

# Suggestions for Reconstruction of the Nonantum Road Corridor for safety and nonmotorized accommodation

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by  
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## Purpose

The planned reconstruction of Nonantum Road offers the opportunity to improve safety for all users of the corridor, restore its parkland nature, and improve access and mobility for nonmotorized users. The DCR presented a plan for reconstruction to the Massachusetts Bicycle and Pedestrian Advisory Board at the June 21, 2006 meeting. Despite the clear improvements to the path adjacent to the road, we are concerned that plans needlessly limit cyclist access to the roadway itself. In this document, we present our experience using the roadway and adjacent path, then suggest some alternatives for improving cyclists' safety and mobility without compromising other modes.

## Summary of Recommendations

- Rebuild roadway with a single general-purpose through lane in each direction. This should not reduce vehicle throughput for the roadway, as the throughput is currently limited by waiting at traffic signals, not available lanes.
- Expand parkland and path (currently proposed by DCR).
- Provide dedicated right and left turn lanes for access to adjacent roadways and lots.
- Improve control of flow into and out of lots, across the path.
- Convert Charlesbank Road intersection to a controlled intersection, with either roundabout or signal.
- accommodate cyclists on the roadway, with either wide curb lanes or bike lanes, consistent with transportation planning policy and best practices.
- Improve pedestrian crossings.

## Current Conditions

Since it is expected that the DCR has the best information on details of the roadway and right of way, this section limits itself to perspectives from regular use of the corridor.

### *Pathway*

The eastern terminus of this path segment is at the North Beacon St. bridge, adjacent to the intersections of Nonantum Rd., North Beacon St., Soldier's Field Rd. (extension), and Leo Birmingham Pkwy in a pseudo-rotary configuration. The path connects via the bridge sidewalk towards Watertown and via a curb cut and crosswalk to the path farther downstream along Soldier's Field Rd. on the south side of the river. Legal roadway access (no jumping curbs or crossing without a crosswalk) at this location is summarized in the following table.

<i>Roadway</i>	<i>To Path</i>	<i>From Path</i>
Nonantum Rd.	Traverse rotary; U-turn	Enter No. Beacon crosswalk; turn right
Birmingham Pkwy./Parson's St.	Traverse rotary; merge right into No. Beacon crosswalk	Enter No. Beacon crosswalk; traverse rotary

<i>Roadway</i>	<i>To Path</i>	<i>From Path</i>
Soldier's Field Rd.	Merge left two lanes; enter No. Beacon crosswalk from either side in rotary <i>or</i> leave roadway to right and wait for (unprotected) crossing at No. Beacon crosswalk	Enter No. Beacon crosswalk; traverse rotary
North Beacon St.	Turn right onto path from crosswalk.	Cross to median at No. Beacon crosswalk; enter roadway and turn left (unprotected turn).

From here the path proceeds west. Conditions are similar along its entire length: narrow, near the roadway, with a very rough surface. Trees along the path present three dangers: their roots deteriorate the surface, the branches overhang the path causing hazard of eye damage and even head impact, and the vegetation screens the path and road from each others' view. Trees planted in the planting strip between the path and roadway present a particularly serious hazard at driveways crossing the path, where roadway users cannot see path users and thus cannot yield appropriately. For a short distance past Charlesbank Rd., there is a guardrail adjacent to the road, in the pathway, further narrowing the usable space. Further west, the guardrail is moved to the river side of the path, so that an out-of-control vehicle will be guided along the path and into a path user or lamppost. In this area, there is no planting strip between the path and roadway. As it approaches Watertown Square, the path narrows, with signs and lampposts placed in the pathway.

Driveways to DCR lots cross the path in five places. Motorists leaving the roadway are turning from a high speed roadway across a poorly-seen path; motorists entering the roadway are trying to merge into a high speed roadway. Our experience has been that they rarely yield to the path, especially at night. The crosswalk stripings are worn and there are no other indications of a path or a requirement to yield. As mentioned, screening vegetation makes yielding very difficult.

