

Appendix O

Bicycle Best Practices Screening and Bicycle Facilities Toolkit

Best Practices Screening

In addition to traditional solutions to bicycle travel within the corridor such as bike lanes, shared lane markings, share the road signs, innovative approaches and state-of-the-practice designs were examined. Most of the design treatments are in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), the American Association of State Highway and Transportation Officials (AASHTO), and New Jersey Department of Transportation's *Bicycle Compatible Roadways and Bikeways and Pedestrian Compatible Planning and Design Guidelines*. However, there are several potential solutions to bicycle and pedestrian access and safety problems currently in use which are not included in the above mentioned guidelines such as "colored bike lanes," "bike boxes," and "crossbikes." Their use is typically justified as a result of their being implemented under the FHWA/MUTCD experimental process. A few of the design treatments recommended along the corridor are highlighted below. More treatments and additional information on bicycle best practices can be found in the Bicycle Facilities Toolkit.



Buffered Bike Lane



Shared Lane Marking / Bicycle Priority Lane



Intersection Crossing Markings



Combined Bike Lane / Turn Lane



Crossbike Treatment



High-intensity Activated Crosswalk (HAWK signal)



Bicycle Loop Detector



Wayfinding Signage with time and distance



Bicycle Racks and Lockers

Bicycle Facilities Toolkit - Table of Contents

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BICYCLE LANES

CONVENTIONAL	DESCRIPTION/FEATURES	BENEFITS		
 <p data-bbox="386 812 621 862">Photo: Bike JC Location: Jersey City, NJ</p>	<p data-bbox="646 337 1087 521">A portion of the roadway that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists.</p>	<table border="1"> <thead> <tr> <th data-bbox="1115 574 1982 626">DRAWBACKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1115 626 1982 852"> <ul data-bbox="1123 298 1919 824" style="list-style-type: none"> • Enables bicyclists to ride at their preferred speed without interference from prevailing traffic conditions • Facilitates predictable behavior and movements between bicyclists and motorists • Visually reminds motorists of bicyclists' right to the street • Not all users will be comfortable in a bike lane • When next to on-street parking there is a risk of bicyclists getting 'doored' • Greater enforcement required to prevent motorists from parking in the bike lane </td> </tr> </tbody> </table>	DRAWBACKS	<ul data-bbox="1123 298 1919 824" style="list-style-type: none"> • Enables bicyclists to ride at their preferred speed without interference from prevailing traffic conditions • Facilitates predictable behavior and movements between bicyclists and motorists • Visually reminds motorists of bicyclists' right to the street • Not all users will be comfortable in a bike lane • When next to on-street parking there is a risk of bicyclists getting 'doored' • Greater enforcement required to prevent motorists from parking in the bike lane
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION				
<ul data-bbox="94 976 1016 1357" style="list-style-type: none"> • Bike lanes are most helpful on streets with: <ul data-bbox="191 1011 783 1122" style="list-style-type: none"> ○ $\geq 3,000$ motor vehicle average daily traffic ○ a posted speed ≥ 25 mph ○ high transit vehicle volume • Should typically be provided on both sides of two-way streets to prevent wrong-way riding • The min. width of a bike lane next to a parking lane, a curb or other vertical surface is 5 ft. • On roadways with no curb, gutter or on-street parking, the min. width is 4 ft. 	<table border="1"> <thead> <tr> <th data-bbox="1039 1057 1982 1109">RESOURCES</th> </tr> </thead> <tbody> <tr> <td data-bbox="1039 1109 1982 1279"> <ul data-bbox="1052 976 1856 1252" style="list-style-type: none"> • MUTCD - Can be implemented at present time • AASHTO – included in <i>Guide to Bicycle Facilities, 4th Edition</i> • NJDOT Bicycle Compatible Roadways and Bikeways, Planning and Design Guidelines (1996) • AASHTO <i>Guide for the Development of Bicycle Facilities, 4th Edition</i> • NYCDOT Street Design Manual. (2009) </td> </tr> <tr> <th data-bbox="1039 1279 1982 1331">CURRENT USAGE</th> </tr> <tr> <td data-bbox="1039 1331 1982 1458"> <ul data-bbox="1052 1344 1822 1373" style="list-style-type: none"> • Most common bicycle facility in use in the United States </td> </tr> </tbody> </table>	RESOURCES	<ul data-bbox="1052 976 1856 1252" style="list-style-type: none"> • MUTCD - Can be implemented at present time • AASHTO – included in <i>Guide to Bicycle Facilities, 4th Edition</i> • NJDOT Bicycle Compatible Roadways and Bikeways, Planning and Design Guidelines (1996) • AASHTO <i>Guide for the Development of Bicycle Facilities, 4th Edition</i> • NYCDOT Street Design Manual. (2009) 	CURRENT USAGE	<ul data-bbox="1052 1344 1822 1373" style="list-style-type: none"> • Most common bicycle facility in use in the United States
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BICYCLE LANES

BUFFERED	DESCRIPTION/FEATURES	BENEFITS		
 <p data-bbox="367 781 621 829">Photo: The RBA Group Location: Philadelphia, PA</p>	<p data-bbox="646 342 1079 565">Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.</p>	<table border="1"> <thead> <tr> <th data-bbox="1115 639 1982 691">DRAWBACKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1115 691 1982 833"> <ul data-bbox="1123 305 1963 764" style="list-style-type: none"> • Provides greater shy distance between motor vehicles and bicyclists. • Provides space for bicyclists to pass another bicyclist without encroaching into the adjacent motor vehicle travel lane. • Encourages bicyclists to ride outside of the door zone when buffer is between parked cars and bike lane. • Appeals to a wider cross-section of bicycle users. </td> </tr> </tbody> </table>	DRAWBACKS	<ul data-bbox="1123 305 1963 764" style="list-style-type: none"> • Provides greater shy distance between motor vehicles and bicyclists. • Provides space for bicyclists to pass another bicyclist without encroaching into the adjacent motor vehicle travel lane. • Encourages bicyclists to ride outside of the door zone when buffer is between parked cars and bike lane. • Appeals to a wider cross-section of bicycle users.
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION		
<ul data-bbox="94 943 722 1166" style="list-style-type: none"> • Buffered bike lanes should be considered on streets with: <ul style="list-style-type: none"> ○ high traffic volume ○ regular truck traffic ○ high parking turnover ○ speed limit > 35 mph 	<ul data-bbox="751 943 1934 1052" style="list-style-type: none"> • MUTCD - can be implemented at present time if pavement markings that are compliant with the MUTCD are used • AASHTO – included in <i>Guide to Bicycle Facilities, 4th Edition</i> 		
	<table border="1"> <thead> <tr> <th data-bbox="743 1063 1982 1115">RESOURCES</th> </tr> </thead> <tbody> <tr> <td data-bbox="743 1115 1982 1230"> <ul data-bbox="751 1117 1902 1224" style="list-style-type: none"> • MUTCD section 3D-01 • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011 • NYCDOT Street Design Manual. (2009) </td> </tr> </tbody> </table>	RESOURCES	<ul data-bbox="751 1117 1902 1224" style="list-style-type: none"> • MUTCD section 3D-01 • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011 • NYCDOT Street Design Manual. (2009)
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BICYCLE LANES

LEFT-SIDE	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="197 719 655 769">Photo: www.bikepedimages.com - Laura Sandt Location: Portland, OR</p>	<p data-bbox="678 337 1079 521">Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median divided streets.</p>	<div data-bbox="1119 302 1969 581"> <p data-bbox="1119 302 1969 370">• Improves motorists' visibility of bicyclists by having the bike lane on the driver's side.</p> <p data-bbox="1119 378 1969 446">• Minimizes door zone conflicts next to parking because of fewer door openings on the passenger side of vehicles.</p> <p data-bbox="1119 454 1969 522">• Fewer bus and truck conflicts as most bus stops and loading zones are on the right side of the street.</p> </div> <div data-bbox="1119 589 1969 634"> <p data-bbox="1119 589 1969 634">DRAWBACKS</p> </div> <div data-bbox="1119 643 1969 834"> <p data-bbox="1119 643 1969 711">• Bicyclists and motorists generally expect bicycle traffic to be on the right side of a street.</p> <p data-bbox="1119 719 1969 834">• If parking is allowed on the left side, there can be difficulties for drivers seeing bicycles when entering or especially leaving the parking lane</p> </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="90 943 863 1247" style="list-style-type: none"> • On streets with: <ul data-bbox="184 980 863 1170" style="list-style-type: none"> ○ high parking turnover ○ rush hour parking restrictions ○ high volumes of right turn movements by motor vehicles ○ a significant number of left-turning bicyclists. • On streets where traffic enters into an add lane on the right-hand side, as from a freeway off-ramp. 	<ul data-bbox="919 943 1730 1011" style="list-style-type: none"> • MUTCD – can be implemented at present time • AASHTO – included in <i>Guide to Bicycle Facilities, 4th Edition</i> <div data-bbox="919 1027 1988 1073"> <p data-bbox="919 1027 1988 1073">RESOURCES</p> </div> <ul data-bbox="919 1081 1948 1149" style="list-style-type: none"> • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011 <div data-bbox="919 1206 1988 1252"> <p data-bbox="919 1206 1988 1252">CURRENT USAGE</p> </div> <ul data-bbox="919 1260 1955 1406" style="list-style-type: none"> • Left-side bike lanes are used in the following US cities: Hoboken, NJ; New York City, NY; Berkeley, CA; Boston, MA; Chicago, IL; Eugene, OR; Madison, WI; Minneapolis, MN; Naples, FL; Portland, OR; Sacramento, CA; San Francisco, CA; Seattle, WA; DC

BICYCLE LANES

CONTRAFLOW	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="422 651 625 704">Photo: NACTO Location: Chicago, IL</p>	<p data-bbox="646 302 1178 643">Contraflow bicycle lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only. Contra-flow lanes are separated with yellow center lane striping.</p>	<p data-bbox="1207 302 1978 529">BENEFITS</p> <ul data-bbox="1207 302 1978 529" style="list-style-type: none"> • Decreases trip distance, the number of intersections encountered, and travel times for bicyclists by eliminating out-of-direction travel. • Limits dangerous wrong-way riding by allowing cyclists to safely ride in the opposite direction of cars • Reduces sidewalk riding <p data-bbox="1207 537 1978 586">DRAWBACKS</p> <ul data-bbox="1207 594 1978 659" style="list-style-type: none"> • May introduce additional conflict points as motorists may not expect on-coming bicyclists

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="94 820 835 1432" style="list-style-type: none"> • Where it would provide substantial savings in out-of-direction travel and/or direct access to high-use destinations • Where there will be fewer conflicts when compared to a route on other streets • When there are few intersecting driveways, alleys, or streets on the side of the street with the contra-flow lane • Where bicyclists can effectively and conveniently make transitions at the termini of the contra-flow lane • The contraflow lane must be placed to the motorists left and be separated by a yellow centerline marking • Any intersecting alleys, major driveways and streets must have signs indicating to motorists that they should expect two-way bicycle traffic 	<ul data-bbox="871 820 1978 925" style="list-style-type: none"> • MUTCD – can be implemented at present time if signs and pavement markings that are compliant with the MUTCD are used • AASHTO – included in the <i>Guide to Bicycle Facilities, 4th Edition</i>
	<p data-bbox="871 941 1978 982">RESOURCES</p> <ul data-bbox="871 990 1978 1063" style="list-style-type: none"> • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011
	<p data-bbox="871 1088 1978 1128">CURRENT USAGE</p> <ul data-bbox="871 1136 1978 1291" style="list-style-type: none"> • Contra-flow bike lanes are used in the following US cities: Austin, TX; Boise, ID; Boulder, CO; Cambridge, MA; Brookline, MA; Baltimore, MD; Chicago, IL; Eugene, OR; Madison, WI; Minneapolis, MN; Portland, OR; San Francisco, CA; Seattle, WA; Washington, DC

