Portland's Cycle Track and Buffered Bike Lanes: Are they working?

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Cycle Track and Buffered Bike Lanes

SW Stark Street from West Burnside to SW Naito Parkway & SW Oak Street from SW Naito Parkway to SW10th Avenue

SW Clay to SW Jackson Streets
About 0.34 miles
Evaluation Questions

- What are the perceptions of all users?
- Are the facilities being used as intended?
- Do the users understand the facility?
- Are there any operational issues?
- What additional delay has been introduced for motor vehicles?
## Overview of Methods

<table>
<thead>
<tr>
<th>Type</th>
<th>Data</th>
<th>Cycle Track</th>
<th>Buffered Bike Lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User Surveys</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motorists</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Cyclists</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Pedestrians</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Businesses</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Traffic Analysis (Video)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Motorist Delay</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Bike/Ped Interactions</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Bike/Motorist Interactions</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
SW Broadway (PSU) Cycle Track

Before

After
Cycle Track - Cyclist Survey

- 398 cyclists “intercepted”
- 124 Responded to online survey (31%)

72% male
28% female
Cycle Track - Motorist Survey

- 500 motorists invited to participate
- 148 took paper survey (30%)

Age Group of Respondent

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-17</td>
<td>1</td>
</tr>
<tr>
<td>18-24</td>
<td>29</td>
</tr>
<tr>
<td>25-34</td>
<td>39</td>
</tr>
<tr>
<td>35-44</td>
<td>20</td>
</tr>
<tr>
<td>45-54</td>
<td>24</td>
</tr>
<tr>
<td>55-64</td>
<td>20</td>
</tr>
<tr>
<td>65+</td>
<td>10</td>
</tr>
</tbody>
</table>

Number of responses (n=143) 50% male, 50% female 50% never ride a bicycle
Cycle Track – Pedestrian Survey

- ~753 pedestrians invited to participate
- 198 took paper survey (26%)

Age Group of Respondent:

- 0-17: 1
- 18-24: 40
- 25-34: 80
- 35-44: 29
- 45-54: 19
- 55-64: 23
- 65+: 5

Number of responses (n=197)

50% male, 50% female
33% never cycle
Video Review – Cycle Track

18 hours total

“Before” Video – 6 hrs
Dates: June 3-4, 2009
Intersections: SW Bwy & Harrison

“After” Video – 12 hrs
Dates: August 3-12, 2010
Intersections: SW Broadway & Montgomery, SW Bwy & College
Riding on SW Broadway (Stated)

Number of responses (n=121)

- I don't know: Before = 4, After = 1
- 4 or more Days a Week: Before = 32, After = 51
- 1-3 Days a Week: Before = 22, After = 36
- 1-3 Times a Month: Before = 16, After = 22
- Less than Once a Month: Before = 25, After = 10
- Never: Before = 22, After = 1

Never
Preference for Cycle Track

“Consider two scenarios: Imagine you are cycling from home to work.

- Under scenario A, the total trip requires 4 miles of cycling, including 2 miles on a busy street with a bike lane.
- Under scenario B, the total trip is 4.5 miles; however, 2 of those miles are on a cycle track.

Which scenario would you choose?”

A majority (59%) would choose the cycle track.
# Cyclist Counts and Lane Choice

## Before: SW Broadway at Harrison
### 6/3/2009 (Weds)

<table>
<thead>
<tr>
<th>Time</th>
<th>Bike Lane</th>
<th>MV Lane</th>
<th>Sidewalk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-8am</td>
<td>36</td>
<td>4</td>
<td>1</td>
<td>41</td>
</tr>
<tr>
<td>8-9am</td>
<td>32</td>
<td>5</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>9-10am</td>
<td>47</td>
<td>7</td>
<td>0</td>
<td>54</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td><strong>115</strong></td>
<td><strong>16</strong></td>
<td><strong>1</strong></td>
<td><strong>132</strong></td>
</tr>
<tr>
<td>4-5pm</td>
<td>40</td>
<td>4</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>5-6pm</td>
<td>51</td>
<td>8</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>6-7pm</td>
<td>40</td>
<td>5</td>
<td>0</td>
<td>45</td>
</tr>
<tr>
<td><strong>PM</strong></td>
<td><strong>131</strong></td>
<td><strong>17</strong></td>
<td><strong>1</strong></td>
<td><strong>149</strong></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>246</strong></td>
<td><strong>33</strong></td>
<td><strong>2</strong></td>
<td><strong>281</strong></td>
</tr>
</tbody>
</table>

