



**Capital Region Transportation Council
Technical Assistance Program**

TECHNICAL MEMORANDUM

Town of Ballston Intersection Traffic and Safety Assessment 5-2-2025

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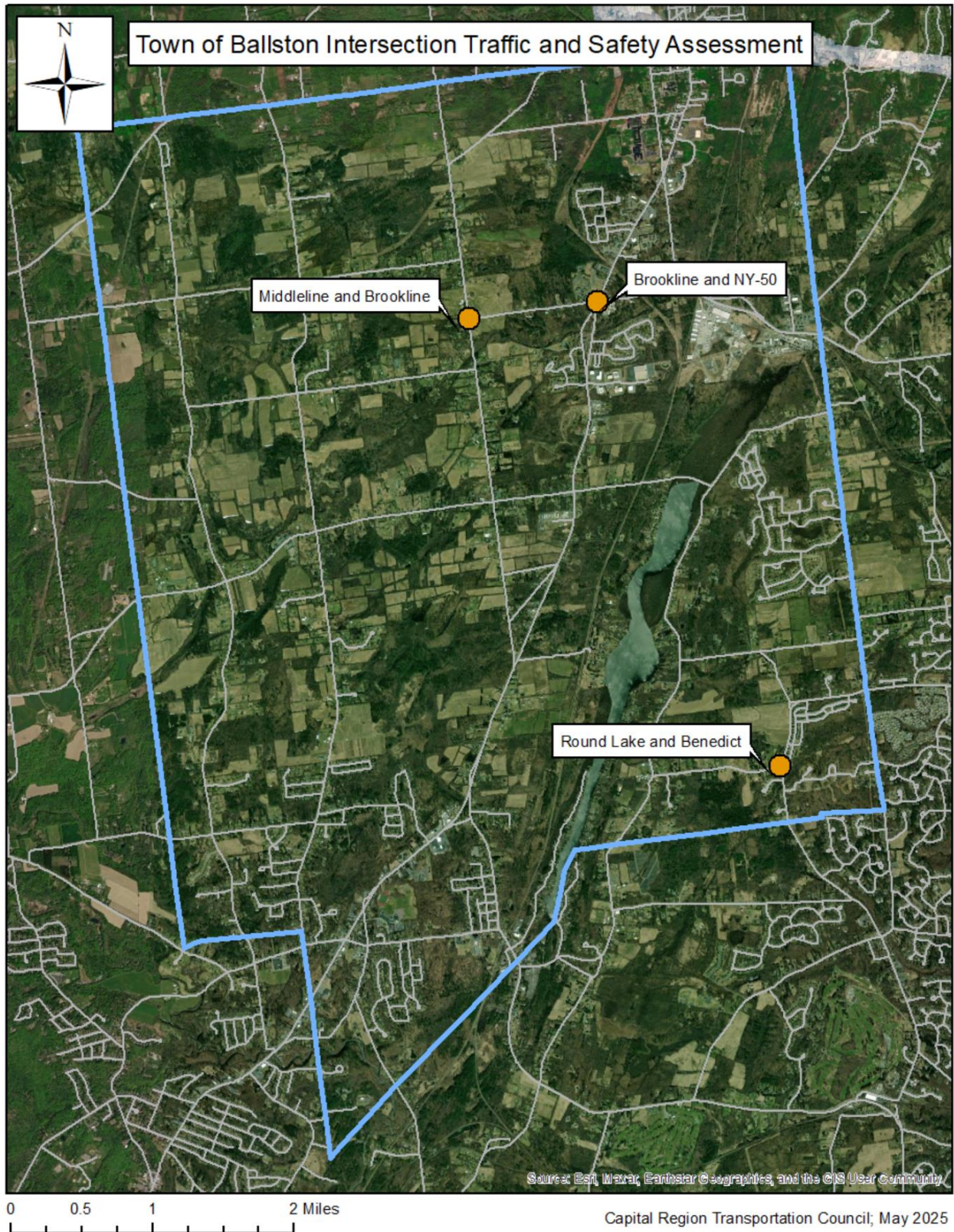
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Background

