proponent and the Town as a potential safety improvement even though the proposed development is not expected to add traffic to this movement.
30. VAI recommends that Bow Road be either changed to a dead-end roadway or modified to restrict it to a one-way road. However, TEC recommends that the Town consider prohibiting left-turns from the Bow Road approaches to both Route 27 and 126 along with traffic islands to reinforce right-turn maneuvers. This will eliminate the potential for cut-through traffic associated with the proposed development, but will still allow full access for vehicles desiring the enter Bow Road from Routes 27 and 126. This will require enforcement of the regulatory signs through the Wayland Police Department.
31. Figure 3-44 depicts the traffic control recommendations for the multiple intersections that comprise the junction of Glezen Lane and Training Field Road. While this proposal reduces the number of conflict points for traffic in this area by creating a one-way couplet of roadways, it may encourage speed for traffic movements on Glezen Lane westbound. TEC recommends that the Town consider closing the northerly edge of the triangle to through traffic in both directions and creating one defined intersection for Glezen Lane / Training Field Road in the southeasterly corner of the triangle. This will increase travel time for Glezen Lane traffic and significantly lower the speed potential along this section of Glezen Lane.

32. Figure 3-45 presents conceptual changes to Glezen Lane and Moore Road close to their intersections with Route 126. There is insufficient analysis performed at this time to evaluate the merits of this proposal. Undoubtedly, there will be secondary impacts to Claypit Hill Road, Training Field Road, Bow Road, and the intersection of Routes 27/ 126.
33. The introduction of speed humps on local roadways will require a review of sight distance as well as drainage patterns to avoid ponding. We recommend a field meeting between the Proponent, VAI, TEC, Wayland Highway, and the Planning Department to investigate potential locations.
34. The Proponent has offered several Transportation Demand Management (TDM) measures to reduce the need for residents to own and operate their own vehicle. These measures should be incorporated within the future conditions of approval and should require annual documentation of the use of the program.

The comments provided within this letter are not associated with a formal application to the Planning Board for a Master Special Permit. Once the application is submitted, the Planning Board should confirm that the items listed within this letter are submitted for review whether as part of an update report or through a response-to-comments memorandum that can append the recently submitted traffic report.

If you have any questions regarding our preliminary review of the referenced materials, please do not hesitate to contact me at (978) 794-1792 x145.

Sincerely,
TEC, Inc.

Kevin R. Dandrade, PE, PTOE
Senior Engineer

cc: Lynne Dunbrack, Chair, Planning Board
Mark Santangelo, Chair, Board of Road Commissioners (by e-mail)
Stephen Kadlik, Highway Director of Operations (by e-mail)
Frederick Turkington, Town Manager (by e-mail)
Joseph Nolan, Chair, Board of Selectmen (by e-mail)
Bill Whitney, Board of Selectmen (by e-mail)
Francis Dougherty, KGI Properties / Twenty Wayland, LLC
Kenneth Cram, PE, Vanasse & Associates, Inc.

TEC, INC.
65 GLENN STREET
LAWRENCE, MASSACHUSETTS 01843
(P) 978.794.1792 (F) 978.794.1793

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MEMORANDUM

TO: Mr. Lawrence Stabile, Chair
Wayland Planning Board
41 Cochituate Road
Wayland, MA 01760

DATE: April 19, 2006

FROM: Kevin R. Dandrade, PE, PTOE

PROJECT NO.: T0124.01

RE: Traffic Assessment – 2006 Mixed Use Overlay District Proposal
Wayland, Massachusetts

INTRODUCTION

The purpose of this memorandum is to update the Planning Board on the results of the traffic analysis completed for the 2006 Mixed Use Overlay District (MUOD) zoning proposal for the former Raytheon site, currently owned by Twenty Wayland, LLC. At the request of the Wayland Planning Board, TEC, Inc. evaluated the general traffic impacts associated with new vehicle trips generated by a reduced development program that is consistent with the proposed April 2006 MUOD zoning amendment. The TEC assessment also includes several other trip generation estimates to compare the following development scenarios:

- Assumed Existing Office Use – Fully Reoccupied (410,000 sf)
- June 2005 Proposal by Twenty Wayland, LLC
- November 2005 MUOD Proposal
- April 2006 MUOD Proposal
- 40B Residential Proposal

For the April 2006 MUOD scenario, the estimated new vehicle trips were distributed to the roadways surrounding the site. The impacts of the new trips for the April 2006 MUOD Proposal were gauged by performing signalized capacity analyses at key locations and they were compared to the impacts associated with the original June 2005 Twenty Wayland, LLC proposal. This memorandum also offers recommendations for improvements at key locations and suggestions for future studies.

TRIP GENERATION

TEC previously reviewed the trip generation estimates performed by Vanasse & Associates, Inc. (VAI) on behalf of entities seeking to re-develop the former Raytheon site. Their traffic report[1] identified an assumed existing allowable use of 410,000 square feet (sf) of general office building space. The June 2005 VAI analysis was based on a development program consisting of approximately 308,000 sf of retail area, 40,000 sf of office space, 40,000 sf of municipal use, and 100 residential apartment units. TEC reviewed the VAI report and offered comments and

[1] *Preliminary Traffic Impact and Access Study – Proposed Town Center – Wayland, MA*, Vanasse & Associates, Inc., June 14, 2005 (prepared for Streetscape, LLC).

recommendations as a peer review agent for the Town of Wayland Board of Road Commissioners[2].

The current TEC analysis effort includes calculations of vehicle trip generation for the development program assumed for the April 2006 MUOD Bylaw and other proposals as a comparison. TEC used an assumption of various land uses and allowable sizes listed within the "2005 MUOD Bylaw" column within the summary document provided by the Town to estimate future trip generation characteristics. The April 2006 MUOD proposal identifies the following maximum allowable size of individual uses with land use categories identified by the Institute of Transportation Engineers (ITE)[3]:

Land Use Category	ITE Land Use Code	Size
Shopping Center – General Retail	820	155,000 sf
General Office Building	710	10,000 sf
Municipal Office Complex	733	40,000 sf
Residential Condominiums	230	100 units

The trip generation rate for a Shopping Center is appropriate for calculating the total number of trips for the total building area of retail users, knowing that individual uses on the site may vary. The proposed (allowable) supermarket is typically associated with a slightly higher trip generation rate, but the other smaller users identified within the restrictions of the April 2006 MUOD zoning balance the overall rate. For the residential portion, TEC's analysis assumes a trip generation rate for condominiums rather than apartments because the condominium rates are slightly more conservative. However, they can be considered interchangeable with no noticeable difference in traffic.

TEC has been informed that no specific use has been determined for the municipal area allocated on the site. For the purposes of this evaluation, a municipal office complex (similar to a Town Hall facility) was assumed since it contributes a higher volume of traffic to the adjacent roadway network during the typical commuter peak hours. If the municipal building use changes to a library or community recreational facility, there may be a higher level of trips during some weekend periods, but lower traffic during the typical commuter peak periods.

In addition, the property owner recently submitted a 40B Comprehensive Permit Application for 200 condominium units, which involves the demolition of the existing office building. The Town has asked TEC to also estimate the number of trips associated with that proposal as an additional point of comparison.

TEC performed a detailed analysis of the trips associated with each assumed land use for the weekday daily, weekday morning and evening commuter peaks, Saturday daily, and Saturday peak periods (See Attachment C). The table on the

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[2] Letter from TEC to Stephen Kadlik, Highway Director, dated August 8, 2005, regarding Traffic Engineering Peer Review – Proposed Town Center Project (Redevelopment of Former Raytheon Property) – Wayland, Massachusetts (See Attachment A).

[3] *Trip Generation*, 7th Edition, Institute of Transportation Engineers, Volumes 2 and 3, 2003.

following page presents a summary of the trip generation characteristics of various proposals for the site.

Trip Generation Comparison (Total Trips) – Former Raytheon Site

Time Period	410,000 sf Assumed Existing Office Use (Fully Reoccupied) [1]	June 2005 Proposal by Twenty Wayland, LLC [1]	November 2005 MUOD Proposal [2]	April 2006 MUOD Proposal [3]	200-unit 40B Residential Proposal [4]
Weekday Daily	3,954	16,350	12,238	11,014	1,157
Weekday AM Peak	580	514	425	373	90
Weekday PM Peak	538	1,554	1,234	1,100	106
Saturday Daily	896	19,374	14,372	13,007	1,152
Saturday Midday Peak	116	1,864	1,388	1,228	101

Notes:
1. Based on land uses from *Preliminary Traffic Impact and Access Assessment - Proposed Town Center* by Vanasse & Associates - June 14, 2005
2. From Wayland Planning Board's 2005 proposed Mixed-Use Overlay District zoning proposal - See Attachment B
3. From Wayland Planning Board's 2006 proposed Mixed-Use Overlay District zoning proposal - See Attachment B
4. Based on MassHousing Development Application for "The Residences at Wayland Center" submitted by Twenty Wayland, LLC on February 16, 2006

The differences between the assumed full reoccupation of the 410,000 sf office building and the April 2006 MUOD proposal can be viewed on the previous page. If the April 2006 MUOD is approved and constructed, the morning peak hour should reflect an approximate 30% drop in overall trip generation for the site. During the weekday evening peak hour, the 2006 MUOD is expected to increase the total trips accessing the site by close to 100%. However, some of these trips are "passby" trips and are already on the adjacent roadways passing the site for another reason. The number of "new" trips during the evening peak hour increases over the existing assumed use by approximately 66%.

The greatest difference in the number of new trips will occur during the weekend period when the traditional office user generates very few trips. During the Saturday daily and Saturday midday peak hour intervals, the number of trips associated with the 2006 MUOD is expected to increase substantially over the fully re-occupied office building use (>1000% increase). Although the 2006 MUOD reflects a reduction of the overall development program when compared with the June 2005 Twenty Wayland, LLC and the November 2005 MUOD proposals, it will elevate the traffic volumes on the adjacent street during the Saturday peak intervals to a level that is closer to that of the typical weekday commuter peak hours. TEC did not assume a credit for residents that may already pass through the intersection on their way to other shopping opportunities and will be "intercepted" by the proposed development.

As tabulated above, the 40B residential proposal would introduce the lowest number of vehicle trips during the traditional peak hours even when compared with the fully re-occupied office building use.

BACKGROUND GROWTH AND TRIP DISTRIBUTION

The 2005 traffic data collected by VAI was used as a basis for TEC's analyses. In order to assess future year conditions, TEC adjusted the existing 2005 traffic volumes for the study area by 1% per year for five years, which is consistent with the VAI study that TEC reviewed previously. The 2010 No-Build traffic volumes also include background traffic from the Wayland Commons 40B age-restricted residential development[4], which is proposed to access Old Sudbury Road (Route 27) near the access point for the existing office building.

The new trips associated with the 2006 MUOD proposal were distributed to the adjacent roadway network based on existing traffic volumes and U.S. Census data collected previously by VAI and reviewed by TEC. A copy of the estimated trip distribution graphics from the VAI study is provided within Attachment D.

The following is a summary of the approximate peak hour traffic volumes (in vehicles per hour) on roadway segments near the site under existing actual and future build conditions:

Peak Hour Traffic Volume Comparison for Adjacent Roadways

Roadway Segment	2005 Actual Conditions	2010 Build Condition June 2005 Twenty Wayland, LLC Proposal	2010 Build Condition April 2006 MUOD Proposal
Route 20 (East of Site Roadway)			
PM Peak Hour	1,418	1,716	1,551
SAT Peak Hour	1,662	1,951	1,937
Route 27 (South of Site Roadway)			
PM Peak Hour	1,077	1,469	1,436
SAT Peak Hour	698	1,114	1,050

The operations analysis that follows describes the impacts of the additional future build traffic volumes on the intersections and arterial roadways in the surrounding area, most notably the intersection of Route 20 at Routes 27/126.

OPERATIONS ANALYSIS

TEC analyzed the 2010 Build conditions assuming full build-out of the April 2006 MUOD proposal on the site. As part of this effort, the Planning Board has asked TEC to assume a full connection through the site between Route 20 and Route 27 ("Site Roadway") in order to provide a similar comparison to the analyses previously prepared by VAI.

[4] Traffic Impact and Access Study – Wayland Commons – A Residential Community, VHB/Vanasse Hangen Brustlin, Inc., June 2005.

This assessment concentrates on the comparative results for the following four intersections:

- Route 20 at Proposed Site Roadway
- Route 20 at Routes 27/126
- Route 27 at Route 126 (north of Route 20)
- Route 27 at Proposed Site Roadway

Based on the volumes of traffic accessing the site, TEC recommends physical improvements as well as traffic control improvements to safely and efficiently accommodate the new movements. The number of travel lanes used within the attached TEC analyses is consistent with the lane use proposed by VAI in their report. Under full-build conditions for the 2006 MUOD proposal, TEC anticipates the need for traffic signals at the four major intersections listed above. At the intersection of Routes 20 / 27 / 126, TEC assumes that the improvements currently under construction by MassHighway will be completed in conformance with the approved plans.

The following is a summary of the results of the capacity analyses for each signalized intersection during the expected peak hours under 2005 actual conditions and 2010 build conditions. The two build conditions assessed include the original June 2005 Twenty Wayland, LLC proposal and the April 2006 MUOD proposal (See Attachment E for detailed analyses).

Signalized Intersection Peak Hour Capacity Analysis Results

	2005 Actual Conditions			2010 Build Condition June 2005 Twenty Wayland, LLC Proposal			2010 Build Condition April 2006 MUOD Proposal		
Intersection/ Overall Results	Overall V/C[a]	Delay[b]	LOS[c]	Overall V/C	Delay	LOS	Overall V/C	Delay	LOS
Route 20 at Site Roadway									
Weekday Evening	N/A	N/A	N/A	0.89	27.3	C	0.76	18.2	B
Saturday Midday				0.99	40.2	D	0.91	28.2	C
Route 20 at Routes 27/126*									
Weekday Evening	1.02	62.0	E	1.22	102.5	F	1.17	97.2	F
Saturday Midday	0.84	38.9	D	0.99	57.2	E	0.89	43.8	D
Route 27 at Route 126									
Weekday Evening	N/A	N/A	N/A	0.84	14.6	B	0.76	10.7	B
Saturday Midday				0.68	9.2	A	0.57	6.9	A
Route 27 at Site Roadway									
Weekday Evening	N/A	N/A	N/A	0.56	9.9	A	0.56	8.9	A
Saturday Midday				0.50	9.9	A	0.42	8.8	A

(See table notes on the following page)

Table Notes:

*The 2005 Existing and 2010 Build traffic volumes from the VAI study were analyzed based on the completion of the MassHighway improvements for Routes 20 at Routes 27/126 and Route 27 at Route 126

[a]Volume-to-Capacity ratio as a weighted-average for each movement at the intersection

[b]Delay in seconds (average per vehicle entering the intersection)

[c]Level of service (A-F)

N/A - Not Applicable; the intersection is not currently signalized

As tabulated on the previous page, there will be a moderate decrease in delay at the proposed intersection of Route 20 at the proposed Site Roadway when considering the 2006 MUOD proposal. The level of traffic volumes at this intersection requires exclusive turn lanes on each Route 20 and side street approach. TEC has assumed that the access for Russell's Garden Center will be consolidated at the proposed traffic signal. With the June 2005 Twenty Wayland, LLC development proposal, the eastbound left turn and southbound left turn movements will likely operate with long delays at level of service (LOS F) unless additional turn lanes are provided.

Regardless of which mixed-use development proposal is accepted, the intersection of Route 20 at Routes 27/126 will operate in an over-capacity situation during the weekday evening commuter peak period, because that peak period also corresponds with a high level of trip generation for most of the uses that would be on the site. The April 2006 MUOD proposal will reduce delays slightly over the June 2005 Twenty Wayland, LLC proposal during the weekday evening peak hour, but will still operate at LOS F as an intersection with long queues on each approach. However, TEC expects the operating condition of this intersection to be better under the 2006 MUOD Proposal than the full occupancy of the existing office building (assumed at 410,000 sf). Because the existing office use has established limitations on the number of vehicles that can access the northeasterly parking lot for the former Raytheon site via the Route 27 gated entrance, full re-occupancy of that office building would put an additional strain on the intersection of Route 20 at Routes 27/126 by introducing additional turning movements. For the foregoing reasons, TEC recommends that the Planning Board consider a through road between Route 20 and Route 27 as part of any development proposal for the site.

