# APPENDIX A

This appendix summarizes public comments received as of 2015, including comments received at both public meetings.

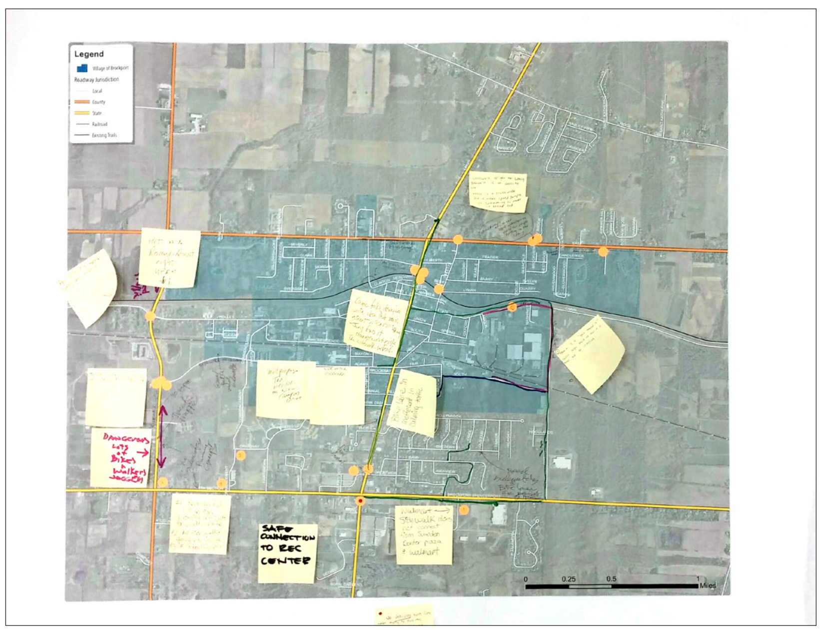
## PUBLIC INFORMATION MEETING 1

The first Open House for the Village of Brockport's Active Transportation Plan was held on Thursday April 9th, 2015 from 7:00 P.M.-9:00 P.M. at the Brockport Village Hall. The purpose of the open house was to receive input from members of the community regarding Active Transportation throughout the Village. The team welcomed all comments, concerns and suggestions from over 20 signed-in attendees for making Brockport a better community for all modes of transportation.

### MEETING FORMAT

The open house was held as a walk-in session with no formal presentation. Attendees were asked to sign in at the welcome area and received project handouts and a comment sheet. A showcase of display boards and flip charts were available for observation and comments. The following stations were provided:

- Welcome
- Benefits of Active Transportation
- Existing Conditions
- Pedestrian and Bicycle Level of Service
- Priority Intersections
- Destinations and Distances
- School Connectivity
- Erie Canalway Trail
- Active Transportation Toolbox
- Parallel Projects & Initiatives
- Village Map of Transportation Network




### GENERAL COMMENTS

The following comments were received through a series of flip charts and post-it notes located around the room.

- Bike lane on Route 19 starts and stops - not continuous. Typical comment throughout village.
- Consider all mobility levels.
- Redman Rd intersection needs improvement
- Protected bike lanes - left turn issue.
- Monroe and Main St - problem turning left - poor sight lines.

- Need “share the road” signs at round-abouts.
- Problem - distracted drivers (and pedestrians, bicyclists, skateboarders, etc.).
- People want to cross Main Street near wegmans - need a crosswalk.
- Very dangerous for walking and driving - crosswalk North of Main St. Canal Bridge.
- Lack of sidewalks going into Wegmans.
- Lack of sidewalks going along Commencement and into Brockport Central.
- Need traffic calming for Main Street.
- Raised sidewalks into Campus.
- Possible shared use trail along New Campus Drive.
- Can the Village provide bike parking structures near/along Main Street?
- Round-about on Redman Road at intersections of New Campus Drive and West Ave?
- Smith Street bridge - sidewalk accessibility issues. Biking south over Smith Street bridge is a safety issue.
- Improved crossings along East Avenue needed.
- No sidewalk along New Campus Drive.
- Provide Sweden Town Park access off Redman Road for pedestrians.
- Need direct access from the Village of Brockport to the schools and Wegmans.
- Lots of bikers/walkers along Redman Road - Dangerous.
- Need safe connection to the Clarkson Rec center.
- Walmart sidewalk does not connect from Sweden Center Plaza to Walmart.
- Need sidewalks and bike lanes in neighborhoods too.
- Bike lanes are inefficient as traffic calming along Route 19.
- Some people find Main St as dangerous.

# PUBLIC INFORMATION MEETING 2

The second Open House for the Village of Brockport's Active Transportation Plan was held on Tuesday, June 30th, 2015 from 7:00 P.M.-9:00 P.M. at the Brockport Village Hall. The purpose of the open house was to receive input from members of the community regarding preliminary recommendations for Active Transportation throughout the Village. The team welcomed all comments, concerns and suggestions from over 30 signed-in attendees for making Brockport a better community for all modes of transportation.

## MEETING FORMAT

The open house was held as a walk-in session with no formal presentation. The June 30th open house was a display of preliminary recommendations for improving safety, mobility, and connectivity for pedestrians and bicyclists. Attendees were asked to sign in at the welcome area and received project handouts and a comment sheet. The following showcase of display boards and flip charts were available for observation and comments. Corresponding comments are provided below.

### SUMMARY OF PUBLIC INPUT

### PRIORITY INTERSECTION RECOMMENDATIONS

- Need intersection improvements at Sweden Town Park entrance.
- Where is the crosswalk being re-located at Priority Intersection #3?
- Can we have pedestrian only crossing time signal, dedicated pedestrian phase.

### SIDEWALK NETWORK PRIORITY GAPS

- Potential sidewalk addition along Central School Drive, north of Barclay. Possible shared use markings and signage on this stretch.

### TRAIL RECOMMENDATIONS

- Rail line is still active west of the frozen food storage facility. This section of rail could show a rails-with-trails option, while the abandoned section could show a rails-to-trails facility.

### SCHOOL CONNECTIVITY

- Coordinate with Safe Routes to School Application.

### ERIE CANALWAY BRIDGE IMPROVEMENTS

- Sidewalk at Park Ave bridge is still closed. Needs repairs to re-open.



- No pedestrian walks either side of Smith Street bridge from Clinton Street. Bridge walkway dead ends at south end of bridge.
- Not just ADA compliant, but family friendly - currently unpassable areas with strollers and small children.
- Main Street bridge will need barrier if proposing to move crosswalk. Currently cars fly over the bridge, very unsafe location for crossing.

## ON-STREET BICYCLE FACILITIES RECOMMENDATIONS

- Check LOS data. On Rt 19, from Rt 31 to Crestview has no bike facility. Possibly show a sidepath in this location. Revise all bike lane segments along Main Street (lanes start and stop).

## SEPARATED BIKE LANE PLANNING & DESIGN GUIDE - FHWA, 2015

## REDMAN ROAD CONCEPTUAL ROAD DIET CANDIDATE

- Alternative #2 for the Redman Road Diet is preferred.
- The problem with both bike lanes on the same side of the street is, what happens at corners? What happens when you cross the street? What happens when a car comes out of the driveway and turns into it?
- Can we investigate a speed limit reduction on Redman Road? Current speed that vehicles travel is out of control.

## OWENS ROAD CONCEPTUAL IMPROVEMENTS

## GENERAL RECOMMENDATIONS

## PROGRAMS, POLICIES, EDUCATION & OUTREACH

# APPENDIX B

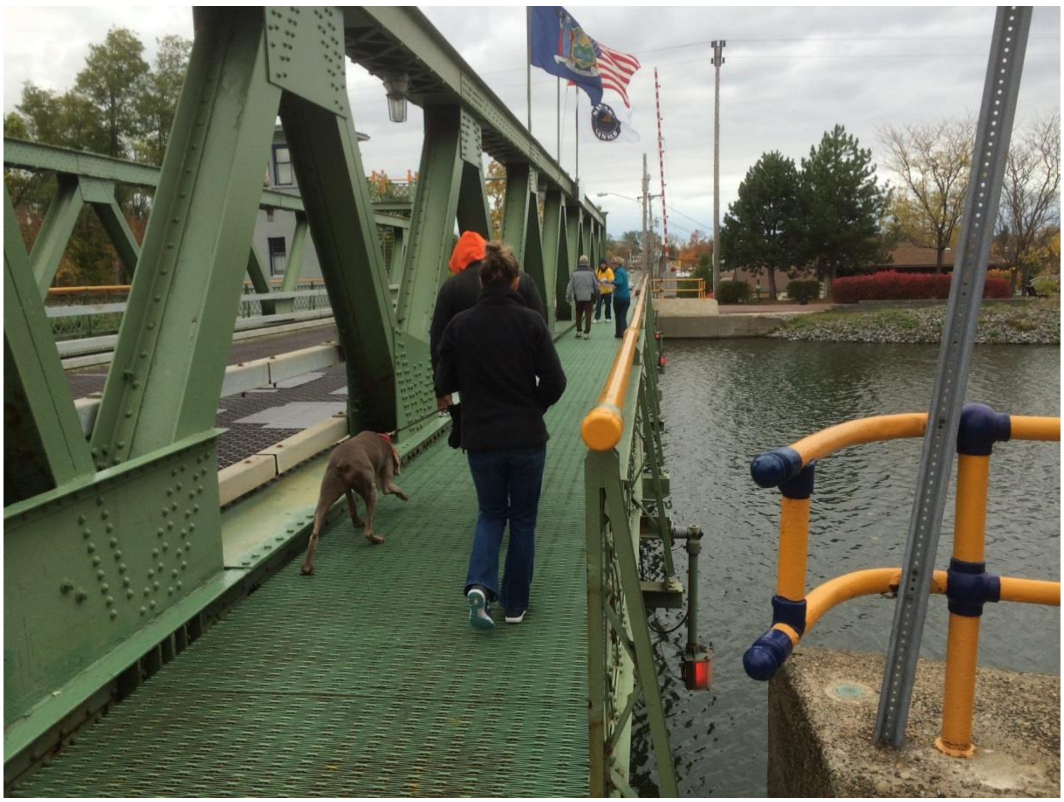
## WALKING AND BICYCLING TOURS FIELD NOTES

### (PROJECT ADVISORY COMMITTEE - PAC)

**Village of Brockport Active Transportation Plan**
**UPWP Task No. 8762**
**Sunday October 26, 2014 Steering Committee Village Walking Tour**

**Main Street Canal Bridge**
Steel bridge decking is a difficult, low friction surface for cyclists. Slippery when wet, or frozen.

Crosswalk on the north side of the bridge is not perpendicular to road centerline.
Placement of cross-walk and vertical alignment makes visibility difficult for drivers.
Cross walk on north side of bridge is on downhill side; drivers are picking up speed.
Consider placement of more advanced system to alert drivers of pedestrian crossing movements.



**Park Ave Canal Bridge-**
Slightly better vertical alignment, but same issues as the Main Street Bridge.
Crosswalk is not perpendicular to road centerline.
A common vocabulary of signage, pavement markings and warning devices should be deployed at all canal bridges in the Village. System consistency will help promote consistent safe behavior.

Crosswalk warning placards are not visible to north-bound drivers; utility pole and bridge structure partially conceal the placards for northbound drivers. Two-side placards mounted on a single post, so they only give advance notice to northbound drivers. Placards should probably be installed in highly visible locations on both sides of the crosswalks.

Currently, the walkway on the east side of the bridge is blocked off for repairs. Lack of coordination between NY Canal Corp and NYSDOT is preventing completion of necessary repairs.

“**Goat Path” between elementary school and back side of Wegmans:**
The informal trail indicates a strong desire line and established use pattern. The “goat path” is well-worn, and has received some placement of gravel surfacing.

Formal establishment of this desire line as a shared-use pathway could provide safe off-road access to the Wegmans plaza for college students, school groups, and residents of Ellis Drive housing. Full pedestrian and bicycle connectivity would need to be established to the main entrance of Wegmans.

A side path along the existing school parking could provide a link to Central School Drive.

**Wegman’s parking lots**, although nicely landscaped, are not supportive to bicycle and pedestrian travel. Consider recommending design guidance or stronger code language to provide bike and pedestrian-friendly parking lots in new commercial developments.