At Brooks St. there is a crosswalk and signal, but the crossing of Brooks St. itself (necessary for access from Brooks St. to the path) has a walk phase during a conflicting road phase. Signs warn pedestrians to beware of turning vehicles, an apparent inversion of the normal right-of-way rules. At Charlesbank Rd. and Maple St. there is no curb cut, signal, or crosswalk. Pedestrians must run across in a clear space; westbound cyclists can either run across or merge into the roadway (by jumping the curb) and then turn left. Eastbound cyclists must cross as pedestrians and then stop in the rightmost westbound lane to lift the bicycle over the curb.

At the western terminus, Watertown Square has curb cuts and pedestrian signals, providing reasonable access between the roadway and pathway. However, the sight lines and available width at the end of the Galen Street bridge are very restricted.

Because parts of the path are immediately adjacent to the roadway, eastbound cyclists on the path are in danger of falling into oncoming traffic, being struck by vehicles jumping the curb, and, at night, being blinded by oncoming headlights.

The pathway is more lightly used than other sections (such as those downstream), but still sees substantial use. Users are mixed between lone pedestrians (frequently

joggers), groups of pedestrians (often slow-moving and obstructing the whole path), and cyclists, both transportation and recreational, with a mixture of equipment and speed.

### *Roadway*

Both lanes in both directions are narrow, with no significant shoulder. The lefthand westbound lane at Charlesbank road is designated left-turn only, although it is often used as a through lane. Lane markings were recently repainted (having worn out almost completely), but this does not seem to have decreased the tendency for motorists to straddle lanes at times. Pavement is poor, but particularly so in the right hand eastbound lane. This lane is so badly deteriorated that a cyclist needs to use the entire lane, dodging from left to right as pavement allows.

The road is straight and has excellent sight lines east of Charlesbank Road, but has fairly sharp curves west of it. Vegetation grows up to the edge of the roadway, limiting the sight lines where there is a curve. Maple St. enters just east of a curve, giving good visibility to and from Nonantum Rd. to the east, but poor visibility to the west.

### *Motor Traffic*

Traffic is heaviest east of Charlesbank Rd., due to heavy access into Newton Corner. DCR parkways provide a fairly high-speed through route from downtown Boston to the Massachusetts Turnpike via the Newton Corner rotary, which avoids the \$1 toll and resultant backup. Conventional wisdom states that "everybody" on Nonantum Road is really accessing the Pike. Although this is likely hyperbole, at least half the traffic does exit to Charlesbank Rd. This is a significant regional transportation problem, and we are pleased to see the DCR attempting to quantify it in the context of the Storrow Drive reconstruction.

Overall, motor traffic on Nonantum Road is fairly light but very fast. Posted limit is 40MPH but that speed is rare; 50-60MPH is a "common" observed range. Eastbound traffic "trickles" on and is usually quite spread-out. An eastbound cyclist can occupy the right hand lane and allow passing with little difficulty, even in busy morning hours when traffic backs up at the Brooks St. light. Westbound traffic is much more "platooned" by the light at the rotary and tends to travel west at high speed in a knot occupying both lanes, with little space for motorists in the right hand lane to merge left and pass a westbound cyclist. Motorists also appear to be confused by the presence of cyclists in the road on the side with a path. However, in between these knots of traffic there are usually large empty spaces. Westbound traffic flow is clearly limited by the light at North Beacon St.; eastbound traffic flow is limited by the light at Brooks St. In neither direction is the full carrying capacity of two lanes used or required.

Sections of the road can be roughly categorized as "arrow-straight" or "curved." On straight sections, motorists tend to build up significant speed, as they perceive no dangers (driveways and the pathway being screened by trees). Even on the straights, motorists often will stray across lane lines. On curves, motorists tend to maintain their speed, and lane positioning becomes even worse. With two available lanes in each direction, motorists are tempted to pass even at high speed on curves with narrow lanes.

Westbound traffic exiting to Charlesbank Rd. frequently will not yield to eastbound Nonantum Rd. traffic, perhaps because the left exit to Charlesbank follows a straighter path than continuing onto Nonantum. Through traffic will also often ignore the left-turn only restriction, as the lane continues beyond the intersection. As a result, it is very difficult for

westbound traffic to evaluate oncoming motorists and determine if they will yield as required, or if evasive action is necessary.

Despite the truck prohibition, tractor-trailer rigs use Nonantum Rd. on a fairly regular basis (observed on about 1/4 of trips in the corridor, mostly entering from Charlesbank Rd.). Smaller "panel trucks" are very common, but it is unclear whether they are violating the prohibition.