BICYCLE LANES

ADVISORY	DESCRIPTION/FEATURES	BENEFITS		
 <p data-bbox="319 732 619 779">Photo: BikeWalkTwinCities.org Location: Minneapolis, MN</p>	<p data-bbox="646 337 1142 755">An advisory bike lane is similar to a regular bike lane, but is used on low-volume streets that are narrow. An advisory bike lane is marked with a solid white line on the right (next to parked cars) and a dotted line to the left. These markings give bicyclists a space to ride, but are also available to motorists if space is needed to pass oncoming traffic. Also known as “suggestion lanes.”</p>	<table border="1"> <thead> <tr> <th data-bbox="1161 581 1986 630">DRAWBACKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1161 630 1986 779"> <ul style="list-style-type: none"> <li data-bbox="1171 305 1934 407">• Provides bicyclists a designated place to ride while also allowing motorists to use the space to pass oncoming traffic. <li data-bbox="1171 418 1829 451">• Remind people that the road is a shared space. <li data-bbox="1171 462 1730 495">• Direct bicyclists where and how to ride. <li data-bbox="1171 506 1782 539">• Reduces motorist encroaching on bicyclists. </td> </tr> </tbody> </table>	DRAWBACKS	<ul style="list-style-type: none"> <li data-bbox="1171 305 1934 407">• Provides bicyclists a designated place to ride while also allowing motorists to use the space to pass oncoming traffic. <li data-bbox="1171 418 1829 451">• Remind people that the road is a shared space. <li data-bbox="1171 462 1730 495">• Direct bicyclists where and how to ride. <li data-bbox="1171 506 1782 539">• Reduces motorist encroaching on bicyclists.
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION				
<ul style="list-style-type: none"> <li data-bbox="94 933 793 966">• Roads that are too narrow for standard bike lanes. <li data-bbox="94 977 590 1010">• Roadways with low traffic volume. <li data-bbox="94 1021 764 1053">• Only used on roads without marked centerlines. <li data-bbox="94 1065 600 1097">• Used in both rural and urban areas. 	<ul style="list-style-type: none"> <li data-bbox="926 894 1976 927">• Not included in the MUTCD or AASHTO’s <i>Guide to Bicycle Facilities, 4th Edition</i> <table border="1"> <thead> <tr> <th data-bbox="915 982 1986 1031">RESOURCES</th> </tr> </thead> <tbody> <tr> <td data-bbox="915 1031 1986 1133"> <ul style="list-style-type: none"> <li data-bbox="926 1040 1766 1105">• City of Minneapolis, MN; http://www.ci.minneapolis.mn.us/bicycles/WCMS1P-083250 </td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="915 1140 1986 1188">CURRENT USAGE</th> </tr> </thead> <tbody> <tr> <td data-bbox="915 1188 1986 1312"> <ul style="list-style-type: none"> <li data-bbox="926 1198 1759 1230">• Commonly used in dozens of European bicycle friendly cities. <li data-bbox="926 1242 1877 1274">• Currently used in the following US cities: Minneapolis, MN; Edina, MN </td> </tr> </tbody> </table>	RESOURCES	<ul style="list-style-type: none"> <li data-bbox="926 1040 1766 1105">• City of Minneapolis, MN; http://www.ci.minneapolis.mn.us/bicycles/WCMS1P-083250 	CURRENT USAGE	<ul style="list-style-type: none"> <li data-bbox="926 1198 1759 1230">• Commonly used in dozens of European bicycle friendly cities. <li data-bbox="926 1242 1877 1274">• Currently used in the following US cities: Minneapolis, MN; Edina, MN
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CYCLE TRACKS

ONE-WAY PROTECTED	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="407 643 611 695">Photo: NACTO Location: Chicago, IL</p>	<p data-bbox="632 337 1022 716">A one-way protected cycle track is an exclusive bike facility that has elements of a separated path and an on-road bike lane. While still within the roadway, cycle tracks are physically separated from motor vehicle traffic with bollards, car parking or other barrier.</p>	<div data-bbox="1047 302 1955 574"> <ul style="list-style-type: none"> • Dedicates and protects space for bicyclists. • Eliminates risk and fear of collisions with over-taking vehicles. • Reduces risk of ‘dooring’ compared to a bike lane. • Prevents double-parking. • Low implementation cost by making use of existing pavement and drainage and by using parking lane as a barrier. • More attractive for bicyclists of all levels and ages. </div> <div data-bbox="1047 621 1955 781"> <p data-bbox="1052 621 1241 654">DRAWBACKS</p> <ul style="list-style-type: none"> • Snow removal and street sweeping may require special equipment. • Require considerations at crossings of driveways and minor intersections. </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul style="list-style-type: none"> • Streets on which bike lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high traffic volumes, high speed traffic, high demand for double parking, and high parking turnover. • Along streets with high bicycle volumes • The minimum desired width for a cycle track should be 5 ft. • In areas with high bicyclist volumes or uphill sections, the minimum desired width should be 7 ft. to allow for bicyclists passing each other. • 3 ft. is the desired width for a parking buffer to allow for passenger loading and to prevent door collisions. • Special consideration should be given at transit stops to manage bicycle & pedestrian interactions 	<div data-bbox="1047 907 1902 1057"> <ul style="list-style-type: none"> • MUTCD - since cycle tracks are not a traffic control device, the MUTCD has no restriction on its use. • AASHTO – cycle tracks are not included in AASHTO’s <i>Guide to Bicycle Facilities, 4th Edition</i>. </div> <div data-bbox="1047 1065 1988 1200"> <p data-bbox="1052 1065 1226 1097">RESOURCES</p> <ul style="list-style-type: none"> • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011 </div> <div data-bbox="1047 1208 1988 1453"> <p data-bbox="1052 1208 1304 1240">CURRENT USAGE</p> <ul style="list-style-type: none"> • Commonly used in dozens of European bicycle friendly cities. • Currently used in the following US cities: New York, NY; Boulder, CO; Cambridge, MA; Chicago, IL; Long Beach, CA; Minneapolis, MN; Missoula, MT; Portland, OR; San Francisco, CA; St. Petersburg, FL; Washington, DC </div>

CYCLE TRACKS

TWO-WAY PROTECTED	DESCRIPTION/FEATURES	BENEFITS		
 <p data-bbox="373 683 604 734">Photo: The RBA Group Location: Brooklyn, NYC</p>	<p data-bbox="632 337 1010 638">Two-way cycle tracks (also known as protected bike lanes, separated bikeways, and on-street bike paths) are physically separated bike facilities that allow bicycle movement in both directions on one side of the road.</p>	<table border="1"> <thead> <tr> <th data-bbox="1029 581 1990 631">DRAWBACKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1029 631 1990 730"> <ul data-bbox="1039 305 1942 711" style="list-style-type: none"> • On one-way streets, reduces out of direction travel by providing contra-flow movement • Dedicates and protects space for bicyclists. • Eliminates risk and fear of collisions with over-taking vehicles. • Reduces risk of ‘dooring’. • More attractive to a wide range of bicyclists at all levels and ages. </td> </tr> </tbody> </table>	DRAWBACKS	<ul data-bbox="1039 305 1942 711" style="list-style-type: none"> • On one-way streets, reduces out of direction travel by providing contra-flow movement • Dedicates and protects space for bicyclists. • Eliminates risk and fear of collisions with over-taking vehicles. • Reduces risk of ‘dooring’. • More attractive to a wide range of bicyclists at all levels and ages.
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<ul data-bbox="1039 305 1942 711" style="list-style-type: none"> • On one-way streets, reduces out of direction travel by providing contra-flow movement • Dedicates and protects space for bicyclists. • Eliminates risk and fear of collisions with over-taking vehicles. • Reduces risk of ‘dooring’. • More attractive to a wide range of bicyclists at all levels and ages. 				

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION				
<ul data-bbox="94 849 1003 1230" style="list-style-type: none"> • On streets with few conflicts such as driveways or cross-streets on one side of the street or extra right-of-way on one side • On streets where there is not enough room for a one-way cycle track on both sides of the street or where contra-flow bicycle travel is desired / more destinations are on one side thereby reducing the need to cross the street. • To connect with another bicycle facility, such as a second cycle track on one side of the street. • The desirable two-way cycle track width is 12 feet. Minimum width in constrained locations is 8 feet. 	<table border="1"> <thead> <tr> <th data-bbox="1029 1003 1990 1053">RESOURCES</th> </tr> </thead> <tbody> <tr> <td data-bbox="1029 849 1990 1003"> <ul data-bbox="1039 849 1974 995" style="list-style-type: none"> • MUTCD – since cycle tracks are not a traffic control device, the MUTCD has no restriction on its use. • AASHTO – cycle tracks are not included in AASHTO’s <i>Guide to Bicycle Facilities, 4th Edition</i> </td> </tr> <tr> <th data-bbox="1029 1141 1990 1192">CURRENT USAGE</th> </tr> <tr> <td data-bbox="1029 1192 1990 1343"> <ul data-bbox="1039 1206 1974 1312" style="list-style-type: none"> • Currently used in the following US cities: Austin, TX; Cambridge, MA; Eugene, OR; Indianapolis, IN; New York City, NY; Portland, OR; Saint Petersburg, FL; Washington, DC </td> </tr> </tbody> </table>	RESOURCES	<ul data-bbox="1039 849 1974 995" style="list-style-type: none"> • MUTCD – since cycle tracks are not a traffic control device, the MUTCD has no restriction on its use. • AASHTO – cycle tracks are not included in AASHTO’s <i>Guide to Bicycle Facilities, 4th Edition</i> 	CURRENT USAGE	<ul data-bbox="1039 1206 1974 1312" style="list-style-type: none"> • Currently used in the following US cities: Austin, TX; Cambridge, MA; Eugene, OR; Indianapolis, IN; New York City, NY; Portland, OR; Saint Petersburg, FL; Washington, DC
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CYCLE TRACKS

RAISED	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="359 727 583 776">Photo: Will Vanlue Location: Hillsboro, OR</p>	<p data-bbox="604 337 1056 906">Raised cycle tracks are bicycle facilities that are vertically separated from motor vehicle traffic. A raised cycle track may allow for one-way or two-way travel by bicyclists. When placed adjacent to a travel lane, one-way raised cycle tracks may be configured with a mountable curb to allow entry and exit from the bicycle lane for passing other bicyclists or to access vehicular turn lanes. This configuration has also been known as a 'raised bike lane.'</p>	<div data-bbox="1094 302 1990 651"> <ul style="list-style-type: none"> • Dedicates and protects space for bicyclists. • More attractive to a wider range of bicyclists at all levels and ages. • Encourages bicyclists to ride in the bikeway rather than on the sidewalk. • Keeps motorists from easily entering the cycle track. • Minimizes maintenance costs due to limited motor vehicle wear. • With new roadway construction a raised cycle track can be less expensive to construct than a wide or buffered bicycle lane. </div> <div data-bbox="1094 659 1990 708"> <p>DRAWBACKS</p> </div> <div data-bbox="1094 716 1990 901"> <ul style="list-style-type: none"> • Raised cycle tracks may be incompatible with conventional street sweeping equipment and snow plow equipment, depending on their configuration. There should be enough shy distance on the adjacent roadway so that snow is not stored on the raised cycle track. </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul style="list-style-type: none"> • Along higher speed streets with few driveways and cross streets and high bicycle volumes. • Along streets on which bike lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high traffic volumes, high speed traffic, high demand for double parking, and high parking turnover. • On streets with numerous curves where vehicle encroachment into bike lanes may be a concern. 	<ul style="list-style-type: none"> • MUTCD – since cycle tracks are not a traffic control device, the MUTCD has no restriction on its use. • AASHTO – cycle tracks are not included in AASHTO’s <i>Guide to Bicycle Facilities, 4th Edition</i>
	<p>RESOURCES</p>
	<ul style="list-style-type: none"> • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011
	<p>CURRENT USAGE</p>
<ul style="list-style-type: none"> • Commonly used in dozens of European bicycle friendly cities. • Currently used in the following US cities: Brooklyn, NY; Atlanta, GA; Bend, OR; Cambridge, MA; Denton, TX; Denver, CO; Eugene, OR; Missoula, MT; Portland, OR; Rapid City, SD 	

