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| TO: | Joshua Bartus, Project Manager<br>MassDOT | DATE: | August 1, 2024<br>(Revised September 20, 2024)<br>(Revised November 22, 2024)<br>(Revised February 20, 2025)<br>(Revised March 12, 2025) |
| FROM: | Haralampos Stathopoulos, P.E., PTOE<br>Jessica Lizza, P.E., PTOE | HSH PROJECT NO.: | 2021055.15 |
| SUBJECT: | Milton – Route 28 Corridor Road Diet Feasibility Study from Chickatawbut Road to Reedsdale Road | | |

# Executive Summary

This memorandum is part of the Massachusetts Department of Transportation's (MassDOT's) ongoing efforts to evaluate alternatives for potential corridor safety and operational improvements along Route 28 just north of Chickatawbut Road to Reedsdale Road. These potential improvements were investigated in response to concerns raised by the public and the Town of Milton.

A road diet was evaluated on Route 28, reducing either northbound or southbound traffic to one lane except at intersections requiring left-turn lanes. The cross-sectional width gained from the road diet may support multiple new transportation uses (such as shared-use path or a center-running left-turn lane with raised medians); however, this study focuses solely on the feasibility of the road diet. The road diet alternatives for Route 28 included:

- Alternative 1 – Northbound Road Diet: narrowing the roadway to one lane northbound and maintaining two southbound travel lanes. The northbound road diet would start approximately 1,350 feet north of the Chickatawbut Road roundabout and end south of Reedsdale Road.
- Alternative 2 – Northbound Road Diet, Version 2: narrowing the roadway to one lane northbound and maintaining two southbound travel lanes. The northbound road diet would start at the Chickatawbut Road roundabout and end south of Reedsdale Road.
- Alternative 3 – Southbound Road Diet: narrowing the roadway to one lane southbound and maintaining two northbound travel lanes. The southbound road diet would start at the Reedsdale Road intersection and end north of the Chickatawbut Road roundabout.

The following study results conclude why a road diet along this Route 28 segment is not feasible in either direction:

- Travel time along the corridor from the Scanlon Drive/Russ Street intersection to Reedsdale Road:
  - Overall corridor travel time improved in the a.m. peak hour but worsened in the p.m. peak hour, except for Alternative 1.
  - Even though the a.m. peak hour saw overall improvement in travel times, the actual improvement was noticeable in only half the corridor, depending on the road diet alternative.
    - Alternative 2 – the corridor experienced congestion in the northbound direction at the roundabout, due to removing one through lane from the roundabout. The remaining portion of the corridor saw the travel time improvement due to reduced traffic and increased speeds.
- Vehicle-hours of Delay along the corridor:
  - Alternative 1 shows an increase in vehicle-hours of delay in both the a.m. and p.m. peak hours, north of Hillside Street.
  - Alternative 2 experiences an increase in vehicle-hours of delay in the a.m. peak hour, south of Chickatawbut Road, and in the p.m. peak hour, north of Hillside Street.
  - Alternative 3 experiences an increase in vehicle-hours of delay in the a.m. peak hour, north of Hillside Street, and in the p.m. peak hour, south of Chickatawbut Road.
- Bus Travel Time:
  - This metric shows that bus travel times experience an increase under Alternative 2 and Alternative 3.
- Corridor Vehicle Speeds:
  - A goal of the road diet is to reduce the speeds along Route 28 to increase safety along the corridor. However, while the portions of the corridor that saw congestion saw a reduction in speeds, the portions that saw less traffic due to the upstream congestion resulted in speed increases.
- Driveway Delay:
  - This metric focused on the driveways and side streets nearest the proposed Chickatawbut Road intersection roundabout. The results determined that the existing conditions see less delay at the driveways than the road diet alternatives during the a.m. peak, except for Alternative 3. During the p.m. peak hour, some

driveways are expected to see less delay under Alternatives 1 and 3, and others are expected to see more delay under all alternatives.

- Queues:
  - Each of the road diet alternatives saw increased queues along the Route 28 corridor, with queues extending well over a mile.
  - The most notable impact of queueing was noted at Chickatawbut Road. The two northbound road diet alternatives presented queues like or worse than existing conditions, thus maintaining or worsening the impacts at the I-93 interchange.

A supplemental memorandum focused on driveway delay is provided in **Appendix A**. This memorandum compared the existing conditions against:

- Future No-build (increase in volumes only);
- Future No-build with Roundabout (at Route 28 and Chickatawbut Road);
- Future No-build with Roundabout and Metering (at Route 28 and Chickatawbut Road and metering signals on northbound and southbound approaches to the roundabout);
- Road Diet Alternative 1;
- Road Diet Alternative 2;
- Road Diet Alternative 3; and
- The Route 28 at Chickatawbut Road roundabout without a road diet.

The data presented in that memorandum showed an average delay increase for the side streets and driveways under Alternatives 1 and 2 for all peak hours when compared to No-build conditions, and an average delay decrease under Alternative 3.

Two Road Safety Audits (RSAs) were conducted along Route 28:

- Milton: Reedsdale Road to north of Chickatawbut Road; and
- Quincy/Randolph: south of Chickatawbut Road to north of Scanlon Drive/Russ Street.

The RSAs identified issues like speeding, poor sight distances at unsignalized intersections, and signal timing problems. Proposed countermeasures include short-term fixes (e.g., signal adjustments) and long-term solutions (e.g., medians to restrict left turns). Potential short- and long-term improvements are to be further evaluated and designed separate from the Route 28 at Chickatawbut Road intersection improvement project. The RSA reports are available on MassDOT's RSAs website.

Metering of the Route 28 traffic at the proposed Chickatawbut Road roundabout was also evaluated in a memorandum dated May 2023, which is provided in **Appendix C**. The metering included using specially timed signals to create gaps for driveways and side streets. The analysis presented focused only on the proposed roundabout. The May 2023 memorandum analysis showed some improvement on Chickatawbut Road but lacked insight into the metering's impact on driveways north of the roundabout, prompting further analysis that is presented in this memorandum. The analysis presented in this memorandum indicates that the No-build with Roundabout and Metering scenario results in slightly worse driveway delays than the Future No-build with Roundabout and Alternative 3 scenarios but performs better than all other scenarios.

This memorandum concludes that:

- A road diet is not feasible in either direction, as at least one peak hour would experience heavy congestion on Route 28, leading to traffic diverting to local roads; and
- The Future No-build with Roundabout scenario results in slightly less driveway delay than the Future No-build with Roundabout and Metering scenario. Though the difference is minimal, abutters are concerned about any increase, making the Future No-build with Roundabout, the current MassDOT design, the preferred option.

Therefore, the recommended scenario is no road diet, a roundabout, and Pedestrian Hybrid Beacons (PHBs).

# Introduction

The purpose of this memorandum is to present the feasibility of a road diet along the Route 28 Corridor, from Chickatawbut Road to Reedsdale Road in Milton, Massachusetts. The Massachusetts Department of Transportation (MassDOT) tasked ***Howard Stein Hudson (HSH)*** with this study, as part of the Route 28 at Chickatawbut Road Intersection Improvements Project (PInfo #607342). The need for this study resulted from several comments and concerns made by residents living near the Route 28 at Chickatawbut Road intersection and along Route 28, who believe that the proposed roundabout at the Route 28 and Chickatawbut Road intersection will make it more difficult for them to exit their driveway and enter Route 28. The study limits extend along Route 28 from the intersection of Route 28 and Reedsdale Road to the intersection of Route 28 and Scanlon Drive/Russ Street.

The memorandum will briefly describe the alternatives that were studied, the necessary improvements at certain intersections that will allow the implementation of the road diet, and the results of the study. The results presented in the memorandum will focus on performance metrics such as:

- Travel time along the corridor;
- Vehicle-hours of delay experienced by those driving through the corridor;
- Average vehicular speed and how it changes between alternatives;
- Demand rate or unmet demand at specific points along the corridor;
- Driveway delay; and
- Queues on the Route 28 mainline at specific locations.

The appendices provided include additional traffic information such as the network volumes used in the analysis, VISSIM calibration notes, tabulated data, and capacity analysis results.

# Feasibility Study

## Alternatives Description

This section will provide a brief description of each alternative studied under this effort. This memorandum and analysis focus on the impact of changing the number of travel lanes along the corridor. The alternatives which reduce the number of lanes on Route 28 would allow for roadway space to be reallocated to separate bicycle accommodations. However, the alternatives include

providing an exclusive left-turn lane at select intersections, and those locations would require further investigation for bicycle connectivity through them.

## EXISTING AND FUTURE NO-BUILD CONDITIONS

Under the existing conditions, Route 28 and its intersections remain as they are today, without any changes to signals, number of lanes, etc. This means that the existing signal at the Route 28 and Chickatawbut Road intersection is still in place. Under the future No-build conditions, the only thing that changes are the corridor volumes, which are increased by a 10-year horizon (2023 to 2033).

## NO-BUILD WITH ROUNDABOUT

This alternative analyzes the Route 28 corridor with the proposed roundabout at the Route 28 and Chickatawbut Road intersection. The roundabout will be modeled as depicted currently in the latest design plans under MassDOT Project #607342, including the Pedestrian Hybrid Beacons (PHBs) on the Route 28 legs of the roundabout.

## NO-BUILD WITH ROUNDABOUT AND METERING

This alternative evaluates the Route 28 corridor with a proposed roundabout at Route 28 and Chickatawbut Road. Instead of PHBs on Route 28, 20-second metering signals will be used to create longer gaps for Chickatawbut Road and nearby driveways to enter. The 20 second duration was selected after testing 10-, 15-, and 20-second intervals to ensure safe gaps and smooth roundabout flow.

## ALTERNATIVE 1 – NORTHBOUND ROAD DIET

Alternative 1 studied the feasibility of a northbound road diet, which would reduce the northbound direction to one travel lane and maintain two southbound travel lanes. The lane reduction on Route 28 northbound is proposed 880 feet north of the proposed roundabout at Route 28 and Chickatawbut Road to better accommodate the anticipated queue on Route 28 northbound at the merge point without creating gridlock through the roundabout. Specific intersection improvements needed to allow the implementation of this alternative would include:

- Route 28 at Reedsdale Road:
  - Intersection lane use remains unchanged, except for the westbound approach which is proposed to provide one exclusive left-turn lane and a shared through/right-turn lane;
  - Provide markings and signs to better inform intended lane use throughout the intersection;
  - Narrow the south leg of the intersection (Route 28 northbound) to three 11-foot-wide travel lanes;

  - Modify signal equipment to provide a Flashing Yellow Left Arrow (FYLA) for Reedsdale Road westbound; and
  - Modify timings and coordinate signal with the signal at Reed Street/Access Road.
- Route 28 at Reed Street/Access Road:
  - Open Route 28 northbound to two lanes and mark the inside northbound lane as an exclusive left-turn lane. Remaining intersection lane assignments remain unchanged; and
  - Provide protected left-turn phasing and coordinate with signals at Reedsdale Road and Hillside Street.
- Route 28 at Hallen Avenue:
  - Open Route 28 northbound to two lanes and mark the inside northbound lane as an exclusive left-turn lane. Remaining intersection lane assignments remain unchanged
- Route 28 at Hillside Street:
  - Open Route 28 northbound to two lanes and mark the inside northbound lane as an exclusive left-turn lane. Allow U-turns from this lane to assist residents residing on the northbound side of Route 28 to change direction from northbound to southbound and avoid turning left from their driveways (current concern). Remaining intersection lane assignments remain unchanged; and
  - Provide protected left-turn phase and coordinate with Reed Street/Access Road signal.
- Route 28 Northbound through I-93 Interchange:
  - Provide markings between inner loop ramps to delineate an auxiliary lane for weaving vehicles;
  - Provide markings and signs for a Yield Condition for the I-93 Southbound Off-Ramp; and
  - Improve the merge area to the north of the I-93 Southbound Off-Ramp by better delineating the two Route 28 northbound travel lanes and the start of the merge area (signs and markings).

**Figure 1** presents the corridor proposed conditions graphically.

## ALTERNATIVE 2 – NORTHBOUND ROAD DIET V2

The second alternative still looks into the northbound road diet, however, rather than merging the two northbound lanes north of Chickatawbut Road, this alternative proposes that the Route 28 northbound approach at Chickatawbut Road be revised to one left-turn/thru lane and one right-turn-

only lane so that only a single northbound lane departs the roundabout. All other improvements mentioned under Alternative 1 would be the same. **Figure 2** presents the proposed conditions graphically.

Figure 1. ***Route 28 Corridor Northbound Road Diet – Alternative 1***

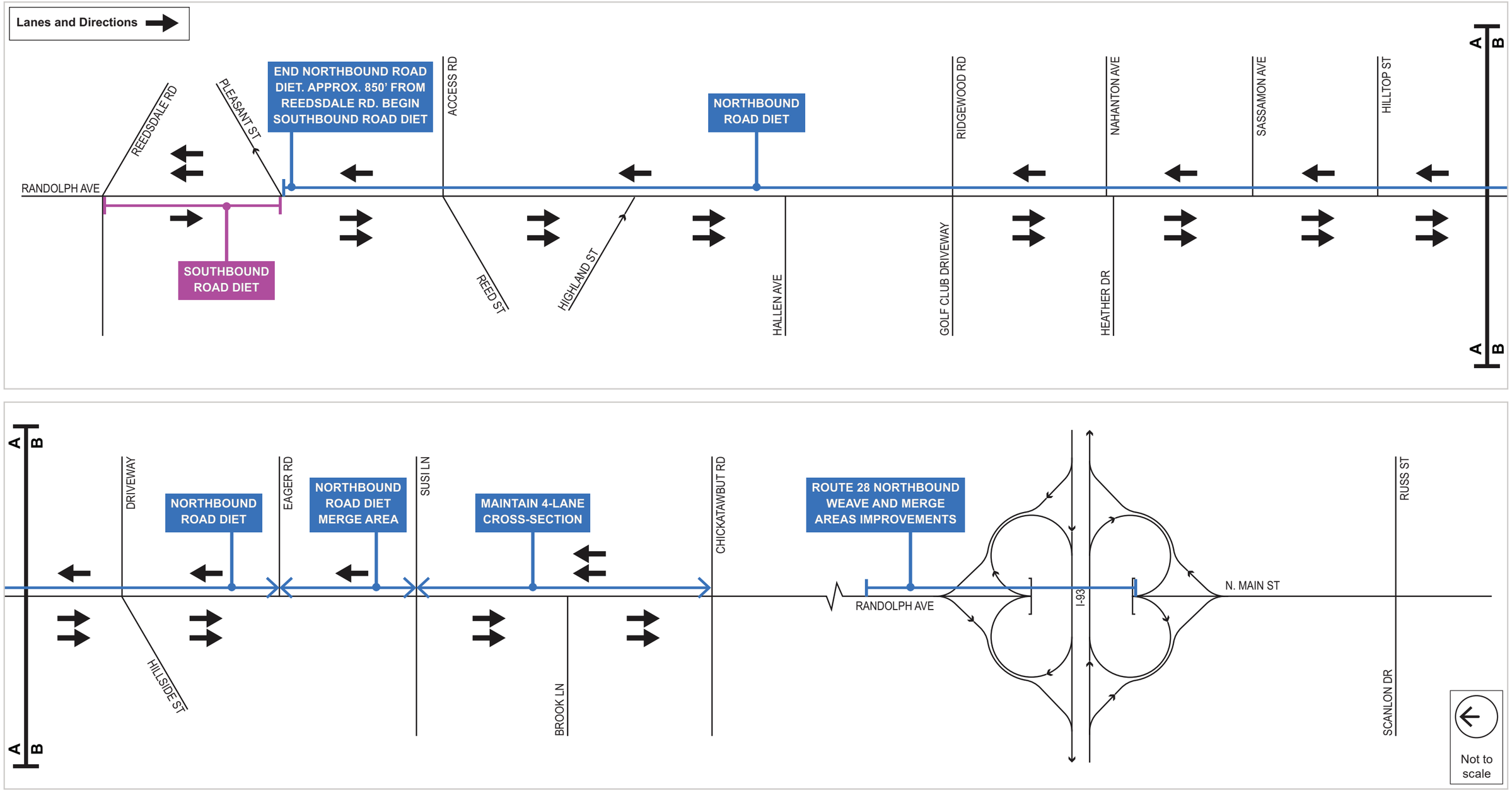
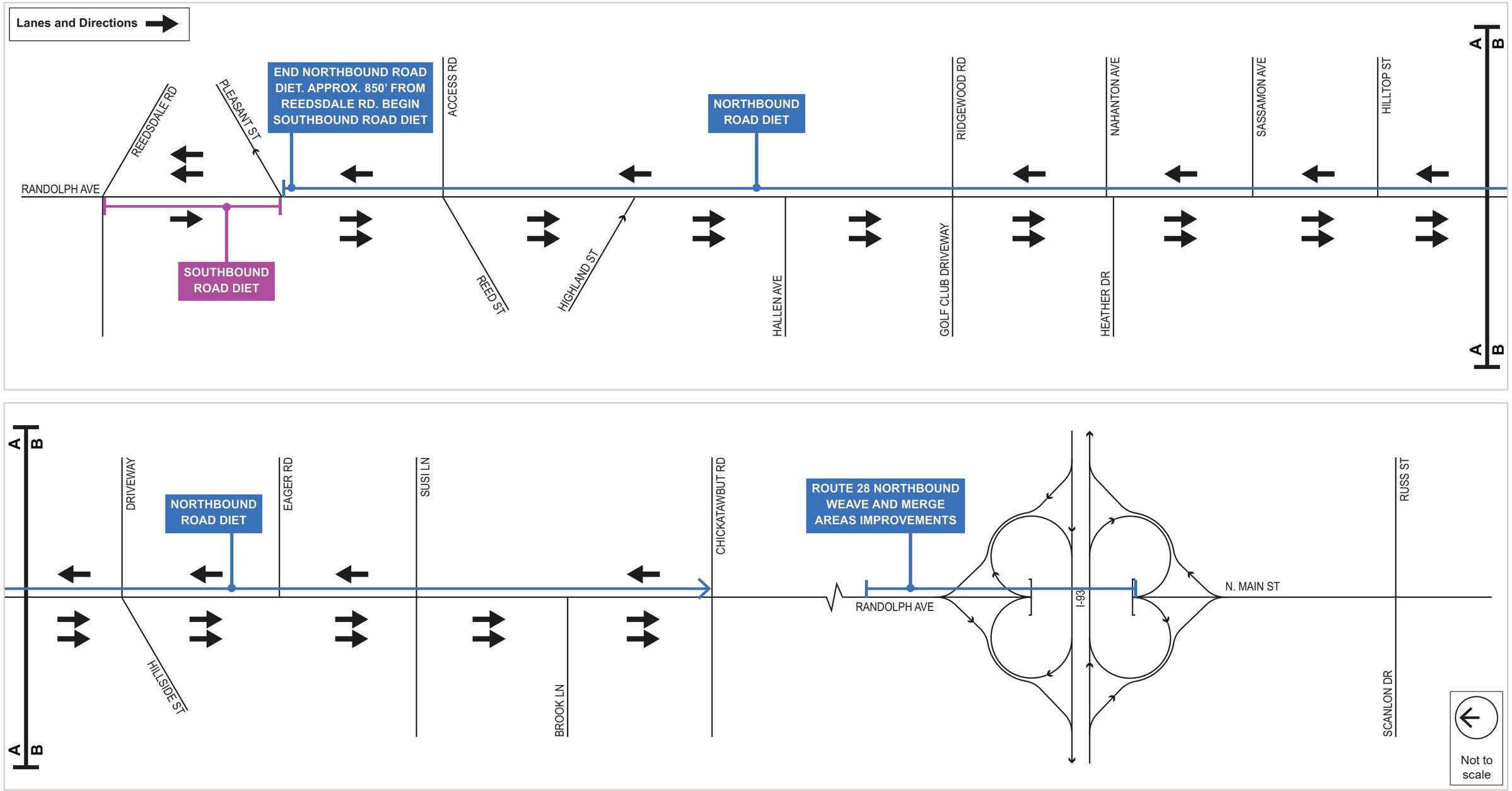


Figure 2. ***Route 28 Corridor Northbound Road Diet – Alternative 2***

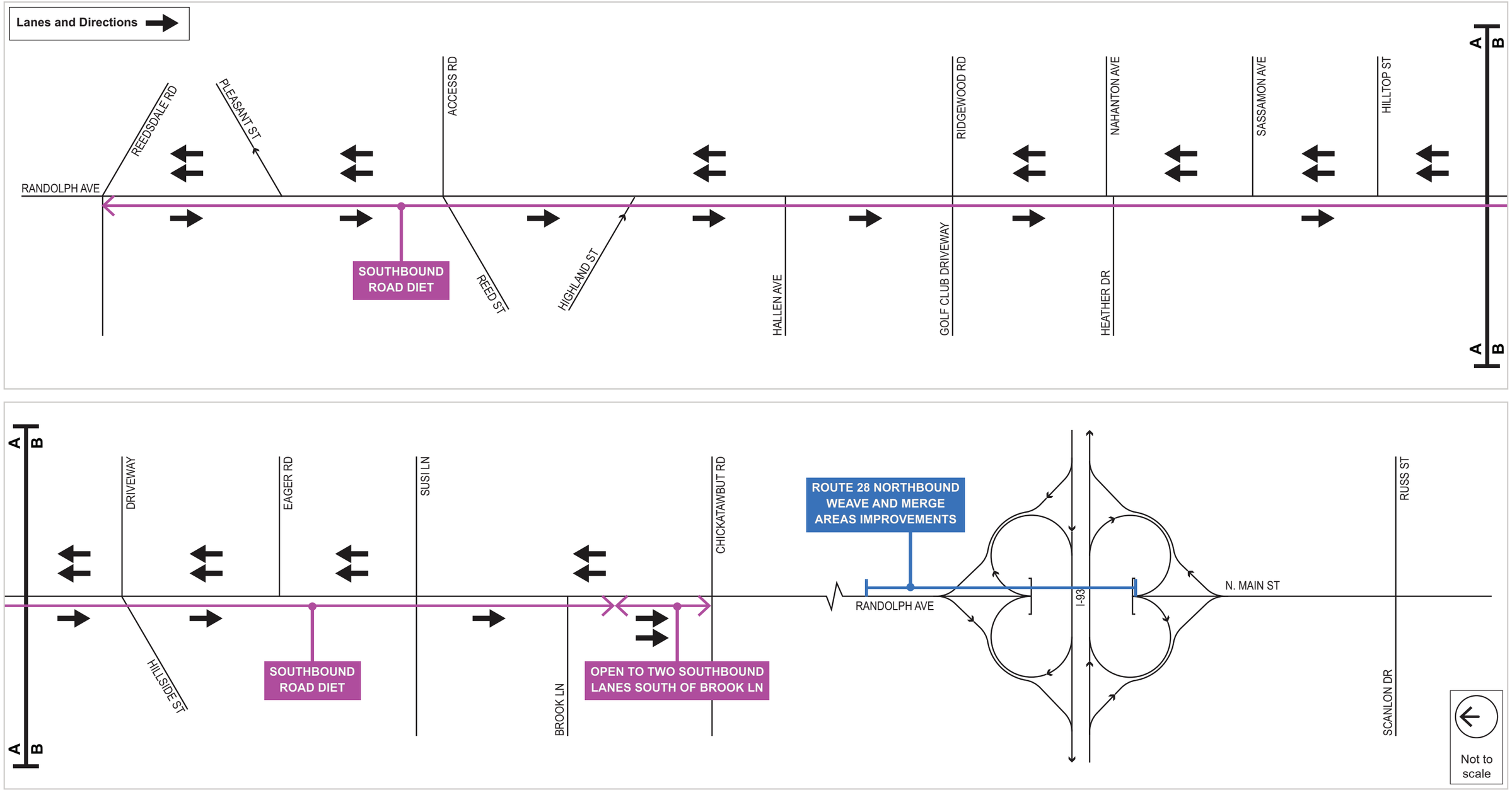


## ALTERNATIVE 3 – SOUTHBOUND ROAD DIET

The southbound diet would start immediately to the south of the Route 28 and Reedsdale Road intersection, by providing only one southbound receiving lane that will continue all the way to Chickatawbut Road, where it would open to two lanes at approximately 250 feet to the north of the roundabout. The northbound direction would maintain the two travel lanes throughout the study corridor.

The lane use modifications, as well as the signal modifications, at the Route 28 at Reedsdale Road and Reed Street/Access Road intersections would be similar to the other alternatives. However, this alternative would not provide a U-turn at the Hillside Street intersection for residents on the northbound side of Route 28 to change direction. The Route 28 northbound area through the I-93 Interchange modifications would also be similar to the other alternatives. **Figure 3** presents the proposed improvements graphically.

Figure 3. ***Route 28 Corridor Southbound Road Diet – Alternative 3***



# Performance Metrics

This section will describe the metrics that data was collected for and compared against No-build conditions, as well as between the alternatives.

Existing (2023) and Future (2033) Conditions volumes and Vissim model calibration notes, as well as roundabout capacity calibration in Vissim notes, can be found in **Appendix B**.

## TRAVEL TIME AND VEHICLE-HOURS OF DELAY

This metric measures the total amount of time that Route 28 vehicles are delayed due to congestion along the length of the study corridor. HSH conducted field travel time runs within specific corridor segments at the same time the traffic counts were being collected (September 2023), to calibrate the Vissim models and compare the Alternatives' simulated travel times against. The travel time segments selected were:

- South of Route 28 at Reedsdale Road to north of Route 28 at Chickatawbut Road;
- North of Route 28 at Chickatawbut Road to north of Route 28 at Scanlon Drive/Russ Street; and
- South of Route 28 at Reedsdale Road to north of Route 28 at Scanlon Drive/Russ Street.

The vehicle-hours of delay were calculated as follows:

- ***Existing Conditions***: Vehicle-hours traveled were determined by multiplying the number of vehicles passing through specific points in the VISSIM model by their travel time between these points.
- ***No-build and Alternatives***: Using the same method, vehicle-hours traveled were calculated for No-build and alternative scenarios. The difference between No-build and existing vehicle-hours traveled determined the delay under No-build conditions.
- ***Comparing Alternatives***: The difference between vehicle-hours traveled for each alternative and the No-build scenario indicated the change in vehicle-hours of delay for each alternative.

**Figure 4** and **Figure 5** present the travel time (in minutes) and vehicle-hours of delay results of the Vissim modeling for the Existing conditions. The No-build conditions and the three alternatives travel time and vehicle-hours of delay are presented in **Figure 6** through **Figure 9** . Tabulated data for these results can be found in **Appendix B**.

Figure 4. ***Travel Time – Existing (2023) Conditions***

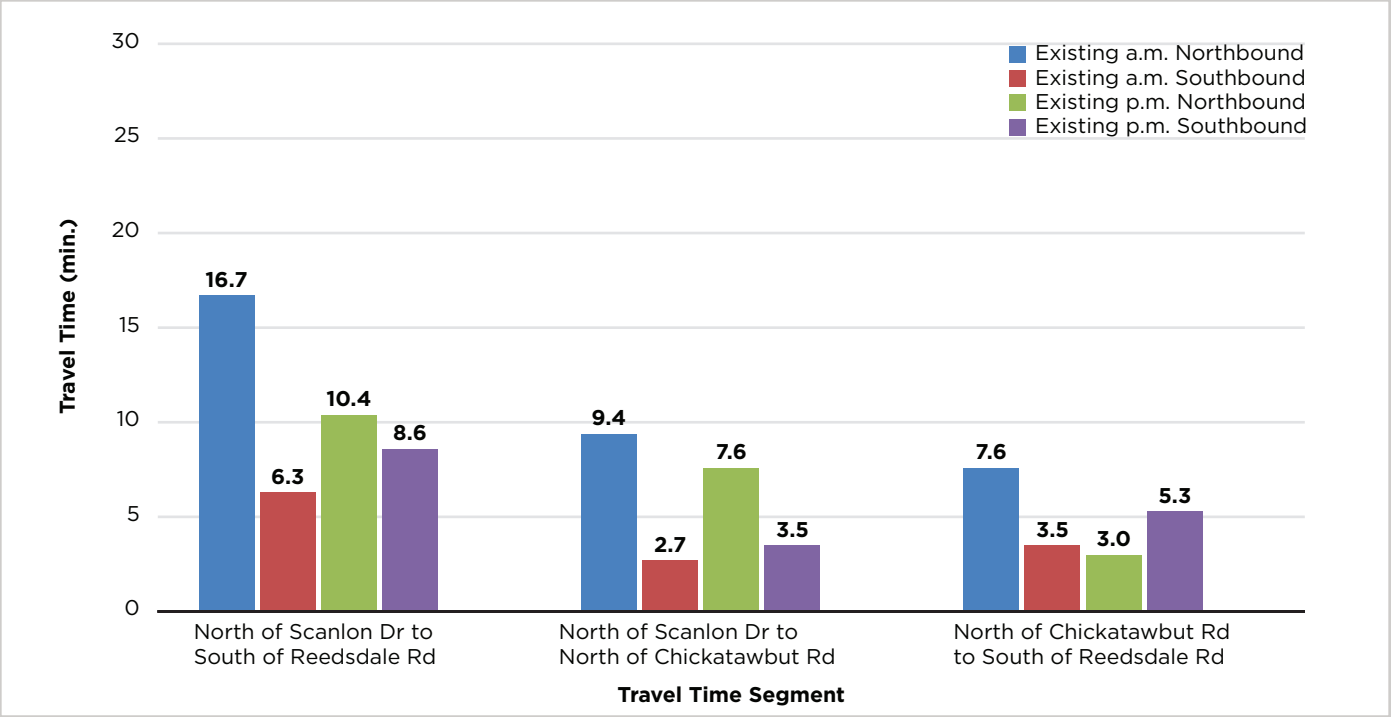



Figure 5. ***Vehicle Hours of Delay – Existing (2023) Conditions***

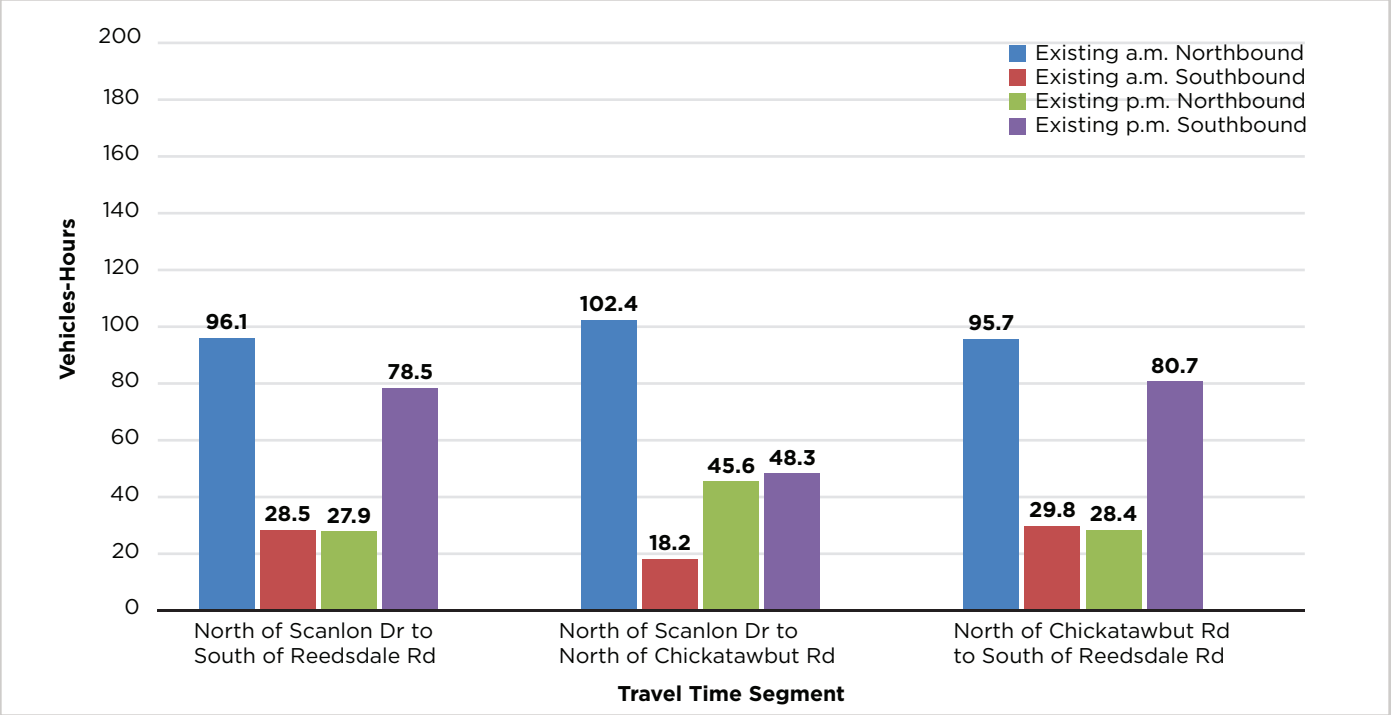


Figure 6. ***a.m. Peak Travel Time Comparison of Future Alternatives***

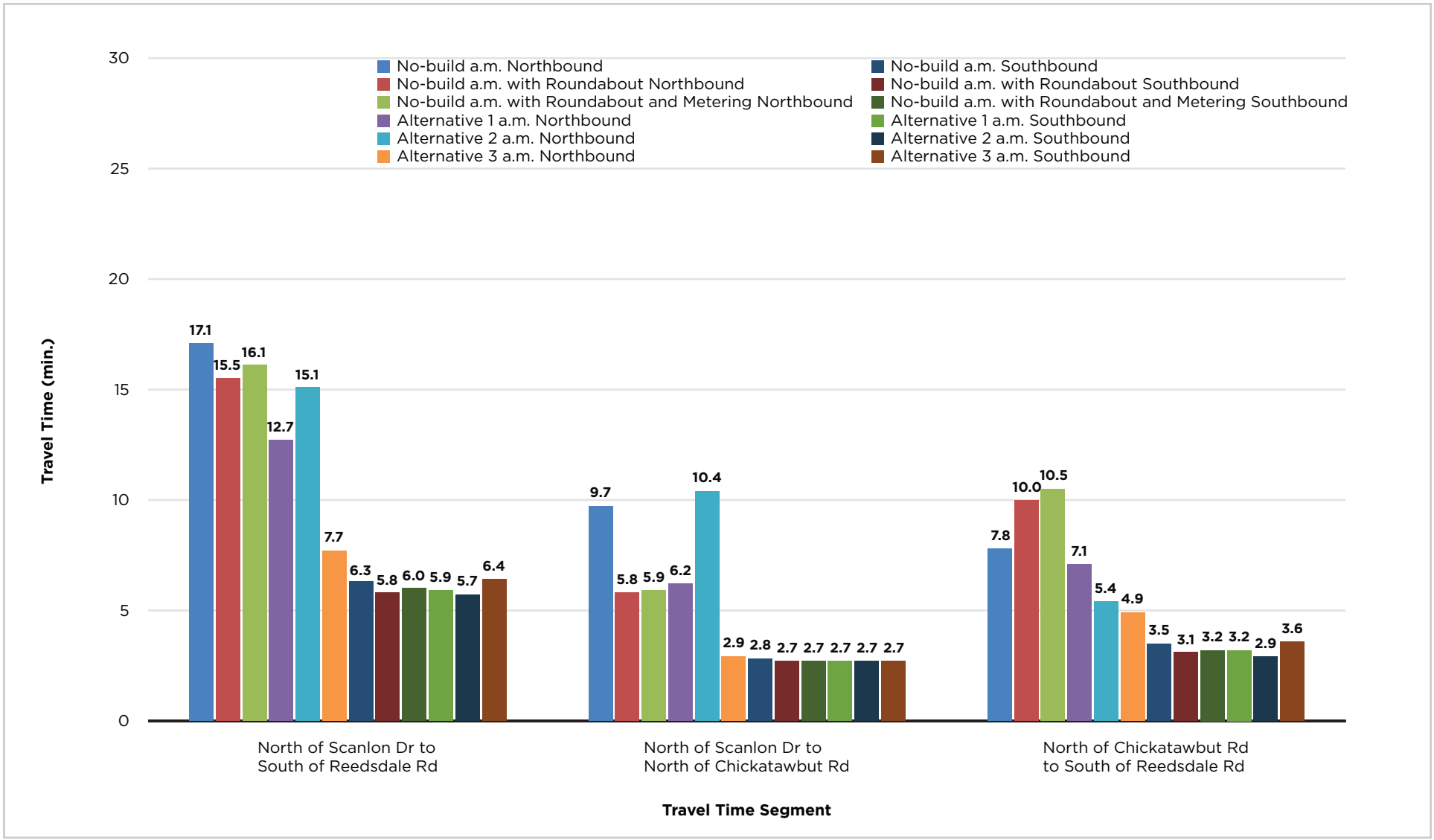


Figure 7. ***p.m. Peak Travel Time Comparison of Future Alternatives***

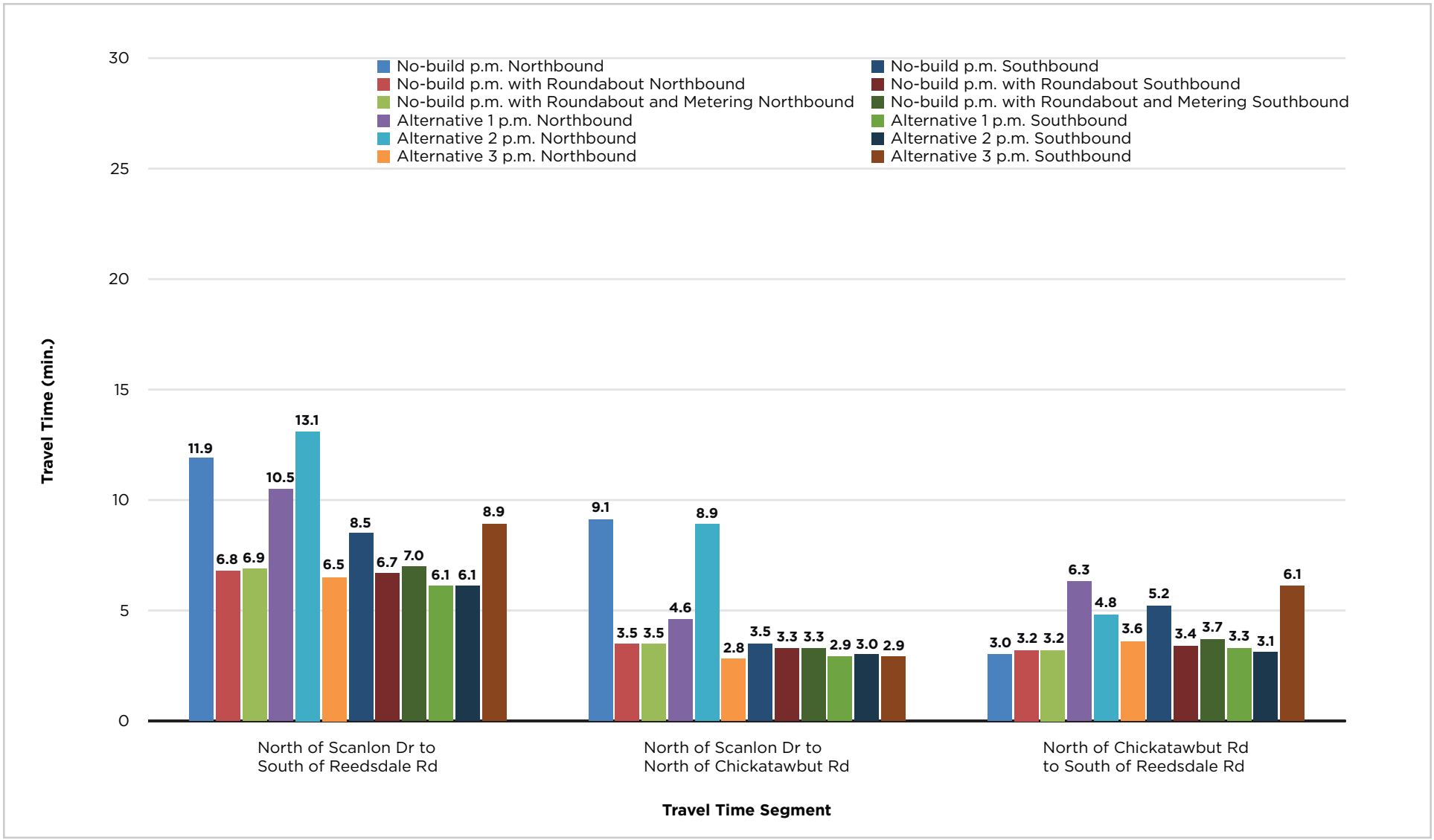


Figure 8. ***a.m. Peak Vehicle-hours of Delay Comparison of Future Alternatives***

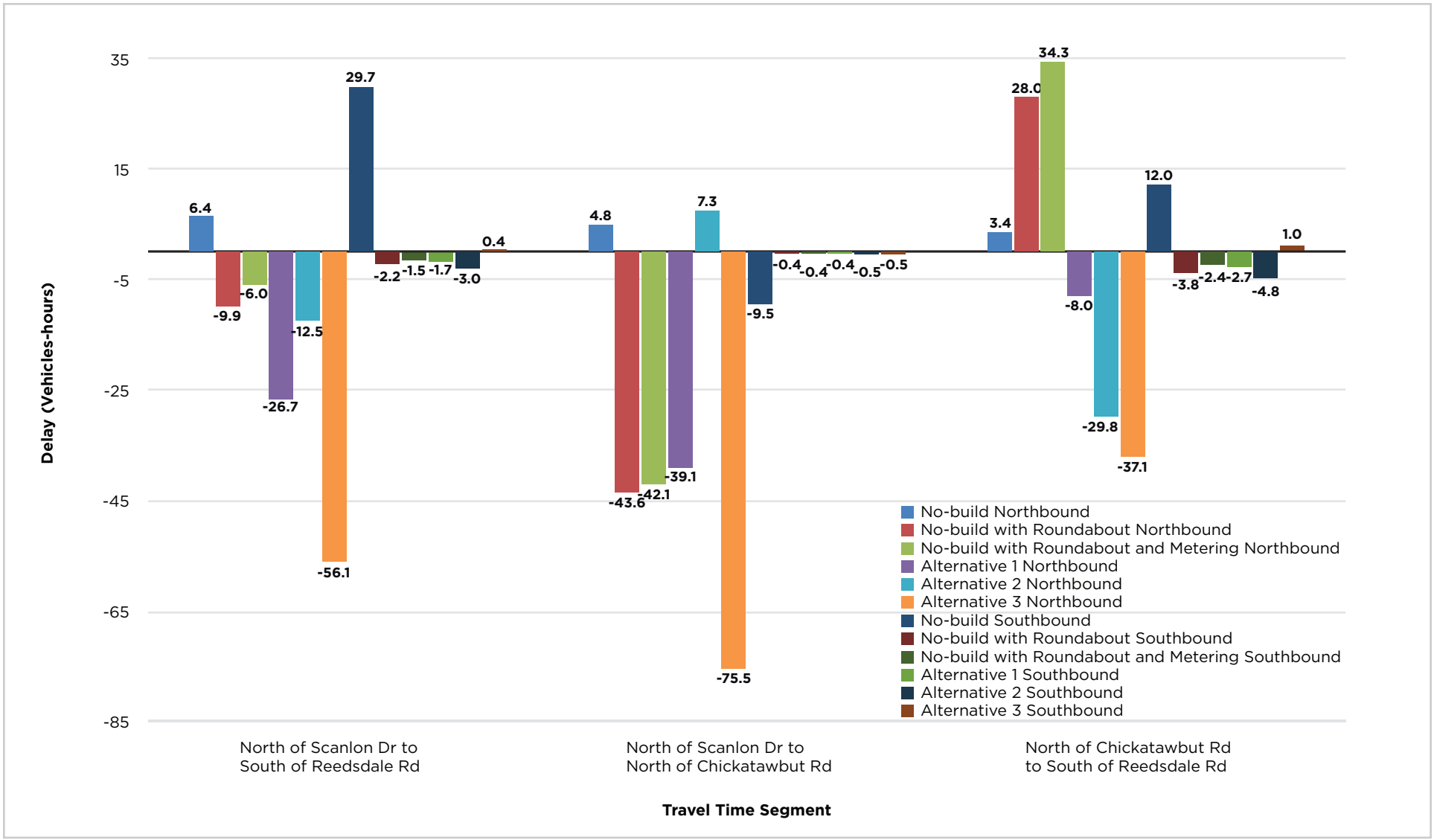
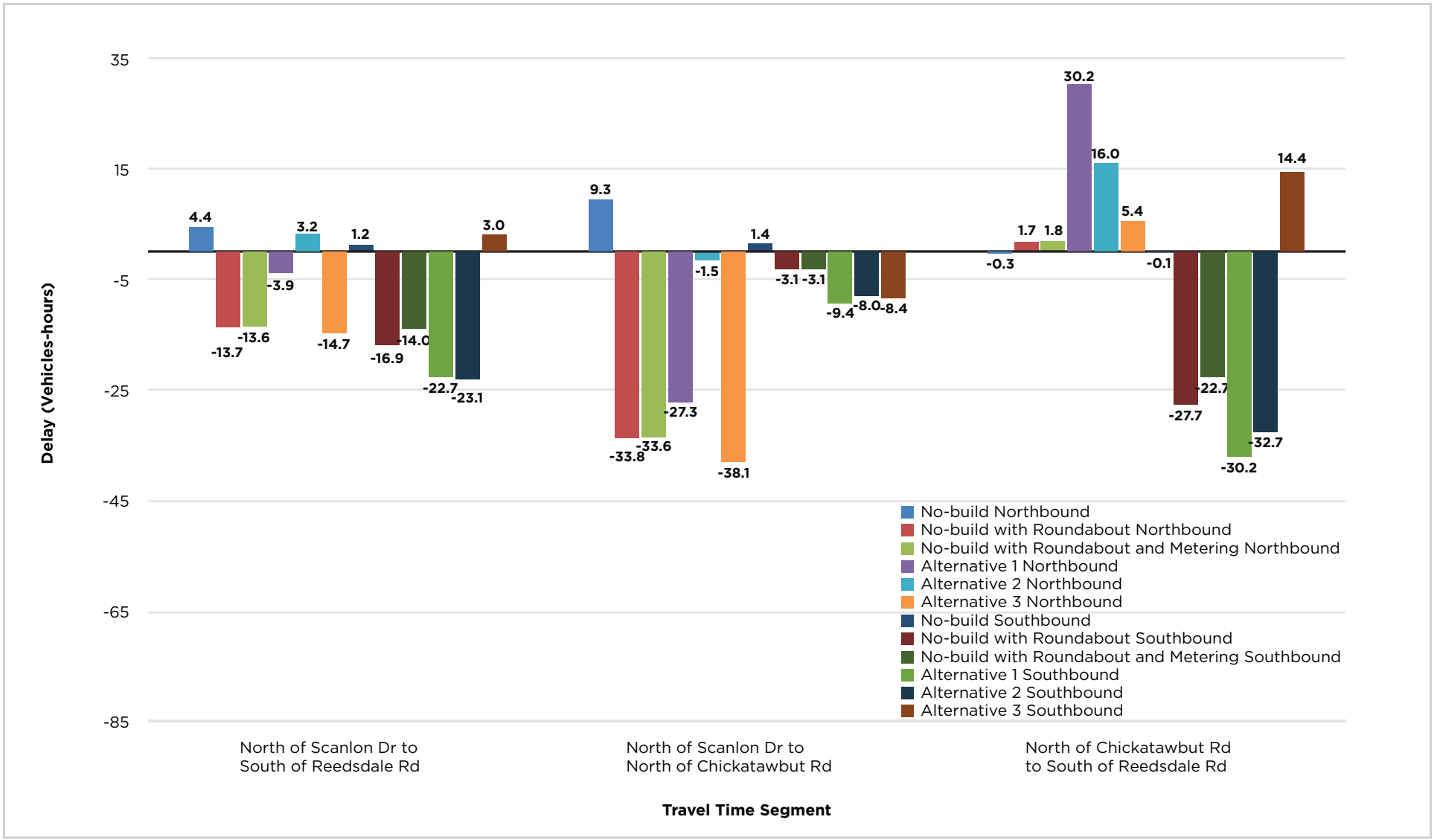


Figure 9. ***p.m. Peak Vehicle-hours of Delay Comparison of Future Alternatives***



As can be seen from the charts that compare the future No-build conditions against the northbound and southbound road diet alternatives, when considering the entire corridor travel times and vehicle-hours of delay, Alternative 3 in the northbound direction and Alternative 2 in the southbound direction are expected to see improved travel times and less vehicle-hours of delay during both the a.m. and p.m. peak hours.