**Sweden Clarkson Community Center**

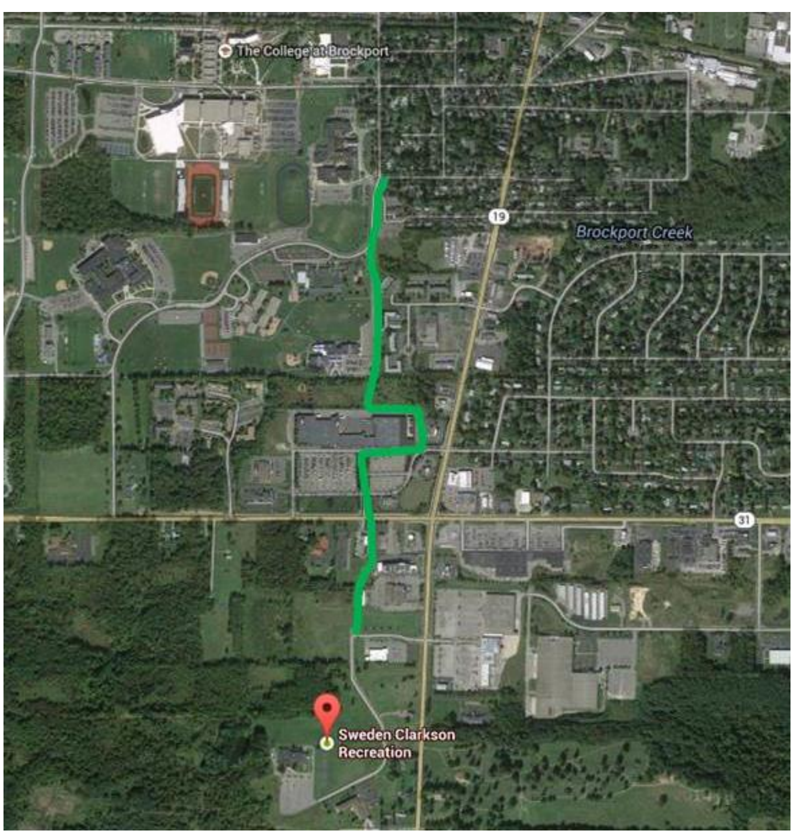
The community center is a significant local destination, but its location presents access challenges for pedestrians and bicyclists. A senior living apartment complex is adjacent to the community center**.** Duryea Drive/Baders Way, the access road leading to the community center, has low traffic volumes, good sight distances, and a sidewalk along one side. The stretch of Route 19 between Rt. 31 and Baders Way is less safe for walkers and cyclists.

Sidewalk should be installed along both sides of rt. 19 from rt. 31 to Duryea Drive.

Explore the possibility of an off-road shared use-path from the Duryea Drive/Baders Way bend heading north to rt. 31.

Thinking aggressively, a pedestrian activated crossing signal could be installed to cross rt. 31 where Tim Horton's and Wegmans driveways align. Bike/pedestrian improvements could provide a safe route thru the Wegmans site and connect to the "goat path" and ultimately to Central School Drive.

The possibility exists for a continuous north-south off-road pathway that would provide an alternative to bicycling on rt. 19



**Sweden Town Park Trail**

This trail provides a 2 mile circuit around Sweden Town Park, which is a significant local destination and recreational resource**.** Connectivity should be provided between the Trail and improved bike/pedestrian facilities along the park access road. Connector pathways that establish walking loops off the main trail could provide a diversity of walking routes for visitors of all mobility level. As the trail development evolves, a GPS-based way finding system can be established. Possible spurs to Redman Road and rt. 31A can connect the main trail to the existing street grid.

**Main Street Crosswalks**

Crosswalks in the Village core are well-marked and constructed according to current best practices.
Recent construction of curb bump-outs enhances pedestrian safety.
Mid block crossings are not signalized, and rely on driver behavior to stop for pedestrians.
“Yield to pedestrian” pedestrian signage is currently placed on the side of the roads.
Pedestrian warning signage placed in the roadway may have added traffic calming effect, but may pose maintenance and operations challenges.
Active warning systems with flashing lights may enhance pedestrian safety at key crosswalk locations.
Pedestrian safety along Main Street will ultimately depend on a collaboration of good design, proper enforcement, and education and outreach that supports safe behavior of drivers, pedestrians and bicyclists.

North of Canal, the Main Street crosswalk at Liberty Street has nor crosswalk warning placards to alert drivers of pedestrians crossing.


There are several areas in and around the Village where both cycling and pedestrian traffic should be accommodated by a multi- accommodating both bikers and walkers. Such areas include, but are not limited to the following:

• New Campus Drive from where the sidewalk ends near the Information Center after passing SERC and from there out to the Redman Road/New Campus Drive Intersection, plus the crossing to the Town of Sweden Community Park

• From the Information Center South along Commencement Drive and along Commencement Drive within the Central School District

• From Rt. 31 down Owens Road to State Street by the Canal.

• From this intersection along the Canal into Brockport

Pedestrian crosswalk on Main Street (near the Verizon, Sherman Williams mall) into Wegmans does not have a pedestrian signal

Clarkson/Lake Road/104 intersection has no pedestrian crossing signals (pedestrians cross at their own risk)

East Avenue's sidewalks end at Havenwood St. Sidewalk should extend on out to Sunflower Landing

More sidewalks needed in the McCormack Place Development

Smith Street Bridge steps down to Perry Street need repair

Walking from Smith Street Bridge down Clinton Street currently dangerous

**Village of Brockport Active Transportation Plan**
**UPWP Task No. 8762**

**<u>October 25, 2014 Steering Committee Bicycle Tour</u>**

Tour started at 9 AM at the Brockport Welcome Center. Five project team members attended.

**Park Avenue canal bridge**
Crosswalk on north side of bridge is on the downhill, and difficult for drivers to see. Cross-walk signs are not highly visible in their current locations. Steel grate decking on bridge is difficult for bicyclists.

Need enhancements to signage and pavement markings alerting drivers to the presence of cyclists and walkers. Need to direct cyclists where to ride, and how to safely cross the bridge. Treatments should be consistent at all Canal bridges in the project area.

**Canal Trail**
Canal trail surface is stone dust. Appears to be well-graded and maintained . No significant drainage or accessibility issues were observed. Meets ADA requirements along this segment of the trail.
Note pro's and con's of stone dust trails for walkers, joggers, cyclists and dogs.

**McCormick Place.** "55+ patio home community with condo status".
Connection from housing to Canal trail is not well-developed and is not ADA-accessible.
Future phases of McCormick Place build-out should consider upgrading connectivity and accessibility.

**Sunflower Landing**, east of McCormick Place, has somewhat better connection to the Canal. Mowed grass path encourages connectivity, but is not ADA compliant.

Both developments would benefit from establishing connections to the Canal Trail. Village design guidelines and site plan review process could discuss full connectivity for bicyclists and pedestrians between new development and community assets like the Canal Trail


Entrance to Sunflower Landing off of East Ave. may be lacking adequate sight distances.
No cross walks at the intersection, and sidewalks north and south of East Ave. do not align.

There is no sidewalk along East Avenue between Sunflower Landing and McCormick Place.
(Sidewalk exists on the south side of East Avenue, west of Havenwood Drive)

A fully inclusive community design for active living would have both developments connected to Canal trail via ADA compliant shared-use pathways. The Canal Trail would provide connectivity between the developments, and into the Village center. Sidewalk along East Avenue should be extended to Sunflower Landing.

Shoulder width along East Avenue feels somewhat uncomfortable, given the traffic speeds.

Along East Avenue,  shoulder  west bound (north side of road) is more consistent and in better condition than shoulder eastbound (south side of road)

New sidewalk on the north side of East Avenue would provide safe connectivity between Seymour Library and residential streets to the east (Mission Hill Drive, Summer Hill Drive, etc.)

Complete sidewalk connectivity between Sunflower Landing and the Village would need to be collaboration between Sweden, Clarkson and Brockport.

Look for improved pedestrian and bicycle connectivity to the library. Verify that bicycle parking facilities at the library meet current best practices.

Note: disconnected subdivisions. How does a neighbor on Mission Hill Drive visit a friend on Sherwood Drive? Municipal planning guidelines could require that new developments provide pedestrian connectivity to adjacent subdivisions

Look for any road diet opportunities in Brockport.
Look for opportunities and appropriate locations to consider installation of buffered bike lanes .

At roundabout intersection of East Ave and Lake Road (State route 19), marked shoulder disappears. No bicycle space in the roundabout.

**Intersection of 19 and 104** is problematic for both pedestrians and bicyclists.
Crosswalks are marked, but no pedestrian signals are installed. NYSDOT drainage grates can become obstacles for cyclists. Priority Intersection requires further analysis and recommendations.

As a traffic calming measure, consider aggressive placement of speed indicators (latest models, with LED strobes), especially along roads with 40 mph speed limit

Consistency and continuity of the network is important. Around Brockport shoulders of various width and conditions, shared use lanes ("sharrows") and bicycle lanes are mixed together along a single roadway (Main St., for example)

**Smith Street Bridge/ Clinton Street:**
Walkways on both sides of bridge, but guide rail prevents bicycle access.
Potential micro-brewery development and redevelopment of an existing historic structure could revitalize neighborhood; (refer to Clinton Street Master Plan)
Plan for a fully inclusive active transportation system in this area

**New Campus Drive and Redman Road.**
4 way intersection with high traffic volumes and poor sight distances.

Field verify sight distance using DOT protocol.
Need pedestrian gap analysis for road crossing.

**New Campus Drive Information Center to Redman Road**
Need shared biking/pedestrian multi-use lane along New Campus Drive from SUNY-Brockport Information Building to Redman Road.

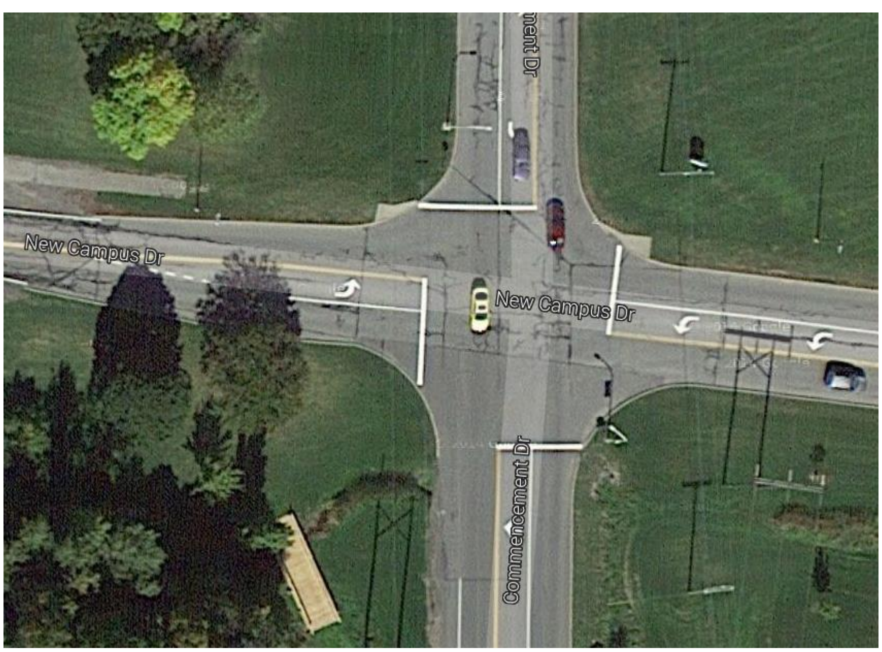
**College Suites Apartments:**
Currently under-utilized student housing. Possible foreclosure and sale to new owner. Possible upgrade of complex to a senior living community that would share services/events/facilities at the college (similar to Rivers Run in Henrietta).
Senior populations could trigger special considerations at the intersection: reduced mobility and increased pedestrian crossing times, visual acuity, loss of hearing, etc
Existing subdivision roads offer good potential for ped/bike access to Sweden Town Park.

The College should be encouraged to pursue **Bicycle-Friendly University** status from the League of American Bicyclists http://bikeleague.org/university

There is a very unique opportunity to create an **"active community synergy"** between the Brockport Active Transportation Plan (in progress), Safe Routes to School (funding applied for), and the College pursuing Bicycle Friendly University Status.
Should all 3 pieces come to fruition, the Village should certainly pursue status as a Bicycle Friendly Community in the future ( http://bikeleague.org/community )

The College should have a **campus-wide multi-use pathway system**, separated from the roadways. Meet all AASHTO trail design standards, and full ADA compliance.

Note pathway gaps and lack of crosswalks at New Campus Drive and Commencement Drive.



Close proximity of the **Brockport Schools** complex to the College and Village is a strong asset, but requires a fully inclusive, barrier-free multi-modal circulation system that encourages pedestrian and bicycle travel. Bicycle parking facilities at schools need to be upgraded.
see comments from Brockport kids on lack of bike parking space.)
Providing bike parking shelters instead of open racks sends a powerful message that bicycles are a legitimate transportation mode and not just toys. Covered bicycle parking encourages more rides in more weather.