## After: SW Broadway at Montgomery
### 8/4/2010 (Weds)

<table>
<thead>
<tr>
<th>Time</th>
<th>Cycle Track</th>
<th>MV Lane</th>
<th>Sidewalk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-8am</td>
<td>45</td>
<td>1</td>
<td>0</td>
<td>46</td>
</tr>
<tr>
<td>8-9am</td>
<td>44</td>
<td>1</td>
<td>0</td>
<td>45</td>
</tr>
<tr>
<td>9-10am</td>
<td>35</td>
<td>0</td>
<td>1</td>
<td>36</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td><strong>124</strong></td>
<td><strong>2</strong></td>
<td><strong>1</strong></td>
<td><strong>127</strong></td>
</tr>
<tr>
<td>4-5pm</td>
<td>36</td>
<td>2</td>
<td>0</td>
<td>38</td>
</tr>
<tr>
<td>5-6pm</td>
<td>59</td>
<td>1</td>
<td>1</td>
<td>61</td>
</tr>
<tr>
<td>6-7pm</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td><strong>PM</strong></td>
<td><strong>118</strong></td>
<td><strong>3</strong></td>
<td><strong>1</strong></td>
<td><strong>122</strong></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>242</strong></td>
<td><strong>5</strong></td>
<td><strong>2</strong></td>
<td><strong>249</strong></td>
</tr>
</tbody>
</table>

### Totals
- **Before**: 281 cyclists (88% Bike Lane, 12% MV Lane, 1% Sidewalk)
- **After**: 249 cyclists (97% Cycle Track, 2% MV Lane, 1% Sidewalk)
I understand how PEDESTRIANS are supposed to cross this section of SW Broadway

Most pedestrians understand how they are supposed to cross this section of SW Broadway

The cycle track has made this section of SW Broadway SAFER for me as a cyclist.

The cycle track has made this section EASIER for me to use as a cyclist.

The cycle track makes for a better cycling environment in Portland.

Motor vehicle driver behavior on this section of SW Broadway is safer and calmer

Motor vehicles travel at faster speeds since the cycle track was installed.

While riding IN THE CYCLE TRACK, I have to pay a lot of attention to avoid being “doored”

While riding IN A STANDARD BIKE LANE next to parking, I have to pay a lot of attention to avoid...
View of traffic signals
Cyclist compliance with red signal

- **Before**
  - 55 cyclists arrive on red, 41% violated the red signal indication

- **After**
  - Of 113 cyclists arriving on red, 44% violated the red signal
  - 63% stated that they were required to STOP
Cyclist left-turn movements

**Stated**
- 33%
- 7.5%
- 54%

**Observed (24)**
- 29%
- 29% + 29%*

* Waited next to in the cycle track
Motor vehicle delay is low

- Motor vehicle delay is still low after removing one travel lane
- LOS A < 10 sec/veh
The cycle track has made driving safer
I like that bikes and cars are more separated
Parking is more stressful and challenging
I have changed how I drive
Traffic has gotten worse since the cycle track
Driver behavior is safer and calmer
It takes longer to drive this section of SW Broadway

Motorists' opinions

<table>
<thead>
<tr>
<th></th>
<th>Non Cyclist</th>
<th>Cyclist</th>
</tr>
</thead>
<tbody>
<tr>
<td>The cycle track has</td>
<td></td>
<td></td>
</tr>
<tr>
<td>made driving safer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>Somewhat Disagree</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>Neither Agree nor</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree nor Disagree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat Agree</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Strongly Disagree
Somewhat Disagree
Neither Agree nor Disagree
Agree nor Disagree
Strongly Agree
Somewhat Agree
Interactions with pedestrians

- **Survey**
  - 12% (24/197) peds stated that they had been involved in near collision with cyclist
  - 24% (48/197) peds had witnessed a near collision
  - 31% of cyclist stated they had encountered a pedestrian in the cycle track during green

- **Video**
  - 113/407 cyclists passed within 15’ of ped
  - Noted 10/113 (9%) interactions (5 minor, 4 evasive, 1 emergency)
Other issues

- Parking does not seem to be a problem any more.
- Loss of curb access presents a challenge to physically handicapped persons.
  - Note TriMet #68 buses enter cycle track to disembark passengers in AM peak.
Recommendations

- **Bicycle-pedestrian interactions**
  - Bike signal in cycle track
  - Additional striping, signing (crosswalk in cycle track).