When looking at the segment between north of the Scanlon Drive/Russ Street intersection and north of the Chickatawbut Road intersection, and during the a.m. peak hour, Alternative 3 is expected to see improved travel times and less vehicle-hours of delay in both the northbound and southbound directions. During the p.m. peak hour, Alternative 3 in the northbound direction and Alternative 1 in the southbound direction are expected to see improved travel times and less vehicle-hours of delay.

The bus travel times were also collected, as there are buses using Route 28 through the study area; the Massachusetts Bay Transportation Authority (MBTA) bus route #240 and the Brockton Area Transit (BAT), which is a flag-down bus service. Today, these buses stop at the curb to board and alight riders at nine different stops on each side of the study corridor. Under the alternatives, these bus stops are proposed to be pull-out areas, so the stopped buses do not block the large volumes traveling up and down Route 28 within the study area. **Figure 10** shows the existing bus travel times, whereas **Figure 11** and **Figure 12** present the a.m. and p.m. peak hour travel times, respectively, for the No-build conditions and the alternatives.

Figure 10. ***Existing (2023) Condition Bus Travel Times - Route 28***

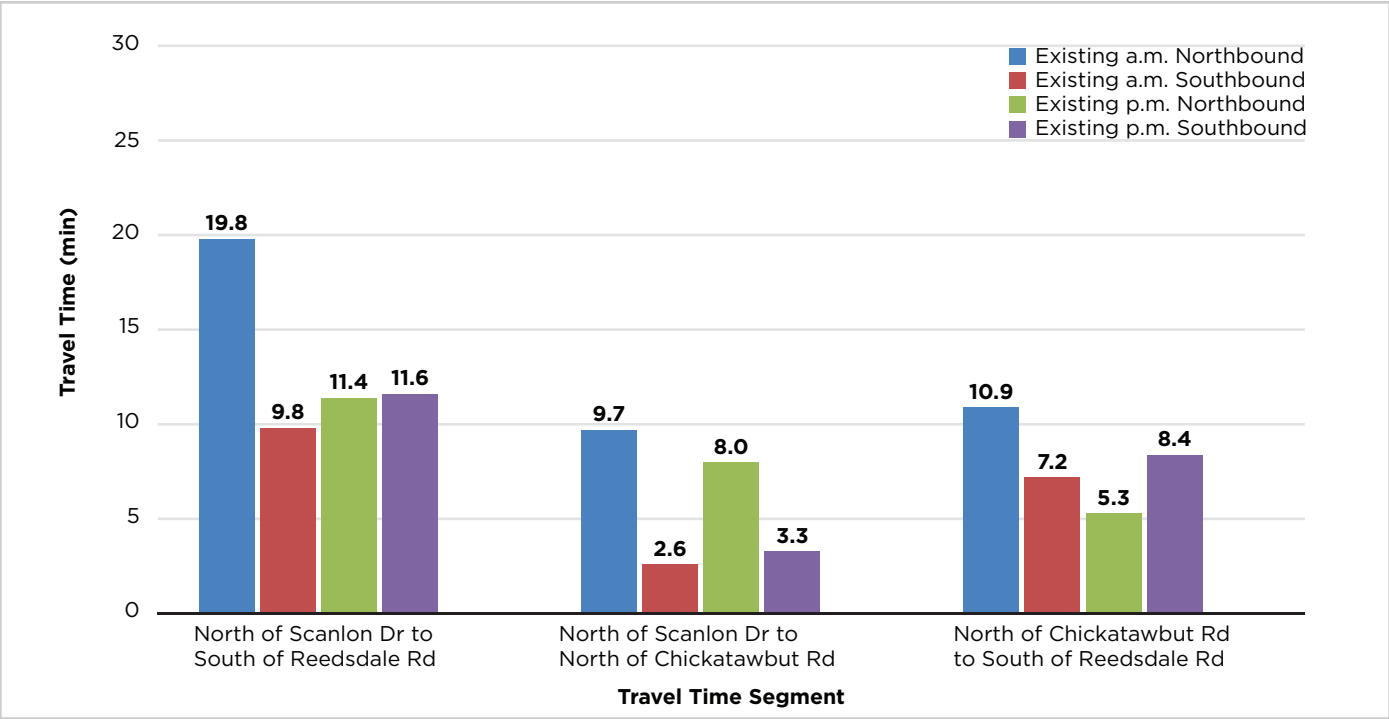


Figure 11. ***Comparison of Future Alternatives - a.m. Peak Hour Bus Travel Times***

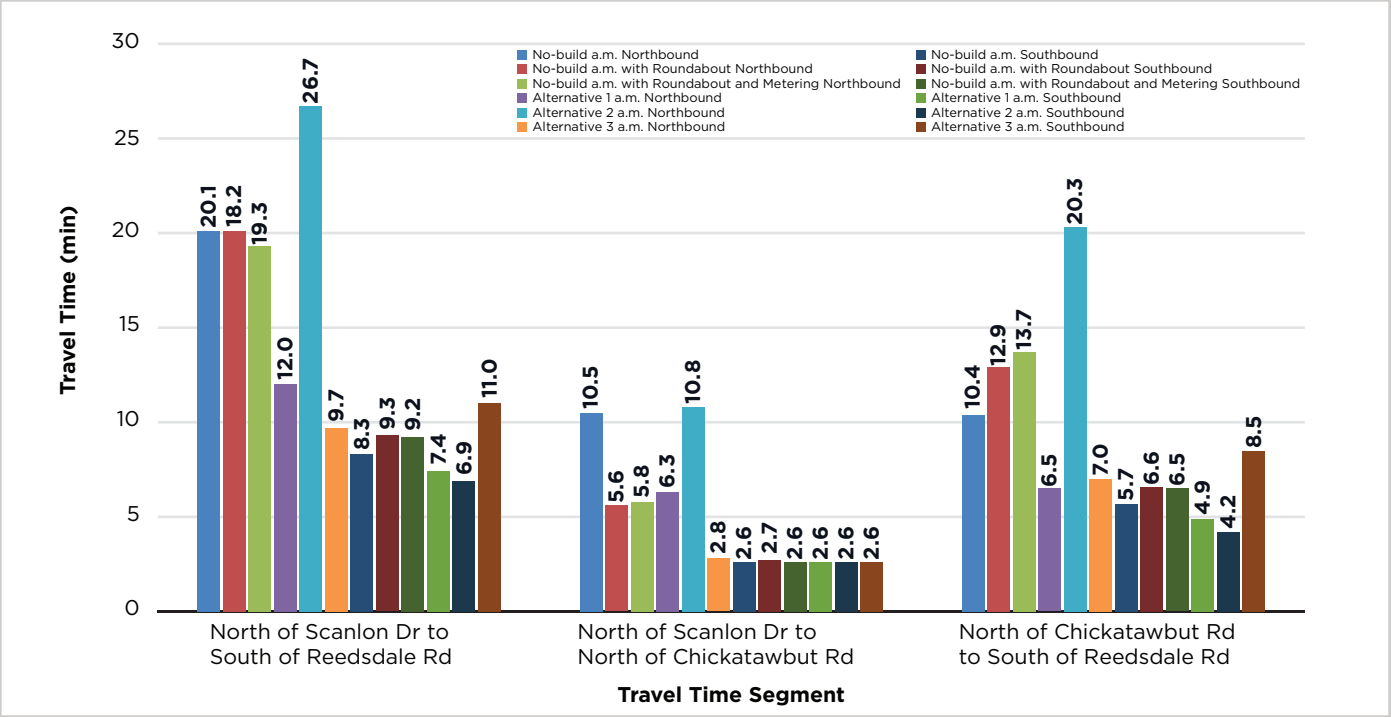
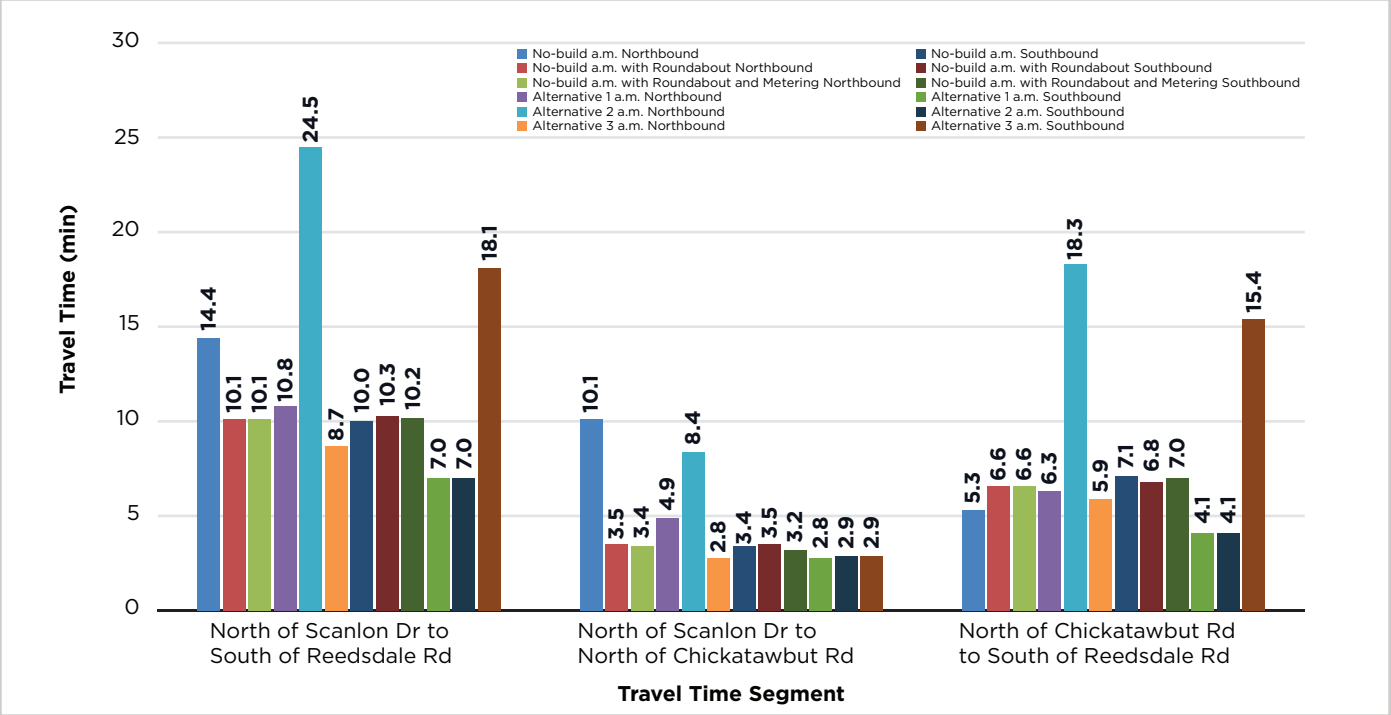



Figure 12. ***Comparison of Future Alternatives - p.m. Peak Hour Bus Travel Times***



As can be seen from **Figure 10** through **Figure 12**, and when comparing the alternatives against the No-build travel times, Alternative 2 is expected to increase bus travel times in the northbound direction for both the a.m. and p.m. peak hours, and Alternative 3 is expected to increase bus travel times in the southbound direction for both the a.m. and p.m. peak hours.

## AVERAGE VEHICLE SPEEDS

Vehicle speeds along the Route 28 corridor were measured at five different locations in all the models:

- South of Reedsdale Road;
- South of Reed Street/Access Road;
- South of Hillside Street;
- South of Chickatawbut Road; and
- Between the I-93 inner loop ramps.

The changes in average speeds at different locations will point out where there is congestion or free-flow traffic along the corridor depending on the alternative. **Figure 13** and **Figure 14** present the Existing conditions average vehicle speeds for the northbound and southbound directions respectively during the weekday a.m. and p.m. peak hours. **Figure 15** and **Figure 16** provide a comparison between the No-build conditions and the alternatives' average vehicle speeds for the northbound and southbound directions respectively.

Tabulated data for the average vehicle speeds can be found in **Appendix B**.

Figure 13. ***Route 28 Northbound Average Speeds, Existing (2023) a.m. & p.m. Peaks***

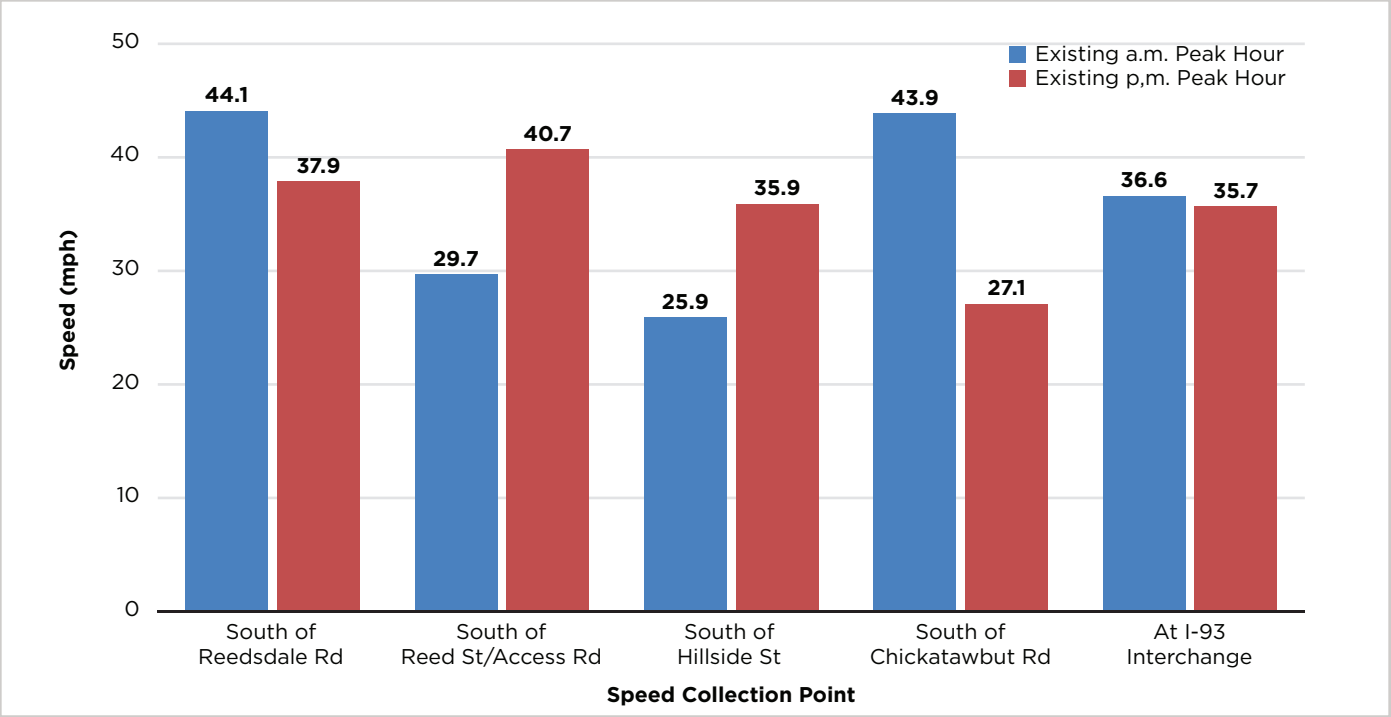



Figure 14. ***Route 28 Southbound Average Speeds, Existing (2023) a.m. & p.m. Peaks***

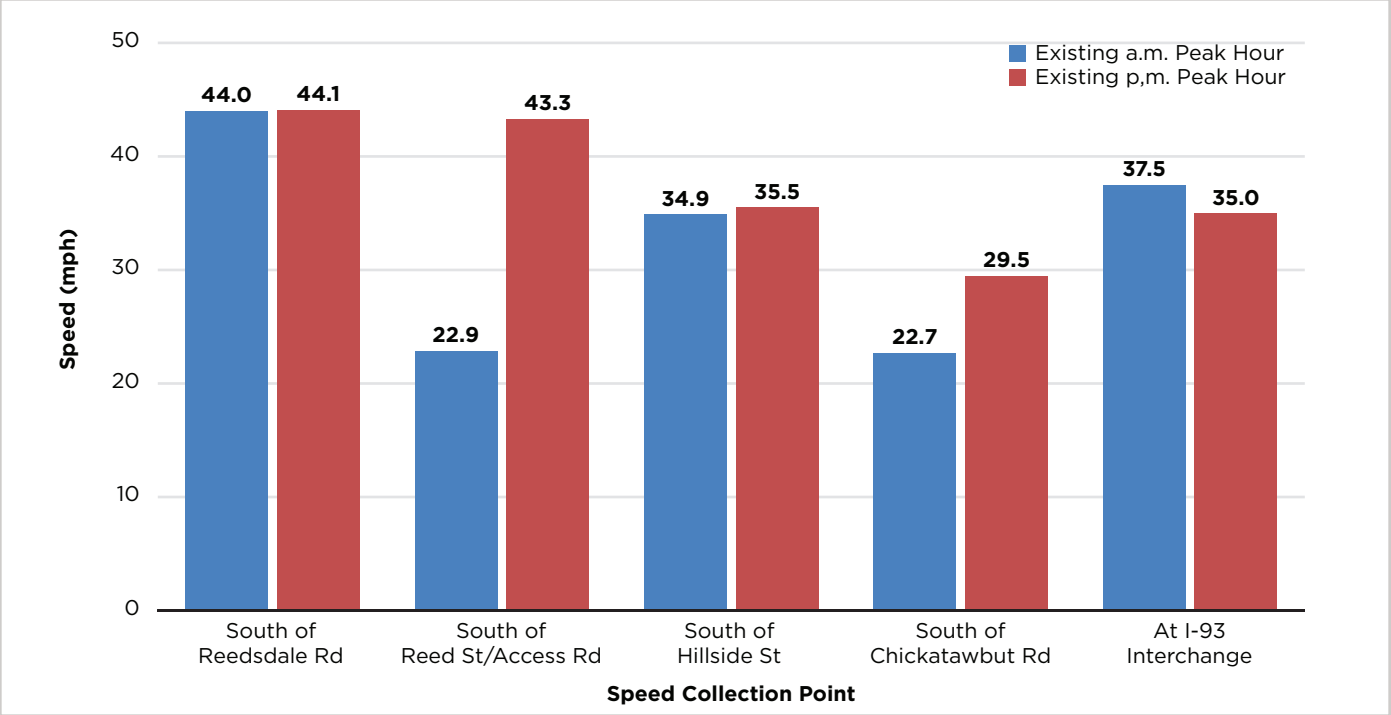


Figure 15. ***Route 28 Northbound Speed Comparison of Future Alternatives***

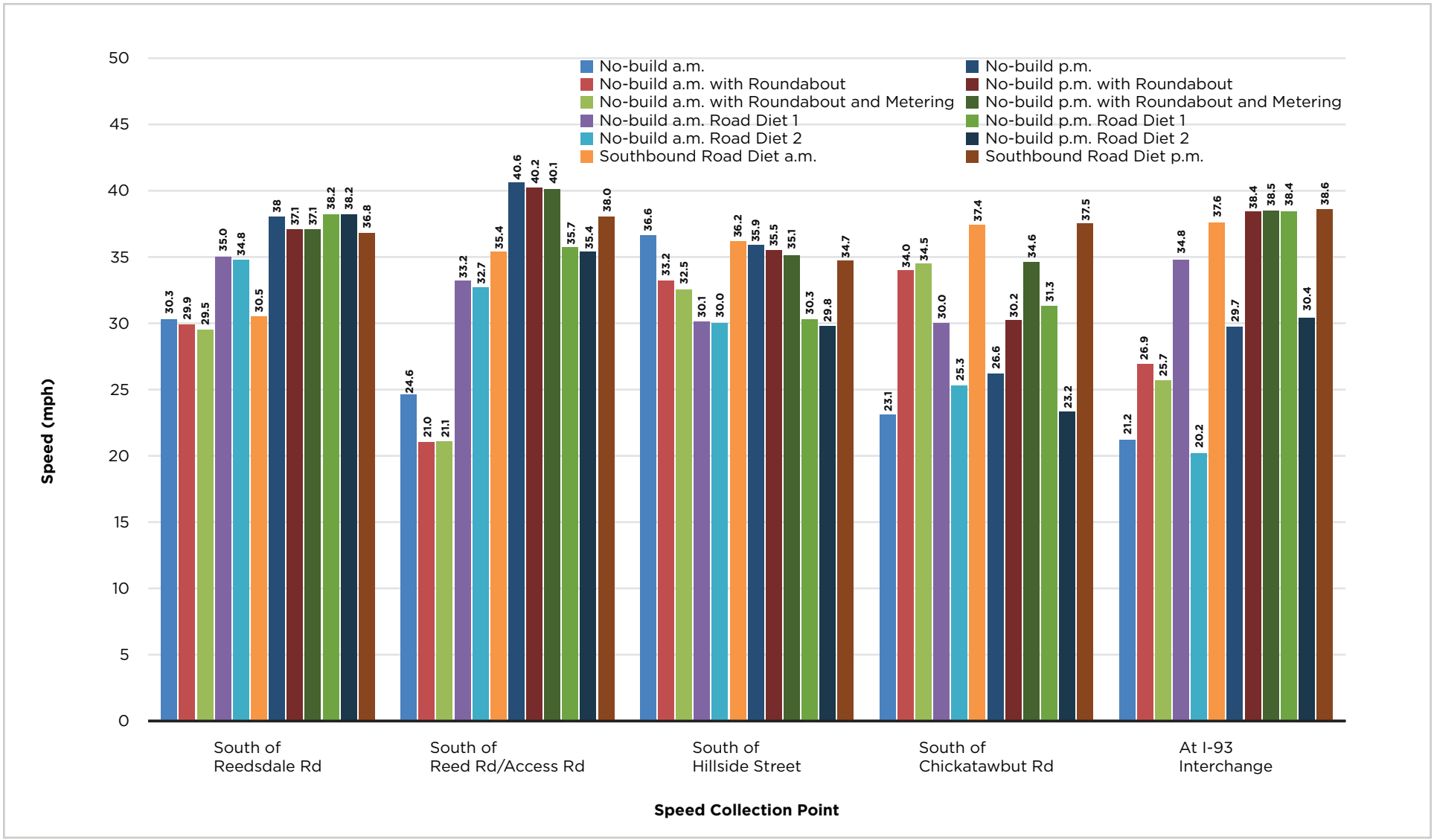
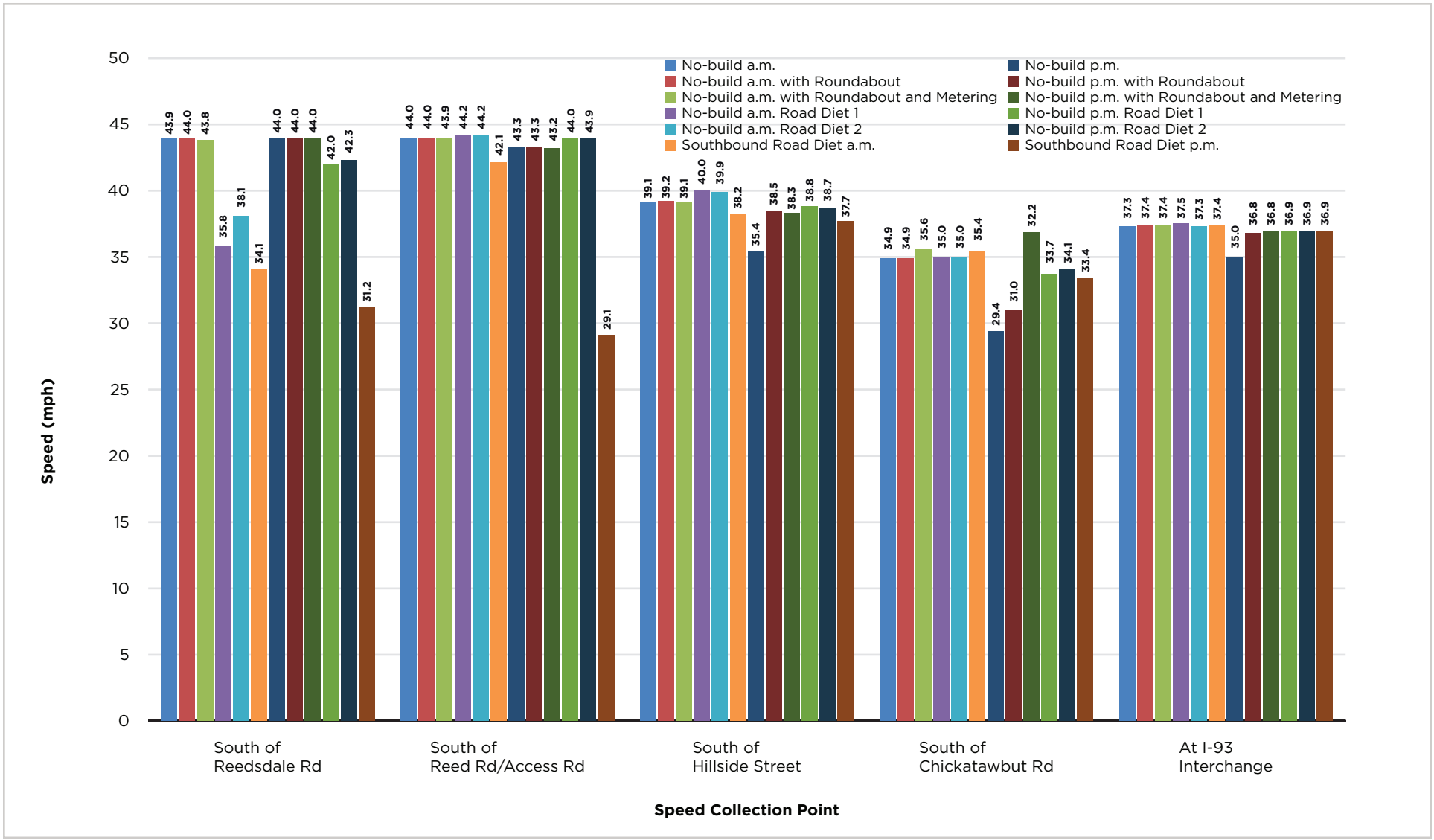


Figure 16. ***Route 28 Southbound Average Speeds Comparison of Future Alternatives***



The speed charts presented previously generally show the following:

**IN THE NORTHBOUND DIRECTION:**

- During the a.m. peak hour, speeds throughout the corridor under Alternatives 1 through 3 vary slightly along the corridor and show an increase over No-build conditions, except for the segment between Hillside Street and Chickatawbut Road that shows a decrease in vehicle speeds; and
- During the p.m. peak hour, Alternative 1 shows a speed decrease between Reed Street/Access Road and Hillside Street, Alternative 2 shows a speed decrease between Reed Street/Access Road and Chickatawbut Road, and Alternative 3 shows a speed decrease between Reedsdale Road and Hillside Street. The remaining segments show an increase in speeds.

**IN THE SOUTHBOUND DIRECTION:**

- During the a.m. peak hour, Alternative 3 shows speed decreases between Reedsdale Road and Hillside Street, whereas Alternatives 1 and 2 shows speed decreases between Reedsdale Road and Reed Street/Access Road only. The remaining segments show speed increases; and
- During the p.m. peak hour, Alternative 3 shows speed decreases between Reedsdale Road and Reed Street/Access Road, whereas Alternatives 1 and 2 shows speed decreases between Reedsdale Road and Reed Street/Access Road only. The remaining segments show speed increases

## DEMAND RATE/UNMET DEMAND

This metric will show two things: a) how the modeled Existing conditions compare to the observed Existing conditions, and b) the expected unmet demand, if any, of each alternative. Unmet demand in this case corresponds to the difference between the number of vehicles programmed to travel through a specific location within the study area based on the measured (or projected) volumes, and the number of vehicles making it through that location under each alternative in the Vissim model.

This comparison will be presented using a modified Chi-Squared statistic called the GEH statistic. The GEH statistic is a formula used in traffic engineering, traffic forecasting, and traffic modeling to compare two sets of traffic volumes. The GEH statistic is an empirical formula that has proven useful for a variety of traffic analysis purposes[1].

[1] "VISSIM Calibration and Validation" Technical Report, Wisconsin Department of Transportation, pg. 5-5

The formula for the GEH statistic is: $GEH = \sqrt{( (M-C)2 / (0.5 \times (M+C)) )}$

Where M is the traffic volume from the Vissim model and C is the real-world traffic count. GEH values give an indication of how the model compares to the real-world conditions.

The Existing conditions Vissim model underwent this GEH statistic check to determine if the results were a good match for the observed conditions. The No-build and alternatives underwent this check to compare the results and determine if future alternatives meet the future demand.

For the purpose of the Route 28 Corridor Road Diet Feasibility, the below values will have the corresponding meaning:

- GEH < 5.0 – Vissim modeled demand closely models observed/measured demand;
- For 5 < GEH < 10 – Vissim model shows some congestion; and
- For GEH > 10 – Vissim model shows gridlock and much of the demand isn't met.

**Table 1** presents the existing conditions GEH values, and **Table 2** presents the GEH values for the No-build and the alternatives and compares them against each other.

*Table 1. Existing (2023) Conditions GEH*

| Location on Route 28 | Northbound GEH | Southbound GEH |
|---|---|---|
| **a.m. peak Hour** | | |
| South of Reedsdale Road | 4.5 | 0.2 |
| South of Reed Street/Access Road | 4.5 | 0.2 |
| South of Hillside Street | 4.4 | 0.5 |
| South of Chickatawbut Road | 6.9 | 0.5 |
| Between the I-93 inner loop ramps | 2.9 | 0.0 |
| **p.m. peak Hour** | | |
| South of Reedsdale Road | 1.4 | 0.8 |
| South of Reed Street/Access Road | 2.7 | 0.8 |
| South of Hillside Street | 2.7 | 0.8 |
| South of Chickatawbut Road | 3.9 | 2.6 |
| Between the I-93 inner loop ramps | 0.5 | 1.1 |

As can be seen by the GEH values for the Existing conditions, the southbound modeled demand is a close match to the observed demand for both peak hours. As for the northbound modeled demand, the GEH value for south of Chickatawbut Road indicates congestion, something that is experienced along this part of the corridor, during the a.m. peak hour, in the northbound direction.

*Table 2. Demand Rate – No-build (2033) Conditions vs. Alternatives*

| Location on Route 28 | Northbound Demand Rate | | | | | | Southbound Demand Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No build | No build w/RBT(1) | No build w/RBT+MET(2) | Alternative 1 | Alternative 2 | Alternative 3 | No build | No build w/RBT(1) | No build w/RBT+MET(2) | Alternative 1 | Alternative 2 | Alternative 3 |
| **a.m. peak Hour** | | | | | | | | | | | | |
| South of Reedsdale Road | 5.0 | 5.2 | 5.3 | 5.2 | 8.2 | 2.2 | 0.4 | 0.4 | 0.3 | 0.3 | 3.6 | 0.6 |
| South of Reed Street/Access Road | 5.1 | 5.1 | 5.3 | 9.5 | 27.4 | 2.9 | 0.2 | 0.2 | 0.2 | 0.3 | 4.7 | 0.6 |
| South of Hillside Street | 4.6 | 2.8 | 2.7 | 9.7 | 17.0 | 3.0 | 0.4 | 0.3 | 0.2 | 0.6 | 3.8 | 0.6 |
| South of Chickatawbut Road | 7.3 | 3.2 | 3.3 | 6.3 | 18.6 | 3.2 | 0.6 | 0.4 | 0.4 | 0.6 | 2.9 | 0.4 |
| Between the I-93 inner loop ramps | 4.1 | 1.8 | 1.8 | 1.6 | 15.9 | 1.5 | 0.1 | 0.1 | 0.1 | 0.3 | 9.1 | 0.0 |
| **p.m. peak Hour** | | | | | | | | | | | | |
| South of Reedsdale Road | 2.4 | 0.8 | 0.5 | 2.2 | 3.3 | 0.6 | 1.5 | 2.1 | 2.0 | 1.7 | 1.4 | 6.2 |
| South of Reed Street/Access Road | 5.1 | 1.8 | 1.3 | 5.2 | 6.7 | 1.0 | 1.1 | 1.5 | 1.5 | 1.3 | 1.6 | 6.8 |
| South of Hillside Street | 5.7 | 1.9 | 1.1 | 5.5 | 7.2 | 0.7 | 1.3 | 1.3 | 1.2 | 0.8 | 1.2 | 8.0 |
| South of Chickatawbut Road | 5.8 | 0.7 | 0.3 | 2.7 | 7.3 | 0.7 | 3.1 | 3.3 | 2.9 | 3.2 | 2.1 | 6.8 |
| Between the I-93 inner loop ramps | 1.5 | 0.2 | 0.3 | 0.2 | 1.9 | 0.4 | 1.8 | 2.0 | 1.7 | 1.5 | 1.3 | 3.6 |

*(1) Future No-Build with Roundabout at Route 28 and Chickatawbut Road*
*(2) Future No-Build with Roundabout at Route 28 and Chickatawbut Road and with Metering signals on Route 28 legs*

The GEH values for the No-build conditions show that conditions for the northbound direction will worsen significantly in the future, whereas the southbound direction will be able to process the increased demand.

When comparing these results, the following conclusions can be drawn:

### A.M. PEAK HOUR

- Alternative 1 is expected to process the same demand with the No-build conditions in either direction of the corridor, except for the portion south of Reed Street/Access Road to south of Hillside Street and in the northbound direction only;
- Alternative 2 is expected to process less demand when compared to the No-build conditions in either direction of the corridor; and
- Alternative 3 is expected to process more demand when compared to No-build conditions in the northbound direction, and the same demand with No-build conditions in the southbound direction.

### P.M. PEAK HOUR

- Alternative 1 is expected to process the same demand with the No-build conditions, in either direction of the corridor, except for the segment south of Chickatawbut Road;
- Alternative 2 is expected to process more demand than No-build conditions and in the northbound direction. In the southbound direction, Alternative 2 is expected to process demand comparable to the No-build conditions; and
- Alternative 3, in the northbound direction, is expected to process approximately all of the increased demand. However, in the southbound direction, is expected to process less demand than No-build conditions and both Alternatives 1 and 2.

If one of these road diet alternatives is chosen, vehicles are expected to reroute due to increased congestion. Based on recent Origin-Destination data pulled from MassDOT's INRIX (see 2024-04-10 Interim Improvements Presentation and related material submitted to MassDOT on April 10, 2024), assumptions can be made for what roadways vehicles may divert to in order to avoid this increased congestion. For the northbound road diet, drivers might use I-93 Northbound, which is already congested during the a.m. peak hour, but this is acceptable as I-93 should be used instead of Route 28. For the southbound road diet, drivers might use Route 138, Unquity Road, or Reedsdale Road to Pleasant Street, connecting to East Milton Square and I-93 Southbound. However, this would increase traffic on mostly residential or slow-speed roads, raising safety concerns for residents leaving their driveways.

## DRIVEWAY DELAY

Concerns about impacts to traffic from the proposed Route 28 at Chickatawbut Road roundabout and the heavy traffic on Route 28 include access for properties and local side streets near the proposed roundabout. The driveway delays under No-build conditions and proposed alternatives were analyzed using Vissim, focusing on driveways between Susi Lane and Hillside Street. In No-build, No-build with Roundabout, and No-build with Roundabout and Metering conditions, the studied movement was a left turn from the driveway to Route 28 Southbound. Under the alternatives, this movement is proposed as a right turn out of the driveways and a U-turn at the signalized intersection of Route 28 and Hillside Street, the nearest intersection allowing a U-turn.

Although field observations were not conducted at these driveways, they were consistently modeled in Vissim for a fair comparison. The metric focuses on driveway delay under No-build conditions and alternatives. **Figure 17** and **Figure 18** show the driveway delay analysis results.

Tabulated data for the driveway delays can be found in **Appendix B**.