CYCLE TRACKS

RAISED AND PROTECTED	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="365 743 583 797">Photo: The RBA Group Location: Hoboken, NJ</p>	<p data-bbox="611 337 989 678">Many raised cycle tracks are paired with a furnishing zone between the cycle track and motor vehicle travel lane and/or pedestrian area. A raised and protected cycle track may allow for one-way or two-way travel by bicyclists.</p>	<div data-bbox="1016 302 2001 638"> <p data-bbox="1016 302 1163 285">BENEFITS</p> <ul data-bbox="1016 302 2001 638" style="list-style-type: none"> • Dedicates and protects space for bicyclists. • More attractive to a wider range of bicyclists at all levels and ages. • Encourages bicyclists to ride in the bikeway rather than on the sidewalk. • Keeps motorists from easily entering the cycle track. • Minimizes maintenance costs due to limited motor vehicle wear. • With new roadway construction a raised cycle track can be less expensive to construct than a wide or buffered bicycle lane. </div> <div data-bbox="1016 638 2001 846"> <p data-bbox="1016 651 1213 634">DRAWBACKS</p> <ul data-bbox="1016 699 2001 846" style="list-style-type: none"> • Raised cycle tracks may be incompatible with conventional street sweeping equipment and snow plow equipment, depending on their configuration. There should be enough shy distance on the adjacent roadway so that snow is not stored on the raised cycle track. </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="92 959 724 1382" style="list-style-type: none"> • Along higher speed streets with few driveways and cross streets and high bicycle volumes. • Along streets on which bike lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high traffic volumes, high speed traffic, high demand for double parking, and high parking turnover. • On streets with numerous curves where vehicle encroachment into bike lanes may be a concern. 	<ul data-bbox="749 959 1955 1068" style="list-style-type: none"> • MUTCD – since cycle tracks are not a traffic control device, the MUTCD has no restriction on its use. • AASHTO – cycle tracks are not included in AASHTO’s <i>Guide to Bicycle Facilities, 4th Edition</i> <div data-bbox="749 1076 2001 1125"> <p data-bbox="749 1076 926 1060">RESOURCES</p> <ul data-bbox="749 1133 2001 1166" style="list-style-type: none"> • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011 </div> <div data-bbox="749 1206 2001 1255"> <p data-bbox="749 1206 1003 1190">CURRENT USAGE</p> <ul data-bbox="749 1263 2001 1409" style="list-style-type: none"> • Commonly used in dozens of European bicycle friendly cities. • Currently used in the following US cities: Hoboken, NJ; Brooklyn, NY; Atlanta, GA; Bend, OR; Cambridge, MA; Denton, TX; Denver, CO; Eugene, OR; Missoula, MT; Portland, OR; Rapid City, SD </div>

Off-Road Facilities

SHARED USE PATH	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="174 711 678 760">Photo: The RBA Group Location: Henry Hudson Trail, Middlesex County, NJ</p>	<p data-bbox="701 306 1213 727">Shared use paths are bikeways that are physically separated from motorized vehicular traffic by an open space of barrier and either within the highway right-of-way or within an independent right-of-way. Shared use path facilities accommodate a variety of non-motorized uses, most often bicycle and pedestrian traffic. Shared use paths are an addition, and complimentary, to the roadway network.</p>	<p data-bbox="1239 269 1955 540">BENEFITS</p> <ul data-bbox="1239 269 1955 540" style="list-style-type: none"> • Completely separated from motor vehicle traffic. • Can provide users with shortcuts. • Can provide an enjoyable recreational opportunity. • Have few intersections and as a result are safer for bicyclists than facilities located alongside or on roadways. • Appeal to users of all ages and abilities. <p data-bbox="1239 553 1434 589">DRAWBACKS</p> <ul data-bbox="1239 605 1923 716" style="list-style-type: none"> • Rarely the most direct means of transportation. • Shared-use paths attract a variety of user groups who often have conflicting needs.

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="92 878 974 1417" style="list-style-type: none"> • Shared-use paths that provide different lanes for users who travel at different speeds prevent conflicts between user groups on high use trails. • 10 ft. is the recommended minimum width for a two-way, shared use path on a separate right of way. • 2 ft. of graded area should be maintained adjacent to both sides of the path and 3 ft. of clear distance should be maintained between the edge of the trail and lateral obstructions. • Shared use paths fall under the accessibility requirements of the Americans with Disabilities Act (ADA) <ul data-bbox="191 1271 932 1417" style="list-style-type: none"> ○ Paths in the public right-of-way should be designed in accordance with <i>PROWAG</i> ○ Paths built in independent rights-of-way should meet the guidelines in <i>ANPRM</i> 	<ul data-bbox="1001 878 1812 946" style="list-style-type: none"> • MUTCD – can be implemented at present time • AASHTO – included in <i>Guide to Bicycle Facilities, 4th Edition</i> <p data-bbox="1001 1000 1178 1036">RESOURCES</p> <ul data-bbox="1001 1052 1902 1243" style="list-style-type: none"> • <i>AASHTO Guide for the Design of Bicycle Facilities</i> • New Jersey DOT's Bicycle Compatible Roadways and Bikeways • <i>Proposed Right-of-Way Accessibility Guidelines (PROWAG)</i> • <i>Advance Notice of Proposed Rulemaking (ANPRM) on Accessibility Guidelines for Shared Use Paths</i> <p data-bbox="1001 1260 1255 1295">CURRENT USAGE</p> <ul data-bbox="1001 1312 1959 1422" style="list-style-type: none"> • Common examples include rail rights-of-way (usually, though not necessarily abandoned or inactive), canal tow-paths, greenways along stream corridors and utility rights of way.

Off-Road Facilities

SIDEPATH	DESCRIPTION/FEATURES	BENEFITS		
 <p data-bbox="485 695 676 743">Photo: AASHTO Location: Unknown</p>	<p data-bbox="701 305 1146 410">Sidepaths are a specific type of shared use path that run adjacent to the roadway.</p>	<table border="1"> <thead> <tr> <th data-bbox="1173 446 1986 495">DRAWBACKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1173 495 1986 764"> <ul data-bbox="1180 267 1896 764" style="list-style-type: none"> • They provide an element of separation from motor vehicles. • Appeal to a wider variety of users. • A 2-way sidepath on one side of the road may need additional road crossings. • Bicyclists using the roadway may be harassed by motorists who believe bicyclists should be on the sidepath. • Potential conflicts with motorists at driveways and intersections. </td> </tr> </tbody> </table>	DRAWBACKS	<ul data-bbox="1180 267 1896 764" style="list-style-type: none"> • They provide an element of separation from motor vehicles. • Appeal to a wider variety of users. • A 2-way sidepath on one side of the road may need additional road crossings. • Bicyclists using the roadway may be harassed by motorists who believe bicyclists should be on the sidepath. • Potential conflicts with motorists at driveways and intersections.
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION					
<ul data-bbox="94 878 974 1382" style="list-style-type: none"> • Where right-of-way or other physical constraints prohibit path alignment in independent rights-of-way and there are no practical alternatives for improving the roadway or accommodating bicyclists on nearby parallel streets. • When the sidepath can be built with few street and/or driveway crossings. • When the adjacent roadway has relatively high-volume and high-speed traffic • The minimum recommended distance between a path and the roadway curb is 5'. When the separation is less than 5', a physical barrier or railing should be provided. • Utilizing or providing a sidewalk as a shared use path is undesirable. 	<table border="1"> <thead> <tr> <th data-bbox="995 987 1986 1036">RESOURCES</th> </tr> </thead> <tbody> <tr> <td data-bbox="995 873 1986 987"> <ul data-bbox="1001 878 1812 951" style="list-style-type: none"> • MUTCD – can be implemented at present time • AASHTO – included in <i>Guide to Bicycle Facilities, 4th Edition</i> </td> </tr> <tr> <td data-bbox="995 1036 1986 1252"> <ul data-bbox="1001 1057 1902 1247" style="list-style-type: none"> • AASHTO <i>Guide for the Design of Bicycle Facilities</i> • New Jersey DOT's Bicycle Compatible Roadways and Bikeways • <i>Proposed Right-of-Way Accessibility Guidelines (PROWAG)</i> • <i>Advance Notice of Proposed Rulemaking (ANPRM) on Accessibility Guidelines for Shared Use Paths</i> </td> </tr> <tr> <th data-bbox="995 1252 1986 1300">CURRENT USAGE</th> </tr> <tr> <td data-bbox="995 1300 1986 1451"> <ul data-bbox="1001 1317 1562 1349" style="list-style-type: none"> • Common throughout the United States. </td> </tr> </tbody> </table>	RESOURCES	<ul data-bbox="1001 878 1812 951" style="list-style-type: none"> • MUTCD – can be implemented at present time • AASHTO – included in <i>Guide to Bicycle Facilities, 4th Edition</i> 	<ul data-bbox="1001 1057 1902 1247" style="list-style-type: none"> • AASHTO <i>Guide for the Design of Bicycle Facilities</i> • New Jersey DOT's Bicycle Compatible Roadways and Bikeways • <i>Proposed Right-of-Way Accessibility Guidelines (PROWAG)</i> • <i>Advance Notice of Proposed Rulemaking (ANPRM) on Accessibility Guidelines for Shared Use Paths</i> 	CURRENT USAGE	<ul data-bbox="1001 1317 1562 1349" style="list-style-type: none"> • Common throughout the United States.
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CURRENT USAGE						
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INTERSECTION TREATMENTS

BIKE BOXES	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="233 626 573 706">Photo: National Association of City Transportation Officials Location: New York, NYC</p>	<p data-bbox="600 310 972 610">A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.</p>	<div data-bbox="999 310 1974 545"> <ul style="list-style-type: none"> • Reduces right-turn (“right-hook”) conflicts between bicyclists and motorists at intersections by increasing cyclist visibility to drivers and providing a space for cyclists to wait at signalized intersections. • Allows cyclists to position themselves properly to execute a left turn and increases their visibility to drivers traveling in the opposing direction </div> <div data-bbox="999 553 1974 594"> <p>DRAWBACKS</p> </div> <div data-bbox="999 602 1974 706"> <ul style="list-style-type: none"> • Right turns on red must be prohibited, though an exception may be made for cyclists (“Except Bikes”). Bicycle boxes may not be compatible at intersections with high volume of right-turning vehicles. </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<p data-bbox="96 826 821 850">Bike boxes should be considered on streets with:</p> <ul data-bbox="96 862 821 1162" style="list-style-type: none"> • At signalized intersections with high volumes of bicycles and/or motor vehicles • Intersections with frequent bicyclist left-turns and/or motorist right-turns. • Where a left turn is required to follow a designated bike route • When the dominant motor vehicle traffic flows right and bicycle traffic continues through. 	<div data-bbox="848 826 1974 907"> <ul style="list-style-type: none"> • Bike boxes and green pavement for bike lanes are considered experimental treatments that may be adopted by the MUTCD in the future. </div> <div data-bbox="848 915 1974 964"> <p>RESOURCES</p> <ul style="list-style-type: none"> • National Association of City Transportation Officials Urban Bikeway Design Guide </div> <div data-bbox="848 1037 1974 1086"> <p>CURRENT USAGE</p> </div> <div data-bbox="848 1094 1974 1240"> <p>Currently used in the following US cities: Austin, TX; Alexandria, VA; Boston, MA; Baltimore, MD; Boston, MA; Cambridge, MA; Chicago, IL; Minneapolis, MN; New York, NY; Phoenix, AZ; Portland, OR; Roswell, GA; San Francisco, CA; Seattle, WA; Tucson, AZ and Washington, DC.</p> </div>

INTERSECTION TREATMENTS

INTERSECTION CROSSING MARKINGS	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="317 667 655 748">Photo: National Association of City Transportation Officials Location: Chicago, IL</p>	<p data-bbox="678 297 1098 524">Intersection crossing markings indicate the intended path of bicyclists. They guide bicyclists on a safe and direct path through intersections, including driveways and ramps.</p>	<ul data-bbox="1119 297 1980 605" style="list-style-type: none"> • Raises awareness for both bicyclists and motorists to potential conflict areas. • Reinforces that through bicyclists have priority over turning vehicles or vehicles entering the roadway (from driveways or cross streets). • Guides bicyclists through the intersection in a straight and direct path. • Makes bicycle movements more predictable. <p data-bbox="1119 621 1318 654">DRAWBACKS</p> <ul data-bbox="1119 670 1980 743" style="list-style-type: none"> • May give cyclists a false sense of safety while crossing intersections with high volumes of right-turns.

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<p data-bbox="90 855 856 888">Intersection Crossing Markings should be considered with:</p> <ul data-bbox="90 896 877 1326" style="list-style-type: none"> • Signalized intersections, particularly through wide or complex intersections where the bicycle path may be unclear. • Along roadways with bike lanes or cycle tracks. • Across driveways and Stop or Yield-controlled cross-streets. • Where typical vehicle movements frequently encroach into bicycle space, such as across ramp-style exits and entries where the prevailing speed of ramp traffic at the conflict point is low enough that motorist yielding behavior can be expected. 	<ul data-bbox="919 855 1927 888" style="list-style-type: none"> • Accepted by MUTCD and AASHTO's Guide to Bicycle Facilities, 4th Edition <p data-bbox="919 920 1098 953">RESOURCES</p> <ul data-bbox="919 969 1791 1083" style="list-style-type: none"> • FHWA Manual on Uniform Traffic Control Devices. (2009). • DC Bicycle Facility Design Guide. (2005). • Portland Bicycle Plan for 2030: Survey of Best Practices. (2009). <p data-bbox="919 1099 1182 1131">CURRENT USAGE</p> <ul data-bbox="919 1148 1980 1334" style="list-style-type: none"> • Commonly used in dozens of European bicycle friendly cities. • Seen in the form of dotted line extensions in most US bicycle-friendly cities. • Found in the form of color or other innovation in the following cities: Austin, TX; Boston, MA; Chicago, IL; Decatur, GA; Denver, CO; Eugene, OR; Memphis, TN; New York, NY; Portland, OR; San Francisco, CA; Washington, DC.