### **Safety Issues (Current Conditions)**

- Narrow pathway
- Poor access between roadways and pathway
- Poor sightlines in places
- "Speedway" perception of the roadway
- Motorists turning at high speed and failing to yield

### **Goals for Reconstruction**

We suggest the following goals for this project, which we believe are compatible with the goals of the DCR and the MDC Master Plan.

#### *Traffic Calming*

High motorist speeds through this corridor represent a significant danger to all users; reducing peak speeds will be of benefit to all.

#### *Restoring Parkland and Widening Path*

Re-emphasizing the parkway nature of this road has benefits of its own, by providing more green space for park visitors. Widening the path and increasing its separation from the road increases safety for all path users. Finally, appropriate use of greening and narrowing contributes to traffic calming.

#### *Improved Access to Corridor*

Cyclists and pedestrians both need safer and easier access into the parkland. Through cyclists need easy use of the corridor to access destinations beyond it.

#### *Maintaining Reasonable Level of Service for Motorists*

Since it is unlikely that demand for motorist access to Nonantum Rd. will decrease significantly in the short term, the reconstructed design should meet that demand. Fortunately, current demand appears to be well below capacity.

### **The Case for On-Road Cyclist Accommodation**

It has been suggested that the sidepath represents adequate facilities for cyclists and the roadway should have narrow lanes (for purposes of traffic-calming), with two westbound through lanes, one eastbound, and no provision for motorists overtaking cyclists (shoulder, bike lanes, or wide outside lane). The argument is that the vast majority of cyclists would prefer to ride on the sidepath, and the rest do not merit special consideration. We disagree with this assessment for a number of reasons.

#### *Known safety issues of sidepaths*

Cycling safety research has well established that crossing and turning conflicts, such as at intersections and driveways, represent the largest danger to cyclists from motorists. Furthermore, it has been established that sidewalk and sidepath facilities, especially at the speeds necessary for meaningful transportation cycling (i.e. with the potential to displace private automobile use), are significantly more dangerous than roadway cycling. Cyclists traveling at these speeds also pose a significant danger to pedestrians on pathways, an issue that has surfaced repeatedly in public discussions of DCR paths. Two specific references are Cross and Fisher, 1977 (summarized in the AAA report at <http://www.truewheelers.org/research/studies/aaa/> ) and Wachtel and Lewiston, ITE Journal, Sept. 1994 (available online at <http://www.bicyclinglife.com/Library/Accident-Study.pdf> )

For maximum safety, then, cyclist use of the roadway should be considered and even encouraged. Furthermore, experienced cyclists who are familiar with the dangers of sidepaths are likely to use the roadway, so it is reasonable to provide the best and safest experience possible for them.

### *Established practice*

The DCR's predecessor, the MDC, has already calmed two roadways via lane reduction and addition of a bike lane: Charles River Road (Watertown Square to North Beacon St.) and North Beacon Street (Charles River Road to the bridge over the Charles River). The DCR also has narrowed the travel lanes on Greenough Boulevard between Western Avenue and the Eliot Bridge, making shoulder space available for cyclists. Many cyclists enjoy making use of these facilities, despite the availability of the adjacent path.

Middlesex Fells Parkway and Mystic Valley Parkway have wide lanes and are popular with bicyclists. West Roxbury Parkway, Turtle Pond Parkway and Eneking Parkway not only have wide lanes but are part of Massachusetts Bike Route 1, the Claire Saltonstall Bikeway.

The Charles River Conservancy reports a high rate of crashes on the paths. We are interested in any data the DCR may have on relative rate of crashes on DCR paths and roadways.

The new MassHighway design manual, section 11.2, states "Shared use paths and trails...should not preclude shared use of streets either by regulation or design."

Since Nonantum Road is not a limited-access highway, cycling on the roadway cannot be prohibited under Massachusetts statutes.

The MDC Master Plan for the Charles River basin recommends widening the shoulders for on-road bicycle accommodation to "...provide space for those cyclists wanting to bike on the parkways..." (pg. 73). This master plan was produced by the DCR's predecessor with significant public input.

The 1999 *AASHTO Guide for the Development of Bicycle Facilities* (pg. 33 and following) notes that "Shared use paths should not be considered a substitute for street improvements even when the path is located adjacent to the highway."