Figure 17. ***Driveway Delay within Merge Area – a.m. Peak Hour***

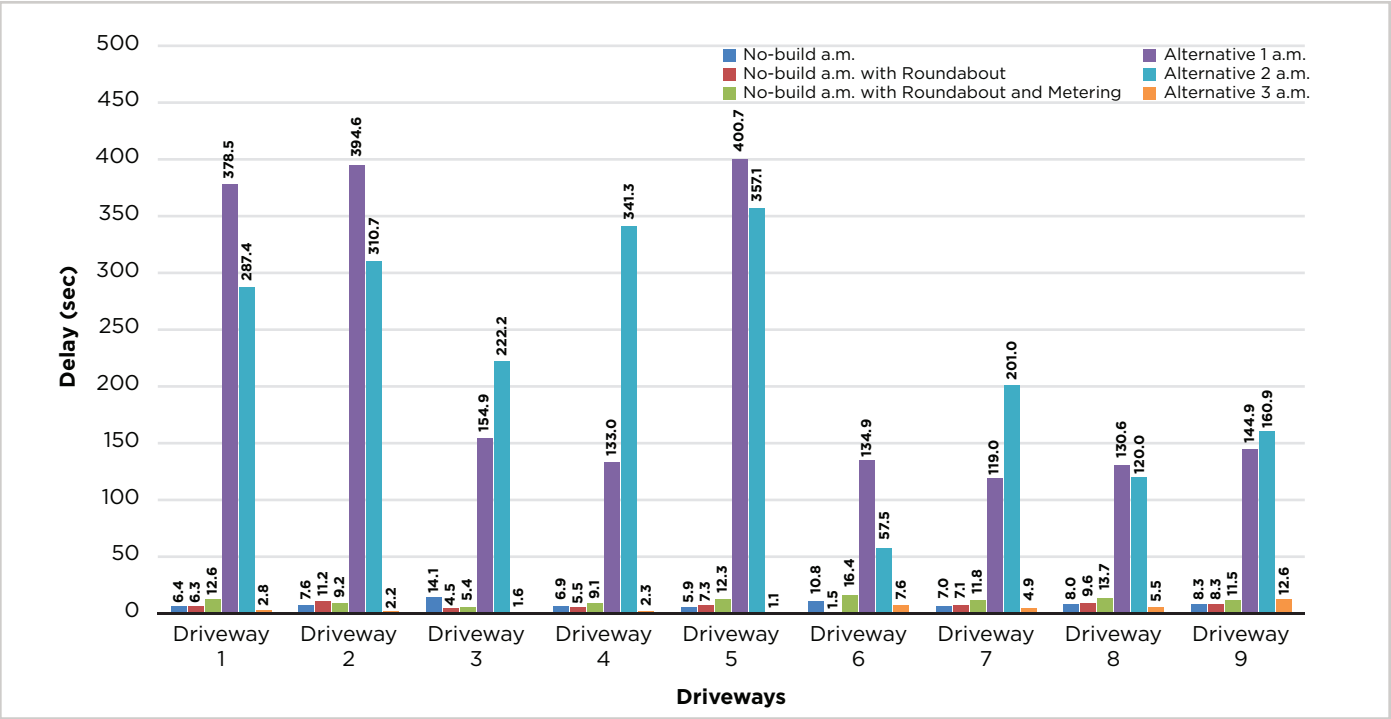
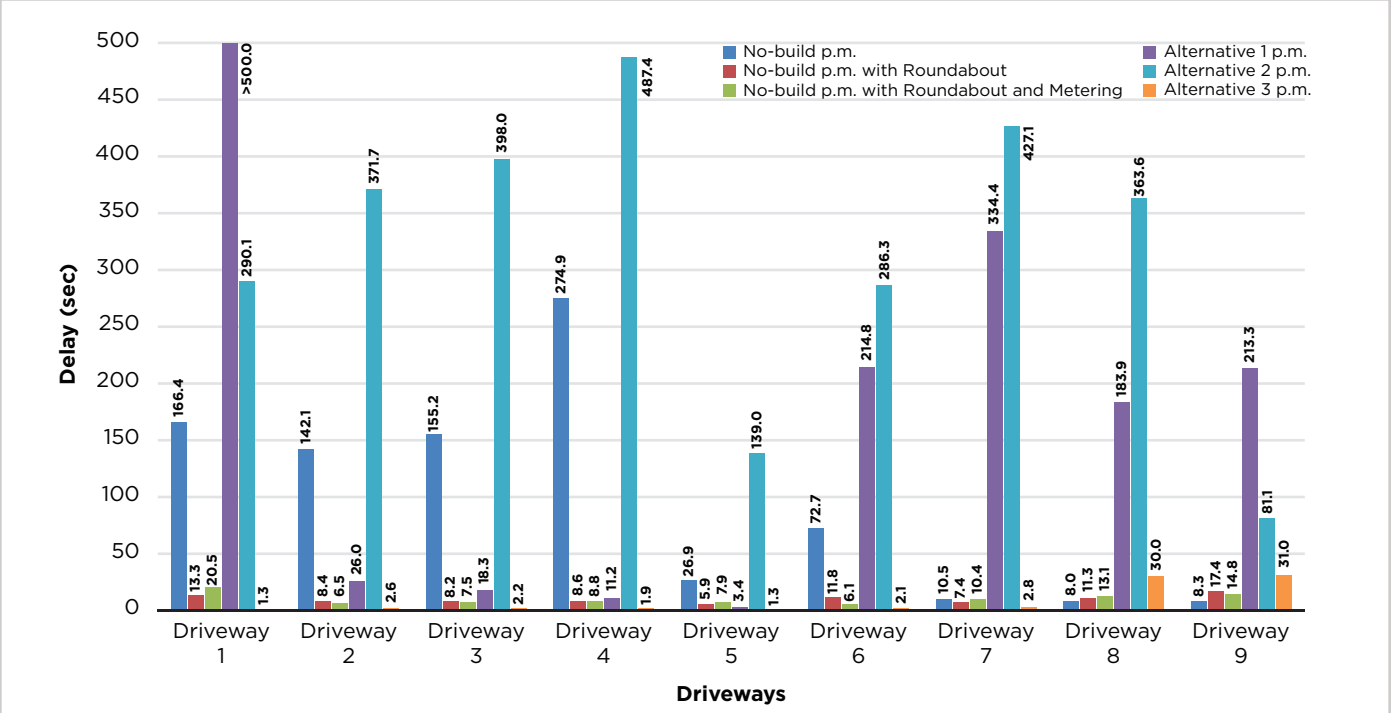



Figure 18. ***Driveway Delay within Merge Area – p.m. Peak Hour***



The two driveway delay charts show that Alternative 1 and 2 are expected to increase the delay experienced by the driveways located between Susi Lane and Hillside Street, when compared to the No-build conditions and Alternative 3. On the other hand, under Alternative 3, those driveways are expected to see similar to less delay when compared to No-build conditions and the other alternatives.

## QUEUES ALONG ROUTE 28 CORRIDOR

The queue information at the signalized intersections and the roundabout at Route 28 and Chickatawbut Road were also collected under this study. The focus was the queues on the Route 28 mainline.

The queues are presented in this memo to show if there are any expected queues that will be very long and spill back to adjacent intersections. The queues are presented in **Figure 19** through **Figure 22** as bar charts and, following those charts, are a discussion of the queues and specifically those that are expected to spill back to adjacent intersections.

Tabulated data for the queues can be found in **Appendix B** in the capacity analysis tables. It should be noted that where queues are spilling back beyond one or more intersections, they were added together to show the actual queue length in the charts below.

Figure 19. *a.m. Peak Hour Average and Maximum Queues – Route 28 Mainline Eastbound/Southbound*

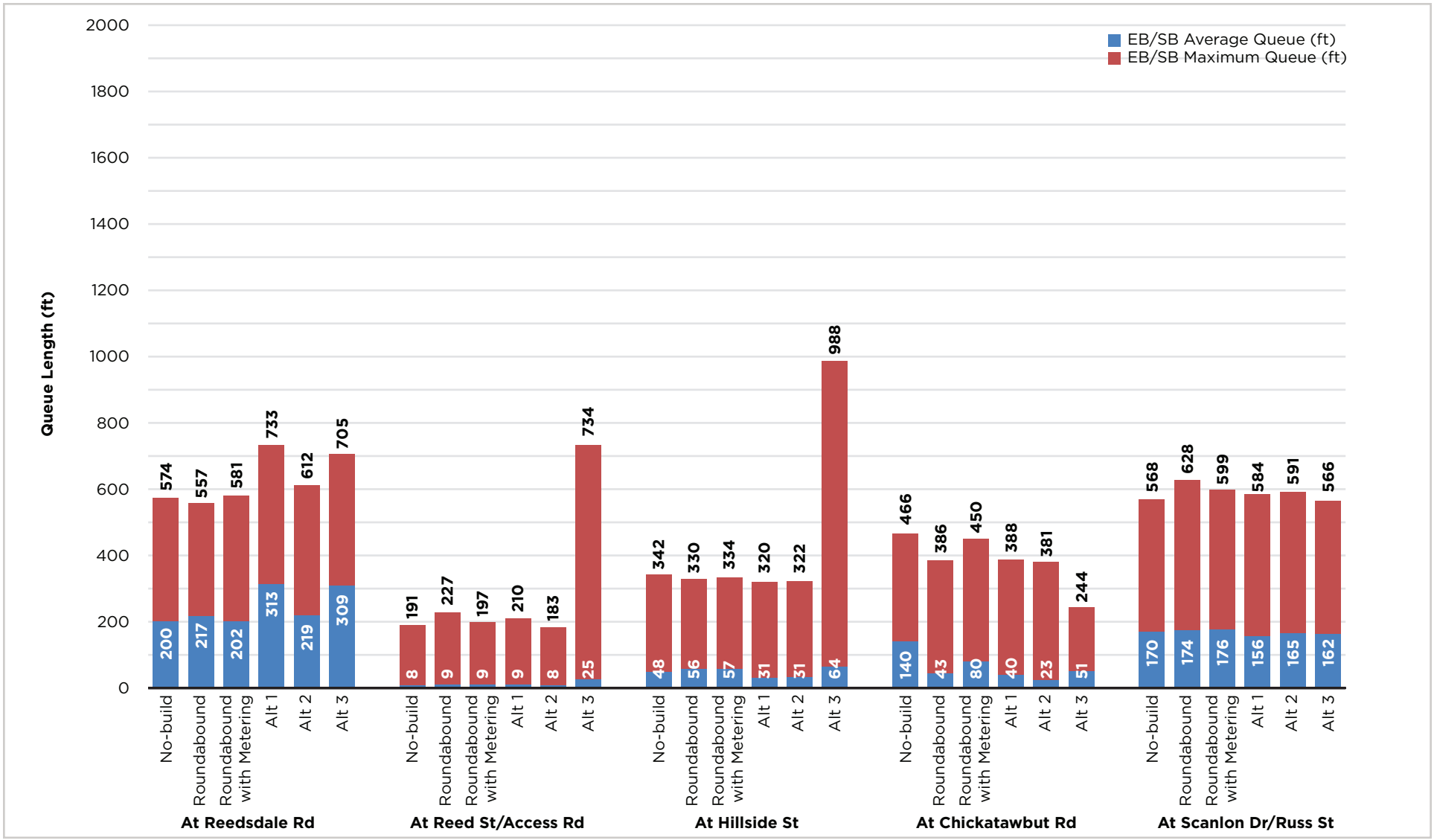


Figure 20. ***p.m. Peak Hour Average and Maximum Queues – Route 28 Mainline Eastbound/Southbound***

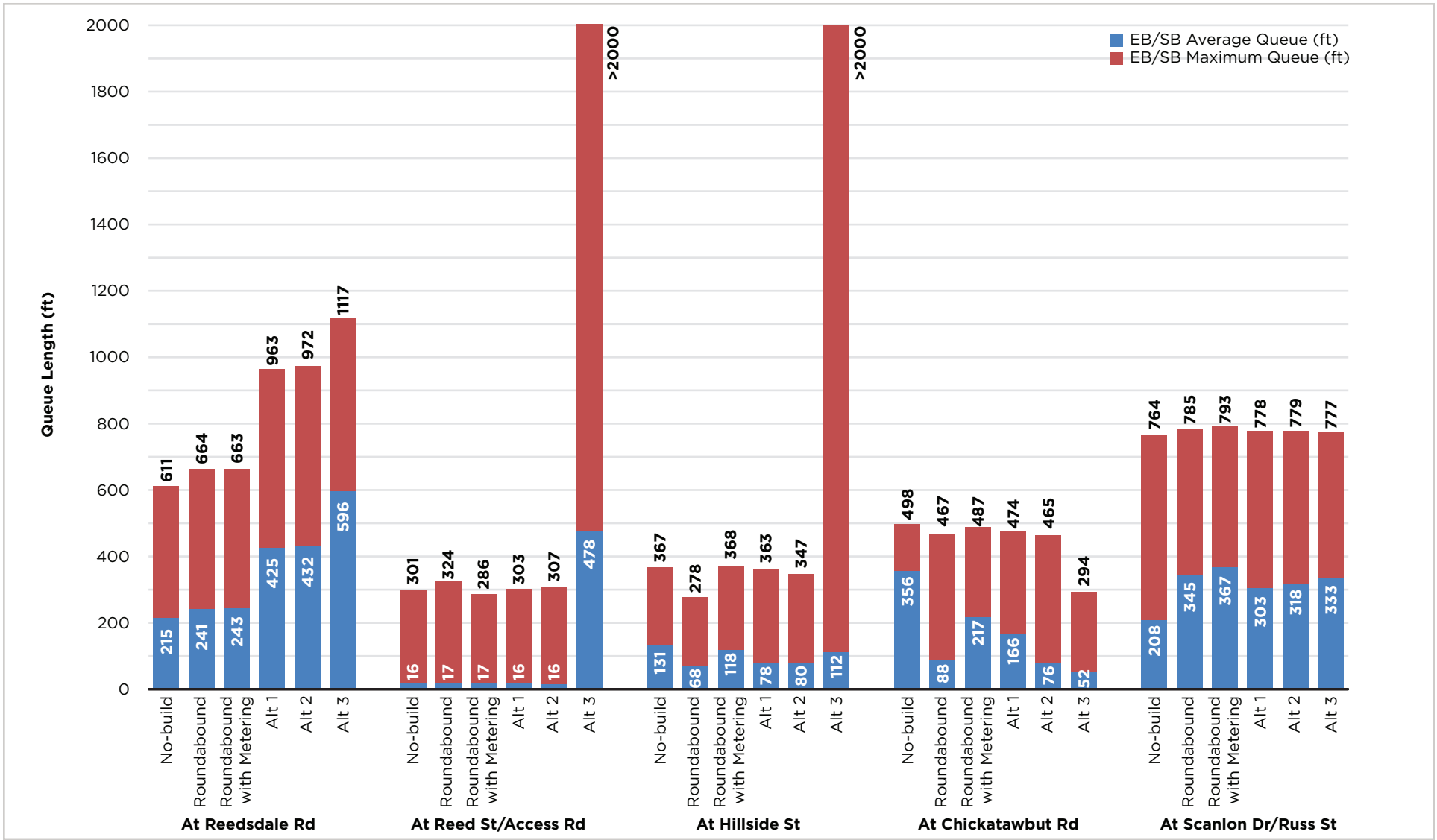


Figure 21. *a.m. Peak Hour Average and Maximum Queues – Route 28 Mainline Northbound*

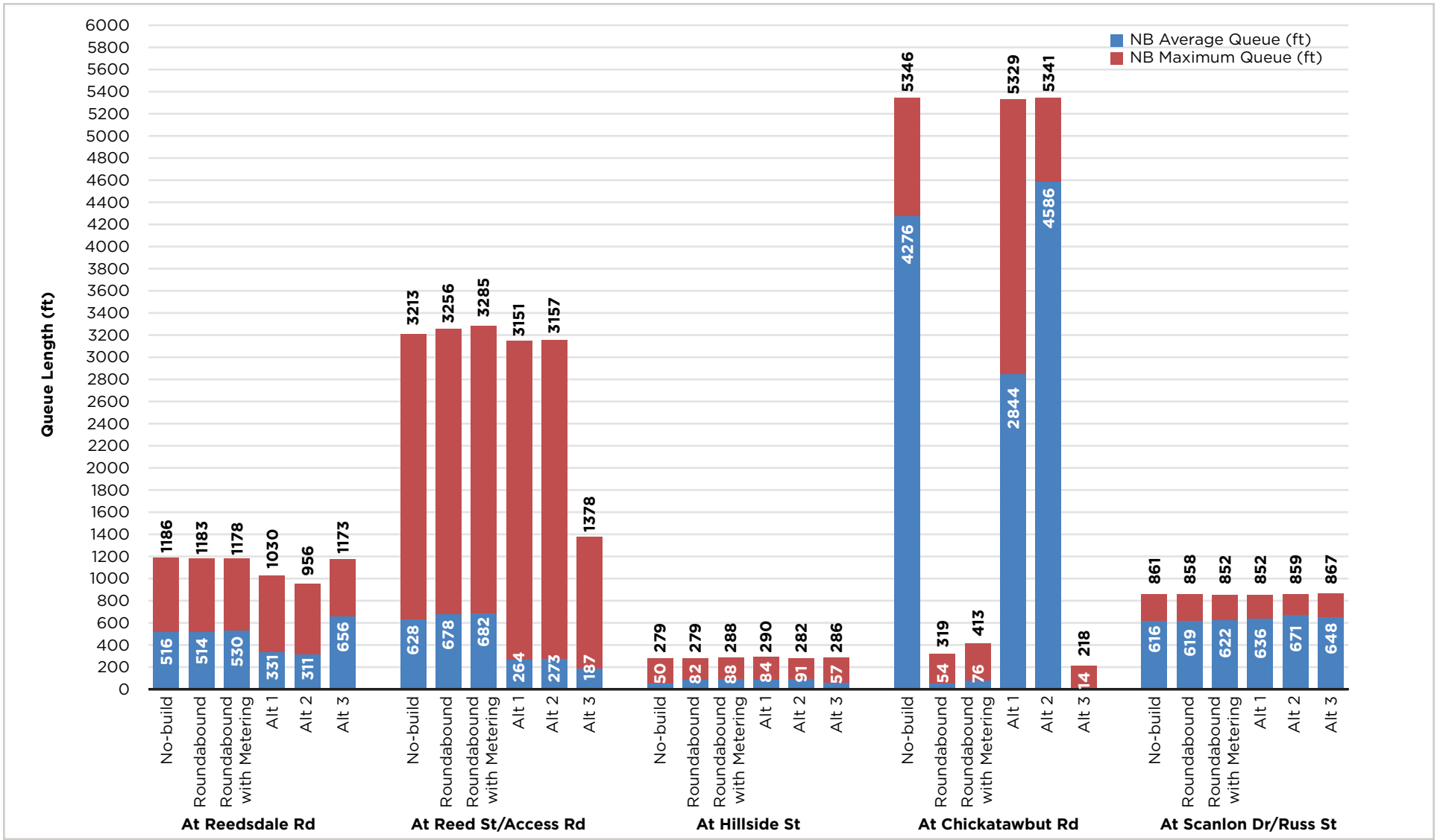
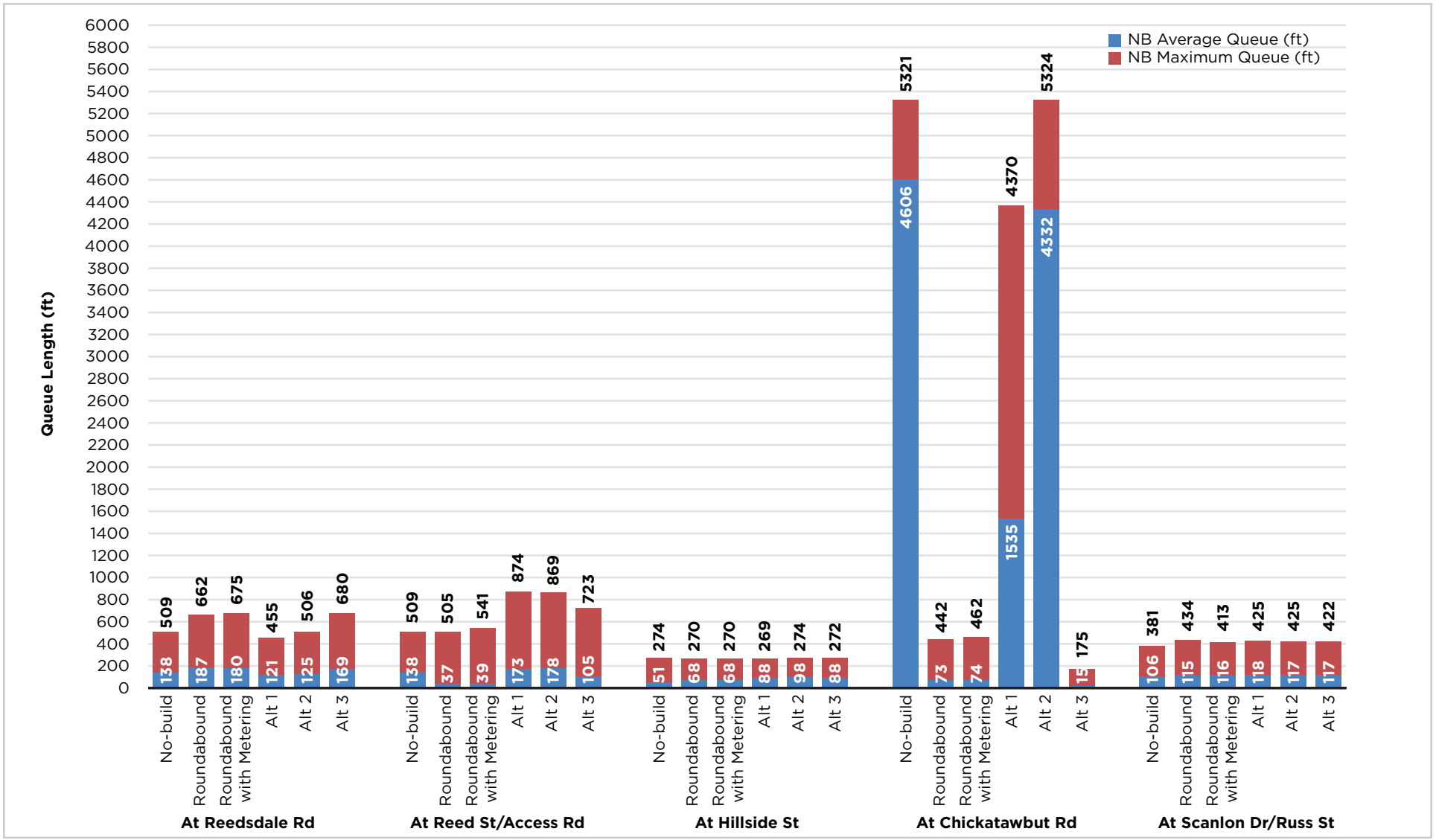


Figure 22. ***p.m. Peak Hour Average and Maximum Queues – Route 28 Mainline Northbound***



As the charts show, most of the queues along the corridor and the signalized intersections are contained within the intersection and not spilling back to other intersections, except for the following:

- ***Route 28 at Hillside Street*** – a.m. and p.m. southbound queues will spill back to other intersections under Alternative 3. Specifically, during the a.m. peak, it is expected that the queues will extend to just south of Ridgewood Road. During the p.m. peak hour, it is expected that the southbound queues will reach just south of Reedsdale Road. Due to the length of this queue, Reedsdale Road eastbound is expected to experience queues that will reach past Clifton Street.
- ***Route 28 at Reedsdale Road*** – a.m. peak hour queues in the northbound direction are expected to reach just past Pleasant Street under Alternative 3.
- ***Route 28 at Reed Street/Access Road*** – a.m. and p.m. peak hour queues in the northbound direction, and under Alternatives 1 and 2, are expected to reach past Sassamon Avenue.
- ***Route 28 at Chickatawbut Road*** – a.m. and p.m. peak hour northbound queues are expected to reach near the I-93 Interchange under Alternatives 1 and 2. These lengthy queues are expected to influence queues throughout the interchange, as happens today under Existing conditions.

# Conclusion

To summarize the results, when looking at the different metrics for each alternative the following results can be inferred:

- ***Travel times and Vehicle-Hours of Delay:*** Alternative 3 provides the better reduction in travel time and vehicle-hours of delay, only in the northbound direction, over the other alternatives and in either peak hour, whereas Alternative 2 provides the better reduction in travel time and vehicle-hours of delay in the southbound direction.
- ***Average Speeds:*** While the point of the improvements is not to increase speeds along the corridor, a road diet may affect the speeds as it may create or ease congestion at points throughout the corridor. For example, there is a large drop in average speed in the southbound direction and in the p.m. peak hour under Alternative 3. As the other metrics show, Alternative 3 is expected to experience long queues during the p.m. peak hour, thus slower speeds. The alternatives with the largest increases to speeds are Alternative 1 and Alternative 3 in the northbound direction and both peak hours.

- ***Demand Rate:*** Depending on the peak hour and the traveling direction, each alternative sees locations where the processed demand does not improve over the No-build conditions. In the a.m. peak hour and in the northbound direction, Alternatives 1 and 2 see less demand processed over the No-build. In the p.m. peak hour and in the southbound direction, Alternative 3 sees less demand processed over the No-build, whereas, in the northbound direction, Alternative 2 sees less demand processed over the No-build;
- ***Driveway Delay:*** Alternative 3 provides the better reduction in delay, or delays that are similar to No-build conditions, experienced by driveways near the proposed roundabout at Route 28 and Chickatawbut Road, whereas Alternatives 1 and 2 increases the delay expected at those same driveways by minutes in many cases.
- ***Queues along Route 28 Corridor:*** Similar to the other metrics, the queues also show areas of congestion under each alternative, depending on the peak hour and travel direction. When looking in the northbound direction and during both the a.m. and p.m. peak hours, Alternatives 1 and 2 are expected to see long northbound queues at Route 28 and Chickatawbut Road, which have the potential of impacting the Route 28 at I-93 interchange, similar to the No-build conditions. When looking at the southbound direction and the p.m. peak only, Alternative 3 is expected to see long southbound queues at Route 28 Hillside Street intersection that spill back all the way to Route 28 at Reedsdale Road intersection, much longer than seen under No-build or Alternatives 1 and 2.

In summary, the memorandum shows that a road diet along Route 28 is feasible only in the p.m. peak hour in the northbound direction and between Hillside Street and Reedsdale Road, or in the southbound direction between Hillside Street and Chickatawbut Road and only in the a.m. peak hour. If a road diet were implemented along the entire length of the Route 28 corridor, it is likely that vehicles will divert to I-93 (northbound road diet) or local streets and arterials (southbound road diet), like Route 138, Unquity Road, or Reedsdale Road to Pleasant Street that connect to East Milton Square and I-93 Southbound. A road diet can work for part of the Route 28 corridor but not the entire stretch, unless vehicles reroute to other roadways. For driveway delay, maintaining two northbound lanes reduces delays, as shown in Alternative 3, highlighting the need for two lanes up to Hillside Street to handle a.m. peak northbound demand and avoid merge issues, unless, again, Route 28 northbound vehicles reroute to I-93 northbound.

To conclude, while this memorandum focuses on comparing the future No-build conditions to the three different road diet alternatives, data on all metrics for the No-build conditions with a roundabout at Route 28 and Chickatawbut Road with the PHBs and without the PHBs but with

metering signals, are also presented. While those two conditions show similar conditions to existing/future No-build conditions, it should be noted that the only change considered under the No-build conditions with a roundabout at Route 28 and Chickatawbut Road with the PHBs and without the PHBs but with metering signals, is the roundabout at Route 28 and Chickatawbut Road and no other changes at the rest of the corridor.

HSH is available to discuss the findings of the memorandum further at the request of MassDOT.

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# Appendix A

## Milton – Route 28 Corridor Road Diet Feasibility Study from Chickatawbut Road to Reedsdale Road Supplemental Memorandum

| | | | |
|---|---|---|---|
| TO: | Joshua Bartus, Project Manager<br>MassDOT | DATE: | December 20, 2024<br>(Revised February 20, 2025) |
| FROM: | Haralampos Stathopoulos, P.E., PTOE, HSH<br>Jessica Lizza, P.E., PTOE, HSH | HSH PROJECT NO.: | 2021055.15 |
| SUBJECT: | Milton – Route 28 Corridor Road Diet Feasibility Study from Chickatawbut Road to Reedsdale Road – Addendum #1 | | |

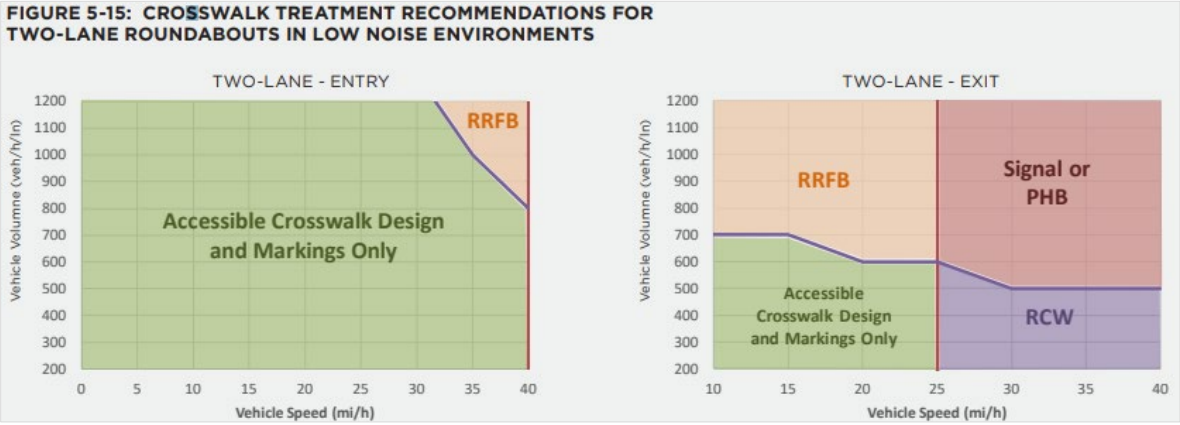
# Introduction

This technical memorandum is an addendum to the memorandum titled "Milton Route 28 Corridor Road Diet Feasibility Study from Chickatawbut Road to Reedsdale Road", submitted to the Massachusetts Department of Transportation (MassDOT) by ***Howard Stein Hudson (HSH)*** on August 1, 2024. This memorandum focuses on delay at the driveways between Hillside Street and Chickatawbut Road, and at Eager Road and Susi Lane, as presented in the August memorandum. HSH met with MassDOT on August 13, 2024, to discuss the road diet feasibility study results. In that meeting, MassDOT requested that HSH study the impacts to the driveways and local roadways located along the part of Route 28 between the Chickatawbut Road proposed roundabout and south of the Hillside Street signalized intersection without a road diet in place, and also study what metering the proposed roundabout would do to the driveways and side streets in question; this information was not studied as part of the August memorandum.

Roundabout metering was suggested by concerned Milton residents during the design development of the project and was studied under a Roundabout Metering memorandum completed in May 2023. That study analyzed metering effects only at the roundabout and using the SIDRA software, which did not provide any input on driveway delay, just changes in operation at the proposed roundabout under metering. The May 2023 memorandum suggested more in-depth analysis to determine if roundabout metering will negatively or positively impact the concerned driveways and side streets. The additional analysis was completed under this addendum.

It should be noted that to implement roundabout metering at the proposed Chickatawbut Road roundabout, the currently proposed Pedestrian Hybrid Beacon (PHB) on the Route 28 approach and departure legs will need to be removed as they would conflict with the roundabout metering signal control. However, the MassDOT *Guidelines for the Planning and Design of Roundabouts* (March 2022) requires the PHBs be provided for the Route 28 crossings, as depicted by **Figure 1**, an excerpt from the document.

*Figure 1. Crosswalk Treatment Recommendations for Two-Lane Roundabouts in Low Noise Environments*




Vehicles on Route 28 currently travel with speeds above 30 miles per hour (mph); the volume in both directions of Route 28 is over 700 vehicles per hour per lane (vphpl). According to this data, the guidelines recommend a PHB for safe crossings. If the roundabout metering is implemented and the PHBs are removed, the crossings would require a different type of control to maintain the safety currently provided by the PHBs. A possible option is Rectangular Rapid Flashing Beacons (RRFBs) with raised crossings. Alternative crossings would require further investigation.

When it comes to volumes at the studied residential driveways, it was assumed that one vehicle per hour would enter Route 28 from the driveways, as no turning movement counts were conducted at the driveways, just side streets. **Table 1** and **Table 2** present the expected delays at the concerned driveways and side streets under the following conditions:

- Future No-build – Future volumes (2033), the signal at Route 28 and Chickatawbut Road is retained as it is today, and no other changes occur along the corridor;
- Future No-build with Roundabout – Future volumes, the proposed roundabout at Route 28 and Chickatawbut Road is installed, and no other changes occur along the corridor;
- Future No-build with Roundabout and Metering – Future volumes, the proposed roundabout at Route 28 and Chickatawbut Road is installed and provided with metering signals but no PHBs, and no other changes occur along the corridor; and
- Alternative 1, Alternative 2, and Alternative 3 are as described in the August 2024 Road Diet Feasibility Study memorandum.

*Table 1. a.m. Peak Hour Driveway Delay Comparison – No-build vs. Alternatives*

| Location on Route 28 | No-build Delay (sec) | No-build w/ Roundabout Delay (sec) | No-build w/ Roundabout Metering Delay (sec) | Alternative 1 Delay (sec) | Alternative 2 Delay (sec) | Alternative 3 Delay (sec) |
|---|---|---|---|---|---|---|
| **a.m. peak Hour** | | | | | | |
| **Between Eager Rd and Susi Lane** | | | | | | |
| Susi Ln EB | 3.7 | 4.1 | 4.1 | 15.5 | 7.1 | 1.8 |
| Susi Ln WB | 8.0 | 7.5 | 7.9 | 34.6 | 42.7 | 8.6 |
| Driveway #1 | 6.4 | 6.3 | 12.6 | 378.5 | 287.4 | 2.8 |
| Driveway #2 | 7.6 | 11.2 | 9.2 | 394.6 | 310.7 | 2.2 |
| Driveway #3 | 14.1 | 4.5 | 5.4 | 154.9 | 222.2 | 1.6 |
| Driveway #4 | 6.9 | 5.5 | 9.1 | 133.0 | 341.3 | 2.3 |
| Driveway #5 | 5.9 | 7.3 | 12.3 | 400.7 | 357.1 | 1.1 |
| **Between Hillside St and Eager Rd** | | | | | | |
| Eager Rd WB | 10.3 | 12.5 | 8.1 | 127.7 | 66.0 | 13.2 |
| Driveway #6 | 10.8 | 1.5 | 16.4 | 134.9 | 57.5 | 7.6 |
| Driveway #7 | 7.0 | 7.1 | 11.8 | 119.0 | 201.0 | 4.9 |
| Driveway #8 | 8.0 | 9.6 | 13.7 | 130.6 | 120.0 | 5.5 |
| Driveway #9 | 8.3 | 8.3 | 11.5 | 144.9 | 160.9 | 12.6 |
| Avg. Delay | 8.1 | 7.1 | 10.2 | 180.7 | 181.2 | 5.4 |
| Max. Delay | 14.1 | 12.5 | 16.4 | 400.7 | 357.1 | 13.2 |
| Min. Delay | 3.7 | 1.5 | 4.1 | 15.5 | 7.1 | 1.1 |

*Table 2. p.m. Peak Hour Driveway Delay Comparison – No-build vs. Alternatives*

| Location on Route 28 | No-build Delay (sec) | No-build w/ Roundabout Delay (sec) | No-build w/ Roundabout Metering Delay (sec) | Alternative 1 Delay (sec) | Alternative 2 Delay (sec) | Alternative 3 Delay (sec) |
|---|---|---|---|---|---|---|
| **p.m. peak Hour** | | | | | | |
| **Between Eager Rd and Susi Lane** | | | | | | |
| Susi Ln EB | 16 | 7.9 | 11.0 | 9.4 | 11.4 | 12.6 |
| Susi Ln WB | 24.4 | 3.7 | 13.4 | 24.1 | 19.5 | 4.0 |
| Driveway #1 | 166.4 | 13.3 | 20.5 | 532.6 | 290.1 | 1.3 |
| Driveway #2 | 142.1 | 8.4 | 6.5 | 26.0 | 371.7 | 2.6 |
| Driveway #3 | 155.2 | 8.2 | 7.5 | 18.3 | 398.0 | 2.2 |
| Driveway #4 | 274.9 | 8.6 | 8.8 | 11.2 | 487.4 | 1.9 |
| Driveway #5 | 26.9 | 5.9 | 7.9 | 3.4 | 139.0 | 1.3 |
| **Between Hillside St and Eager Rd** | | | | | | |
| Eager Rd WB | 33.1 | 10.2 | 9.7 | 101.3 | 58.5 | 19.5 |
| Driveway #6 | 72.7 | 11.8 | 6.1 | 214.8 | 286.3 | 2.1 |
| Driveway #7 | 10.5 | 7.4 | 10.4 | 334.4 | 427.1 | 2.8 |
| Driveway #8 | 8 | 11.3 | 13.1 | 183.9 | 363.6 | 30.0 |
| Driveway #9 | 8.3 | 17.4 | 14.8 | 213.3 | 81.1 | 31.0 |
| Avg. Delay | 96.1 | 10.3 | 10.6 | 170.9 | 316.0 | 8.4 |
| Max. Delay | 274.9 | 17.4 | 20.5 | 532.6 | 487.4 | 31.0 |
| Min. Delay | 8.0 | 1.5 | 4.1 | 3.4 | 7.1 | 1.1 |

The results in **Table 1** and **Table 2** show the following:

- During the a.m. peak hour, the Alternative 3 – Southbound Road Diet scenario is expected to see the lowest average and minimum delays and perform the best overall when it comes to the driveways, Susi Lane and Eagle Road. The No-build with Roundabout scenario is expected to see the second lowest delays, while the No-build with Roundabout and Metering option is expected to see an increase in delay compared to the No-build scenario. Alternative 1 and Alternative 2 scenarios – both Northbound Road Diet options – are expected to see substantial delay increases.
- During the p.m. peak hour, the same results as in the a.m. peak hour can be seen – Alternative 3 scenario is expected to see the lowest average and minimum delays and perform the best overall for the driveways, Susi Lane and Eagle Road, with the No-build with Roundabout seeing the second lowest delays. The No-build with Roundabout and Metering scenario is expected to see lower delays than the No-build scenario but slightly worse than the No-build with Roundabout scenario. Alternative 1 and Alternative 2 scenarios are still expected so see substantial delay increases.

While Alternative 3 is expected to see a decrease in delays for the driveways and side streets immediately to the north of the Route 28 at Chickatawbut Road proposed roundabout, when compared to the No-build and all other scenarios studied, as can be seen in the August 2024 memorandum, Alternative 3 is also expected to create heavy congestion on Route 28 southbound, especially in the p.m. peak hour, which may cause vehicles to reroute and use local streets, like Route 138, Unquity Road, Reedsdale Road, and Pleasant Street to avoid this congestion.

The next two scenarios that provide a decrease in driveway and side street delay are the No-build with Roundabout and No-build with Roundabout and Metering. The No-build with Roundabout scenario provides slightly larger decrease in delay, meaning that providing metering signals at the roundabout is not expected to provide a larger benefit than the roundabout with the PHBs, making the No-build with Roundabout scenario the preferable scenario to improve driveway and side street delay.

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# Appendix B

## Traffic Data, VISSIM Calibration, and Analysis Results

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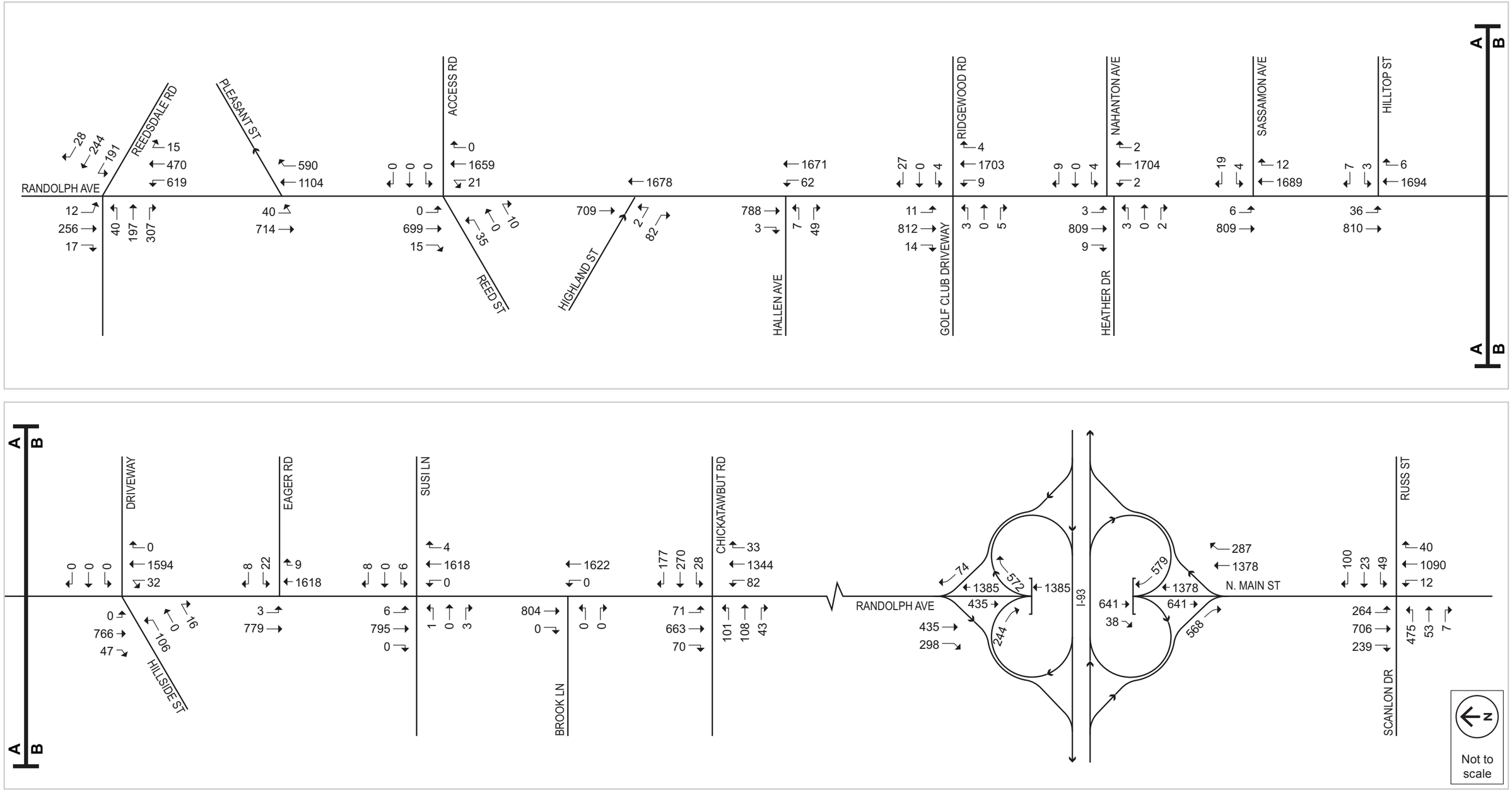
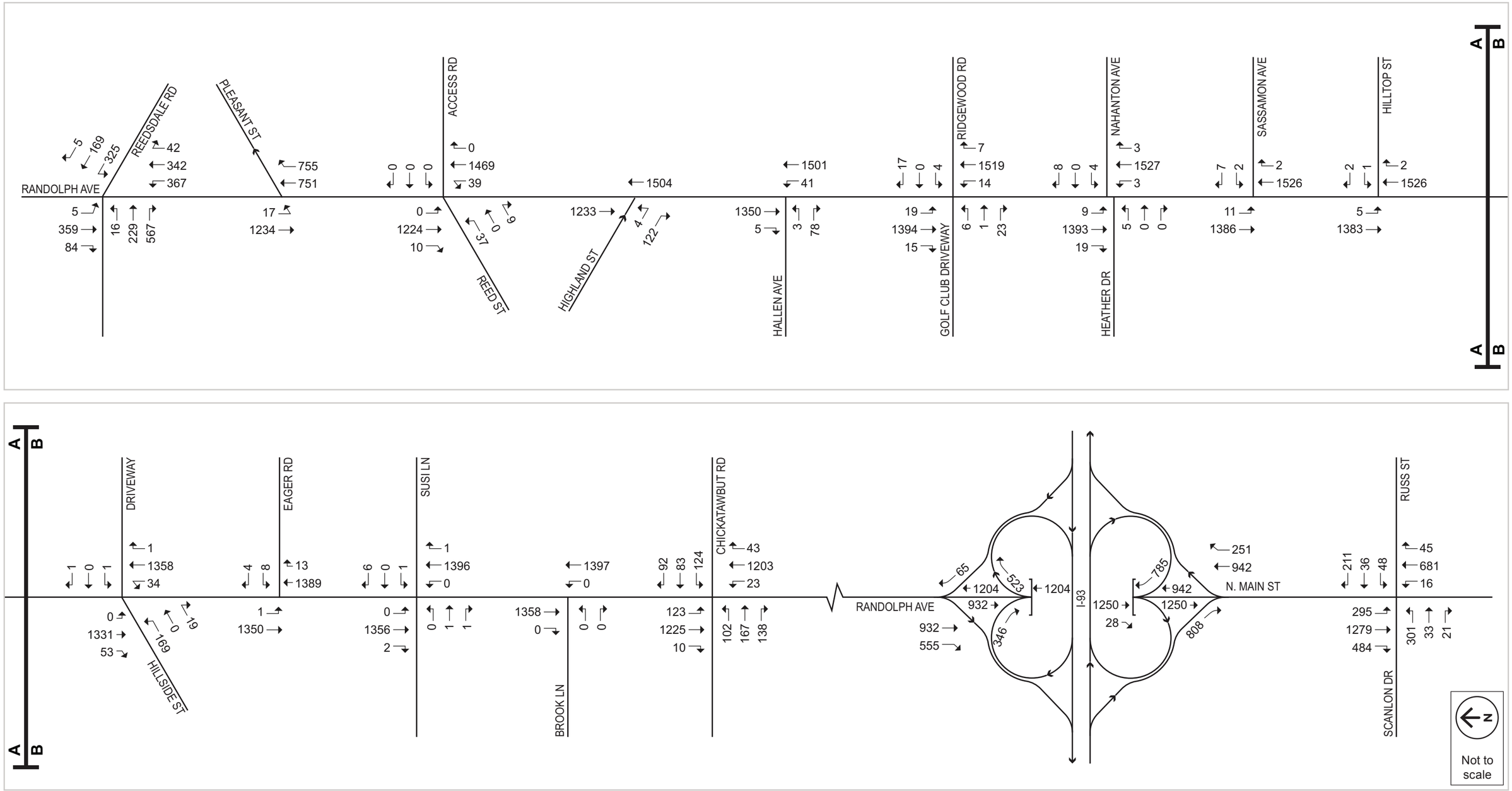
# Existing (2023) a.m. and p.m. Vehicle, Pedestrian, and Bicycle Volumes