Look at possibility of shared-use lane markings on **South Avenue**. Coordinate with next scheduled roadway resurfacing project.
(minimum 14’ lane width required. Add South Avenue to study network for field data collection)

**Intersection of Rt. 31 and Rt. 19 (Main Street)**

Very difficult conditions for both pedestrians and bicyclists.
Priority intersection requires further analysis and recommendations


Investigate **abandoned CSX rail corridor** that intersects Owens Road. Possible future rails to trails development. If paired with the Canal Trail, could create a bike-friendly loop system for recreation, fitness and tourism.
(Check with Bob Torzynski if this rail segment has been identified in the Regional Trails Initiative)

Shoulder conditions on **Owens Road** need improvement. Space is available for an off-road side path to separate bicycles and pedestrians from traffic.  Minimal driveway conflicts along the west side of Owens Road from Rt 31 to East Canal Road.

**Maintenance** of shoulder stripes and other pavement markings are critical for bicycle safety.
Minor adjustments to road maintenance schedules can be cost-neutral, but have significant impact on bicycle conditions.

**Bicycle Facility Hierarchy** (from least preferable to most preferable)
No bicycle space
Shared space with autos (high potential of conflicts with autos)
buffered space with autos (moderate potential of conflicts with autos)
Shared-use side path (potential conflicts with pedestrians)
Physically separated bicycle space (cycle track)

# APPENDIX C

## PEDESTRIAN AND BICYCLE LEVEL OF SERVICE MODELS

## APPENDIX C: PEDESTRIAN AND BICYCLE LEVEL OF SERVICE MODELS

**Bicycle Level of Service Model.** The statistically-calibrated mathematical equation entitled the *Bicycle Level of Service*[1] *Model (Version 2.0)* was used as the foundation of Brockport's existing bicycling conditions evaluation. This *Model* is the most accurate method of evaluating the bicycling conditions of shared roadway environments. It uses the same measurable traffic and roadway factors that transportation planners and engineers use for other travel modes. With statistical precision, the *Model* clearly reflects the effect on bicycling suitability or "compatibility" due to factors such as roadway width, bike lane widths and striping combinations, traffic volume, pavement surface conditions, motor vehicles speed and type, and on-street parking.

The *Bicycle LOS Model* is based on the proven research documented in *Transportation Research Record 1578* published by the Transportation Research Board of the National Academy of Sciences. It was developed with a background of over 100,000 miles of evaluated urban, suburban, and rural roads and streets across North America. It now forms the basis for the bicycle level of service methodology contained in the *Highway Capacity Manual*. Many urbanized area planning agencies and state highway departments are using this established method of evaluating their roadway networks. These include metropolitan areas across North America such as Atlanta GA, Baltimore MD, Birmingham AL, Philadelphia PA, San Antonio TX, Houston TX, Buffalo NY, Anchorage AK, Lexington KY, and Tampa FL as well as state departments of transportation such as, Delaware Department of Transportation (DelDOT), New York State Department of Transportation (NYDOT), Maine Department of Transportation (MeDOT) and others.

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[1] Landis, Bruce W. "Real-Time Human Perceptions: Toward a Bicycle Level of Service" *Transportation Research Record 1578*, Transportation Research Board, Washington DC 1997 (see Appendix A).

Widespread application of the original form of the *Bicycle LOS Model* has provided several refinements. Application of the *Bicycle LOS Model* in the metropolitan area of Philadelphia resulted in the final definition of the three effective width cases for evaluating roadways with on-street parking. Application of the *Bicycle LOS Model* in the rural areas surrounding the greater Buffalo region resulted in refinements to the "low traffic volume roadway width adjustment". A 1997 statistical enhancement to the *Model* (during statewide application in Delaware) resulted in better quantification of the effects of high-speed truck traffic [see the $SP_t(1+10.38HV)^2$ term]. As a result, *Version 2.0* (now with FDOT-approved truck volume adjustment factor included) has the highest correlation coefficient ($R^2 = 0.77$) of any form of the *Bicycle LOS Model*.

Version 2.0 of the *Bicycle LOS Model* has been employed to evaluate the roads and streets that comprise the TPO's study network. Its form is shown below:

$$\text{Bicycle LOS} = a_1 \ln(Vol_{15}/L_n) + a_2 SP_t(1+10.38HV)^2 + a_3(1/PR_5)^2 + a_4(W_e)^2 + C$$

Where:

$Vol_{15}$ = Volume of directional traffic in 15 minute time period

$$Vol_{15} = (ADT \times D \times K_d) / (4 \times PHF)$$

where:
ADT = Average Daily Traffic on the segment or link
D = Directional Factor
$K_d$ = Peak to Daily Factor
PHF = Peak Hour Factor

$L_n$ = Total number of directional *through* lanes
$SP_t$ = Effective speed limit

$$SP_t = 1.1199 \ln(SP_p - 20) + 0.8103$$

where:
$SP_p$ = Posted speed limit (a surrogate for average running speed)

HV = percentage of heavy vehicles (as defined in the *Highway Capacity Manual*)

$PR_5$ = FHWA's five point pavement surface condition rating
$W_e$ = Average effective width of outside through lane:

where:
$W_e = W_v - (10\ ft\ \times \%\ OSPA)$ and $W_l = 0$
$W_e = W_v + W_l\ (1 - 2 \times \%\ OSPA)$ and $W_l > 0$ & $W_{ps} = 0$

$W_e = W_v + W_l - 2\ (10 \times \%\ OSPA)$ and $W_l > 0$ & $W_{ps} > 0$ and a bikelane exists

where:
$W_t$ = total width of outside lane (and shoulder) pavement
OSPA = percentage of segment with occupied on-street parking
$W_l$ = width of paving between the outside lane stripe and the edge of pavement
$W_{ps}$= width of pavement striped for on-street parking
$W_v$ = Effective width as a function of traffic volume

and:
$W_v = W_t$ if ADT > 4,000veh/day
$W_v = W_t(2-0.00025 \times ADT)$ if ADT $\leq$ 4,000veh/day, and if the street/ road is undivided and unstriped

$a_1$: 0.507 $a_2$: 0.199 $a_3$: 7.066 $a_4$: - 0.005 C: 0.760

($a_1$ - $a_4$) are coefficients established by multi-variate regression analysis.

The *Bicycle LOS* score resulting from the final equation is stratified into service categories A, B, C, D, E, and F (according to the ranges shown in Table D1) to reflect users' perception of the road segment's level of service for bicycle travel.

**TABLE D1 Bicycle Level of Service Categories**

| LEVEL OF SERVICE | BLOS SCORE |
|---|---|
| A | $\leq 1.5$ |
| B | $> 1.5$ and $\leq 2.5$ |
| C | $> 2.5$ and $\leq 3.5$ |
| D | $> 3.5$ and $\leq 4.5$ |
| E | $> 4.5$ and $\leq 5.5$ |
| F | $> 5.5$ |

This stratification is in accordance with the linear scale established during the referenced research (i.e., the research project bicycle participants' aggregate response to roadway and traffic stimuli).

**Data Collection/Inventory Guidelines**

Following is the list of data required for computation of the *Bicycle LOS* scores as well as the associated guidelines for their collection and compilation into the programmed database.

*Average Daily Traffic (ADT)*

ADT is the average daily traffic volume on the segment or link. The programmed database will convert these volumes to $Vol_{15}$ (volume of directional traffic every fifteen minutes) using the Directional Factor (D), Peak to Daily Factor ($K_d$) and Peak Hour Factor (PHF) for the road segment.

*Percent Heavy Vehicles (HV)*

Percent HV is the percentage of heavy vehicles (as defined in the *Highway Capacity Manual*).

*Number of lanes of traffic (L)*

L reflects the total number of *through* traffic lanes of the road segment and its configuration (D = Divided, U = Undivided, OW = One-Way, S = Two-Way Left Turn Lane). The programmed database converts these lanes into directional lanes.

*Posted Speed Limit ($S_p$)*

$S_p$ is recorded as posted.

*$W_t$ - Total width of pavement*

$W_t$ is measured from the center of the road, yellow stripe, or (in the case of a multilane configuration) the lane separation striping to the edge of pavement or to the gutter pan of the curb.

*$W_l$ - Width of pavement between the outside lane stripe and the edge of pavement*

$W_l$ is measured from the outside lane stripe to the edge of pavement or to the gutter pan of the curb. When there is angled parking adjacent to the outside lane, $W_l$ is measured from the outside lane stripe to the traffic-side end of the parking stall stripes.

*Width of pavement is the pavement striped for on-street parking ($W_{ps}$)*

$W_{ps}$ is recorded only if there is parking to the right of a striped bike lane (not if the striped parking area is immediately adjacent to the outside lane).

*OSPA %*

OSPA% is the estimated percentage of the segment (excluding driveways) along which there is occupied on-street parking at the time of survey.

*Pavement Condition (PC)*

PC is the pavement condition of the motor vehicle travel lane according to the FHWA's five-point pavement surface condition rating shown below in Figure D1.

*Designated Bike Lane*

A "Y" is coded if there is a signed and marked bike lane on the segment; otherwise "N" is entered.

| RATING | PAVEMENT CONDITION |
|---|---|
| 5.0 (Very Good) | Only new or nearly new pavements are likely to be smooth enough and free of cracks and patches to qualify for this category. |
| 4.0 (Good) | Pavement, although not as smooth as described above, gives a first class ride and exhibits signs of surface deterioration |
| 3.0 (Fair) | Riding qualities are noticeably inferior to those above; may be barely tolerable for high-speed traffic. Defects may include rutting, map cracking, and extensive patching. |
| 2.0 (Poor) | Pavements have deteriorated to such an extent that they affect the speed of free-flow traffic. Flexible pavement has distress over 50 percent or more of the surface. Rigid pavement distress includes joint spalling, patching, etc. |
| 1.0 (Very Poor) | Pavements that are in an extremely deteriorated condition. Distress occurs over 75 percent or more of the surface. |

Source: U.S. Department of Transportation. Highway Performance Monitoring System-Field Manual. Federal Highway Administration. Washington, DC, 1987.

**Figure D1 Pavement Condition Descriptions**

The *Pedestrian Level of Service (Pedestrian LOS) Model*[1] will be used for the evaluation of walking conditions. This model is the most accurate method of evaluating the walking conditions within shared roadway environments. It uses the same measurable traffic and roadway factors that transportation planners and engineers use for other travel modes. With statistical precision, the *Model* clearly reflects the effect on walking suitability or "compatibility" due to factors such as roadway width, presence of sidewalks and intervening buffers, barriers within those buffers, traffic volume, motor vehicles speed, and on-street parking. The form of the *Pedestrian Level of Service Model*, and the definition of its terms are as follows:

$$\text{Ped LOS} = -1.2276 \ln (W_{ol} + W_l + f_p \times \%OSP + f_b \times W_b + f_{sw} \times W_s) + 0.0091 (Vol_{15}/L) + 0.0004\, SPD^2 + 6.0468$$

Where:

$W_{ol}$ = Width of outside lane (feet)
$W_l$ = Width of shoulder or bike lane (feet)
$f_p$ = On-street parking effect coefficient (=0.20)
%OSP = Percent of segment with on-street parking
$f_b$ = Buffer area barrier coefficient (=5.37 for trees spaced 20 feet on center)
$W_b$ = Buffer width (distance between edge of pavement and

sidewalk, feet)

$f_{sw}$ = Sidewalk presence coefficient
= $6 - 0.3W_s$
$W_s$ = Width of sidewalk (feet)
$Vol_{15}$ = average traffic during a fifteen (15) minute period
L = total number of (through) lanes (for road or street)
SPD = Average running speed of motor vehicle traffic (mi/hr)

The Pedestrian LOS score resulting from the final equation is pre-stratified into service categories "A, B, C, D, E, and F", according to the ranges shown below, which reflect users' perception of the road segments level of service for pedestrian travel. This stratification is in accordance with the linear scale established during the research (i.e., the research project participants' aggregate response to roadway and traffic stimuli).

[1] Landis, B.W., V.R. Vattikitti, R.M. Ottenberg, D.S. McLeod, M. Guttenplan, Modeling the Roadside Walking Environment: Pedestrian LOS, *Transportation Research Record 1773*, Transportation Research Board, National Research Council, Washington, DC, 2001.