INTERSECTION TREATMENTS

TWO-STAGE TURN QUEUE BOXES	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="283 646 625 722">Photo: National Association of City Transportation Officials Location: Portland, OR</p>	<p data-bbox="646 305 1176 641">Two-stage left (aka Copenhagen-Left, Melbourne-Left, jug-handle turn) offers bicyclists a safe left-turn movement where there are physical/safety barriers to entering the roadway in advance of the intersection. Bicyclists proceed straight across the intersection to the far side and then queue in front of the cross-street traffic.</p>	<div data-bbox="1207 305 1976 519"> <p data-bbox="1207 305 1354 289">BENEFITS</p> <ul data-bbox="1207 305 1976 519" style="list-style-type: none"> • Reduces conflicts between motorists and bicyclists. • Bicyclists can position themselves in front of traffic on cross street. • Reduces complexity of left-turn for bicyclists. </div> <div data-bbox="1207 527 1976 722"> <p data-bbox="1207 527 1396 568">DRAWBACKS</p> <ul data-bbox="1207 576 1976 722" style="list-style-type: none"> • Bicyclists must wait for two signals rather than one. • Bicyclists may feel uncomfortable in the queuing area. </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<p data-bbox="96 841 825 982">This treatment should be considered in an environment where cycle tracks or bike lanes are adjacent to multiple motor vehicle travel lanes. In addition, several specific areas for typical usage are:</p> <ul data-bbox="142 990 825 1226" style="list-style-type: none"> • Signalized intersections. • Along roadways with high traffic speeds and/or traffic volumes. • Where a significant number of bicyclists turn left from a right side facility. • To safely navigate streetcar tracks. 	<ul data-bbox="877 841 1633 868" style="list-style-type: none"> • Adopted in Portland, OR as an experimental treatment.
	<p data-bbox="877 938 1045 966">RESOURCES</p> <ul data-bbox="877 982 1675 1015" style="list-style-type: none"> • Portland Bicycle Plan for 2030: Survey of Best Practices.
	<p data-bbox="877 1084 1129 1112">CURRENT USAGE</p> <ul data-bbox="877 1128 1976 1242" style="list-style-type: none"> • Commonly used in dozens of European bicycle friendly cities and Atlanta, GA; Cambridge, MC; Philadelphia, PA; Portland, OR; New York, NY; Salt Lake City, UT; Chicago, IL

INTERSECTION TREATMENTS

MEDIAN REFUGE	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="283 686 621 768">Photo: National Association of City Transportation Officials Manual Location: New York, NY</p>	<p data-bbox="646 302 1142 716">Median refuge islands are protected spaces placed in the center of the street to facilitate bicycle and pedestrian crossings. Crossings of two-way streets are facilitated by allowing bicyclists and pedestrians to navigate only one direction of traffic at a time. Medians configured to protect cycle tracks can both facilitate crossings and also function as two-stage turn queue boxes.</p>	<p data-bbox="1171 256 1310 285">BENEFITS</p> <ul data-bbox="1171 302 1976 532" style="list-style-type: none"> • Calms traffic and provides space for safe bicycle and pedestrian crossing • Allows bicyclists and pedestrian to cross while focusing on one direction of traffic at a time • On two-way streets allows bicyclists to take advantage of gaps in one direction of traffic at a time. <p data-bbox="1171 589 1335 618">DRAWBACKS</p> <ul data-bbox="1171 634 1934 781" style="list-style-type: none"> • May restrict left-turn movements of automobiles. • Requires right-of-way that may result in loss of parking spaces or a travel lane. • Cost.

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="94 911 884 1097" style="list-style-type: none"> • A median refuge should be considered for relatively wide roadways with multiple lanes and few gaps in traffic. • May be used at signalized or un-signalized crossings. • Can be effective when located at intersections between signalized intersections that create gaps. 	<ul data-bbox="926 911 1755 940" style="list-style-type: none"> • Accepted by AASHTO's <i>Guide to Bicycle Facilities, 4th Edition</i> <p data-bbox="926 1049 1100 1078">RESOURCES</p> <ul data-bbox="926 1097 1692 1127" style="list-style-type: none"> • <i>AASHTO Guide for the Development of Bicycle Facilities.</i> <p data-bbox="926 1203 1178 1232">CURRENT USAGE</p> <ul data-bbox="926 1252 1860 1362" style="list-style-type: none"> • Commonly used in dozens of European bicycle friendly cities. • Currently used in the following US cities: Austin, TX; Los Angeles, CA; Minneapolis, MN; Portland, OR; San Francisco, CA.

INTERSECTION TREATMENTS

THROUGH BIKE LANES	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="262 711 619 763">Photo: League of Michigan Bicyclists Location: Lansing, MI</p>	<p data-bbox="640 300 1100 829">For bicyclists traveling in a conventional bike lane or from a truncated cycle track, the approach to an intersection with vehicular turn lanes can present a significant challenge. For this reason it is vital that bicyclists are provided with an opportunity to correctly position themselves to avoid conflicts with turning vehicles. A “through bicycle lane” or ‘bicycle pocket’ at the intersection provides that protection.</p>	<div data-bbox="1117 300 1982 730"> <p data-bbox="1125 300 1266 284">BENEFITS</p> <ul data-bbox="1125 300 1982 730" style="list-style-type: none"> • Enables bicyclists to correctly position themselves to the left of right turn lanes or to the right of left turn lanes. • Reduces conflicts between turning motorists and bicycle through traffic. • Provides bicyclists with guidance to follow the preferred travel path. • Leads to more predictable bicyclist and motorist travel movements. • Alerts motorists to expect and yield to merging bicycle traffic. • Signifies an appropriate location for motorists to safely merge across the bike lane into the turn lane. </div> <div data-bbox="1117 730 1982 829"> <p data-bbox="1125 738 1318 771">DRAWBACKS</p> <ul data-bbox="1125 787 1711 820" style="list-style-type: none"> • Routine roadway maintenance is needed. </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<p data-bbox="88 945 720 977">A through bike lane should be considered when:</p> <ul data-bbox="88 982 892 1291" style="list-style-type: none"> • On streets with right-side bike lanes and right-turn only lanes at intersections. • On streets with left-side bike lanes and left-turn only lanes at intersections. • On streets with bike lanes and an auxiliary right-turn-only lane added in advance of the intersection. • On streets with bike lanes and a parking lane that transition into a turn lane at intersections. 	<div data-bbox="913 945 1982 1055"> <ul data-bbox="913 945 1982 1055" style="list-style-type: none"> • Most US jurisdictions are familiar with their design and application as described in the MUTCD and AASHTO <i>Guide for the Development of Bicycle Facilities</i>. </div> <div data-bbox="913 1055 1982 1193"> <p data-bbox="921 1063 1094 1096">RESOURCES</p> <ul data-bbox="921 1112 1690 1193" style="list-style-type: none"> • AASHTO Guide for the Development of Bicycle Facilities. • FHWA Manual on Uniform Traffic Control Devices. </div> <div data-bbox="913 1193 1982 1305"> <p data-bbox="921 1201 1171 1234">CURRENT USAGE</p> <ul data-bbox="921 1250 1827 1291" style="list-style-type: none"> • Bicycle lanes are the most common bicycle facility in use in the US. </div>

INTERSECTION TREATMENTS

COMBINED BICYCLE LANE/ TURN LANE	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="268 695 613 779">Photo: National Association of City Transportation Officials Manual Location: Bend, OR</p>	<p data-bbox="634 354 1020 808">A combined bike lane/turn lane places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. Using shared lane markings or conventional bicycle stencils with a dashed line delineates the space for bicyclists and advises motorists and bicyclists of proper positioning within the lane.</p>	<div data-bbox="1045 272 1980 662"> <p data-bbox="1045 272 1192 313">BENEFITS</p> <ul data-bbox="1050 354 1963 621" style="list-style-type: none"> • Preserves positive guidance for bicyclists in a situation where the bicycle lane would otherwise be dropped prior to an intersection. • Allows “dual use” of lane where there is insufficient space for both bicycle lane and dedicated right-turn lane. • Reduces the risk of ‘right hook’ collisions at intersections. • Maintains bicyclist comfort and priority in the absence of a dedicated bicycle through lane. </div> <div data-bbox="1045 670 1980 808"> <p data-bbox="1045 670 1245 711">DRAWBACKS</p> <ul data-bbox="1050 719 1927 792" style="list-style-type: none"> • Through-bicyclists may block right-turning motorists where turn capacity is needed. </div>
WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION	
<ul data-bbox="94 922 1008 1263" style="list-style-type: none"> • A combined bicycle lane/turn lane should be considered where a bike lane approaches a congested intersection that requires an exclusive right-turn lane for motorists. • This treatment should be considered when: <ul data-bbox="189 1076 1008 1263" style="list-style-type: none"> ○ < 10% of auto traffic is right-turning. ○ If > 25% of auto traffic is right-turning, use bike box in adjacent through lane if bike demand is sufficient. ○ Use shared lane marking in right-turn lane to show through bicycle movement. 	<ul data-bbox="1050 922 1816 954" style="list-style-type: none"> • Adopted in Portland, OR as an experimental treatment. <div data-bbox="1045 1036 1980 1174"> <p data-bbox="1045 1036 1224 1076">RESOURCES</p> <ul data-bbox="1050 1092 1486 1125" style="list-style-type: none"> • Portland Bicycle Plan for 2030 </div> <div data-bbox="1045 1182 1980 1341"> <p data-bbox="1045 1182 1308 1222">CURRENT USAGE</p> <p data-bbox="1045 1230 1980 1341">Currently used in the following US Cities: Austin, TX; Bend, OR; Billings, MT; Colorado Springs, CO; Chicago, IL; Eugene, OR; Kona, HI; New York, NY; Portland, OR; Provo, UT; San Francisco, CA; Washington, DC.</p> </div>	

INTERSECTION TREATMENTS

CYCLE TRACK INTERSECTION APPROACH	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="289 738 634 820">Photo: National Association of City Transportation Officials Manual Location: Cambridge, MA</p>	<p data-bbox="653 350 1467 961">The approach to an intersection from a cycle track should be designed to reduce turn conflicts for bicyclists and/or to provide connections to intersecting bicycle facility types. This is typically achieved by removing the protected cycle track barrier or parking lane (or lowering a raised cycle track to street level), and shifting the bicycle lane to be closer to or shared with the adjacent motor vehicle lane. At these intersections, the experience is similar to a conventional bike lane and may involve similar applications of merging area treatments and intersection crossing markings. At the intersection, the cycle track may transition to a conventional bike lane or a combined bike lane/turn lane. Cycle track crossings of signalized intersections can also be accomplished through the use of a bicycle signal phase that reduces conflicts with motor vehicles by separating in time potentially conflicting bicycle and motor vehicle movements.</p>	<ul data-bbox="1493 350 1978 779" style="list-style-type: none"> • On one-way streets, reduces out of direction travel by providing contra-flow movement • Dedicates and protects space for bicyclists. • Eliminates risk and fear of collisions with over-taking vehicles. • Reduces risk of ‘dooring’. • More attractive to a wide range of bicyclists at all levels and ages. <p data-bbox="1493 787 1978 836">DRAWBACKS</p> <ul data-bbox="1493 836 1978 950" style="list-style-type: none"> • May require additional considerations at driveway and side-street crossings.