League of American Bicyclists' policy states "Road systems must accommodate bicyclists...All roads...are bicycle facilities, and should be thought of as such throughout their design and maintenance cycles." Similarly, "MassBike advocates that cities and towns should design, maintain, and police roads with cyclists in mind."

Precedent and best-practice guidelines, in Massachusetts and nationally, from a

designer's perspective and a cyclist's perspective, argue against sidepaths as the sole method of cyclist accommodation.

#### *Access to roadways and destinations*

The placement of the pathway adjacent to the river puts the roadway and sometimes complicated intersections between a pathway user and other roadways and destinations. This is best illustrated by a route from Newton Corner into Brighton. On the roadway, a cyclist can enter from Maple St., pick a safe lane position towards the right of the road, and continue safely through to the Birmingham Parkway and North Beacon St. with a minimum of crossings. The same route via the path requires crossing the street with no crosswalk at Maple, crossing five driveways, then navigating across a busy intersection to Birmingham Parkway, either by entering at North Beacon or by crossing Nonantum Rd. at Brooks St. and waiting on Brooks St. to turn right into the intersection. The most dangerous part of the route--the complicated and high-speed intersection--cannot be avoided by use of the pathways.

Use of Nonantum Road permits easy access to destinations and connecting roadways which are difficult, dangerous, or require excessive travel time to reach via the path.

#### *Providing maximum choice for maximum number of users*

It has often been argued that sidepaths provide options for cyclists who may be less comfortable using the roadway or untrained in doing so. The assumption is that additional expense and facilities are justified in accommodating those of varying needs and ability. This same argument supports ensuring that experienced, high-speed cyclists receive facilities appropriate for their transportation needs.

Even the best sidepath is a lower-speed facility, due to the presence of pedestrians and inexperienced or slower cyclists and the need for special caution. Most reasonably fit individuals (regular riding is generally sufficient to achieve this level of fitness) can, with experience, easily attain speeds that are unsafe on a sidepath but perfectly safe on a well-designed roadway. This faster cycling is far more competitive with motor vehicles as a means of transportation.

Although highly experienced cyclists can and will cycle on a roadway with narrow lanes, they are usually more comfortable if motor vehicles can easily overtake. On a roadway with two narrow lanes in each direction, overtaking requires a lane change. With a single narrow lane, safely overtaking a cyclist may be impossible. Providing extra space on the margins of the roadway (in the form of a wide outside lane, bike lane, or wide shoulder) facilitates easy overtaking, more comfortable cycling, and better efficiency of traffic flow. Furthermore, many cyclists who may not be comfortable cycling on a narrow high-speed road can be comfortable with adequate width.

Finally, moving faster cyclists to the roadway removes them from the path. This decreases crowding and reduces the top speed on the path, benefiting all path users: those cyclists who choose to use it, inline skaters, and pedestrians.

#### *Clear demand from users*

Charles River Rd. and North Beacon St. (between Charles River Rd. and Little Greenough Blvd.), as corridors with both bike lanes and adjacent paths, indicate the relative

desirability of each option to cyclists. We collected the following data:

<i>Roadway</i>	<i>Date</i>	<i>Time</i>	<i>Cyclists on Path</i>	<i>Cyclists in Roadway</i>
Charles River Rd.	07/17/06	8:10-9:10AM	0	15
Charles River Rd.	07/17/06	5:15-6:15PM	3	27
No. Beacon St.	07/18/06	8:08AM-9:08AM	9	36
No. Beacon St.	07/18/06	5:17PM-6:17PM	8	30

(In addition, six cyclists were observed using the sidewalk on the north side of North Beacon St., and three small motorbikes were observed making use of the bike lanes.)

While by no means comprehensive, these data indicate a strong desire by cyclists to make use of the roadway. 84% of cyclists observed chose the roadway over the adjacent path.

#### *De-emphasizing high-speed nature of roadway*

Discouraging cycling on the roadway reinforces the perception that parkways are for high-speed motor traffic. The presence of low-speed vehicles forces drivers to slow and increase their awareness. Cyclist accommodation also benefits users of other vehicles with similar characteristics, such as motorized bicycles and light motorcycles. With rising gas prices, these may become significantly more popular. If a message is sent that "roadways are for cars," their users may choose instead to ride on the sidepath, with poor results for all. If, however, it is emphasized that "The roadway is for many classes of vehicles," they can easily be absorbed into the mix.