The Transportation Council has prepared this technical memorandum on behalf of the Town of Ballston to document traffic and safety issues at three intersections in the Town. The three intersections under study are:

- **Round Lake Road and Benedict Road** – this three-legged intersection has stop control on the Benedict Road approach. The intersection is on a horizontal curve with limited sight distance. Concerns have been expressed to the Town about safety at this intersection, particularly in inclement weather. Saratoga County DPW replaced the chevron signs with larger chevrons and added reflective strips to the sign posts in 2024.
- **Middleline Road and Brookline Road** – this three-legged intersection has stop control on the Brookline Road approach. Concerns were expressed about truck turning movements at this intersection.
- **Intersection of Brookline Road and State Route 50** – this signalized intersection was the site of a fatal hit-and-run crash in 2023. The Town of Ballston also raised concerns regarding growing traffic through the intersection and the use of Brookline Road as a cut-through road. The intersection has a large footprint and unusual 5-legged geometry to accommodate an exit lane for Mourningkill Drive.

Transportation Council staff have compiled summaries of prior planning efforts, examined the crash history at each location, conducted field visits, and compiled key findings and recommendations into this memo.



Prior Planning Efforts

Transportation Council staff have reviewed planning studies and traffic assessments involving the study area and summarized key findings below.

Town of Ballston Comprehensive Plan (2022) – The Town’s comprehensive plan identified traffic congestion as a major concern of Town residents. Traffic and congestion are predicted to grow as residential and commercial development continue to expand throughout the Town. Roadway safety is also a known concern in the Town, with the Town’s 2006 Report Card recommendation 37 being “Address roadway safety”. The Town’s 2022 comprehensive plan synthesizes these traffic concerns in recommendation I-6 – “Coordinate with CDTC, CDTA, the County and NYSDOT as needed to promote the Town’s vision. Areas of coordination may include traffic improvements at key intersections, enforcement of speed limits along certain roadway corridors, traffic calming within the hamlets, promote safer bus stops to keep folks out of the elements and more.”

<https://www.townofballstonny.org/DocumentCenter/View/661/Updated-Comprehensive-Plan-2022-PDF>

MUTCD Horizontal Curve Guidance (11th Edition, 2023) – Chapter 2C of the Manual of Uniform Traffic Control Devices (MUTCD) provides regulatory guidance on the use of warning signs and object markers on roadways with horizontal curves. The study area has several horizontal curves that may benefit from improved signage. MUTCD guidance shall be reviewed for applicability to the study area. [https://mutcd.fhwa.dot.gov/pdfs/11th Edition/Chapter2c.pdf](https://mutcd.fhwa.dot.gov/pdfs/11th%20Edition/Chapter2c.pdf)

NYSDOT Roadway Departure Safety Action Plan (RwDSAP, 2024) – roadway departures were identified in the earlier NY State Strategic Highway Safety Plan as a top emphasis area. The RwDSAP identifies roadway segments with one or more risk factors present and strategies to treat roadway departure crashes on these segments. Round Lake Road from Eastline to west of MacKenna Ct is identified as a Roadway Departure Primary Eligible Location. More information on the plan can be found at: <https://www.dot.ny.gov/divisions/operating/osss/highway/rwdsap>.

As part of the RwDSAP, NYSDOT has issued a call for local projects to receive HSIP (Highway Safety Improvement Program) funding. Project sponsors must submit an application by June 13, 2025. The recommendations identified at the Round Lake and Benedict site should be considered for submission. As the minimum HSIP award is \$250,000, the applicant may wish to bundle multiple site together into a single systemic submission.

FHWA Every Day Counts: Reducing Rural Roadway Departures – Federal Highway Administration (FHWA) data shows that rural roadway departures account for one-third of all traffic fatalities. One of the four pillars identified on reducing rural roadway departures is a focus on proven cost-effective countermeasures. The countermeasures are focused on three primary ways to prevent deaths from these incidents, namely keeping vehicles in their lane, reducing the potential for crashes, and minimizing crash severity. The FHWA has specific treatments for achieving each of these three goals outlined on their website.