The intersection of Route 27 at Route 126 will operate at LOS F with excessive delays for the Concord Road approach if a traffic signal is not installed at that location. The expected number of left-turning vehicles on the Route 27 southbound approach warrants the introduction of an exclusive left-turn lane to provide a refuge area for turning vehicles and make the through movement more efficient. Although the traditional capacity analysis results show a very good level of service, this intersection is often affected by queues from the intersection of Route 20 at Routes 27/126. TEC expects moderate delays for the Route 27 at Route 126 intersection with operations that reflect higher delays (LOS D or E) during future commuter peak hours.

The intersection of Route 27 at the proposed Site Roadway is expected to warrant the installation of a traffic signal under full-build conditions. Therefore, it was analyzed with signalization under the 2010 build conditions for the 2006 MUOD proposal. TEC recommends that a traffic signal be installed at this location only if actual traffic volumes warrant its introduction. If the April 2006 MUOD proposal is accepted and constructed, it is likely that the risk of cut-through traffic along Glezen Lane and Bow Road can be reduced if there are longer delays for motorists attempting to turn left from the proposed Site Roadway onto Route 27 northbound. The introduction of a traffic signal at the intersection of Route 27 at Route 126 will also likely influence motorists leaving the site to use Old Sudbury Road (Route 27) southbound to access Concord Road (Route 126) northbound via Library Lane.

If the 40B Comprehensive Permit Application is approved and no other further development occurs on the site, TEC does not anticipate a need for any significant widening improvements or the installation of traffic signals at the intersections of Route 20 at Site Roadway or Route 27 at Site Roadway. This is contingent on the use of a gated access to the residential community that restricts cut-through traffic from Route 20 to Route 27, as currently shown on the plans accompanying the 40B application[5]. However, the volume of traffic using Route 20 to access the site may require the construction of a short right-turn lane on Route 20 westbound at the Site Roadway. The applicant will be required to coordinate with MassHighway to confirm the need for geometric improvements as part of their Highway Access Permit. It is unlikely that other off-site traffic mitigation measures will be warranted as part of the 40B Comprehensive Permit. Although the 40B proposal generates the lowest volume of traffic, a gated access road through the site will not alleviate the intersection of Route 20 at Route 27/126 because through traffic would not be permitted.

CONCLUSIONS / RECOMMENDATIONS

This assessment is meant to summarize and compare the general traffic impacts associated with the various development proposals for the former Raytheon site. It is not a comprehensive assessment of all of the traffic impacts associated with the development of the site. However, it is a reasonable representation of the characteristics of the existing roadway network required to accommodate the proposed traffic volumes. It also defines specific elements of geometric mitigation and changes in traffic control necessary to reasonably process traffic. TEC maintains all of its recommendations from the original review of the Twenty Wayland, LLC traffic study prepared by VAI and offers the following recommendations to the Planning Board to consider as it moves forward on the April 2006 MUOD zoning proposal.

The Planning Board and/or the Applicant should:

1. Identify as many pedestrian connections as possible to connect the proposed site with the existing sidewalk network and adjacent parcels, including the potential for a rail trail that spans between Route 20 and Routes 27/126.

2. Perform a detailed review of travel times and intersection delays along Glezen Lane, Bow Road, and other local roadways to perform a more detailed

[5] The Residences at Wayland Center, Site Plan (Sheet C-1), Sasaki Associates / Arrowstreet, February 15, 2006 (Prepared for Twenty Wayland, LLC)

assessment of cut-through traffic potential associated with the proposed site connection between Route 20 and Route 27.

3. Consider widening and signalization for the main entrance on Route 20 due to the excessive delays that would be realized due to lack of gaps in the Route 20 mainline traffic and the high volume of commuter and retail traffic that will likely use this entrance. Route 20 is under the jurisdiction of MassHighway and will require permitting for a highway access permit, traffic signal permit, and environmental permitting associated with fill areas within a flood plain.

4. Consider a through Site Roadway between Route 20 and Route 27 as part of any proposal for the site in order to partially alleviate the turning movements at the intersection of Route 20 at Routes 27/126 and reduce the overall travel distances for site-related trips that either originate northeast of the site or are bound for locations northeast of the site.

5. Consider the widening along Route 27 at the proposed Site Roadway with early installation of the conduit infrastructure for a potential traffic signal. The traffic signal should not be installed unless fully warranted. If there are longer delays for left-turning motorists exiting from the site due to stop sign control, that would encourage the use of Route 126 for those bound for points northeast of the site.

6. Consider peak hour turning restrictions (*e.g.,* 7:00 to 9:00 AM and 3:00 to 6:00 PM) for the intersections of Old Sudbury Road (Route 27) at Bow Road and Glezen Lane. If the Route 27 northbound site traffic is prohibited from turning onto Bow Road or Glezen Lane, it will force site traffic to use Route 27 southbound to Route 126 for exiting movements (travel to the northeast) during the busiest times of the day. If left-turns are prohibited out of the same side streets during the peak hours, it will influence motorists to use Route 126 southbound to enter the site.

7. Consider widening Route 27 at its junction with Route 126 to provide an exclusive southbound left-turn lane as depicted in the conceptual design prepared by VAI. The traffic signal is currently warranted during the peak hours and will be further justified following either full occupancy of the existing buildings or redevelopment under the proposed 2006 MUOD. Any signal design at the intersection of Route 27 at Route 126 should be included as a signal system with the intersection of Route 20 at Routes 27/126 with queue detection for Route 27/126 northbound traffic near Millbrook Road.

8. Consider reversing the direction of permissible travel on Library Lane for the one-way operation so it can operate as an advance right-turn lane for Route 126 southbound traffic attempting to turn right onto Route 27 northbound.

9. Develop a Route 20 transportation plan that identifies the possibility of widening to provide defined left-turn lanes at major private driveways, consolidate driveways, and improve pedestrian features along this arterial roadway.

TEC is pleased to present the results of these analyses and looks forward to working with the Town of Wayland to identify the project controls and commitments for parties involved as you proceed with this zoning proposal. Please feel free to contact us with any questions regarding our findings and recommendations.

Attachments:

A – Peer Review Letter from TEC to Stephen Kadlik, Highway Director, August 8, 2005
B – Comparison of Planning Board's Proposed MUOD Bylaws 2005 vs 2006
C – TEC Trip Generation Calculations / Comparisons (8 pages)
D – Trip Distribution Estimates – Vanasse & Associates, Inc., June 14, 2005
E – Capacity Analyses

Attachment A

Peer Review Letter from TEC to Stephen Kadlik, Highway Director, August 8, 2005

TRANSPORTATION
ENGINEERING + CONSTRUCTION, INC.   INNOVATORS IN PROJECT DELIVERY

Stephen Kadlik
Highway Director
Town of Wayland – Board of Road Commissioners
195 Main Street
Wayland, MA 01778

August 8, 2005
Ref: T0124

Re: Traffic Engineering Peer Review - Proposed Town Center Project
(Redevelopment of Former Raytheon Property)
Wayland, Massachusetts

Dear Mr. Kadlik,

At the request of the Board of Road Commissioners, Transportation Engineering and Construction, Inc. (TEC) completed an independent peer review of the following documents submitted to the Town of Wayland for the development known as the Proposed Town Center:

- Preliminary Traffic Impact and Access Assessment – Proposed Town Center
  Vanasse & Associates, Inc., June 14, 2005
- Peer Review – Wayland Town Center Traffic Impact Study and Mitigation Plan
  Fay, Spofford, & Thorndike, LLC, June 16, 2005
- Conceptual Improvement Plans – 3 Intersections (Updated Mitigation Plans)
  Vanasse & Associates, Inc., revisions dated July 11, 2005 and July 22, 2005
- Traffic Distribution Worksheets and Conceptual Site Design
  Vanasse & Associates, delivered to TEC on July 15, 2005
- Route 20 at Route 27/126 Intersection Plans – CAD files
  Greenman-Pedersen, Inc., delivered to TEC by e-mail on July 14, 2005

Vanasse & Associates, Inc. (VAI) and Fay, Spofford, & Thorndike (FST) completed an appropriate level of review of the general traffic impacts associated with the requested change in land use zoning for the 56.5 acre site previously used by Raytheon and Polaroid. The study completed by VAI and the subsequent peer review by FST are the preliminary assessments of traffic conditions associated with the redevelopment of the site. Although this study did not project future year conditions without the "by right" use, the presented scenarios provide a comparison of the full reuse of the existing office buildings in comparison to the conceptual development program for a mixed use site, which is primarily retail in nature. If the Town supports the change in zoning, this site is expected to undergo site plan and special permit review through the Planning Board, a Physical Alteration Permit through the Board of Road Commissioners, and all state level permitting, including the MassHighway Driveway Access Permit review and the Massachusetts Environmental Policy Act (MEPA) review.

In reviewing the assumptions for traffic included in the "by right" use of office space, TEC inquired of the Building Inspector's office concerning any special permit conditions that may have been required when the office space was first permitted. Most of these documents were not available at the time TEC prepared this review letter. If there were prior controls over shift times (typical for

TEN NEW ENGLAND BUSINESS CENTER DRIVE • SUITE 107 • ANDOVER, MA 01810 • TEL 978.794.1792 • FAX 978.794.1793 • WWW.TECMASS.COM

both Raytheon and Polaroid) or transportation demand management measures, the traffic volumes for the existing use depicted in the VAI report would need to be revised, as the reduced volumes would make the net difference between the number of trips (no-build versus build) greater. A careful review of the initial 1954 Zoning Board of Appeals decision, and subsequent modifications to that decision, will be required to determine what, if any, rights currently exist for site traffic to use the Route 27 driveway for access under the "by right" scenario.

The traffic study identifies the lane use and traffic control needs for each designated access point for the proposed development. The proposed design accommodates cut-through traffic along a primary site road that has minimal curb cuts along its length with a traffic calming roundabout and curvilinear alignment. During the weekday morning and evening and Saturday midday peak hours, there is a consistent volume of traffic turning from Route 20 to/from Route 27/126 that will likely be candidates as cut-through users for this new private road. In fact, the results of the mitigated analyses rely, in part, on this cut-through trend. If the private driveway is designed in accordance with Town and/or MassHighway standards, there should be no inherent safety issues with its use by cut-through traffic.

The broader issue lies with the understanding that this new roadway will be maintained by the property owner. The public will likely come to expect that this new private roadway will be maintained at the same level as the other town infrastructure due to its location and accessibility. Therefore, it will be important that the Town require a bonded maintenance plan to ensure that the public will continue to comfortably and safely use the new roadway and partially alleviate the intersection of Routes 20/27/126. The project name "Town Center" also infers municipal ownership. The proponent should provide multiple pedestrian connections between the existing roadway network and the proposed site to tie the site into the existing town center rather than creating an isolated development on its periphery.

The existing and proposed land uses have different traffic generation characteristics depending on the time period analyzed. TEC agrees with the summary table entitled, "Number of Vehicles Passing Through the Route 20/27 Intersection", shown on page 4 of the FST Peer Review letter dated June 16, 2005. This table shows that the two land uses will have similar traffic generation during the typical morning and evening commuter peak hours. However, the weekday and Saturday daily volumes will be noticeably higher. The proposed land use change will have its greatest impact during the Saturday midday peak hour since the retail use has a much higher trip generation rate than an office use. The mixed use Town Center proposal will add approximately 14% more traffic at the intersection of Routes 20/27/126 during the Saturday midday peak hour over the "by right" use of the property during a Saturday peak period. If there are no feasible or available mitigation measures that can alleviate the impacts of the Saturday peak traffic so as to make traffic volumes less and, therefore, comparable to a no-build (or "by right") condition, the Town can consider requesting a minor reduction in the proposed development program to reduce the future traffic volumes.

The following is a discussion of specific intersections included within the VAI study:

Boston Post Road (Route 20) at Proposed Private Road

The proposed site roadway intersects with Boston Post Road (Route 20) from the north along with a new driveway for Russell's Garden Center to form a new four-way signalized intersection. Route 20 will need to be widened to accommodate auxiliary left- and right-turn lanes, which are necessary to safely and efficiently process the projected traffic volumes. The proposed turning movement volumes necessitate the proposed geometry. The concept for this intersection was modified from the initial concept originally included within the VAI traffic assessment, which had shown the need for two eastbound left turn lanes. The traffic analyses should be updated to reflect the newly proposed geometry and updated traffic information for Russell's Garden Center.

The proposed realignment of the Russell's Garden Center Driveway should improve the safety characteristics along this stretch of Route 20 due to the long uncontrolled curb cut that exists today. These improvements are shown on a sketch-level plan that has not been developed to include information concerning the vertical profile of Route 20 and associated slope impacts. TEC understands that this intersection lies within the 100-year flood plain of the Sudbury River. The applicant will be required to mitigate any fill areas within this flood plain. Additional detail will be required to support the driveway permit process for MassHighway at this state highway location.

Old Sudbury Road (Route 27) at Proposed Private Road

The proposed private road will intersect Old Sudbury Road (Route 27) from the west to form a T-intersection at the approximate location of the former Raytheon driveway. This intersection lies adjacent to conservation land signed as the Bow Meadow and owned by the Sudbury Valley Trustees. The level of impact to conservation land or wetland bodies is not discernable based on the information shown on the plan. The most recent concept depicts the need to widen Old Sudbury Road on the west side (site side) to accommodate new auxiliary lanes for left and right turns. The proposed road geometry can be revised to reduce the width for only one lane entering the site since there should be sufficient capacity to handle the traffic from one left-turn and one right-turn lane turning from Route 27. The proposed development and the adjacent 40B residential proposal, named "Wayland Commons" should maintain the vegetative buffer areas along their frontage wherever possible in order to maintain the rural characteristics of Old Sudbury Road. The driveways for the Wayland Commons should be consolidated with the proposed private roadway at a location behind the expected queue for vehicles waiting to turn onto Route 27.

While this intersection may meet signal warrants upon full development, TEC recommends that this intersection be designed with conduits to facilitate a future signal installation, but remain unsignalized until the applicant can demonstrate the need for signalization based on actual site traffic volumes. The construction costs associated with any proposed signal should be bonded with the applicant since it is tied closely to the travel time benefits for cut-through traffic. In association with the proposed roadway plans that will be reviewed as part of any future site plan process, the applicant should provide a traffic signal design that conforms to the Town of Wayland's standard for post-mounted traffic signals. The operating expenses associated with the proposed traffic signal should be funded (and bonded) by the project proponent.

The traffic that is projected to use this easterly point of access for the proposed development from points north along Route 126 are projected to travel through the intersection of Route 27 / 126. In reality, many of these motorists will be influenced to use Bow Road or Glezen Lane due to long delays on the Route 126 approach near the library. The VAI study should be expanded to review the safety and capacity considerations along these roadways, either at this level or at the site plan review level.

Old Sudbury Road (Route 27) at Concord Road (Route 126)

As noted by VAI and FST, the Concord Road approach will operate at Level of Service F (LOS F) during all peak hours and currently meets the minimum threshold for the installation of the traffic signal. The current VAI concept shows widening along Route 27 to accommodate a southbound exclusive left-turn lane for turns onto Route 126 northbound. The left-turn lane will be helpful from a safety perspective by providing a refuge area for left-turns while allowing through vehicles to bypass. There is also a noticeable benefit for intersection capacity associated with the proposed widening.

The Town should be aware that the capacity analyses have been performed without consideration of an exclusive pedestrian phase at the signal even though there is a recreational trail proposed along the MBTA right-of-way. This will equate to slightly longer delays for each vehicle approach. Currently, the northbound traffic bound for Route 27 is not required to stop. If a traffic signal is installed at this location, the northbound through queues will often block the lane for vehicles turning onto Route 126 northbound and may extend back to Millbrook Road during the evening peak hours. Any traffic signal at this location should be designed with northbound queue detection near Millbrook Road to limit the risk of queues extending back to Route 20.

The concept does not currently show a proposed extension of the new sidewalk network to the north along the west side of Route 27. This will be necessary to provide a logical connection for pedestrians accessing the east side of the proposed development.

Old Sudbury Road (Route 27/126) at Millbrook Road / Pelham Island Road Extension

Under existing conditions, this intersection is blocked by traffic approaching Route 20 during most peak hours. Once completed, the MassHighway improvement project will modify Pelham Island Road Extension, west of Route 27/126, to become one-way westbound. This will relocate the eastbound movements on Pelham Island Road Extension over to the adjacent intersection at Routes 20/27/126. While the proposed development will add traffic along Route 27, it is not expected to significantly worsen the operations at the Old Sudbury Road/Millbrook Road intersection since it is already impacted under existing conditions. A "Do Not Block Intersection" sign should be maintained at this intersection to encourage motorists to keep the intersection clear for turning movements to/from Millbrook Road and for access for emergency vehicles.