**Pedestrian Level-of-Service Categories**

| LEVEL-OF-SERVICE | Pedestrian LOS Score |
|---|---|
| A | ≤ 1.5 |
| B | > 1.5 and ≤ 2.5 |
| C | > 2.5 and ≤ 3.5 |
| D | > 3.5 and ≤ 4.5 |
| E | > 4.5 and ≤ 5.5 |
| F | > 5.5 |

The *Pedestrian LOS Model* is used by planners and engineers throughout the United States in a variety of planning and design applications. The *Pedestrian LOS Model* can be used to conduct a benefits comparison among proposed sidewalk/roadway cross-sections, identify roadways that are candidates for reconfiguration for sidewalk improvements, and to prioritize and program roadways for sidewalk improvements.

## Additional Data Collection and Inventory Guidelines

Following is the additional list of data used in the computation of the Pedestrian LOS scores (beyond those previously described for the bicycle mode). Also described are the associated guidelines for their collection and compilation into the database.

Width of Buffer ($W_b$) – is the width of a grass buffer. The width of the buffer is measured from the edge of pavement or back of curb to the beginning edge of the sidewalk. If a sidewalk has trees planted within its surface, then the horizontal width of the sidewalk occupied by the trees is considered the buffer width.

Width of Sidewalk ($W_s$) – is the width of the sidewalk, measured from either the edge of pavement, if a grass buffer is not present. If a grass buffer is present, the width is measured from the edge of the buffer to the back side of the sidewalk.

Sidewalk Percentage – is the percentage of sidewalk coverage (estimated in increments of 25%) of the segment; this is to be collected directionally

Tree Spacing in Buffer – is the spacing of trees within a buffer, measured from the center (width of spacing between trees). Trees can either be in a grass buffer or in sidewalk islands.

Cross-section – a “C” is recorded if there is a curb and gutter on the segment, an “S” if there is an open shoulder. Note: Indicate any ditches or swales adjacent to the edge of pavement of the segment in the comments field.

Roadside Profile Condition – This data item is collected to assist in determining the lateral area available for bicycle lane or paved shoulder and sidewalk construction. It is the area between the outside edge of the pavement and the right-of-way line. The profile condition assists in determining the type of facility, hence its cost [i.e., bicycle lane or paved shoulder or bike path]. Roadside profiles were classified as one of the three types illustrated below. Condition 1, buildable shoulder, is defined as an area adjoining the edge of pavement with a minimum width of seven feet and a maximum cross-slope of 6%. Condition 2 is a swale. Condition 3 is a ditch or canal.  The ARC is to provide total right-of-way width.

# APPENDIX D

## PEDESTRIAN AND BICYCLE LEVEL OF SERVICE DATA SHEETS

| ROADWAY SEGMENT | | | | | | VEHICLE COUNT DATA | | FIELD INVENTORY DATA | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seg_ID | Road Name | From | To | Length (LS) (mi) | Direction | Hourly Directional Volume | Percent Heavy Vehicles | Posted Speed | Lanes (L) | Total Direction Width | Paved Shoulder Width | On-Street Parking Width (marked) | % On-Street Parking | Pavement Condition Rating | Bike Lane Mark | Cross Sec. | Buffer Width | Tree Spcg. In Buffer | % with Sidewalk | Sidewalk Width | Road Profile Con (1,2,3) | Signals per Seg. | Pedestrian LOS | | Bicycle LOS | |
| | | | | | | V | HV | $SP_p$ | Th | $W_t$ | $W_l$ | $W_{ps}$ | OSPA | $PC_t$ | | | BW | | | $W_S$ | | | PLOS | PLOS | BLOS | BLOS |
| | | | | | | | directional | | | | | | | | | | | | | | | | Score | Grade | | |
| | | | | mi | | (veh/hr) | % | mph | # | ft | ft | ft | % | (1....5) | (Y/N) | C/S | ft | (ft/ctr) | % | ft | (1,2,3) | | (0...7) | (A...F) | (0...7) | (A...F) |
| 1 | Adams St | Allen St | Route 19 | 0.26 | | 159 | 2 | 30 | 2 | 12 | 0 | 0 | 0 | 5 | N | C | 9 | 45 | 100 | 4 | 1 | 1 | 0.93 | A | 2.20 | B |
| 2 | Allen St | Adams St | Central School Dr | 0.16 | N | 175 | 4.01 | 30 | 2 | 12 | 0 | 0 | 0 | 5 | N | C | 12 | 30 | 100 | 8 | 1 | 1 | 0.62 | A | 2.95 | C |
| | Allen St | Adams St | Central School Dr | | S | 115 | 3.77 | 30 | 2 | 12 | 0 | 0 | 0 | 5 | N | C | 12 | 30 | 100 | 8 | 1 | 1 | 0.33 | A | 1.95 | B |
| 3 | Brockway Pl | Route 19 | End | 0.14 | | 159 | 2 | 30 | 2 | 10.5 | 0 | 0 | 0 | 3 | N | C | 13 | 55 | 100 | 4 | 1 | 0 | 0.44 | A | 2.95 | C |
| 4 | Centennial Ave | Allen St | Route 19 | 0.22 | E | 215 | 3.7 | 30 | 2 | 12 | 0 | 0 | 0 | 5 | N | C | 8 | 30 | 100 | 4 | 1 | 1 | 1.24 | A | 2.99 | C |
| | Centennial Ave | Allen St | Route 19 | | W | 267 | 8 | 30 | 2 | 12 | 0 | 0 | 0 | 5 | N | C | 8 | 30 | 100 | 4 | 1 | 1 | 1.17 | A | 4.07 | D |
| 5 | Central School Dr | Allen St | Hartshorn Dr | 0.68 | | 159 | 2 | 30 | 2 | 12.5 | 0 | 0 | 0 | 4 | N | C | 10 | 0 | 100 | 9.5 | 1 | 0 | 0.60 | A | 2.27 | B |
| 6 | Central School Dr | Hartshorn Dr | Commencement Dr | 0.19 | | 159 | 2 | 30 | 2 | 14 | 0 | 0 | 0 | 4 | N | C | 0 | 0 | 0 | 0 | 1 | 0 | 3.57 | D | 1.98 | B |
| 7 | Clark St | Smith St | Beverly Dr | 0.5 | | 159 | 2 | 30 | 2 | 11 | 0 | 0 | 0 | 4 | N | C | 5 | 25 | 100 | 5 | 1 | 0 | 2.33 | B | 2.53 | C |
| 8 | Clark St | Smith St | Route 19 | 0.3 | | 159 | 2 | 30 | 2 | 9.5 | 0 | 0 | 0 | 4 | N | C | 4 | 0 | 100 | 4 | 1 | 0 | 1.46 | A | 2.75 | C |
| 9 | Clinton St | Route 19 | Erie Canal Bridge | 0.26 | | 159 | 2 | 30 | 2 | 14 | 0 | 0 | 0 | 3 | N | C | 3 | 0 | 100 | 4 | 1 | 0 | 2.40 | B | 2.33 | B |
| 10 | Commencement Dr | Route 31 | New Campus Dr | 0.78 | | 159 | 2 | 30 | 2 | 16.5 | 4 | 0 | 0 | 4 | N | S | 0 | 0 | 0 | 0 | 2 | 1 | 3.37 | C | 0.56 | A |
| 11 | Commencement Dr | New Campus Dr | Holley St | 0.29 | | 159 | 2 | 25 | 2 | 14 | 0 | 0 | 0 | 3 | N | C | 0 | 0 | 0 | 0 | 1 | 0 | 3.46 | C | 2.10 | B |
| 12 | East Ave | Route 19 | Havenwood Dr | 0.78 | E | 239 | 2 | 40 | 2 | 14.5 | 3 | 0 | 0 | 5 | N | C | 7.5 | 0 | 100 | 4 | 1 | 1 | 2.73 | C | 2.15 | B |
| | East Ave | Route 19 | Havenwood Dr | | W | 269 | 2 | 40 | 2 | 14.5 | 3 | 0 | 0 | 5 | N | C | 7.5 | 0 | 100 | 4 | 1 | 1 | 2.80 | C | 2.21 | B |
| 13 | East Ave | Havenwood Dr | Wedgewood Ct | 0.44 | E | 239 | 2 | 40 | 2 | 16.5 | 0 | 0 | 0 | 5 | N | S | 0 | 0 | 0 | 0 | 3 | 0 | 3.85 | D | 1.58 | B |
| | East Ave | Havenwood Dr | Wedgewood Ct | | W | 269 | 2 | 40 | 2 | 16.5 | 0 | 0 | 0 | 5 | N | S | 0 | 0 | 0 | 0 | 3 | 0 | 3.93 | D | 1.64 | B |
| 14 | Erie St | Route 31 | End | 0.47 | | 159 | 2 | 30 | 2 | 13 | 0 | 0 | 0 | 4 | N | C | 7 | 100 | 100 | 4 | 1 | 1 | 2.31 | B | 2.18 | B |
| 15 | Fayette St | East Ave | Erie Canal Bridge | 0.32 | N | 153 | 2 | 30 | 2 | 12.5 | 0 | 0 | 0 | 4 | N | C | 5 | 30 | 100 | 3.66 | 1 | 0 | 1.63 | B | 2.20 | B |
| | Fayette St | East Ave | Erie Canal Bridge | | S | 100 | 2 | 30 | 2 | 12.5 | 0 | 0 | 0 | 4 | N | C | 5 | 30 | 100 | 3.66 | 1 | 0 | 1.17 | A | 1.41 | A |
| 16 | Fayette St | Erie Canal Bridge | Park Ave | 0.22 | N | 153 | 2 | 30 | 2 | 17.5 | 0 | 0 | 0 | 3 | N | C | 10 | 35 | 100 | 4 | 1 | 1 | 0.63 | A | 1.40 | A |
| | Fayette St | Erie Canal Bridge | Park Ave | | S | 100 | 2 | 30 | 2 | 17.5 | 0 | 0 | 0 | 3 | N | C | 10 | 35 | 100 | 4 | 1 | 1 | 0.55 | A | 0.07 | A |
| 17 | Hillcrest Parkway | Route 19 | End | 0.11 | | 159 | 2 | 30 | 2 | 21 | 0 | 0 | 0 | 4 | N | C | 9 | 30 | 100 | 4 | 1 | 1 | 0.76 | A | 0.21 | A |
| 18 | Holley St | Redman Rd | Commencement Dr | 0.68 | E | 102 | 2 | 30 | 2 | 15 | 4 | 0 | 0 | 3 | N | S | 0 | 0 | 0 | 0 | 1 | 0 | 3.34 | C | 0.05 | A |
| | Holley St | Redman Rd | Commencement Dr | | W | 104 | 2 | 30 | 2 | 15 | 4 | 0 | 0 | 3 | N | S | 0 | 0 | 0 | 0 | 1 | 0 | 3.35 | C | 0.10 | A |
| 19 | Holley St | Commencement Dr | Monroe Ave | 0.39 | E | 190 | 4.71 | 30 | 2 | 14 | 0 | 0 | 0 | 3 | N | S | 0 | 0 | 0 | 0 | 1 | 0 | 3.65 | D | 3.03 | C |
| | Holley St | Commencement Dr | Monroe Ave | | W | 146 | 2.83 | 30 | 2 | 14 | 0 | 0 | 0 | 3 | N | S | 7 | 0 | 100 | 5 | 1 | 0 | 2.14 | B | 2.01 | B |
| 20 | Kenyon St | Adams St | Monroe Ave | 0.28 | N/S | 225 | 6.6 | 30 | 2 | 10 | 0 | 0 | 0 | 5 | N | C | 7 | 30 | 100 | 5 | 1 | 0 | 2.46 | B | 3.86 | D |
| | Kenyon St | Adams St | Monroe Ave | | N | 196 | 1.29 | 30 | 2 | 10 | 0 | 0 | 0 | 5 | N | C | 7 | 30 | 100 | 5 | 1 | 0 | 1.10 | A | 2.74 | C |
| 21 | Monroe Ave | Holley St | Route 19 | 0.4 | E/W | 131 | 2 | 30 | 2 | 15.5 | 0 | 0 | 100 | 3 | N | C | 10 | 25 | 100 | 4 | 1 | 0 | 0.44 | A | 3.06 | C |
| 22 | New Campus Drive | Redman Rd | Commencement Dr | 0.58 | | 159 | 2 | 30 | 2 | 12.5 | 1 | 0 | 0 | 3 | n | s | 0 | 0 | 0 | 0 | 1 | 0 | 3.71 | D | 2.46 | B |
| 23 | New Campus Drive | Commencement Dr | Allen St | 0.59 | | 159 | 2 | 30 | 2 | 12.5 | 0 | 0 | 0 | 5 | N | S/C | 0 | 0 | 0 | 0 | 1 | 0 | 3.71 | D | 2.11 | B |
| 24 | Owens Rd | Route 31 | South Ave | 0.65 | | 159 | 2 | 45 | 2 | 13 | 2 | 0 | 0 | 4 | N | S | 45 | | 50 | 5 | 1 | 1 | 1.87 | B | 2.15 | B |
| 25 | Owens Rd | South Ave | State St | 0.48 | | 159 | 2 | 45 | 2 | 13 | 2 | 0 | 0 | 4 | N | S | 0 | 0 | 0 | 0 | 1 | 0 | 4.11 | D | 2.15 | B |
| 26 | Park Ave | Fayette St | Route 19 | 0.27 | N/S | 159 | 2 | 30 | 2 | 14 | 0 | 0 | 0 | 5 | N | C | 10 | 75 | 100 | 4 | 1 | 1 | 2.18 | B | 1.82 | B |