<https://highways.dot.gov/safety/rwd/forrwd>

Existing Conditions

Site Aerials and Photos

Round Lake Round and Benedict Road:



Middleline Road and Brookline Road:



Brookline and Route 50:



Roadway Information System (RIS)

NYSDOT maintains a database of roadway characteristics including federal aid eligibility, roadway ownership, speed limits, and more. The relevant information available for study area roadways is summarized below.

	Federal Aid System	Ownership	Speed Limit
Round Lake Road	No	Saratoga County	45mph
Benedict Road	No	Town of Ballston	40mph
Brookline Road	West of Route 50 – No; East of Route 50 – Yes	Saratoga County	West of Route 50 – 45; East of Route 50 – 40
State Route 50	Yes	NYSDOT	45mph
Middleline Road	Yes	Saratoga County	45mph
Mourningkill Dr	No	Town of Ballston	30mph

In addition, there is a posted curve advisory speed of 20mph on Round Lake Road approaching Benedict Road.

Traffic Count Data

Traffic count data on certain roads in the study area is available from the NYSDOT Traffic Data Viewer. Count data on intersection approaches is summarized below. Figures are reported as Annual Average Daily Traffic (AADT), the sum of traffic in both directions, in vehicles/day.

Round Lake Road and Benedict Road

- Round Lake, east of Benedict– 5,044 AADT (2023)
- Round Lake, west of Benedict – 4,770 AADT (2023)
- Benedict – No data available

Middleline Road and Brookline Road

- Middleline Road, north of Brookline – 7,441 AADT (2023)

- Middleline Road, south of Brookline – 4,083 AADT (2023)
 - This count site also has vehicle speed data; the average speed was reported to be 50.5 mph, and the 85th percentile speed was 51.1 mph. The posted speed limit is 45 mph.
- Brookline Road – 4,602 AADT (2023)

Brookline Road and State Route 50

- Route 50 – 9,985 AADT (2023)
 - This count site also has vehicle speed data; the average speed was reported to be 44.7 mph, and the 85th percentile speed was 56.5 mph. The posted speed limit is 45 mph.
- Brookline Road, west of Rt 50 – 4,602 AADT (2023)
- Brookline Road, west of Rt 50 – 7,820 AADT (2023)
- Mourningkill Drive – No data available

Crash History

Transportation Council staff reviewed five years of crash data from all three study sites. Crash reports were obtained from the NYSDOT CLEAR (Crash Location & Engineering Analysis Repository) system for the five-year period from January 2020 through December 2024. Only reported crashes are in the dataset. Crash records from the final months of 2024 may not yet be complete due to the time needed for a crash report to be included in the system.

Round Lake Road and Benedict Road:

In the five-year period examined, 13 crashes were reported at this site:

- Four crashes involved injuries. Of these, two were collisions between motor vehicles, and two were collisions with fixed objects.
- Nearly all crashes occurred in inclement weather: 10 crashes occurred in wet conditions, one in snow/ice conditions, and only two crashes in dry conditions. This corroborates the Town's observations about this site. Pavement friction treatments may be needed here, such as High-Friction Surface Treatment (HFST), to help vehicles maintain control during inclement weather. Better visibility treatments and drawing attention to the curve advisory speed of 20 mph would also help.

- Four crashes were between motor vehicles; all other crashes were with fixed objects, including the embankment, the home on the corner, or 'other fixed objects' not specified in the crash dataset.

Other curves on Round Lake Road had similar crash histories. The curve to the north (near Anchor Dr/Diamond Rd) had nine crashes, mostly fixed-object collisions in dry conditions. To the west, the curves near Lake Road and Lundy Lane had a total of 24 crashes, 10 in wet conditions. The curve safety treatments recommended in this report for Round Lake Road and Benedict Road may be applicable to other curves on Round Lake Road.