Boston Post Road (Route 20) at Old Sudbury Road / Cochituate Road (Routes 27/126)

MassHighway is currently completing the safety and capacity improvements to this intersection based on plans prepared by Greenman-Pedersen, Inc. (GPI). TEC understands that a functional design report was not completed by MassHighway for this project. Therefore, there is limited recent count information. Route 20 (State Highway) is being widened to accommodate one exclusive left-turn lane, one through lane, and one very short exclusive right-turn lane in each direction. Each of the Route 27/126 approaches consists of one exclusive left-turn lane and one shared through-right lane. There are several cultural and environmental constraints at this intersection that limit future widening without impacts. Based on traffic operations alone, a five-lane cross-section on Route 20, with one exclusive left-turn lane and two through lanes in each direction, is necessary to efficiently handle peak hour traffic volumes. However, this will have significant impacts to private and town-owned parcels as well as Mill Brook.

The current VAI-proposed mitigation concept for this intersection calls for the reconstruction of Route 20 to allow two shared through lanes in each direction. This will create a two-lane approach for approximately 300 feet in advance of the signal and will require a lane reduction approximately 300 feet after the intersection. Both the current MassHighway improvements and the proposed VAI concept utilize short travel lanes for processing the projected traffic volumes under the No-Build and Build scenarios. With the VAI concept, during the peak hours, the innermost lane will operate as a defacto left-turn lane since it only requires one queued left-turning vehicle to restrict flow for through traffic. The option to prohibit left-turns at the intersection during peak hours will have noticeable capacity benefits, but will impede regional access to Route 27/126 and cause motorists to perform U-turn movements at nearby public streets or private parking lots along Route 20. This will increase the overall number of trips entering the intersection.

TEC expects limited capacity benefits with the VAI-intended changes during the typical peak hours with a possible degradation in safety since left turns and through movements would again share the same lane. The capacity analyses do not consider the effects of the exclusive pedestrian phase at this intersection. Therefore, the Town should expect slightly higher delays than what is depicted in the analyses supplied by VAI. TEC believes that, even with implementation of VAI's proposed design, this intersection will continue to operate effectively at LOS F (greater than 80 seconds of average delay per vehicle) during the peak hours due to the short auxiliary lanes and the likelihood of long queues, especially on Route 20.

This intersection defines Wayland's town center. The design accommodations for the proposed project need to balance the through capacity for this state highway (Route 20), capacity for the town-maintained infrastructure (Route 27/126), and the cultural and environmental constraints along each leg of the intersection. Given a choice between the current MassHighway improvements or the improvements suggested by VAI, TEC recommends that the Town attempt to maintain the MassHighway improvements currently under construction. This will provide a similar level of traffic flow, will avoid unnecessary interim delays due to construction activities, and will not compromise the planned landscaping enhancements.

Boston Post Road (Route 20) at Pelham Island Road

This unsignalized intersection lies approximately 300 feet west of the intersection of Routes 20/27/126. The Route 20 eastbound left-turns onto Pelham Island Road Extension will be relocated to Route 20/27/126; this should improve the safety characteristics for left-turning vehicles bound for points to the north. There are currently significant delays during the weekday peak hours for motorists attempting to turn left out of Pelham Island Road adjacent to the Town Building driveway. While the proposed development will add through traffic on Route 20, it is not expected to significantly change the operations for motorists exiting from Pelham Island Road since the Route 20 queues currently extend beyond this intersection during the weekday peak periods.

Boston Post Road (Route 20) at Old County Road

This intersection lies along Route 20 west of the site within the Town of Sudbury on the opposite side of the Sudbury River. Under existing conditions, this intersection warrants the introduction of an exclusive eastbound left-turn lane on Route 20. Whether as part of the "by right" scenario or the proposed mixed use development, there will be additional future through traffic on Route 20 that will have a risk of being queued behind an eastbound left-turning vehicle waiting for a gap in westbound traffic. TEC understands that Old County Road is often used as a bypass route for traffic when Route 20 is heavily congested in Wayland during peak hours.

Route 20 Commercial Corridor

The VAI study does not identify deficiencies within the existing commercial corridor along Route 20 between Pelham Island Road and Russell's Garden Center. This section of Route 20 has a two-lane cross-section. There are often long delays for left turns into and out of private sites. The report should be expanded to study the effects on major retail driveways and investigate potential mitigation associated with the additional vehicle trips that will be added to Route 20.

Pedestrian/Multi-Use Trail Connections

The conceptual site design does not identify specific pedestrian connections to adjacent sites or to the MBTA right-of-way. The applicant should propose pedestrian/bicycle connections along Route 20, Route 27, as well as along and through the MBTA right-of-way to make the development as "walkable" as possible.

Conclusions

The Preliminary Traffic Impact and Access Assessment was prepared to identify the general traffic conditions for the reuse of the Raytheon/Polaroid site for a mixed use development. The proposed Town Center proposal will have traffic impacts that can be reasonably mitigated at each end of the proposed private roadway. The Town should request additional analysis of traffic operations along Route 20 between Routes 27/126 and the proposed private roadway to assess the impacts on the existing business community. The applicant should assess the existing and future mobility through the commercial corridor, identify deficiencies, and propose any appropriate mitigation. The intersection of Routes 20/27/126 will operate at a degraded level of service whether considering the full re-use of the existing office buildings or the redevelopment for retail and other mixed use.

TEC recommends that the Town of Wayland request the following action items from the applicant's design team as part of the site plan approval process once a final development program has been defined with more detailed site engineering:

- Confirm traffic operating conditions for the former office use including any previously established shift times

- Provide an additional 2010 No-Build scenario that assesses the impacts of background traffic growth exclusive of the "by right" use as included in the VAI preliminary report
- Quantify the number of trips expected to use cut-through routes along Bow Road, Glezen Lane, Plain Road, or Claypit Hill Road, considering travel time assessments between the proposed site and primary routes to/from the north (Concord Road – Route 126) and to/from east (Route 20) through the established local residential streets
- Update the analysis to consider the effects of pedestrian phasing at each signalized intersection
- Provide a simulated analysis (SimTraffic or CorSim) of the No-build and Build conditions at the intersections of Route 20/27/126 and Route 27/126 to review the global corridor delays associated both with the MassHighway improvements and those recommended by VAI
- Provide detailed design plans showing the geometric and signalization improvements at each end of the proposed private roadway
- Provide plans for multiple pedestrian/multi-use trail connections along roadways, the MBTA right-of-way, and possibly through easements on adjacent parcels to access Route 20
- Provide additional data and analysis of the traffic impacts to the existing Route 20 commercial corridor between Route 27/126 and Russell's Garden Center
- Provide new data and updated traffic analyses for the Russell's Garden Center approach to the new intersection at Route 20.

There is sufficient information included in VAI's preliminary report and FST's subsequent peer review to identify the general traffic impacts related to the change in land use zoning. The Town of Wayland and MassHighway will have several opportunities to determine if the traffic impacts of the finalized development program are sufficiently mitigated at the study area intersections.

Please call me at (978) 794-1792 (x145) if you have any questions regarding specific areas of our traffic engineering review for the Town Center proposal. Thank you for this opportunity to assist the Town of Wayland.

Very truly yours,
TRANSPORTATION ENGINEERING
AND CONSTRUCTION, INC.

Kevin R. Dandrade, P.E., PTOE
Senior Traffic Engineer

Attachment B

Comparison of Planning Board's Proposed MUOD Bylaws 2005 vs 2006

Attachment B

Mixed-Use Overlay District (at the former Raytheon site)
Planning Board Article for Special Town Meeting

COMPARISON OF PLANNING BOARD'S PROPOSED MUOD BYLAWS 2005 vs. 2006

	2005 MUOD Bylaw	**2006 MUOD Bylaw**
Overall Size of Project	**450,000 sq. ft. Gross Floor Area ("GFA")**	**372,500 sq. ft. Gross Floor Area ("GFA")**
▪ **Non-Residential**	▪ 200,000 sq. ft. GFA ▪ Not more than 10% of such GFA shall be dedicated to office uses	▪ 165,000 sq. ft. GFA ▪ Office uses shall not be more than 10,000 sq. ft. GFA
▪ **Residential**	▪ 210,000 sq. ft. GFA ▪ 120 units/240 bedrooms ▪ At least 70% (147 units) to be 2 bedroom units ▪ 25% of units to be Affordable	▪ 167,500 sq. ft. GFA ▪ 100 units/200 bedrooms ▪ Up to 15 units with 3 bedrooms ▪ 25% of units to be Affordable
▪ **Municipal**	40,000 sq. ft. GFA	40,000 sq. ft. GFA
▪ **Open space**	At least 2 acres	At least 2 acres
Aggregate Limits On Individual Establishments ("Stores")		
▪ **Food Store**	48,000 sq. ft. GFA	45,000 sq. ft. GFA
▪ **Large Stores**	Between 20,000 and 30,000 sq. ft. GFA	2 "stores" at between 10,000 and 15,000 sq. ft.
▪ **Medium Large Stores**	Between 10,000 and 20,000 sq. ft. GFA	3 "stores" at between 7,000 and 10,000 sq. ft.
▪ **Medium Stores**	Not more than 10,000 sq. ft. GFA	5 "stores" at between 5,000 and 7,000 sq. ft.
▪ **Small Stores**	Not more than 10,000 sq. ft. GFA	Unlimited "stores" at not more than 5,000 sq. ft.
Project Controls		
▪ **Ability to Reduce Total Aggregate Size of Project to Mitigate for Traffic**	Yes	No
▪ **Level of Master Special Permitting (MSP) Control**	▪ Moderate Control ▪ Planning Board could exert control over the project in terms of overall size, size of buildings, and specific uses	▪ Limited Control ▪ Essentially the Mixed-Use Project is an as-of-right project ▪ Once categories of interchangeable uses have been established, project can freely change uses within a category
▪ **Ability to Control Access Onto Rt. 27 (Old Sudbury Rd.)**	Yes – through MSP conditions	Yes – through MSP conditions

Attachment C

TEC Trip Generation Calculations / Comparisons (8 pages)

Trip Generation Assessment - Comparison of Proposals

Project: Updated 2006 Town Center Mixed Use Overlay District (MUOD)
Date: April 4, 2006
Analyst: TEC / Kevin R. Dandrade, P.E., P.T.O.E.
Source: Institute of Transportation Engineers - Trip Generation - 7th Ed.

Comparison of Total Trips (Primary + Pass-by + Shared) Associated with the Former Raytheon Site

	Assumed Existing Office Use (Fully Re-occupied)[1]	June '05 Proposal by Twenty Wayland, LLC	November 2005 MUOD Proposal[2]	April 2006 MUOD Proposal[3]	40B Residential Proposal[4]
Weekday Daily	3954	16,350	12238	11014	1157
Weekday AM PH - Adjacent Street	580	514	425	373	90
Weekday PM PH - Adjacent Street	538	1554	1234	1100	106
Saturday Daily	896	19374	14372	13007	1152
Sat Midday PH	116	1864	1388	1228	101

Notes:
1. based on land uses from Preliminary Traffic Impact and Access Assessment - Proposed Town Center by Vanasse & Associates - June 14, 2005
2. from Wayland Planning Board's 2005 proposed Mixed-Use Overlay District zoning proposal - See Attachment B
3. from Wayland Planning Board's 2006 proposed Mixed-Use Overlay District zoning proposal - See Attachment B
4. based on MassHousing Development Application for "The Residences at Wayland Center" submitted by Twenty Wayland, LLC on February 16, 2006.

Trip Generation Assessment - Assumed Existing Office Use (Fully Re-occupied)

Project: Updated 2006 Town Center Mixed Use Overlay District (MUOD)
Date: April 7, 2006
Analyst: TEC / Kevin R. Dandrade, P.E., P.T.O.E.
Source: Institute of Transportation Engineers - Trip Generation - 7th Ed.

Based on Building Area

410 ksf General Office Building - ITE LUC 710 (Used within Comparative analysis)

Units: 410 KSF

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips 0%*	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	4514	3954	0	0	3954	50%	50%	1977	1977
Weekday AM PH - Adjacent Street	636	580	0	0	580	88%	12%	510	70
Weekday PM PH - Adjacent Street	611	538	0	0	538	17%	83%	91	447
Saturday Daily	972	896	0	0	896	50%	50%	448	448
Sat Midday PH	168	116	0	0	116	54%	46%	63	53

Trip Generation Assessment - November 2005 MUOD Proposal

Project: Updated 2006 Town Center Mixed Use Overlay District (MUOD)
Date: March 30, 2006
Analyst: TEC / Kevin R. Dandrade, P.E., P.T.O.E.
Source: Institute of Transportation Engineers - Trip Generation - 7th Ed.

10 ksf General Office Building - ITE LUC 710
Units: 10 KSF

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips[2]	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	110	227	0	7	220	50%	50%	110	110
Weekday AM PH - Adjacent Street	16	30	0	1	29	88%	12%	25	3
Weekday PM PH - Adjacent Street	15	90	0	3	87	17%	83%	15	72
Saturday Daily	24	40	0	1	39	50%	50%	19	19
Sat Midday PH	4	6	0	0	6	54%	46%	3	3

10 ksf Medical-Dental Office Building - ITE LUC 720
Size: 10 ksf

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips[2]	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	361	194	0	6	188	50%	50%	94	94
Weekday AM PH - Adjacent Street	25	N/A	0	1	24	79%	21%	19	5
Weekday PM PH - Adjacent Street	37	37	0	1	36	27%	73%	10	26
Saturday Daily	90	N/A	0	3	87	50%	50%	43	43
Sat Midday PH	36	N/A	0	1	35	57%	43%	20	15

180.0 ksf Shopping Center - ITE LUC 820
Units: 180 KSF

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 25%	Shared Trips[2]	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	7729	9951	2488	299	7165	50%	50%	3582	3582
Weekday AM PH - Adjacent Street	185	223	56	7	160	61%	39%	98	63
Weekday PM PH - Adjacent Street	675	923	231	28	664	48%	52%	319	345
Saturday Daily	8995	13381	3345	401	9634	50%	50%	4817	4817
Sat Midday PH	895	1268	317	38	913	52%	48%	475	438

Assumes a Pass-by Rate of 25%

40 ksf Government Office Complex - ITE LUC 733
Size: 40 ksf

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips[2]	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	1117	N/A	0	34	1083	50%	50%	542	542
Weekday AM PH - Adjacent Street	88	N/A	0	3	86	89%	11%	76	9
Weekday PM PH - Adjacent Street	114	N/A	0	3	111	31%	69%	34	76
Saturday Daily	0	N/A	0	0	0	50%	50%	0	0
Sat Midday PH	0	N/A	0	0	0	50%	50%	0	0

120 Residential Condominium Units - ITE LUC 230

Units: 120 Res. Units

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips[2]	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	703	749	0	22	727	50%	50%	363	363
Weekday AM PH	53	60	0	2	58	17%	83%	10	48
Weekday PM PH	62	70	0	2	68	67%	33%	45	22
Saturday Daily	680	862	0	26	836	50%	50%	418	418
Sat Midday PH	56	77	0	2	75	54%	46%	41	35

Total Trips - All Uses

					# Primary Trips	
	Total Trips	Passby Trips	Shared Trips	Primary Trips	IN	OUT
Weekday Daily	12238	2488	367	9383	4691	4691
Weekday AM PH - Adjacent Street	425	56	13	357	228	129
Weekday PM PH - Adjacent Street	1234	231	37	966	423	543
Saturday Daily	14372	3345	431	10596	5298	5298
Sat Midday PH	1388	317	42	1029	538	491

Note:
1. Pass-by Trip and Shared Trip estimates based on ITE Trip Generation Handbook, Figures 5.5, 5.8 and Tables 5.4, 5.7, 7.1, 7.2
2. Shared trip assumption: 3% for all time periods

Trip Generation Assessment - April 2006 MUOD Proposal

Project: Updated 2006 Town Center Mixed Use Overlay District (MUOD)
Date: April 4, 2006
Analyst: TEC / Kevin R. Dandrade, P.E., P.T.O.E.
Source: Institute of Transportation Engineers - Trip Generation - 7th Ed.