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<p data-bbox="90 1076 1041 1339">A cycle track intersection approach should be considered when:</p> <ul data-bbox="90 1117 1041 1339" style="list-style-type: none"> • Where cycle tracks approach intersections where turning movements across the path of the bicyclist (either left or right) is allowed. • At intersections with a single dedicated right turn lane for motor vehicles. • On cycle tracks protected by on street parking or otherwise removed from the travel lane. 	<ul data-bbox="1083 1076 1978 1141" style="list-style-type: none"> • Since cycle tracks are not a traffic control device, the MUTCD has no restriction on its use.
	<p data-bbox="1083 1157 1978 1198">RESOURCES</p> <ul data-bbox="1083 1206 1978 1239" style="list-style-type: none"> • National Association of City Transportation Officials Manual
	<p data-bbox="1083 1255 1978 1295">CURRENT USAGE</p> <ul data-bbox="1083 1304 1978 1448" style="list-style-type: none"> • Commonly used in dozens of European bicycle friendly cities. • Currently used in the following US cities: Brooklyn, NY; Cambridge, MA; Chicago, IL; Long Beach, CA; Missoula, MT; New York City, NY; Portland, OR; San Francisco, CA; Washington, DC

INTERSECTION TREATMENTS

GRADE SEPARATED CROSSINGS	DESCRIPTION/FEATURES	BENEFITS				
 <p data-bbox="199 776 714 824">Photo: North Carolina Department of Transportation Location: Unknown</p>	<p data-bbox="739 337 1150 602">A grade-separated crossing provides continuity of a bicycle/pedestrian facility over or under a barrier. A bicycle/pedestrian crossing structure may be either a bridge or an underpass.</p>	<table border="1"> <thead> <tr> <th data-bbox="1169 293 1986 337">BENEFITS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1169 337 1986 646"> <ul style="list-style-type: none"> <li data-bbox="1184 305 1976 370">• A grade-separated crossing is a safe way for bicyclists and pedestrians to cross rivers, streets, and railroads. <li data-bbox="1184 378 1976 443">• This type of crossing provides continuity of the bicycle or pedestrian facility. </td> </tr> <tr> <th data-bbox="1169 646 1986 699">DRAWBACKS</th> </tr> <tr> <td data-bbox="1169 699 1986 893"> <p data-bbox="1184 711 1976 889">Many bicyclists and pedestrians will not use an overpass that is inconvenient. Instead, pedestrians may choose a time saving, and sometimes more hazardous crossing. Fencing or other controls may be required to reinforce the safe crossing point.</p> </td> </tr> </tbody> </table>	BENEFITS	<ul style="list-style-type: none"> <li data-bbox="1184 305 1976 370">• A grade-separated crossing is a safe way for bicyclists and pedestrians to cross rivers, streets, and railroads. <li data-bbox="1184 378 1976 443">• This type of crossing provides continuity of the bicycle or pedestrian facility. 	DRAWBACKS	<p data-bbox="1184 711 1976 889">Many bicyclists and pedestrians will not use an overpass that is inconvenient. Instead, pedestrians may choose a time saving, and sometimes more hazardous crossing. Fencing or other controls may be required to reinforce the safe crossing point.</p>
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION						
<p data-bbox="94 1003 745 1458">A grade-separated crossing should be considered when a bicycle facility meets a barrier, such as an active multi-track railroad, stream, or freeway, and continuity of the route is desired. There are two main types of grade-separated crossings: overpasses (bridges) and underpasses (most often these would be culverts). When a heavily utilized multi-use pathway intersects with a high volume multi-lane roadway, it is desirable to provide an overpass or an underpass to separate multi-use pathway users from conflicts with motor vehicle traffic.</p>	<table border="1"> <thead> <tr> <th data-bbox="764 995 1986 1109">TREATMENT STATUS/ADOPTION</th> </tr> </thead> <tbody> <tr> <td data-bbox="764 1109 1986 1162"> <p data-bbox="772 1003 1892 1073">Most US jurisdictions are familiar with their design and application as described in the MUTCD and AASHTO <i>Guide for the Development of Bicycle Facilities</i>.</p> </td> </tr> <tr> <th data-bbox="764 1162 1986 1243">RESOURCES</th> </tr> <tr> <td data-bbox="764 1243 1986 1299"> <ul style="list-style-type: none"> <li data-bbox="772 1170 1541 1203">• AASHTO <i>Guide for the Development of Bicycle Facilities</i>. <li data-bbox="772 1211 1472 1243">• FHWA Manual on Uniform Traffic Control Devices. </td> </tr> <tr> <th data-bbox="764 1299 1986 1380">CURRENT USAGE</th> </tr> <tr> <td data-bbox="764 1380 1986 1461"> <ul style="list-style-type: none"> <li data-bbox="772 1307 1329 1339">• Commonly used throughout the world. </td> </tr> </tbody> </table>	TREATMENT STATUS/ADOPTION	<p data-bbox="772 1003 1892 1073">Most US jurisdictions are familiar with their design and application as described in the MUTCD and AASHTO <i>Guide for the Development of Bicycle Facilities</i>.</p>	RESOURCES	<ul style="list-style-type: none"> <li data-bbox="772 1170 1541 1203">• AASHTO <i>Guide for the Development of Bicycle Facilities</i>. <li data-bbox="772 1211 1472 1243">• FHWA Manual on Uniform Traffic Control Devices. 	CURRENT USAGE	<ul style="list-style-type: none"> <li data-bbox="772 1307 1329 1339">• Commonly used throughout the world.
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INTERSECTION TREATMENTS

CROSSBIKE	DESCRIPTION/FEATURES	BENEFITS		
 <p data-bbox="268 688 621 764">Photo: IBPI, Alta Planning & Design, Portland State Univ Location: Berkeley, CA</p>	<p data-bbox="646 302 1173 524">Pavement markings adjacent to the crosswalk indicating space for bicycles to cross major intersections. Increases visibility of bicycles at intersections and encourages motorists to yield right-of-way to bicyclists waiting to cross.</p>	<table border="1"> <thead> <tr> <th data-bbox="1205 524 1978 573">DRAWBACKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1205 581 1978 651"> <p data-bbox="1205 581 1961 651">Cross-bike will have higher than normal wear based on the level of crossing auto traffic.</p> </td> </tr> </tbody> </table>	DRAWBACKS	<p data-bbox="1205 581 1961 651">Cross-bike will have higher than normal wear based on the level of crossing auto traffic.</p>
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION				
<p data-bbox="96 881 814 946">Cross-bike intersection treatment should be considered when:</p> <ul data-bbox="96 959 856 1187" style="list-style-type: none"> • Where main bicycle routes cross relatively minor collectors. • Where cross traffic has to yield right-of-way to crossing bicyclists. • Not appropriate where speeds exceed 30 mph unless signalized. 	<ul data-bbox="930 881 1927 987" style="list-style-type: none"> • Currently considered an experimental treatment and is recognized by city and state DOTs, notably Portland Bureau of Transportation and City of Tucson. <table border="1"> <thead> <tr> <th data-bbox="930 995 1978 1044">RESOURCES</th> </tr> </thead> <tbody> <tr> <td data-bbox="930 1052 1978 1133"> <ul data-bbox="930 1052 1961 1122" style="list-style-type: none"> • United State Department of Transportation Federal Highway Administration. (2006). <i>BikeSafe: Bicycle countermeasure selection system.</i> </td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="930 1141 1978 1190">CURRENT USAGE</th> </tr> </thead> <tbody> <tr> <td data-bbox="930 1198 1978 1304"> <p data-bbox="930 1198 1934 1304">Currently installed in Tucson, AZ; Portland, OR; Berkeley, California; Delta, BC; London, England; Vancouver, BC; Vienna, Austria; Paris, France; Groningen, Netherlands.</p> </td> </tr> </tbody> </table>	RESOURCES	<ul data-bbox="930 1052 1961 1122" style="list-style-type: none"> • United State Department of Transportation Federal Highway Administration. (2006). <i>BikeSafe: Bicycle countermeasure selection system.</i> 	CURRENT USAGE	<p data-bbox="930 1198 1934 1304">Currently installed in Tucson, AZ; Portland, OR; Berkeley, California; Delta, BC; London, England; Vancouver, BC; Vienna, Austria; Paris, France; Groningen, Netherlands.</p>
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INTERSECTION TREATMENTS

ZIG-ZAG LINE TREATMENT	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="153 727 619 781">Photo: Virginia Transportation Research Council Location: Loudoun County, VA</p>	<p data-bbox="646 302 1066 756">Zig-Zag lines marked on the road before the crossing advise motorists that they are approaching a crossing that may be hidden because of a curve or crest or dip in the road. Zig-zag pavement markings are perceptual countermeasures used to create safer driving environments by attempting to increase motorist awareness near crosswalks.</p>	<p data-bbox="1098 302 1955 370"> <ul style="list-style-type: none"> The zig-zag pavement markings had a sustained positive effect on speed reduction at problem intersections. </p> <p data-bbox="1098 565 1289 597">DRAWBACKS</p> <p data-bbox="1098 613 1898 760"> <ul style="list-style-type: none"> Lower speed reactions by drivers due to zig-zag pavement markings are often a direct result of confusion and cautiousness, since the markings are met with limited understanding as to their purpose. </p>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="94 927 1073 1114" style="list-style-type: none"> Zig-zag pavement markings should be included considered as a safety countermeasure at mid-block crossings where there is a need for higher awareness. The longitudinal length of the pavement markings be based on sight distance and posted speed limit 	<p data-bbox="1123 927 1976 1073">VDOT's Northern Region Traffic Engineering Division is involved in an experiment with the Federal Highway Administration that studies whether zig-zag pavement markings be included in the Manual on Uniform Traffic Control Devices.</p> <p data-bbox="1123 1097 1297 1130">RESOURCES</p> <p data-bbox="1123 1146 1965 1219">Virginia Transportation Research Council: <i>Best Practices in Traffic Operations and Safety: Phase II: Zig-zag Pavement Markings.</i></p> <p data-bbox="1123 1317 1373 1349">CURRENT USAGE</p> <p data-bbox="1123 1365 1871 1398">Currently being experimented with in Hawaii and Virginia.</p>

SIGNING & STRIPING

SHARED LANE MARKINGS OR SHARROWS	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="367 824 625 873">Photo: The RBA Group Location: Philadelphia, PA</p>	<p data-bbox="646 386 1079 764">Shared lane markings or “sharrows” are road markings used to indicate a shared lane environment for bicycles and automobiles. They are not a facility type but are used to support a complete bicycle network. Shared lane markings are most appropriate for lower volume, lower speed streets.</p>	<div data-bbox="1108 354 1986 706"> <p data-bbox="1108 354 1255 310">BENEFITS</p> <ul data-bbox="1108 354 1986 706" style="list-style-type: none"> • Reinforces the legitimacy of bicycle traffic on the street. • Assists bicyclists with lateral positioning away from the door zone & other hazards. • May be configured to offer directional and wayfinding guidance. • Requires no additional street space. • Reduces the incidence of sidewalk riding and wrong-way riding. • Can provide wayfinding. </div> <div data-bbox="1108 706 1986 873"> <p data-bbox="1108 716 1304 753">DRAWBACKS</p> <ul data-bbox="1108 764 1986 873" style="list-style-type: none"> • Does not dedicate exclusive use for bicyclists. </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="94 982 1079 1446" style="list-style-type: none"> • When there is insufficient width to provide bike lanes. • On a steep downgrade. • On streets with posted 35 mph speeds or faster and motor vehicle volumes higher than 3,000 aadt shared lane markings <i>is not a preferred treatment</i>. On these streets other bikeway types are preferred. • Sharrows shall not be used on shoulders or in designated bicycle lanes. • On-streets with parallel parking, the centers of the sharrows should be placed at least 11 feet from the face of the curb. • On-streets without parking, the centers of the sharrows should be at least 4 feet from the face of the curb. • They should be placed immediately after an intersection and spaced at intervals not greater than 250 feet thereafter. 	<div data-bbox="1108 982 1986 1096"> <p data-bbox="1108 982 1608 971">TREATMENT STATUS/ADOPTION</p> <ul data-bbox="1108 982 1986 1096" style="list-style-type: none"> • MUTCD – can be implemented at present time • AASHTO – included in in AASHTO’s <i>Guide to Bicycle Facilities, 4th Edition</i> </div> <div data-bbox="1108 1096 1986 1344"> <p data-bbox="1108 1105 1297 1143">RESOURCES</p> <ul data-bbox="1108 1154 1986 1344" style="list-style-type: none"> • Included in: <ul data-bbox="1213 1193 1549 1263" style="list-style-type: none"> ○ MUTCD section 9C.07 ○ AASHTO section 4.4 • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011 </div> <div data-bbox="1108 1344 1986 1481"> <p data-bbox="1108 1354 1377 1391">CURRENT USAGE</p> <ul data-bbox="1108 1403 1986 1481" style="list-style-type: none"> • Commonly used throughout the US including in: Hoboken, NJ; Princeton, NJ; New Brunswick, NJ; New York, NY </div>