Middleline Road and Brookline Road:

In the five-year period examined, 12 crashes were reported at this site:

- Three crashes involved injuries. One was reported as a head-on collision, another was a left-turning collision, and one was a fixed-object collision with a tree.
- Nine crashes were between motor vehicles, and three involved fixed object collisions.
- Four crashes occurred during wet or snow/ice conditions.
- On the one-mile segment of Middleline Road near the intersection with Brookline (the segment between Randall Road and Devils Lane), there were an additional 15 crashes in the five-year period. Of these, ten were collisions between motor vehicles, and four were collisions with deer. They mainly occurred in dry conditions.

Brookline Road and State Route 50:

For this analysis, crashes within 150 feet of the intersection were examined. In the five-year period examined, 44 crashes were reported at this site:

- There was one fatal crash and six crashes involving injuries during this period. The fatal crash occurred on November 15, 2023, when a pedestrian was struck in a crosswalk at approximately 5:45 AM. The crash was a hit-and-run and the driver was arrested the following day. The table below summarizes crashes by severity.

Severity	Count
Fatal	1
Injury	6
Property damage	37

- The table below summarizes crashes by reported collision type, with rear-end collisions being most common, followed by right angle. This is typical of signalized intersections.

Collision Type	Count
Head on	3
Left turn	6
Other	7
Overtaking	1
Rear end	16
Right angle	9
Right turn	1
Sideswipe	1

- Of the 44 reported crashes, 39 were collisions between motor vehicles, four involved fixed objects, and one was the pedestrian-involved fatal crash.
- 34 crashes occurred in daylight conditions, and 10 occurred in dark conditions.
- 35 crashes occurred in dry conditions, three in snow/ice conditions, and six in wet conditions.
- Outside the 150-foot radius around the intersection, there was a cluster of 11 more crashes on Brookline Road to the east; these include several rear end collisions, and almost all occurred in the PM peak period. This suggests that these crashes may be in the PM peak queues that back up from the State Route 50 signal.

Field Visit Observations

Transportation Council staff conducted a series of field visits. Staff used a checklist to record observations relating to signal operations, access management, transit operations, freight operations, infrastructure condition, and more. All three sites were visited.

The full field visit notes are included as Appendix A. The observations were used to create the problem statement that follows.

Problem Statement

Round Lake Road and Benedict Road:

- Three-legged intersection within a horizontal curve. The curve advisory speed is 20 mph, with 45 mph speed limit on the Round Lake approaches. Tight curve with approximately 300 foot radius. There is also a gradient sloping down to the south.
- Crash history shows high number of crashes in wet conditions and high number of road departure crashes. Vehicles approaching from Round Lake may not slow down sufficiently to maintain pavement friction in wet conditions. Downhill gradient may also contribute to loss of pavement friction.
- Roadside hazards are present, including speed embankment on the southeast corner, utility poles, and a home on the southwest corner that has been struck multiple times.
- No lighting at intersection.
- Limited sight distance on certain movements due to horizontal curve.
- Saratoga County stakeholders report that improper speed, driver impairment, and sign blindness may contribute to crashes at this location.

Middleline Road and Brookline Road:

- Three-legged right angle intersection. High speeds on the Middleline approaches makes turning off Brookline challenging. NYSDOT speed data collected during a traffic count reports average speed was 50.5 mph, and the 85th percentile speed was 51.1 mph. The posted speed limit is 45 mph. Trucks turning from Brookline need to wait for large gaps to safely begin turning.
- Short queues were observed on Brookline when vehicles wait to make a left turn.
- Left-turning trucks from Middleline onto Brookline were observed crossing the Brookline stop bar and centerline.

Brookline Road and State Route 50:

- Five-legged signalized intersection. The intersection is skewed, and Mourningkill exits the intersection to form a fifth leg.
- No turn lanes on approaches. Left-turning vehicles were observed to impede through-movements. On the southbound approach, through-moving vehicles would use the shoulder to pass. On the westbound approach, vehicles would wait in the middle of the intersection to make a left turn.