- **Left-turns**
  - Additional channelization
  - Bike signals on far or near side

- **ADA/Curb issues**
  - Install raised concrete curb
  - Create landing pad by raising cycle track to curb height.
SW Stark and Oak Buffered Bike Lanes

Before

After

Proposed Buffered Bike Lane:
SW Oak - Stark

Legend:
- Buffered Bike Lane
- Existing bike lanes
- Off-street path
- Streetcar / MAX
- See cross section detail
<table>
<thead>
<tr>
<th>Intersection</th>
<th>SW Oak</th>
<th>SW Stark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right turn possible</td>
<td>Presence of turn lane</td>
</tr>
<tr>
<td>SW 12(^{th}) Ave</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>SW 11(^{th}) Ave</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>SW 10(^{th}) Ave</td>
<td>Yes</td>
<td>Shared bike lane / turn lane</td>
</tr>
<tr>
<td>SW 9(^{th}) Ave</td>
<td>No</td>
<td>--</td>
</tr>
<tr>
<td>SW Park Ave</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SW Broadway Ave</td>
<td>No</td>
<td>--</td>
</tr>
<tr>
<td>SW 6(^{th}) Ave</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SW 5(^{th}) Ave</td>
<td>No</td>
<td>--</td>
</tr>
<tr>
<td>SW 4(^{th}) Ave</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SW 3(^{rd}) Ave</td>
<td>No</td>
<td>--</td>
</tr>
<tr>
<td>SW 2(^{nd}) Ave</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SW 1(^{st}) Ave/ SW Washington</td>
<td>No</td>
<td>--</td>
</tr>
<tr>
<td>SW Naito Parkway</td>
<td>Start</td>
<td>--</td>
</tr>
</tbody>
</table>
Buffered Bike Lanes – Cyclist Survey

- **297 Cyclists “intercepted”**
- **125 Responded to online survey (42%)**

### Age Group of Respondents

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-17</td>
<td>0</td>
</tr>
<tr>
<td>18-24</td>
<td>4</td>
</tr>
<tr>
<td>25-34</td>
<td>34</td>
</tr>
<tr>
<td>35-44</td>
<td>55</td>
</tr>
<tr>
<td>45-54</td>
<td>22</td>
</tr>
<tr>
<td>55-64</td>
<td>6</td>
</tr>
</tbody>
</table>

- **72% male**
- **28% female**
Buffered Bike Lane - Motorist Survey

- ~500 Motorists invited to participate
- 114 took paper survey (23%)

54% male and 45% female.
43% never cycle.
Buffered Bike Lane – Business Survey

- All street facing businesses on SW Stark and Oak invited to participate (59)
- 35 Surveys Completed (59%)

<table>
<thead>
<tr>
<th>Daily Customers</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 25</td>
<td>Less than 5</td>
</tr>
<tr>
<td>25-49</td>
<td>5-9</td>
</tr>
<tr>
<td>50-99</td>
<td>10-14</td>
</tr>
<tr>
<td>100-199</td>
<td>15-19</td>
</tr>
<tr>
<td>200+</td>
<td>20-24</td>
</tr>
<tr>
<td></td>
<td>25+</td>
</tr>
</tbody>
</table>
### Video Review

#### Before Video – 6 hrs
- Dates: Sept. 2-4, 2009
- Intersections:
  - SW 4th and Oak
  - SW 5th and Stark

#### After Video – 12 hrs
- Dates: Aug. 9-19, 2010
- Intersections:
  - SW 3rd and Stark
  - SW 6th and Oak
  - SW 4th and Oak
Cyclists perceptions

Riding on SW Oak and SW Stark is SAFER for me as a cyclist.

Riding on SW Oak and SW Stark is EASIER for me as a cyclist.