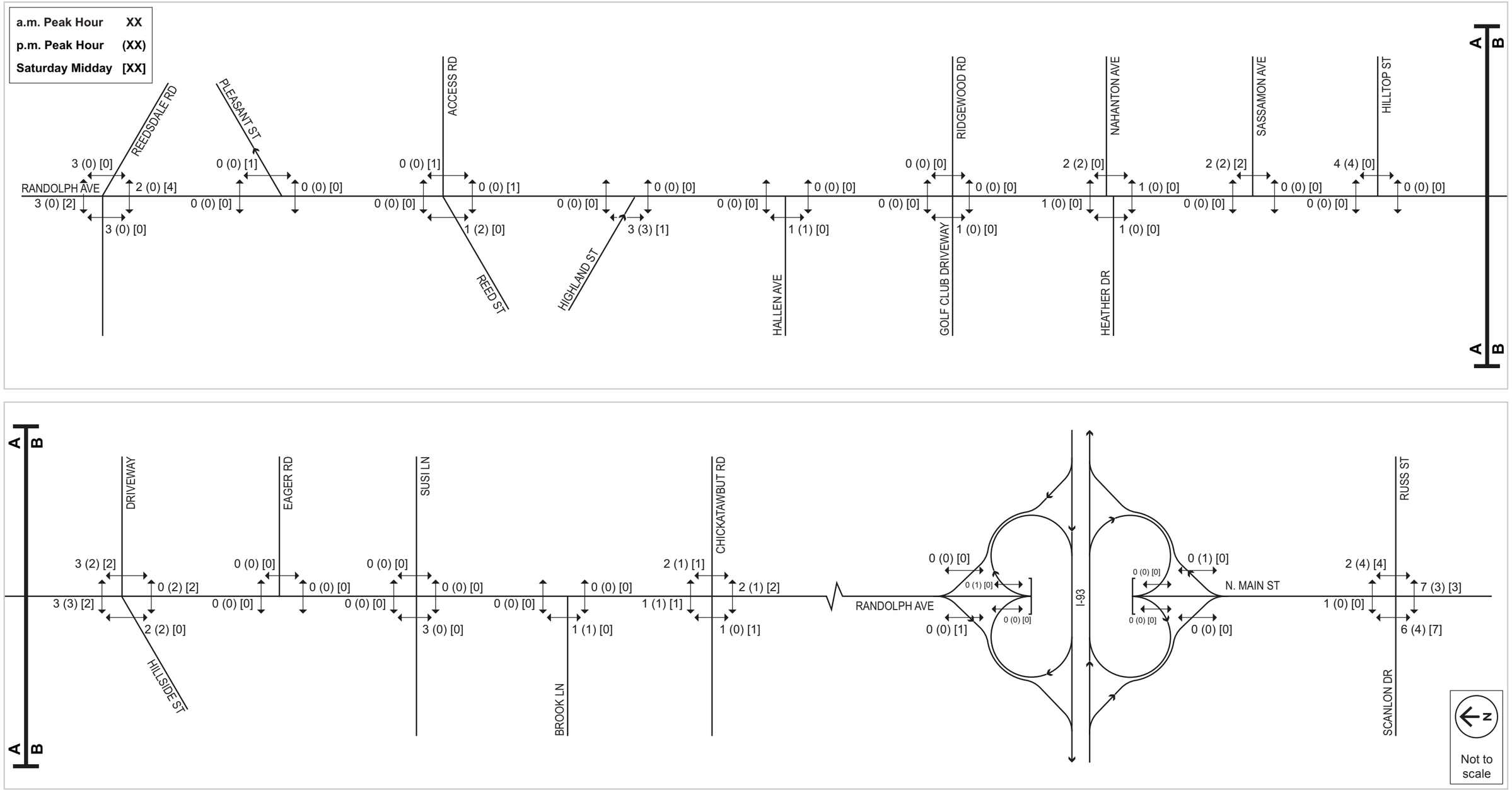
Appendix C. ***Existing (2023) Condition Vehicle Volumes, Weekday a.m. Peak Hour***



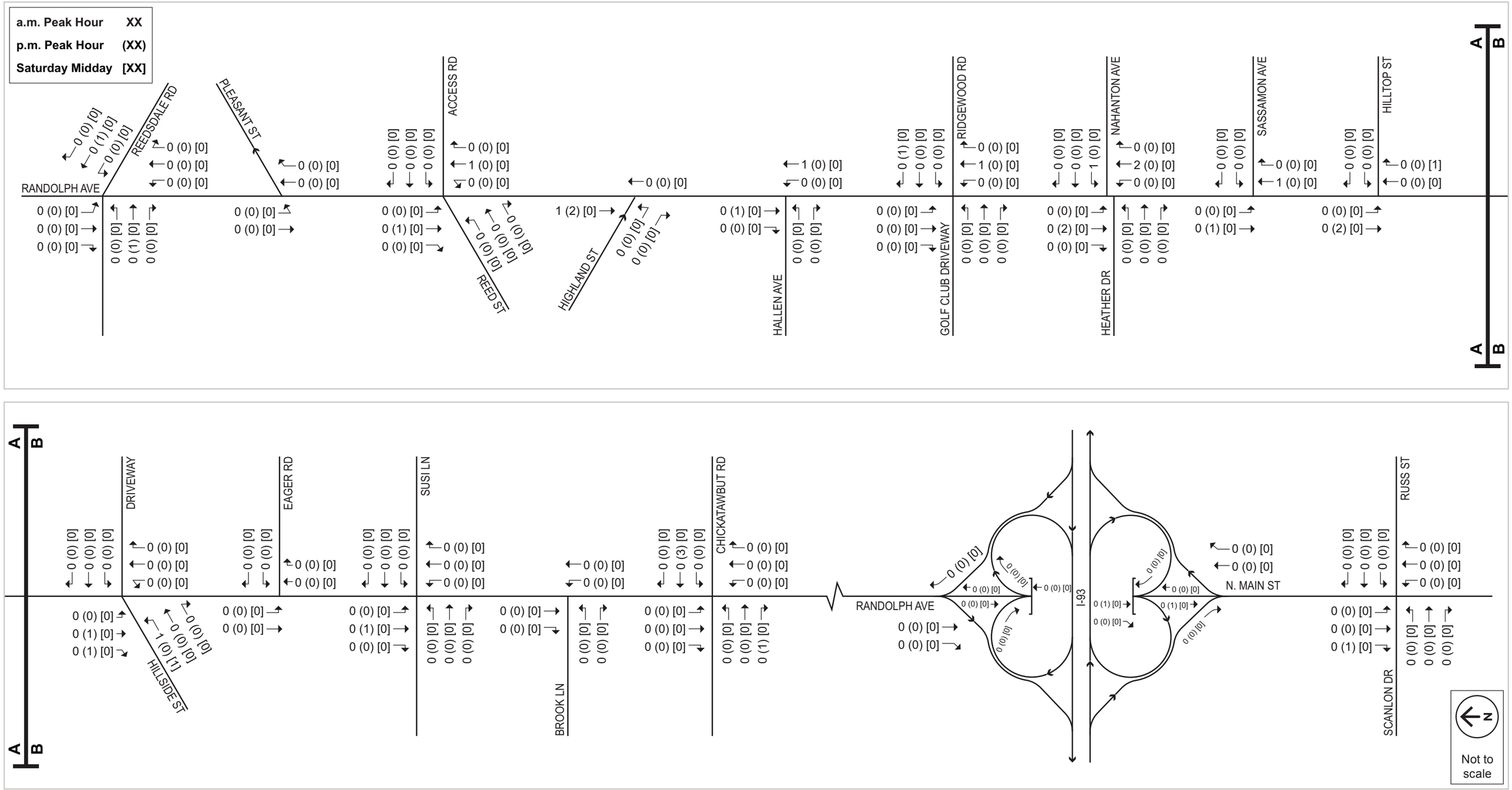
Appendix C. ***Existing (2023) Condition Vehicle Volumes, Weekday p.m. Peak Hour***



Appendix C. ***Existing (2023) Condition Pedestrian Volumes, Weekday a.m. and p.m. Peak Hours***



Appendix C. ***Existing (2023) Condition Bicycle Volumes, Weekday a.m. and p.m. Peak Hours***



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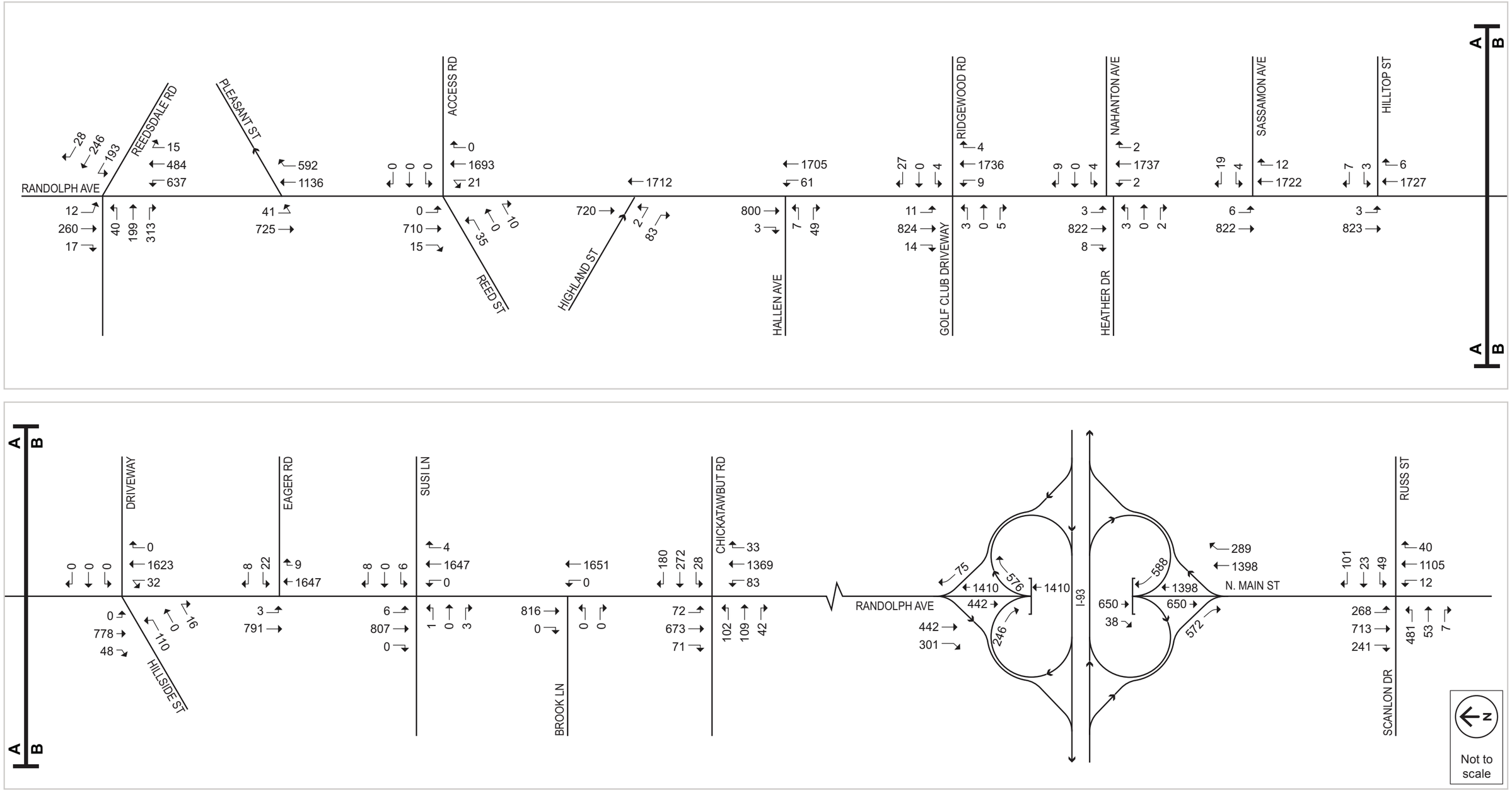
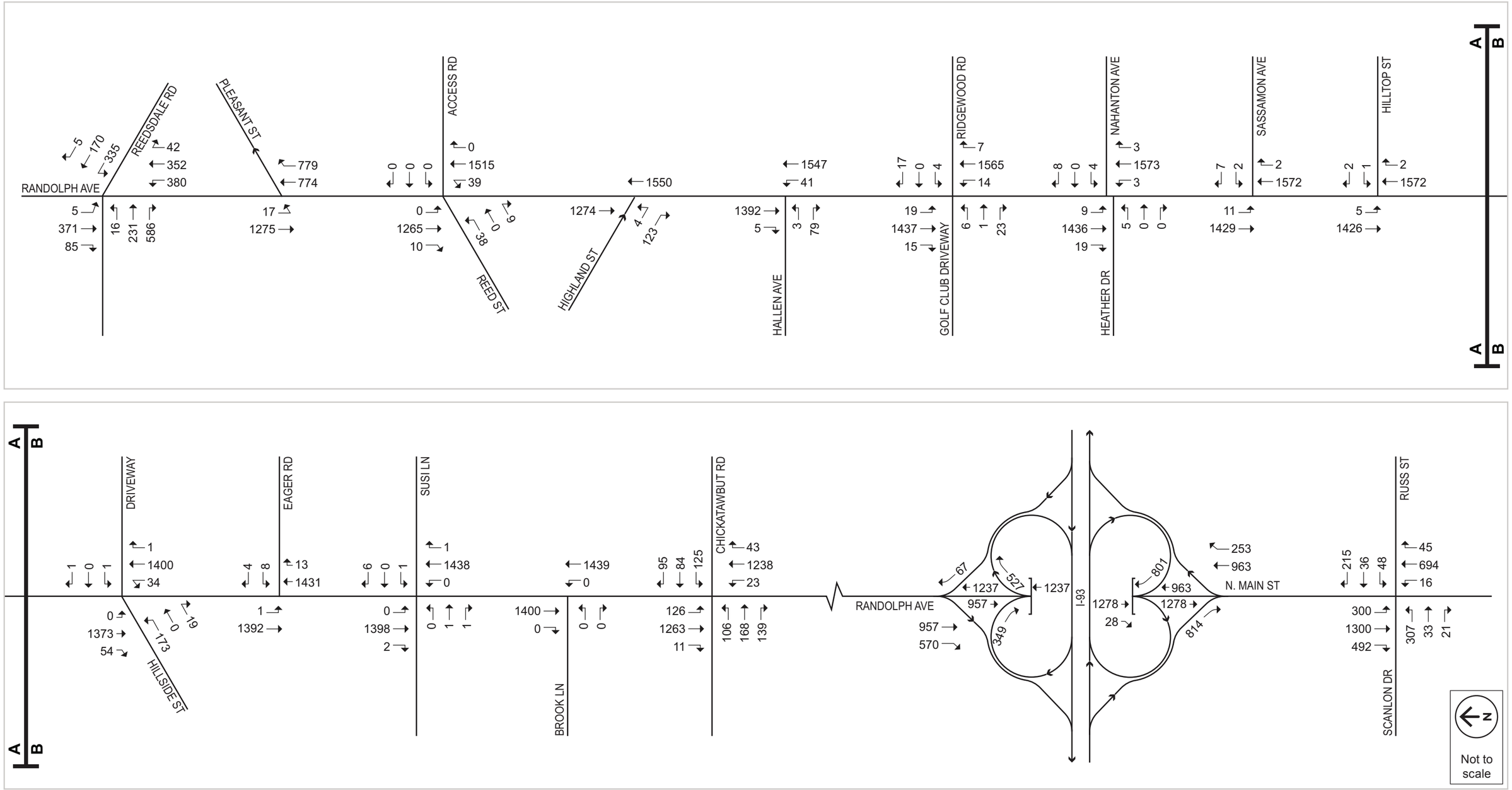
# Future (2034) a.m. and p.m. Vehicle Volumes

Appendix C. ***Future (2034) Condition Vehicle Volumes, Weekday a.m. Peak Hour***



Appendix C. ***Future (2034) Condition Vehicle Volumes, Weekday p.m. Peak Hour***



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# VISSIM Model Calibration Notes

## VISSIM PARAMETER CALIBRATIONS

| Parameter | Required Calibration |
|---|---|
| **Existing and No-build Models** | |
| **Driver Behavior** | ■ Created a duplicate Urban Behavior where the following things changed:<br>– Changed Time before Diffusion from the default 60 seconds (sec) to 120 sec;<br>– Checked on Advanced Merging;<br>– Checked on Cooperative Lane Change;<br>■ Created an aggressive merging behavior for links and connectors on Route 28 Northbound (NB) at and north of the I-93 Southbound (SB) off-ramp to Route 28 NB. |
| **Connector Lane Change** | Changed lane change distance and emergency stop distance as described below:<br>■ Route 28 at Chickatawbut Rd:<br>– SB Left Emergency Stop distance from the default 16.4 ft to 50 ft;<br>– SB Left Lane change distance from the default 656.2 ft to 700 ft;<br>■ Rte 28 at hillside<br>– NB Left Emergency stop distance to 100 ft;<br>– NB Left Lane change distance to 1000 ft;<br>■ Rte 28 at Reedsdale<br>– NB Left, Thru, and Right Emergency stop distance to 50 ft;<br>– NB Left, Thru, and Right Lane change distance to 1000 ft;<br>– Eastbound (EB) Thru Emergency stop distance to 50 ft;<br>– Westbound (WB) Left Emergency stop distance to 50 ft; |
| **Routing Decision** | Placed Routing Decision point for Route 28 SB at Chickatawbut Road just south of Susi Lane, to achieve field-like conditions of travel and queueing. |
| **Desired Speed Decision** | ■ Rte 28 at Pleasant St, South of Reedsdale Rd:<br>– Introduced a slower speed decision that starts at 900 sec to create the backup seen in the a.m. peak hour field observations;<br>– Adjusted that slower speed decision from 3-8mph to 4-10mph to not cause a longer NB queue than observed (observations showed it didn't go past Highland St, 3-8mph had it going past Hallen Ave);<br>■ Route 28 NB, North of I-93 SB Off-ramp:<br>– Added two desired speed decisions on Rte 28 NB, one right after the merge with I-93 SB off-ramp to slow them down, and in the narrow single |

| Parameter | Required Calibration |
|---|---|
| | lane section to get vehicles back up to the speeds experienced out in the field;<br>■ Chickatawbut Rd WB – while measured 50%-ile speed was 18 miles per hour (mph), the average speed in the model was adjusted to 19.5 mph, as vehicles in the model were going too slow under uncongested conditions. |
| **Conflict Areas** | ■ I-93 NB Off-Ramp to Rte 28 NB<br>– Changed the Merge Conflict area front and rear gap from 0.5 to 3<br>– Changed the VisibLink2 value from 328.1 to 550<br>■ Changed I-93 SB off-ramp merge conflict area with Rte 28 NB parameters:<br>– Front and Rear gap to 0.2;<br>– Safety Distance to 1.0;<br>■ Changed the merge area to 3 lanes to have it act like it does today.<br>■ Route 28 at Chickatawbut Rd:<br>– For EB Left and WB Left conflicts between them and the conflicting throughs, used a Priority rule instead of conflict area, with 1 sec Min Gap, to better match model operations with field observations. |
| **Special Setups** | ■ Field observations at Route 28 and Chickatawbut Rd found that the majority of thru vehicles used the outside lane to continue thru the intersection, to avoid the vehicles stopping to make a left-turn to Chickatawbut Rd WB. This was modeled by drawing a short connector in the Route 28 NB link, and routing 70% of the a.m. peak vehicles thru it, and 60% of the p.m. peak vehicles, to match observations. |
| **Alternative 1 thru 3 Models** | |
| **General** | Almost all the modifications mentioned above remained for the alternatives, except for:<br>■ The special connector for Route 28 NB thru at Chickatawbut Rd, as that intersection will be a roundabout in the future;<br>■ The priority rules for the EB and WB lefts at Route 28 NB and Chickatawbut Rd; and<br>■ The two desired speed decisions on Route 28 NB, north of the I-93 SB off-ramp and south of Chickatawbut Rd. |

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# VISSIM Roundabout Capacity Calibration Notes

The tables that follow show the data and formulas used to determine the appropriate driver behavior and gap acceptance for each leg of the Route 28 at Chickatawbut Road roundabout for the VISSIM model roundabout capacity to match the calculated roundabout capacity, using the HCM 7 formulas mentioned below.

It should be noted that for some legs and circulating volume variations the 10% capacity threshold mentioned in the MassDOT guide for roundabout calibration in VISSIM could not be achieved, however, the capacity is very close to 10% and much better than what the default VISSIM behavior and gap acceptance was providing that those instances of not meeting the 10% capacity threshold were deemed acceptable and the set of behavior and gap acceptance parameter values were used for the calibrated roundabout in all VISSIM models for this study.

**A.M.**

| *Route 28 NB Approach Capacity* | *Counts* [1] | *Original VISSIM* [2] | *Alt #1* [3] | *Alt #2* [4] | *Alt #3* [5] |
|---|---|---|---|---|---|
| HCM 6 Formula[a] | 1098 | 1098 | 1081 | 1086 | 1080 |
| Default VISSIM Behavior[b] | - | 708 | 619 | 560 | 526 |
| % Difference | - | 35% | 43% | 48% | 51% |
| Behavior Adjust #1[c] | - | 723 | 645 | 584 | 552 |
| % Difference | - | 34% | 40% | 46% | 49% |
| Behavior Adjust #2[d] | - | 773 | 662 | 616 | 562 |
| % Difference | - | 30% | 39% | 43% | 48% |
| Behavior Adjust #3[e] | - | 814 | 698 | 646 | 587 |
| % Difference | - | 26% | 35% | 41% | 46% |
| Behavior+Conflict Adjust #1[f] | - | 965 | 902 | 780 | 694 |
| % Difference | - | 12% | 17% | 28% | 36% |
| Behavior+Conflict Adjust #2[g] | - | 1101 | 994 | 896 | 794 |
| % Difference | - | 0% | 8% | 17% | 27% |
| Behavior+Conflict Adjust #3[h] | - | 1106 | 1079 | 996 | 899 |
| % Difference | - | -1% | 0% | 8% | 17% |
| Behavior+Conflict Adjust #3[h] | - | 1054 | 1017 | 1050 | 1025 |
| % Difference | - | 4% | 6% | 3% | 5% |

| *Route 28 SB Approach Capacity* | *Counts* [1] | *Original VISSIM* [2] | *Alt #1* [3] | *Alt #2* [4] | *Alt #3* [5] |
|---|---|---|---|---|---|
| HCM 6 Formula[a] | 1002 | 1002 | 968 | 976 | 967 |
| Default VISSIM Behavior[b] | - | 894 | 832 | 787 | 747 |
| % Difference | - | 11% | 14% | 19% | 23% |
| Behavior Adjust #1[c] | - | 948 | 892 | 860 | 818 |
| % Difference | - | 5% | 8% | 12% | 15% |
| Behavior Adjust #2[d] | - | 996 | 949 | 909 | 858 |
| % Difference | - | 1% | 2% | 7% | 11% |
| Behavior Adjust #3[e] | - | 1009 | 973 | 957 | 917 |
| % Difference | - | -1% | -1% | 2% | 5% |
| Behavior+Conflict Adjust #1[f] | - | 958 | 1087 | 1038 | 957 |
| % Difference | - | 4% | -12% | -6% | 1% |
| Behavior+Conflict Adjust #2[g] | - | 1103 | 1113 | 1088 | 1003 |
| % Difference | - | -10% | -15% | -11% | -4% |
| Behavior+Conflict Adjust #3[h] | - | 1426 | 1150 | 1115 | 1013 |
| % Difference | - | -42% | -19% | -14% | -5% |
| Behavior+Conflict Adjust #3[h] | - | 903 | 863 | 891 | 885 |
| % Difference | - | 10% | 11% | 9% | 9% |

| *Chickatawbut EB Approach Capacity* | *Counts* [1] | *Original VISSIM* [2] | *Alt #1* [3] | *Alt #2* [4] | *Alt #3* [5] |
|---|---|---|---|---|---|
| HCM 6 Formula[a] | 736 | 736 | 731 | 741 | 743 |
| Default VISSIM Behavior[b] | - | 234 | 262 | 292 | 315 |
| % Difference | - | 68% | 64% | 61% | 58% |
| Behavior Adjust #1[c] | - | 243 | 257 | 289 | 302 |
| % Difference | - | 67% | 65% | 61% | 59% |
| Behavior Adjust #2[d] | - | 239 | 264 | 280 | 303 |
| % Difference | - | 68% | 64% | 62% | 59% |
| Behavior Adjust #3[e] | - | 227 | 260 | 272 | 293 |
| % Difference | - | 69% | 64% | 63% | 61% |
| Behavior+Conflict Adjust #1[f] | - | 120 | 276 | 395 | 447 |
| % Difference | - | 84% | 62% | 47% | 40% |
| Behavior+Conflict Adjust #2[g] | - | 148 | 293 | 426 | 505 |
| % Difference | - | 80% | 60% | 43% | 32% |
| Behavior+Conflict Adjust #3[h] | - | 269 | 272 | 431 | 527 |
| % Difference | - | 63% | 63% | 42% | 29% |
| Behavior+Conflict Adjust #3[h] | - | 670 | 651 | 656 | 674 |
| % Difference | - | 9% | 11% | 12% | 9% |

| *Chickatawbut WB Approach Capacity* | *Counts* [1] | *Original VISSIM* [2] | *Alt #1* [3] | *Alt #2* [4] | *Alt #3* [5] |
|---|---|---|---|---|---|
| HCM 6 Formula[a] | 379 | 379 | 377 | 386 | 390 |
| Default VISSIM Behavior[b] | - | 267 | 315 | 354 | 373 |
| % Difference | - | 30% | 16% | 8% | 4% |
| Behavior Adjust #1[c] | - | 267 | 330 | 350 | 376 |
| % Difference | - | 30% | 12% | 9% | 4% |
| Behavior Adjust #2[d] | - | 267 | 332 | 353 | 377 |
| % Difference | - | 30% | 12% | 9% | 3% |
| Behavior Adjust #3[e] | - | 270 | 329 | 344 | 366 |
| % Difference | - | 29% | 13% | 11% | 6% |
| Behavior+Conflict Adjust #1[f] | - | 232 | 414 | 528 | 607 |
| % Difference | - | 39% | -10% | -37% | -56% |
| Behavior+Conflict Adjust #2[g] | - | 282 | 429 | 536 | 628 |
| % Difference | - | 26% | -14% | -39% | -61% |
| Behavior+Conflict Adjust #3[h] | - | 350 | 409 | 517 | 606 |
| % Difference | - | 8% | -9% | -34% | -55% |
| Behavior+Conflict Adjust #3[h] | - | 341 | 355 | 346 | 371 |
| % Difference | - | 10% | 6% | 10% | 5% |

1 - Using the counts and no modifications (see Table 4)
2 - Using Default VISSIM settings
3 - See Table 1 for volume changes
4 - See Table 1 for volume changes
5 - See Table 1 for volume changes

a - see HCM Formula in Table 2
b thru h- See Table 3

**TABLE 1 - Circulating Volume Variation**

| | Orig (vol) | Orig (%) | Mod #1 (vol) | Mod #1 | Mod #2 (vol) | Mod #2 | Mod #3 (vol) | Mod #3 |
|---|---|---|---|---|---|---|---|---|
| Rte 28 NB L | 83 | 6% | 119 | 8% | 119 | 8% | 134 | 9% |
| Rte 28 NB T | 1369 | 92% | 1337 | 90% | 1307 | 88% | 1277 | 86% |
| Rte 28 NB R | 33 | 2% | 30 | 2% | 59 | 4% | 74 | 5% |
| Chicka WB L | 28 | 6% | 38 | 8% | 38 | 8% | 43 | 9% |
| Chicka WB T | 272 | 57% | 264 | 55% | 254 | 53% | 245 | 51% |
| Chicka WB R | 180 | 38% | 182 | 38% | 192 | 40% | 197 | 41% |
| Rte 28 SB L | 72 | 9% | 90 | 11% | 90 | 11% | 98 | 12% |
| Rte 28 SB T | 673 | 82% | 653 | 80% | 636 | 78% | 620 | 76% |
| Rte 28 SB R | 71 | 9% | 73 | 9% | 90 | 11% | 98 | 12% |
| Chicka EB L | 102 | 40% | 106 | 42% | 106 | 42% | 109 | 43% |
| Chicka EB T | 109 | 43% | 104 | 41% | 99 | 39% | 94 | 37% |
| Chicka EB R | 42 | 17% | 43 | 17% | 48 | 19% | 51 | 20% |

**TABLE 2 - HCM 7 formulas for Approach capacity**

Two-Lane Entry Conflicted by One Circulating Lane

Eq 22-2 $c_{e,pce} = 1{,}420e^{(-0.91\times10^{-3})v_{c,pce}}$

One-Lane Entry Conflicted by Two Circulating Lanes

Eq 22-3 $c_{e,pce} = 1{,}420e^{(-0.85\times10^{-3})v_{c,pce}}$

Where $c_{e,pce}$ Capacity of each entry lane in passenger car equivalent/hour

$v_{c,pce}$ Conflicting volume in circulating lane in passenger car equivalent/hour

**TABLE 3 - VISSIM Driver Behavior settings by Alternative**

| | Avg. Standstill Dist | Additive Part of Safety Distance | Multiplicative Part of Safety Distance | Anticipate Routing | Safety Distance | Front Gap | Rear Gap | |
|---|---|---|---|---|---|---|---|---|
| Default VISSIM | 6.56 | 2 | 3 | 0% | 1.5 | 0.5 | 0.5 | All Legs |
| Behavior Adjust #1 | 3.28 | 1 | 2 | 0% | 1.5 | 0.5 | 0.5 | All Legs |
| Behavior Adjust #2 | 1.64 | 0.5 | 1 | 0% | 1.5 | 0.5 | 0.5 | All Legs |
| Behavior Adjust #3 | 0.82 | 0.15 | 0.15 | 0% | 1.5 | 0.5 | 0.5 | All Legs |
| Behavior+Conflict Adjust #1 | 0.82 | 0.15 | 0.15 | 100% | 1 | 0.3 | 0.3 | All Legs |
| Behavior+Conflict Adjust #2 | 0.82 | 0.15 | 0.15 | 100% | 0.5 | 0.1 | 0.1 | All Legs |
| Behavior+Conflict Adjust #3 | 0.82 | 0.15 | 0.15 | 100% | 0.2 | 0.1 | 0.1 | All Legs |
| Behavior+Conflict Adjust #3 -A | 0.82 | 0.15 | 0.15 | 100% | 0.2 | 0.1 | 0.1 | Rte 28 NB |
| | | | | 100% | 0.1 | 0.1 | 0.1 | Chickatawbut WB & EB |
| | | | | 0% | 1.8 | 1 | 1 | Rte 28 SB |

**TABLE 4 - Volumes from Counts**

| | AM |
|---|---|
| Route 28 NB Entering | 1485 |
| RBT EB Circulating | 283 |
| Chicka WB Entering | 480 |
| RBT NB Circulating | 1554 |
| Route 28 SB Entering | 816 |
| RBT WB Circulating | 383 |
| Chicka EB Entering | 253 |
| RBT SB Circulating | 773 |

**P.M.**

| ***Route 28 NB Approach Capacity*** | *Counts* [1] | *Original VISSIM* [2] | *Mod #1* [3] | *Mod #2* [4] | *Mod #3* [5] |
|---|---|---|---|---|---|
| HCM 6 Formula [a] | 987 | 987 | 960 | 982 | 973 |
| Default VISSIM Behavior [b] | - | 846 | 635 | 611 | 547 |
| % Difference | - | 14% | 34% | 38% | 44% |
| Behavior Adjust #1 [c] | - | 857 | 658 | 645 | 574 |
| % Difference | - | 13% | 31% | 34% | 41% |
| Behavior Adjust #2 [d] | - | 868 | 682 | 670 | 601 |
| % Difference | - | 12% | 29% | 32% | 38% |
| Behavior Adjust #3 [e] | - | 899 | 718 | 701 | 606 |
| % Difference | - | 9% | 25% | 29% | 38% |
| Behavior+Conflict Adjust #1 [f] | - | 1102 | 932 | 792 | 706 |
| % Difference | - | -12% | 3% | 19% | 27% |
| Behavior+Conflict Adjust #2 [g] | - | 1142 | 1022 | 909 | 826 |
| % Difference | - | -16% | -6% | 7% | 15% |
| Behavior+Conflict Adjust #3 [h] | - | 1182 | 1106 | 1009 | 922 |
| % Difference | - | -20% | -15% | -3% | 5% |
| Behavior+Conflict Adjust #3 [h] | - | 981 | 945 | 951 | 937 |
| % Difference | - | 1% | 2% | 3% | 4% |

| ***Route 28 SB Approach Capacity*** | *Counts* [1] | *Original VISSIM* [2] | *Alt #1* [3] | *Alt #2* [4] | *Alt #3* [5] |
|---|---|---|---|---|---|
| HCM 6 Formula [a] | 1150 | 1150 | 1119 | 1125 | 1115 |
| Default VISSIM Behavior [b] | - | 908 | 843 | 714 | 670 |
| % Difference | - | 21% | 25% | 37% | 40% |
| Behavior Adjust #1 [c] | - | 942 | 903 | 761 | 710 |
| % Difference | - | 18% | 19% | 32% | 36% |
| Behavior Adjust #2 [d] | - | 1003 | 949 | 810 | 753 |
| % Difference | - | 13% | 15% | 28% | 32% |
| Behavior Adjust #3 [e] | - | 1047 | 998 | 838 | 922 |
| % Difference | - | 9% | 11% | 26% | 17% |
| Behavior+Conflict Adjust #1 [f] | - | 1465 | 1109 | 1056 | 952 |
| % Difference | - | -27% | 1% | 6% | 15% |
| Behavior+Conflict Adjust #2 [g] | - | 1456 | 1131 | 1103 | 997 |
| % Difference | - | -27% | -1% | 2% | 11% |
| Behavior+Conflict Adjust #3 [h] | - | 1461 | 1151 | 1136 | 1029 |
| % Difference | - | -27% | -3% | -1% | 8% |
| Behavior+Conflict Adjust #3 [h] | - | 1057 | 985 | 989 | 962 |
| % Difference | - | 8% | 12% | 12% | 14% |

| ***Chickatawbut EB Approach Capacity*** | *Counts* [1] | *Original VISSIM* [2] | *Alt #1* [3] | *Alt #2* [4] | *Alt #3* [5] |
|---|---|---|---|---|---|
| HCM 6 Formula [a] | 394 | 394 | 398 | 409 | 416 |
| Default VISSIM Behavior [b] | - | 163 | 269 | 470 | 504 |
| % Difference | - | 59% | 32% | -15% | -21% |
| Behavior Adjust #1 [c] | - | 182 | 268 | 479 | 512 |
| % Difference | - | 54% | 33% | -17% | -23% |
| Behavior Adjust #2 [d] | - | 189 | 270 | 482 | 511 |
| % Difference | - | 52% | 32% | -18% | -23% |
| Behavior Adjust #3 [e] | - | 186 | 266 | 476 | 290 |
| % Difference | - | 53% | 33% | -16% | 30% |
| Behavior+Conflict Adjust #1 [f] | - | 133 | 267 | 402 | 467 |
| % Difference | - | 66% | 33% | 2% | -12% |
| Behavior+Conflict Adjust #2 [g] | - | 145 | 293 | 435 | 515 |
| % Difference | - | 63% | 26% | -6% | -24% |
| Behavior+Conflict Adjust #3 [h] | - | 145 | 269 | 431 | 523 |
| % Difference | - | 63% | 32% | -5% | -26% |
| Behavior+Conflict Adjust #3 [h] | - | 361 | 398 | 420 | 448 |
| % Difference | - | 8% | 0% | -3% | -8% |

| ***Chickatawbut WB Approach Capacity*** | *Counts* [1] | *Original VISSIM* [2] | *Alt #1* [3] | *Alt #2* [4] | *Alt #3* [5] |
|---|---|---|---|---|---|
| HCM 6 Formula [a] | 447 | 447 | 442 | 458 | 461 |
| Default VISSIM Behavior [b] | - | 218 | 306 | 435 | 504 |
| % Difference | - | 51% | 31% | 5% | -9% |
| Behavior Adjust #1 [c] | - | 232 | 312 | 444 | 514 |
| % Difference | - | 48% | 29% | 3% | -11% |
| Behavior Adjust #2 [d] | - | 244 | 318 | 446 | 530 |
| % Difference | - | 45% | 28% | 3% | -15% |
| Behavior Adjust #3 [e] | - | 244 | 315 | 454 | 359 |
| % Difference | - | 45% | 29% | 1% | 22% |
| Behavior+Conflict Adjust #1 [f] | - | 309 | 397 | 526 | 606 |
| % Difference | - | 31% | 10% | -15% | -31% |
| Behavior+Conflict Adjust #2 [g] | - | 328 | 418 | 530 | 615 |
| % Difference | - | 27% | 5% | -16% | -33% |
| Behavior+Conflict Adjust #3 [h] | - | 318 | 384 | 512 | 592 |
| % Difference | - | 29% | 13% | -12% | -28% |
| Behavior+Conflict Adjust #3 [h] | - | 417 | 435 | 453 | 473 |
| % Difference | - | 7% | 2% | 1% | -3% |

1 - Using the counts and no modifications (see Table 4)
2 - Using Default VISSIM settings
3 - See Table 1 for volume changes
4 - See Table 1 for volume changes
5 - See Table 1 for volume changes

a - see HCM Formula in Table 2
b thru h- See Table 3

**TABLE 1 - Circulating Volume Variation**

| | Orig (vol) | Orig (%) | Mod #1 (vol) | Mod #1 | Mod #2 (vol) | Mod #2 | Mod #3 (vol) | Mod #3 |
|---|---|---|---|---|---|---|---|---|
| Rte 28 NB L | 23 | 2% | 52 | 4% | 52 | 4% | 65 | 5% |
| Rte 28 NB T | 1231 | 95% | 1206 | 93% | 1180 | 91% | 1154 | 89% |
| Rte 28 NB R | 43 | 3% | 39 | 3% | 65 | 5% | 78 | 6% |
| Chicka WB L | 125 | 41% | 119 | 39% | 112 | 37% | 106 | 35% |
| Chicka WB T | 84 | 28% | 91 | 30% | 91 | 30% | 94 | 31% |
| Chicka WB R | 95 | 31% | 94 | 31% | 100 | 33% | 103 | 34% |
| Rte 28 SB L | 126 | 9% | 153 | 11% | 153 | 11% | 167 | 12% |
| Rte 28 SB T | 1256 | 90% | 1226 | 88% | 1198 | 86% | 1170 | 84% |
| Rte 28 SB R | 11 | 1% | 14 | 1% | 42 | 3% | 56 | 4% |
| Chicka EB L | 106 | 26% | 116 | 28% | 99 | 24% | 103 | 25% |
| Chicka EB T | 168 | 41% | 161 | 39% | 153 | 37% | 145 | 35% |
| Chicka EB R | 139 | 34% | 140 | 34% | 149 | 36% | 153 | 37% |

**TABLE 2 - HCM 7 formulas for Approach capacity**

Two-Lane Entry Conflicted by One Circulating Lane

Eq 22-2 $c_{e,pce} = 1{,}420e^{(-0.91\times10^{-3})v_{c,pce}}$

One-Lane Entry Conflicted by Two Circulating Lanes

Eq 22-3 $c_{e,pce} = 1{,}420e^{(-0.85\times10^{-3})v_{c,pce}}$

| | | |
|---|---|---|
| Where | $c_{e,pce}$ | Capacity of each entry lane in passenger car equivalent/hour |
| | $v_{c,pce}$ | Conflicting volume in circulating lane in passenger car equivalent/hour |

**TABLE 3 - VISSIM Driver Behavior settings by Alternative**

| | Avg. Standstill Dist | Additive Part of Safety Distance | Multiplicative Part of Safety Distance | Anticipate Routing | Safety Distance | Front Gap | Rear Gap | |
|---|---|---|---|---|---|---|---|---|
| Default VISSIM | 6.56 | 2 | 3 | 0% | 1.5 | 0.5 | 0.5 | |
| Behavior Adjust #1 | 3.28 | 1 | 2 | 0% | 1.5 | 0.5 | 0.5 | |
| Behavior Adjust #2 | 1.64 | 0.5 | 1 | 0% | 1.5 | 0.5 | 0.5 | |
| Behavior Adjust #3 | 0.82 | 0.15 | 0.15 | 0% | 1.5 | 0.5 | 0.5 | |
| Behavior+Conflict Adjust #1 | 0.82 | 0.15 | 0.15 | 100% | 1 | 0.3 | 0.3 | |
| Behavior+Conflict Adjust #2 | 0.82 | 0.15 | 0.15 | 100% | 0.5 | 0.1 | 0.1 | |
| Behavior+Conflict Adjust #3 | 0.82 | 0.15 | 0.15 | 100% | 0.2 | 0.1 | 0.1 | |
| Behavior+Conflict Adjust #3 -A | 1 | 0.15 | 0.23 | 100% | 1.4 | 0.5 | 0.5 | Rte 28 NB |
| | | | | 100% | 0.4 | 0.2 | 0.2 | Chickatawbut WB |
| | | | | 0% | 0.9 | 0.5 | 0.5 | Rte 28 SB |
| | | | | 100% | 0.1 | 0.1 | 0.1 | Chickatawbut EB |

**TABLE 4 - Volumes from Counts**

| | PM |
|---|---|
| Route 28 NB Entering | 1297 |
| RBT EB Circulating | 400 |
| Chicka WB Entering | 304 |
| RBT NB Circulating | 1360 |
| Route 28 SB Entering | 1393 |
| RBT WB Circulating | 232 |
| Chicka EB Entering | 413 |
| RBT SB Circulating | 1507 |

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# Existing Travel Time and Vehicle Hours of Delay