- Traffic congestion was observed during the weekday peak period of the field visit. Queues that did not clear within one cycle of the signal were observed on the northbound and southbound approaches at 3:30pm.
- Driveways are close to the intersection on the northeast and southeast corners. Queue conflicts were observed when vehicles enter or exit Valero through queues during red phases.
- The CDTA 450 transit bus briefly impedes the southbound travel lane when stopped. Southbound vehicles are able to go around the bus but cross partially into the northbound lane to do so. The transit stop has no benches or amenities.
- Freight movement issues were observed during the field visit. A right-turning truck moving northbound to eastbound was observed crossing the centerline.
- Saratoga County stakeholders report that red-light running by tractor trailers is common, mostly eastbound on Brookline crossing NY-50.

Recommendations and Next Steps

Round Lake Road and Benedict Road:

Recommendations at this location relate to moderating vehicle speed on the approach to the horizontal curve, improving visibility and awareness of the curve, and improving pavement friction. These recommendations are consistent with MUTCD and NYSDOT Roadway Departure Safety Action Plan guidance. Many of the recommendations made here may also be applicable to other curves on Round Lake Road. Round Lake is a County road, so coordination with Saratoga County on advancing these recommendations is required.

Enhanced Delineation for Horizontal Curves – this FHWA publication contains recommendations for safety countermeasures that can be deployed in advance of or within a horizontal curve, including:

- **In-lane curve warning pavement markings:** these markings improve awareness of the curve. FHWA suggests that these markings may reduce crashes by 35%. Examples below.



Above, left: "CURVE AHEAD" paired with transverse rumble strips. Right: "SLOW" and arrow.

- **Optical speed bars:** transverse strips placed on the centerline and shoulders are spaced at gradually reducing distances. They are used to increase drivers' perception of speed and are a relatively low-cost countermeasure.



Above: optical speed bars on a curve approach

- **Dynamic speed feedback signs:** on Round Lake Road approaches, consider installing dynamic speed display/feedback signs. Per USDOT, 'research shows these types of signs have been effective at reducing speeds by 5 mph'. These signs may be installed permanently and can be solar powered for ease of installation.



- **Dynamic curve warning signs:** instead of displaying vehicle speed, these signs light a flashing beacon when a vehicle is detected and is approaching too fast. FHWA states that studies have shown a speed reduction of up to 8.8 mph and a crash reduction of about 56%.



Above, left: "SPEED TOO FAST FOR CURVE" with radar-activated flashing beacons. Right: Sequential Dynamic Curve Warning System with LEDs within chevrons.

- **High Friction Surface Treatment (HFST):** as most crashes at the curve occur in wet conditions, improving pavement friction may help reduce crashes considerably. Per FHWA, HFST is estimated to reduce wet crashes by 83 percent and total crashes by 57 percent. HFST involves applying a layer of high-friction aggregate, such as crushed flint or bauxite, to the pavement using a polymer binder.



Above: HFST applied to a curve

(Guidance for selecting materials which have demonstrated satisfactory friction performance can be found in the NYSDOT Comprehensive Pavement Design Manual. <https://www.dot.ny.gov/divisions/engineering/design/dqab/cpdm>).

The recommendations given above are applicable to other horizontal curves on Round Lake Road or elsewhere in the Town of Ballston. Consider bundling curve treatments at several curves together into a single systemic safety project. Bundling sites together will lower the cost per site, as one crew may be able to apply treatments to multiple sites in a single day.

Curve treatments are eligible for fund sources available through the Transportation Council, such as HSIP (Highway Safety Improvement Program), and for discretionary grants such as the SS4A (Safe Streets and Roads for All) Implementation grants. In addition, as part of NYSDOT's Roadway Departure Safety Action Plan (RwDSAP), NYSDOT has issued a call for local projects, which may be found here: <https://www.dot.ny.gov/divisions/operating/osss/highway/rwdsap>. Project sponsors must submit an application by June 13, 2025.