10 ksf General Office Building - ITE LUC 710

Units: 10 KSF

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips²	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	110	227	0	7	220	50%	50%	110	110
Weekday AM PH - Adjacent Street*	16	30	0	1	29	88%	12%	25	3
Weekday PM PH - Adjacent Street	15	90	0	3	87	17%	83%	15	72
Saturday Daily	24	40	0	1	39	50%	50%	19	19
Sat Midday PH	4	6	0	0	6	54%	46%	3	3

155.0 ksf Shopping Center - ITE LUC 820

Units: 155 KSF

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 25%	Shared Trips²	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	6656	9029	2257	271	6501	50%	50%	3251	3251
Weekday AM PH - Adjacent Street	160	204	51	6	147	61%	39%	89	57
Weekday PM PH - Adjacent Street	581	836	209	25	602	48%	52%	289	313
Saturday Daily	7745	12178	3044	365	8768	50%	50%	4384	4384
Sat Midday PH	770	1151	288	35	829	52%	48%	431	398

Assumes a Pass-by Rate of 25%

40 ksf Government Office Complex - ITE LUC 733

Size: 40 ksf

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips²	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	1117	N/A	0	34	1083	50%	50%	542	542
Weekday AM PH - Adjacent Street	88	N/A	0	3	86	89%	11%	76	9
Weekday PM PH - Adjacent Street	114	N/A	0	3	111	31%	69%	34	76
Saturday Daily	0	N/A	0	0	0	50%	50%	0	0
Sat Midday PH	0	N/A	0	0	0	50%	50%	0	0

100 Residential Condominium Units - ITE LUC 230

Units: 100 Res. Units

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips²	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	586	642	0	19	623	50%	50%	311	311
Weekday AM PH	44	52	0	2	50	17%	83%	9	42
Weekday PM PH	52	60	0	2	58	67%	33%	39	19
Saturday Daily	567	790	0	24	766	50%	50%	383	383
Sat Midday PH	47	72	0	2	69	54%	46%	38	32

Total Trips - All Uses

	Total Trips	Passby Trips	Shared Trips	Primary Trips	# Primary Trips	
					IN	OUT
Weekday Daily	11014	2257	330	8427	4213	4213
Weekday AM PH - Adjacent Street	373	51	11	311	200	112
Weekday PM PH - Adjacent Street	1100	209	33	858	377	481
Saturday Daily	13007	3044	390	9573	4786	4786
Sat Midday PH	1228	288	37	904	471	432

Note: 1. Pass-by Trip and Shared Trip estimates based on ITE Trip Generation Handbook, Figures 5.5, 5.8 and Tables 5.4, 5.7, 7.1, 7.2
2. Shared trip assumption: 3% for all time periods

Trip Generation Assessment
Comparison of Assumed Existing Office Use / April 2006 MUOD

Project: Updated 2006 Town Center Mixed Use Overlay District (MUOD)
Date: April 4, 2006
Analyst: TEC / Kevin R. Dandrade, P.E., P.T.O.E.
Source: Institute of Transportation Engineers - Trip Generation - 7th Ed.

Difference in Total Trips (Primary + Pass-by + Shared) Associated with the Site

	Assumed Existing Office Use (Fully Re-occupied)	April 2006 MUOD Proposal	Difference
Weekday Daily	3954	11014	7061
Weekday AM PH - Adjacent Street	580	373	-207
Weekday PM PH - Adjacent Street	538	1100	562
Saturday Daily	896	13007	12112
Sat Midday PH	116	1228	1112

Difference in Primary (New) Trips Associated with the Site

	Assumed Existing Office Use (Fully Re-occupied)	April 2006 MUOD Proposal	Difference
Weekday Daily	3954	8427	4473
Weekday AM PH - Adjacent Street	580	311	-269
Weekday PM PH - Adjacent Street	538	858	320
Saturday Daily	896	9573	8677
Sat Midday PH	116	904	788

Notes:
1. Pass-by Trips are made by vehicles that are already on Route 20 or Route 27 and turn into the site for a impulse trip and then leave the site bound in the original intended direction of travel.
2. Shared trips are those associated with a person that visits two of the uses on the site during the same interval.
3. Primary trips are those associated with a specific trip to one of the proposed uses and are new to the adjacent street system.

Trip Generation Assessment - 40B Residential Condominium Proposal

Project: Updated 2006 Town Center Mixed Use Overlay District (MUOD)
Date: March 30, 2006
Analyst: TEC / Kevin R. Dandrade, P.E., P.T.O.E.
Source: Institute of Transportation Engineers - Trip Generation - 7th Ed.

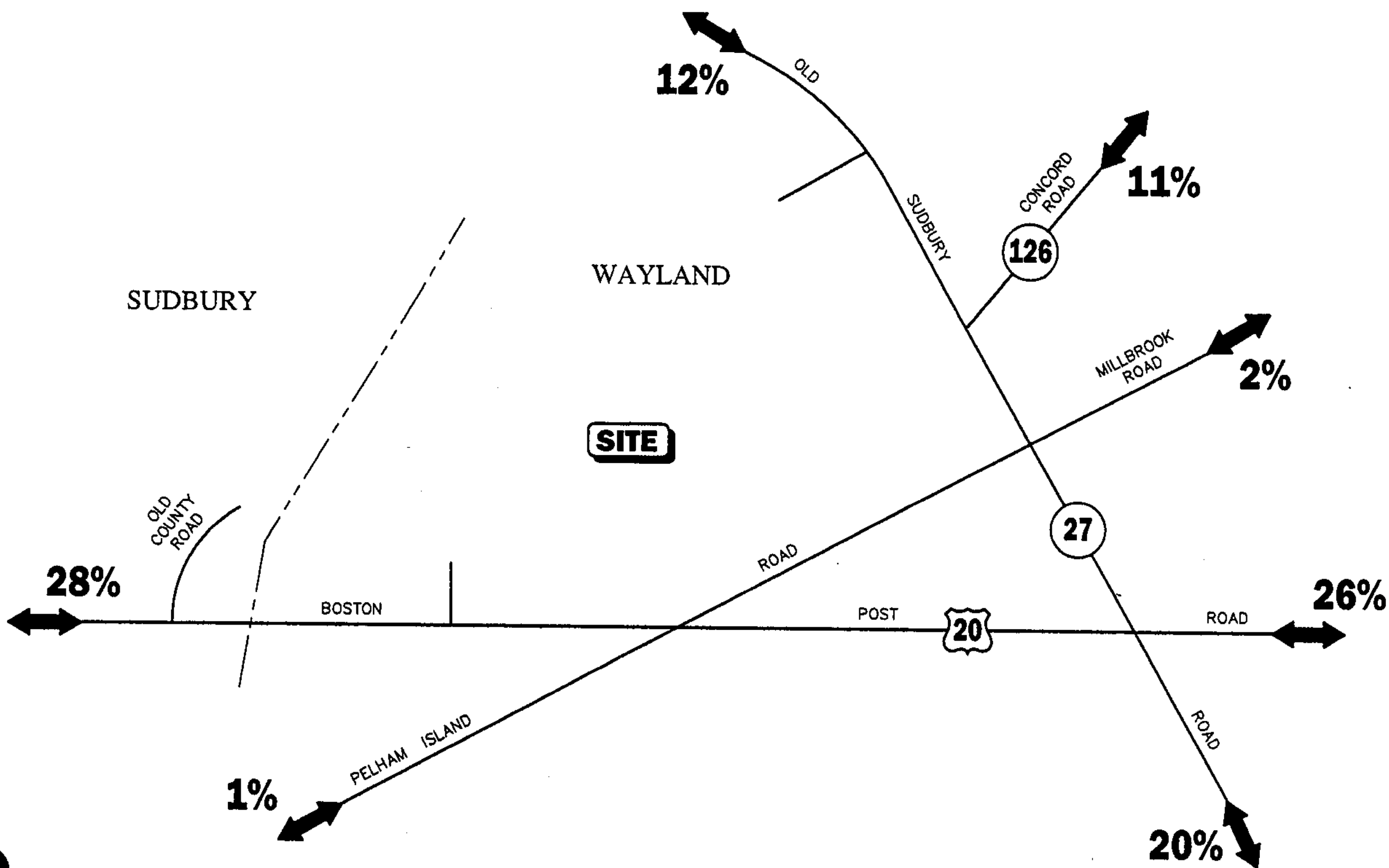
200 Residential Condominium Units - ITE LUC 230*

Units: 200 Res. Units

	Total Trips				Total	% Distribution		# Primary Trips	
	Avg. Rates	Fitted Curve	Pass-by 0%	Shared Trips	Primary Trips	IN	OUT	IN	OUT
Weekday Daily	1172	1157	0	0	1157	50%	50%	578	578
Weekday AM PH	88	90	0	0	90	17%	83%	15	75
Weekday PM PH	104	106	0	0	106	67%	33%	71	35
Saturday Daily	1134	1152	0	0	1152	50%	50%	576	576
Sat Midday PH	94	101	0	0	101	54%	46%	54	46

* ITE defines the trip generation for condominiums based on the total number of units. There is no differentiation for the number of bedrooms per unit.

Attachment D
Trip Distribution Estimates – Vanasse & Associates, Inc.



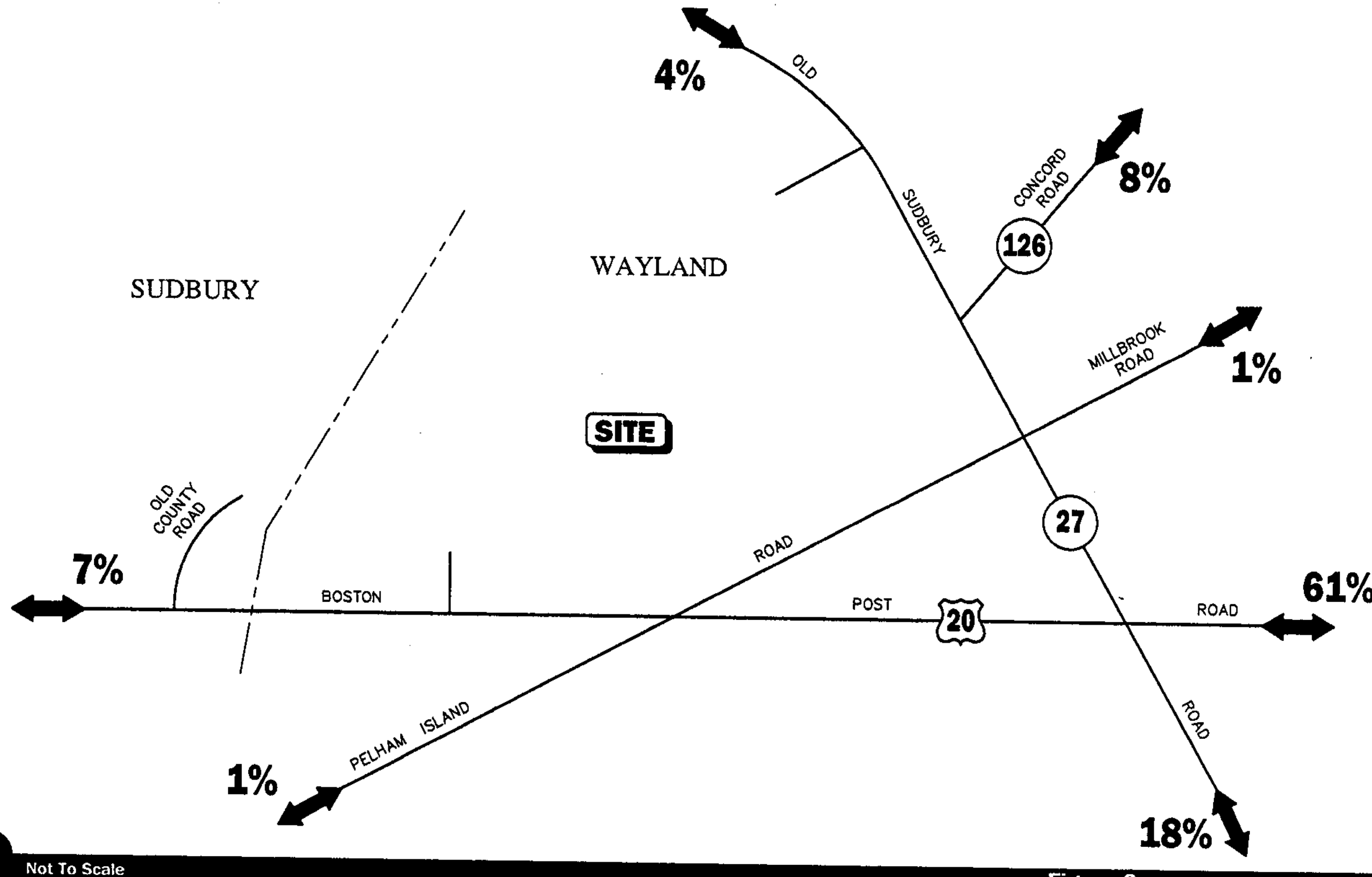
Not To Scale

Figure 8

Trip Distribution Map
Retail Trips

Vanasse & Associates, Inc.
Transportation Engineers & Planners

R:\4419\PTIAS\4419trip.dwg 6/14/2005 4:32:02 PM EDT



Vanasse & Associates, Inc.
Transportation Engineers & Planners

Figure 9

Trip Distribution Map
Residential Trips

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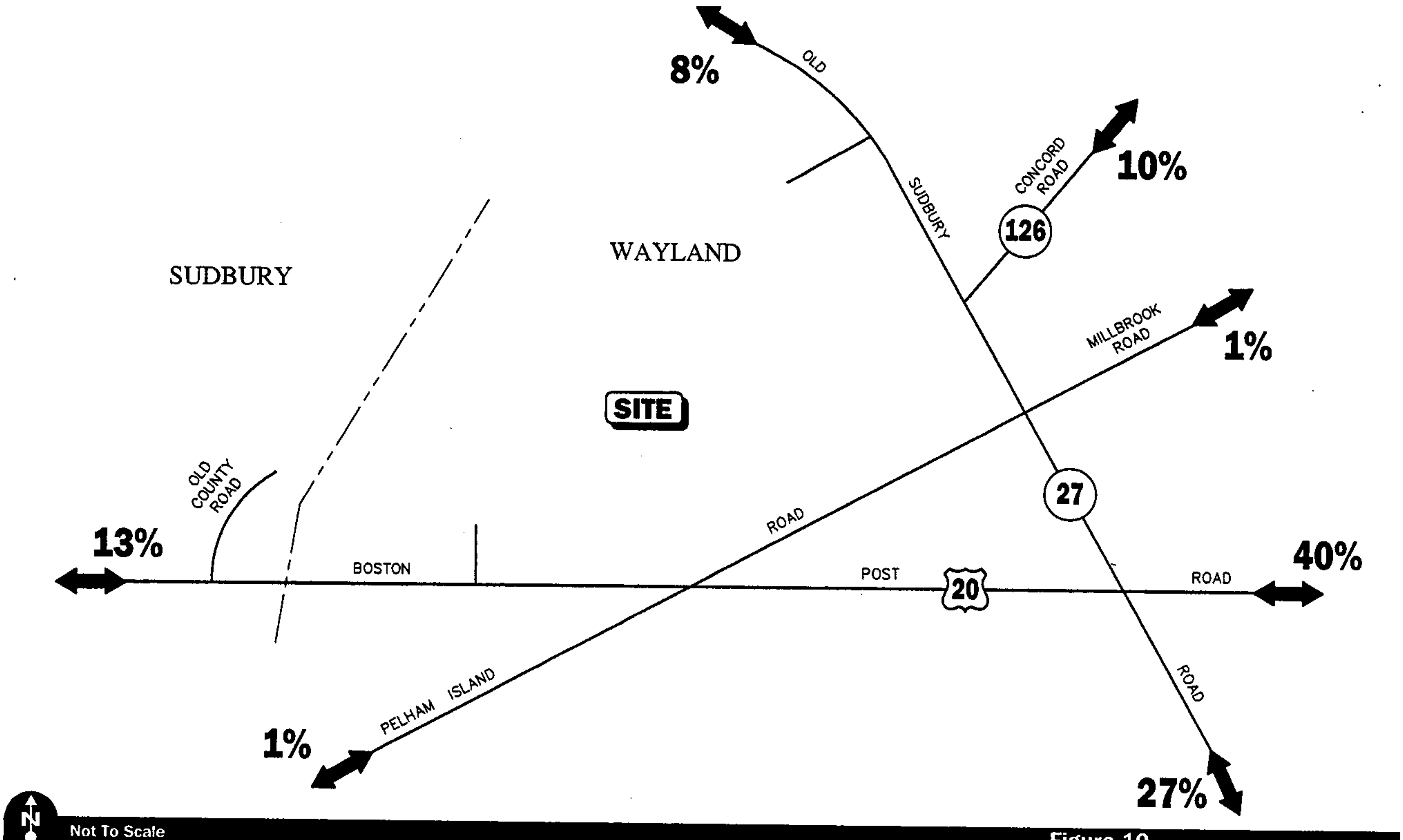