| ROADWAY SEGMENT | | | | | | VEHICLE COUNT DATA | | FIELD INVENTORY DATA | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seg_ID | Road Name | From | To | Length (LS) (mi) | Direction | Hourly Directional Volume | Percent Heavy Vehicles | Posted Speed | Lanes (L) | Total Direction Width | Paved Shoulder Width | On-Street Parking Width (marked) | % On-Street Parking | Pavement Condition Rating | Bike Lane Mark | Cross Sec. | Buffer Width | Tree Spcg. In Buffer | % with Sidewalk | Sidewalk Width | Road Profile Con (1,2,3) | Signals per Seg. | Pedestrian LOS | | Bicycle LOS | |
| | | | | | | V | HV | $SP_p$ | Th | $W_t$ | $W_t$ | $W_{ps}$ | OSPA | $PC_t$ | | | BW | | | $W_S$ | | | PLOS | PLOS | BLOS | BLOS |
| | | | | | | | directional | | | | | | | | | | | | | | | | Score | Grade | | |
| | | | | mi | | (veh/hr) | % | mph | # | ft | ft | ft | % | (1....5) | (Y/N) | C/S | ft | (ft/ctr) | % | ft | (1,2,3) | | (0...7) | (A...F) | (0...7) | (A...F) |
| 27 | Redman Rd | West Ave | New Campus Dr | 0.9 | N | 276 | 6 | 40 | 4 | 26 | 4 | 0 | 0 | 4 | N | C | 0 | 0 | 100 | 7 | 1 | 1 | 2.79 | C | 2.74 | C |
| | Redman Rd | West Ave | New Campus Dr | | S | 258 | 7.99 | 40 | 4 | 26 | 4 | 0 | | 4 | N | C | 0 | 0 | 100 | 7 | 1 | 1 | 2.74 | C | 3.29 | C |
| 28 | Redman Rd | New Campus Dr | Route 31 | 0.63 | N | 276 | 6 | 40 | 2 | 16 | 5 | 0 | 0 | 5 | N | S | 0 | 0 | 0 | 0 | 2 | 1 | 3.98 | D | 2.53 | C |
| | Redman Rd | New Campus Dr | Route 31 | | S | 258 | 7.99 | 40 | 2 | 16 | 5 | 0 | | 5 | N | S | 0 | 0 | 0 | 0 | 2 | 1 | 3.94 | D | 3.09 | C |
| 29 | Route 19 | East Ave | Route 104 | 1 | N | 481 | 3.86 | 40 | 2 | 12 | 5.5 | 0 | 0 | 4 | N | S | 15 | 0 | 100 | 5 | 1 | 1 | 3.11 | C | 3.08 | C |
| | Route 19 | East Ave | Route 104 | | S | 442 | 3.25 | 40 | 2 | 12 | 5.5 | 0 | | 4 | N | S | 15 | 0 | 100 | 5 | 1 | 1 | 3.01 | C | 2.90 | C |
| 30 | Route 19 | Erie Canal Bridge | East Ave | 0.23 | N | 590 | 4.48 | 30 | 2 | 16.5 | 0 | 0 | 0 | 5 | Y | C | 8.5 | 50 | 100 | 5 | 1 | 1 | 3.16 | C | 1.85 | B |
| | Route 19 | Erie Canal Bridge | East Ave | | S | 540 | 4.69 | 30 | 2 | 16.5 | 0 | 0 | | 5 | Y | C | 8.5 | 50 | 100 | 5 | 1 | 1 | 1.90 | B | 1.85 | B |
| 31 | Route 19 | Erie Canal Bridge | Monroe Ave | 0.28 | N | 380 | 2.92 | 30 | 2 | 28 | 0 | 10 | 100 | 5 | Y | C | 6 | 55 | 100 | 12 | 1 | 2 | 1.36 | A | 0.97 | A |
| | Route 19 | Erie Canal Bridge | Monroe Ave | | S | 295 | 3.46 | 30 | 2 | 28 | 0 | 10 | | 5 | Y | C | 6 | 55 | 100 | 12 | 1 | 2 | 1.36 | A | 0.94 | A |
| 32 | Route 19 | Monroe Ave | South Ave | 0.28 | N | 431 | 2.33 | 30 | 2 | 21.5 | 0 | 8 | 100 | 5 | Y | C | 8 | 30 | 100 | 5 | 1 | 1 | 1.45 | A | -0.84 | A |
| | Route 19 | Monroe Ave | South Ave | | S | 381 | 3.38 | 30 | 2 | 21.5 | 0 | 8 | | 5 | Y | C | 8 | 30 | 100 | 5 | 1 | 1 | 1.34 | A | -0.71 | A |
| 33 | Route 19 | South Ave | Centennial Ave | 0.12 | N | 696 | 2 | 30 | 2 | 15 | 4 | 0 | 0 | 5 | Y | C | 12 | 25 | 100 | 5 | 1 | 1 | 1.82 | B | 2.19 | B |
| | Route 19 | South Ave | Centennial Ave | | S | 730 | 2 | 30 | 2 | 15 | 4 | 0 | | 5 | Y | C | 12 | 25 | 100 | 5 | 1 | 1 | 1.84 | B | 2.22 | B |
| 34 | Route 19 | Centennial Ave | Route 31 | 0.6 | N | 650 | 2.96 | 30 | 2 | 18 | 7 | 0 | 0 | 4 | N | C | 9 | 30 | 100 | 4 | 1 | 1 | 1.92 | B | 1.17 | A |
| | Route 19 | Centennial Ave | Route 31 | | S | 655 | 3.62 | 30 | 2 | 18 | 7 | 0 | | 4 | N | C | 9 | 30 | 100 | 4 | 1 | 1 | 1.99 | B | 1.29 | A |
| 35 | Route 31 | Redman Rd | Wegmans West Entrance | 0.95 | E | 588 | 5.62 | 45 | 2 | 18 | 5 | 0 | 0 | 3 | N | S | 0 | 0 | 0 | 0 | 2 | 1 | 4.79 | E | 2.99 | C |
| | Route 31 | Redman Rd | Wegmans West Entrance | | W | 588 | 7.7 | 45 | 2 | 18 | 5 | 0 | | 3 | N | S | 0 | 0 | 0 | 0 | 2 | 1 | 4.79 | E | 3.64 | D |
| 36 | Route 31 | Wegmans West Entrance | Route 19 | 0.24 | E | 588 | 5.62 | 45 | 2 | 16.5 | 4.5 | 0 | 0 | 3 | N | C | 0 | 0 | 0 | 0 | 3 | 1 | 4.90 | E | 3.43 | C |
| | Route 31 | Wegmans West Entrance | Route 19 | | W | 588 | 7.7 | 45 | 2 | 16.5 | 4.5 | 0 | | 3 | N | C | 0 | 0 | 0 | 0 | 3 | 1 | 4.90 | E | 4.08 | D |
| 37 | Route 31 | Route 19 | Sherry Ln | 0.49 | E | 820 | 2 | 45 | 2 | 17 | 5 | 0 | 0 | 3 | N | C | 0 | 0 | 100 | 5 | 1 | 1 | 4.42 | D | 2.46 | B |
| | Route 31 | Route 19 | Sherry Ln | | W | 908 | 2 | 45 | 2 | 17 | 5 | 0 | | 3 | N | C | 0 | 0 | 100 | 5 | 1 | 1 | 4.64 | E | 2.51 | C |
| 38 | Route 31 | Sherry Ln | Walmart | 0.2 | E | 820 | 2 | 45 | 2 | 20 | 8 | 0 | 0 | 3 | Y | S | 0 | 0 | 0 | 0 | 2 | 1 | 5.25 | E | 0.96 | A |
| | Route 31 | Sherry Ln | Walmart | | W | 908 | 2 | 45 | 2 | 20 | 8 | 0 | | 3 | Y | S | 0 | 0 | 0 | 0 | 2 | 1 | 5.47 | E | 1.01 | A |
| 39 | Route 31 | Walmart | Owens Rd | 0.39 | E | 820 | 2 | 45 | 2 | 19.5 | 8 | 0 | 0 | 3 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 5.28 | E | 1.10 | A |
| | Route 31 | Walmart | Owens Rd | | W | 908 | 2 | 45 | 2 | 19.5 | 8 | 0 | 0 | 3 | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 5.51 | F | 1.15 | A |
| 40 | Smith St | Erie Canal Bridge | Clark St | 0.18 | N | 67 | 2 | 30 | 2 | 12 | 0 | 0 | 0 | 3 | N | S | 8 | 0 | 100 | 4 | 1 | 0 | 2.07 | B | 1.32 | A |
| | Smith St | Erie Canal Bridge | Clark St | | S | 50 | 2 | 30 | 2 | 12 | 0 | 0 | | 3 | N | S | 8 | 0 | 100 | 4 | 1 | 0 | 2.03 | B | 0.96 | A |
| 41 | Smith St | Clark St | West Ave | 0.12 | N | 67 | 2 | 30 | 2 | 10 | 0 | 0 | 0 | 3 | N | C | 7 | 30 | 100 | 5 | 1 | 0 | 2.06 | B | 1.93 | B |
| | Smith St | Clark St | West Ave | | S | 50 | 2 | 30 | 2 | 10 | 0 | 0 | | 3 | N | C | 7 | 30 | 100 | 5 | 1 | 0 | 0.73 | A | 1.63 | B |
| 42 | South Ave | Owens Rd | Quaker Maid St | 0.64 | | 159 | 2 | 30 | 2 | 13 | 0 | 0 | 0 | 3 | N | C | 8 | 0 | 0 | 5 | 1 | 0 | 0.86 | A | 2.52 | C |
| 43 | South Ave | Quaker Maid St | Route 19 | 0.29 | | 159 | 2 | 30 | 2 | 14.5 | 0 | 0 | 0 | 3 | N | C | 8 | 35 | 100 | 4 | 1 | 0 | 2.23 | B | 2.22 | B |
| 44 | State St | Owens Rd | Oxford St | 0.5 | | 159 | 2 | 30 | 2 | 12.5 | 1 | 0 | 0 | 3 | N | S | 0 | 0 | 0 | 0 | 1 | 0 | 3.71 | D | 2.46 | B |
| 45 | State St | Oxford St | Route 19 | 0.36 | | 159 | 2 | 30 | 2 | 17 | 0 | 0 | 0 | 4 | N | C | 10 | 30 | 100 | 4 | 1 | 1 | 2.10 | B | 1.31 | A |
| 46 | Utica St | Clinton St | College St | 0.31 | | 159 | 2 | 30 | 2 | 11 | 0 | 0 | 0 | 3 | N | C | 7 | 100 | 100 | 4 | 1 | 0 | 1.03 | A | 2.87 | C |

| ROADWAY SEGMENT | | | | | | VEHICLE COUNT DATA | | FIELD INVENTORY DATA | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Seg_ID | Road Name | From | To | Length (LS) (mi) | Direction | Hourly Directional Volume | Percent Heavy Vehicles | Posted Speed | Lanes (L) | Total Direction Width | Paved Shoulder Width | On-Street Parking Width (marked) | % On-Street Parking | Pavement Condition Rating | Bike Lane Mark | Cross Sec. | Buffer Width | Tree Spcg. In Buffer | % with Sidewalk | Sidewalk Width | Road Profile Con (1,2,3) | Signals per Seg. | Pedestrian LOS | | Bicycle LOS | |
| | | | | | | V | HV | $SP_p$ | Th | $W_t$ | $W_l$ | $W_{ps}$ | OSPA | $PC_t$ | | | BW | | | $W_S$ | | | PLOS | PLOS | BLOS | BLOS |
| | | | | | | | directional | | | | | | | | | | | | | | | | Score | Grade | | |
| | | | | mi | | (veh/hr) | % | mph | # | ft | ft | ft | % | (1....5) | (Y/N) | C/S | ft | (ft/ctr) | % | ft | (1,2,3) | | (0...7) | (A...F) | (0...7) | (A...F) |
| 47 | Utica St | College St | Adams St | 0.19 | | 159 | 2 | 30 | 2 | 11 | 0 | 0 | 0 | 3 | N | C | 8 | 35 | 100 | 5 | 1 | 0 | 1.25 | A | 2.87 | C |
| 48 | West Ave | Route 19 | Idlewood Dr | 0.66 | E/W | 321 | | 35 | 2 | 19 | 7 | 0 | 0 | 2.5 | N | C | 8 | 0 | 100 | 5 | 1 | 1 | 1.39 | A | 0.85 | A |
| 49 | West Ave | Idlewood Dr | Redman Rd | 0.86 | E/W | 321 | | 35 | 2 | 19 | 7 | 0 | 0 | 3 | N | S | 20 | 0 | 100 | 5 | 1 | 1 | 2.29 | B | 0.51 | A |