Middleline Road and Brookline Road:

Recommendations at this location relate to improving intersection geometry to better accommodate truck turns, moderating vehicle speed on Middleline, and enhancing the visibility of the T-junction from the Brookline approach. Both roads are County roads, so coordination with Saratoga County on advancing these recommendations is required.

- **Paved shoulder widening:** vehicles were observed using the gravel shoulder to go around vehicles waiting to make left turns from Brookline. In addition, trucks were observed crossing far over the stop bar and centerline when making a left turn from Middleline southbound onto Brookline. Paving and widening the shoulders on the northeast and southeast corners could provide more space for trucks and vehicles pulling trailers to maneuver.
- **Dynamic speed feedback signs:** a NYSDOT traffic count on Middleline reports average speed to be 50.5 mph, and an 85th percentile speed of 51.1 mph. The posted speed limit is 45 mph. On the Middleline approaches, consider installing dynamic speed display/feedback signs. Per USDOT, 'research shows these types of signs have been effective at reducing speeds by 5 mph'. These signs may be installed permanently and can be solar powered for ease of installation.

- **Intersection safety enhancements:** the USDOT publication “Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections” lists recommendations for this type of intersection:
 - On the Middleline approaches, consider adding advanced intersection warning signs (MUTCD W2-2 signs). This can be coupled with supplemental street name plaques to improve driver awareness of the intersection.



Above: advanced intersection warning signs

- On the Brookline approach, consider adding advance “Stop Ahead” signs (MUTCD W3-1 signs), oversized stop signs, doubled-up stop signs (on both sides), and retroreflective strips in sign posts. See example image below. The approach currently has an older “Stop Ahead” sign about 700 feet from the intersection that appears to have lost its reflectivity.



Above: advanced intersection warning signs

Other intersections on Middleline Road, such as Randall Road to the north or Devils Lane to the south, or intersections elsewhere in the Town of Ballston, may benefit from the same set of

treatments recommended here. As discussed earlier (in the Round Lake Road and Benedict Road section), consider bundling multiple sites together into a single systemic project for efficiency.

Brookline Road and State Route 50:

Recommendations at this site include evaluating dedicated left- and right-turn lanes, evaluating additional through lanes with lane drops on certain approaches, realigning Mourningkill to improve intersection geometry, access management improvements, and roundabout assessment. As State Route 50 is a State Highway, coordination with NYSDOT on advancing any of these recommendations is required.

- **Dedicated left- and right-turn lanes:** queues that did not clear within one cycle of the signal were observed, especially on the northbound and southbound approaches. Left-turning vehicles impeded through-moving traffic by blocking through-lanes as they waited to turn. On certain approaches, vehicles were observed using the shoulders to move around left-turning vehicles. Based on our field observations, left-turn lanes may be warranted on all approaches. Per USDOT, left-turn lanes may result in a 28-48% reduction in total crashes. As next steps, consider:
 - Conducting a turning movement count at this intersection – as this is a State Highway intersection, coordination with NYSDOT to conduct this count is required;
 - Right-of-way availability analysis, to determine if new turn lanes would fit within the existing ROW on each approach;
 - Develop a model of this intersection with Synchro or similar software – this could be used to model the impact of adding lanes on each approach.
- **Additional through-lanes on approaches:** field observation suggests that left-turn lanes would be more effective, but additional through-lanes could also be considered to enhance intersection capacity, especially on the northbound and southbound approaches where the longest queues were observed. State Route 50 would widen to two lanes in advance of the intersection, then drop back to one lane after. Note that while this would improve capacity, it would add a 'lane drop' merge hazard when returning to one lane.
- **Realigning Mourningkill Drive:** very few vehicles were observed entering Mourningkill from the intersection. This additional fifth approach creates an unusual intersection

geometry and a very long crossing distance for pedestrians. Consider realigning Mourningkill so that southbound vehicles enter from State Route 50 south of the intersection. (Currently, northbound vehicles must turn off Mourningkill 200 feet south of the intersection). Realigning Mourningkill may improve intersection clarity, reduce pedestrian crossing distances, and free up right-of-way that could be used for potential left-turn lanes on the northbound and eastbound approaches.