## TRAVEL TIMES AND VEHICLE HOURS OF DELAY – EXISTING (2023) CONDITIONS

| Segment | Volume (vehicles) | Travel Time (min) | Vehicle-Hours Traveled |
|---|---|---|---|
| **a.m. peak Hour** | | | |
| Route 28 Northbound – North of Scanlon Drive to South of Reedsdale Road | 346 | 16.7 | 96.1 |
| Route 28 Northbound – North of Scanlon Road to North of Chickatawbut Road | 655 | 9.4 | 102.4 |
| Route 28 Northbound –North of Chickatawbut Road to South of Reedsdale Road | 757 | 7.6 | 95.7 |
| Route 28 Southbound – South of Reedsdale Road to North of Scanlon Drive | 273 | 6.3 | 28.5 |
| Route 28 Southbound – South of Reedsdale Road to North of Chickatawbut Road | 400 | 2.7 | 18.2 |
| Route 28 Southbound – North of Chickatawbut Road to North of Scanlon Drive | 513 | 3.5 | 29.8 |
| **p.m. peak Hour** | | | |
| Route 28 Northbound – North of Scanlon Drive to South of Reedsdale Road | 162 | 10.4 | 27.9 |
| Route 28 Northbound – North of Scanlon Road to North of Chickatawbut Road | 360 | 7.6 | 45.6 |
| Route 28 Northbound –North of Chickatawbut Road to South of Reedsdale Road | 570 | 3.0 | 28.4 |
| Route 28 Southbound – South of Reedsdale Road to North of Scanlon Drive | 545 | 8.6 | 78.5 |
| Route 28 Southbound – South of Reedsdale Road to North of Chickatawbut Road | 827 | 3.5 | 48.3 |
| Route 28 Southbound – North of Chickatawbut Road to North of Scanlon Drive | 913 | 5.3 | 80.7 |

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# No-build and Alternatives Travel Time and Vehicle Hours of Delay

## TRAVEL TIMES AND VEHICLE HOURS OF DELAY COMPARISON – NO-BUILD (2033) CONDITIONS VS. ALTERNATIVES

| Segment | Volume (veh) | Travel Time (min) | Vehicle-Hours Traveled | Vehicle-Hours of delay | Travel Time (min) | Vehicle-Hours Traveled | Vehicle-Hours of delay | Travel Time (min) | Vehicle-Hours Traveled | Vehicle-Hours of delay | Travel Time (min) | Vehicle-Hours Traveled | Vehicle-Hours of delay | Travel Time (min) | Vehicle-Hours Traveled | Vehicle-Hours of delay | Travel Time (min) | Vehicle-Hours Traveled | Vehicle-Hours of delay |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **a.m. peak Hour** | | | | | | | | | | | | | | | | | | | |
| | | **No-build** | | | **No-build w/RBT** | | | **No-build w/RBT+MET** | | | **Alternative 1** | | | **Alternative 2** | | | **Alternative 3** | | |
| Route 28 Northbound – North of Scanlon Dr to South of Reedsdale Rd | 359 | 17.1 | 102.5 | 6.4 | 15.5 | 92.6 | -9.9 | 16.1 | 96.4 | -6.0 | 12.7 | 75.7 | -26.7 | 15.1 | 90.0 | -12.5 | 7.7 | 46.3 | -56.1 |
| Route 28 Northbound – North of Scanlon Rd to North of Chickatawbut Rd | 662 | 9.7 | 107.2 | 4.8 | 5.8 | 63.6 | -43.6 | 5.9 | 65.1 | -42.1 | 6.2 | 68.1 | -39.1 | 10.4 | 114.5 | 7.3 | 2.9 | 31.7 | -75.5 |
| Route 28 Northbound –North of Chickatawbut Rd to South of Reedsdale Rd | 765 | 7.8 | 99.1 | 3.4 | 10.0 | 127.1 | 28.0 | 10.5 | 133.4 | 34.3 | 7.1 | 91.1 | -8.0 | 5.4 | 69.2 | -29.8 | 4.9 | 62.0 | -37.1 |
| Route 28 Southbound – South of Reedsdale Rd to North of Scanlon Dr | 282 | 6.3 | 29.7 | 29.7 | 5.8 | 27.5 | -2.2 | 6.0 | 28.2 | -1.5 | 5.9 | 28.0 | -1.7 | 5.7 | 26.7 | -3.0 | 6.4 | 30.1 | 0.4 |
| Route 28 Southbound – South of Reedsdale Rd to North of Chickatawbut Rd | 410 | 2.8 | 19.0 | -9.5 | 2.7 | 18.6 | -0.4 | 2.7 | 18.6 | -0.4 | 2.7 | 18.6 | -0.4 | 2.7 | 18.5 | -0.5 | 2.7 | 18.4 | -0.6 |
| Route 28 Southbound – North of Chickatawbut Rd to North of Scanlon Dr | 517 | 3.5 | 30.2 | 12.0 | 3.1 | 26.4 | -3.8 | 3.2 | 27.8 | -2.4 | 3.2 | 27.5 | -2.7 | 2.9 | 25.4 | -4.8 | 3.6 | 31.2 | 1.0 |
| **p.m. peak Hour** | | | | | | | | | | | | | | | | | | | |
| Route 28 Northbound – North of Scanlon Dr to South of Reedsdale Rd | 163 | 11.9 | 32.3 | 4.4 | 6.8 | 18.6 | -13.7 | 6.9 | 18.7 | -13.6 | 10.5 | 28.4 | -3.9 | 13.1 | 35.5 | 3.2 | 6.5 | 17.6 | -14.7 |
| Route 28 Northbound – North of Scanlon Rd to North of Chickatawbut Rd | 361 | 9.1 | 54.9 | 9.3 | 3.5 | 21.1 | -33.8 | 3.5 | 21.3 | -33.6 | 4.6 | 27.6 | -27.3 | 8.9 | 53.4 | -1.5 | 2.8 | 16.8 | -38.1 |
| Route 28 Northbound –North of Chickatawbut Rd to South of Reedsdale Rd | 556 | 3.0 | 28.1 | -0.3 | 3.2 | 29.8 | 1.7 | 3.2 | 29.9 | 1.8 | 6.3 | 58.3 | 30.2 | 4.8 | 44.1 | 16.0 | 3.6 | 33.5 | 5.4 |
| Route 28 Southbound – South of Reedsdale Rd to North of Scanlon Dr | 559 | 8.5 | 79.7 | 1.2 | 6.7 | 62.7 | -16.9 | 7.0 | 65.6 | -14.0 | 6.1 | 57.0 | -22.7 | 6.1 | 56.5 | -23.1 | 8.9 | 82.7 | 3.0 |
| Route 28 Southbound – South of Reedsdale Rd to North of Chickatawbut Rd | 845 | 3.5 | 49.7 | 1.4 | 3.3 | 46.6 | -3.1 | 3.3 | 46.6 | -3.1 | 2.9 | 40.3 | -9.4 | 3.0 | 41.7 | -8.0 | 2.9 | 41.3 | -8.4 |
| Route 28 Southbound – North of Chickatawbut Rd to North of Scanlon Dr | 928 | 5.2 | 80.6 | -0.1 | 3.4 | 52.9 | -27.7 | 3.7 | 57.8 | -22.7 | 3.3 | 50.3 | -30.2 | 3.1 | 47.9 | -32.7 | 6.1 | 94.9 | 14.4 |

*(1) – No-build with Roundabout at Route 28 and Chickatawbut Rd, (2) – No-build with Roundabout at Route 28 and Chickatawbut Rd and Metering signals on Route 28 legs*

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# Existing Average Speeds

## ROUTE 28 NORTHBOUND AVERAGE SPEEDS – EXISTING (2023) A.M. AND P.M. PEAKS

| Location on Route 28 | Northbound Average Speed (mph) | Southbound Average Speed (mph) |
|---|---|---|
| **a.m. peak Hour** | | |
| South of Reedsdale Road | 44.1 | 40.0 |
| South of Reed Street/Access Road | 29.7 | 22.9 |
| South of Hillside Street | 25.9 | 34.9 |
| South of Chickatawbut Road | 43.9 | 22.7 |
| Between the I-93 inner loop ramps | 36.6 | 37.5 |
| **p.m. peak Hour** | | |
| South of Reedsdale Road | 37.9 | 44.1 |
| South of Reed Street/Access Road | 40.7 | 43.3 |
| South of Hillside Street | 35.9 | 35.5 |
| South of Chickatawbut Road | 27.1 | 29.5 |
| Between the I-93 inner loop ramps | 35.7 | 35.0 |

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# No-build and Alternatives Average Speeds

## NO-BUILD AND ALTERNATIVES AVERAGE VEHICLE SPEED

| Location on Route 28 | Northbound Average Speed (mph) | Southbound Average Speed (mph) | Northbound Average Speed (mph) | Southbound Average Speed (mph) | Northbound Average Speed (mph) | Southbound Average Speed (mph) | Northbound Average Speed (mph) | Southbound Average Speed (mph) | Northbound Average Speed (mph) | Southbound Average Speed (mph) | Northbound Average Speed (mph) | Southbound Average Speed (mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No-Build | | No-Build w/RBT[1] | | No-Build w/RBT+MET[2] | | Northbound Road Diet | | Northbound Road Diet v2 | | Southbound Road Diet | |
| **a.m. peak Hour** | | | | | | | | | | | | |
| South of Reedsdale Road | 30.3 | 43.9 | 29.9 | 44.0 | 29.5 | 43.8 | 35.0 | 35.8 | 34.8 | 38.1 | 30.5 | 34.1 |
| South of Reed Street/Access Road | 24.6 | 44.0 | 21.0 | 44.0 | 21.1 | 43.9 | 33.2 | 44.2 | 32.7 | 44.2 | 35.4 | 42.1 |
| South of Hillside Street | 36.6 | 39.1 | 33.2 | 39.2 | 32.5 | 39.1 | 30.1 | 40.0 | 30.0 | 39.9 | 36.2 | 38.2 |
| South of Chickatawbut Road | 23.1 | 34.9 | 34.0 | 34.9 | 34.5 | 35.6 | 30.0 | 35.0 | 25.3 | 35.0 | 37.4 | 35.4 |
| Between the I-93 inner loop ramps | 21.2 | 37.3 | 26.9 | 37.4 | 25.7 | 37.4 | 34.8 | 37.5 | 20.2 | 37.3 | 37.6 | 37.4 |
| **p.m. peak Hour** | | | | | | | | | | | | |
| South of Reedsdale Road | 38.0 | 44.0 | 37.1 | 44.0 | 37.1 | 44.0 | 38.2 | 42.0 | 38.2 | 42.3 | 36.8 | 31.2 |
| South of Reed Street/Access Road | 40.6 | 43.3 | 40.2 | 43.3 | 40.1 | 43.2 | 35.7 | 44.0 | 35.4 | 43.9 | 38.0 | 29.1 |
| South of Hillside Street | 35.9 | 35.4 | 35.5 | 38.5 | 35.1 | 38.3 | 30.3 | 38.8 | 29.8 | 38.7 | 34.7 | 37.7 |
| South of Chickatawbut Road | 26.6 | 29.4 | 30.2 | 31.0 | 34.6 | 32.2 | 31.3 | 33.7 | 23.3 | 34.1 | 37.5 | 33.4 |
| Between the I-93 inner loop ramps | 29.7 | 35.0 | 38.4 | 36.8 | 38.5 | 36.8 | 38.4 | 36.9 | 30.4 | 36.9 | 38.6 | 36.9 |

*(1) – No-build with Roundabout at Route 28 and Chickatawbut Rd, (2) – No-Build with Roundabout at Route 28 and Chickatawbut Rd and Metering on Route 28 legs*

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# No-build and Alternatives Driveway Delays

## DRIVEWAY DELAY – NO-BUILD VS. ALTERNATIVES

| Location on Route 28 | No-build Delay (sec) | No-build w/RBT Delay (sec) | No-build w/RBT+MET Delay (sec) | Alternative 1 Delay (sec) | Alternative 2 Delay (sec) | Alternative 3 Delay (sec) |
|---|---|---|---|---|---|---|
| **a.m. peak Hour** | | | | | | |
| **Between Eager Rd and Susi Lane** | | | | | | |
| Driveway #1 | 6.4 | 6.3 | 12.6 | 378.5 | 287.4 | 2.8 |
| Driveway #2 | 7.6 | 11.2 | 9.2 | 394.6 | 310.7 | 2.2 |
| Driveway #3 | 14.1 | 4.5 | 5.4 | 154.9 | 222.2 | 1.6 |
| Driveway #4 | 6.9 | 5.5 | 9.1 | 133.0 | 341.3 | 2.3 |
| Driveway #5 | 5.9 | 7.3 | 12.3 | 400.7 | 357.1 | 1.1 |
| **Between Hillside St and Eager Rd** | | | | | | |
| Driveway #6 | 10.8 | 1.5 | 16.4 | 134.9 | 57.5 | 7.6 |
| Driveway #7 | 7.0 | 7.1 | 11.8 | 119.0 | 201.0 | 4.9 |
| Driveway #8 | 8.0 | 9.6 | 13.7 | 130.6 | 120.0 | 5.5 |
| Driveway #9 | 8.3 | 8.3 | 11.5 | 144.9 | 160.9 | 12.6 |
| **p.m. peak Hour** | | | | | | |
| **Between Eager Rd and Susi Lane** | | | | | | |
| Driveway #1 | 166.4 | 13.3 | 20.5 | 532.6 | 290.1 | 1.3 |
| Driveway #2 | 142.1 | 8.4 | 6.5 | 26.0 | 371.7 | 2.6 |
| Driveway #3 | 155.2 | 8.2 | 7.5 | 18.3 | 398.0 | 2.2 |
| Driveway #4 | 274.9 | 8.6 | 8.8 | 11.2 | 487.4 | 1.9 |
| Driveway #5 | 26.9 | 5.9 | 7.9 | 3.4 | 139.0 | 1.3 |
| **Between Hillside St and Eager Rd** | | | | | | |
| Driveway #6 | 72.7 | 11.8 | 6.1 | 214.8 | 286.3 | 2.1 |
| Driveway #7 | 10.5 | 7.4 | 10.4 | 334.4 | 427.1 | 2.8 |
| Driveway #8 | 8.0 | 11.3 | 13.1 | 183.9 | 363.6 | 30.0 |
| Driveway #9 | 8.3 | 17.4 | 14.8 | 213.3 | 81.1 | 31.0 |

*(1) – No-build with Roundabout at Route 28 and Chickatawbut Rd,*
*(2) – No-build with Roundabout at Route 28 and Chickatawbut Rd and Metering on Route 28 legs*

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# Existing Capacity Analysis

## EXISTING (2023) CONDITIONS CAPACITY ANALYSIS – SIGNALIZED INTERSECTIONS

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|
| **a.m. peak Hour** | | | | |
| **Route 28 at Reedsdale Rd** | **F** | **81.8** | **-** | **-** |
| Route 28 EB left/thru | F | 99.3 | 184 | 554 |
| Route 28 EB right | C | 28.2 | 184 | 554 |
| Reedsdale WB left/thru \| thru/right | E | 61.2 | 140 | 478 |
| Route 28 NB left \| left/thru/right | F | 112.0 | 506 | 1184 |
| Route 28 SB left/thru/right | E | 65.6 | 145 | 462 |
| **Route 28 at Reed Street/Access Road** | **D** | **41.9** | **-** | **-** |
| Reed EB left/thru/right | D | 45.8 | 17 | 178 |
| Access WB left/thru/right | A | 0.0 | 0 | 0 |
| Route 28 NB left/thru \| thru/right | E | 61.1 | 441 | 906 |
| Route 28 SB left/thru \| thru/right | A | 3.7 | 9 | 195 |
| **Route 28 at Hillside Street** | **B** | **12.3** | **-** | **-** |
| Hillside EB left/thru/right | D | 38.3 | 33 | 199 |
| Driveway WB left/thru/right | A | 0.0 | 0 | 0 |
| Route 28 NB left/thru \| thru/right | A | 8.4 | 50 | 272 |
| Route 28 SB left/thru \| thru/right | B | 15.1 | 52 | 326 |
| **Route 28 at Chickatawbut Road** | **F** | **117.2** | - | - |
| Chickatawbut EB left/thru/right | D | 49.9 | 85 | 362 |
| Chickatawbut WB left/thru/right | F | 99.5 | 436 | 850 |
| Route 28 NB left/thru \| thru/right | F | 188.1 | 4438 | 5348 |
| Route 28 SB left/thru \| thru/right | D | 42.4 | 158 | 489 |
| **Route 28 at Scanlon Drive/Russ Street** | **E** | **68.3** | - | - |
| Scanlon EB left | D | 43.9 | 101 | 433 |
| Scanlon EB left/thru/right | D | 43.9 | 101 | 433 |
| Russ WB left | D | 42.9 | 46 | 272 |
| Russ WB thru/right | D | 45.0 | 46 | 272 |
| Route 28 NB left | F | 98.9 | 648 | 853 |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|
| Route 28 NB thru \| thru/right | F | 124.5 | 648 | 853 |
| Route 28 SB left | F | 83.0 | 174 | 616 |
| Route 28 SB hru \| thru/right | B | 17.7 | 174 | 616 |
| **p.m. peak Hour** | | | | |
| **Route 28 at Reedsdale Rd** | **E** | **67.7** | **-** | **-** |
| Route 28 EB left/thru | E | 76.1 | 200 | 584 |
| Route 28 EB right | D | 33.4 | 200 | 584 |
| Reedsdale WB left/thru \| thru/right | F | 152.2 | 444 | 554 |
| Route 28 NB left \| left/thru/right | D | 43.9 | 144 | 567 |
| Route 28 SB left/thru/right | E | 64.5 | 230 | 466 |
| **Route 28 at Reed Street/Access Road** | **A** | **5.4** | **-** | **-** |
| Reed EB left/thru/right | D | 40.3 | 13 | 137 |
| Access WB left/thru/right | A | 0.0 | 0 | 0 |
| Route 28 NB left/thru \| thru/right | A | 5.4 | 29 | 456 |
| Route 28 SB left/thru \| thru/right | A | 3.9 | 16 | 299 |
| **Route 28 at Hillside Street** | **B** | **17.4** | **-** | **-** |
| Hillside EB left/thru/right | D | 41.1 | 53 | 200 |
| Driveway WB left/thru/right | A | 0.0 | 0 | 0 |
| Route 28 NB left/thru \| thru/right | A | 9.9 | 51 | 259 |
| Route 28 SB left/thru \| thru/right | C | 21.0 | 128 | 363 |
| **Route 28 at Chickatawbut Road** | **F** | **120.8** | - | - |
| Chickatawbut EB left/thru/right | F | 96.7 | 342 | 839 |
| Chickatawbut WB left/thru/right | E | 56.7 | 124 | 485 |
| Route 28 NB left/thru \| thru/right | F | 218.4 | 4407 | 5322 |
| Route 28 SB left/thru \| thru/right | E | 55.2 | 353 | 495 |
| **Route 28 at Scanlon Drive/Russ Street** | **C** | **28.0** | - | - |
| Scanlon EB left | D | 31.5 | 48 | 215 |
| Scanlon EB left/thru/right | D | 30.7 | 48 | 215 |
| Russ WB left | D | 47.2 | 47 | 394 |
| Russ WB thru/right | D | 44.3 | 47 | 394 |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|
| Route 28 NB left | C | 26.7 | 104 | 404 |
| Route 28 NB thru \| thru/right | D | 34.1 | 104 | 404 |
| Route 28 SB left | D | 42.6 | 210 | 747 |
| Route 28 SB thru \| thru/right | C | 22.7 | 210 | 747 |

## EXISTING (2023) CONDITIONS CAPACITY ANALYSIS – UNSIGNALIZED INTERSECTIONS

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|
| **a.m. peak Hour** | | | | |
| **Route 28 at Pleasant Street** | **D** | **51.9** | - | - |
| Route 28 NB thru \| thru/right | E | 78.2 | 726 | 1037 |
| Route 28 SB left/thru \| thru/right | A | 3.1 | 8 | 182 |
| **Route 28 at Highland Street** | **C** | **21.7** | - | - |
| Highland EB left/right | A | 2.0 | 1 | 79 |
| Route 28 NB thru \| thru | D | 33.2 | 240 | 693 |
| Route 28 SB thru \| thru | A | 0.8 | 0 | 58 |
| **Route 28 at Hallen Avenue** | **C** | **21.7** | - | - |
| Hallen EB left/right | E | 68.4 | 28 | 194 |
| Route 28 NB left/thru \| thru | D | 30.7 | 241 | 889 |
| Route 28 SB thru \| thru/right | A | 0.6 | 1 | 88 |
| **Route 28 at Ridgewood Road/Wollaston Golf Club** | **A** | **6.0** | - | - |
| Wollaston Golf Club EB left/thru/right | A | 3.4 | 0 | 33 |
| Ridgewood WB left/thru/right | A | 9.9 | 1 | 65 |
| Route 28 NB left/thru \| thru/right | A | 8.4 | 49 | 368 |
| Route 28 SB left/thru \| thru/right | A | 1.5 | 4 | 212 |
| **Route 28 at Nahanton Avenue** | **A** | **1.2** | - | - |
| Nahanton WB left/right | A | 5.4 | 0 | 74 |
| Route 28 NB thru \| thru/right | A | 1.4 | 21 | 205 |
| Route 28 SB left/thru \| thru | A | 0.9 | 1 | 144 |
| **Route 28 at Heather Drive** | **A** | **1.7** | - | - |
| Heather EB left/right | B | 16.6 | 0 | 29 |
| Route 28 NB left/thru \| thru | A | 2.6 | 18 | 203 |
| Route 28 SB thru \| thru/right | A | 0.1 | 1 | 146 |
| **Route 28 at Sassamon Avenue** | **A** | **3.4** | - | - |
| Sassamon WB left/right | A | 6.7 | 0 | 52 |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|
| Route 28 NB thru \| thru/right | A | 5.1 | 31 | 342 |
| Route 28 SB left/thru \| thru | A | 0.3 | 0 | 54 |
| **Route 28 at Hilltop Street** | **A** | **1.3** | - | - |
| Hilltop WB left/right | B | 14.0 | 2 | 109 |
| Route 28 NB thru \| thru/right | A | 1.5 | 9 | 329 |
| Route 28 SB left/thru \| thru | A | 0.9 | 0 | 88 |
| **Route 28 at Eager Road** | **A** | **0.5** | - | - |
| Eager WB left/right | A | 7.3 | 1 | 84 |
| Route 28 NB thru \| thru/right | A | 0.5 | 3 | 154 |
| Route 28 SB left/thru \| thru | A | 0.3 | 0 | 40 |
| **Route 28 at Susi Lane** | **A** | **0.6** | - | - |
| Susi EB left/thru/right | A | 2.4 | 0 | 29 |
| Susi WB left/thru/right | A | 6.4 | 1 | 52 |
| Route 28 NB thru \| thru/right | A | 0.5 | 3 | 190 |
| Route 28 SB left/thru \| thru | A | 0.6 | 4 | 144 |
| **Route 28 at Brook Lane** | **A** | **1.1** | - | - |
| Brook EB left/right | A | 0.0 | 0 | 0 |
| Route 28 NB left/thru \| thru | A | 0.4 | 0 | 0 |
| Route 28 SB thru \| thru/right | A | 2.3 | 6 | 232 |
| **Route 28 at I-93 SB Off-Ramp** | **F** | **171.5** | - | - |
| I-93 SB Off-Ramp WB right | A | 0.7 | 0 | 0 |
| Route 28 NB thru \| thru | F | 182.6 | 1228 | 1573 |
| **Route 28 at I-93 SB Off-Ramp** | **A** | **4.5** | - | - |
| I-93 SB Off-Ramp EB right | A | 0.4 | 0 | 70 |
| Route 28 SB thru \| thru | A | 6.9 | 0 | 0 |
| **Route 28 at I-93 NB Off-Ramp** | **D** | **35.5** | - | - |
| I-93 NB Off-Ramp WB right | D | 36.7 | 193 | 1007 |
| Route 28 NB thru \| thru | D | 31.7 | 58 | 165 |
| **Route 28 at I-93 NB Off-Ramp** | **A** | **1.3** | - | - |
| I-93 NB Off-Ramp EB right | A | 0.6 | 0 | 47 |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|
| Route 28 SB thru \| thru | A | 2.1 | 7 | 148 |
| **p.m. peak hour** | | | | |
| **Route 28 at Pleasant Street** | **A** | **5.0** | - | - |
| Route 28 NB thru \| thru/right | A | 8.4 | 63 | 574 |
| Route 28 SB left/thru \| thru/right | A | 1.2 | 2 | 135 |
| **Route 28 at Highland Street** | **A** | **1.0** | - | - |
| Highland EB left/right | A | 3.0 | 3 | 96 |
| Route 28 NB thru \| thru | A | 0.8 | 1 | 162 |
| Route 28 SB thru \| thru | A | 0.9 | 1 | 121 |
| **Route 28 at Hallen Avenue** | **A** | **1.8** | - | - |
| Hallen EB left/right | A | 3.1 | 1 | 70 |
| Route 28 NB left/thru \| thru | A | 2.5 | 11 | 345 |
| Route 28 SB thru \| thru/right | A | 0.8 | 1 | 144 |
| **Route 28 at Ridgewood Road/Wollaston Golf Club** | **A** | **1.7** | - | - |
| Wollaston Golf Club EB left/thru/right | A | 5.7 | 1 | 59 |
| Ridgewood WB left/thru/right | A | 6.5 | 1 | 66 |
| Route 28 NB left/thru \| thru/right | A | 1.2 | 4 | 252 |
| Route 28 SB left/thru \| thru/right | A | 2.1 | 9 | 299 |
| **Route 28 at Nahanton Avenue** | **A** | **1.3** | - | - |
| Nahanton WB left/right | A | 5.9 | 0 | 58 |
| Route 28 NB thru \| thru/right | A | 0.2 | 3 | 174 |
| Route 28 SB left/thru \| thru | A | 2.4 | 12 | 265 |
| **Route 28 at Heather Drive** | **A** | **0.5** | - | - |
| Heather EB left/right | B | 15.8 | 0 | 37 |
| Route 28 NB left/thru \| thru | A | 0.4 | 1 | 182 |
| Route 28 SB thru \| thru/right | A | 0.5 | 4 | 160 |
| **Route 28 at Sassamon Avenue** | **A** | **1.2** | - | - |
| Sassamon WB left/right | B | 13.9 | 0 | 42 |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|
| Route 28 NB thru \| thru/right | A | 0.8 | 1 | 159 |
| Route 28 SB left/thru \| thru | A | 1.5 | 6 | 133 |
| **Route 28 at Hilltop Street** | **A** | **5.7** | - | - |
| Hilltop WB left/right | A | 4.0 | 1 | 85 |
| Route 28 NB thru \| thru/right | A | 0.5 | 2 | 221 |
| Route 28 SB left/thru \| thru | B | 11.1 | 62 | 516 |
| **Route 28 at Eager Road** | **A** | **5.2** | - | - |
| Eager WB left/right | E | 64.4 | 6 | 98 |
| Route 28 NB thru \| thru/right | A | 0.3 | 2 | 141 |
| Route 28 SB left/thru \| thru | A | 9.6 | 45 | 238 |
| **Route 28 at Susi Lane** | **A** | **4.9** | - | - |
| Susi EB left/thru/right | B | 17.3 | 0 | 27 |
| Susi WB left/thru/right | A | 9.3 | 1 | 42 |
| Route 28 NB thru \| thru/right | A | 0.6 | 2 | 230 |
| Route 28 SB left/thru \| thru | A | 9.1 | 52 | 177 |
| **Route 28 at Brook Lane** | **B** | **15.9** | - | - |
| Brook EB left/right | A | 0.0 | 0 | 0 |
| Route 28 NB left/thru \| thru | A | 0.3 | 0 | 31 |
| Route 28 SB thru \| thru/right | D | 31.4 | 217 | 460 |
| **Route 28 at I-93 SB Off-Ramp** | **E** | **66.2** | - | - |
| I-93 SB Off-Ramp WB right | A | 0.4 | 0 | 0 |
| Route 28 NB thru \| thru | E | 70.1 | 387 | 1110 |
| **Route 28 at I-93 SB Off-Ramp** | **B** | **16.1** | - | - |
| I-93 SB Off-Ramp EB right | A | 0.9 | 1 | 114 |
| Route 28 SB thru \| thru | C | 22.3 | 0 | 50 |
| **Route 28 at I-93 NB Off-Ramp** | **A** | **3.3** | - | - |
| I-93 NB Off-Ramp WB right | A | 3.1 | 8 | 75 |
| Route 28 NB thru \| thru | A | 3.4 | 2 | 63 |
| **Route 28 at I-93 NB Off-Ramp** | **A** | **3.7** | - | - |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|
| I-93 NB Off-Ramp EB right | A | 6.9 | 57 | 160 |
| Route 28 SB thru \| thru | A | 1.6 | 2 | 143 |

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# No-build and Alternatives Capacity Analysis

## NO-BUILD (2033) CONDITIONS AND ALTERNATIVES CAPACITY ANALYSIS – SIGNALIZED INTERSECTIONS

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No-build (2033) | | | | No-build w/RBT[1] | | | | No-build w/RBT+MET[2] | | | | Alternative 1 – Northbound Road Diet | | | | Alternative 2 – Northbound Road Diet v2 | | | | Alternative 3 – Southbound Road Diet | | | |
| **a.m. peak Hour** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Route 28 at Reedsdale Rd** | **F** | **83.0** | - | - | **F** | **84.8** | - | - | **F** | **86.6** | - | - | **F** | **88.2** | - | - | **E** | **76.2** | - | - | **F** | **94.5** | - | - |
| Route 28 EB left/thru | E | 57.8 | 200 | 574 | E | 62.7 | 217 | 557 | E | 68.9 | 202 | 581 | F | 149.9 | 313 | 733 | F | 105.6 | 219 | 612 | F | 165.1 | 309 | 705 |
| Route 28 EB right | F | 101.2 | 200 | 574 | F | 110.8 | 217 | 557 | F | 99.8 | 202 | 581 | F | 138.8 | 296 | 477 | D | 52.9 | 219 | 612 | C | 25.8 | 309 | 705 |
| Reedsdale WB left | Not under No-build | | | | | | | | | | | | F | 91.5 | 152 | 450 | E | 68.5 | 121 | 424 | F | 88.5 | 139 | 450 |
| Reedsdale WB left/thru \| thru/right (thru/right in all alts) | E | 60.9 | 139 | 534 | E | 68.9 | 162 | 503 | E | 76.5 | 174 | 511 | D | 42.8 | 152 | 450 | D | 40.5 | 139 | 424 | D | 41.6 | 136 | 452 |
| Route 28 NB left \| left/thru/right | F | 115.7 | 516 | 1186 | F | 111.5 | 514 | 1183 | F | 116.2 | 530 | 1178 | E | 76.2 | 331 | 1030 | E | 73.8 | 311 | 956 | F | 118.5 | 656 | 1173 |
| Route 28 SB left/thru/right | E | 63.2 | 139 | 459 | E | 63.9 | 143 | 459 | E | 61.9 | 141 | 469 | F | 139.4 | 296 | 477 | F | 118.3 | 254 | 476 | F | 82.2 | 188 | 467 |
| **Route 28 at Reed Street/Access Road** | **E** | **56.1** | - | - | **E** | **58.2** | - | - | **E** | **59.9** | - | - | **B** | **11.7** | - | - | **B** | **12.2** | - | - | **B** | **17.9** | - | - |
| Reed EB left/thru/right | D | 51.1 | 19 | 176 | D | 51.9 | 17 | 164 | D | 51.5 | 18 | 169 | D | 51.6 | 17 | 164 | D | 51.5 | 18 | 171 | E | 56.4 | 20 | 174 |
| Access WB left/thru/right | A | 0.0 | 0 | 0 | A | 0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 |
| Route 28 NB left (Alt 1 & 2 Only) | Not under No-build | | | | | | | | | | | | B | 15.1 | 264 | 895 | B | 11.3 | 243 | 894 | Not under this alternative | | | |
| Route 28 NB left/thru \| thru/right (thru/right in Alt 1 & 2) | F | 83.4 | 628 | 913 | F | 86.7 | 678 | 913 | F | 90.4 | 68 | 913 | B | 14.7 | 264 | 895 | B | 15.7 | 273 | 889 | C | 22.0 | 187 | 846 |
| Route 28 SB left/thru \| thru/right (left/thru/right in Alt 3) | A | 3.3 | 8 | 191 | A | 0.7 | 0 | 52 | A | 3.6 | 9 | 197 | A | 3.5 | 9 | 210 | A | 3.3 | 8 | 183 | A | 5.2 | 25 | 734 |
| **Route 28 at Hillside Street** | **B** | **12.2** | - | - | **B** | **15.9** | - | - | **B** | **17.0** | - | - | **B** | **18.9** | - | - | **B** | **19.9** | - | - | **B** | **13.6** | - | - |
| Hillside EB left/thru/right | D | 40.2 | 36 | 209 | D | 46.4 | 41 | 206 | D | 50.1 | 48 | 210 | F | 218.9 | 167 | 229 | F | 201.3 | 163 | 235 | F | 105.4 | 97 | 209 |
| Driveway WB left/thru/right | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 |
| Route 28 NB left | Not under No-build | | | | | | | | | | | | E | 61.2 | 84 | 290 | E | 65.8 | 83 | 280 | Not under this alternative | | | |
| Route 28 NB left/thru \| thru/right (thru/right in Alt 1 & 2) | A | 8.2 | 50 | 279 | B | 13.3 | 82 | 279 | B | 16.9 | 88 | 288 | A | 7.4 | 84 | 290 | A | 8.6 | 91 | 282 | A | 7.8 | 57 | 286 |
| Route 28 SB left/thru \| thru/right (left/thru/right in Alt 3) | B | 14.5 | 48 | 342 | B | 15.9 | 56 | 330 | B | 16.6 | 57 | 334 | A | 9.3 | 31 | 320 | A | 9.7 | 31 | 322 | B | 10.2 | 64 | 364 |
| **Route 28 at Chickatawbut Road** | **F** | **113.7** | - | - | **E** | **56.9** | - | - | **C** | **22.6** | - | - | **F** | **148.2** | - | - | **F** | **222.0** | - | - | **D** | **30.3** | - | - |
| Chickatawbut EB left/thru/right | E | 56.5 | 99 | 422 | C | 21.4 | 11 | 201 | C | 20.8 | 7 | 201 | F | 90.2 | 102 | 626 | C | 26.5 | 11 | 235 | B | 19.2 | 5 | 190 |
| Chickatawbut WB left/thru/right | F | 111.9 | 503 | 898 | F | 335.6 | 1316 | 2708 | D | 42.1 | 124 | 712 | F | 942.1 | 3493 | 5309 | F | 1528.2 | 4213 | 5309 | F | 123.4 | 496 | 1446 |
| Route 28 NB left/thru \| thru/right (left/thru in Alt 2 only) | F | 174.7 | 4276 | 5346 | B | 15.3 | 54 | 319 | B | 18.4 | 76 | 413 | F | 155.4 | 2844 | 5329 | F | 221.9 | 4585 | 5341 | B | 12.4 | 14 | 213 |
| Route 28 NB right (Alt 2 only) | Not under No-build | | | | | | | | | | | | Not under this alternative | | | | F | 202.9 | 4773 | 5340 | Not under this alternative | | | |
| Route 28 SB left/thru \| thru/right | D | 38.7 | 140 | 466 | B | 10.2 | 43 | 386 | B | 18.6 | 80 | 450 | B | 15.8 | 40 | 388 | A | 5.7 | 23 | 381 | B | 12.4 | 51 | 244 |
| **Route 28 at Scanlon Drive/Russ Street** | **E** | **64.7** | - | - | **E** | **64.8** | - | - | **E** | **64.9** | - | - | **E** | **65.3** | - | - | **E** | **79.8** | - | - | **E** | **66.9** | - | - |
| Scanlon EB left | D | 40.9 | 97 | 408 | D | 42.4 | 102 | 409 | D | 42.2 | 101 | 409 | D | 43.5 | 109 | 406 | E | 77.8 | 181 | 432 | D | 44.4 | 47 | 246 |
| Scanlon EB left/thru/right | D | 40.9 | 97 | 408 | D | 42.3 | 102 | 409 | D | 41.5 | 101 | 409 | D | 45.3 | 109 | 406 | F | 84.0 | 181 | 432 | D | 46.0 | 47 | 246 |
| Russ WB left | D | 45.0 | 45 | 239 | D | 43.7 | 44 | 248 | D | 45.1 | 47 | 259 | D | 45.7 | 45 | 250 | D | 50.7 | 65 | 311 | D | 46.4 | 47 | 246 |
| Russ WB thru/right | D | 42.9 | 45 | 239 | D | 44.6 | 44 | 248 | D | 46.1 | 47 | 259 | D | 45.9 | 45 | 250 | E | 66.3 | 65 | 311 | D | 44.5 | 47 | 246 |
| Route 28 NB left | F | 111.2 | 616 | 861 | F | 99.0 | 619 | 858 | F | 99.1 | 622 | 852 | F | 100.6 | 636 | 852 | F | 128.8 | 671 | 859 | F | 100.6 | 648 | 867 |
| Route 28 NB thru \| thru/right | F | 115.7 | 616 | 861 | F | 116.5 | 619 | 858 | F | 118.1 | 622 | 852 | F | 118.9 | 636 | 852 | F | 147.8 | 671 | 859 | F | 118.3 | 648 | 867 |
| Route 28 SB left | F | 80.6 | 170 | 568 | E | 79.3 | 174 | 628 | F | 80.5 | 176 | 599 | E | 71.8 | 156 | 584 | E | 79.6 | 165 | 591 | E | 76.1 | 162 | 566 |
| Route 28 SB hru \| thru/right | B | 17.9 | 170 | 568 | B | 17.6 | 174 | 628 | B | 13.9 | 176 | 599 | B | 17.7 | 156 | 584 | B | 16.5 | 165 | 591 | B | 18.1 | 162 | 566 |
| **p.m. peak Hour** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Route 28 at Reedsdale Rd** | **E** | **71.1** | - | - | **E** | **78.0** | - | - | **E** | **76.8** | - | - | **F** | **86.7** | - | - | **F** | **89.1** | - | - | **F** | **106.3** | - | - |
| Route 28 EB left/thru | D | 47.3 | 215 | 611 | D | 53.4 | 241 | 664 | E | 66.7 | 243 | 663 | F | 170.9 | 425 | 963 | F | 163.0 | 432 | 972 | F | 144.6 | 596 | 1117 |
| Route 28 EB right | E | 74.9 | 215 | 611 | F | 96.5 | 241 | 664 | F | 90.6 | 243 | 663 | F | 124.6 | 382 | 488 | E | 74.9 | 432 | 972 | F | 120.8 | 596 | 1117 |
| Reedsdale WB left | Not under No-build | | | | | | | | | | | | F | 137.1 | 355 | 557 | F | 135.4 | 355 | 556 | F | 186.3 | 421 | 558 |
| Reedsdale WB left/thru \| thru/right (thru/right in all alts) | F | 165.8 | 464 | 571 | F | 178.4 | 468 | 565 | F | 151.7 | 470 | 566 | D | 47.5 | 355 | 557 | D | 50.8 | 373 | 559 | E | 57.1 | 423 | 553 |
| Route 28 NB left \| left/thru/right | D | 43.1 | 138 | 509 | D | 49.9 | 187 | 662 | D | 51.9 | 180 | 675 | D | 38.1 | 121 | 455 | D | 39.0 | 125 | 506 | D | 45.1 | 169 | 680 |
| Route 28 SB left/thru/right | E | 73.1 | 264 | 480 | F | 84.2 | 301 | 481 | F | 80.8 | 291 | 483 | F | 124.6 | 382 | 488 | F | 125.2 | 384 | 488 | F | 153.1 | 381 | 464 |
| **Route 28 at Reed Street/Access Road** | **A** | **5.6** | - | - | **A** | **5.9** | - | - | **A** | **6.1** | - | - | **A** | **8.0** | - | - | **A** | **8.4** | - | - | **C** | **25.2** | - | - |
| Reed EB left/thru/right | D | 42.3 | 14 | 142 | D | 42.9 | 14 | 139 | D | 44.0 | 15 | 148 | D | 52.8 | 17 | 153 | D | 52.2 | 17 | 157 | E | 79.9 | 25 | 170 |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No-build (2033) | | | | No-build w/RBT[1] | | | | No-build w/RBT+MET[2] | | | | Alternative 1 – Northbound Road Diet | | | | Alternative 2 – Northbound Road Diet v2 | | | | Alternative 3 – Southbound Road Diet | | | |
| Access WB left/thru/right | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 |
| Route 28 NB left | Not under No-build | | | | | | | | | | | | B | 14.3 | 173 | 874 | B | 13.4 | 178 | 869 | Not under this alternative | | | |
| Route 28 NB left/thru \| thru/right (thru/right in Alt 1 & 2 only) | A | 5.7 | 30 | 459 | A | B | 10.9 | 178 | 869 | 7.9 | 39 | 541 | A | 9.9 | 173 | 874 | B | 10.3 | 161 | 882 | B | 14.3 | 105 | 723 |
| Route 28 SB left/thru \| thru/right | A | 4.0 | 16 | 301 | A | A | 3.7 | 16 | 307 | 3.8 | 17 | 286 | A | 3.8 | 16 | 303 | A | 3.7 | 15 | 325 | D | 38.4 | 478 | 999 |
| **Route 28 at Hillside Street** | **B** | **17.9** | - | - | **B** | **17.8** | - | - | **B** | **16.9** | - | - | **B** | **17.2** | - | - | **B** | **18.3** | - | - | **B** | **18.7** | - | - |
| Hillside EB left/thru/right | D | 40.9 | 54 | 200 | D | 42.5 | 56 | 200 | D | 40.9 | 54 | 200 | F | 88.6 | 114 | 200 | F | 90.9 | 116 | 200 | F | 97.2 | 126 | 201 |
| Driveway WB left/thru/right | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | F | 151.1 | 2 | 68 | F | 251.2 | 2 | 68 | A | 0.0 | 0 | 0 |
| Route 28 NB left | Not under No-Build | | | | | | | | | | | | E | 71.1 | 88 | 269 | E | 72.5 | 93 | 254 | Not under this alternative | | | |
| Route 28 NB left/thru \| thru/right (thru/right in Alt 1 & 2 only) | B | 10.3 | 51 | 274 | B | 11.5 | 68 | 278 | C | 20.5 | 68 | 270 | A | 8.8 | 88 | 269 | B | 10.1 | 98 | 274 | B | 14.4 | 88 | 272 |
| Route 28 SB left/thru \| thru/right | C | 21.3 | 131 | 367 | C | 20.4 | 129 | 362 | B | 19.1 | 118 | 368 | B | 12.9 | 78 | 363 | B | 13.3 | 80 | 347 | B | 10.7 | 112 | 369 |
| **Route 28 at Chickatawbut Road** | **F** | **132.1** | - | - | **D** | **32.6** | - | - | **D** | **36.9** | - | - | **F** | **295.5** | - | - | **F** | **122.1** | - | - | **B** | **16.2** | - | - |
| Chickatawbut EB left/thru/right | F | 114.4 | 410 | 903 | F | 127.7 | 446 | 1794 | F | 104.6 | 359 | 1643 | F | 216.1 | 764 | 2386 | D | 46.3 | 92 | 621 | D | 47.0 | 96 | 618 |
| Chickatawbut WB left/thru/right | E | 69.7 | 162 | 568 | E | 63.2 | 73 | 744 | E | 58.8 | 92 | 895 | F | 298.4 | 740 | 2399 | F | 262.2 | 589 | 1768 | D | 31.6 | 35 | 330 |
| Route 28 NB left/thru \| thru/right (left/thru in Alt 2 only) | F | 245.4 | 4606 | 5321 | B | 18.5 | 73 | 442 | C | 22.2 | 74 | 462 | F | 104.3 | 1535 | 4370 | F | 260.9 | 4332 | 5324 | B | 11.3 | 15 | 175 |
| Route 28 NB right (Alt 2 only) | Not under No-Build | | | | | | | | | | | | Not under this alternative | | | | F | 221.4 | 4698 | 5334 | Not under this alternative | | | |
| Route 28 SB left/thru \| thru/right | D | 54.7 | 356 | 498 | B | 15.9 | 88 | 467 | C | 29.9 | 217 | 487 | C | 21.5 | 166 | 474 | B | 12.5 | 76 | 465 | A | 9.1 | 52 | 294 |
| **Route 28 at Scanlon Drive/Russ Street** | **C** | **28.0** | - | - | **D** | **47.8** | - | - | **D** | **50.8** | - | - | **D** | **45.7** | - | - | **D** | **47.3** | - | - | **D** | **42.9** | - | - |
| Scanlon EB left | C | 28.6 | 48 | 244 | D | 34.4 | 53 | 238 | D | 34.7 | 53 | 238 | D | 38.8 | 59 | 262 | D | 40.0 | 60 | 253 | E | 79.3 | 166 | 528 |
| Scanlon EB left/thru/right | C | 22.0 | 53 | 361 | D | 34.2 | 53 | 238 | D | 33.5 | 53 | 238 | D | 39.1 | 59 | 262 | D | 38.1 | 60 | 253 | E | 71.9 | 166 | 528 |
| Russ WB left | D | 48.5 | 54 | 389 | F | 147.2 | 338 | 586 | F | 163.9 | 371 | 585 | F | 145.5 | 323 | 565 | F | 153.1 | 345 | 568 | E | 67.8 | 166 | 528 |
| Russ WB thru/right | D | 33.7 | 48 | 263 | F | 155.6 | 338 | 586 | F | 170.4 | 371 | 585 | F | 148.0 | 323 | 565 | F | 158.3 | 345 | 568 | E | 79.0 | 166 | 528 |
| Route 28 NB left | C | 26.4 | 106 | 381 | D | 49.5 | 115 | 434 | D | 47.8 | 116 | 413 | D | 52.6 | 118 | 425 | E | 59.3 | 117 | 425 | D | 48.6 | 117 | 422 |
| Route 28 NB thru \| thru/right | D | 34.5 | 106 | 381 | D | 37.4 | 115 | 434 | D | 38.4 | 116 | 413 | D | 37.9 | 118 | 425 | D | 37.6 | 117 | 425 | D | 38.3 | 117 | 422 |
| Route 28 SB left | D | 45.7 | 208 | 764 | F | 88.1 | 345 | 785 | F | 93.9 | 367 | 793 | E | 78.8 | 303 | 778 | F | 80.4 | 318 | 779 | F | 93.8 | 333 | 777 |
| Route 28 SB thru \| thru/right | C | 21.7 | 208 | 764 | D | 31.0 | 345 | 785 | C | 27.8 | 367 | 793 | C | 27.8 | 303 | 778 | C | 28.6 | 318 | 779 | D | 31.9 | 333 | 777 |