SIGNING AND STRIPING

GREEN COLORED PAVEMENT	DESCRIPTION/FEATURES	BENEFITS				
 <p data-bbox="401 792 653 839">Photo: The RBA Group Location: Philadelphia, PA</p>	<p data-bbox="678 337 1087 602">Colored pavement can be utilized as a corridor treatment along the length of a bike lane or cycle track, or as a spot treatment, such as a bike box, conflict area, or intersection crossing marking.</p>	<table border="1"> <thead> <tr> <th data-bbox="1115 293 1982 618">BENEFITS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1115 293 1982 618"> <ul data-bbox="1125 302 1955 529" style="list-style-type: none"> • Increases the visibility of the bicycle facility. • Promoted the multi-modal nature of a corridor. • Reinforces priority to bicyclists in conflict areas. Conflict points are locations where motorists and cyclists must cross each other's path (e.g., at intersections or merge areas). • Increases motorist yielding behavior. </td> </tr> <tr> <th data-bbox="1115 618 1982 672">DRAWBACKS</th> </tr> <tr> <td data-bbox="1115 672 1982 839"> <ul data-bbox="1125 680 1898 712" style="list-style-type: none"> • Colored pavement may require additional maintenance. </td> </tr> </tbody> </table>	BENEFITS	<ul data-bbox="1125 302 1955 529" style="list-style-type: none"> • Increases the visibility of the bicycle facility. • Promoted the multi-modal nature of a corridor. • Reinforces priority to bicyclists in conflict areas. Conflict points are locations where motorists and cyclists must cross each other's path (e.g., at intersections or merge areas). • Increases motorist yielding behavior. 	DRAWBACKS	<ul data-bbox="1125 680 1898 712" style="list-style-type: none"> • Colored pavement may require additional maintenance.
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION					
<ul data-bbox="90 953 909 1455" style="list-style-type: none"> • Across intersections, particularly through wide or complex intersections where the bicycle path may be unclear. • Across conflict areas such as driveways, yield-controlled cross-streets, and ramp exits and entries. • Within bike lanes or cycle tracks. • The pavement should be skid resistant and retro-reflective. • A "Yield to Bikes" sign should be used at intersections or driveways where bicyclists have the right of way. • Normal white bike lane lines shall be provided along the edges for consistency and enhance nighttime visibility. • The color green is required by the MUTCD for bicycle facilities to minimize confusion with other traffic control markings 	<table border="1"> <tbody> <tr> <td data-bbox="932 945 1982 1117"> <ul data-bbox="942 953 1965 1101" style="list-style-type: none"> • MUTCD - Interim approval has been granted for the use of green pavement markings for bike lanes and cycle tracks within intersections, green bike lanes at conflict points or green behind bike lane symbols and arrows • AASHTO – can be used based on FHWA interim approval </td> </tr> <tr> <th data-bbox="932 1117 1982 1170">RESOURCES</th> </tr> <tr> <td data-bbox="932 1170 1982 1260"> <ul data-bbox="942 1179 1965 1243" style="list-style-type: none"> • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011 </td> </tr> <tr> <th data-bbox="932 1260 1982 1313">CURRENT USAGE</th> </tr> <tr> <td data-bbox="932 1313 1982 1463"> <ul data-bbox="942 1321 1965 1463" style="list-style-type: none"> • Application of colored pavement is seen in the following US cities: New York, NY; Washington, DC; Austin, TX; Boston, MA; Cambridge, MA; Chicago, IL; Columbia, MO; Eugene, OR; Indianapolis, IN; Minneapolis, MN; Missoula, MT; Portland, OR; Salt Lake City, UT; San Francisco, CA; Seattle </td> </tr> </tbody> </table>	<ul data-bbox="942 953 1965 1101" style="list-style-type: none"> • MUTCD - Interim approval has been granted for the use of green pavement markings for bike lanes and cycle tracks within intersections, green bike lanes at conflict points or green behind bike lane symbols and arrows • AASHTO – can be used based on FHWA interim approval 	RESOURCES	<ul data-bbox="942 1179 1965 1243" style="list-style-type: none"> • National Association of City Transportation Officials, <i>Urban Bikeway Design Guide</i>, April 2011 	CURRENT USAGE	<ul data-bbox="942 1321 1965 1463" style="list-style-type: none"> • Application of colored pavement is seen in the following US cities: New York, NY; Washington, DC; Austin, TX; Boston, MA; Cambridge, MA; Chicago, IL; Columbia, MO; Eugene, OR; Indianapolis, IN; Minneapolis, MN; Missoula, MT; Portland, OR; Salt Lake City, UT; San Francisco, CA; Seattle
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SIGNING & STRIPING

BICYCLE PRIORITY LANES	DESCRIPTION/FEATURES	BENEFITS				
 <p data-bbox="268 824 705 878">Photo: Salt Lake City, Transportation Division Location: Salt Lake City, UT</p>	<p data-bbox="730 337 1270 602">A Bicycle Priority Lane is a shared lane treatment in which a sharrow along with paint or dashed lines delineate a bicycle zone as a lane-within-a-lane. The name alludes to priority seating on a bus: if a cyclist is there, motorists should yield the space, but if not they are free to use it.</p>	<table border="1" data-bbox="1318 298 1982 933"> <thead> <tr> <th data-bbox="1318 298 1982 337">BENEFITS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1318 337 1982 651"> <ul data-bbox="1325 305 1976 646" style="list-style-type: none"> • More visible than sharrows alone. • Further defines ideal road position for bikes in the right hand lane in order to induce motorists to completely change lanes to pass. • Encourages cyclists to ride away from the door zone & to encourage motorist acceptance of those who do. • Encourages sidewalk cyclists to ride in the street. </td> </tr> <tr> <th data-bbox="1318 651 1982 704">DRAWBACKS</th> </tr> <tr> <td data-bbox="1318 704 1982 933"> <ul data-bbox="1325 716 1969 927" style="list-style-type: none"> • Bicycle priority lanes are not separated, so those riders who are not comfortable sharing the lane with motorists are unlikely to use it. • Requires periodic maintenance to renew paint, and use of paint materials that are not slippery. </td> </tr> </tbody> </table>	BENEFITS	<ul data-bbox="1325 305 1976 646" style="list-style-type: none"> • More visible than sharrows alone. • Further defines ideal road position for bikes in the right hand lane in order to induce motorists to completely change lanes to pass. • Encourages cyclists to ride away from the door zone & to encourage motorist acceptance of those who do. • Encourages sidewalk cyclists to ride in the street. 	DRAWBACKS	<ul data-bbox="1325 716 1969 927" style="list-style-type: none"> • Bicycle priority lanes are not separated, so those riders who are not comfortable sharing the lane with motorists are unlikely to use it. • Requires periodic maintenance to renew paint, and use of paint materials that are not slippery.
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION					
<ul data-bbox="94 1052 877 1312" style="list-style-type: none"> • When more visibility is desired than sharrows alone. • The green sharrow lane is useful for streets where traffic speeds are slow, allowing for a comfortable mixing of bicycle and motor vehicle traffic. • Business districts with space constraints that do not allow for bike lanes or cycle track facilities are candidates for this treatment. 	<table border="1" data-bbox="898 1045 1982 1477"> <tbody> <tr> <td data-bbox="898 1045 1982 1127"> <ul data-bbox="905 1052 1818 1078" style="list-style-type: none"> • FHWA is currently experimenting with green highlighted sharrows. </td> </tr> <tr> <th data-bbox="898 1127 1982 1180">RESOURCES</th> </tr> <tr> <td data-bbox="898 1180 1982 1300"> <ul data-bbox="905 1187 1955 1295" style="list-style-type: none"> • <i>Bicycle Priority Lanes: A Proposal for Marking Shared Lanes</i>, by Peter Furth • <i>Cycle Tracks and Bicycle Priority Lanes: More Tools to Serve Traffic-Intolerant Riders</i>; </td> </tr> <tr> <th data-bbox="898 1300 1982 1354">CURRENT USAGE</th> </tr> <tr> <td data-bbox="898 1354 1982 1477"> <ul data-bbox="905 1360 1591 1386" style="list-style-type: none"> • Salt Lake City, UT; Brookline, MA; Long Beach, CA </td> </tr> </tbody> </table>	<ul data-bbox="905 1052 1818 1078" style="list-style-type: none"> • FHWA is currently experimenting with green highlighted sharrows. 	RESOURCES	<ul data-bbox="905 1187 1955 1295" style="list-style-type: none"> • <i>Bicycle Priority Lanes: A Proposal for Marking Shared Lanes</i>, by Peter Furth • <i>Cycle Tracks and Bicycle Priority Lanes: More Tools to Serve Traffic-Intolerant Riders</i>; 	CURRENT USAGE	<ul data-bbox="905 1360 1591 1386" style="list-style-type: none"> • Salt Lake City, UT; Brookline, MA; Long Beach, CA
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CURRENT USAGE						
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SIGNING AND STRIPING

WAYFINDING SIGNAGE AND MARKINGS		BENEFITS
DESCRIPTION/FEATURES		
<p>A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to:</p> <ul style="list-style-type: none"> • Designate a system of routes. • Designate a continuous or preferred route. • Provide location specific guidance. 		<ul style="list-style-type: none"> • Indicates to bicyclists and motorists that they are on a designated bikeway. • Identifies the best routes to destinations. May include time and distance. • Pavement markings can be installed to help reinforce routes and directional signage and to provide bicyclist positioning and route branding benefits. • Under urban conditions, pavement markings may often be more visible than signs to users of the route.
<p>Wayfinding Signage</p>  <p>Photo: The RBA Group Location: Philadelphia, PA</p>	<p>Wayfinding Markings</p>  <p>Photo: NACTO Location: Portland, OR</p>	

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul style="list-style-type: none"> • Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes. • Signs should be oriented so bicyclists have sufficient time to comprehend the sign and change their course, when needed. 	<ul style="list-style-type: none"> • MUTCD - can be implemented at present time if signs and pavement markings that are compliant with the MUTCD are used, but currently is experimental if a non-compliant sign or marking is used.
	<p>RESOURCES</p> <ul style="list-style-type: none"> • MUTCD Chapter 9 – section 9B.20 • AASHTO <i>Guide to Bicycle Facilities, 4th Edition</i> – Section 4.11
	<p>CURRENT USAGE</p> <ul style="list-style-type: none"> • The use of bicycle wayfinding signs is very common. • The use of pavement markings to identify bikeways has been experimented with in Portland, OR and Berkeley, CA

SIGNING AND STRIPING

BICYCLES MAY USE FULL LANE SIGN (R4-11)	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="533 758 764 810">Photo: arlnow.com Location: Arlington, VA</p>	<p data-bbox="785 337 1188 560">The BICYCLES MAY USE FULL LANE sign may be used in locations where it is important to inform road users that bicyclists might occupy the travel lane.</p>	<p data-bbox="1226 302 1934 370">BENEFITS</p> <ul data-bbox="1226 302 1934 370" style="list-style-type: none"> Reinforces the law to both motorists and bicyclists that bicyclists might occupy the travel lane. <p data-bbox="1226 548 1423 581">DRAWBACKS</p> <ul data-bbox="1226 597 1934 708" style="list-style-type: none"> Fear that the sign could mislead inexperienced bicyclists into occupying inappropriate, and unsafe, positions within a roadway.

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="92 943 1020 1284" style="list-style-type: none"> The BICYCLES MAY USE FULL LANE sign may be used on roadways where no bicycle lanes or adjacent shoulders usable by bicyclists are present and where travel lanes are too narrow for bicyclists and motor vehicles to operate side by side. The sign may be used in addition to or instead of the Shared Lane Marking. AASHTO's <i>Guide for Bicycle Facilities, 4th Edition</i> recommends using the BICYCLE MAY USE FULL LANE Sign when lane widths are less than 14 ft. 	<ul data-bbox="1052 943 1927 1049" style="list-style-type: none"> MUTCD – can be implemented at present time AASHTO – included in in AASHTO's <i>Guide to Bicycle Facilities, 4th Edition</i> <p data-bbox="1052 1065 1226 1097">RESOURCES</p> <ul data-bbox="1052 1114 1724 1187" style="list-style-type: none"> MUTCD Chapter 9 - section 9B.06 AASHTO <i>Guide to Bicycle Facilities</i> - section 4.3.2 <p data-bbox="1052 1219 1304 1252">CURRENT USAGE</p> <ul data-bbox="1052 1268 1692 1300" style="list-style-type: none"> Commonly used throughout the United States

SIGNING & STRIPING

SHARE THE ROAD SIGNS (W11-1 & W16-1P)	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="522 886 749 937">Photo: The RBA Group Location: Highlands, NJ</p>	<p data-bbox="772 358 1226 545">A SHARE THE ROAD sign assembly is intended to alert motorists that bicyclists may be encountered and that they should be mindful and respectful of bicyclists.</p>	<p data-bbox="1251 326 1955 431"> <ul style="list-style-type: none"> Alert motorists that bicyclists may be encountered and that they should be mindful and respectful of bicyclists. </p> <p data-bbox="1251 570 1446 605">DRAWBACKS</p> <p data-bbox="1251 621 1976 769"> <ul style="list-style-type: none"> Sign is not a substitute for design measures that can improve the quality of service for bicyclists. Sign says nothing about where on the road bicyclists are expected to ride. </p>
WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION	
<ul data-bbox="94 1003 1104 1468" style="list-style-type: none"> In situations where there is a need to warn motorists to watch for bicyclists traveling along the highway, the SHARE THE ROAD (W16-1P) plaque (see Figure 9B-3) may be used in conjunction with the W11-1 sign. AASHTO's <i>Guide for Bicycle Facilities, 4th Edition</i> recommends using the SHARE THE ROAD sign when lane widths are greater than or equal to 14 ft. At the end of a bike lane, or where a shared use path ends. In work zones where bicyclists may need to share a narrower space than usual. Sign should not be used to address reported traffic operational issues, as the addition of this warning sign will not significantly improve bicycling conditions. Sign should not be used to indicate a bike route. 	<ul data-bbox="1134 1003 1969 1109" style="list-style-type: none"> MUTCD – can be implemented at present time AASHTO – included in in AASHTO's <i>Guide to Bicycle Facilities, 4th Edition</i> <p data-bbox="1134 1125 1308 1161">RESOURCES</p> <ul data-bbox="1134 1177 1969 1247" style="list-style-type: none"> MUTCD Chapter 9 – section 9B.19 AASHTO <i>Guide to Bicycle Facilities, 4th Edition</i> – section 4.3.2 <p data-bbox="1134 1279 1388 1315">CURRENT USAGE</p> <ul data-bbox="1134 1331 1780 1360" style="list-style-type: none"> Commonly used throughout the United States 	

SIGNING AND STRIPING

WRONG WAY RIDING SIGNS (R5-1B)	DESCRIPTION/FEATURES	BENEFITS
 <p>R5-1b</p> <p>R9-3cP</p>	<p>Bicycles are vehicles and when operated on a roadway they should travel in the same direction as other roadway traffic.</p>	<p>BENEFITS</p> <ul style="list-style-type: none"> Reinforces the legal requirement of bicyclists to ride with traffic. <p>DRAWBACKS</p> <ul style="list-style-type: none"> Can contribute to sign clutter if not mounted back-to-back with other signs.