# APPENDIX E

## SCHEMATIC COSTS FOR PEDESTRIAN AND BICYCLE INFRASTRUCTURE

## Costs for Pedestrian and Bicycle Infrastructure Improvements

**Source:** *http://www.pedbikeinfo.org/cms/downloads/Countermeasure%20Costs_Report_Nov2013.pdf*

| Infrastructure | Description | Median | Average | Minimum Low | Maximum High | Cost Unit | Number of Sources (Observations) |
|---|---|---|---|---|---|---|---|
| Bicycle Parking | Bicycle Locker | $2,140 | $2,090 | $1,280 | $2,680 | Each | 4 (5) |
| Bicycle Parking | Bicycle Rack | $540 | $660 | $64 | $3,610 | Each | 19 (21) |
| Bikeway | Bicycle Lane | $89,470 | $133,170 | $5,360 | $536,680 | Mile | 6 (6) |
| Bikeway | Signed Bicycle Route | $27,240 | $25,070 | $5,360 | $64,330 | Mile | 3 (6) |
| Bikeway | Signed Bicycle Route with Improvements | $241,230 | $239,440 | $42,890 | $536,070 | Mile | 1 (6) |
| Bollard | Bollard | $650 | $730 | $62 | $4,130 | Each | 28 (42) |
| Crosswalk | High Visibility Crosswalk | $3,070 | $2,540 | $600 | $5,710 | Each | 4(4) |
| Crosswalk | Striped Crosswalk | $340 | $770 | $110 | $2,090 | Each | 8 (8) |
| Crosswalk | Striped Crosswalk | $5.87 | $8.51 | $1.03 | $26 | Linear Foot | 12 (48) |
| Crosswalk | Striped Crosswalk | $6.32 | $7.38 | $1.06 | $31 | Square Foot | 5 (15) |
| Curb/Gutter | Curb | $18 | $21 | $1.05 | $110 | Linear Foot | 16 (68) |
| Curb Extension | Curb Extension/ Choker/ Bulb-Out | $10,150 | $13,000 | $1,070 | $41,170 | Each | 19(28) |
| Curb Ramp | Truncated Dome/Detectable Warning | $37 | $42 | $6.18 | $260 | Square Foot | 9 (15) |
| Curb Ramp | Wheelchair Ramp | $740 | $810 | $89 | $3,600 | Each | 16 (31) |
| Curb Ramp | Wheelchair Ramp | $12 | $12 | $3.37 | $76 | Square Foot | 10 (43) |
| Fence/Gate | Gate | $510 | $910 | $330 | $1,710 | Each | 5 (5) |
| Flashing Beacon | Flashing Beacon | $5,170 | $10,010 | $360 | $59,100 | Each | 16 (25) |
| Flashing Beacon | RRFB | $14,160 | $22,250 | $4,520 | $52,310 | Each | 3 (4) |
| Gateway | Gateway Sign | $350 | $340 | $130 | $520 | Each | 3 (4) |
| Gateway | Structure | $15,350 | $22,750 | $5,000 | $64,330 | Each | 5 (6) |
| Path | Multi-Use Trail - Paved | $261,000 | $481,140 | $64,710 | $4,288,520 | Mile | 11 (42) |
| Path | Multi-Use Trail - Unpaved | $83,870 | $121,390 | $29,520 | $412,720 | Mile | 3 (7) |
| Pavement Marking | Advance Stop/Yield Line | $380 | $320 | $77 | $570 | Each | 3 (5) |
| Pavement Marking | Advance Stop/Yield Line | $10 | $10 | $4.46 | $100 | Square Foot | 1 (4) |
| Pavement Marking | Island Marking | $1.49 | $1.94 | $0.41 | $11 | Square Foot | 1 (4) |
| Pavement Marking Symbol | Pedestrian Crossing | $310 | $360 | $240 | $1,240 | Each | 4 (6) |
| Pavement Marking Symbol | Shared Lane/Bicycle Marking | $160 | $180 | $22 | $600 | Each | 15 (39) |
| Pavement Marking Symbol | School Crossing | $520 | $470 | $100 | $1,150 | Each | 4 (18) |
| Signal | Audible Pedestrian Signal | $810 | $800 | $550 | $990 | Each | 4 (4) |
| Signal | Countdown Timer Module | $600 | $740 | $190 | $1,930 | Each | 14 (18) |
| Signal | Pedestrian Signal | $980 | $1,480 | $130 | $10,000 | Each | 22 (33) |
| Signal | Signal Face | $490 | $430 | $130 | $800 | Each | 3 (6) |
| Signal | Signal Head | $570 | $550 | $100 | $1,450 | Each | 12 (26) |
| Signal | Signal Pedestal | $640 | $800 | $490 | $1,160 | Each | 3 (5) |
| Pedestrian/Bike Detection | Furnish and Install Pedestrian Detector | $180 | $390 | $68 | $1,330 | Each | 7 (14) |
| Pedestrian/Bike Detection | Push Button | $230 | $350 | $61 | $2,510 | Each | 22 (34) |
| Railing | Pedestrian Rail | $95 | $100 | $7.20 | $690 | Linear Foot | 29 (83) |
| Raised Crossing | Raised Crosswalk | $7,110 | $8,170 | $1,290 | $30,880 | Each | 14 (14) |
| Roundabout/ Traffic Circle | Roundabout/ Traffic Circle | $27,190 | $85,370 | $5,000 | $523,080 | Each | 11 (14) |
| Sidewalk | Asphalt Paved Shoulder | $5.81 | $5.56 | $2.96 | $7.65 | Square Foot | 1 (4) |
| Sidewalk | Concrete Sidewalk | $27 | $32 | $2.09 | $410 | Linear Foot | 46 (164) |
| Sidewalk | Concrete Sidewalk - Patterned | $38 | $36 | $11 | $170 | Linear Foot | 4 (5) |
| Sidewalk | Concrete Sidewalk - Stamped | $45 | $45 | $4.66 | $160 | Linear Foot | 12 (17) |
| Sidewalk | Concrete Sidewalk + Curb | $170 | $150 | $23 | $230 | Linear Foot | 4 (7) |
| Sidewalk | Sidewalk | $34 | $45 | $14 | $150 | Linear Foot | 17 (24) |
| Sign | Stop/Yield Signs | $220 | $300 | $210 | $560 | Each | 4 (4) |
| Speed Bump/Hump | Speed Table | $2,090 | $2,400 | $2,000 | $4,180 | Each | 5 (5) |
| Street Furniture | Street Trees | $460 | $430 | $54 | $940 | Each | 7(7) |
| Street Furniture | Bench | $1,660 | $1,550 | $220 | $5,750 | Each | 15 (17) |
| Street Furniture | Bus Shelter | $11,490 | $11,560 | $5,230 | $41,850 | Each | 4 (4) |

Note: Costs for Pedestrian and Bicycle Infrastructure Improvements is for conceptual budgetting purposes only. Unit costs should be checked prior to estimating.