*(1) – No-build with Roundabout at Route 28 and Chickatawbut Rd,*
*(2) – No-build with Roundabout at Route 28 and Chickatawbut Rd and Metering on Route 28 legs*

## NO-BUILD (2033) CONDITIONS AND ALTERNATIVES CAPACITY ANALYSIS – UNSIGNALIZED INTERSECTIONS

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No-Build (2033) | | | | No-build w/RBT[1] | | | | No-build w/RBT+MET[2] | | | | Alternative 1 – Northbound Road Diet | | | | Alternative 2 – Northbound Road Diet v2 | | | | Alternative 3 – Southbound Road Diet | | | |
| a.m. peak Hour | | | | | | | | | | | | | | | | | | | | | | | | |
| **Route 28 at Pleasant Street** | **E** | **58.9** | - | - | **E** | **58.4** | - | - | **E** | **59.9** | - | - | **C** | **21.4** | - | - | **B** | **17.5** | - | - | **D** | **37.8** | - | - |
| Route 28 NB thru \| thru/right | F | 89.8 | 807 | 1044 | F | 87.9 | 838 | 1042 | F | 91.3 | 841 | 1045 | B | 15.5 | 209 | 1010 | B | 16.4 | 218 | 1010 | D | 46.0 | 486 | 1026 |
| Route 28 SB left/thru \| thru/right | A | 2.9 | 7 | 136 | A | 4.7 | 15 | 231 | C | 21.6 | 14 | 278 | D | 32.5 | 176 | 759 | B | 19.9 | 91 | 517 | B | 19.7 | 136 | 1060 |
| **Route 28 at Highland Street** | **D** | **32.4** | - | - | **D** | **39.3** | - | - | **D** | **41.3** | - | - | **A** | **6.1** | - | - | **A** | **6.5** | - | - | **A** | **5.5** | - | - |
| Highland EB left/right | A | 1.5 | 1 | 71 | D | 30.6 | 17 | 176 | F | 131.6 | 11 | 158 | A | 4.0 | 3 | 101 | A | 3.4 | 2 | 78 | A | 4.9 | 3 | 102 |
| Route 28 NB thru \| thru | D | 50.1 | 374 | 756 | E | 59.4 | 466 | 758 | E | 63.3 | 481 | 755 | A | 9.0 | 130 | 735 | B | 10.1 | 148 | 745 | A | 7.2 | 56 | 533 |
| Route 28 SB thru \| thru | A | 0.6 | 0 | 29 | A | 0.7 | 0 | 52 | A | 0.7 | 0 | 58 | A | 0.7 | 0 | 81 | A | 0.5 | 0 | 23 | A | 1.5 | 2 | 245 |
| **Route 28 at Hallen Avenue** | **C** | **28.0** | - | - | **D** | **45.5** | - | - | **D** | **49.9** | - | - | **A** | **7.7** | - | - | **A** | **7.4** | - | - | **A** | **5.6** | - | - |
| Hallen EB left/right | F | 94.2 | 34 | 204 | E | 77.4 | 30 | 212 | F | 134.6 | 23 | 191 | A | 8.5 | 3 | 94 | B | 14.6 | 5 | 113 | B | 14.7 | 6 | 137 |
| Route 28 left (Alt 1 & 2 only) | Not under No-build | | | | | | | | | | | | B | 18.9 | 175 | 758 | A | 10.0 | 155 | 1084 | Not under this alternative | | | |
| Route 28 NB left/thru \| thru (thru in Alt 1 & 2) | D | 40.5 | 326 | 1114 | E | 68.0 | 603 | 1130 | E | 75.0 | 666 | 1136 | B | 11.8 | 219 | 1102 | B | 11.4 | 198 | 1091 | A | 6.6 | 54 | 677 |
| Route 28 SB thru \| thru/right | A | 0.4 | 0 | 38 | A | 0.6 | 0 | 69 | A | 1.0 | 0 | 71 | A | 0.4 | 0 | 41 | A | 0.3 | 0 | 6 | A | 2.7 | 4 | 385 |
| **Route 28 at Ridgewood Road/Wollaston Golf Club** | **A** | **6.8** | - | - | **B** | **15.7** | - | - | **B** | **18.3** | - | - | **A** | **4.0** | - | - | **A** | **4.1** | - | - | **A** | **3.1** | - | - |
| Wollaston Golf Club EB left/thru/right | A | 4.9 | 0 | 42 | A | 1.4 | 0 | 37 | A | 2.1 | 1 | 34 | A | 2.0 | 0 | 42 | A | 2.4 | 1 | 37 | A | 7.7 | 0 | 28 |
| Ridgewood WB left/thru/right | B | 11.9 | 1 | 69 | B | 17.8 | 2 | 89 | C | 20.1 | 2 | 73 | D | 31. | 2 | 84 | C | 28.9 | 1 | 73 | A | 9.1 | 2 | 70 |
| Route 28 NB left/thru \| thru/right | A | 9.9 | 60 | 430 | C | 23.6 | 156 | 455 | C | 27.7 | 197 | 480 | A | 5.0 | 48 | 418 | A | 5.2 | 51 | 421 | A | 1.5 | 7 | 332 |
| Route 28 SB left/thru \| thru/right | A | 0.9 | 1 | 145 | A | 1.4 | 4 | 197 | B | 12.0 | 4 | 169 | A | 1.4 | 3 | 170 | A | 1.4 | 3 | 146 | A | 6.5 | 32 | 598 |
| **Route 28 at Nahanton Avenue** | **A** | **1.3** | - | - | **A** | **3.1** | - | - | **A** | **3.8** | - | - | **A** | **1.1** | - | - | **A** | **1.2** | - | - | **A** | **1.1** | - | - |
| Nahanton WB left/right | A | 7.8 | 1 | 71 | D | 30.2 | 2 | 89 | C | 26.2 | 3 | 92 | C | 23.0 | 1 | 88 | C | 26.6 | 1 | 92 | A | 8.6 | 1 | 69 |
| Route 28 NB thru \| thru/right | A | 1.6 | 23 | 198 | A | 4.2 | 66 | 221 | A | 4.0 | 70 | 220 | A | 1.0 | 26 | 220 | A | 1.2 | 23 | 206 | A | 0.3 | 4 | 198 |
| Route 28 SB left/thru \| thru | A | 0.5 | 1 | 140 | A | 0.8 | 1 | 150 | B | 10.6 | 1 | 134 | A | 0.7 | 1 | 119 | A | 0.7 | 1 | 112 | A | 2.3 | 10 | 402 |
| **Route 28 at Heather Drive** | **A** | **1.9** | - | - | **A** | **5.8** | - | - | **A** | **6.9** | - | - | **A** | **1.4** | - | - | **A** | **1.3** | - | - | **A** | **0.6** | - | - |
| Heather EB left/right | C | 24.4 | 1 | 47 | F | 130.0 | 3 | 77 | E | 70.0 | 2 | 79 | A | 2.0 | 1 | 59 | C | 28.2 | 1 | 57 | C | 24.4 | 0 | 0 |
| Route 28 NB left/thru \| thru | A | 2.8 | 20 | 211 | A | 8.5 | 75 | 267 | A | 9.5 | 95 | 286 | A | 1.9 | 25 | 252 | A | 1.9 | 26 | 258 | A | 0.6 | 3 | 193 |
| Route 28 SB thru \| thru/right | A | 0.1 | 1 | 150 | A | 0.1 | 2 | 142 | A | 0.2 | 59 | 240 | A | 0.1 | 1 | 133 | A | 0.1 | 1 | 132 | A | 0.5 | 3 | 146 |
| **Route 28 at Sassamon Avenue** | **A** | **4.2** | - | - | **B** | **16.3** | - | - | **B** | **19.9** | - | - | **A** | **4.5** | - | - | **A** | **4.5** | - | - | **A** | **1.2** | - | - |
| Sassamon WB left/right | A | 7.9 | 0 | 71 | C | 25.9 | 2 | 89 | C | 24.0 | 1 | 83 | D | 34.1 | 2 | 93 | C | 27.1 | 1 | 79 | A | 7.6 | 1 | 70 |
| Route 28 NB thru \| thru/right | A | 6.2 | 40 | 411 | C | 24.8 | 197 | 659 | C | 28.7 | 251 | 726 | A | 6.5 | 79 | 674 | A | 6.7 | 84 | 690 | A | 1.1 | 0 | 108 |
| Route 28 SB left/thru \| thru | A | 0.3 | 0 | 64 | A | 0.3 | 0 | 49 | B | 11.6 | 1 | 79 | A | 0.4 | 0 | 47 | A | 0.4 | 0 | 25 | A | 1.2 | 4 | 193 |
| **Route 28 at Hilltop Street** | A | 1.5 | - | - | **A** | **5.2** | - | - | **A** | **6.5** | - | - | **A** | **1.8** | - | - | **A** | **2.2** | - | - | **A** | **2.3** | - | - |
| Hilltop WB left/right | **B** | **14.5** | 2 | 118 | B | 19.0 | 2 | 106 | B | 19.9 | 2 | 111 | B | 18.7 | 2 | 106 | C | 27.9 | 3 | 116 | D | 35.2 | 3 | 101 |
| Route 28 NB thru \| thru/right | A | 1.7 | 12 | 304 | A | 7.2 | 69 | 440 | A | 8.7 | 87 | 471 | A | 2.2 | 28 | 438 | A | 2.8 | 41 | 453 | A | 0.7 | 4 | 299 |
| Route 28 SB left/thru \| thru | A | 0.8 | 0 | 57 | A | 1.4 | 1 | 123 | A | 7.1 | 1 | 134 | A | 0.9 | 1 | 96 | A | 1.0 | 1 | 116 | A | 5.4 | 23 | 624 |
| **Route 28 at Eager Road** | **A** | **0.6** | - | - | **A** | **1.5** | - | - | **A** | **1.8** | - | - | **A** | **4.9** | - | - | **A** | **5.0** | - | - | **A** | **0.9** | - | - |
| Eager WB left/right | B | 10.3 | 2 | 93 | B | 12.5 | 2 | 94 | A | 8.1 | 1 | 42 | F | 127.7 | 15 | 149 | E | 66.0 | 7 | 132 | B | 13.2 | 2 | 101 |
| Route 28 NB thru \| thru/right | A | 0.6 | 3 | 159 | A | 1.9 | 12 | 171 | A | 2.0 | 19 | 199 | A | 4.2 | 31 | 185 | A | 6.0 | 50 | 191 | A | 0.3 | 2 | 155 |
| Route 28 SB left/thru \| thru | A | 0.3 | 0 | 38 | A | 0.3 | 0 | 34 | A | 6.0 | 0 | 66 | A | 1.2 | 1 | 74 | A | 0.9 | 0 | 29 | A | 1.6 | 1 | 130 |
| **Route 28 at Susi Lane** | **A** | **0.7** | - | - | **A** | **1.5** | - | - | **A** | **1.7** | - | - | **D** | **31.6** | - | - | **A** | **9.1** | - | - | **A** | **1.2** | - | - |
| Susi EB left/thru/right | A | 3.7 | 0 | 26 | A | 4.1 | 0 | 36 | A | 4.1 | 0 | 33 | B | 15.5 | 0 | 84 | A | 7.1 | 1 | 70 | A | 1.8 | 0 | 27 |
| Susi WB left/thru/right | A | 8.0 | 1 | 70 | A | 7.5 | 1 | 68 | A | 7.9 | 1 | 79 | D | 34.6 | 3 | 86 | D | 42.7 | 3 | 97 | A | 8.6 | 1 | 83 |
| Route 28 NB thru \| thru/right | A | 0.5 | 2 | 193 | A | 2.0 | 14 | 237 | A | 1.5 | 15 | 261 | D | 51.0 | 351 | 430 | B | 14.0 | 156 | 421 | A | 0.4 | 2 | 232 |
| Route 28 SB left/thru \| thru | A | 0.9 | 3 | 135 | A | 0.6 | 3 | 149 | A | 0.5 | 3 | 154 | A | 1.0 | 2 | 177 | A | 1.1 | 2 | 199 | A | 2.8 | 16 | 506 |
| **Route 28 at Brook Lane** | **A** | **1.8** | - | - | **A** | **1.1** | - | - | **A** | **1.4** | - | - | **D** | **32.9** | - | - | **A** | **9.6** | - | - | **A** | **0.6** | - | - |
| Brook EB left/right | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 |
| Route 28 NB left/thru \| thru | A | 0.4 | 0 | 0 | A | 1.4 | 8 | 162 | A | 1.8 | 13 | 273 | D | 53.2 | 620 | 973 | B | 15.8 | 362 | 755 | A | 0.6 | 0 | 0 |
| Route 28 SB thru \| thru/right | A | 4.3 | 14 | 195 | A | 0.5 | 0 | 27 | A | 0.7 | 1 | 94 | A | 0.6 | 1 | 119 | A | 0.4 | 0 | 89 | A | 0.6 | 0 | 68 |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No-Build (2033) | | | | No-build w/RBT[1] | | | | No-build w/RBT+MET[2] | | | | Alternative 1 – Northbound Road Diet | | | | Alternative 2 – Northbound Road Diet v2 | | | | Alternative 3 – Southbound Road Diet | | | |
| **Route 28 at I-93 SB Off-Ramp** | **F** | **175.7** | - | - | **F** | **124.3** | - | - | **F** | **126.6** | - | - | **D** | **48.7** | - | - | **F** | **175.4** | - | - | **A** | **3.3** | - | - |
| I-93 SB Off-Ramp WB right | A | 1.9 | 0 | 21 | A | 0.8 | 0 | 0 | A | 1.0 | 0 | 8 | B | 12.4 | 4 | 121 | C | 23.6 | 6 | 124 | A | 2.4 | 1 | 104 |
| Route 28 NB thru \| thru | F | 186.9 | 1289 | 1573 | F | 131.9 | 996 | 1568 | F | 134.3 | 1035 | 1569 | D | 50.9 | 345 | 1518 | F | 185.8 | 1092 | 1577 | A | 3.4 | 0 | 0 |
| **Route 28 at I-93 SB Off-Ramp** | **A** | **4.3** | - | - | **A** | **4.8** | - | - | **A** | **5.0** | - | - | **A** | **4.3** | - | - | **A** | **4.1** | - | - | **A** | **3.8** | - | - |
| I-93 SB Off-Ramp EB right | A | 0.3 | 0 | 53 | A | 0.4 | 0 | 71 | A | 0.4 | 0 | 78 | A | 0.3 | 0 | 55 | A | 0.3 | 0 | 64 | A | 0.3 | 0 | 56 |
| Route 28 SB thru \| thru | A | 6.6 | 0 | 0 | A | 7.3 | 0 | 0 | A | 7.5 | 0 | 0 | A | 6.7 | 0 | 0 | A | 6.2 | 0 | 0 | A | 6.0 | 0 | 0 |
| **Route 28 at I-93 NB Off-Ramp** | **D** | **34.5** | - | - | **B** | **10.8** | - | - | **B** | **12.7** | - | - | **A** | **7.7** | - | - | **E** | **68.8** | - | - | **A** | **2.0** | - | - |
| I-93 NB Off-Ramp WB right | D | 30.7 | 57 | 164 | B | 11.2 | 24 | 141 | B | 14.4 | 31 | 147 | A | 1.9 | 5 | 82 | B | 17.5 | 41 | 168 | A | 0.1 | 0 | 0 |
| Route 28 NB thru \| thru | D | 35.6 | 185 | 910 | B | 10.6 | 35 | 391 | B | 12.2 | 40 | 403 | B | 10.3 | 56 | 495 | F | 93.6 | 549 | 1379 | A | 2.8 | 0 | 0 |
| **Route 28 at I-93 NB Off-Ramp** | **A** | **1.2** | - | - | **A** | **1.3** | - | - | **A** | **1.3** | - | - | **A** | **1.3** | - | - | **A** | **1.3** | - | - | **A** | **1.2** | - | - |
| I-93 NB Off-Ramp EB right | A | 1.9 | 6 | 163 | A | 2.1 | 7 | 154 | A | 2.1 | 7 | 151 | A | 2.1 | 7 | 150 | A | 2.1 | 7 | 156 | A | 2.0 | 6 | 149 |
| Route 28 SB thru \| thru | A | 0.6 | 0 | 10 | A | 0.6 | 0 | 45 | A | 0.6 | 0 | 18 | A | 0.6 | 0 | 16 | A | 0.6 | 0 | 17 | A | 0.5 | 0 | 25 |
| **p.m. peak hour** | | | | | | | | | | | | | | | | | | | | | | | | |
| **Route 28 at Pleasant Street** | **A** | **4.6** | - | - | **A** | **6.5** | - | - | **A** | **6.3** | - | - | **A** | **6.4** | - | - | **A** | **6.1** | - | - | **D** | **31.9** | - | - |
| Route 28 NB thru \| thru/right | A | 7.8 | 56 | 607 | B | 10.7 | 99 | 801 | B | 10.2 | 94 | 728 | B | 10.0 | 110 | 952 | A | 2.1 | 3 | 120 | D | 30.1 | 316 | 939 |
| Route 28 SB left/thru \| thru/right | A | 1.2 | 2 | 142 | A | 1.2 | 2 | 120 | B | 16.5 | 3 | 129 | A | 2.3 | 4 | 125 | A | 9.8 | 103 | 941 | D | 34.5 | 485 | 1226 |
| **Route 28 at Highland Street** | **A** | **1.0** | - | - | **A** | **1.2** | - | - | **A** | **1.2** | - | - | **A** | **2.5** | - | - | **A** | **3.0** | - | - | **C** | **26.7** | - | - |
| Highland EB left/right | A | 2.6 | 2 | 88 | A | 3.1 | 3 | 96 | A | 4.2 | 3 | 98 | A | 4.0 | 4 | 125 | A | 3.4 | 3 | 105 | F | 450.5 | 236 | 326 |
| Route 28 NB thru \| thru | A | 0.9 | 1 | 151 | A | 1.2 | 3 | 244 | A | 1.2 | 2 | 200 | A | 4.1 | 48 | 717 | A | 5.1 | 61 | 711 | A | 1.2 | 3 | 232 |
| Route 28 SB thru \| thru | A | 0.8 | 0 | 112 | A | 0.9 | 1 | 119 | A | 1.0 | 1 | 119 | A | 0.6 | 0 | 29 | A | 0.6 | 0 | 87 | D | 36.7 | 388 | 917 |
| **Route 28 at Hallen Avenue** | **A** | **1.6** | - | - | **A** | **1.9** | - | - | **A** | **2.2** | - | - | **A** | **3.0** | - | - | **A** | **2.7** | - | - | **B** | **18.3** | - | - |
| Hallen EB left/right | A | 3.3 | 1 | 89 | A | 3.6 | 2 | 90 | A | 5.5 | 1 | 77 | A | 4.6 | 2 | 95 | A | 4.5 | 2 | 86 | F | 133.6 | 73 | 280 |
| Route 28 left (Alt 1 & 2 only) | Not under No-Build | | | | | | | | | | | | B | 12.0 | 90 | 1061 | B | 11.4 | 73 | 981 | Not under this alternative | | | |
| Route 28 NB left/thru \| thru (thru in Alt 1 & 2) | A | 2.5 | 11 | 346 | A | 2.7 | 14 | 401 | A | 7.8 | 19 | 417 | A | 5.4 | 87 | 1050 | A | 4.7 | 67 | 1000 | A | 5.0 | 31 | 501 |
| Route 28 SB thru \| thru/right | A | 0.5 | 0 | 113 | A | 0.8 | 1 | 138 | A | 1.0 | 2 | 172 | A | 0.3 | 0 | 19 | A | 0.4 | 0 | 64 | C | 28.8 | 367 | 746 |
| **Route 28 at Ridgewood Road/Wollaston Golf Club** | **A** | **1.4** | - | - | **A** | **1.9** | - | - | **A** | **2.0** | - | - | **A** | **3.3** | - | - | **A** | **3.3** | - | - | **B** | **18.4** | - | - |
| Wollaston Golf Club EB left/thru/right | A | 3.3 | 1 | 54 | A | 3.8 | 1 | 60 | A | 3.8 | 1 | 54 | A | 8.3 | 3 | 82 | A | 8.2 | 3 | 89 | D | 34.3 | 3 | 88 |
| Ridgewood WB left/thru/right | A | 5.8 | 1 | 60 | A | 7.4 | 1 | 59 | B | 10.6 | 0 | 48 | C | 27.9 | 1 | 54 | C | 25.3 | 1 | 51 | D | 44.7 | 6 | 93 |
| Route 28 NB left/thru \| thru/right | A | 1.5 | 6 | 292 | A | 1.6 | 8 | 305 | A | 8.8 | 112 | 412 | A | 3.9 | 34 | 418 | A | 4.1 | 40 | 420 | A | 2.9 | 15 | 365 |
| Route 28 SB left/thru \| thru/right | A | 1.2 | 2 | 183 | A | 2.0 | 8 | 274 | A | 8.1 | 8 | 303 | A | 2.0 | 7 | 207 | A | 1.9 | 7 | 249 | D | 37.8 | 565 | 1065 |
| **Route 28 at Nahanton Avenue** | **A** | **0.7** | - | - | **A** | **0.8** | - | - | **A** | **0.8** | - | - | **A** | **1.0** | - | - | **A** | **1.1** | - | - | **A** | **6.1** | - | - |
| Nahanton WB left/right | A | 6.5 | 0 | 52 | B | 10.6 | 1 | 73 | A | 7.4 | 0 | 53 | B | 19.9 | 1 | 68 | B | 19.7 | 1 | 71 | D | 40.9 | 3 | 89 |
| Route 28 NB thru \| thru/right | A | 0.3 | 4 | 185 | A | 0.3 | 7 | 192 | A | 0.2 | 9 | 243 | A | 0.7 | 14 | 193 | A | 1.0 | 18 | 190 | A | 0.4 | 10 | 191 |
| Route 28 SB left/thru \| thru | A | 1.0 | 3 | 235 | A | 1.3 | 5 | 278 | A | 5.6 | 5 | 237 | A | 1.2 | 5 | 233 | A | 1.0 | 4 | 249 | B | 12.9 | 143 | 538 |
| **Route 28 at Heather Drive** | **A** | **0.4** | - | - | **A** | **0.4** | - | - | **A** | **0.4** | - | - | **A** | **0.9** | - | - | **A** | **0.9** | - | - | **A** | **1.4** | - | - |
| Heather EB left/right | B | 15.8 | 0 | 36 | C | 25.5 | 0 | 48 | C | 20.1 | 0 | 47 | D | 50.6 | 1 | 56 | D | 53.7 | 1 | 50 | C | 23.1 | 0 | 8 |
| Route 28 NB left/thru \| thru | A | 0.5 | 3 | 207 | A | 0.5 | 2 | 190 | A | 7.3 | 3 | 214 | A | 1.4 | 14 | 237 | A | 1.6 | 19 | 240 | A | 0.7 | 3 | 210 |
| Route 28 SB thru \| thru/right | A | 0.3 | 2 | 144 | A | 0.3 | 2 | 154 | A | 0.2 | 3 | 214 | A | 0.2 | 1 | 136 | A | 0.2 | 1 | 140 | A | 2.2 | 28 | 170 |
| **Route 28 at Sassamon Avenue** | **A** | **1.1** | - | - | **A** | **0.9** | - | - | **A** | **0.7** | - | - | **A** | **2.3** | - | - | **A** | **2.9** | - | - | **A** | **3.4** | - | - |
| Sassamon WB left/right | A | 5.3 | 0 | 46 | A | 7.1 | 0 | 53 | A | 6.9 | 0 | 39 | C | 25.7 | 0 | 35 | C | 27.7 | 0 | 42 | E | 73.5 | 3 | 97 |
| Route 28 NB thru \| thru/right | A | 1.1 | 2 | 175 | A | 0.8 | 1 | 125 | A | 0.8 | 2 | 180 | A | 3.8 | 41 | 665 | A | 5.1 | 61 | 665 | A | 1.1 | 1 | 136 |
| Route 28 SB left/thru \| thru | A | 1.0 | 3 | 148 | A | 0.9 | 3 | 162 | A | 4.6 | 1 | 120 | A | 0.6 | 1 | 151 | A | 0.6 | 1 | 145 | A | 5.8 | 42 | 226 |
| **Route 28 at Hilltop Street** | **A** | **6.6** | - | - | **A** | **5.0** | - | - | **A** | **3.9** | - | - | **A** | **2.2** | - | - | **A** | **3.0** | - | - | **A** | **9.1** | - | - |
| Hilltop WB left/right | C | 24.0 | 1 | 85 | B | 13.0 | 1 | 78 | B | 18.0 | 0 | 77 | D | 31.0 | 1 | 76 | C | 23.6 | 1 | 77 | F | 152.9 | 3 | 79 |
| Route 28 NB thru \| thru/right | A | 0.6 | 3 | 288 | A | 0.7 | 4 | 284 | A | 0.5 | 5 | 324 | A | 1.1 | 11 | 433 | A | 1.9 | 31 | 442 | A | 0.6 | 2 | 188 |
| Route 28 SB left/thru \| thru | B | 12.5 | 73 | 619 | A | 9.9 | 53 | 558 | B | 13.2 | 37 | 514 | A | 3.4 | 12 | 328 | A | 4.1 | 17 | 386 | C | 20.2 | 276 | 722 |
| **Route 28 at Eager Road** | **A** | **4.1** | - | - | **A** | **0.4** | - | - | **A** | **0.5** | - | - | **A** | **3.5** | - | - | **A** | **4.2** | - | - | **A** | **1.4** | - | - |
| Eager WB left/right | D | 33.1 | 12 | 108 | B | 10.2 | 1 | 56 | A | 9.7 | 1 | 66 | F | 101.3 | 3 | 99 | E | 58.5 | 2 | 84 | B | 19.5 | 1 | 79 |
| Route 28 NB thru \| thru/right | A | 0.4 | 2 | 151 | A | 0.4 | 3 | 148 | A | 0.8 | 4 | 190 | A | 5.0 | 36 | 178 | A | 6.8 | 52 | 182 | A | 2.4 | 10 | 554 |
| Route 28 SB left/thru \| thru | A | 7.5 | 34 | 234 | A | 0.4 | 0 | 98 | A | 3.2 | 1 | 130 | A | 1.2 | 0 | 53 | A | 1.3 | 0 | 41 | A | 0.5 | 2 | 142 |

| Intersection and Movement | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) | LOS | Delay (sec) | Average Queue (ft) | Maximum Queue (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No-Build (2033) | | | | No-build w/RBT[1] | | | | No-build w/RBT+MET[2] | | | | Alternative 1 – Northbound Road Diet | | | | Alternative 2 – Northbound Road Diet v2 | | | | Alternative 3 – Southbound Road Diet | | | |
| **Route 28 at Susi Lane** | **A** | **4.6** | - | - | **A** | **0.6** | - | - | **A** | **0.9** | - | - | **C** | **26.2** | - | - | **A** | **7.7** | - | - | **A** | **1.5** | - | - |
| Susi EB left/thru/right | B | 16.0 | 0 | 28 | A | 7.9 | 0 | 19 | B | 11.0 | 0 | 26 | A | 9.4 | 0 | 42 | B | 11.4 | 0 | 39 | B | 12.6 | 0 | 25 |
| Susi WB left/thru/right | C | 24.4 | 1 | 46 | A | 3.7 | 0 | 35 | B | 13.4 | 0 | 40 | C | 24.1 | 1 | 51 | B | 19.5 | 1 | 47 | A | 4.0 | 0 | 49 |
| Route 28 NB thru \| thru/right | A | 0.7 | 4 | 237 | A | 0.4 | 2 | 175 | A | 0.8 | 2 | 192 | D | 53.0 | 322 | 425 | B | 15.3 | 160 | 402 | A | 0.4 | 2 | 206 |
| Route 28 SB left/thru \| thru | A | 8.2 | 48 | 176 | A | 0.7 | 6 | 163 | A | 2.2 | 11 | 183 | A | 1.5 | 6 | 309 | A | 1.0 | 3 | 268 | A | 2.8 | 30 | 767 |
| **Route 28 at Brook Lane** | **B** | **16.5** | - | - | **A** | **1.3** | - | - | **A** | **3.9** | - | - | **C** | **23.7** | - | - | **A** | **7.9** | - | - | **A** | **0.7** | - | - |
| Brook EB left/right | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 | A | 0.0 | 0 | 0 |
| Route 28 NB left/thru \| thru | A | 0.4 | 0 | 44 | A | 0.0 | 0 | 7 | A | 0.9 | 0 | 57 | D | 44.8 | 466 | 959 | B | 15.3 | 327 | 957 | A | 0.6 | 1 | 96 |
| Route 28 SB thru \| thru/right | D | 32.1 | 221 | 461 | A | 2.1 | 10 | 256 | A | 7.0 | 43 | 436 | A | 4.1 | 23 | 349 | A | 1.4 | 5 | 275 | A | 0.8 | 2 | 231 |
| **Route 28 at I-93 SB Off-Ramp** | **F** | **138.2** | - | - | **A** | **6.8** | - | - | **A** | **6.6** | - | - | **A** | **9.3** | - | - | **F** | **101.7** | - | - | **A** | **2.5** | - | - |
| I-93 SB Off-Ramp WB right | A | 0.9 | 0 | 2 | A | 0.4 | 0 | 0 | A | 0.4 | 0 | 0 | A | 4.5 | 1 | 52 | B | 16.9 | 3 | 84 | A | 1.8 | 0 | 50 |
| Route 28 NB thru \| thru | F | 146.9 | 832 | 1555 | A | 7.1 | 24 | 276 | A | 6.9 | 23 | 258 | A | 9.6 | 41 | 416 | F | 107.1 | 582 | 1481 | A | 2.5 | 0 | 0 |
| **Route 28 at I-93 SB Off-Ramp** | **B** | **16.6** | - | - | **B** | **13.5** | - | - | **B** | **13.2** | - | - | **A** | **5.4** | - | - | **A** | **5.4** | - | - | **A** | **6.7** | - | - |
| I-93 SB Off-Ramp EB right | A | 0.9 | 1 | 103 | A | 1.1 | 1 | 122 | A | 1.0 | 1 | 116 | A | 0.8 | 1 | 94 | A | 0.9 | 1 | 114 | A | 0.9 | 1 | 121 |
| Route 28 SB thru \| thru | C | 22.9 | 0 | 44 | B | 18.3 | 0 | 42 | B | 18.0 | 0 | 42 | A | 7.2 | 0 | 0 | A | 7.2 | 0 | 0 | A | 9.3 | 0 | 14 |
| **Route 28 at I-93 NB Off-Ramp** | **A** | **9.8** | - | - | **A** | **1.3** | - | - | **A** | **1.3** | - | - | **A** | **1.1** | - | - | **B** | **13.9** | - | - | **A** | **1.0** | - | - |
| I-93 NB Off-Ramp WB right | B | 10.2 | 27 | 144 | A | 0.9 | 0 | 47 | A | 0.9 | 0 | 29 | A | 0.1 | 0 | 0 | A | 7.0 | 21 | 111 | A | 0.1 | 0 | 0 |
| Route 28 NB thru \| thru | A | 9.6 | 18 | 314 | A | 1.7 | 0 | 0 | A | 1.6 | 0 | 0 | A | 1.8 | 0 | 0 | B | 18.9 | 59 | 516 | A | 1.7 | 0 | 0 |
| **Route 28 at I-93 NB Off-Ramp** | **A** | **3.7** | - | - | **A** | **5.9** | - | - | **A** | **6.2** | - | - | **A** | **4.6** | - | - | **A** | **4.9** | - | - | **A** | **5.4** | - | - |
| I-93 NB Off-Ramp EB right | A | 7.1 | 62 | 159 | A | 9.4 | 76 | 164 | B | 10.3 | 82 | 164 | A | 8.3 | 68 | 162 | A | 8.6 | 70 | 162 | A | 8.2 | 64 | 162 |
| Route 28 SB thru \| thru | A | 1.3 | 1 | 107 | A | 3.7 | 9 | 313 | A | 3.7 | 8 | 293 | A | 2.3 | 4 | 235 | A | 2.6 | 5 | 221 | A | 3.4 | 7 | 280 |

*(1) – No-build with Roundabout at Route 28 and Chickatawbut Rd,*
*(2) – No-build with Roundabout at Route 28 and Chickatawbut Rd and Metering on Route 28 legs*

HOWARD STEIN HUDSON

Engineers + Planners

# Appendix C

## Route 28 at Chickatawbut Road Traffic Sensitivity Memorandum – May 2023

| | | | |
|---|---|---|---|
| TO: | Joshua Bartus, Project Manager - MassDOT<br>James Danila, PE PTOE, State Traffic Engineer - MassDOT | DATE: | May 4, 2023 |
| FROM: | Andrew Fabiszewski - Howard Stein Hudson | HSH PROJECT NO.: | 2021055.15 |
| SUBJECT: | Milton Rte 28 at Chickatawbut Rd – Roundabout Metering Sensitivity Analysis | | |

## Background

The Randolph Avenue (Route 28)/Chickatawbut Road intersection is undergoing 75% design for the needed improvements to enhance safety and operations. At the Design Public Hearing (October 27, 2022), several community concerns were brought up regarding the availability of gaps for traffic on Chickatawbut Road to be able to turn onto Randolph Avenue. As a result of these concerns, HSH was asked to evaluate roundabout metering signals to be able to control traffic flows along Route 28 and provide gaps for Chickatawbut Road to enter the intersection with Route 28. Chickatawbut Road is intended to function as a Department of Conservation and Recreation (DCR) parkway providing access to environmentally sensitive parkland and recreation opportunities. However, while Chickatawbut Road serves as an important neighborhood connection for local residents, much of the traffic utilizing this road is cutting through to avoid regional congestion along I-93. The roundabout is expected to see significant queuing along Chickatawbut Road due to a lack of gaps in Route 28. This memorandum assesses the traffic that is likely to divert from Chickatawbut Road due to increased queues and performs a sensitivity analysis to assess traffic operations at the roundabout considering these potential diversions.

## Data Collection and Methodology

***Howard Stein Hudson (HSH)*** used the Massachusetts Department of Transportation's (MassDOT's) INRIX data subscription to conduct segment analyses for all movements along Chickatawbut Road approaching the Randolph Avenue intersection (eastbound/westbound lefts, throughs, and rights). The data was collected as the average of Tuesday-Thursday for 2022 during the a.m. and p.m. peak periods. The Origin-Destinations are grouped by Traffic Analysis Zones (TAZs) to show the general geographic areas of where the trips begin and end. The INRIX data maps are included in **Appendix A** to this memo.

The segment route origins were then assessed as to the likelihood of diversion by comparing the route to other potential travel routes. If an equally viable alternative route was identified, the

percentage from that route was diverted away from the Chickatawbut Road approach to Randolph Avenue. The new traffic volumes were then factored by an increase of 10% and a decrease of 10% as well as the baseline to be utilized for a sensitivity analysis on the impact in queueing and delays on Chickatawbut Road with SIDRA traffic operations analysis.

## Route Alternatives

The origin and destination maps shown in **Appendix A** highlight where most drivers utilizing the segments are starting and ending their trips. For each of these movements, we identified alternative routes for the non-local drivers to utilize as follows:

- Eastbound Left
  - The relatively small number of vehicles from the further west TAZs (TAZ 1541 – Dover, MA; TAZ 1614 – Westwood, MA; and TAZ 1674/1676 – Canton, MA) can utilize I-93 eastbound and head north on Route 28.
- Eastbound Through
  - TAZ's to the North (TAZ 1071/1072/1077 – Milton, MA) have the alternative of utilizing Reedsdale Road to access Route 28 to Chickatawbut Road.
- Eastbound Right
  - Like the eastbound through movement, TAZ's to the north (TAZ 0409/0413 – Boston, MA; and TAZ 1071/1072 – Milton, MA) have the alternative of utilizing Reedsdale Road to access Route 28 to Chickatawbut Road.
- Westbound Left
  - Many vehicles are seen are coming from TAZ's north as far as Boston (TAZ 0154/0386 – Boston, MA; and TAZ 1081/1087/1099/1109/1111 – Quincy, MA), indicating that some are getting off I-93 to utilize Chickatawbut Road; these would be assumed to stay on I-93 in this re-route.
- Westbound Through
  - TAZ's to the north (TAZ 1081/1087 – Quincy, MA) have the alternative of utilizing East Milton Square to Pleasant Street to access Route 28 to Chickatawbut Road.
- Westbound Right
  - TAZ's to the southeast (TAZ 1794/797/1799 – Braintree, MA) have the alternative of utilizing I-93 to Route 28 and continuing north rather than cutting through on Chickatawbut Road.

## Operations Analysis

Traffic operations analysis was conducted using SIDRA Intersection, an industry standard software for analyzing roundabout operations. The previous SIDRA traffic operations without roundabout metering and with rerouting as a result are shown in **Table 1.** Metering signals were added in SIDRA to assess the traffic operations impacts of signals stopping the mainline Route 28 traffic to provide more gaps for Chickatawbut Road traffic to utilize the roundabout. The metered signals were set to activate based on a 600 feet queue (roughly 24 vehicles) along Chickatawbut Road. It will result in a maximum of a 110-second cycle length, giving Chickatawbut Road a 10-second gap every roughly two (2) minutes. The roundabout metering will be conducted directionally depending on the peak hour, with the northbound approach metered during the a.m. peak hour and the southbound approach metered in the p.m. peak hour. **Table 2 Table 2**shows the SIDRA operations analysis for the intersection with roundabout metering and rerouted traffic. The SIDRA outputs are included in **Appendix B**.

*Table 1. Roundabout Traffic Operations Without Metering Analysis*

| Intersection/Movement | LOS | Delay (Sec) | V/C Ratio | 50% Queue (ft) | 95% Queue (ft) | LOS | Delay (Sec) | V/C Ratio | 50% Queue (ft) | 95% Queue (ft) | LOS | Delay (Sec) | V/C Ratio | 50% Queue (ft) | 95% Queue (ft) | LOS | Delay (Sec) | V/C Ratio | 50% Queue (ft) | 95% Queue (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Volumes | | | | | Reroute Sensitivity | | | | | +10% Reroute Sensitivity | | | | | -10% Reroute Sensitivity | | | | |
| **a.m. Peak Hour** | | | | | | | | | | | | | | | | | | | | |
| **Rte 28/Chickatawbut Rd** | **D** | **26.4** | - | - | - | **C** | **19.2** | - | - | - | **C** | **16.0** | - | - | - | **C** | **23.7** | - | - | - |
| Chickatawbut EB | B | 10.2 | 0.31 | 13 | 32 | A | 9.1 | 0.24 | 9 | 23 | A | 8.8 | 0.22 | 8 | 21 | A | 9.4 | 0.26 | 10 | 26 |
| Chickatawbut WB | F | 117.9 | 1.12 | 229 | 570 | F | 74.4 | 0.97 | 99 | 276 | F | 53.8 | 0.87 | 61 | 171 | F | 102.4 | 1.07 | 172 | 464 |
| Route 28 NB approach | B | 13.2 | 0.69 | 100 | 249 | B | 12.2 | 0.67 | 68 | 161 | B | 12.0 | 0.66 | 59 | 143 | B | 12.5 | 0.68 | 79 | 190 |
| Route 28 SB approach | B | 10.6 | 0.53 | 42 | 105 | B | 10.6 | 0.54 | 43 | 106 | B | 10.2 | 0.52 | 41 | 101 | B | 10.7 | 0.54 | 43 | 107 |
| **p.m. Peak Hour** | | | | | | | | | | | | | | | | | | | | |
| **Rte 28/Chickatawbut Rd** | **E** | **41.4** | - | - | - | **B** | **13.1** | - | - | - | **B** | **14.3** | - | - | - | **B** | **12.1** | - | - | - |
| Chickatawbut EB | F | 190.5 | 1.28 | 360 | 895 | D | 30.2 | 0.59 | 31 | 80 | E | 36.0 | 0.66 | 38 | 99 | D | 25.8 | 0.51 | 25 | 64 |
| Chickatawbut WB | C | 15.1 | 0.59 | 44 | 110 | B | 10.3 | 0.39 | 20 | 51 | B | 11.2 | 0.43 | 24 | 61 | A | 9.5 | 0.35 | 17 | 42 |
| Route 28 NB approach | A | 6.4 | 0.32 | 18 | 45 | A | 6.0 | 0.30 | 17 | 43 | A | 6.1 | 0.31 | 18 | 44 | A | 5.9 | 0.30 | 17 | 42 |
| Route 28 SB approach | C | 21.7 | 0.83 | 204 | 506 | B | 14.9 | 0.73 | 134 | 340 | C | 15.8 | 0.75 | 145 | 372 | B | 14.1 | 0.71 | 121 | 304 |

*Table 2. Roundabout With Metering Traffic Operations Comparison*

| Intersection/ Movement | LOS | Delay (Sec) | V/C Ratio | 50% Queue (ft) | 95% Queue (ft) | LOS | Delay (Sec) | V/C Ratio | 50% Queue (ft) | 95% Queue (ft) | LOS | Delay (Sec) | V/C Ratio | 50% Queue (ft) | 95% Queue (ft) | LOS | Delay (Sec) | V/C Ratio | 50% Queue (ft) | 95% Queue (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Volumes | | | | | Reroute Sensitivity | | | | | +10% Reroute Sensitivity | | | | | -10% Reroute Sensitivity | | | | |
| **a.m. Peak Hour** | | | | | | | | | | | | | | | | | | | | |
| **Rte 28/Chickatawbut Rd** | **C** | **17.5** | - | - | - | **B** | **12.5** | - | - | - | **B** | **11.3** | - | - | - | **C** | **15.3** | - | - | - |
| Chickatawbut EB approach | A | 7.1 | 0.31 | 13 | 32 | A | 6.3 | 0.24 | 9 | 23 | A | 6.0 | 0.21 | 8 | 21 | A | 6.5 | 0.26 | 10 | 26 |
| Chickatawbut WB approach | E | 41.1 | 0.82 | 109 | 271 | D | 34.8 | 0.77 | 74 | 185 | D | 28.4 | 0.69 | 57 | 142 | E | 38.6 | 0.80 | 98 | 243 |
| Route 28 NB approach | C | 18.2 | 0.88 | 645 | 1053 | B | 10.9 | 0.80 | 611 | 997 | B | 10.5 | 0.79 | 599 | 978 | B | 14.7 | 0.84 | 637 | 1039 |
| Route 28 SB approach | A | 6.0 | 0.51 | 33 | 82 | A | 6.2 | 0.52 | 34 | 84 | A | 6.1 | 0.51 | 34 | 83 | A | 6.2 | 0.51 | 34 | 84 |
| **p.m. Peak Hour** | | | | | | | | | | | | | | | | | | | | |
| **Rte 28/Chickatawbut Rd** | **D** | **28.2** | - | - | - | **B** | **10.6** | - | - | - | **A** | **9.4** | - | - | - | **B** | **12.1** | - | - | - |
| Chickatawbut EB approach | F | 68.7 | 0.96 | 135 | 336 | C | 22.3 | 0.58 | 39 | 96 | C | 19.2 | 0.51 | 32 | 80 | D | 26.5 | 0.65 | 46 | 115 |
| Chickatawbut WB approach | A | 9.9 | 0.56 | 34 | 84 | A | 6.7 | 0.40 | 20 | 49 | A | 6.0 | 0.36 | 17 | 41 | A | 7.5 | 0.44 | 23 | 57 |
| Route 28 NB approach | A | 2.1 | 0.30 | 16 | 40 | A | 2.3 | 0.30 | 17 | 43 | A | 2.2 | 0.30 | 17 | 42 | A | 2.4 | 0.31 | 18 | 44 |
| Route 28 SB approach | E | 35.5 | 1.01 | 887 | 1448 | B | 13.1 | 0.84 | 651 | 1063 | B | 11.8 | 0.82 | 611 | 998 | B | 14.8 | 0.87 | 704 | 1148 |

## Traffic Operations Summary

As shown in **Table 1**, the rerouted operations indicate that if the queueing conditions on Chickatawbut Road become poor as a result of the roundabout, there are many vehicles who are not reliant on Chickatawbut Road that have the potential to re-route and result in more acceptable levels of service. In comparing **Table 1** to **Table 2**, the traffic operations with roundabout metering are greatly improved along the Chickatawbut Road approaches compared to the previously conducted analysis. The Chickatawbut Road eastbound and westbound approaches show substantial decreases in queueing while the mainline Route 28 shows increased queueing, more like the existing condition, in the peak direction (northbound in the a.m. and southbound in the p.m.). The peak directional queueing and metering along Route 28 may also help residents who are concerned with the inability to exit their driveways along Route 28 as this will create breaks in the traffic. Were the roundabout metering option to be further pursued, a more detailed investigation with more time periods would need to be conducted to see if metering is necessary outside of the peak hours. Due to the hourly variation of traffic along Route 28 and Chickatawbut Road, it is possible that metering would only need to occur during peak periods.