#### *Traffic calming and lane width*

As mentioned above, accommodating cyclists has traffic-calming effects of its own. Calming works by making drivers acutely aware of hazards so that they slow down to deal with them, so visible cyclists, clearly marked pedestrian crossings, and obvious intersections can all calm traffic.

It has been claimed that narrow lanes will have a calming effect. The lanes on Nonantum Road are already quite narrow, yet this does not seem to calm traffic. In fact, having two narrow lanes in the same direction would seem to encourage the behavior that has been called out as particularly dangerous on this roadway (drag racing). Discouraging motorists from passing each other would seem to be far more beneficial; in fact, the City of Toronto has focussed on lane reduction as a means of traffic calming, to good effect.

Lane narrowing, on the other hand, has a far more mixed evaluation in the literature. There seems to be a consensus that lane narrowing to facilitate other calming measures (including bicycle accommodation) works well, as does removing through lanes, but narrowing lanes alone has very little impact. A review of literature on lane width and traffic calming is available at:

[http://www.arlingtonva.us/Departments/CPHD/forums/columbia/street\\_space/CPHDForumsColumbiaStreetSpace.aspx](http://www.arlingtonva.us/Departments/CPHD/forums/columbia/street_space/CPHDForumsColumbiaStreetSpace.aspx)

### **Suggested Treatments**

These two suggested designs provide examples of how the corridor can be improved, as an illustration of concepts rather than a specific engineering plan.

## **Base Treatment**

### *Roadway cross-section*

The basic roadway alignment in both suggested treatments is a single general-purpose travel lane in each direction. This will slow the very fast drivers by preventing high-speed overtaking.

Dedicated turn lanes are recommended for all intersections. A dedicated turn lane permits traffic queueing without affecting the flow of through traffic. It also allows motorists to slow and yield properly for a turn, instead of worrying that slowing may result in a rear-end collision from those behind.

At any particular point, then, there are likely to be three lanes, but only one through lane in each direction. Rather than adding capacity to the mainline, this approach allocates destination-specific lanes early and clearly.

Suggested posted speed limit is 35MPH. There is a psychological line between 35 and 40MPH, where 40 suggests "high-speed rural highway." The entire length of Nonantum Rd. (1.5 miles) can be traversed in 2min15sec at 40MPH or 2min35sec at 35MPH, assuming there are no other delays. A 40MPH speed limit may be perfectly safe if it is observed and motorists slow as necessary to respond to conditions.

### *Path alignment and driveway crossings*

Path alignment is also the same in both treatments. Since the path will be pulled further back from the roadway behind a planting strip, it is strongly suggested that the path be far enough back at driveways for a motorists to nearly complete a turn off the roadway before having to cross the path, although dedicated turn lanes will reduce the need for a waiting space at the path.. Similarly, a sufficiently wide strip will allow motorists entering the roadway to cross the path and watch for an opening to turn without blocking the crosswalk. This strip should be planted with grass and flowers, but not trees or high bushes--the path must remain visible from the road, and root incursions should be avoided. Yield signs should be posted on both sides of all path crossings, facing perpendicular to the path, to warn motorists to yield to the path traffic.

From east to west, the current path crossings and suggested treatments are:

Lot east of Daly field (Currently large driveway with small median): Reduce to two driveways, clearly marked in and out, with a substantial grassed median in between. Currently motorists enter and exit across the whole area.

Inbound driveway should be single-lane, but appropriately flared to allow entrance from eastbound Nonantum Rd. Outbound driveway should be two lanes, clearly marked left-turn and right-turn. (*henceforth Driveway 1*)

Lot between field and rink (Currently medium-width driveway): Treat as above. Potentially eliminate access road between the this lot and the previous to allow expanded parkland. (*Driveway 2*)

Small lot directly west of rink: Remove roadway access, if at all possible.

Connect to lot east of the rink via a roadway north of the rink.

(Alternative to the above crossings: Relocate path between river and the lot.

This would substantially increase the length of the path, make it more secluded/dangerous at night, and potentially put the path in the floodplain.

Not recommended.)