## NYSDOT Quick Estimator Reference - Calculations - Upstate

| Item | Unit | Unit Price | Included NYSDOT item numbers | Breakdown | Note |
|---|---|---|---|---|---|
| 4' wide sidewalk | LF | 33.00 | 608.0101 - CONCRETE SIDEWALKS AND DRIVEWAYS<br>203.02 - UNCLASSIFIED EXCAVATION AND DISPOSAL<br>304.12 - SUBBASE COURSE TYPE II | ITEM 608.0101 **$23/LF**<br>ITEM 203.02 **$5/LF**<br>ITEM 304.12 **$5/LF** | Includes excavation, disposal, subbase material, compaction, construction of sidewalk and finish work. Does not include, sawcutting driveways, excavation to additional depth for driveways, curbing, grading, or turf establishment. |
| 5' wide sidewalk | LF | 39.00 | 608.0101 - CONCRETE SIDEWALKS AND DRIVEWAYS<br>203.02 - UNCLASSIFIED EXCAVATION AND DISPOSAL<br>304.12 - SUBBASE COURSE TYPE II | ITEM 608.0101 **$27/LF**<br>ITEM 203.02 **$6/LF**<br>ITEM 304.12 **$6/LF** | Includes excavation, disposal, subbase material, compaction, construction of sidewalk and finish work. Does not include, sawcutting driveways, excavation to additional depth for driveways, curbing, grading, or turf establishment. |
| 10' multiuse asphalt path | LF | 74.00 | 608.020102 - HMA SIDEWALKS DRIVEWAYS AND BICYCLE PATHS | ITEM 608. 020102 **$74/LF** | Includes all prep of subgrade, sawcutting and tack coat. Doesn't include curbing, grading or turf establishment. NOTE: Prices have been volatile over the past 3 years. |
| ADA curb ramp | EA | 1,250.00 | 608.0105nn15 - CONCRETE SIDEWALKS AND DRIVEWAYS | ITEM 608.0105nn15 **$1250/ EA** | Includes site survey, demolition, saw cutting, excavation, disposal, fill, subbase material, compaction, construction of ramp, landings and associated curbing, detectable warning units, repairs to affected asphaltm topsoil, establishing turf (to disturbed areas), and finish work. NOTE: Limited price history data in PIC: Ramp Types 1-13 not all reported . |
| LS Type crosswalk | EA | 770.00 | 685.04 - WHITE EPOXY REFLECTORIZED PAVEMENT SYMBOLS - 15 MILS<br>635.0103-CLEANING AND PREPARATION OF PAVEMENT SURFACES | ITEM 685.04 **$0.42/LF**<br>ITEM 635.0103 **$0.68/LF** | Assume 700 LF of 4" striping per crosswalk |
| Concrete Curbing | LF | 53.00 | 609.04 CAST IN PLACE CONCRETE CURB<br>520.5014--08 SAW CUTTING (EDGE OF PAVEMENT PARALLEL TO CURB)<br>203.02 - UNCLASSIFIED EXCAVATION AND DISPOSAL<br>203.03 - EMBANKMENT IN PLACE<br>304.12 -SUBBASE TYPE II<br>402.128102 - TOP COURSE<br>503.1010 - FOUNDATION CONCRETE | ITEM 609.04 **$ 32/LF**<br>ITEM 520.5014--08 **$ 4/LF**<br>ITEM 203.02 **$ 5/LF**<br>ITEM 203.03 **$ 0.60/LF**<br>ITEM 304.12 **$6 /LF**<br>ITEM 402.128102 **$ 3.8 /LF**<br>ITEM 503.1010 **$7.2/LF** | Includes excavation for curb, subbase, removing asphalt from existing roadway adjacen to proposed curb, patching asphalt adjacent to curb. |
| Asphalt Paved Snow Storage Area | SF | 8.00 | 608.020102 - HMA SIDEWALKS DRIVEWAYS AND VEGETATION CONTROL STRIPS | ITEM 608.020102 **8/SF** | |
| Raised crosswalk | EA | 15,000.00 | | | |
| Mini roundabout | EA | 175,000.00 | | | |
| Small Single Post-Mounted Signs | EA | 130.00 | 645.5201 or 645.5202 - GROUND MOUNTED SIGN PANELS<br>645.81 or 645.830502 - SIGN POST | ITEM 645.52xx **$ 30/EA**<br>ITEM 645.8* **$ 100/EA** | Includes the cost of excavation and backfill and furnishing all labor, materials, and equipment necessary to complete the work |
| Solar powered radar speed sign | EA | 7,000.00 | 645.80000001 | | Limited price data |
| Wooden Bollard - Fixed | EA | 200.00 | 615.75 - TIMBER BOLLARDS FIXED | ITEM 615.75 **$ 200/EA** | Includes the cost of excavation and backfill and furnishing all labor, materials, and equipment necessary to complete the work |
| Wooden Bollard - Moveable | EA | 500.00 | 615.76 TIMBER BOLLARDS MOVEABLE | ITEM 615.76 **$ 500/EA** | Includes the cost of excavation and backfill and furnishing all labor, materials, and equipment necessary to complete the work |
| Pedestrian push button on existing signal | EA | 2,005.00 | 680.520108 - CONDUIT, METAL STEEL, ZINC COATED, 3 NPS<br>680.8142- PEDESTRIAN SIGNAL POST TOP MOUNTED ASSEMBLY<br>680.8225--10 PEDESTRIAN PUSHBUTTON AND SIGN-WITHOUT POST<br>680.730514 - SIGNAL CABLE, 5 CONDUCTOR, 14 AWG<br>680.8131 AUDIBLE PEDESTRIAN SIGNAL<br>680.813103 PEDESTRIAN SIGNAL SECTION, TYPE I, 1 ft<br>680.813104 INSTALL LED PEDESTRIAN SIGNAL MODULE | ITEM 680.520108 **$ 600/EA**<br>ITEM 680.8142 **$150 /EA**<br>ITEM 680.8225--10 **$190/EA**<br>ITEM 680.730514 **$200 /EA**<br>ITEM 680.8131 **$ 650/EA**<br>ITEM 680.813103 **$ 165/EA**<br>ITEM 680.813104 **$ 50/EA** | Includes demolition, saw cutting, excavation, disposal, fill, topsoil, establishing turf (to disturbed areas), repairs to affected asphalt and/or concrete as necessary, Pedestrian Signal Systems and components, (removed and or supplied / installed), Pedestrian Signal Systems wiring (removed and or supplied / installed), furnishing electrical service, finish work, and any required adjustments to utilities. |
| New signal with ped push buttons | EA | 6,580.00 | 680.510501- PULLBOX, RECTANGULAR<br>680.520108 - CONDUIT, METAL STEEL, ZINC COATED, 3 NPS<br>680.8142- PEDESTRIAN SIGNAL POST TOP MOUNTED ASSEMBLY<br>680.8225--10 PEDESTRIAN PUSHBUTTON AND SIGN-WITHOUT POST<br>680.730514 - SIGNAL CABLE, 5 CONDUCTOR, 14 AWG<br>206.03 - CONDUIT EXCAVATION AND BACKFILL, INCLUDING SURFACE RESTORATION<br>680.6724-TRAFFIC SIGNAL POLE-TOP MOUNTED 8FT HIGH<br>680.8131 AUDIBLE PEDESTRIAN SIGNAL<br>680.813103 PEDESTRIAN SIGNAL SECTION, TYPE I, 1 ft<br>680.813104 INSTALL LED PEDESTRIAN SIGNAL MODULE | ITEM 680.510501 **$ 1100/EA**<br>ITEM 680.520108 **$ 600/EA**<br>ITEM 680.8142 **$ 150/EA**<br>ITEM 680.8225--10 **$190/EA**<br>ITEM 680.730514 **$ 200/EA**<br>ITEM 206.03 **$ 2500/EA**<br>ITEM 680.6724 **$ 975/EA**<br>ITEM 680.8131 **$650 /EA**<br>ITEM 680.813103 **$ 165/EA**<br>ITEM 680.813104 **$ 50/EA** | Includes demolition, saw cutting, excavation, disposal, fill, topsoil, establishing turf (to disturbed areas), repairs to affected asphalt and/or concrete as necessary, Traffic Signal Systems, and components (removed and or supplied / installed), Traffic Signal Systems wiring, including vehicle detection (removed and or supplied / installed), furnishing electrical service, finish work, and any required adjustments to utilities. |
| Establish turf | SY | 4.75 | 613.03-TOPSOIL- TYPE B<br>610.0203-ESTABLISH TURF | ITEM 613.03 **$ 4/SY**<br>ITEM 610.0203 **$ 0.75/SY** | Assume 3" topsoil depth |
| Segmental block retaining wall | SF | 40.00 | | | Include the cost of furnishing the leveling pad, segmental precast concrete block units, backfill, unit fill, cap units, underdrain and geotextile and all labor,materials, and equipment necessary to satisfactorily complete the work. Does NOT include excavation. Very limited price data. |
| Alter Drainage Structure | EA | 1,000.00 | | | Ajust elevation of structure, alter structure to accept pipe. |
| % WZTC based on project complexity | 5% | Percentage | | | |
| % for Incidentals, Inflation and Contingencies | 20% | Percentage | | | |
| **Total Construction Cost =** | | | | | |
| % for Survey | 10% | Percentage | | | |
| % for Design based on project complexity | 5-15% | Percentage | | | |
| % for Construction Inspection | 9% | Percentage | | | |
| **Total Project Cost =** | | | | | |

Note: NYSDOT Quick Estimator Reference is for conceptual budgetting purposes only. Unit costs should be checked prior to estimating. Last updated: 06/11/2012

# APPENDIX F

## ECONOMIC IMPACT OF TRAILS

## Economic Impacts of Trails

http://www.americantrails.org/resources/economics/GreenwaySumEcon.html

**Source:** American Trails
**Subject:** Economic Impacts of Trails
**Findings:**

- "In the vicinity of Philadelphia's 1,300 acre Pennypack Park, property values correlate significantly with proximity to the park. In 1974, the park accounted for 33 percent of the value of land 40 feet away from the park, nine percent when located 1,000 feet away, and 4.2 percent at a distance of 2,500 feet." [Hammer, Coughlin and Horn, 1974]

## Impacts of Trails and Trail Use

http://www.americantrails.org/resources/adjacent/sumadjacent.html

**Source:** American Trails
**Subject:** Impacts of Trails and Trail Use
**Findings:**

- "A 1978 study of property values in Boulder, Colorado, noted that housing prices declined an average of $4.20 for each foot of distance from a greenbelt up to 3,200 feet. In one neighborhood, this figure was $10.20 for each foot of distance. The same study determined that, other variables being equal, the average value of property adjacent to the greenbelt would be 32% higher than those 3,200 feet away."

## Property Value/Desirability Effects of Bike Paths Adjacent to Residential Areas

http://128.175.63.72/projects/DOCUMENTS/bikepathfinal.pdf

**Source:** University of Delaware
**Subject:** Property Value Near Bike Paths
**Findings:**

- "The analysis indicates that the impact of proximity to a bike path on property prices is positive, controlling for the number of bedrooms, years since sale, acres, land, buildings, total number of rooms, total assessment. The properties within 50m of the bike paths show a positive significance of at least $8,800 and even higher when controlled for specific variables."

## Bicycle Paths: Safety Concerns and Property Values

http://www.greenway.org/pdf/la_bikepath_safety.pdf

**Source:** Los Angeles County, Metropolitan Transportation Authority
**Subject:** Home sales near trails
**Findings:**

- "Homes sales were examined in the seven Massachusetts towns through which the Minuteman Bikeway and Nashua River Rail Trail run. Statistics on list and selling prices and on days on the market were analyzed. The analysis shows that homes near these rail trails sold at 99.3% of the list price as compared to 98.1% of the list price for other homes sold in these towns. The most significant feature of home sales near rail trails is that these homes sold in an average of 29.3 days as compared to

50.4 days for other homes.” [*Home Sales Near Two Massachusetts Trails,* Jan. 25, 2006. Craig Della Penna]

**Table 1. Home Sales near Rail Trails**

| Town | No. of Properties Sold | Average List Price | Average Sale Price | Ratio of Sale to List | Days on the Market |
|---|---|---|---|---|---|
| Arlington | 10 | $513,750 | $509,690 | 99.2% | 27.1 |
| Lexington | 10 | $906,090 | $907,040 | 100.1% | 18.5 |
| Bedford | 3 | $511,600 | $500,833 | 97.9% | 55.3 |
| Ayer | 1 | $329,900 | $317,500 | 96.2% | 47.0 |
| Groton | 2 | $689,900 | $675,000 | 97.8% | 22.0 |
| Dunstable | 1 | $695,000 | $685,000 | 98.6% | 20.0 |
| Pepperell | 3 | $385,833 | $376,333 | 97.5% | 48.3 |
| Average | | $643,180 | $638,377 | 99.3% | 29.3 |

**Table 2. Home Sales not near Rail Trails**

| Town | No. of Properties Sold | Average List Price | Average Sale Price | Ratio of Sale to List | Days on the Market |
|---|---|---|---|---|---|
| Arlington | 119 | $558,775 | $556,327 | 99.6% | 28.3 |
| Lexington | 166 | $871,533 | $849,470 | 97.5% | 54.4 |
| Bedford | 38 | $633,912 | $624,289 | 98.5% | 42.4 |
| Ayer | 30 | $344,677 | $340,155 | 98.7% | 73.0 |
| Groton | 53 | $605,198 | $584,689 | 96.6% | 80.4 |
| Dunstable | 12 | $587,946 | $578,965 | 98.5% | 83.2 |
| Pepperell | 57 | $384,818 | $379,482 | 98.6% | 80.2 |
| Average | | $645,607 | $633,072 | 98.1% | 50.4 |

[*Home Sales Near Two Massachusetts Trails,* Jan. 25, 2006. Craig Della Penna]

- “Realizing the selling power of greenways, developers of the Shepherd’s Vineyard housing development in Apex, North Carolina added $5,000 to the price of 40 homes adjacent to the regional greenway, Those homes were still the first to sell.” [*Economic Benefits of Trails and Greenways,* Rails-to-Trails Conservancy, 2004]
- “The average price for all homes sold in greenway corridors was nearly 10 percent higher than the average price for all homes. Similarly, the average prices for all homes near greenways with trails and in conservation corridors were higher than the overall average sale price. For homes near the Monon Trail, the average sale price was 11 percent higher than for all homes that sold in 1999.” [*Public Choices and Property Values: Evidence from Greenways in Indianapolis*, Center for Urban Policy and the Environment, December 2003]
- “A study of property values near greenbelts in Boulder, Colorado, noted that…other variables being equal, the average value of property adjacent to the greenbelt would be 32 percent higher than those 3,200 feet away.” [*Economic Impacts of Rivers, Trails and Greenways: Property Values.* Resource Guide published by the National Parks Service, 1995]
- “A study completed by the Office of Planning in Seattle, Washington, for the 12 mile Burke-Gilman trail was based upon surveys of homeowners and real estate agents. The survey of real estate agents revealed that property near, but not immediately adjacent to the trail, sells for an average of 6 percent more.” [*Economic Impacts of*

*Rivers, Trails and Greenways: Property Values.* Resource Guide published by the National Parks Service, 1995]

- "In a survey of adjacent landowners along the Luce Line rail-trail in Minnesota, 61 percent of the suburban residential owners noted an increase in their property value as a result of the trail. New owners felt the trail had a more positive effect on adjacent property values than did continuing owners. Appraisers and real estate agents claimed that trails were a positive selling point for suburban residential property." [*Economic Impacts of Rivers, Trails and Greenways: Property Values.* Resource Guide published by the National Parks Service, 1995]
- "A survey of Denver residential neighborhoods by the Rocky Mountain Research Institute shows the public's increasing interest in greenways and trails. From 1980 to 1990, those who said they would pay extra for greenbelts and parks in their neighborhood rose from 16 percent to 48 percent." [*Economic Impacts of Rivers, Trails and Greenways: Property Values.* Resource Guide published by the National Parks Service, 1995]
- "Recognizing what had happened, the realty companies decided to restructure the pricing of future lots located along the Mountain-Bay Trail. thus, in the addition of Highridge Estates, the average lot located along the rail was priced 26 percent higher than slightly larger lots not located along the trail." [*Perceptions of How the Presence of Greenway Trails Affects the Value of Proximate Properties.* Journal of Park and Recreation Administration, Fall 2001. John L. Crompton.]

### A Study of Trail Impacts on Property Values, Noise and Crime

http://library.michigantrails.org/education-and-advocacy/a-study-of-trail-impacts-on-property-values-noise-andcrime/

**Source:** Michigan Trails
**Subject:** Trail Impacts on Property Values, Noise and Crime
**Findings:**

- For all trail segments studied, the median home sale prices adjacent to the trail are escalating faster than countywide. The rate of increase was particularly high in certain areas. The results indicated that the trail does not negatively impact property values and suggested that it may help increase property values by roughly 2 percent to 3 percent annually over inflation.
- Realtors were surveyed as well, and 90 percent said that home sales had increased significantly or increased somewhat in areas near the trail versus other areas in the market.