Figure 10

Trip Distribution Map
Office and Municipal Trips

Vanasse & Associates, Inc.
Transportation Engineers & Planners

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Attachment E

Capacity Analyses

Abbreviations:
HCM = Highway Capacity Manual
LOS = Level of Service
ICU = Intersection Capacity Utilization

2005 Existing Conditions
Weekday Evening Peak Hour &
Saturday Midday Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	11	11	12	11	11	12	12	11	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1454	1881	1561	1745	1900	1546	1745	1898		1728	1879	
Flt Permitted	0.09	1.00	1.00	0.10	1.00	1.00	0.09	1.00		0.22	1.00	
Satd. Flow (perm)	133	1881	1561	183	1900	1546	171	1898		400	1879	
Volume (vph)	175	618	128	29	627	281	169	401	3	124	610	40
Peak-hour factor, PHF	0.94	0.94	0.94	0.96	0.96	0.96	0.86	0.86	0.86	0.94	0.94	0.94
Adj. Flow (vph)	186	657	136	30	653	293	197	466	3	132	649	43
RTOR Reduction (vph)	0	0	28	0	0	39	0	0	0	0	0	0
Lane Group Flow (vph)	186	657	108	30	653	254	197	469	0	132	692	0
Heavy Vehicles (%)	20%	1%	0%	0%	0%	1%	0%	0%	0%	1%	0%	3%
Turn Type	pm+pt		pt+ov	pm+pt		pt+ov	pm+pt			pm+pt		
Protected Phases	5	2	2 3	1	6	6 7	7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	53.4	45.4	58.4	42.6	39.0	52.0	45.0	39.0		45.0	39.0	
Effective Green, g (s)	57.0	48.4	62.4	46.6	42.0	56.0	53.0	43.0		53.0	43.0	
Actuated g/C Ratio	0.47	0.40	0.51	0.38	0.34	0.46	0.43	0.35		0.43	0.35	
Clearance Time (s)	7.0	7.0		5.0	7.0		8.0	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	181	746	798	129	654	710	203	669		283	662	
v/s Ratio Prot	c0.09	0.35	0.07	0.01	0.34	0.16	c0.08	0.25		0.04	c0.37	
v/s Ratio Perm	c0.39			0.08			0.34			0.16		
v/c Ratio	1.03	0.88	0.13	0.23	1.00	0.36	0.97	0.70		0.47	1.05	
Uniform Delay, d1	35.9	34.1	15.6	28.1	40.0	21.4	58.0	34.0		23.9	39.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	74.3	14.1	0.1	0.9	34.8	0.3	54.4	3.3		1.2	47.4	
Delay (s)	110.2	48.2	15.7	29.0	74.8	21.7	112.4	37.3		25.1	86.9	
Level of Service	F	D	B	C	E	C	F	D		C	F	
Approach Delay (s)		55.5			57.4			59.5			77.0	
Approach LOS		E			E			E			E	

Intersection Summary

HCM Average Control Delay	62.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	122.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	11	11	12	11	11	12	12	11	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	1863	1561	1711	1863	1546	1694	1874		1728	1839	
Flt Permitted	0.12	1.00	1.00	0.27	1.00	1.00	0.26	1.00		0.11	1.00	
Satd. Flow (perm)	220	1863	1561	477	1863	1546	463	1874		208	1839	
Volume (vph)	199	500	213	52	488	163	175	437	12	193	309	42
Peak-hour factor, PHF	0.92	0.92	0.92	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	216	543	232	58	548	183	184	460	13	208	332	45
RTOR Reduction (vph)	0	0	59	0	0	29	0	0	0	0	0	0
Lane Group Flow (vph)	216	543	173	58	548	154	184	473	0	208	377	0
Heavy Vehicles (%)	0%	2%	0%	2%	2%	1%	3%	1%	0%	1%	1%	5%
Turn Type	pm+pt		pt+ov	pm+pt		pt+ov	pm+pt			pm+pt		
Protected Phases	5	2	2 3	1	6	6 7	7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	57.1	47.3	64.3	43.9	39.1	55.1	38.9	29.9		40.9	30.9	
Effective Green, g (s)	60.1	50.3	68.3	47.9	42.1	59.1	46.9	33.9		48.9	34.9	
Actuated g/C Ratio	0.50	0.42	0.57	0.40	0.35	0.49	0.39	0.28		0.41	0.29	
Clearance Time (s)	7.0	7.0		5.0	7.0		8.0	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	288	781	888	250	654	761	314	529		262	535	
v/s Ratio Prot	c0.09	0.29	0.11	0.01	c0.29	0.10	0.06	c0.25		c0.09	0.21	
v/s Ratio Perm	0.29			0.08			0.17			0.23		
v/c Ratio	0.75	0.70	0.19	0.23	0.84	0.20	0.59	0.89		0.79	0.70	
Uniform Delay, d1	23.6	28.6	12.5	23.9	35.8	17.2	26.6	41.3		28.0	38.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.5	5.1	0.1	0.5	12.2	0.1	2.8	17.4		15.1	4.2	
Delay (s)	34.0	33.6	12.6	24.3	48.0	17.3	29.3	58.7		43.1	42.2	
Level of Service	C	C	B	C	D	B	C	E		D	D	
Approach Delay (s)		28.8			39.1			50.5			42.5	
Approach LOS		C			D			D			D	

Intersection Summary

HCM Average Control Delay	38.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

2010 Weekday Evening Peak Hour Build Conditions for
Vanasse & Associates Traffic Volumes
(June '05 Twenty Wayland, LLC Proposal)
with TEC's Assumed Lane Use and Timing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	11	11	12	11	11	12	12	11	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1454	1881	1561	1745	1900	1546	1745	1899		1728	1881	
Flt Permitted	0.09	1.00	1.00	0.09	1.00	1.00	0.09	1.00		0.11	1.00	
Satd. Flow (perm)	132	1881	1561	167	1900	1546	171	1899		197	1881	
Volume (vph)	98	744	208	30	746	392	286	492	3	187	703	42
Peak-hour factor, PHF	0.94	0.94	0.94	0.96	0.96	0.96	0.86	0.86	0.86	0.94	0.94	0.94
Adj. Flow (vph)	104	791	221	31	777	408	333	572	3	199	748	45
RTOR Reduction (vph)	0	0	38	0	0	38	0	0	0	0	0	0
Lane Group Flow (vph)	104	791	183	31	777	370	333	575	0	199	793	0
Heavy Vehicles (%)	20%	1%	0%	0%	0%	1%	0%	0%	0%	1%	0%	3%
Turn Type	pm+pt		pt+ov	pm+pt		pt+ov	pm+pt			pm+pt		
Protected Phases	5	2	2 3	1	6	6 7	7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	47.4	43.4	58.4	44.6	41.0	58.0	49.0	39.0		45.0	37.0	
Effective Green, g (s)	53.4	46.4	62.4	48.6	44.0	62.0	57.0	43.0		53.0	41.0	
Actuated g/C Ratio	0.44	0.38	0.51	0.40	0.36	0.51	0.47	0.35		0.43	0.34	
Clearance Time (s)	7.0	7.0		5.0	7.0		8.0	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	134	715	798	126	685	786	261	669		236	632	
v/s Ratio Prot	c0.04	c0.42	0.12	0.01	0.41	0.24	c0.15	0.30		0.08	0.42	
v/s Ratio Perm	0.30			0.09			c0.45			0.28		
v/c Ratio	0.78	1.11	0.23	0.25	1.13	0.47	1.28	0.86		0.84	1.25	
Uniform Delay, d1	58.4	37.8	16.5	30.4	39.0	19.4	56.2	36.7		27.5	40.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.0	66.6	0.1	1.0	77.7	0.4	150.5	10.7		23.0	127.3	
Delay (s)	82.4	104.4	16.6	31.4	116.7	19.8	206.7	47.4		50.6	167.8	
Level of Service	F	F	B	C	F	B	F	D		D	F	
Approach Delay (s)		85.0			82.0			105.8			144.3	
Approach LOS		F			F			F			F	

Intersection Summary

HCM Average Control Delay	102.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	122.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	113.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.98	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1805	1881	1881	1615	1783	
Flt Permitted	0.15	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	288	1881	1881	1615	1783	
Volume (vph)	73	510	822	325	324	64
Peak-hour factor, PHF	0.76	0.76	0.99	0.99	0.80	0.80
Adj. Flow (vph)	96	671	830	328	405	80
RTOR Reduction (vph)	0	0	0	0	12	0
Lane Group Flow (vph)	96	671	830	328	473	0
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	Perm			pm+ov		
Protected Phases		6	2	8	8	
Permitted Phases	6			2		
Actuated Green, G (s)	25.4	25.4	25.4	40.8	15.4	
Effective Green, g (s)	26.4	26.4	26.4	42.8	16.4	
Actuated g/C Ratio	0.52	0.52	0.52	0.84	0.32	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	150	978	978	1615	576	
v/s Ratio Prot		0.36	c0.44	0.07	c0.27	
v/s Ratio Perm	0.33			0.14		
v/c Ratio	0.64	0.69	0.85	0.20	0.82	
Uniform Delay, d1	8.8	9.1	10.5	0.8	15.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.8	1.6	6.7	0.0	8.8	
Delay (s)	15.6	10.7	17.2	0.8	24.6	
Level of Service	B	B	B	A	C	
Approach Delay (s)		11.3	12.5		24.6	
Approach LOS		B	B		C	

Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	50.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1863	1583	1770	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.42	1.00
Satd. Flow (perm)	1770	1583	1863	1583	779	1881
Volume (vph)	216	289	294	148	277	609
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	235	314	320	161	301	662
RTOR Reduction (vph)	0	162	0	50	0	0
Lane Group Flow (vph)	235	152	320	111	301	662
Heavy Vehicles (%)	2%	2%	2%	2%	2%	1%
Turn Type		pt+ov		pt+ov	pm+pt	
Protected Phases	4	4 5	6	6 4	5	2
Permitted Phases					2	
Actuated Green, G (s)	10.8	24.9	23.0	38.8	37.1	37.1
Effective Green, g (s)	11.8	25.9	24.0	39.8	38.1	38.1
Actuated g/C Ratio	0.20	0.45	0.41	0.69	0.66	0.66
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	2.0		2.0		2.0	2.0
Lane Grp Cap (vph)	361	708	772	1088	685	1238
v/s Ratio Prot	c0.13	0.10	0.17	0.07	0.08	c0.35
v/s Ratio Perm					0.21	
v/c Ratio	0.65	0.21	0.41	0.10	0.44	0.53
Uniform Delay, d1	21.2	9.8	12.0	3.0	4.7	5.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.2	0.1	1.6	0.0	0.2	1.7
Delay (s)	24.3	9.8	13.6	3.1	4.9	6.9
Level of Service	C	A	B	A	A	A
Approach Delay (s)	16.0		10.1			6.3
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	57.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00		0.95	1.00
Satd. Flow (prot)	1770	1870		1770	1881	1583		1803	1583		1778	1583
Flt Permitted	0.95	1.00		0.44	1.00	1.00		0.73	1.00		0.71	1.00
Satd. Flow (perm)	1770	1870		816	1881	1583		1357	1583		1325	1583
Volume (vph)	283	554	20	20	705	193	20	10	20	224	10	277
Peak-hour factor, PHF	0.96	0.96	0.92	0.92	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	295	577	22	22	750	205	22	11	22	243	11	301
RTOR Reduction (vph)	0	2	0	0	0	79	0	0	17	0	0	72
Lane Group Flow (vph)	295	597	0	22	750	126	0	33	5	0	254	229
Heavy Vehicles (%)	2%	1%	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Perm		Perm	Perm		Perm	Perm		pm+ov
Protected Phases	5	2			6			4			8	5
Permitted Phases				6		6	4		4	8		8
Actuated Green, G (s)	15.4	55.3		34.9	34.9	34.9		16.8	16.8		16.8	32.2
Effective Green, g (s)	16.4	56.3		35.9	35.9	35.9		17.8	17.8		17.8	34.2
Actuated g/C Ratio	0.20	0.69		0.44	0.44	0.44		0.22	0.22		0.22	0.42
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0		5.0	5.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	354	1282		357	823	692		294	343		287	737
v/s Ratio Prot	c0.17	0.32			c0.40							0.06
v/s Ratio Perm				0.03		0.08		0.02	0.00		c0.19	0.08
v/c Ratio	0.83	0.47		0.06	0.91	0.18		0.11	0.01		0.89	0.31
Uniform Delay, d1	31.5	6.0		13.4	21.6	14.1		25.8	25.3		31.2	16.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	14.7	0.1		0.0	14.0	0.0		0.1	0.0		25.4	0.1
Delay (s)	46.3	6.1		13.4	35.6	14.2		25.9	25.3		56.5	16.1
Level of Service	D	A		B	D	B		C	C		E	B
Approach Delay (s)		19.3			30.6			25.6			34.6	
Approach LOS		B			C			C			C	

Intersection Summary

HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

2010 Saturday Midday Peak Hour Build Conditions for
Vanasse & Associates Traffic Volumes
(June '05 Twenty Wayland, LLC Proposal)
with TEC's Assumed Lane Use and Timing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	11	11	12	11	11	12	12	11	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	1863	1561	1711	1863	1546	1694	1873		1728	1846	
Flt Permitted	0.10	1.00	1.00	0.10	1.00	1.00	0.15	1.00		0.15	1.00	
Satd. Flow (perm)	183	1863	1561	185	1863	1546	274	1873		280	1846	
Volume (vph)	110	632	300	55	628	293	291	431	13	282	404	44
Peak-hour factor, PHF	0.92	0.92	0.92	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	120	687	326	62	706	329	306	454	14	303	434	47
RTOR Reduction (vph)	0	0	75	0	0	50	0	0	0	0	0	0
Lane Group Flow (vph)	120	687	251	62	706	279	306	468	0	303	481	0
Heavy Vehicles (%)	0%	2%	0%	2%	2%	1%	3%	1%	0%	1%	1%	5%
Turn Type	pm+pt		pt+ov	pm+pt		pt+ov	pm+pt			pm+pt		
Protected Phases	5	2	2 3	1	6	6 7	7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	41.2	37.2	53.2	40.8	36.0	52.0	31.0	22.0		31.0	22.0	
Effective Green, g (s)	47.2	40.2	57.2	44.8	39.0	56.0	39.0	26.0		39.0	26.0	
Actuated g/C Ratio	0.47	0.40	0.57	0.44	0.39	0.55	0.39	0.26		0.39	0.26	
Clearance Time (s)	7.0	7.0		5.0	7.0		8.0	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	194	742	884	170	719	857	289	482		294	475	
v/s Ratio Prot	c0.04	0.37	0.16	0.02	c0.38	0.18	c0.14	0.25		0.13	0.26	
v/s Ratio Perm	0.25			0.14			c0.27			0.27		
v/c Ratio	0.62	0.93	0.28	0.36	0.98	0.33	1.06	0.97		1.03	1.01	
Uniform Delay, d1	22.6	29.0	11.3	21.7	30.7	12.2	26.9	37.1		26.8	37.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.8	19.2	0.2	1.3	29.4	0.2	69.3	33.4		60.6	44.5	
Delay (s)	28.4	48.2	11.5	23.0	60.1	12.5	96.2	70.5		87.4	82.0	
Level of Service	C	D	B	C	E	B	F	E		F	F	
Approach Delay (s)		35.5			43.7			80.7			84.1	
Approach LOS		D			D			F			F	