However, there are potential drawbacks to consider; the roundabout metering may improve operations along Chickatawbut Road, inducing more regional traffic to utilize Chickatawbut Road, a DCR parkway through sensitive environmental areas, to avoid I-93. Were this to be the case, we would recommend coordination with DCR and investigating further changes to the queue length detection of the roundabout metering to find a proper balance of acceptable Chickatawbut Road operations with accommodating the local traffic.

HOWARD STEIN HUDSON

Engineers + Planners

# Appendix A

## INRIX Data

Figure 1. ***Chickatawbut Road Eastbound Left-turn Segment Analysis, a.m. Peak Period***

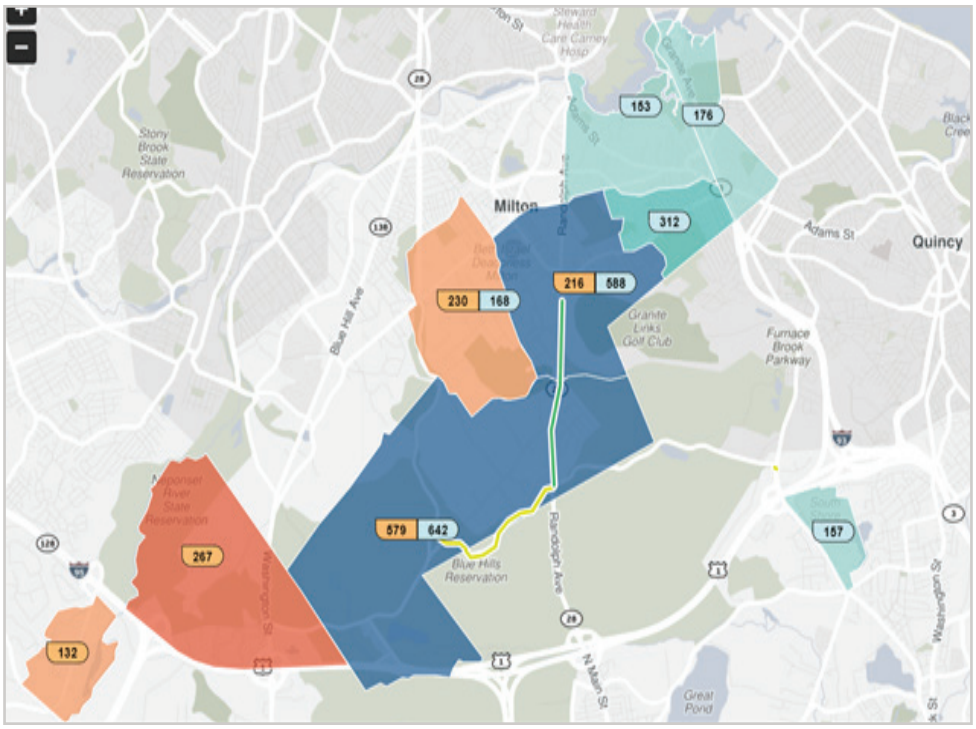



Figure 2. ***Chickatawbut Road Eastbound Left-turn Segment Analysis, p.m. Peak Period***

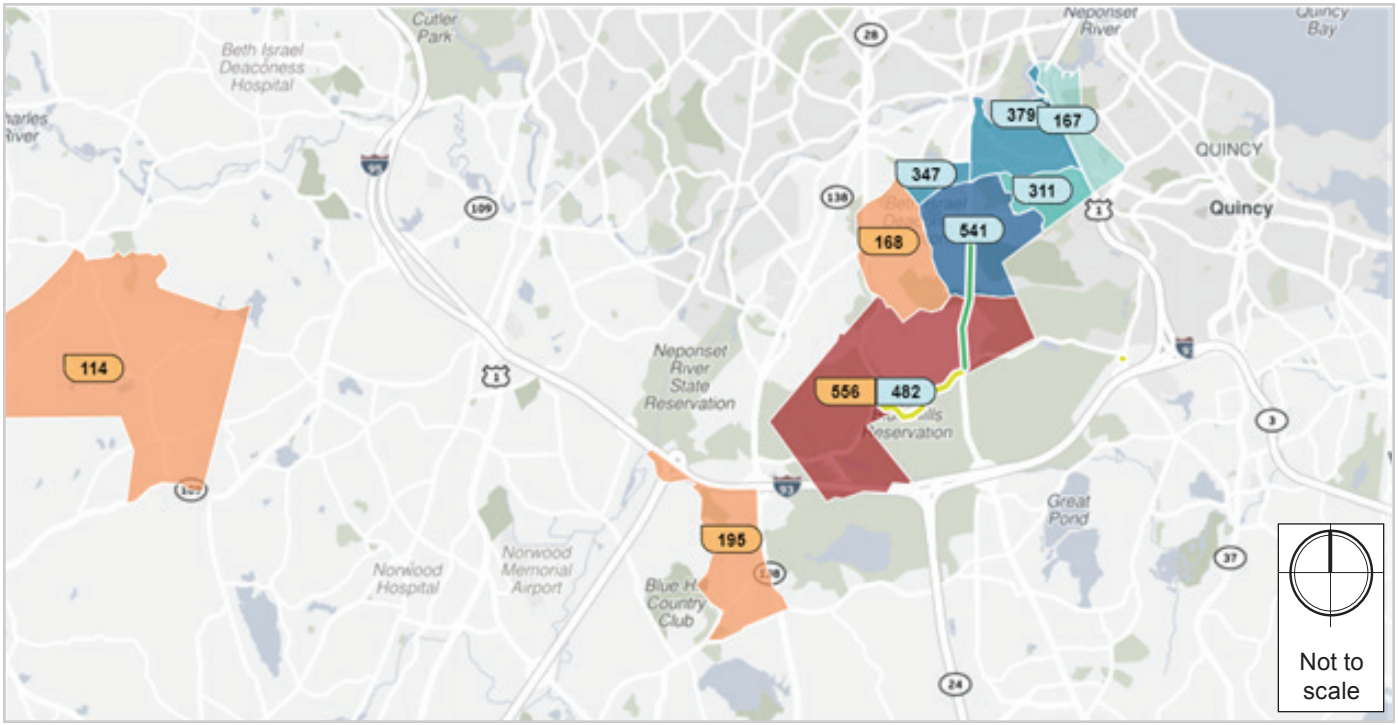


Figure 3. ***Chickatawbut Road Eastbound Through Segment Analysis, a.m. Peak Period***

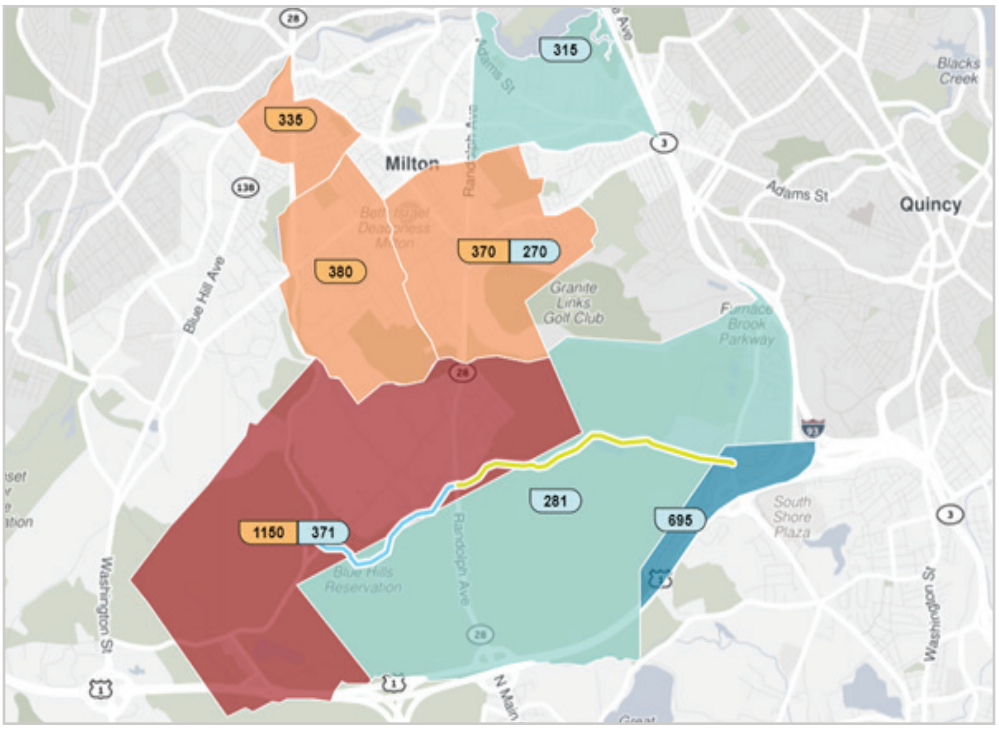
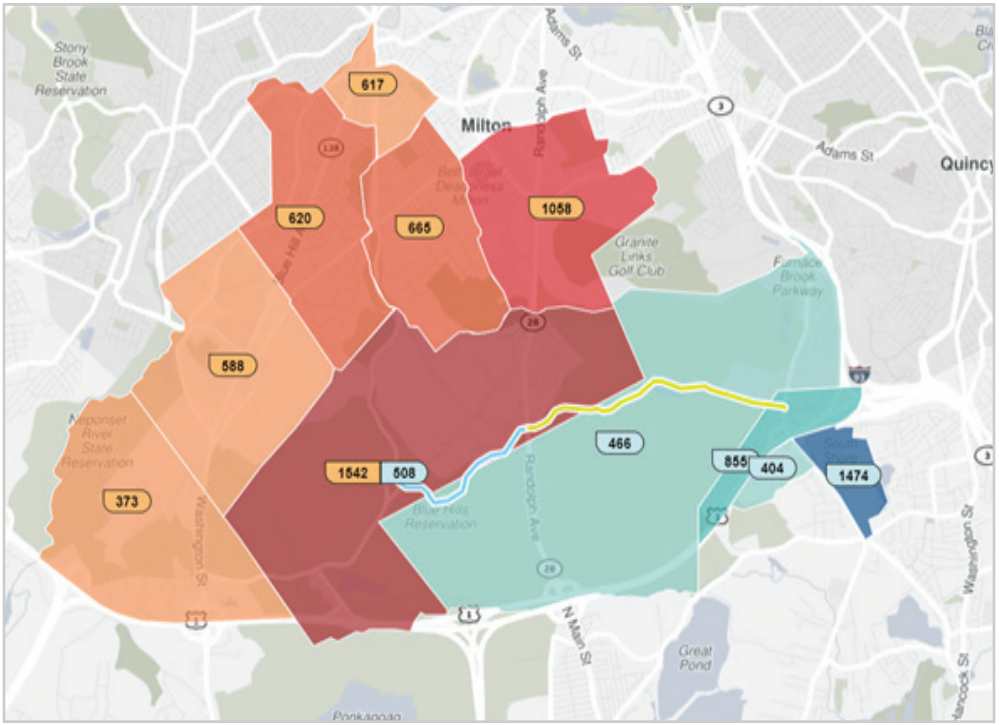



Figure 4. ***Chickatawbut Road Eastbound Through Segment Analysis, p.m. Peak Period***




Not to scale

Figure 5. ***Chickatawbut Road Eastbound Right-turn Segment Analysis, a.m. Peak Hour***

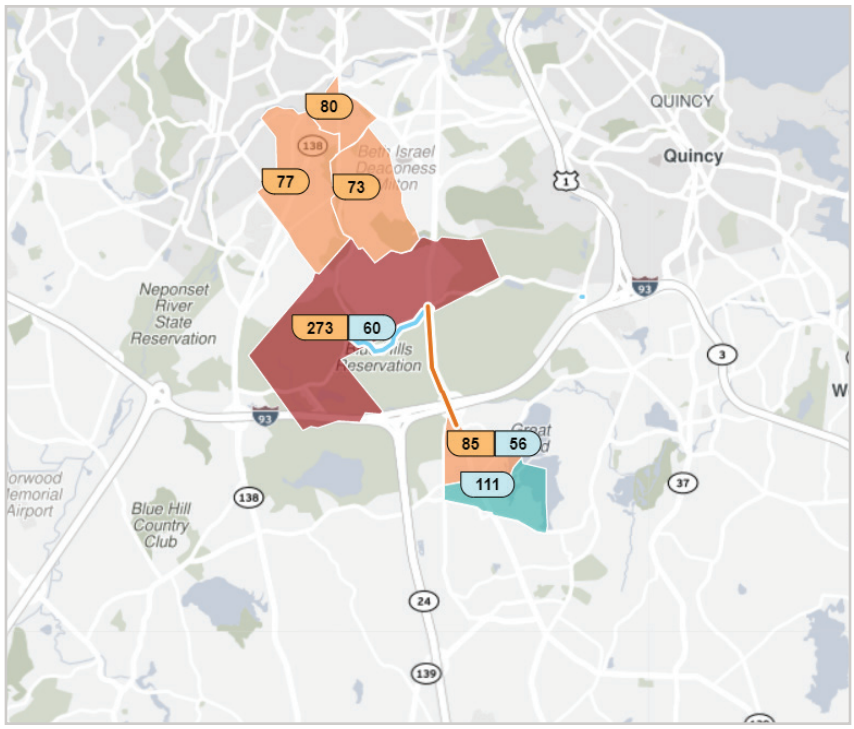



Figure 6. ***Chickatawbut Road Eastbound Right-turn Segment Analysis, a.m. Peak Period***

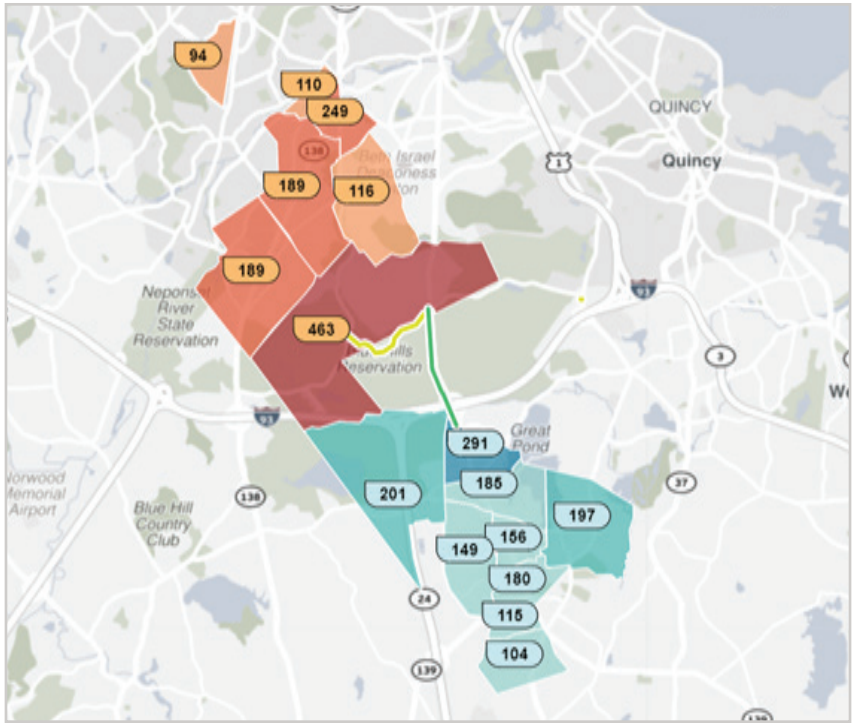


Figure 7. ***Chickatawbut Road Westbound Left-turn Segment Analysis, a.m. Peak Period***

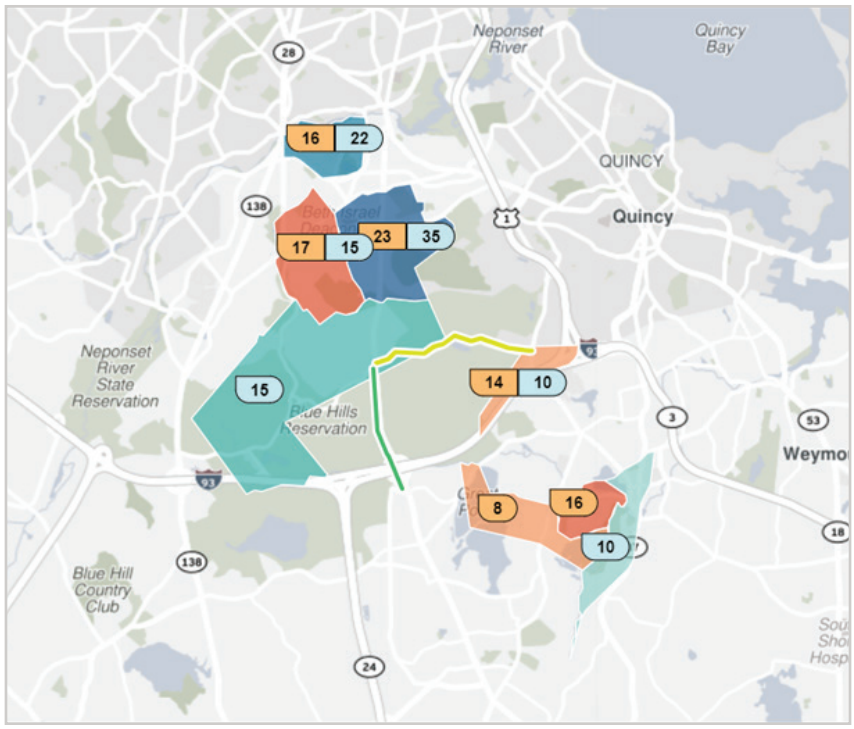
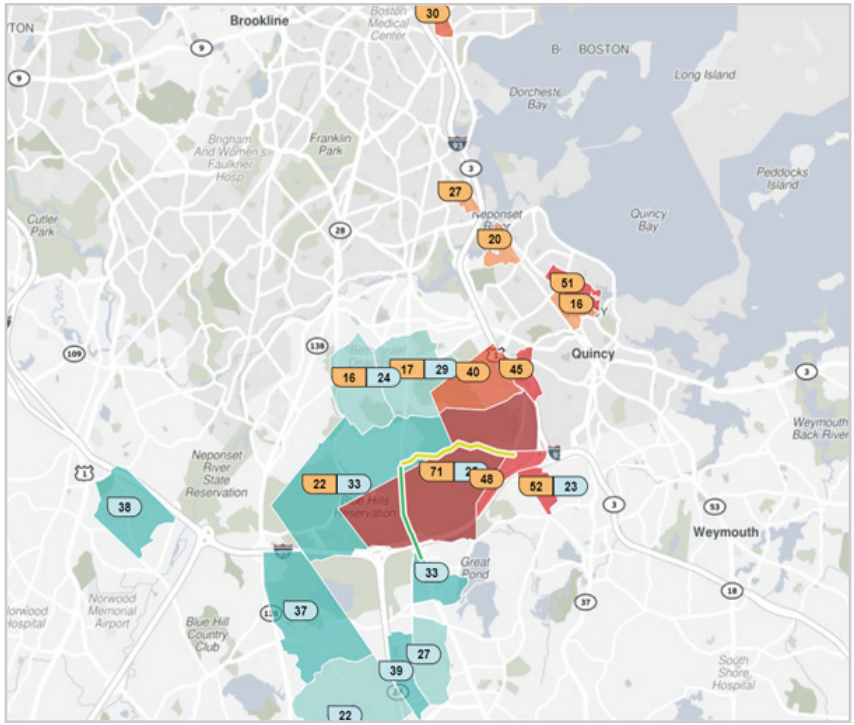



Figure 8. ***Chickatawbut Road Westbound Left-turn Segment Analysis, p.m. Peak Period***




Not to scale

Figure 9. ***Chickatawbut Road Westbound Through Segment Analysis, a.m. Peak Hour***

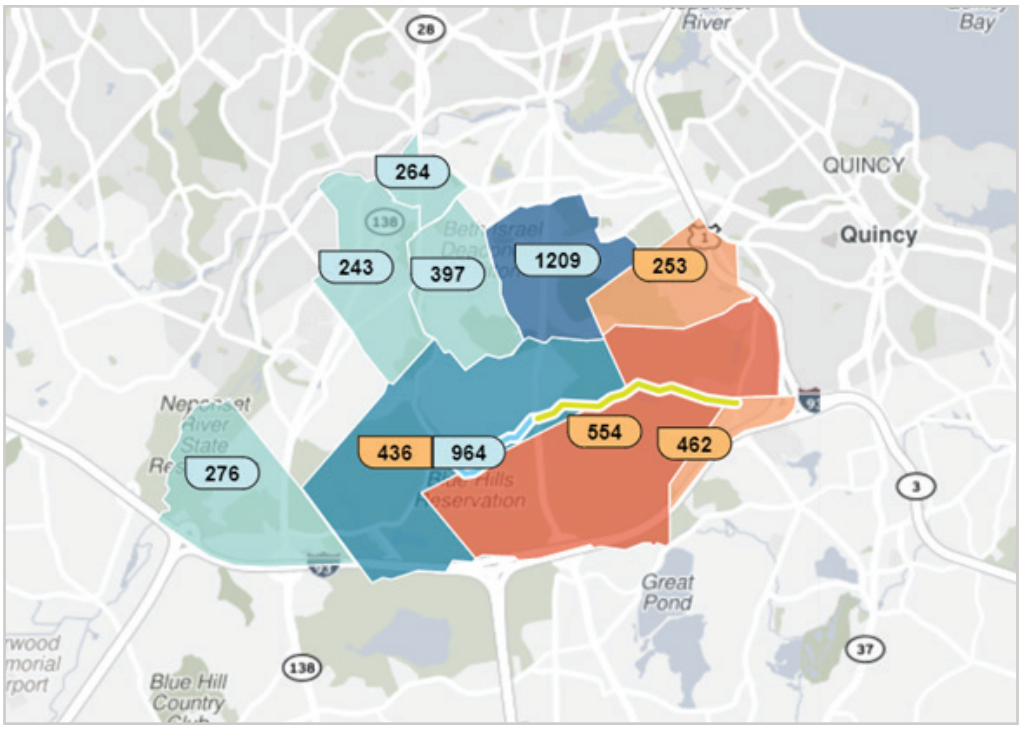
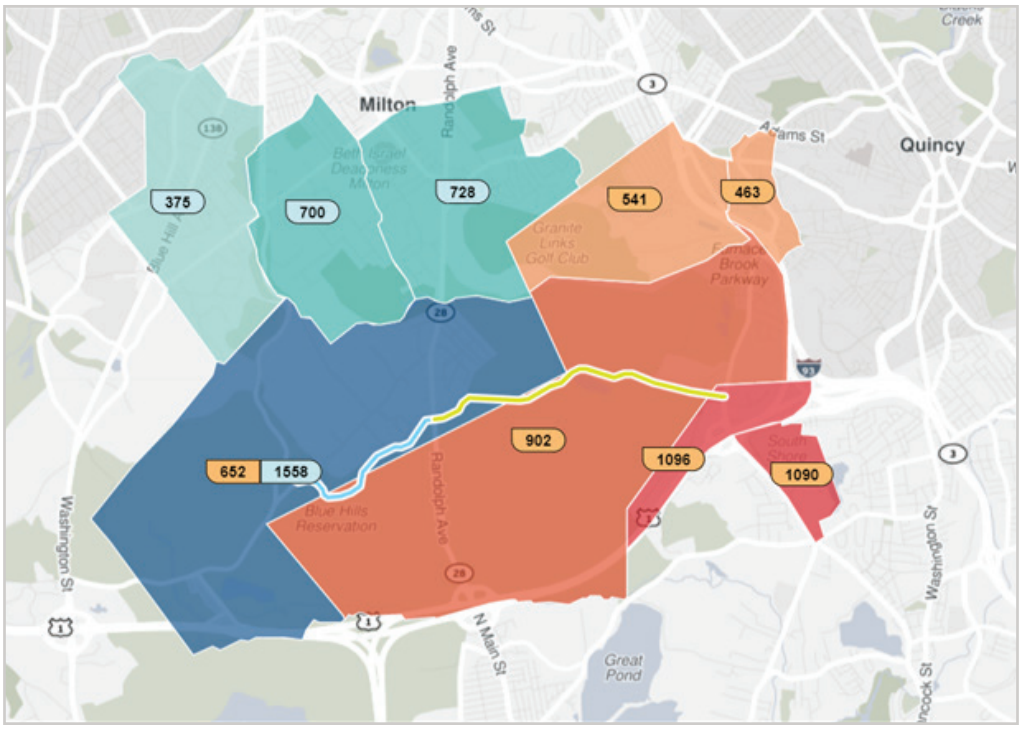



Figure 10. ***Chickatawbut Road Westbound Through Segment Analysis, p.m. Peak Hour***




Not to scale

Figure 11. ***Chickatawbut Road Westbound Right-turn Segment Analysis, a.m. Peak Period***

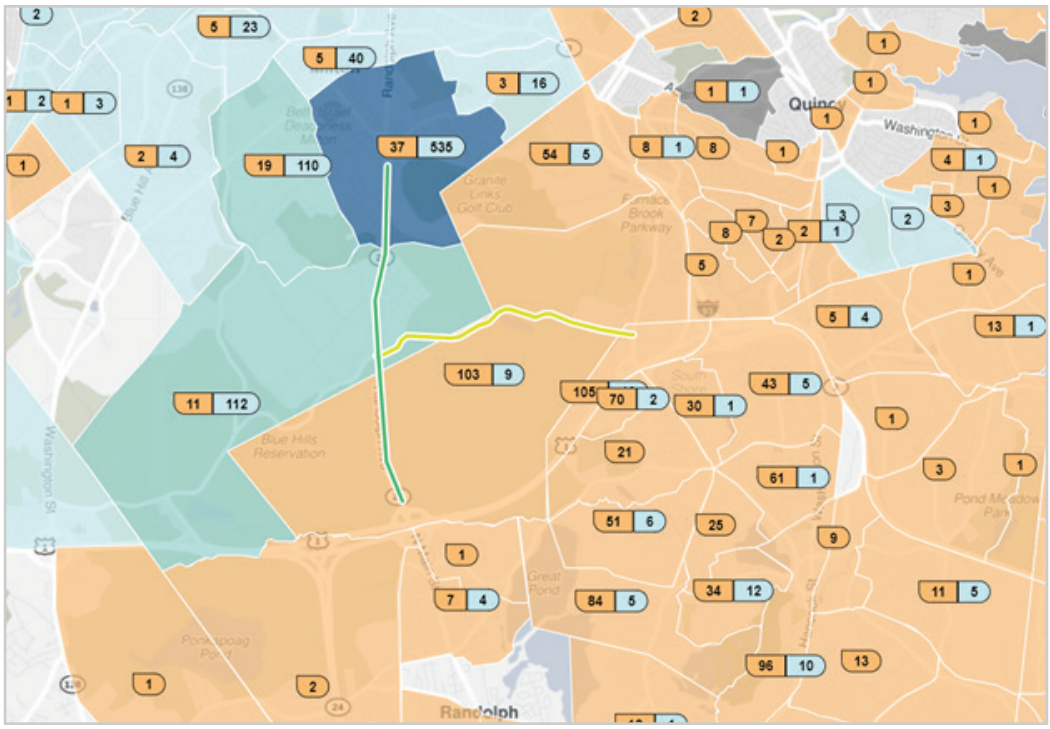
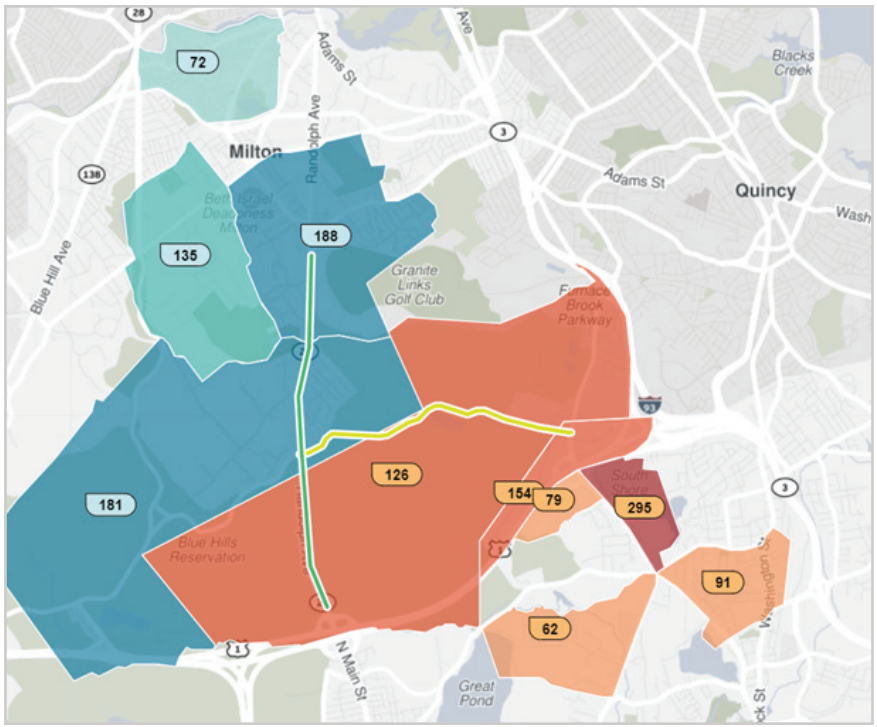



Figure 12. ***Chickatawbut Road Westbound Right-turn Segment Analysis p.m. Peak Period***




Not to scale

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# Appendix B

SIDRA

# MOVEMENT SUMMARY

## Site: 101 [Roundabout metered - AM Base (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout Metering

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 202 | 0.0 | 220 | 0.0 | 0.878 | 18.2 | LOS C | 41.8 | 1052.7 | 0.98 | 0.95 | 1.42 | 28.4 |
| 8 | T1 | 1232 | 1.3 | 1339 | 1.3 | 0.878 | 18.2 | LOS C | 41.8 | 1052.7 | 0.98 | 0.95 | 1.42 | 28.7 |
| 18 | R2 | 37 | 0.0 | 40 | 0.0 | 0.878 | 18.2 | LOS C | 41.7 | 1052.3 | 0.98 | 0.95 | 1.42 | 28.1 |
| Approach | | 1471 | 1.1 | 1599 | 1.1 | 0.878 | 18.2 | LOS C | 41.8 | 1052.7 | 0.98 | 0.95 | 1.42 | 28.6 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 21 | 0.0 | 23 | 0.0 | 0.823 | 39.0 | LOS E | 10.8 | 271.3 | 1.00 | 1.49 | 2.52 | 22.2 |
| 6 | T1 | 205 | 0.5 | 220 | 0.5 | 0.823 | 39.0 | LOS E | 10.8 | 271.3 | 1.00 | 1.49 | 2.52 | 22.2 |
| 16 | R2 | 144 | 0.0 | 155 | 0.0 | 0.823 | 39.0 | LOS E | 10.8 | 271.3 | 1.00 | 1.49 | 2.52 | 21.9 |
| Approach | | 370 | 0.3 | 398 | 0.3 | 0.823 | 41.1 | LOS E | 10.8 | 271.3 | 1.00 | 1.49 | 2.52 | 22.1 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 65 | 0.0 | 69 | 0.0 | 0.510 | 7.4 | LOS A | 3.2 | 82.1 | 0.66 | 0.60 | 0.71 | 33.9 |
| 4 | T1 | 585 | 2.0 | 622 | 2.0 | 0.510 | 7.5 | LOS A | 3.2 | 82.1 | 0.61 | 0.54 | 0.65 | 34.4 |
| 14 | R2 | 30 | 0.0 | 32 | 0.0 | 0.230 | 3.3 | LOS A | 1.0 | 26.2 | 0.51 | 0.41 | 0.51 | 34.7 |
| Approach | | 680 | 1.7 | 723 | 1.7 | 0.510 | 6.0 | LOS A | 3.2 | 82.1 | 0.61 | 0.54 | 0.65 | 34.4 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 45 | 0.0 | 49 | 0.0 | 0.312 | 5.9 | LOS A | 1.3 | 31.8 | 0.62 | 0.62 | 0.62 | 34.0 |
| 2 | T1 | 85 | 0.0 | 92 | 0.0 | 0.312 | 5.9 | LOS A | 1.3 | 31.8 | 0.62 | 0.62 | 0.62 | 34.0 |
| 12 | R2 | 91 | 0.0 | 99 | 0.0 | 0.312 | 10.2 | LOS B | 1.3 | 31.8 | 0.62 | 0.62 | 0.62 | 33.2 |
| Approach | | 221 | 0.0 | 240 | 0.0 | 0.312 | 7.1 | LOS A | 1.3 | 31.8 | 0.62 | 0.62 | 0.62 | 33.7 |
| All Vehicles | | 2742 | 1.0 | 2960 | 1.0 | 0.878 | 17.5 | LOS C | 41.8 | 1052.7 | 0.86 | 0.90 | 1.31 | 29.0 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Roundabout metered - AM Sensitivity (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout Metering

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 202 | 0.0 | 220 | 0.0 | 0.800 | 10.9 | LOS B | 39.6 | 997.1 | 0.88 | 0.65 | 0.96 | 31.2 |
| 8 | T1 | 1232 | 1.3 | 1339 | 1.3 | 0.800 | 10.9 | LOS B | 39.6 | 997.1 | 0.88 | 0.65 | 0.97 | 31.5 |
| 18 | R2 | 37 | 0.0 | 40 | 0.0 | 0.800 | 10.9 | LOS B | 39.5 | 996.7 | 0.88 | 0.65 | 0.97 | 30.9 |
| Approach | | 1471 | 1.1 | 1599 | 1.1 | 0.800 | 10.9 | LOS B | 39.6 | 997.1 | 0.88 | 0.65 | 0.97 | 31.5 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 17 | 0.0 | 18 | 0.0 | 0.765 | 33.5 | LOS D | 7.4 | 184.9 | 0.94 | 1.28 | 2.05 | 23.7 |
| 6 | T1 | 187 | 0.5 | 201 | 0.5 | 0.765 | 33.5 | LOS D | 7.4 | 184.9 | 0.94 | 1.28 | 2.05 | 23.7 |
| 16 | R2 | 120 | 0.0 | 129 | 0.0 | 0.765 | 33.5 | LOS D | 7.4 | 184.9 | 0.94 | 1.28 | 2.05 | 23.3 |
| Approach | | 324 | 0.3 | 348 | 0.3 | 0.765 | 34.8 | LOS D | 7.4 | 184.9 | 0.94 | 1.28 | 2.05 | 23.6 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 65 | 0.0 | 69 | 0.0 | 0.515 | 7.6 | LOS A | 3.3 | 84.0 | 0.67 | 0.61 | 0.73 | 33.8 |
| 4 | T1 | 585 | 2.0 | 622 | 2.0 | 0.515 | 7.6 | LOS A | 3.3 | 84.0 | 0.62 | 0.55 | 0.66 | 34.4 |
| 14 | R2 | 30 | 0.0 | 32 | 0.0 | 0.232 | 3.4 | LOS A | 1.1 | 26.6 | 0.51 | 0.42 | 0.51 | 34.7 |
| Approach | | 680 | 1.7 | 723 | 1.7 | 0.515 | 6.2 | LOS A | 3.3 | 84.0 | 0.62 | 0.55 | 0.66 | 34.3 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 34 | 0.0 | 37 | 0.0 | 0.237 | 4.9 | LOS A | 0.9 | 23.0 | 0.59 | 0.59 | 0.59 | 34.5 |
| 2 | T1 | 63 | 0.0 | 68 | 0.0 | 0.237 | 4.9 | LOS A | 0.9 | 23.0 | 0.59 | 0.59 | 0.59 | 34.4 |
| 12 | R2 | 71 | 0.0 | 77 | 0.0 | 0.237 | 9.0 | LOS A | 0.9 | 23.0 | 0.59 | 0.59 | 0.59 | 33.7 |
| Approach | | 168 | 0.0 | 183 | 0.0 | 0.237 | 6.3 | LOS A | 0.9 | 23.0 | 0.59 | 0.59 | 0.59 | 34.1 |
| All Vehicles | | 2643 | 1.1 | 2853 | 1.1 | 0.800 | 12.5 | LOS B | 39.6 | 997.1 | 0.80 | 0.70 | 1.00 | 31.0 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Roundabout metered - AM Sensitivity - (-10%) (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout Metering

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 202 | 0.0 | 220 | 0.0 | 0.793 | 10.5 | LOS B | 38.8 | 977.6 | 0.86 | 0.61 | 0.92 | 31.4 |
| 8 | T1 | 1232 | 1.3 | 1339 | 1.3 | 0.793 | 10.5 | LOS B | 38.8 | 977.6 | 0.87 | 0.61 | 0.93 | 31.8 |
| 18 | R2 | 37 | 0.0 | 40 | 0.0 | 0.793 | 10.5 | LOS B | 38.7 | 977.1 | 0.87 | 0.61 | 0.93 | 31.1 |
| Approach | | 1471 | 1.1 | 1599 | 1.1 | 0.793 | 10.5 | LOS B | 38.8 | 977.6 | 0.87 | 0.61 | 0.93 | 31.7 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 15 | 0.0 | 16 | 0.0 | 0.685 | 27.1 | LOS D | 5.7 | 141.6 | 0.91 | 1.16 | 1.73 | 25.5 |
| 6 | T1 | 168 | 0.5 | 181 | 0.5 | 0.685 | 27.1 | LOS D | 5.7 | 141.6 | 0.91 | 1.16 | 1.73 | 25.4 |
| 16 | R2 | 108 | 0.0 | 116 | 0.0 | 0.685 | 27.1 | LOS D | 5.7 | 141.6 | 0.91 | 1.16 | 1.73 | 25.0 |
| Approach | | 291 | 0.3 | 313 | 0.3 | 0.685 | 28.4 | LOS D | 5.7 | 141.6 | 0.91 | 1.16 | 1.73 | 25.3 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 65 | 0.0 | 69 | 0.0 | 0.513 | 7.5 | LOS A | 3.3 | 83.2 | 0.66 | 0.61 | 0.72 | 33.8 |
| 4 | T1 | 585 | 2.0 | 622 | 2.0 | 0.513 | 7.5 | LOS A | 3.3 | 83.2 | 0.62 | 0.55 | 0.66 | 34.4 |
| 14 | R2 | 30 | 0.0 | 32 | 0.0 | 0.231 | 3.4 | LOS A | 1.0 | 26.4 | 0.51 | 0.42 | 0.51 | 34.7 |
| Approach | | 680 | 1.7 | 723 | 1.7 | 0.513 | 6.1 | LOS A | 3.3 | 83.2 | 0.62 | 0.55 | 0.66 | 34.3 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 31 | 0.0 | 34 | 0.0 | 0.214 | 4.6 | LOS A | 0.8 | 20.5 | 0.58 | 0.57 | 0.58 | 34.6 |
| 2 | T1 | 57 | 0.0 | 62 | 0.0 | 0.214 | 4.6 | LOS A | 0.8 | 20.5 | 0.58 | 0.57 | 0.58 | 34.6 |
| 12 | R2 | 64 | 0.0 | 70 | 0.0 | 0.214 | 8.7 | LOS A | 0.8 | 20.5 | 0.58 | 0.57 | 0.58 | 33.8 |
| Approach | | 152 | 0.0 | 165 | 0.0 | 0.214 | 6.0 | LOS A | 0.8 | 20.5 | 0.58 | 0.57 | 0.58 | 34.2 |
| All Vehicles | | 2594 | 1.1 | 2800 | 1.1 | 0.793 | 11.3 | LOS B | 38.8 | 977.6 | 0.79 | 0.65 | 0.93 | 31.6 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Roundabout metered - AM Sensitivity - (+10%) (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout Metering