While riding in the BUFFERED BIKE LANES, I have to pay a lot of attention to avoid being “doored”.

While riding in STANDARD BIKE LANES, I have to pay a lot of attention to avoid being “doored”.

I prefer a BUFFERED BIKE LANE over a STANDARD BIKE LANE.
Riding on SW Stark/Oak (Stated)

Number of responses (n=125)

- I don't remember: 6 Before, 35 After
- 4 or more days a week: 35 Before, 79 After
- 1-3 days a week: 19 Before, 35 After
- 1-3 days a month: 10 Before, 9 After
- Less than one day a month: 14 Before, 14 After
- Never: 1 Before, 41 After
### Cyclist Counts on SW Stark/Oak (Observed)

<table>
<thead>
<tr>
<th>Street</th>
<th>Before (9/09)</th>
<th>After (8/10)</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW Oak (AM)</td>
<td>74</td>
<td>275</td>
<td>275%</td>
</tr>
<tr>
<td>SW Stark (PM)</td>
<td>191</td>
<td>339</td>
<td>77%</td>
</tr>
</tbody>
</table>
Some confusion about use

- When can cars be in the buffered bike lane?
# Observed right-turning actions

<table>
<thead>
<tr>
<th>Turning Action</th>
<th>Stark/5&lt;sup&gt;th&lt;/sup&gt; 8/10/10</th>
<th>Stark/5&lt;sup&gt;th&lt;/sup&gt; 8/11/10</th>
<th>Oak /4&lt;sup&gt;th&lt;/sup&gt; 8/17/10</th>
<th>Oak /4&lt;sup&gt;th&lt;/sup&gt; 8/18/10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right turn from the motor vehicle lane</td>
<td>35</td>
<td>30</td>
<td>49</td>
<td>52</td>
<td>166</td>
</tr>
<tr>
<td>Right turn from the buffered bike lane</td>
<td>37</td>
<td>27</td>
<td>21</td>
<td>22</td>
<td>107</td>
</tr>
<tr>
<td>Right turn from parking lane/area</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>61</td>
<td>78</td>
<td>77</td>
<td>291</td>
</tr>
</tbody>
</table>
Motorists’ opinions

- The buffered bike lanes have made driving safer
- The buffered bike lanes have made driving less convenient
- I like that bikes and cars are more separated
- Parking is more stressful and challenging
- I have changed how I drive
- Traffic has gotten worse since the buffered bike lanes
- Driver behavior is safer and calmer
- It takes longer to drive these sections of SW Oak and Stark

- Strongly Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Strongly Agree
Motor vehicle delay

Average Control Delay per Vehicle

0.0 10.0 20.0 30.0 40.0 50.0 60.0

4:00-4:14:59
4:15-4:29:59
4:30-4:44:59
4:45-4:59:59
5:00-5:14:59
5:15-5:29:59
5:30-5:44:59
5:45-6:00

SW4th and Oak, 8/17
SW4th and Oak, 8/18
SW5th and Stark, 8/10
SW5th and Stark, 8/10
Businesses: Some Support

- I support the buffered bike lanes on SW Oak
- I support the buffered bike lanes on SW Stark
- The buffered bike lanes are an important part of downtown Portland’s bicycle network
- Downtown business owners should encourage their employees to get to work by means other than driving alone.
- The buffered bike lanes increase transportation options for employees and/or customers
Business Concerns

The buffered bike lanes...

...make parking more difficult for my customers

...make deliveries to my business more challenging

...make parking more difficult for my employees

...have had a positive effect on my business sales

...increase bike and foot traffic to my business
Recommendations

- Additional markings (bike stencils or color) to further delineate the lane as a bike lane
- Consistent treatment of right turns
Conclusions

- Both facilities appear to be working well though some improvements identified.
- SW Broadway cycle track is unique
  - Pedestrian issue is “worst case” on the SW Broadway (issues existed prior to cycle track) but best case for right-turn conflicts
Cycle Tracks

Images from “Cycle Tracks: Lessons Learned” Alta Design + Planning
Buffered Bike Lanes

New York (Streetsblog)  Seattle (SDOT)
Questions?

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Mayor’s Office Video

- http://www.vimeo.com/10559007