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul style="list-style-type: none"> For locations where wrong-way riding by bicyclists is frequently observed. The Bicycle WRONG WAY (R5-1b) sign and RIDE WITH TRAFFIC (R9-3cP) plaque (see Figure 9B-2) may be placed facing wrong-way bicycle traffic, such as on the left side of a roadway. This sign and plaque may be mounted back-to-back with other signs to minimize visibility to other traffic. The RIDE WITH TRAFFIC plaque should be used only in conjunction with the Bicycle WRONG WAY sign, and should be mounted directly below the Bicycle WRONG WAY sign. 	<ul style="list-style-type: none"> MUTCD – can be implemented at present time AASHTO – included in in AASHTO’s <i>Guide to Bicycle Facilities, 4th Edition</i> <p>RESOURCES</p> <ul style="list-style-type: none"> MUTCD Chapter 9 – section 9B.07 AASHTO <i>Guide to Bicycle Facilities, 4th Edition</i> – section 4.3.2 <p>CURRENT USAGE</p> <ul style="list-style-type: none"> Commonly used throughout the United States

SIGNING AND STRIPING

ACTIVE WARNING BEACON	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="470 703 680 753">Photo: NACTO Location: Billings, MT</p>	<p data-bbox="701 310 1213 570">Active warning beacons are user-actuated amber flashing lights that supplement warning signs at unsignalized intersections or mid-block crosswalks. Beacons can be actuated either manually by a push-button or passively through detection.</p> <p data-bbox="701 578 1213 805">Rectangular Rapid Flash Beacons (RRFBs), a type of active warning beacon, use an irregular flash pattern similar to emergency flashers on police vehicles and can be installed on either two-lane or multi-lane roadways.</p>	<p data-bbox="1239 269 1978 578">BENEFITS</p> <ul data-bbox="1239 269 1978 578" style="list-style-type: none"> • Offers lower cost alternative to traffic signals and Hybrid Beacons. • Significantly increases driver yielding behavior at crossings when supplementing standard crossing warning signs and markings. • The unique nature of the stutter flash (RRFBs) elicits a greater response from drivers than traditional methods. <p data-bbox="1239 586 1978 634">DRAWBACKS</p> <ul data-bbox="1239 643 1978 748" style="list-style-type: none"> • Depending on power supply, maintenance can be minimal. If solar power is used, RRFBs should run for years without issue.

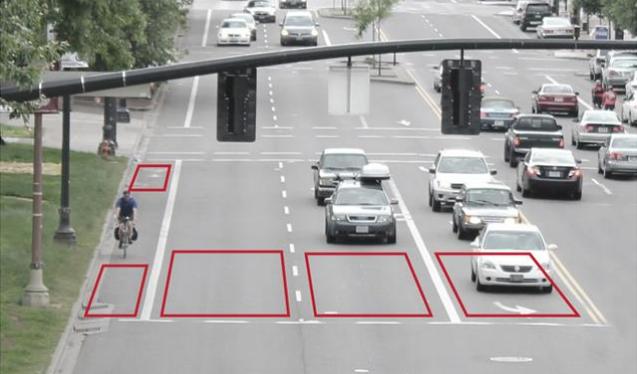
WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="92 956 968 1419" style="list-style-type: none"> • Usually implemented at high-volume pedestrian crossings, but may also be considered for priority bicycle route crossings. • At locations where bike facilities cross roads at mid-block locations or at intersections where signals are not warranted or desired. • At locations where driver compliance at bicycle crossings is low. • Beacons shall be unlit when not activated. • If intended for use by bicyclists, push button actuation shall be provided, and should be located so bicyclists can activate the signal without dismounting. Push buttons should have a supplemental sign facing the bicyclist's approach to increase visibility. 	<p data-bbox="1001 956 1646 989">• MUTCD - can be implemented at present time</p> <p data-bbox="1001 1053 1178 1094">RESOURCES</p> <ul data-bbox="1001 1110 1955 1219" style="list-style-type: none"> • MUTCD –not included in the 2009 MUTCD because it was granted Interim Approval status too late to include in the January 2008 Notice of Proposed Amendments (NPA). <p data-bbox="1001 1227 1255 1268">CURRENT USAGE</p> <p data-bbox="1001 1284 1969 1435">Several municipalities and counties in the United States have experimented with and evaluated RRFBs for bicycles (as well as pedestrians), including the following: Billings, MT; Boulder, CO; Las Cruces, NM; Miami-Dade, FL; Portland, OR; St. Petersburg, FL; Wilmington, NC</p>

SIGNALS

HYBRID (HAWK) SIGNAL	DESCRIPTION/FEATURES	BENEFITS		
 <p>Photo: National Association of City Transportation Officials Location: West Bloomfield Township, MI</p>	<p>A hybrid beacon, also known as a High-intensity Activated Crosswalk (HAWK), consists of a signal-head with two red lenses over a single yellow lens on the major street, and pedestrian and/or bicycle signal heads for the minor street.</p>	<table border="1"> <thead> <tr> <th data-bbox="1245 610 1986 664">DRAWBACKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1245 664 1986 781"> <ul style="list-style-type: none"> • HAWK's major disadvantage is its high price, at \$75,000 to \$100,000 per crossing. </td> </tr> </tbody> </table>	DRAWBACKS	<ul style="list-style-type: none"> • HAWK's major disadvantage is its high price, at \$75,000 to \$100,000 per crossing.
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION				
<p>A hybrid/HAWK signal should be considered when:</p> <ul style="list-style-type: none"> • Where bike routes intersect major streets without existing signalized crossings. • Where off-street bicycle or pedestrian facilities intersect major streets without existing signalized crossings. • At mid-block crossings of major roadways with high bicycle or pedestrian volumes. 	<p>Chapter 4F of the 2009 MUTCD provides guidance and standards for hybrid beacons at un-signalized and mid-block pedestrian crossings, but does not consider hybrid beacons for bicyclist crossings.</p> <table border="1"> <thead> <tr> <th data-bbox="1039 1008 1986 1062">RESOURCES</th> </tr> </thead> <tbody> <tr> <td data-bbox="1039 1062 1986 1182"> <ul style="list-style-type: none"> • FHWA Manual on Uniform Traffic Control Devices (but should be installed using pedestrian guidelines and used by bicyclists.) • National Association of City Transportation Officials Manual </td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="1039 1182 1986 1235">CURRENT USAGE</th> </tr> </thead> <tbody> <tr> <td data-bbox="1039 1235 1986 1464"> <p>Hybrid beacons have been implemented in several US cities, including the following: Alexandria, VA; Bloomington, IN; Fort Collins, CO; Madison, WI; Miami, FL; Salt Lake City, UT; Phoenix, AZ; Portland, OR; Tucson, AZ; Washington, DC.</p> </td> </tr> </tbody> </table>	RESOURCES	<ul style="list-style-type: none"> • FHWA Manual on Uniform Traffic Control Devices (but should be installed using pedestrian guidelines and used by bicyclists.) • National Association of City Transportation Officials Manual 	CURRENT USAGE	<p>Hybrid beacons have been implemented in several US cities, including the following: Alexandria, VA; Bloomington, IN; Fort Collins, CO; Madison, WI; Miami, FL; Salt Lake City, UT; Phoenix, AZ; Portland, OR; Tucson, AZ; Washington, DC.</p>
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SIGNALS

SIGNAL DETECTION (LOOP DETECTORS, VIDEO DETECTION, BICYCLE PUSHBUTTONS)	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="401 768 737 847">Photo: National Association of City Transportation Officials Location: Portland, OR</p>	<p data-bbox="764 354 1131 768">Bicycle detection is used at actuated signals to alert the signal controller of bicycle crossing demand on a particular approach. Bicycle detection occurs either through the use of push-buttons or by automated means (e.g., in-pavement loops, video, microwave, etc).</p>	<div data-bbox="1159 354 1961 667"> <p data-bbox="1159 354 1297 310">BENEFITS</p> <ul data-bbox="1159 354 1961 667" style="list-style-type: none"> • Improves efficiency and reduces delay for bicycle travel. • Increases convenience and safety of bicycling and helps establish bicycling as a legitimate mode of transportation on streets. • Discourages red light running by bicyclists without causing excessive delay to motorists. • Can be used to prolong the green phase to provide adequate time for bicyclists to clear the intersection. </div> <div data-bbox="1159 672 1961 760"> <p data-bbox="1159 672 1352 711">DRAWBACKS</p> <ul data-bbox="1159 716 1335 760" style="list-style-type: none"> • High cost. </div>

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<p data-bbox="90 961 779 987">An automated signal detector should be considered :</p> <ul data-bbox="90 992 905 1187" style="list-style-type: none"> • At intersections with bicycle signal heads and/or bicycle-specific phasing that are actuated. • In bike lanes on intersection approaches that are actuated. • In left turn lanes with actuated left-turn signals where bicyclists may also turn left. 	<p data-bbox="942 961 1978 1024">Most US jurisdictions are familiar with their design and application as described in the MUTCD and AASHTO Guide for the Development of Bicycle Facilities.</p> <div data-bbox="942 1029 1988 1166"> <p data-bbox="942 1029 1152 1068">RESOURCES</p> <ul data-bbox="942 1073 1717 1166" style="list-style-type: none"> • AASHTO Guide for the Development of Bicycle Facilities. • FHWA Manual on Uniform Traffic Control Devices. </div> <div data-bbox="942 1170 1988 1295"> <p data-bbox="942 1170 1194 1209">CURRENT USAGE</p> <p data-bbox="942 1214 1955 1295">Bicycle signal detection is widely used in North American and European cities, both at standard signalized intersections and those with bicycle signal phases.</p> </div>

BICYCLE PARKING

SHORT TERM BICYCLE PARKING		DESCRIPTION/FEATURES
 <p>Inverted U – intuitive and secures bicycle at two points; easy to park when properly sited and spaced; accessible from both sides. Photo: The RBA Group</p>	 <p>Post and Ring – similar usability as Inverted U but is easy to implement by retrofitting parking meter posts with rings. Photo: Streetsblog.org</p>	 <p>Tree guard bicycle racks – Intuitive, similar in usability to Inverted U but only accessible from one side. Photo: City of Berkeley, CA</p>
<p>BENEFITS</p> <ul style="list-style-type: none"> • Low cost and fast implementation. • May be able to use existing fixtures such as meters and tree guards to retrofit racks. • Highly secure and requires little maintenance other than snow removal. 		<p>DRAWBACKS</p> <ul style="list-style-type: none"> • Bicycle is not completely secure and parts can be removed by vandals. • Cannot be reserved and may not be consistently available for daily commuting to a transit facility or workplace. • Bicycle is typically exposed to the elements and possible weather damage such as rust.
<p>WHEN TO USE/TYPICAL APPLICATION</p> <p>A short-term parking fixture should be:</p> <ul style="list-style-type: none"> • Convenient to cyclist destination • Placed no more than 50' from the entrance. • Visible from the destination to provide security. • Located in a high-traffic area for security. • Identified by MUTCD sign D4-3 "Bicycle Parking." • Located along natural "desire lines" from bikeways. 		<p>TREATMENT STATUS/ADOPTION</p> <ul style="list-style-type: none"> • Accepted by MUTCD and AASHTO's <i>Guide to Bicycle Facilities</i>, 4th Edition <p>RESOURCES</p> <ul style="list-style-type: none"> • APBP <i>Bicycle Parking Guidelines</i> <p>CURRENT USAGE</p> <ul style="list-style-type: none"> • Commonly used in most US cities.