- **Access management improvements:** driveways close to intersections are crash hazards due to vehicles needing to turn through queues to access these driveways. Before future development occurs in the area (either on the vacant northwest corner, or redevelopment on the other corners), consider amending the Town Code's zoning requirements to require driveways be placed a certain distance from intersections (based on parcel size and roadway traffic volumes) to reduce queue conflicts. If driveways must be placed close to the intersection, consider restricting these to right-in right-out only to reduce crash risk.
- **Roundabout assessment:** in addition to evaluating turning lanes, a Synchro model could also be used to determine if a roundabout is feasible at this location. A roundabout may need to have more than one lane on certain approaches to accommodate observed traffic during peak periods. A detailed ROW analysis would be needed to determine if a roundabout could fit within existing public ROW. A roundabout may also potentially address the red-light running issue noted by Saratoga County staff.

The Transportation Council has resources available to complete small-scale engineering studies, such as traffic data collection and Synchro modeling, as a next step if agreeable to all stakeholders.

NYSDOT is not completing capacity-related projects, and widening of Route 50 is not currently planned in NYSDOT's Capital Program. Capacity improvements would need to be Town- or County-led and completed with non-state funds.

References

Enhanced Delineation for Horizontal Curves (U.S. Department of Transportation Federal Highway Administration FHWA-SA-21-035). <https://highways.dot.gov/safety/proven-safety-countermeasures/enhanced-delineation-horizontal-curves> and https://highways.dot.gov/sites/fhwa.dot.gov/files/Enhanced%20Delineation%20for%20Curves_508.pdf.

Roadway Departures, Underutilized Curve Safety Solutions. (U.S. Department of Transportation Federal Highway Administration). <https://highways.dot.gov/sites/fhwa.dot.gov/files/2023-04/FHWA-Curve-Safety-Solutions.pdf>

Roadside Design Improvements at Curves (U.S. Department of Transportation Federal Highway Administration FHWA-SA-21-029). <https://highways.dot.gov/safety/proven-safety-countermeasures/roadside-design-improvements-curves>

FHWA Highway Safety Programs - High Friction Surface Treatments (HFST). <https://highways.dot.gov/safety/rwd/keep-vehicles-road/pavement-friction/hfst>

Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections U.S. Department of Transportation. Federal Highway Administration. FHWA-SA-21-031. <https://highways.dot.gov/safety/proven-safety-countermeasures/systemic-application-multiple-low-cost-countermeasures-stop> and https://highways.dot.gov/sites/fhwa.dot.gov/files/Systemic%20Application%20at%20Stop-Controlled%20Intersections_508.pdf.

Dedicated Left- and Right-Turn Lanes at Intersections. U.S. Department of Transportation. Federal Highway Administration. FHWA-SA-21-041. <https://highways.dot.gov/safety/proven-safety-countermeasures/dedicated-left-and-right-turn-lanes-intersections>

NYSDOT Comprehensive Pavement Design Manual. <https://www.dot.ny.gov/divisions/engineering/design/dqab/cpdm>

Appendix A: Field Visit Observations

Capital Region Transportation Council
Town of Ballston Technical Assistance

Field Visits
November 19, 2024

Three locations were visited:

- Round Lake Round and Benedict Road (2 to 3pm)
- Middeline Road and Brookline Road (3 to 3:30pm)
- Brookline and State Route 50 (3:30 to 4pm)

A field visit checklist was prepared and completed for each of the visited locations. A summary of observations for each location is compiled below.