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 202 | 0.0 | 220 | 0.0 | 0.844 | 14.7 | LOS B | 41.2 | 1038.8 | 0.93 | 0.78 | 1.17 | 29.7 |
| 8 | T1 | 1232 | 1.3 | 1339 | 1.3 | 0.844 | 14.7 | LOS B | 41.2 | 1038.8 | 0.94 | 0.79 | 1.18 | 30.0 |
| 18 | R2 | 37 | 0.0 | 40 | 0.0 | 0.844 | 14.7 | LOS B | 41.1 | 1038.4 | 0.94 | 0.79 | 1.18 | 29.4 |
| Approach | | 1471 | 1.1 | 1599 | 1.1 | 0.844 | 14.7 | LOS B | 41.2 | 1038.8 | 0.94 | 0.79 | 1.18 | 29.9 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 19 | 0.0 | 20 | 0.0 | 0.802 | 36.6 | LOS E | 9.7 | 242.6 | 0.99 | 1.42 | 2.35 | 22.8 |
| 6 | T1 | 206 | 0.5 | 222 | 0.5 | 0.802 | 36.6 | LOS E | 9.7 | 242.6 | 0.99 | 1.42 | 2.35 | 22.8 |
| 16 | R2 | 132 | 0.0 | 142 | 0.0 | 0.802 | 36.6 | LOS E | 9.7 | 242.6 | 0.99 | 1.42 | 2.35 | 22.5 |
| Approach | | 357 | 0.3 | 384 | 0.3 | 0.802 | 38.6 | LOS E | 9.7 | 242.6 | 0.99 | 1.42 | 2.35 | 22.7 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 65 | 0.0 | 69 | 0.0 | 0.513 | 7.6 | LOS A | 3.3 | 84.0 | 0.67 | 0.61 | 0.72 | 33.8 |
| 4 | T1 | 585 | 2.0 | 622 | 2.0 | 0.513 | 7.6 | LOS A | 3.3 | 84.0 | 0.62 | 0.55 | 0.66 | 34.4 |
| 14 | R2 | 30 | 0.0 | 32 | 0.0 | 0.231 | 3.4 | LOS A | 1.1 | 26.7 | 0.51 | 0.42 | 0.51 | 34.7 |
| Approach | | 680 | 1.7 | 723 | 1.7 | 0.513 | 6.2 | LOS A | 3.3 | 84.0 | 0.62 | 0.55 | 0.66 | 34.3 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 37 | 0.0 | 40 | 0.0 | 0.260 | 5.2 | LOS A | 1.0 | 25.5 | 0.60 | 0.60 | 0.60 | 34.4 |
| 2 | T1 | 69 | 0.0 | 75 | 0.0 | 0.260 | 5.2 | LOS A | 1.0 | 25.5 | 0.60 | 0.60 | 0.60 | 34.3 |
| 12 | R2 | 78 | 0.0 | 85 | 0.0 | 0.260 | 9.4 | LOS A | 1.0 | 25.5 | 0.60 | 0.60 | 0.60 | 33.5 |
| Approach | | 184 | 0.0 | 200 | 0.0 | 0.260 | 6.5 | LOS A | 1.0 | 25.5 | 0.60 | 0.60 | 0.60 | 34.0 |
| All Vehicles | | 2692 | 1.1 | 2906 | 1.1 | 0.844 | 15.3 | LOS C | 41.2 | 1038.8 | 0.84 | 0.80 | 1.16 | 29.9 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Roundabout metered - PM Base (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout Metering

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 24 | 0.0 | 24 | 0.0 | 0.299 | 3.3 | LOS A | 1.6 | 39.9 | 0.44 | 0.30 | 0.44 | 35.8 |
| 8 | T1 | 632 | 1.8 | 638 | 1.8 | 0.299 | 3.3 | LOS A | 1.6 | 40.0 | 0.44 | 0.30 | 0.44 | 35.9 |
| 18 | R2 | 12 | 0.0 | 12 | 0.0 | 0.299 | 3.3 | LOS A | 1.6 | 40.0 | 0.44 | 0.30 | 0.44 | 34.9 |
| Approach | | 668 | 1.7 | 675 | 1.7 | 0.299 | 2.1 | LOS A | 1.6 | 40.0 | 0.44 | 0.30 | 0.44 | 35.9 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 244 | 0.4 | 254 | 0.4 | 0.556 | 11.1 | LOS B | 3.4 | 84.1 | 0.77 | 0.84 | 0.97 | 31.0 |
| 6 | T1 | 67 | 0.0 | 70 | 0.0 | 0.556 | 11.1 | LOS B | 3.4 | 84.1 | 0.77 | 0.84 | 0.97 | 30.9 |
| 16 | R2 | 71 | 0.0 | 74 | 0.0 | 0.556 | 11.1 | LOS B | 3.4 | 84.1 | 0.77 | 0.84 | 0.97 | 30.3 |
| Approach | | 382 | 0.3 | 398 | 0.3 | 0.556 | 9.9 | LOS A | 3.4 | 84.1 | 0.77 | 0.84 | 0.97 | 30.8 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 75 | 0.0 | 77 | 0.0 | 1.007 | 45.3 | LOS F | 57.0 | 1447.8 | 0.97 | 1.81 | 3.13 | 21.3 |
| 4 | T1 | 1003 | 2.1 | 1023 | 2.1 | 1.007 | 35.0 | LOS F | 57.0 | 1447.8 | 0.91 | 1.42 | 2.36 | 24.4 |
| 14 | R2 | 8 | 0.0 | 8 | 0.0 | 0.453 | 4.4 | LOS A | 6.8 | 174.0 | 0.77 | 0.64 | 0.77 | 33.8 |
| Approach | | 1086 | 1.9 | 1108 | 1.9 | 1.007 | 35.5 | LOS E | 57.0 | 1447.8 | 0.91 | 1.44 | 2.40 | 24.3 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 52 | 0.0 | 57 | 0.0 | 0.955 | 64.3 | LOS F | 13.3 | 335.5 | 1.00 | 1.55 | 2.74 | 18.1 |
| 2 | T1 | 108 | 0.0 | 117 | 0.0 | 0.955 | 64.3 | LOS F | 13.3 | 335.5 | 1.00 | 1.55 | 2.74 | 18.1 |
| 12 | R2 | 185 | 2.2 | 201 | 2.2 | 0.955 | 73.9 | LOS F | 13.3 | 335.5 | 1.00 | 1.55 | 2.74 | 17.9 |
| Approach | | 345 | 1.2 | 375 | 1.2 | 0.955 | 68.7 | LOS F | 13.3 | 335.5 | 1.00 | 1.55 | 2.74 | 18.0 |
| All Vehicles | | 2481 | 1.5 | 2556 | 1.5 | 1.007 | 28.2 | LOS D | 57.0 | 1447.8 | 0.78 | 1.06 | 1.71 | 26.0 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Roundabout metered - PM Sensitivity (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout Metering

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 24 | 0.0 | 24 | 0.0 | 0.302 | 3.4 | LOS A | 1.7 | 42.5 | 0.47 | 0.32 | 0.47 | 35.7 |
| 8 | T1 | 632 | 1.8 | 638 | 1.8 | 0.302 | 3.4 | LOS A | 1.7 | 42.6 | 0.47 | 0.32 | 0.47 | 35.8 |
| 18 | R2 | 12 | 0.0 | 12 | 0.0 | 0.302 | 3.5 | LOS A | 1.7 | 42.6 | 0.47 | 0.32 | 0.47 | 34.8 |
| Approach | | 668 | 1.7 | 675 | 1.7 | 0.302 | 2.3 | LOS A | 1.7 | 42.6 | 0.47 | 0.32 | 0.47 | 35.8 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 155 | 0.4 | 161 | 0.4 | 0.397 | 7.5 | LOS A | 1.9 | 48.6 | 0.70 | 0.72 | 0.77 | 32.5 |
| 6 | T1 | 55 | 0.0 | 57 | 0.0 | 0.397 | 7.5 | LOS A | 1.9 | 48.6 | 0.70 | 0.72 | 0.77 | 32.5 |
| 16 | R2 | 60 | 0.0 | 63 | 0.0 | 0.397 | 7.5 | LOS A | 1.9 | 48.6 | 0.70 | 0.72 | 0.77 | 31.8 |
| Approach | | 270 | 0.2 | 281 | 0.2 | 0.397 | 6.7 | LOS A | 1.9 | 48.6 | 0.70 | 0.72 | 0.77 | 32.3 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 75 | 0.0 | 77 | 0.0 | 0.843 | 14.2 | LOS B | 41.9 | 1063.1 | 0.99 | 0.92 | 1.29 | 30.2 |
| 4 | T1 | 1003 | 2.1 | 1023 | 2.1 | 0.843 | 13.1 | LOS B | 41.9 | 1063.1 | 0.88 | 0.77 | 1.08 | 31.7 |
| 14 | R2 | 8 | 0.0 | 8 | 0.0 | 0.380 | 3.4 | LOS A | 7.8 | 198.4 | 0.65 | 0.47 | 0.65 | 34.2 |
| Approach | | 1086 | 1.9 | 1108 | 1.9 | 0.843 | 13.1 | LOS B | 41.9 | 1063.1 | 0.88 | 0.78 | 1.09 | 31.6 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 43 | 0.0 | 47 | 0.0 | 0.578 | 19.7 | LOS C | 3.8 | 96.1 | 0.91 | 1.01 | 1.23 | 28.2 |
| 2 | T1 | 80 | 0.0 | 87 | 0.0 | 0.578 | 19.7 | LOS C | 3.8 | 96.1 | 0.91 | 1.01 | 1.23 | 28.1 |
| 12 | R2 | 93 | 2.2 | 101 | 2.2 | 0.578 | 27.0 | LOS D | 3.8 | 96.1 | 0.91 | 1.01 | 1.23 | 27.6 |
| Approach | | 216 | 0.9 | 235 | 0.9 | 0.578 | 22.3 | LOS C | 3.8 | 96.1 | 0.91 | 1.01 | 1.23 | 27.9 |
| All Vehicles | | 2240 | 1.6 | 2299 | 1.6 | 0.843 | 10.6 | LOS B | 41.9 | 1063.1 | 0.74 | 0.66 | 0.88 | 32.4 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Roundabout metered - PM Sensitivity - (-10%) (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout Metering

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 24 | 0.0 | 24 | 0.0 | 0.298 | 3.3 | LOS A | 1.6 | 41.4 | 0.45 | 0.30 | 0.45 | 35.7 |
| 8 | T1 | 632 | 1.8 | 638 | 1.8 | 0.298 | 3.3 | LOS A | 1.6 | 41.5 | 0.45 | 0.30 | 0.45 | 35.9 |
| 18 | R2 | 12 | 0.0 | 12 | 0.0 | 0.298 | 3.3 | LOS A | 1.6 | 41.5 | 0.45 | 0.30 | 0.45 | 34.9 |
| Approach | | 668 | 1.7 | 675 | 1.7 | 0.298 | 2.2 | LOS A | 1.6 | 41.5 | 0.45 | 0.30 | 0.45 | 35.8 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 140 | 0.4 | 146 | 0.4 | 0.356 | 6.8 | LOS A | 1.6 | 41.3 | 0.68 | 0.69 | 0.72 | 32.8 |
| 6 | T1 | 50 | 0.0 | 52 | 0.0 | 0.356 | 6.8 | LOS A | 1.6 | 41.3 | 0.68 | 0.69 | 0.72 | 32.8 |
| 16 | R2 | 54 | 0.0 | 56 | 0.0 | 0.356 | 6.8 | LOS A | 1.6 | 41.3 | 0.68 | 0.69 | 0.72 | 32.1 |
| Approach | | 244 | 0.2 | 254 | 0.2 | 0.356 | 6.0 | LOS A | 1.6 | 41.3 | 0.68 | 0.69 | 0.72 | 32.6 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 75 | 0.0 | 77 | 0.0 | 0.824 | 12.5 | LOS B | 39.3 | 997.8 | 0.96 | 0.83 | 1.18 | 30.9 |
| 4 | T1 | 1003 | 2.1 | 1023 | 2.1 | 0.824 | 11.8 | LOS B | 39.3 | 997.8 | 0.86 | 0.70 | 1.00 | 32.2 |
| 14 | R2 | 8 | 0.0 | 8 | 0.0 | 0.371 | 3.2 | LOS A | 7.7 | 196.2 | 0.64 | 0.44 | 0.64 | 34.3 |
| Approach | | 1086 | 1.9 | 1108 | 1.9 | 0.824 | 11.8 | LOS B | 39.3 | 997.8 | 0.86 | 0.71 | 1.01 | 32.1 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 39 | 0.0 | 42 | 0.0 | 0.510 | 16.5 | LOS C | 3.2 | 79.7 | 0.89 | 0.96 | 1.13 | 29.3 |
| 2 | T1 | 72 | 0.0 | 78 | 0.0 | 0.510 | 16.5 | LOS C | 3.2 | 79.7 | 0.89 | 0.96 | 1.13 | 29.3 |
| 12 | R2 | 84 | 2.2 | 91 | 2.2 | 0.510 | 23.6 | LOS C | 3.2 | 79.7 | 0.89 | 0.96 | 1.13 | 28.7 |
| Approach | | 195 | 0.9 | 212 | 0.9 | 0.510 | 19.2 | LOS C | 3.2 | 79.7 | 0.89 | 0.96 | 1.13 | 29.0 |
| All Vehicles | | 2193 | 1.6 | 2249 | 1.6 | 0.824 | 9.4 | LOS A | 39.3 | 997.8 | 0.72 | 0.61 | 0.82 | 32.9 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [Roundabout metered - PM Sensitivity - (+10%) (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout Metering

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 24 | 0.0 | 24 | 0.0 | 0.307 | 3.6 | LOS A | 1.7 | 43.6 | 0.48 | 0.34 | 0.48 | 35.6 |
| 8 | T1 | 632 | 1.8 | 638 | 1.8 | 0.307 | 3.6 | LOS A | 1.7 | 43.7 | 0.48 | 0.34 | 0.48 | 35.7 |
| 18 | R2 | 12 | 0.0 | 12 | 0.0 | 0.307 | 3.6 | LOS A | 1.7 | 43.7 | 0.49 | 0.34 | 0.49 | 34.7 |
| Approach | | 668 | 1.7 | 675 | 1.7 | 0.307 | 2.4 | LOS A | 1.7 | 43.7 | 0.48 | 0.34 | 0.48 | 35.7 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 171 | 0.4 | 178 | 0.4 | 0.441 | 8.4 | LOS A | 2.3 | 57.2 | 0.72 | 0.76 | 0.83 | 32.1 |
| 6 | T1 | 61 | 0.0 | 64 | 0.0 | 0.441 | 8.4 | LOS A | 2.3 | 57.2 | 0.72 | 0.76 | 0.83 | 32.1 |
| 16 | R2 | 66 | 0.0 | 69 | 0.0 | 0.441 | 8.4 | LOS A | 2.3 | 57.2 | 0.72 | 0.76 | 0.83 | 31.4 |
| Approach | | 298 | 0.2 | 310 | 0.2 | 0.441 | 7.5 | LOS A | 2.3 | 57.2 | 0.72 | 0.76 | 0.83 | 32.0 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 75 | 0.0 | 77 | 0.0 | 0.866 | 16.5 | LOS C | 45.3 | 1148.4 | 1.00 | 1.01 | 1.43 | 29.3 |
| 4 | T1 | 1003 | 2.1 | 1023 | 2.1 | 0.866 | 14.7 | LOS B | 45.3 | 1148.4 | 0.89 | 0.84 | 1.18 | 31.0 |
| 14 | R2 | 8 | 0.0 | 8 | 0.0 | 0.390 | 3.5 | LOS A | 7.9 | 200.9 | 0.67 | 0.50 | 0.67 | 34.1 |
| Approach | | 1086 | 1.9 | 1108 | 1.9 | 0.866 | 14.8 | LOS B | 45.3 | 1148.4 | 0.90 | 0.85 | 1.19 | 30.9 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 47 | 0.0 | 51 | 0.0 | 0.647 | 23.8 | LOS C | 4.6 | 115.3 | 0.93 | 1.06 | 1.35 | 26.8 |
| 2 | T1 | 88 | 0.0 | 96 | 0.0 | 0.647 | 23.8 | LOS C | 4.6 | 115.3 | 0.93 | 1.06 | 1.35 | 26.8 |
| 12 | R2 | 102 | 2.2 | 111 | 2.2 | 0.647 | 31.4 | LOS D | 4.6 | 115.3 | 0.93 | 1.06 | 1.35 | 26.3 |
| Approach | | 237 | 0.9 | 258 | 0.9 | 0.647 | 26.5 | LOS D | 4.6 | 115.3 | 0.93 | 1.06 | 1.35 | 26.6 |
| All Vehicles | | 2289 | 1.5 | 2351 | 1.5 | 0.866 | 12.1 | LOS B | 45.3 | 1148.4 | 0.76 | 0.71 | 0.96 | 31.7 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101v [Roundabout - AM Base (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 202 | 0.0 | 220 | 0.0 | 0.691 | 13.2 | LOS B | 9.9 | 248.9 | 0.69 | 0.65 | 0.94 | 30.3 |
| 8 | T1 | 1232 | 1.3 | 1339 | 1.3 | 0.691 | 13.2 | LOS B | 9.9 | 248.9 | 0.69 | 0.65 | 0.94 | 30.6 |
| 18 | R2 | 37 | 0.0 | 40 | 0.0 | 0.691 | 13.2 | LOS B | 9.8 | 248.4 | 0.69 | 0.65 | 0.94 | 30.0 |
| Approach | | 1471 | 1.1 | 1599 | 1.1 | 0.691 | 13.2 | LOS B | 9.9 | 248.9 | 0.69 | 0.65 | 0.94 | 30.5 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 21 | 0.0 | 23 | 0.0 | 1.118 | 117.8 | LOS F | 22.7 | 569.7 | 1.00 | 2.36 | 6.29 | 12.6 |
| 6 | T1 | 205 | 0.5 | 220 | 0.5 | 1.118 | 117.9 | LOS F | 22.7 | 569.7 | 1.00 | 2.36 | 6.29 | 12.6 |
| 16 | R2 | 144 | 0.0 | 155 | 0.0 | 1.118 | 117.8 | LOS F | 22.7 | 569.7 | 1.00 | 2.36 | 6.29 | 12.5 |
| Approach | | 370 | 0.3 | 398 | 0.3 | 1.118 | 117.9 | LOS F | 22.7 | 569.7 | 1.00 | 2.36 | 6.29 | 12.6 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 65 | 0.0 | 69 | 0.0 | 0.533 | 10.8 | LOS B | 4.2 | 105.4 | 0.67 | 0.75 | 0.94 | 31.5 |
| 4 | T1 | 585 | 2.0 | 622 | 2.0 | 0.533 | 10.8 | LOS B | 4.2 | 105.4 | 0.62 | 0.65 | 0.81 | 32.3 |
| 14 | R2 | 30 | 0.0 | 32 | 0.0 | 0.240 | 6.2 | LOS A | 1.0 | 26.0 | 0.52 | 0.45 | 0.52 | 33.0 |
| Approach | | 680 | 1.7 | 723 | 1.7 | 0.533 | 10.6 | LOS B | 4.2 | 105.4 | 0.62 | 0.65 | 0.81 | 32.2 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 45 | 0.0 | 49 | 0.0 | 0.313 | 8.4 | LOS A | 1.3 | 32.0 | 0.62 | 0.62 | 0.63 | 32.6 |
| 2 | T1 | 85 | 0.0 | 92 | 0.0 | 0.313 | 8.4 | LOS A | 1.3 | 32.0 | 0.62 | 0.62 | 0.63 | 32.5 |
| 12 | R2 | 91 | 0.0 | 99 | 0.0 | 0.313 | 12.7 | LOS B | 1.3 | 32.0 | 0.62 | 0.62 | 0.63 | 31.8 |
| Approach | | 221 | 0.0 | 240 | 0.0 | 0.313 | 10.2 | LOS B | 1.3 | 32.0 | 0.62 | 0.62 | 0.63 | 32.2 |
| All Vehicles | | 2742 | 1.0 | 2960 | 1.0 | 1.118 | 26.4 | LOS D | 22.7 | 569.7 | 0.71 | 0.88 | 1.60 | 26.0 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101v [Roundabout - AM Sensitivity (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 202 | 0.0 | 220 | 0.0 | 0.669 | 12.2 | LOS B | 6.4 | 160.5 | 0.62 | 0.45 | 0.66 | 30.7 |
| 8 | T1 | 1232 | 1.3 | 1339 | 1.3 | 0.669 | 12.2 | LOS B | 6.4 | 160.5 | 0.62 | 0.45 | 0.65 | 31.0 |
| 18 | R2 | 37 | 0.0 | 40 | 0.0 | 0.669 | 12.2 | LOS B | 6.3 | 159.9 | 0.62 | 0.45 | 0.65 | 30.4 |
| Approach | | 1471 | 1.1 | 1599 | 1.1 | 0.669 | 12.2 | LOS B | 6.4 | 160.5 | 0.62 | 0.45 | 0.65 | 30.9 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 17 | 0.0 | 18 | 0.0 | 0.969 | 74.4 | LOS F | 11.0 | 276.4 | 0.99 | 1.72 | 3.83 | 16.7 |
| 6 | T1 | 187 | 0.5 | 201 | 0.5 | 0.969 | 74.5 | LOS F | 11.0 | 276.4 | 0.99 | 1.72 | 3.83 | 16.7 |
| 16 | R2 | 120 | 0.0 | 129 | 0.0 | 0.969 | 74.4 | LOS F | 11.0 | 276.4 | 0.99 | 1.72 | 3.83 | 16.5 |
| Approach | | 324 | 0.3 | 348 | 0.3 | 0.969 | 74.4 | LOS F | 11.0 | 276.4 | 0.99 | 1.72 | 3.83 | 16.7 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 65 | 0.0 | 69 | 0.0 | 0.534 | 10.8 | LOS B | 4.2 | 105.8 | 0.67 | 0.75 | 0.94 | 31.5 |
| 4 | T1 | 585 | 2.0 | 622 | 2.0 | 0.534 | 10.7 | LOS B | 4.2 | 105.8 | 0.62 | 0.66 | 0.81 | 32.2 |
| 14 | R2 | 30 | 0.0 | 32 | 0.0 | 0.241 | 6.2 | LOS A | 1.0 | 26.1 | 0.52 | 0.46 | 0.52 | 33.0 |
| Approach | | 680 | 1.7 | 723 | 1.7 | 0.534 | 10.6 | LOS B | 4.2 | 105.8 | 0.62 | 0.66 | 0.81 | 32.2 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 34 | 0.0 | 37 | 0.0 | 0.238 | 7.3 | LOS A | 0.9 | 23.0 | 0.59 | 0.59 | 0.59 | 33.1 |
| 2 | T1 | 63 | 0.0 | 68 | 0.0 | 0.238 | 7.3 | LOS A | 0.9 | 23.0 | 0.59 | 0.59 | 0.59 | 33.0 |
| 12 | R2 | 71 | 0.0 | 77 | 0.0 | 0.238 | 11.5 | LOS B | 0.9 | 23.0 | 0.59 | 0.59 | 0.59 | 32.3 |
| Approach | | 168 | 0.0 | 183 | 0.0 | 0.238 | 9.1 | LOS A | 0.9 | 23.0 | 0.59 | 0.59 | 0.59 | 32.7 |
| All Vehicles | | 2643 | 1.1 | 2853 | 1.1 | 0.969 | 19.2 | LOS C | 11.0 | 276.4 | 0.66 | 0.67 | 1.08 | 28.4 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101v [Roundabout - AM Sensitivity - (-10%) (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 202 | 0.0 | 220 | 0.0 | 0.663 | 11.9 | LOS B | 5.7 | 143.2 | 0.60 | 0.41 | 0.60 | 30.8 |
| 8 | T1 | 1232 | 1.3 | 1339 | 1.3 | 0.663 | 12.0 | LOS B | 5.7 | 143.2 | 0.60 | 0.41 | 0.60 | 31.1 |
| 18 | R2 | 37 | 0.0 | 40 | 0.0 | 0.663 | 12.0 | LOS B | 5.6 | 142.6 | 0.60 | 0.41 | 0.60 | 30.5 |
| Approach | | 1471 | 1.1 | 1599 | 1.1 | 0.663 | 12.0 | LOS B | 5.7 | 143.2 | 0.60 | 0.41 | 0.60 | 31.0 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 15 | 0.0 | 16 | 0.0 | 0.868 | 53.8 | LOS F | 6.8 | 171.2 | 0.96 | 1.41 | 2.72 | 19.8 |
| 6 | T1 | 168 | 0.5 | 181 | 0.5 | 0.868 | 53.9 | LOS F | 6.8 | 171.2 | 0.96 | 1.41 | 2.72 | 19.7 |
| 16 | R2 | 108 | 0.0 | 116 | 0.0 | 0.868 | 53.8 | LOS F | 6.8 | 171.2 | 0.96 | 1.41 | 2.72 | 19.5 |
| Approach | | 291 | 0.3 | 313 | 0.3 | 0.868 | 53.8 | LOS F | 6.8 | 171.2 | 0.96 | 1.41 | 2.72 | 19.7 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 65 | 0.0 | 69 | 0.0 | 0.524 | 10.4 | LOS B | 4.0 | 100.7 | 0.65 | 0.71 | 0.89 | 31.7 |
| 4 | T1 | 585 | 2.0 | 622 | 2.0 | 0.524 | 10.4 | LOS B | 4.0 | 100.7 | 0.61 | 0.62 | 0.77 | 32.4 |
| 14 | R2 | 30 | 0.0 | 32 | 0.0 | 0.236 | 6.1 | LOS A | 1.0 | 25.6 | 0.50 | 0.44 | 0.50 | 33.1 |
| Approach | | 680 | 1.7 | 723 | 1.7 | 0.524 | 10.2 | LOS B | 4.0 | 100.7 | 0.61 | 0.62 | 0.77 | 32.4 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 31 | 0.0 | 34 | 0.0 | 0.215 | 7.0 | LOS A | 0.8 | 20.5 | 0.58 | 0.58 | 0.58 | 33.2 |
| 2 | T1 | 57 | 0.0 | 62 | 0.0 | 0.215 | 7.0 | LOS A | 0.8 | 20.5 | 0.58 | 0.58 | 0.58 | 33.2 |
| 12 | R2 | 64 | 0.0 | 70 | 0.0 | 0.215 | 11.1 | LOS B | 0.8 | 20.5 | 0.58 | 0.58 | 0.58 | 32.4 |
| Approach | | 152 | 0.0 | 165 | 0.0 | 0.215 | 8.8 | LOS A | 0.8 | 20.5 | 0.58 | 0.58 | 0.58 | 32.9 |
| All Vehicles | | 2594 | 1.1 | 2800 | 1.1 | 0.868 | 16.0 | LOS C | 6.8 | 171.2 | 0.64 | 0.59 | 0.88 | 29.5 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101v [Roundabout - AM Sensitivity - (+10%) (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 202 | 0.0 | 220 | 0.0 | 0.675 | 12.4 | LOS B | 7.6 | 190.3 | 0.64 | 0.51 | 0.74 | 30.6 |
| 8 | T1 | 1232 | 1.3 | 1339 | 1.3 | 0.675 | 12.5 | LOS B | 7.6 | 190.3 | 0.64 | 0.51 | 0.74 | 30.9 |
| 18 | R2 | 37 | 0.0 | 40 | 0.0 | 0.675 | 12.5 | LOS B | 7.5 | 189.7 | 0.64 | 0.51 | 0.74 | 30.3 |
| Approach | | 1471 | 1.1 | 1599 | 1.1 | 0.675 | 12.5 | LOS B | 7.6 | 190.3 | 0.64 | 0.51 | 0.74 | 30.8 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 19 | 0.0 | 20 | 0.0 | 1.071 | 102.4 | LOS F | 18.5 | 463.9 | 1.00 | 2.14 | 5.45 | 13.9 |
| 6 | T1 | 206 | 0.5 | 222 | 0.5 | 1.071 | 102.4 | LOS F | 18.5 | 463.9 | 1.00 | 2.14 | 5.45 | 13.8 |
| 16 | R2 | 132 | 0.0 | 142 | 0.0 | 1.071 | 102.4 | LOS F | 18.5 | 463.9 | 1.00 | 2.14 | 5.45 | 13.7 |
| Approach | | 357 | 0.3 | 384 | 0.3 | 1.071 | 102.4 | LOS F | 18.5 | 463.9 | 1.00 | 2.14 | 5.45 | 13.8 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 65 | 0.0 | 69 | 0.0 | 0.538 | 10.9 | LOS B | 4.2 | 107.2 | 0.68 | 0.76 | 0.96 | 31.5 |
| 4 | T1 | 585 | 2.0 | 622 | 2.0 | 0.538 | 10.9 | LOS B | 4.2 | 107.2 | 0.63 | 0.67 | 0.82 | 32.2 |
| 14 | R2 | 30 | 0.0 | 32 | 0.0 | 0.242 | 6.3 | LOS A | 1.0 | 26.2 | 0.52 | 0.46 | 0.52 | 33.0 |
| Approach | | 680 | 1.7 | 723 | 1.7 | 0.538 | 10.7 | LOS B | 4.2 | 107.2 | 0.63 | 0.67 | 0.82 | 32.2 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 37 | 0.0 | 40 | 0.0 | 0.261 | 7.6 | LOS A | 1.0 | 25.6 | 0.60 | 0.60 | 0.60 | 32.9 |
| 2 | T1 | 69 | 0.0 | 75 | 0.0 | 0.261 | 7.6 | LOS A | 1.0 | 25.6 | 0.60 | 0.60 | 0.60 | 32.9 |
| 12 | R2 | 78 | 0.0 | 85 | 0.0 | 0.261 | 11.9 | LOS B | 1.0 | 25.6 | 0.60 | 0.60 | 0.60 | 32.2 |
| Approach | | 184 | 0.0 | 200 | 0.0 | 0.261 | 9.4 | LOS A | 1.0 | 25.6 | 0.60 | 0.60 | 0.60 | 32.6 |
| All Vehicles | | 2692 | 1.1 | 2906 | 1.1 | 1.071 | 23.7 | LOS C | 18.5 | 463.9 | 0.68 | 0.77 | 1.37 | 26.8 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101v [Roundabout - PM Base (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 24 | 0.0 | 24 | 0.0 | 0.316 | 6.3 | LOS A | 1.8 | 45.2 | 0.47 | 0.33 | 0.47 | 33.8 |
| 8 | T1 | 648 | 1.8 | 655 | 1.8 | 0.316 | 6.4 | LOS A | 1.8 | 45.2 | 0.47 | 0.33 | 0.47 | 33.9 |
| 18 | R2 | 12 | 0.0 | 12 | 0.0 | 0.316 | 6.3 | LOS A | 1.8 | 45.2 | 0.47 | 0.33 | 0.47 | 33.0 |
| Approach | | 684 | 1.7 | 691 | 1.7 | 0.316 | 6.4 | LOS A | 1.8 | 45.2 | 0.47 | 0.33 | 0.47 | 33.9 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 250 | 0.4 | 260 | 0.4 | 0.586 | 15.2 | LOS C | 4.4 | 109.9 | 0.79 | 0.96 | 1.31 | 28.9 |
| 6 | T1 | 68 | 0.0 | 71 | 0.0 | 0.586 | 15.1 | LOS C | 4.4 | 109.9 | 0.79 | 0.96 | 1.31 | 28.9 |
| 16 | R2 | 73 | 0.0 | 76 | 0.0 | 0.586 | 15.1 | LOS C | 4.4 | 109.9 | 0.79 | 0.96 | 1.31 | 28.3 |
| Approach | | 391 | 0.3 | 407 | 0.3 | 0.586 | 15.1 | LOS C | 4.4 | 109.9 | 0.79 | 0.96 | 1.31 | 28.8 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 77 | 0.0 | 79 | 0.0 | 0.833 | 23.7 | LOS C | 19.9 | 506.1 | 1.00 | 1.43 | 2.18 | 26.8 |
| 4 | T1 | 1028 | 2.1 | 1049 | 2.1 | 0.833 | 21.6 | LOS C | 19.9 | 506.1 | 0.87 | 1.13 | 1.66 | 28.6 |
| 14 | R2 | 8 | 0.0 | 8 | 0.0 | 0.375 | 7.9 | LOS A | 2.1 | 54.0 | 0.61 | 0.53 | 0.61 | 32.2 |
| Approach | | 1113 | 1.9 | 1136 | 1.9 | 0.833 | 21.7 | LOS C | 19.9 | 506.1 | 0.88 | 1.15 | 1.69 | 28.5 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 54 | 0.0 | 59 | 0.0 | 1.283 | 185.4 | LOS F | 35.5 | 894.8 | 1.00 | 2.75 | 7.55 | 9.1 |
| 2 | T1 | 110 | 0.0 | 120 | 0.0 | 1.283 | 185.4 | LOS F | 35.5 | 894.8 | 1.00 | 2.75 | 7.55 | 9.1 |
| 12 | R2 | 189 | 2.2 | 205 | 2.2 | 1.283 | 194.9 | LOS F | 35.5 | 894.8 | 1.00 | 2.75 | 7.55 | 9.1 |
| Approach | | 353 | 1.2 | 384 | 1.2 | 1.283 | 190.5 | LOS F | 35.5 | 894.8 | 1.00 | 2.75 | 7.55 | 9.1 |
| All Vehicles | | 2541 | 1.5 | 2618 | 1.5 | 1.283 | 41.4 | LOS E | 35.5 | 894.8 | 0.78 | 1.14 | 2.17 | 22.5 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101v [Roundabout - PM Sensitivity (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 24 | 0.0 | 24 | 0.0 | 0.302 | 6.0 | LOS A | 1.7 | 42.7 | 0.43 | 0.28 | 0.43 | 34.0 |
| 8 | T1 | 648 | 1.8 | 655 | 1.8 | 0.302 | 6.0 | LOS A | 1.7 | 42.7 | 0.43 | 0.28 | 0.43 | 34.1 |
| 18 | R2 | 12 | 0.0 | 12 | 0.0 | 0.302 | 6.0 | LOS A | 1.7 | 42.7 | 0.43 | 0.28 | 0.43 | 33.2 |
| Approach | | 684 | 1.7 | 691 | 1.7 | 0.302 | 6.0 | LOS A | 1.7 | 42.7 | 0.43 | 0.28 | 0.43 | 34.0 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 153 | 0.4 | 159 | 0.4 | 0.393 | 10.3 | LOS B | 2.0 | 50.9 | 0.70 | 0.75 | 0.86 | 30.9 |
| 6 | T1 | 54 | 0.0 | 56 | 0.0 | 0.393 | 10.3 | LOS B | 2.0 | 50.9 | 0.70 | 0.75 | 0.86 | 30.9 |
| 16 | R2 | 59 | 0.0 | 61 | 0.0 | 0.393 | 10.3 | LOS B | 2.0 | 50.9 | 0.70 | 0.75 | 0.86 | 30.2 |
| Approach | | 266 | 0.2 | 277 | 0.2 | 0.393 | 10.3 | LOS B | 2.0 | 50.9 | 0.70 | 0.75 | 0.86 | 30.7 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 77 | 0.0 | 79 | 0.0 | 0.728 | 15.3 | LOS C | 13.4 | 340.4 | 0.83 | 0.89 | 1.29 | 29.7 |
| 4 | T1 | 1028 | 2.1 | 1049 | 2.1 | 0.728 | 15.0 | LOS B | 13.4 | 340.4 | 0.72 | 0.72 | 1.03 | 31.0 |
| 14 | R2 | 8 | 0.0 | 8 | 0.0 | 0.328 | 6.5 | LOS A | 1.9 | 47.1 | 0.50 | 0.36 | 0.50 | 32.9 |
| Approach | | 1113 | 1.9 | 1136 | 1.9 | 0.728 | 14.9 | LOS B | 13.4 | 340.4 | 0.73 | 0.73 | 1.05 | 30.9 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 40 | 0.0 | 43 | 0.0 | 0.586 | 26.6 | LOS D | 3.2 | 79.5 | 0.88 | 1.04 | 1.48 | 25.7 |
| 2 | T1 | 63 | 0.0 | 68 | 0.0 | 0.586 | 26.6 | LOS D | 3.2 | 79.5 | 0.88 | 1.04 | 1.48 | 25.7 |
| 12 | R2 | 87 | 2.2 | 95 | 2.2 | 0.586 | 34.3 | LOS D | 3.2 | 79.5 | 0.88 | 1.04 | 1.48 | 25.2 |
| Approach | | 190 | 1.0 | 207 | 1.0 | 0.586 | 30.2 | LOS D | 3.2 | 79.5 | 0.88 | 1.04 | 1.48 | 25.5 |
| All Vehicles | | 2253 | 1.6 | 2310 | 1.6 | 0.728 | 13.1 | LOS B | 13.4 | 340.4 | 0.65 | 0.63 | 0.88 | 31.1 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101v [Roundabout - PM Sensitivity - (+10%) (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 24 | 0.0 | 24 | 0.0 | 0.306 | 6.1 | LOS A | 1.7 | 43.5 | 0.44 | 0.30 | 0.44 | 33.9 |
| 8 | T1 | 648 | 1.8 | 655 | 1.8 | 0.306 | 6.1 | LOS A | 1.7 | 43.5 | 0.44 | 0.30 | 0.44 | 34.0 |
| 18 | R2 | 12 | 0.0 | 12 | 0.0 | 0.306 | 6.1 | LOS A | 1.7 | 43.5 | 0.44 | 0.30 | 0.44 | 33.1 |
| Approach | | 684 | 1.7 | 691 | 1.7 | 0.306 | 6.1 | LOS A | 1.7 | 43.5 | 0.44 | 0.30 | 0.44 | 34.0 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 168 | 0.4 | 175 | 0.4 | 0.434 | 11.2 | LOS B | 2.4 | 61.0 | 0.72 | 0.79 | 0.95 | 30.5 |
| 6 | T1 | 59 | 0.0 | 61 | 0.0 | 0.434 | 11.2 | LOS B | 2.4 | 61.0 | 0.72 | 0.79 | 0.95 | 30.5 |
| 16 | R2 | 65 | 0.0 | 68 | 0.0 | 0.434 | 11.2 | LOS B | 2.4 | 61.0 | 0.72 | 0.79 | 0.95 | 29.9 |
| Approach | | 292 | 0.2 | 304 | 0.2 | 0.434 | 11.2 | LOS B | 2.4 | 61.0 | 0.72 | 0.79 | 0.95 | 30.4 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 77 | 0.0 | 79 | 0.0 | 0.745 | 16.4 | LOS C | 14.6 | 371.6 | 0.87 | 0.99 | 1.45 | 29.3 |
| 4 | T1 | 1028 | 2.1 | 1049 | 2.1 | 0.745 | 15.8 | LOS C | 14.6 | 371.6 | 0.76 | 0.80 | 1.14 | 30.6 |
| 14 | R2 | 8 | 0.0 | 8 | 0.0 | 0.336 | 6.8 | LOS A | 1.9 | 48.3 | 0.52 | 0.39 | 0.52 | 32.8 |
| Approach | | 1113 | 1.9 | 1136 | 1.9 | 0.745 | 15.8 | LOS C | 14.6 | 371.6 | 0.76 | 0.81 | 1.16 | 30.6 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 44 | 0.0 | 48 | 0.0 | 0.664 | 32.3 | LOS D | 3.9 | 98.7 | 0.90 | 1.12 | 1.69 | 24.1 |
| 2 | T1 | 69 | 0.0 | 75 | 0.0 | 0.664 | 32.3 | LOS D | 3.9 | 98.7 | 0.90 | 1.12 | 1.69 | 24.1 |
| 12 | R2 | 96 | 2.2 | 104 | 2.2 | 0.664 | 40.3 | LOS E | 3.9 | 98.7 | 0.90 | 1.12 | 1.69 | 23.7 |
| Approach | | 209 | 1.0 | 227 | 1.0 | 0.664 | 36.0 | LOS E | 3.9 | 98.7 | 0.90 | 1.12 | 1.69 | 23.9 |
| All Vehicles | | 2298 | 1.6 | 2358 | 1.6 | 0.745 | 14.3 | LOS B | 14.6 | 371.6 | 0.68 | 0.69 | 0.97 | 30.6 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101v [Roundabout - PM Sensitivity - (-10%) (Site Folder: General)]

Rt 28/Chickatawbut Rd
Site Category: (None)
Roundabout

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] % | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] ft | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed mph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Rt 28 | | | | | | | | | | | | | | |
| 3 | L2 | 24 | 0.0 | 24 | 0.0 | 0.298 | 5.9 | LOS A | 1.7 | 42.0 | 0.41 | 0.27 | 0.41 | 34.0 |
| 8 | T1 | 648 | 1.8 | 655 | 1.8 | 0.298 | 5.9 | LOS A | 1.7 | 42.0 | 0.41 | 0.27 | 0.41 | 34.1 |
| 18 | R2 | 12 | 0.0 | 12 | 0.0 | 0.298 | 5.9 | LOS A | 1.7 | 41.9 | 0.41 | 0.27 | 0.41 | 33.2 |
| Approach | | 684 | 1.7 | 691 | 1.7 | 0.298 | 5.9 | LOS A | 1.7 | 42.0 | 0.41 | 0.27 | 0.41 | 34.1 |
| East: Chickatawbut Rd | | | | | | | | | | | | | | |
| 1 | L2 | 138 | 0.4 | 144 | 0.4 | 0.352 | 9.6 | LOS A | 1.7 | 41.8 | 0.68 | 0.70 | 0.76 | 31.2 |
| 6 | T1 | 49 | 0.0 | 51 | 0.0 | 0.352 | 9.5 | LOS A | 1.7 | 41.8 | 0.68 | 0.70 | 0.76 | 31.2 |
| 16 | R2 | 53 | 0.0 | 55 | 0.0 | 0.352 | 9.5 | LOS A | 1.7 | 41.8 | 0.68 | 0.70 | 0.76 | 30.6 |
| Approach | | 240 | 0.2 | 250 | 0.2 | 0.352 | 9.6 | LOS A | 1.7 | 41.8 | 0.68 | 0.70 | 0.76 | 31.1 |
| North: Rt 28 | | | | | | | | | | | | | | |
| 7 | L2 | 77 | 0.0 | 79 | 0.0 | 0.711 | 14.4 | LOS B | 12.0 | 304.4 | 0.79 | 0.78 | 1.13 | 30.1 |
| 4 | T1 | 1028 | 2.1 | 1049 | 2.1 | 0.711 | 14.2 | LOS B | 12.0 | 304.4 | 0.69 | 0.63 | 0.92 | 31.3 |
| 14 | R2 | 8 | 0.0 | 8 | 0.0 | 0.320 | 6.3 | LOS A | 1.8 | 46.0 | 0.47 | 0.33 | 0.47 | 33.0 |
| Approach | | 1113 | 1.9 | 1136 | 1.9 | 0.711 | 14.1 | LOS B | 12.0 | 304.4 | 0.69 | 0.64 | 0.93 | 31.2 |
| West: Chickatawbut Rd | | | | | | | | | | | | | | |
| 5 | L2 | 36 | 0.0 | 39 | 0.0 | 0.512 | 22.4 | LOS C | 2.6 | 64.4 | 0.86 | 0.98 | 1.32 | 27.0 |
| 2 | T1 | 57 | 0.0 | 62 | 0.0 | 0.512 | 22.4 | LOS C | 2.6 | 64.4 | 0.86 | 0.98 | 1.32 | 27.0 |
| 12 | R2 | 78 | 2.2 | 85 | 2.2 | 0.512 | 29.9 | LOS D | 2.6 | 64.4 | 0.86 | 0.98 | 1.32 | 26.5 |
| Approach | | 171 | 1.0 | 186 | 1.0 | 0.512 | 25.8 | LOS D | 2.6 | 64.4 | 0.86 | 0.98 | 1.32 | 26.8 |
| All Vehicles | | 2208 | 1.6 | 2262 | 1.6 | 0.711 | 12.1 | LOS B | 12.0 | 304.4 | 0.62 | 0.56 | 0.78 | 31.6 |

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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