Intersection Summary

HCM Average Control Delay	57.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	101.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.97	
Flt Protected	0.95	1.00	1.00	1.00	0.96	
Satd. Flow (prot)	1805	1863	1845	1599	1747	
Flt Permitted	0.40	1.00	1.00	1.00	0.96	
Satd. Flow (perm)	755	1863	1845	1599	1747	
Volume (vph)	78	504	443	314	316	89
Peak-hour factor, PHF	0.89	0.89	0.98	0.98	0.91	0.91
Adj. Flow (vph)	88	566	452	320	347	98
RTOR Reduction (vph)	0	0	0	0	15	0
Lane Group Flow (vph)	88	566	452	320	430	0
Heavy Vehicles (%)	0%	2%	3%	1%	2%	0%
Turn Type	Perm			pm+ov		
Protected Phases		6	2	8	8	
Permitted Phases	6			2		
Actuated Green, G (s)	16.7	16.7	16.7	30.6	13.9	
Effective Green, g (s)	17.7	17.7	17.7	32.6	14.9	
Actuated g/C Ratio	0.44	0.44	0.44	0.80	0.37	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	329	812	804	1599	641	
v/s Ratio Prot		c0.30	0.25	0.07	c0.25	
v/s Ratio Perm	0.12			0.13		
v/c Ratio	0.27	0.70	0.56	0.20	0.67	
Uniform Delay, d1	7.3	9.3	8.6	0.9	10.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	2.1	0.5	0.0	2.2	
Delay (s)	7.5	11.4	9.1	1.0	13.0	
Level of Service	A	B	A	A	B	
Approach Delay (s)		10.9	5.7		13.0	
Approach LOS		B	A		B	

Intersection Summary

HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	40.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1881	1615	1805	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.44	1.00
Satd. Flow (perm)	1770	1583	1881	1615	841	1881
Volume (vph)	218	305	277	205	332	200
Peak-hour factor, PHF	0.92	0.92	0.96	0.96	0.97	0.97
Adj. Flow (vph)	237	332	289	214	342	206
RTOR Reduction (vph)	0	180	0	69	0	0
Lane Group Flow (vph)	237	152	289	145	342	206
Heavy Vehicles (%)	2%	2%	1%	0%	0%	1%
Turn Type		pt+ov		pt+ov	pm+pt	
Protected Phases	4	4 5	6	6 4	5	2
Permitted Phases					2	
Actuated Green, G (s)	10.8	25.5	22.4	38.2	37.1	37.1
Effective Green, g (s)	11.8	26.5	23.4	39.2	38.1	38.1
Actuated g/C Ratio	0.20	0.46	0.40	0.68	0.66	0.66
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	2.0		2.0		2.0	2.0
Lane Grp Cap (vph)	361	725	760	1093	732	1238
v/s Ratio Prot	c0.13	0.10	0.15	0.09	c0.09	0.11
v/s Ratio Perm					c0.22	
v/c Ratio	0.66	0.21	0.38	0.13	0.47	0.17
Uniform Delay, d1	21.2	9.4	12.1	3.3	4.7	3.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.3	0.1	1.4	0.0	0.2	0.3
Delay (s)	24.5	9.5	13.6	3.3	4.9	4.1
Level of Service	C	A	B	A	A	A
Approach Delay (s)	15.7		9.2			4.6
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	57.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00		0.95	1.00
Satd. Flow (prot)	1770	1870		1770	1881	1583		1799	1583		1777	1583
Flt Permitted	0.95	1.00		0.39	1.00	1.00		0.60	1.00		0.71	1.00
Satd. Flow (perm)	1770	1870		729	1881	1583		1125	1583		1316	1583
Volume (vph)	389	674	25	25	718	263	25	10	25	246	10	341
Peak-hour factor, PHF	0.97	0.97	0.97	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	401	695	26	28	798	292	27	11	27	267	11	371
RTOR Reduction (vph)	0	2	0	0	0	103	0	0	21	0	0	54
Lane Group Flow (vph)	401	720	0	28	798	189	0	38	6	0	278	317
Heavy Vehicles (%)	2%	1%	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Perm		Perm	Perm		Perm	Perm		pm+ov
Protected Phases	5	2			6			4			8	5
Permitted Phases				6		6	4		4	8		8
Actuated Green, G (s)	19.0	62.0		38.0	38.0	38.0		18.0	18.0		18.0	37.0
Effective Green, g (s)	20.0	63.0		39.0	39.0	39.0		19.0	19.0		19.0	39.0
Actuated g/C Ratio	0.22	0.70		0.43	0.43	0.43		0.21	0.21		0.21	0.43
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0		5.0	5.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	393	1309		316	815	686		238	334		278	756
v/s Ratio Prot	c0.23	0.38			c0.42							0.09
v/s Ratio Perm				0.04		0.12		0.03	0.00		c0.21	0.11
v/c Ratio	1.02	0.55		0.09	0.98	0.28		0.16	0.02		1.00	0.42
Uniform Delay, d1	35.0	6.6		15.0	25.1	16.4		29.0	28.1		35.5	17.7
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	50.7	0.3		0.0	26.0	0.1		0.1	0.0		54.0	0.1
Delay (s)	85.7	6.8		15.1	51.1	16.5		29.1	28.1		89.5	17.8
Level of Service	F	A		B	D	B		C	C		F	B
Approach Delay (s)		35.0			41.2			28.7			48.5	
Approach LOS		D			D			C			D	

Intersection Summary

HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

2010 Weekday Evening Peak Hour Build Conditions for
TEC, Inc. Calculated Traffic Volumes
(April 2006 MUOD Proposal)
with TEC's Assumed Lane Use and Timing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	11	11	12	11	11	12	12	11	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1454	1881	1561	1745	1900	1546	1745	1898		1728	1880	
Flt Permitted	0.09	1.00	1.00	0.09	1.00	1.00	0.09	1.00		0.12	1.00	
Satd. Flow (perm)	132	1881	1561	167	1900	1546	171	1898		218	1880	
Volume (vph)	97	735	200	30	743	371	267	483	3	185	695	42
Peak-hour factor, PHF	0.94	0.94	0.94	0.96	0.96	0.96	0.86	0.86	0.86	0.94	0.94	0.94
Adj. Flow (vph)	103	782	213	31	774	386	310	562	3	197	739	45
RTOR Reduction (vph)	0	0	37	0	0	39	0	0	0	0	0	0
Lane Group Flow (vph)	103	782	176	31	774	347	310	565	0	197	784	0
Heavy Vehicles (%)	20%	1%	0%	0%	0%	1%	0%	0%	0%	1%	0%	3%
Turn Type	pm+pt		pt+ov	pm+pt		pt+ov	pm+pt			pm+pt		
Protected Phases	5	2	2 3	1	6	6 7	7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	47.4	43.4	58.4	44.6	41.0	58.0	49.0	39.0		45.0	37.0	
Effective Green, g (s)	53.4	46.4	62.4	48.6	44.0	62.0	57.0	43.0		53.0	41.0	
Actuated g/C Ratio	0.44	0.38	0.51	0.40	0.36	0.51	0.47	0.35		0.43	0.34	
Clearance Time (s)	7.0	7.0		5.0	7.0		8.0	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	134	715	798	126	685	786	261	669		243	632	
v/s Ratio Prot	c0.04	c0.42	0.11	0.01	0.41	0.22	c0.14	0.30		0.08	0.42	
v/s Ratio Perm	0.29			0.09			c0.42			0.27		
v/c Ratio	0.77	1.09	0.22	0.25	1.13	0.44	1.19	0.84		0.81	1.24	
Uniform Delay, d1	58.3	37.8	16.4	30.4	39.0	19.0	56.2	36.4		26.9	40.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	22.8	62.1	0.1	1.0	76.0	0.4	116.2	9.6		18.2	121.3	
Delay (s)	81.2	99.9	16.5	31.4	115.0	19.4	172.4	46.0		45.1	161.8	
Level of Service	F	F	B	C	F	B	F	D		D	F	
Approach Delay (s)		82.0			81.9			90.8			138.4	
Approach LOS		F			F			F			F	

Intersection Summary

HCM Average Control Delay	97.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	122.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	111.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	1.00	
Flt Protected	0.95	1.00	1.00	1.00	0.95	
Satd. Flow (prot)	1805	1881	1881	1615	1804	
Flt Permitted	0.16	1.00	1.00	1.00	0.95	
Satd. Flow (perm)	311	1881	1881	1615	1804	
Volume (vph)	75	467	806	274	272	10
Peak-hour factor, PHF	0.76	0.76	0.99	0.99	0.80	0.80
Adj. Flow (vph)	99	614	814	277	340	12
RTOR Reduction (vph)	0	0	0	0	2	0
Lane Group Flow (vph)	99	614	814	277	350	0
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	Perm			pm+ov		
Protected Phases		6	2	8	8	
Permitted Phases	6			2		
Actuated Green, G (s)	23.4	23.4	23.4	35.6	12.2	
Effective Green, g (s)	24.4	24.4	24.4	37.6	13.2	
Actuated g/C Ratio	0.54	0.54	0.54	0.82	0.29	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	166	1007	1007	1615	522	
v/s Ratio Prot		0.33	c0.43	0.05	c0.19	
v/s Ratio Perm	0.32			0.12		
v/c Ratio	0.60	0.61	0.81	0.17	0.67	
Uniform Delay, d1	7.2	7.3	8.7	0.8	14.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.8	0.7	4.6	0.0	2.7	
Delay (s)	11.0	8.0	13.3	0.8	16.9	
Level of Service	B	A	B	A	B	
Approach Delay (s)		8.5	10.1		16.9	
Approach LOS		A	B		B	

Intersection Summary

HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	45.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1863	1583	1770	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.42	1.00
Satd. Flow (perm)	1770	1583	1863	1583	784	1881
Volume (vph)	142	228	314	105	207	687
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	248	341	114	225	747
RTOR Reduction (vph)	0	148	0	33	0	0
Lane Group Flow (vph)	154	100	341	81	225	747
Heavy Vehicles (%)	2%	2%	2%	2%	2%	1%
Turn Type		pt+ov		pt+ov	pm+pt	
Protected Phases	4	4 5	6	6 4	5	2
Permitted Phases					2	
Actuated Green, G (s)	9.2	21.7	24.6	38.8	37.1	37.1
Effective Green, g (s)	10.2	22.7	25.6	39.8	38.1	38.1
Actuated g/C Ratio	0.18	0.40	0.45	0.71	0.68	0.68
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	2.0		2.0		2.0	2.0
Lane Grp Cap (vph)	321	638	847	1119	679	1273
v/s Ratio Prot	c0.09	0.06	0.18	0.05	0.05	c0.40
v/s Ratio Perm					0.17	
v/c Ratio	0.48	0.16	0.40	0.07	0.33	0.59
Uniform Delay, d1	20.7	10.7	10.2	2.5	4.0	4.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.0	1.4	0.0	0.1	2.0
Delay (s)	21.1	10.7	11.7	2.6	4.1	6.9
Level of Service	C	B	B	A	A	A
Approach Delay (s)	14.7		9.4			6.2
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	56.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↑	↱		↰	↱		↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00		0.95	1.00
Satd. Flow (prot)	1770	1870		1770	1881	1583		1803	1583		1779	1583
Flt Permitted	0.95	1.00		0.43	1.00	1.00		0.77	1.00		0.71	1.00
Satd. Flow (perm)	1770	1870		807	1881	1583		1440	1583		1328	1583
Volume (vph)	215	565	20	20	611	154	20	10	20	181	10	229
Peak-hour factor, PHF	0.96	0.96	0.92	0.92	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	224	589	22	22	650	164	22	11	22	197	11	249
RTOR Reduction (vph)	0	2	0	0	0	76	0	0	17	0	0	99
Lane Group Flow (vph)	224	609	0	22	650	88	0	33	5	0	208	150
Heavy Vehicles (%)	2%	1%	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Perm		Perm	Perm		Perm	Perm		pm+ov
Protected Phases	5	2			6			4			8	5
Permitted Phases				6		6	4		4	8		8
Actuated Green, G (s)	12.4	45.2		27.8	27.8	27.8		13.8	13.8		13.8	26.2
Effective Green, g (s)	13.4	46.2		28.8	28.8	28.8		14.8	14.8		14.8	28.2
Actuated g/C Ratio	0.19	0.67		0.42	0.42	0.42		0.21	0.21		0.21	0.41
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0		5.0	5.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	344	1252		337	785	661		309	340		285	739
v/s Ratio Prot	c0.13	0.33			c0.35							0.04
v/s Ratio Perm				0.03		0.06		0.02	0.00		c0.16	0.06
v/c Ratio	0.65	0.49		0.07	0.83	0.13		0.11	0.01		0.73	0.20
Uniform Delay, d1	25.6	5.6		12.0	17.9	12.4		21.8	21.4		25.2	13.2
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	3.3	0.1		0.0	6.9	0.0		0.1	0.0		7.7	0.0
Delay (s)	29.0	5.7		12.1	24.8	12.4		21.8	21.4		32.9	13.2
Level of Service	C	A		B	C	B		C	C		C	B
Approach Delay (s)		11.9			22.0			21.6			22.2	
Approach LOS		B			C			C			C	

Intersection Summary

HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

2010 Saturday Midday Peak Hour Build Conditions for
TEC, Inc. Calculated Traffic Volumes
(April 2006 MUOD Proposal)
with TEC's Assumed Lane Use and Timing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱		↰	↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	11	11	12	11	11	12	12	11	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	1863	1561	1711	1863	1546	1694	1873		1728	1844	
Flt Permitted	0.10	1.00	1.00	0.12	1.00	1.00	0.15	1.00		0.15	1.00	
Satd. Flow (perm)	183	1863	1561	208	1863	1546	274	1873		280	1844	
Volume (vph)	109	589	267	55	580	243	244	412	13	249	373	44
Peak-hour factor, PHF	0.92	0.92	0.92	0.89	0.89	0.89	0.95	0.95	0.95	0.93	0.93	0.93
Adj. Flow (vph)	118	640	290	62	652	273	257	434	14	268	401	47
RTOR Reduction (vph)	0	0	75	0	0	45	0	0	0	0	0	0
Lane Group Flow (vph)	118	640	215	62	652	228	257	448	0	268	448	0
Heavy Vehicles (%)	0%	2%	0%	2%	2%	1%	3%	1%	0%	1%	1%	5%
Turn Type	pm+pt		pt+ov	pm+pt		pt+ov	pm+pt			pm+pt		
Protected Phases	5	2	2 3	1	6	6 7	7	4		3	8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	41.2	37.2	53.2	40.8	36.0	52.0	31.0	22.0		31.0	22.0	
Effective Green, g (s)	47.2	40.2	57.2	44.8	39.0	56.0	39.0	26.0		39.0	26.0	
Actuated g/C Ratio	0.47	0.40	0.57	0.44	0.39	0.55	0.39	0.26		0.39	0.26	
Clearance Time (s)	7.0	7.0		5.0	7.0		8.0	8.0		8.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	194	742	884	179	719	857	289	482		294	475	
v/s Ratio Prot	c0.04	0.34	0.14	0.02	c0.35	0.15	0.11	0.24		c0.12	c0.24	
v/s Ratio Perm	0.24			0.13			0.23			0.23		
v/c Ratio	0.61	0.86	0.24	0.35	0.91	0.27	0.89	0.93		0.91	0.94	
Uniform Delay, d1	21.3	27.9	11.0	20.6	29.3	11.8	25.1	36.6		25.2	36.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.3	12.6	0.1	1.2	17.3	0.2	26.4	24.3		30.6	27.4	
Delay (s)	26.6	40.5	11.2	21.7	46.5	11.9	51.5	60.9		55.7	64.2	
Level of Service	C	D	B	C	D	B	D	E		E	E	
Approach Delay (s)		30.8			35.4			57.5			61.0	
Approach LOS		C			D			E			E	

Intersection Summary

HCM Average Control Delay	43.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	101.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations	↰	↑	↑	↱	⋎	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	1.00	
Flt Protected	0.95	1.00	1.00	1.00	0.95	
Satd. Flow (prot)	1805	1863	1845	1599	1771	
Flt Permitted	0.46	1.00	1.00	1.00	0.95	
Satd. Flow (perm)	869	1863	1845	1599	1771	
Volume (vph)	74	457	413	262	264	7
Peak-hour factor, PHF	0.89	0.89	0.98	0.98	0.91	0.91
Adj. Flow (vph)	83	513	421	267	290	8
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	83	513	421	267	297	0
Heavy Vehicles (%)	0%	2%	3%	1%	2%	0%
Turn Type	Perm			pm+ov		
Protected Phases		6	2	8	8	
Permitted Phases	6			2		
Actuated Green, G (s)	15.0	15.0	15.0	25.1	10.1	
Effective Green, g (s)	16.0	16.0	16.0	27.1	11.1	
Actuated g/C Ratio	0.46	0.46	0.46	0.77	0.32	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	396	849	841	1599	560	
v/s Ratio Prot		c0.28	0.23	0.05	c0.17	
v/s Ratio Perm	0.10			0.11		
v/c Ratio	0.21	0.60	0.50	0.17	0.53	
Uniform Delay, d1	5.7	7.2	6.7	1.0	9.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.8	0.2	0.0	0.4	
Delay (s)	5.8	8.0	6.9	1.1	10.3	
Level of Service	A	A	A	A	B	
Approach Delay (s)		7.7	4.6		10.3	
Approach LOS		A	A		B	