Lot by boathouse (east entrance): Treat as Driveways 1 and 2, with a single-lane entrance and two-lane exit. (*Driveway 3*)

Lot by boathouse (west entrance, into Charlesbank Rd. intersection): Eliminate roadway access--require entry/exit at Driveway 3, where sight lines are better and intersection isn't in the way.

These suggestions replace five chaotic crossings with three well-defined ones. They may result in slightly more backup into the lots; however, the ultimate restriction on flow out of the lot is availability of space on the roadway.

Each of these crossings would have a right-turn and left-turn lane off of Nonantum Rd., providing access to the driveway.

#### *North Beacon St. to Brooks St.*

Currently this stretch has two through lanes and a left turn lane westbound and two through lanes eastbound. Convert to one through lane and a left turn lane westbound, with two through lanes eastbound. This is where two-lane traffic from the rotary must merge to continue on Nonantum Road. Alternatively, permit a slightly longer merging area with two through lanes and no dedicated left turn lane--with this alternative, the final merge would occur after the Brooks St. crossing, and would not permit expansion of the parkland and path in this area.

The signal at the North Beacon St. bridge should be phased to prevent backups from Brooks St. signal into the rotary. Curb cuts should provide access to path from Brooks St. crosswalk and westbound out of the rotary (currently path access from rotary requires short wrong-way ride up North Beacon; in the past there was a poor curb cut here, probably unofficial).

#### *Brooks St. to Driveway 1*

Just west of Brooks St., one through lane eastbound and two westbound (to permit queueing at the light). Partway to Driveway 1, transition to one westbound, one eastbound, and an westbound right turn lane. The location of this transition depends on the relative capacity needs of the turn onto Driveway 1 and eastbound traffic stopped at Brooks St. The westbound road should turn slightly south here, to shift the available space over to the right hand side so the turn lane can be placed in a bulbout (i.e. the straight path should *not* lead into the right hand turn lane). This slight curve will help combat the speedway effect.

#### *Driveway 1 to Driveway 2*

An eastbound left turn lane (into Driveway 1) transitions to a westbound right turn lane (into Driveway 2).

#### *Driveway 2 to Driveway 3*

Similar to above.

#### *Driveway 3 to Charlesbank Rd.*

See details of specific treatments below. In both cases, provide LTOL from eastbound Nonantum into Driveway 3.

#### *Charlesbank Rd. to Maple St.*

One eastbound and one westbound through lane. Strongly suggest prohibiting right turns onto Charlesbank and making this self-enforcing with a sharp corner. Crosswalk with curb cuts and "Pedestrian Crossing" signs just west of Charlesbank intersection. On approach to Maple St., introduce westbound LTOL for access to Maple St. Realign Nonantum Rd. and end of Maple St. to provide a more right-angle intersection and provide better visibility for right turn from Maple to Nonantum--it may be worth using some of the width gained from narrowing the roadway to move the intersection closer to the river and off the hill. Do not recommend allowing left turn from Maple to Nonantum.

#### *Maple St. to Water St.*

Two through lanes, eastbound RTOL approaching Maple if turns are permitted. However, we strongly recommend prohibiting right turn onto Maple from Nonantum, making this self-enforcing with a sharp corner. (Pickup trucks from Direct Tire tend to make this turn frequently.) Crosswalk west of Maple, with signs. Realignment of intersection should make this crosswalk visible from both directions. Potentially an eastbound merge/acceleration lane for traffic entering from Water; this lane would turn into RTOL at Maple unless the right turn is prohibited.

#### *Water St. to Galen St.*

One eastbound lane and two westbound (to allow queueing at light). Current eastbound left hand lane of Watertown St. should be made left turn only onto Galen St. bridge. Left-hand lane of westbound Nonantum Rd. would then be facing LTOL of Watertown St., so perhaps it should be made left turn only to avoid conflicts (with traffic for Watertown St. or Watertown Square in the right hand lane). It may be worth evaluating traffic flow at this intersection to make this choice.

We suggest that any overhead lighting used incorporate full cutoff shielding, to reduce glare. Also, tall vegetation should be kept some distance back from the roadway--not enough to compromise the parkway experience, but with an eye towards effective sightlines and minimizing overhang.

### **Option 1: Wide lanes**

This option incorporates the above elements, but with 14'-15' through lanes. "Share the road signs" or shared-lane markers may also be appropriate to emphasize bicycle accommodation on the road. Turn lanes could be 10' wide, or even less (since they are not carrying high-speed traffic). Where there are two through lanes in a given direction (eastbound at Brooks St.; westbound at Galen St.), they should be narrow (10' wide).