Round Lake Road and Benedict Road

Observations:

- Predominant movement is through traffic on Round Lake, with few vehicles turning onto or off of Benedict
- Numerous landscaping trucks passed through intersection and used Benedict. No larger trucks or transit buses were observed.
- High roadside hazard – southeast corner near apartments had steep embankment and utility poles. Parking area for apartments at bottom of embankment. Southwest corner has a house close to roadway that has been struck multiple times.
- Limited sight distance around curve. Left turns from Benedict have good sight distance to the west, low sight distance to the east. Left-turning vehicles on Round Lake may be a rear-end risk due to the curve.
- No stop bar is striped on Benedict. There is no W1-7 Warning Sign facing Benedict.
- On Round Lake approaches: curve advisory signs and advisory speed of 20 mph, which seems like the appropriate advisory speed but vehicles travel much faster. Many chevron signs on both approaches, with retroreflective channel strips. The Round Lake right-turn onto Benedict is downhill.

- Spoke to resident of southwest corner home: house reportedly gets struck about once a year. Cars traveling too fast on Round Lake WB lose control, especially in wet conditions. There was a recent head-on collision (August 9th 2024) at the intersection, which State Police responded to.
- Round Lake Road speed drops to 40mph past Clifton Park border (name changes to Schaubert Rd past Lake Rd).
- SE corner of intersection has a very wide turn radius, making it easier for cars turning east onto Round Lake or south from WB Round Lake to go through the intersection at higher speeds.
- Several driveways are very close to the intersection to the West and South. One driveway essentially at the north end of the intersection.

Middleline Road and Brookline Road

Observations:

- No turning lanes – short queueing observed on Brookline when a vehicle turns left.
- Left-turning trucks from Middleline were observed crossing the Brookline stop bar and centerline.
- Horse trailers and box trucks were observed crossing the Brookline stop bar quite a bit.
- A right-turning vehicle from Brookline was observed using the unpaved shoulder to go around a left-turning vehicle at the stop bar. Tire tracks suggest this happens often.
- The speed limit on all approaches is 45 mph. High speeds on Middleline makes turns hazardous. Vehicles need large gaps to safely turn.
- Pavement markings in good condition, starting to fade. No lighting at intersection.
- No driveways near intersection - closest driveway is 200 feet to the south on Middleline. No driveways on Brookline. Fields on northeast and southeast corners.
- Minor roadside hazards – utility poles, trees. Two utility poles northeast close to intersection about 5ft from shoulder.
- Close driveways north and south of the intersection on west side of Middleline Rd.

Brookline Road and State Route 50

Observations:

- Simple two-phase signal with no turning lanes or protected movements. Mast arms with cameras on all four approaches. The vehicle actuation seems to be working. Signal timed well, queues would clear with no wasted green.
- The intersection is skewed, with the NB lefts and SB lefts being acute angles.
- Left-turning vehicles were observed impeding through movements due to absence of turn lanes. This was observed on the SB approach, with through movement vehicles using the shoulder to pass. WB left turning vehicles were observed waiting within intersection.
 - Left turn lanes may be warranted on all approaches.
- Queues were observed on the NB and SB approaches at 3:30pm. Queues were observed not to clear within one cycle of the signal.
- Mourningkill Drive is one-way exiting the intersection only, with NB vehicles directed to a stop-control on State Route 50 about 100 ft south of the intersection. No issues observed, low traffic on Mourningkill, but queueing on State Route 50 NB would potentially block the stop control from Mourningkill.
- Driveways: driveways very close to intersection on northeast and southeast corners. Queue conflicts observed when vehicles enter or exit Valero through queues during red phases.
- Transit: CDTA 450. SB bus stops partially in travel lane, SB cars go around it but must enter NB lane to do so. No benches or amenities, stops marked with signs only.
- Freight: a right turning semi moving NB to EB was observed crossing the yellow line.
- Access management: queue conflicts with driveways near intersection. Queuing observed to block busy Valero driveways. The Mourningkill NB exit drive was often blocked by NB queues.
- Pedestrians: crosswalks, Detectable Warning Surface in good condition. Buttons on the SE, SW, NW corners. No button or ped signal on NE corner, possibly it was being replaced as there was a pedestal. The EB approach has a very long crosswalk due to needing to cross Mourningkill as well.