BICYCLE PARKING

LONG TERM BICYCLE PARKING FACILITIES		DESCRIPTION/FEATURES	
 <p>Bike parking in parking garage, New York, NY. Photo: Streetsblog.org</p>	 <p>Bike Lockers at stations on NJ TRANSIT's Morris and Essex rail line. Photo: TransOptions TMA</p>	 <p>Bike station Facility in Washington, D.C. Indoor secure parking is sold to commuters. Photo: Mobis Transportation Alternatives, Inc.</p>	<p>Long-term parking consists of a wider variety of fixture types and site plan layouts and includes cages and bicycle rooms, as well as lockers located in a variety of different settings, both indoors and outdoors. Security is important, since most long-term parking is located in low traffic and out of the way locations.</p>
BENEFITS		DRAWBACKS	
<ul style="list-style-type: none"> • Highly secure, with low risk of vandalism or theft. • Offers protection from the elements and weather related damage and corrosion. • Leased spaces allow for consistent availability for daily cyclist commuters. 		<ul style="list-style-type: none"> • High construction and maintenance costs 	
WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION		
<ul style="list-style-type: none"> • Easy access using effective signage. • Controlled access through either a smart card or key. • A portion of lockers are available to lease as well as on-demand. • Can also be proved by using a dedicated bicycle room or caged area in a garage with smartcard/secure access. • Generally a high level of security is provided with effective lighting, security cameras or security guards. • Protection from weather and the elements is provided, either indoors or with a shelter. 	RESOURCES		
	<ul style="list-style-type: none"> • APBP Bicycle Parking Guidelines 		
	CURRENT USAGE		
<ul style="list-style-type: none"> • Vital component of a bicycle network and used extensively by NJ TRANSIT • Found in various forms in the many US cities. 			

Other

SHARED BIKE BUS LANES (SBBL)	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="426 688 678 740">Photo: JoAnne Fiebe Location: Washington, DC</p>	<p data-bbox="701 306 1155 688">Bike-bus lanes are travel lanes restricted to buses, bicycles, and (usually) vehicles turning right. The lane is separated from general purpose lanes by a solid white line, and designated by signs and painted legends. This configuration requires bicyclists and buses to pass one another in "leapfrog" fashion.</p>	<p data-bbox="1180 269 1953 574">BENEFITS</p> <ul data-bbox="1180 269 1953 574" style="list-style-type: none"> • On a busy arterial street with conventional bike lanes, buses frequently block the bike lane at bus stops. Bicyclists may also be squeezed between the door zone of parked cars on the right and adjacent traffic on the left. A shared lane eliminates these issues. • Provides some degree of space separation between general traffic and bicyclists for their greater safety and comfort. <p data-bbox="1180 586 1373 623">DRAWBACKS</p> <ul data-bbox="1180 639 1892 748" style="list-style-type: none"> • For safe sharing of bike-bus lanes, education of bus drivers is considered important. • Enforcement of SBBL

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="92 878 974 1182" style="list-style-type: none"> • Where constrained right-of-way prevents provision of a separate bicycle lane. • Where municipalities seek ways to accommodate buses and bicycles for better multimodal service. • Necessary width for an SBBL is estimated to be 16 feet, seven inches, where all the following conditions exist: curb and gutter; posted speed limit 30 mph or less, operating speed of buses is 30 mph or less. 	<ul data-bbox="1001 878 1556 906" style="list-style-type: none"> • No current national standards for SBBL <p data-bbox="1001 1000 1178 1037">RESOURCES</p> <ul data-bbox="1001 1053 1969 1125" style="list-style-type: none"> • State design manuals with guidance regarding SBBLs include Maryland, Illinois, Washington, and the District of Columbia. <p data-bbox="1001 1151 1255 1188">CURRENT USAGE</p> <p data-bbox="1001 1205 1877 1313">27 cities in the United State employ shared bike-bus lanes including Tucson, AZ; Madison, WI; Toronto, Ontario; Vancouver, BC; and Philadelphia, PA.</p>

Other

BICYCLE BOULEVARDS	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="191 760 676 813">Photo: www.pedbikeimages.org-Adam Fukushima Location: San Luis Obispo, CA</p>	<p data-bbox="703 267 1142 841">Bicycle boulevards are low-volume and low-speed streets that have been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments. These treatments allow through movements for cyclists while discouraging similar through trips by non-local motorized traffic. Motor vehicle access to properties along the route is maintained.</p>	<p data-bbox="1171 267 1978 657">BENEFITS</p> <ul data-bbox="1171 267 1978 657" style="list-style-type: none"> • Bicycle boulevards are effective at increasing cycling levels and perceptions of safety and can be accomplished with minor changes to street configuration. • Slower vehicle speeds accomplished with traffic-calming measures reduce risk of serious collisions. • Since they are shared facilities, no additional street width is needed. • Bicycle boulevards can be combined with neighborhood greening efforts to enhance street closures and traffic circles with trees and landscaping. <p data-bbox="1171 667 1978 711">DRAWBACKS</p> <ul data-bbox="1171 721 1978 863" style="list-style-type: none"> • Residents and officials often raise concerns related to traffic reduction and calming: access to property; impact on traffic patterns; enforcement issues with motorcycles and mopeds; and emergency response.

WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION
<ul data-bbox="94 976 1152 1474" style="list-style-type: none"> • Bicycle boulevards are best suited for two-lane residential streets where vehicle traffic can be restricted to low volumes and slow speeds. Ideally they are parallel to major streets and provide an alternative without lengthy deviation. • Design elements may include but are not limited to: <ul data-bbox="191 1170 1152 1398" style="list-style-type: none"> ○ Traffic diverters at key intersections to reduce through motor vehicle traffic while permitting bicyclists to pass. ○ Neighborhood traffic circles and mini-roundabouts to slow motor vehicle traffic but allow bicyclists to maintain momentum. ○ Wayfinding signs and shared lane markings and crossing improvements such as a traffic signal, median refuges, curb extensions • Bicycle boulevard design must also take into consideration access for emergency vehicles. 	<ul data-bbox="1182 976 1978 1047" style="list-style-type: none"> • AASHTO – included in <i>Guide to Bicycle Facilities, 4th Edition</i> <p data-bbox="1182 1101 1978 1144">RESOURCES</p> <ul data-bbox="1182 1154 1978 1263" style="list-style-type: none"> • <i>AASHTO Guide to Bicycle Facilities, 4th Edition</i> • <i>Fundamentals of Bicycle Boulevard Planning & Design</i>, Portland State University, July 2009 <p data-bbox="1182 1279 1978 1323">CURRENT USAGE</p> <p data-bbox="1182 1333 1978 1474">Cities that have utilized the bicycle boulevard concept include: Ocean City, NJ; Albuquerque, NM; Berkeley, CA; Emeryville, CA; Eugene, OR; Palo Alto, CA; Portland, OR; Tucson, AZ; Vancouver, BC</p>

Other

BIKE CHANNELS AT TRANSIT STOPS	DESCRIPTION/FEATURES	BENEFITS		
 <p data-bbox="426 657 678 711">Photo: Flickr/AtomicTaco Location: Seattle, WA</p>	<p data-bbox="703 310 1152 570">A bike channel runs between the sidewalk and a public transit boarding island. They can be painted green and/or marked with pavement markings to help clarify the right of way for bicycling and not to walk in the bike lane.</p>	<table border="1"> <thead> <tr> <th data-bbox="1173 542 1986 596">DRAWBACKS</th> </tr> </thead> <tbody> <tr> <td data-bbox="1173 596 1986 729"> <ul data-bbox="1182 272 1978 711" style="list-style-type: none"> • Separates bicyclists, buses and pedestrians. • Allows bicyclists to go around stopped buses without having to go into traffic. • The buses will stop in the traffic lane to load passengers, allowing them to run more smoothly because they do not have to merge back into traffic after each stop. • Potential conflicts with pedestrians exiting transit. • Potential conflicts between bicyclists and public transit vehicles when entering and exiting the bike channel. </td> </tr> </tbody> </table>	DRAWBACKS	<ul data-bbox="1182 272 1978 711" style="list-style-type: none"> • Separates bicyclists, buses and pedestrians. • Allows bicyclists to go around stopped buses without having to go into traffic. • The buses will stop in the traffic lane to load passengers, allowing them to run more smoothly because they do not have to merge back into traffic after each stop. • Potential conflicts with pedestrians exiting transit. • Potential conflicts between bicyclists and public transit vehicles when entering and exiting the bike channel.
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WHEN TO USE/TYPICAL APPLICATION	TREATMENT STATUS/ADOPTION					
<ul data-bbox="94 850 974 1235" style="list-style-type: none"> • At bus/transit boarding islands. • Where there is adequate space for transit riders to get off the bus without stepping directly into the bicycle path. • Where there is adequate visibility for pedestrians to safely cross the bicycle path. • A crosswalk should be painted across the bike lane to indicate to bicyclists to stop for people crossing. • The bike route can be raised to the level of the sidewalk at the stop, so that passengers don't have to negotiate multiple curbs and helping cyclists know that it's a shared area. 	<table border="1"> <tbody> <tr> <td data-bbox="995 839 1986 959"> <ul data-bbox="1003 850 1864 919" style="list-style-type: none"> • No current national standards for Bike Channels around transit boarding islands. </td> </tr> <tr> <th data-bbox="995 959 1986 1013">RESOURCES</th> </tr> <tr> <td data-bbox="995 1013 1986 1114"> <ul data-bbox="1003 1029 1598 1057" style="list-style-type: none"> • See AASHTO for bicycle lane requirements </td> </tr> <tr> <th data-bbox="995 1114 1986 1167">CURRENT USAGE</th> </tr> <tr> <td data-bbox="995 1167 1986 1315"> <ul data-bbox="1003 1183 1822 1252" style="list-style-type: none"> • San Francisco, CA; San Jose, CA; Seattle, WA; Vancouver, BC • Copenhagen and Amsterdam </td> </tr> </tbody> </table>	<ul data-bbox="1003 850 1864 919" style="list-style-type: none"> • No current national standards for Bike Channels around transit boarding islands. 	RESOURCES	<ul data-bbox="1003 1029 1598 1057" style="list-style-type: none"> • See AASHTO for bicycle lane requirements 	CURRENT USAGE	<ul data-bbox="1003 1183 1822 1252" style="list-style-type: none"> • San Francisco, CA; San Jose, CA; Seattle, WA; Vancouver, BC • Copenhagen and Amsterdam
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BICYCLE LIFT OR CYCLOCABLE	DESCRIPTION/FEATURES	BENEFITS
 <p data-bbox="388 1068 678 1122">Photo: mylittlenorway.com Location: Trondheim, Norway</p>	<p>The bicycle lift or 'trampe' works much like a ski lift except that it is integrated into the bike path. At the bottom of the steep 425 meter long hill cyclists place their right foot on the lift and receive a push which transports them upwards at a comfortable speed of 2 meters per second. Since its introduction in 1993, 'Trampe' has assisted more than 220,000 cyclists.</p>	<ul style="list-style-type: none"> • Helps promote bicycling in areas with steep hills. • 41 % of the lift users claim they're using the bicycle more often because of the lift. • Encourages people who don't want to get warm and sweaty from riding up hills. • There have been no accidents.
	<p>WHEN TO USE / TYPICAL APPLICATION</p> <ul style="list-style-type: none"> • On hills less than 1,312 feet. • To increase the use of bicycles. 	<p>DRAWBACKS</p> <ul style="list-style-type: none"> • Some new users have difficulty maintaining balance which can result in falling off. • During winter time the lift is closed. • Cost is about \$440-550/foot <p>TREATMENT STATUS / ADOPTION</p> <ul style="list-style-type: none"> • Design Management AS owns all the patents and licenses. The prototype in Brubakken, Trampe, belongs to the Public Road Administration. Together with the Municipality of Trondheim, the Public Road Administration also pays for the administration of Trampe. Design Management AS is hired to see to and maintain the stability of the prototype.
<p>RESOURCES</p> <ul style="list-style-type: none"> • http://www.trampe.no/english/index.php • http://mylittlenorway.com/2011/08/bike-lift/ 	<p>CURRENT USAGE</p> <ul style="list-style-type: none"> • Trondheim, Norway • According to the Trampe website, both Design Management AS and POMA are now following up a number of cities in Europe, USA, Canada and South Korea. 	