#### *Charlesbank Rd. intersection*

Replace intersection with a modern roundabout of appropriate geometric design to fit the parkland and control speed. Center island should be grassed but not treed (to provide visibility). This would eliminate the conflict between eastbound Nonantum Rd. and traffic turning onto Charlesbank, and calm traffic continuing westbound on Nonantum Rd.

Materials from the TRB's national roundabout conference, including a presentation specifically on designing single-lane roundabouts for desired speeds, can be found here: <http://www.teachamerica.com/transportation.html>

Care should be used in siting and signing the crosswalk west of the roundabout, so westbound traffic does not accelerate into crossing pedestrians, and eastbound traffic pays attention to the crossing as well as the roundabout entry. An entry island of the roundabout may be useful as a pedestrian refuge.

With a roundabout configuration, right turns onto Charlesbank from eastbound Nonantum would be safe and reasonable.

### **Option 2: Bike lanes**

This design again incorporates the common elements, but uses narrow (10'-11') through general-travel lanes and 4'-5' dedicated bike lanes. It requires a more detailed description, thus:

#### *North Beacon St. to Brooks St.*

No bike lanes eastbound; westbound bike lane should begin immediately at North Beacon St. Lanes through the intersection are wide enough to share between a motorist and a cyclist, but as soon as North Beacon St. is passed, they narrow significantly (usually with a heavy platoon of motorists behind). Ideally, a cyclist waiting for the light at North Beacon St. would wait on the right hand side of the right hand lane and ride straight into the left hand edge of the bike lane.

#### *Brooks St. to Driveway 1*

Westbound: Bike lane begins on the right--note that this should be an opening up of the roadway on the right, not a movement of the main travel lane to the left, to keep motorists out of bike lane. On approach to driveway 1, skip-stripe both sides of bike lane, maintain bike lane straight, and introduce RTOL on the right-hand side of bike lane. Switch to solid striping after sufficient distance to merge into RTOL. Consider "blue lane" treatment.

Eastbound: Bike lane widens and becomes right-hand general travel lane approaching Brooks St. light, with sign "Bike lane ends."

#### *Driveway 1 to Driveway 2*

Westbound: treat approach to Driveway 2 like approach to Driveway 1. Maintain straightness of bike lane as much as possible (i.e. direction of travel of bike lane should be same as general travel lane.)

Eastbound: no special treatment, other than maintaining straightness as pass LTOL and RTOL.

#### *Driveway 2 to Driveway 3*

Same as Driveway 1 to Driveway 2.

#### *Driveway 3 to Charlesbank Rd.*

Transition LTOL from eastbound Nonantum into a LTOL for westbound Nonantum onto Charlesbank Rd. "Square up" intersection of Charlesbank and Nonantum. Install traffic signal. Normal phase is green straight arrow presented to Nonantum Rd. (westbound and eastbound), red left arrow to westbound Nonantum, and a red right arrow (with "No Left Turn") to Charlesbank. Charlesbank Rd. and LTOL on Nonantum Rd. should have

detectors (quadrupole loop type or video type, which achieve bicycle detection) which will switch to a phase presenting red arrow to eastbound Nonantum Rd., green left and straight arrows to westbound Nonantum Rd., and green right-turn arrow to Charlesbank Rd. Two detectors may allow a sooner and/or longer green signal if traffic is backed up. No right turn from Nonantum to Charlesbank. Charlesbank Rd. should also have a "No turn on red" sign unless the sightlines are greatly improved over the current situation.

Also provide demand-activated pedestrian signals at the crossing and a dedicated pedestrian phase. This will show red arrows for through traffic on Nonantum, a green left-turn arrow to westbound Nonantum, and a green right-turn arrow to Charlesbank. There is little need for pedestrians to cross Charlesbank here; nothing is north of the roadway except Turnpike Authority property.

*Charlesbank Rd. to Maple St.*

No additional treatment.

*Maple St. to Water St.*

Strongly suggest no right turn onto Maple St. from eastbound Nonantum Rd. If absolutely necessary, create RTOL as on approach to driveways.