Intersection Summary

HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	35.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1881	1615	1805	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.42	1.00
Satd. Flow (perm)	1770	1583	1881	1615	789	1881
Volume (vph)	144	201	330	123	244	275
Peak-hour factor, PHF	0.92	0.92	0.96	0.96	0.97	0.97
Adj. Flow (vph)	157	218	344	128	252	284
RTOR Reduction (vph)	0	129	0	38	0	0
Lane Group Flow (vph)	157	89	344	90	252	284
Heavy Vehicles (%)	2%	2%	1%	0%	0%	1%
Turn Type		pt+ov		pt+ov	pm+pt	
Protected Phases	4	4 5	6	6 4	5	2
Permitted Phases					2	
Actuated Green, G (s)	9.3	22.1	24.3	38.6	37.1	37.1
Effective Green, g (s)	10.3	23.1	25.3	39.6	38.1	38.1
Actuated g/C Ratio	0.18	0.41	0.45	0.70	0.68	0.68
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	2.0		2.0		2.0	2.0
Lane Grp Cap (vph)	323	648	844	1134	692	1271
v/s Ratio Prot	c0.09	0.06	c0.18	0.06	c0.06	0.15
v/s Ratio Perm					0.19	
v/c Ratio	0.49	0.14	0.41	0.08	0.36	0.22
Uniform Delay, d1	20.7	10.4	10.5	2.6	4.1	3.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.0	1.5	0.0	0.1	0.4
Delay (s)	21.1	10.5	12.0	2.7	4.2	3.9
Level of Service	C	B	B	A	A	A
Approach Delay (s)	14.9		9.4			4.0
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	56.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00		0.95	1.00
Satd. Flow (prot)	1770	1872		1770	1881	1583		1799	1583		1779	1583
Flt Permitted	0.95	1.00		0.35	1.00	1.00		0.68	1.00		0.71	1.00
Satd. Flow (perm)	1770	1872		659	1881	1583		1275	1583		1322	1583
Volume (vph)	273	779	25	25	793	186	25	10	25	179	10	253
Peak-hour factor, PHF	0.97	0.97	0.97	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	281	803	26	28	881	207	27	11	27	195	11	275
RTOR Reduction (vph)	0	1	0	0	0	65	0	0	22	0	0	59
Lane Group Flow (vph)	281	828	0	28	881	142	0	38	5	0	206	216
Heavy Vehicles (%)	2%	1%	2%	2%	1%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Perm		Perm	Perm		Perm	Perm		pm+ov
Protected Phases	5	2			6			4			8	5
Permitted Phases				6		6	4		4	8		8
Actuated Green, G (s)	15.4	61.0		40.6	40.6	40.6		14.7	14.7		14.7	30.1
Effective Green, g (s)	16.4	62.0		41.6	41.6	41.6		15.7	15.7		15.7	32.1
Actuated g/C Ratio	0.19	0.72		0.49	0.49	0.49		0.18	0.18		0.18	0.37
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0		5.0	5.0
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)	339	1354		320	913	768		234	290		242	667
v/s Ratio Prot	c0.16	0.44			c0.47							0.06
v/s Ratio Perm				0.04		0.09		0.03	0.00		c0.16	0.07
v/c Ratio	0.83	0.61		0.09	0.96	0.19		0.16	0.02		0.85	0.32
Uniform Delay, d1	33.3	5.9		11.8	21.3	12.5		29.5	28.7		33.9	19.1
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	14.6	0.6		0.0	21.4	0.0		0.1	0.0		23.1	0.1
Delay (s)	47.9	6.5		11.9	42.7	12.5		29.6	28.7		57.0	19.2
Level of Service	D	A		B	D	B		C	C		E	B
Approach Delay (s)		17.0			36.3			29.2			35.4	
Approach LOS		B			D			C			D	

Intersection Summary

HCM Average Control Delay	28.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	85.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Town of Wayland 2006 Mixed Use Overlay District Proposal * Traffic Assessment *

Kevin R. Dandrade, PE, PTOE

TEC, Inc.

Introduction to TEC, Inc.

- TEC is a multi-service civil engineering firm currently assisting the Planning Board with a Traffic Engineering Assessment for the 2006 Mixed Use Overlay District (MUOD) proposal
- TEC is currently assisting the following Town Boards / Department with traffic engineering assignments:
  - Board of Road Commissioners
  - Zoning Board of Appeals (ZBA)
  - Planning Board
  - Wayland Police Department

2006 MUOD Scope of Work

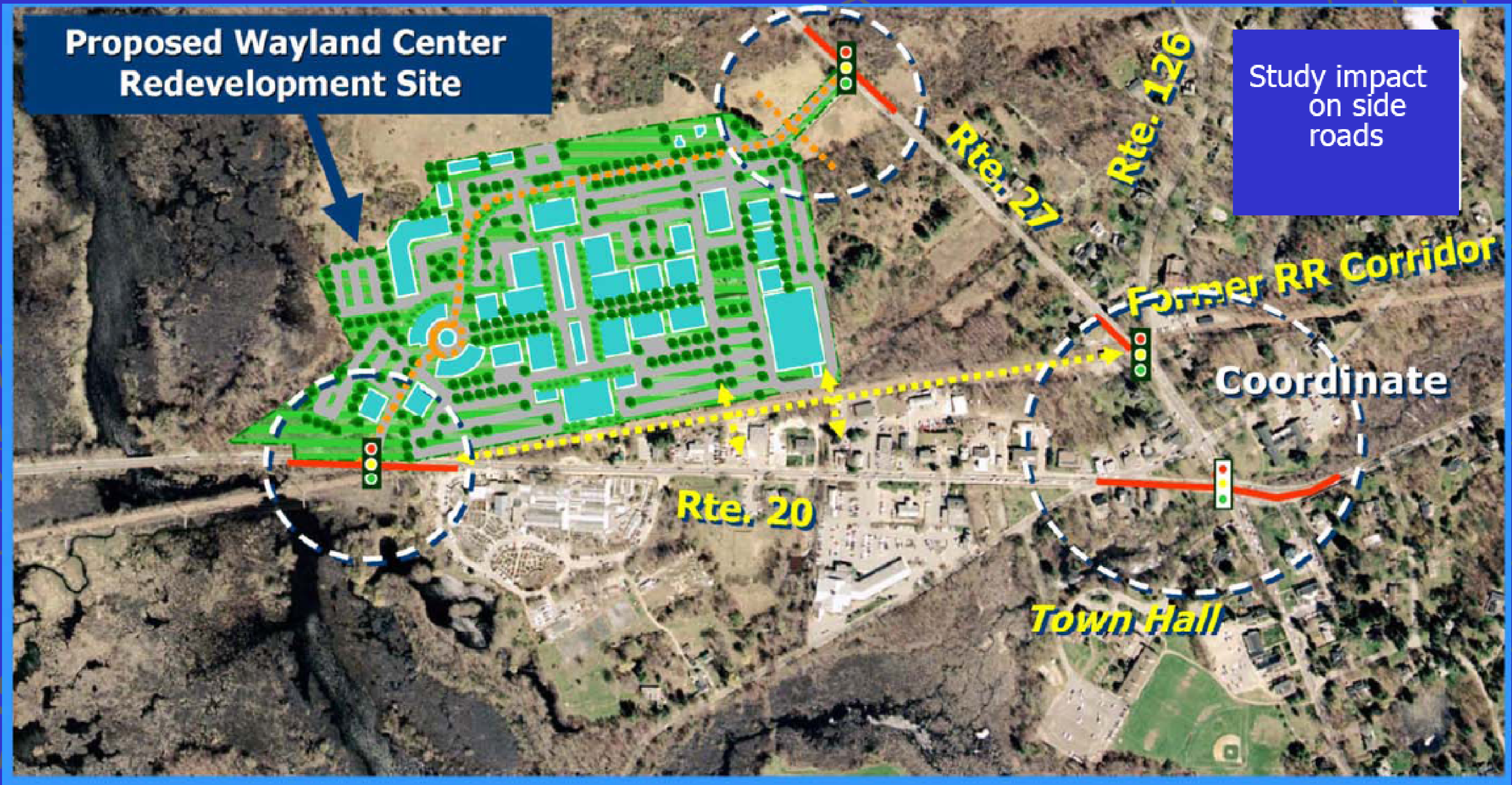
TEC performed the following tasks:

- Estimated vehicle trip generation for five different development proposals on the former Raytheon site in the center of Wayland
- Analyzed intersection capacity for the 2006 MUOD proposal and compared it to the June 2005 Twenty Wayland, LLC proposal
- Evaluated roadway improvements and traffic control devices

Site Proposals Analyzed:

1. Assumed existing office use – Fully Re-occupied
2. June 2005 Twenty Wayland, LLC Proposal
3. November 2005 MUOD Proposal – Planning Board
4. April 2006 MUOD Proposal – Planning Board
5. 40B Comprehensive Permit Proposal (Residential)

Project Areas



Uses Assumed for April 2006 MUOD Proposal

Institute of Transportation Engineers (ITE) categories:

- 155,000 sf Shopping Center (General Retail)
- 10,000 sf General Office
- 40,000 sf Municipal Office Complex
- 100 Residential Condominium Units

Key Elements of Trip Generation

- Primary Trips
- Pass-by Trips
- Shared Trips
- Options to distribute traffic to area roadways

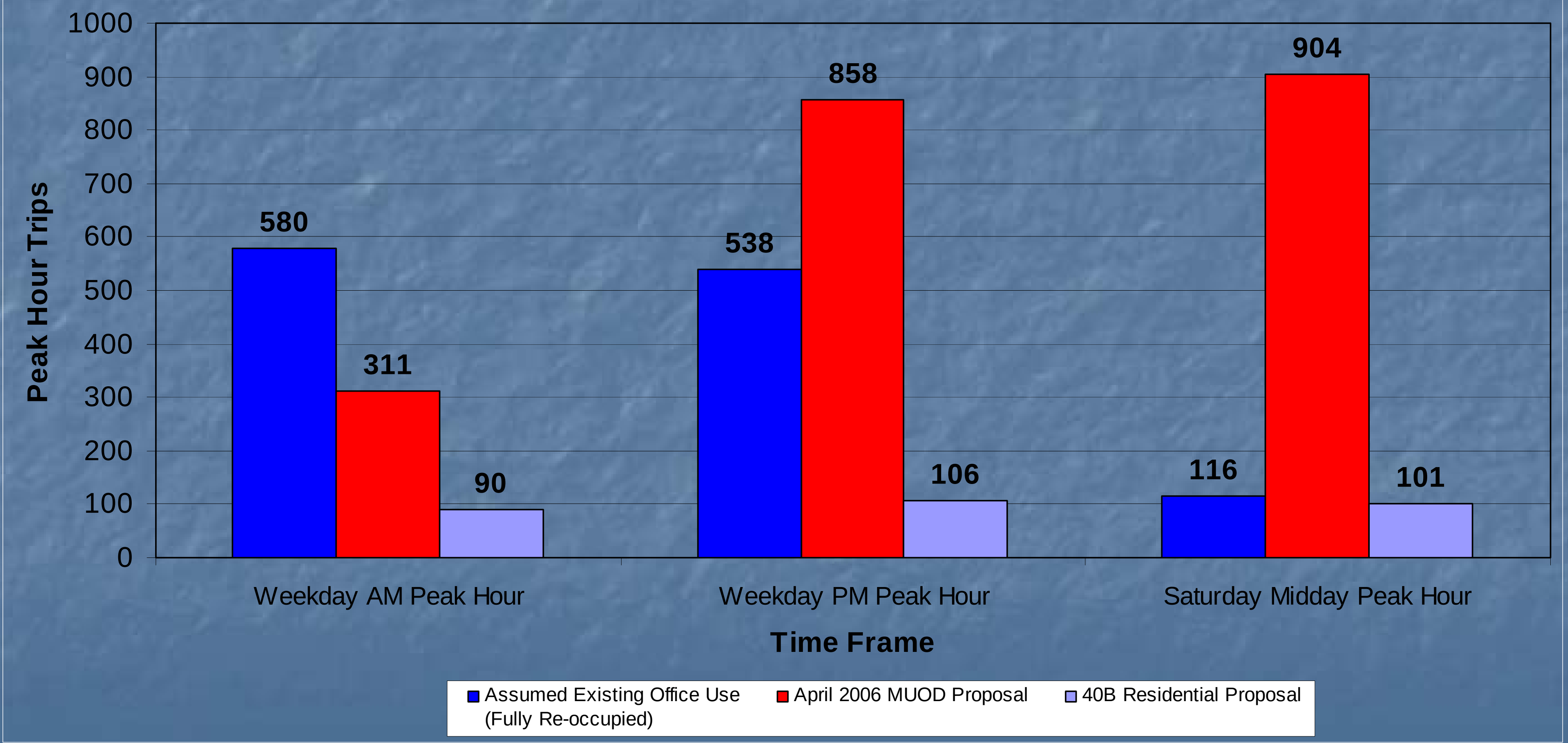
Trip Generation Comparison Estimated *Total* Trips

Time Period	410,000 sf Assumed Existing Office Use (Fully Reoccupied)	June 2005 Twenty Wayland, LLC Proposal	November 2005 MUOD Proposal	April 2006 MUOD Proposal	40B Residential Proposal
Weekday Daily	3,954	16,350	12,238	11,014	1,157
Weekday AM Peak	580	514	425	373	90
Weekday PM Peak	538	1,554	1,234	1,100	106
Saturday Daily	896	19,374	14,372	13,007	1,152
Saturday Peak	116	1,864	1,388	1,228	101

Trip Generation Comparison Estimated *Primary (New)* Trips

Time Period	410,000 sf Assumed Existing Office Use (Fully Reoccupied)	June 2005 Twenty Wayland, LLC Proposal	November 2005 MUOD Proposal	April 2006 MUOD Proposal	40B Residential Proposal
Weekday Daily	3,954	12,822	9,383	8,427	1,157
Weekday AM Peak	580	434	357	311	90
Weekday PM Peak	538	1,226	966	858	106
Saturday Daily	896	14,684	10,596	9,573	1,152
Saturday Peak	116	1,414	1,029	904	101