### A Study of Trail Impacts on Property Values, Noise and Crime

http://library.michigantrails.org/education-and-advocacy/a-study-of-trail-impacts-on-property-values-noise-andcrime/

**Source:** Michigan Trails
**Subject:** Trail Impacts on Property Values, Noise and Crime
**Findings:**

- "81% surveyed felt that the nearby trail's presence would have a positive effect or effect on the ease of sale of their homes." (Fig. 5)

- “The clear majority of residents (63.8%) who bought their homes after construction of the trails reported that the trail had positively influenced their purchase decision.” (Fig. 6)
- “West Papio showed stronger results than the other two trails on property values, ease of home sale, and quality of life. The differences may possibly be due to neighborhood demographics and characteristics of the trail themselves” (Fig. 7.)
- “Of the respondents who purchased their home after the trail existed, 63.8% indicated that the trail had positively influenced their purchase decision.

Fig. 5. Impact of Trail on Sale of Home


Fig. 6. Impact of Trail on Selling Price

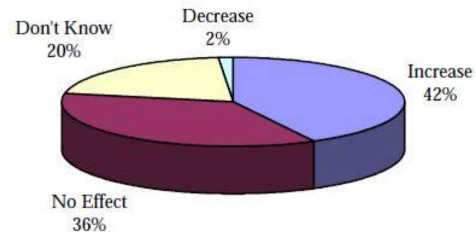



Fig. 7. Trail Impact on Home Sale
Three Trails

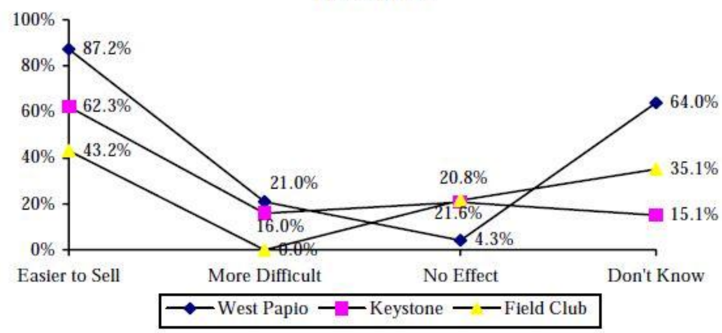
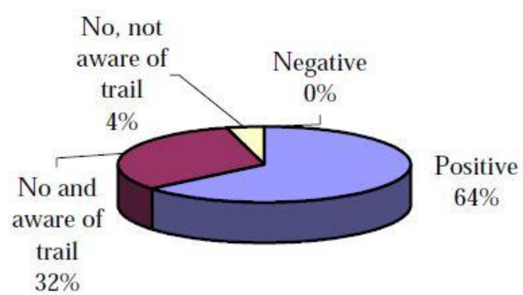



Fig. 8. Influence of Trail on Home Purchase



# APPENDIX G

## BICYCLE AND PEDESTRIAN FACILITY DESIGN FLEXIBILITY

### (FEDERAL HIGHWAY ADMINISTRATION - FHWA)

U.S. Department of Transportation
Federal Highway Administration

# Memorandum

**SENT BY ELECTRONIC MAIL**

Subject: **GUIDANCE:** Bicycle and Pedestrian Facility Design Flexibility Date: August 20, 2013

From: Gloria M. Shepherd
Associate Administrator for Planning, Environment and Realty

Walter C. (Butch) Waidelich, Jr.
Associate Administrator for Infrastructure

Jeffrey A. Lindley
Associate Administrator for Operations

Tony T. Furst
Associate Administrator for Safety

In Reply Refer To: HEPH-10

To: Division Administrators
cc: Directors of Field Services

This memorandum expresses the Federal Highway Administration's (FHWA) support for taking a flexible approach to bicycle and pedestrian facility design. The American Association of State Highway and Transportation Officials (AASHTO) bicycle and pedestrian design guides are the primary national resources for planning, designing, and operating bicycle and pedestrian facilities. The National Association of City Transportation Officials (NACTO) *Urban Bikeway Design Guide* and the Institute of Transportation Engineers (ITE) *Designing Urban Walkable Thoroughfares* guide builds upon the flexibilities provided in the AASHTO guides, which can help communities plan and design safe and convenient facilities for pedestrian and bicyclists. FHWA supports the use of these resources to further develop nonmotorized transportation networks, particularly in urban areas.

## AASHTO Guides

AASHTO publishes two guides that address pedestrian and bicycle facilities:

- *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, July 2004, (AASHTO Pedestrian Guide) provides guidelines for the planning, design, operation, and maintenance of pedestrian facilities, including signals and signing. The guide recommends methods for accommodating pedestrians, which vary among roadway and facility types, and addresses the effects of land use planning and site design on pedestrian mobility.

- *Guide for the Development of Bicycle Facilities* *2012, Fourth Edition* (AASHTO Bike Guide) provides detailed planning and design guidelines on how to accommodate bicycle travel and operation in most riding environments. It covers the planning, design, operation, maintenance, and safety of on-road facilities, shared use paths, and parking facilities. Flexibility is provided through ranges in design values to encourage facilities that are sensitive to local context and incorporate the needs of bicyclists, pedestrians, and motorists.

**NACTO Guide**

NACTO first released the *Urban Bikeway Design Guide* (NACTO Guide) in 2010 to address more recently developed bicycle design treatments and techniques. It provides options that can help create "complete streets" that better accommodate bicyclists. While not directly referenced in the AASHTO Bike Guide, many of the treatments in the NACTO Guide are compatible with the AASHTO Bike Guide and demonstrate new and innovative solutions for the varied urban settings across the country.

The vast majority of treatments illustrated in the NACTO Guide are either allowed or not precluded by the Manual on Uniform Traffic Control Devices (MUTCD). In addition, non-compliant traffic control devices may be piloted through the MUTCD experimentation process. That process is described in Section 1A.10 of the MUTCD and a table on the FHWA's bicycle and pedestrian design guidance Web page is regularly updated (FHWA Bicycle and Pedestrian Design Guidance), and explains what bicycle facilities, signs, and markings are allowed in accordance with the MUTCD. Other elements of the NACTO Guide's new and revised provisions will be considered in the rulemaking cycle for the next edition of the MUTCD.

**ITE Guide**

In 2010, FHWA supported production of the ITE Guide *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*. This guide is useful in gaining an understanding of the flexibility that is inherent in the AASHTO "Green Book," *A Policy on Geometric Design of Highways and Streets*. The chapters emphasize thoroughfares in "walkable communities" – compact, pedestrian-scaled villages, neighborhoods, town centers, urban centers, urban cores and other areas where walking, bicycling and transit are encouraged. It describes the relationship, compatibility and trade-offs that may be appropriate when balancing the needs of all users, adjoining land uses, environment and community interests when making decisions in the project development process.

**Summary**

FHWA encourages agencies to appropriately use these guides and other resources to help fulfill the aims of the *2010 US DOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations* – "...DOT encourages transportation agencies to go beyond the minimum requirements, and proactively provide convenient, safe, and context-sensitive facilities that foster increased use by bicyclists and pedestrians of all ages and abilities, and utilize universal design characteristics when appropriate."

Accompanying this memo are the latest versions of the: 1) AASHTO Bike Guide, 2) NACTO Bike Guide; and 3) the ITE *Designing Walkable Urban Thoroughfares* Guide.

The attachments provide two examples that demonstrate the use of treatments illustrated in the NACTO Guide (i.e., buffered bike lanes and green colored pavement for bicycle lanes) by State or local DOTs, and a list of FHWA staff that can help with questions about pedestrian and bicycle design issues.

*Attachments*

**Attachment 1 – Example 1 & 2**

**Example 1: Michigan DOT's Buffered Bike Lanes**

One of the innovative bicycle facilities discussed in the NACTO *Urban Bikeway Design Guide* is buffered bike lanes. Buffered bike lanes create more space between motor vehicles and bicycles by delineating extra space between the bike lane and parked cars and/or a motor vehicle lane. Buffered bike lanes can be implemented if the pavement markings and channelizing devices are compliant with the MUTCD (see Bicycle Facilities and the Manual on Uniform Traffic Control Devices). Michigan DOT developed a video that describes their efforts to install buffered bike lanes in Oakland County (see Northwestern Highway Bicycle Lane: A Safer Place to Ride). Michigan DOT also developed a brochure that explains buffered bike lanes to the public (see What Every Michigan Driver Should Know About Bike Lanes).

**Example 2: Missoula's Colored Bike Lanes**

MUTCD experimentation is a methodology that analyzes innovative traffic control devices through field deployment for the purpose of testing or evaluating its application or manner of use. An approved request to experiment numbered and titled as Official Ruling "3(09)-3(E) – Colored Bike Lanes – Missoula, MT" illustrates a successful experiment. The City of Missoula submitted a request to experiment in January 2010 in accordance with all Items in Paragraph 11 of Section 1A.10 in the 2009 MUTCD.

The experiment was conducted for one year and revealed that approximately 70 percent of motorists noticed the color conspicuity enhancement to the bike lane. This was interpreted as an increased awareness by motorists of the potential presence of bicyclists at intersections where those motorists would be making a right turn.

The City also reported ancillary findings that were not anticipated in the original Evaluation Plan of the request to experiment. This included psychological discomfort of the cyclist with the lateral locations of the colored bicycle lane with respect to door zones in parallel parking corridors. In addition, the experiment revealed an unintended design weakness where colored bike lanes that achieve high compliance of little or no occupation of motorized vehicles can also be attractive to pedestrians who wish to use them to facilitate their travel in lieu of crowded sidewalks or to patronize parking meters. For these reasons, a successful experiment can reveal unanticipated findings, further demonstrating the value of official experimentation.

This particular experiment provided two conclusions that supported FHWA's decision to issue Interim Approval for green colored pavement for bicycle lanes in April 2011.

For more information see http://mutcd.fhwa.dot.gov/reqdetails.asp?id=1135.

Attachment 2

**FHWA Bicycle and Pedestrian Staff Resources**

Human Environment —Livability and Bicycle and Pedestrian Programs

- Shana Baker, Livability Team Leader, 202-366-4649, shana.baker@dot.gov: Livability, Context Sensitive Solutions
- Christopher Douwes, Trails and Enhancements Program Manager 202-366-5013, christopher.douwes@dot.gov: Transportation Alternatives Program/Enhancement Activities; Recreational Trails Program related activities; Bicycle and pedestrian policy and guidance
- Daniel Goodman, Transportation Specialist, 202-366-9064, daniel.goodman@dot.gov: Bicycle and pedestrian activities; Livability
- Wesley Blount, Program Manager, 202-366-0799, wesley.blount@dot.gov: Safe Routes to School, Discretionary programs

Planning

- Brian Gardner, 202-366-4061, brian.gardner@dot.gov: Modeling
- Jeremy Raw, 202-366-0986, jeremy.raw@dot.gov: Modeling
- Harlan Miller, 202-366-0847, harlan.miller@dot.gov: Planning Oversight
- Kenneth Petty, 202-366-6654 kenneth.petty@dot.gov: Planning Capacity Building

Policy

- Steven Jessberger, 202-366-5052, steven.jessberger@dot.gov, Traffic Monitoring Guide

Infrastructure — Design (including accessible design)

- Michael Matzke, 202-366-4658, michael.matzke@dot.gov

Resource Center— Design (including accessible design)

- Brooke Struve, Safety and Design Team, 720-963-3270, brooke.struve@dot.gov
- Peter Eun, Safety and Design Team, 360-753-9551, peter.eun@dot.gov

Operations — Manual on Uniform Traffic Control Devices

- Kevin Dunn, Transportation Specialist, 202-366-6054, kevin.dunn@dot.gov: MUTCD Team

Pedestrian and Bicycle Safety

- Gabe Rousseau, Safety Operations Team Leader, 202-366-8044, gabe.rousseau@dot.gov: Bicycle and pedestrian safety programs
- Tamara Redmon, Pedestrian Safety Program Manager, 202-366-4077, tamara.redmon@dot.gov: Pedestrian safety

Pedestrian and Bicyclist Safety Research

- Ann Do, 202-493-3319, ann.do@dot.gov
- Jim Shurbutt, 202-493-3420, jimmy.shurbutt@dot.gov

Civil Rights — Accessibility Policy and Compliance

- Patrick Gomez, Resource Center Civil Rights Team, 720-963-3269, patrick.gomez@dot.gov
- Candace Groudine, Director of External Civil Rights Programs, 202-366-4634, candace.groudine@dot.gov