*Water St. to Galen St.*

Westbound: Bike lane expands to become right hand general travel lane, as is done eastbound at Brooks St.

Eastbound: Bike lane starts.

## **Land Use**

Either option would require slightly more width than a simple configuration of three through lanes. Two wide lanes or two narrow lanes with bike lanes would be comparable in width (although slightly narrower) than three narrow lanes; the additional width requirements would come from the turn lanes. However, it is vital for the safety of path users that motorists yield appropriately to the path, requiring them to slow before making a turn, which is facilitated by turn lanes. The turn lanes can, of course, be narrower than a general through lane, so any configuration would take up less width than the current four-lane road.

The space requirements of right turn lanes may be reduced in Option 2 by combining the right turn lane with the bike lane. This treatment is documented in FHWA publication number FHWA-RD-00-151, available at [http://safety.fhwa.dot.gov/ped\\_bike/bike/bsol\\_plan.htm](http://safety.fhwa.dot.gov/ped_bike/bike/bsol_plan.htm) under "Evaluation of a Combined Bicycle Lane/Right Turn Lane in Eugene, Oregon".

The narrowest part of the corridor--west of Charlesbank Road--would require only a single left-turn lane, allowing significant width for path and planting strip along the rest of the road.

## **Advantages and comparisons**

Both options provide safety improvements. Most importantly, they address the issue of the Charlesbank Road interchange. They add visible pedestrian crossings where there are already strong desire lines. Crossings of the path—the most dangerous aspect of

any path—are reduced. Traffic is calmed by reducing opportunities for high-speed overtaking, adding gentle curves to straightaways, improving the greening, and allowing turning traffic to slow and yield appropriately. Finally, cyclists are well-accommodated on the roadway in both cases.

Option 1 (wide outside lanes) is likely the better treatment for advanced cyclists and motorists. Although the Charlesbank roundabout will slow motorists, it will not stop them (and aggravate them). It will not require a new traffic signal. By avoiding bike lanes, it avoids the problems inherent in them (crossing/turning conflicts). However, this option does not provide "cyclist-only" space, does not add a protected road crossing, and requires cyclists to navigate a roundabout, which can be intimidating to many cyclists.

Option 2 (bike lanes) is likely the better option for pedestrians and beginning to intermediate cyclists. Both benefit from a signalized crossing to the path at Charlesbank. Bike lanes tend to be more comfortable than wide outside lanes for many cyclists. It avoids a roundabout. (Note that the Manual on Uniform Traffic Control Devices prohibits bike lanes in a roundabout, requiring that the lane be discontinued before the roundabout.) Problems which can occur with bike lanes are minimized here: there is no on-street parking, crossings are few, and motion across the bike lane requires a very obvious merge. The main disadvantage lies in the cost and inconvenience to motorists of the light at Charlesbank, but this also yields one of this option's main advantages.

Each option uses the same amount of lateral space. Option 1 requires a minimum 14' wide lane, whereas option 2 requires a minimum 10' through lane and 4' bike lane. It would perhaps be possible to compress Option 1 at choke points if absolutely necessary, but this would be highly undesirable (requiring cyclists and motorists to merge at each choke point). From a land use standpoint, then, the main difference is in the size of the roundabout for Option 1.

Two aspects of these options may seem controversial. First is the closing of driveways onto Nonantum. This is necessary primarily for the safety of path users, but also for roadway cyclists and motorists. Currently motorists enter and exit driveways at many places and high speeds; these movements need to be more clearly channelled.

The second major change is making the Charlesbank intersection controlled in some regard. This is vital to the safety of this corridor. Cyclists who are comfortable riding along most of Nonantum Road will avoid it because of this one intersection. (In general, motorists turning left across the path of an oncoming cyclist are a common cause of car/bike collisions). Some motorists avoid the road for the same reason.

## **Conclusion**

We have presented two options for the redesign of Nonantum Road that we believe represent best current practices, improve safety, and calm traffic, while still providing cyclist access to the roadway. Despite the detail, we present these suggestions as examples of possible treatments, not comprehensive design plans. We hope the DCR will accept and consider them seriously, and we look forward to reviewing and providing input on any future detailed design.

Thank you.

Massachusetts Bicycle Coalition, MetroBoston Chapter

Livable Streets Alliance  
Watertown Bicycle/Pedestrian Committee