Comparison of New Peak Hour Trips



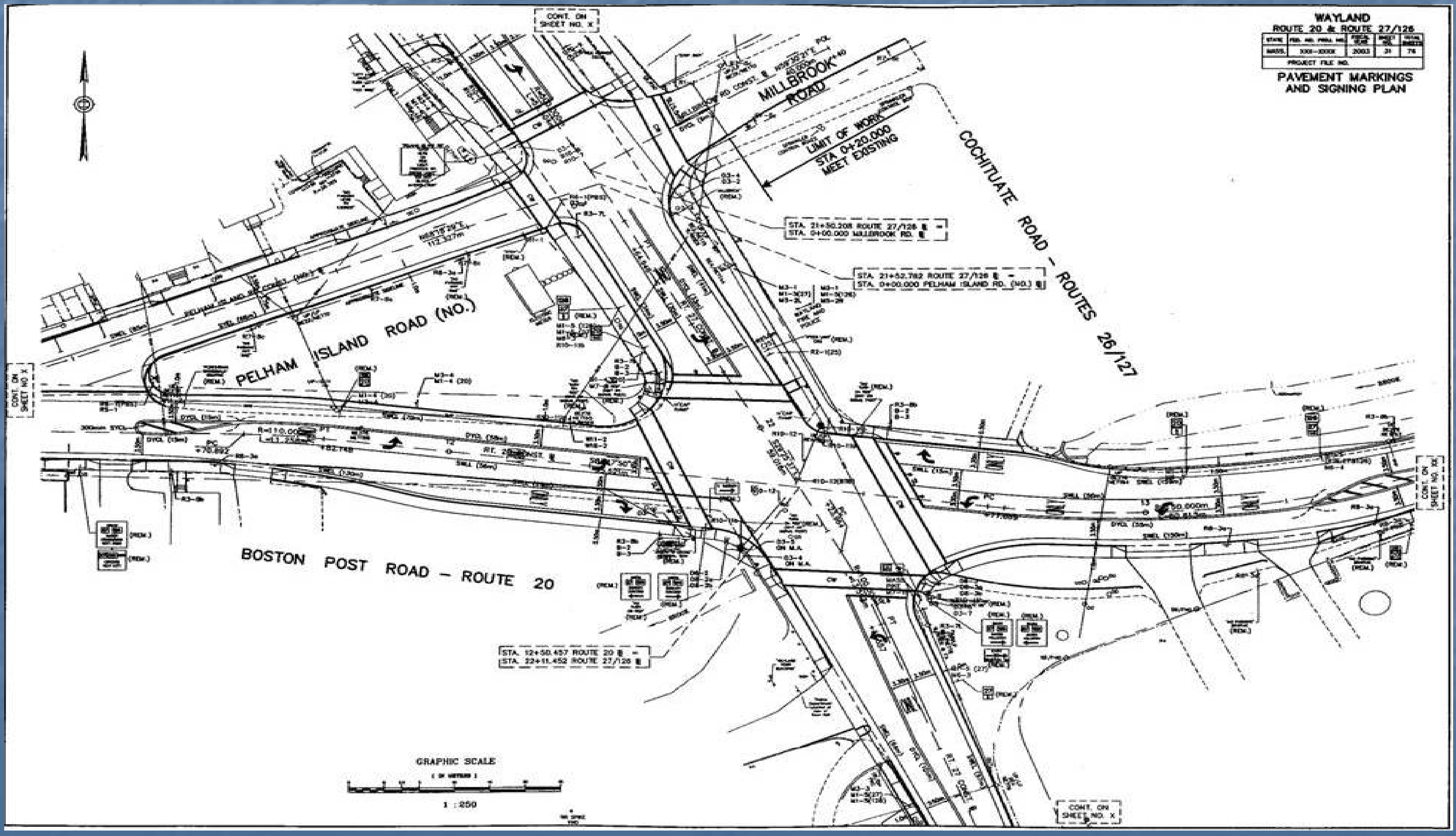
Differences in Trip Generation

- The 2006 MUOD proposal generates more traffic over the course of an entire weekday
- The 2006 MUOD proposal will actually present a reduction in trips during the weekday AM peak
- The impacts of “new” trips at the intersection of Route 20 at Routes 27/126 will be comparable for the fully re-occupied office space and the 2006 MUOD proposal
- The 2006 MUOD proposal will increase Saturday trips significantly
- The 40B Residential proposal will generate the fewest trips during all peak hours (AM, PM, SAT)

Peak Hour Traffic Volume Comparison for Adjacent Roadways

Roadway Segment	2005 Actual Conditions	2010 Build Condition June 2005 Twenty Wayland, LLC Proposal	2010 Build Condition April 2006 MUOD Proposal
Route 20 (East of Site Roadway)			
PM Peak Hour	1,418	1,716	1,551
SAT Peak Hour	1,662	1,951	1,937
Route 27 (South of Site Roadway)			
PM Peak Hour	1,077	1,469	1,436
SAT Peak Hour	698	1,114	1,050

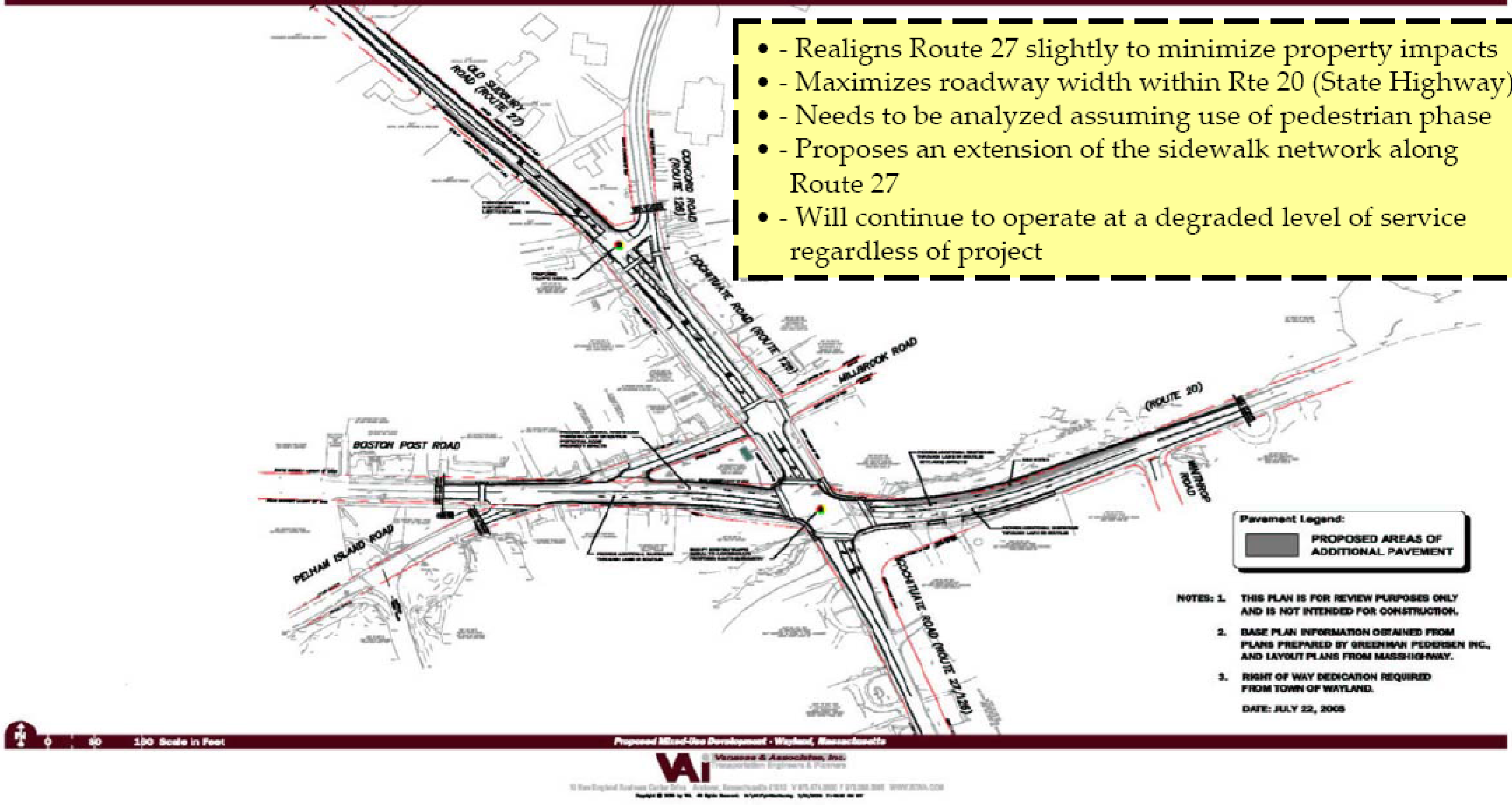
Current MassHighway Project Route 20 at Routes 27 / 126



Route 27 at Route 126

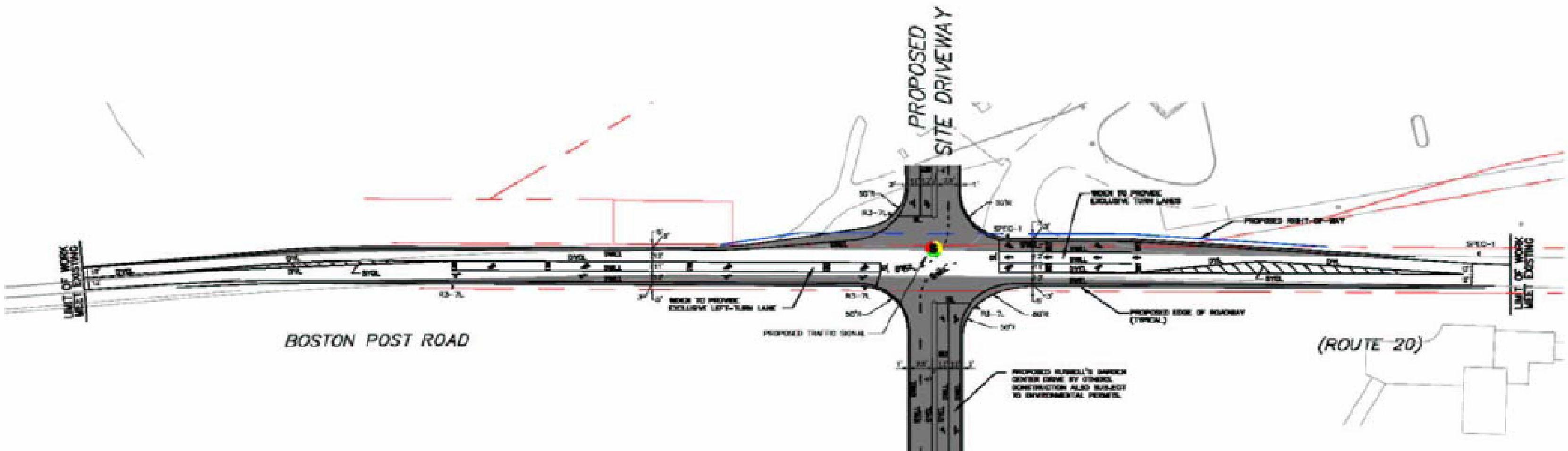
- - Realigns Route 27 slightly to minimize property impacts
- - Maximizes roadway width within Rte 20 (State Highway)
- - Needs to be analyzed assuming use of pedestrian phase
- - Proposes an extension of the sidewalk network along Route 27
- - Will continue to operate at a degraded level of service regardless of project

Figure 3 - Preliminary Conceptual Improvement Plan - Wayland Town Center



Route 20 at Site Roadway

Figure 4 - Preliminary Conceptual Improvement Plan
Boston Post Road (Route 20) at Russell's Nursery

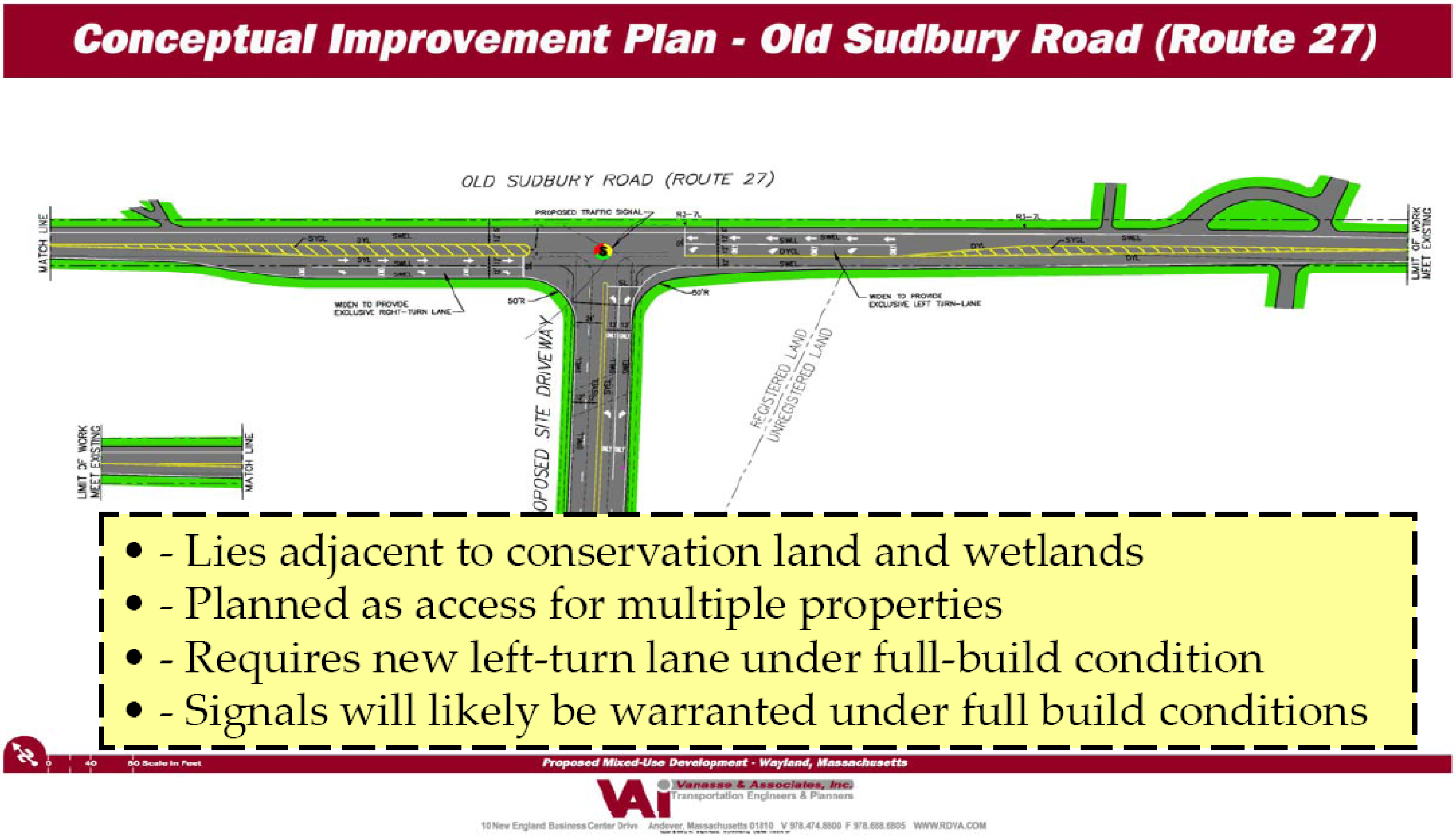


- Considers Russell's Garden Center as 4th leg to intersection
- Modified to a single eastbound left turn lane
- Aligning turn lanes will allow driveways to be narrowed
- Only one entering lane is necessary

0 50 100 Scale in Feet — Proposed Mixed-Use Development - Wayland, Massachusetts

VAI Vanasse & Associates, Inc. Transportation Engineers & Planners

Route 27 at Site Roadway



- - Lies adjacent to conservation land and wetlands
- - Planned as access for multiple properties
- - Requires new left-turn lane under full-build condition
- - Signals will likely be warranted under full build conditions

Summary of Assumed Future-year Intersection Improvements

Route 20 / Site Roadway

- Widen Route 20 for eastbound left-turn and westbound right-turn lane and install signal
- Realign Russell’s Garden Center driveway

Route 27 / Site Roadway

- Widen Route 27 for a new northbound left-turn lane and install traffic signal

Route 27 / Route 126

- Widen Route 27 for a new southbound left-turn lane and install traffic signal

Route 20 at Route 27 / 126

- Maintain MassHighway widening improvements (currently nearing completion)

Capacity Analysis Summary

Signalized Intersection/ Overall Results	June 2005 Twenty Wayland, LLC Proposal			April 2006 Planning Board MUOD Proposal		
	Overall V/C	Delay	LOS	Overall V/C	Delay	LOS
Route 20 at Site Roadway						
Weekday Evening	0.89	27.3	C	0.76	18.2	B
Saturday Midday	0.99	40.2	D	0.91	28.2	C
Route 20 at Routes 27/126						
Weekday Evening	1.22	102.5	F	1.17	97.2	F
Saturday Midday	0.99	57.2	E	0.89	43.8	D
Route 27 at Route 126						
Weekday Evening	0.84	14.6	B	0.76	10.7	B
Saturday Midday	0.68	9.2	A	0.57	6.9	A
Route 27 at Site Roadway						
Weekday Evening	0.56	9.9	A	0.56	8.9	A
Saturday Midday	0.50	9.9	A	0.42	8.8	A

TEC Recommendations

1. Identify Pedestrian Connections
2. Perform Travel Time Assessment for local roads to assess cut-through traffic
3. Widen and Signalize Route 20 / Site Roadway Intersection
4. Consider a connecting Site Roadway between Route 20 and Route 27 as part of any proposal for the site
5. Widen Route 27 at Site Roadway for a new northbound left-turn lane and install conduit for future signal

Recommendations (Continued)

6. Consider peak hour turning restrictions at Route 27 / Glezen Lane and Route 27 / Bow Road
7. Widen Route 27 at Route 126 and install a traffic signal
8. Consider changing one-way operation of Library Lane
9. Study business driveways along Route 20 between Site Roadway and Routes 27 / 126 to identify opportunities for driveway consolidation and widening for turn lanes

Question & Answer Session

Town of Wayland Planning Board

2006 MUOD Proposal

Traffic Assessment

TEC, Inc.