November Ped/Traffic Safety Committee Meeting
November 29, 2018
San Francisco Bike Operations and Design
Alliant Engineering

Present:
- Ryan Anderson, City of Minneapolis
- Brent Clark, SRF
- Peter Dirks, University of MN MTO
- Luis Flores, Dakota County
- Hannah Johnson, Alliant
- Tyler Krage, Alliant
- Todd Olson, Alliant
- Mackenzie Schuster, Alliant
- Stephen Smith, HNTB
- Nick Turner, Alliant

Presentations by Laura Stonehill and Johnathon Chimento from San Francisco Municipal Transportation Agency (SFMTA). Green wave presentation is attached in minutes

Green Wave Presentation – Laura Stonehill

-Purpose of project was to choose project corridors with 4 or more signals, no TSP operation, and significant bicycle traffic, then improve traffic operations of bicycles by coordinating at bicycle speeds.

-Pilot project was implemented at 4 corridors, Valencia, Folsom, 14th, and Northpoint.

- Due to hilly terrain of San Francisco streets, tests were done to determine ideal biking speeds at each corridor. Corresponding speeds were entered into synchro models of existing signal timings. No changes were made to cycle lengths or split times, strictly offsets. Signals ran pretimed 60 or 90 second cycles (during peak times), and were all 2-phased, therefore no left conflict phase issues arose.

- Once Implemented, green wave timing allowed for a large decrease in bicycle stops, and from a qualitative standpoint worked very well. In general bicycle travel times were decreased up to 10%, with nearly 100% reduction in stopping
at reds. Public perception was positive of the timing, and there was a noticeable increase in bicycle traffic on the corridors. Signage was implemented of ideal speeds to hit ideal traffic optimization.

-It should be noted that San Francisco’s traffic signal system is piecemeal, in that most of the corridors are not coordinated, unless there was need for a project to optimize their corridor. Also there was a not a priority to push red to red offset timing, so although motor traffic would theoretically improve if driving at bicycle speeds, in certain cases vehicles did not need to slow down to receive benefits of optimization. No studies were completed to determine impacts on motor traffic as part of this project.

Valencia Bike Lane Design – Johnathon Chimento

Johnathon reviewed the bike lane design plans on Valencia.

Notable points included the following:

-SFMTA’s road system has large lane widths to accommodate firetruck accessibility, which designates up to 26’ of roadway width. This allows for plenty of room to accommodate bike lanes.

-Bike lanes utilize protected status through parking. No issues with door swing and bike lanes (did at first location, updated dimensions to make them work). Parklets also serve as bike protection in addition to street beautification. Still used bollards for protection in addition to parking.

-Specific phases for bikes on signals. Most signals along corridor utilize 2-phase signals. 2 Stage left turn boxes are utilized for left turning bikes.

-Right Turn on Red (RTOR) used in locations with turning boxes and bike signal phases.

-No separate clearance times needed for bike phases, as per California practices.

-Bike lanes functioned very well in locations of floating bus stops.

ROUND ROBIN/ANNOUNCEMENTS

-Next meeting to occur in late January to brainstorm future topics
-Looking for volunteers to champion certain “research” topics
-KC Atkins to take chair role, with Stephen Smith stepping in for co-chair role.

Minutes by Tyler Krage
North Point
14th St
Valencia
Folsom
Where?

• Universe =
  – On bike network
  – 4 or more signals in a row

• Eliminate corridors for:
  – Not having a bike lane
  – Different systems/cycle lengths
  – Transit Signal Priority
  – Offsets already optimized for transit
  – Too many constraints (cross streets already have progression)
  – Can’t change just a part of downtown grid

• Prioritized based on # of cyclists
For any one-way green wave, you can use the following equation to determine the proper offsets needed to maintain progression at a given speed and block length:

\[ \text{Offset} = 0.68 \times \frac{d}{r} \]

\[ d = \text{block length (feet)}, \text{ and } r = \text{design speed (mph)} \]

A two-way green wave works best in flat areas when the cycle length is twice the length of the offset, when there are moderate to low auto volumes, and when traffic lights are equally spaced. Given existing cycle lengths and block lengths, this table shows what design speed would enable a two-way green wave. Highlighted cells indicate bicycle speeds between 10 and 15 mph.

### Two-Way Green Wave Design Speeds

<table>
<thead>
<tr>
<th>Block Length in Feet</th>
<th>Cycle Length in Seconds (divide by 2 to get the offset)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60</td>
</tr>
<tr>
<td>400</td>
<td>9.1</td>
</tr>
<tr>
<td>500</td>
<td>11.3</td>
</tr>
<tr>
<td>600</td>
<td>13.6</td>
</tr>
<tr>
<td>700</td>
<td>15.9</td>
</tr>
<tr>
<td>800</td>
<td>18.1</td>
</tr>
<tr>
<td>900</td>
<td>20.4</td>
</tr>
</tbody>
</table>

Note that if the green phase is the same length of time at each subsequent light, the green wave will be the most straightforward to use.
Model corridor in Synchro
Calculate Design Speed by riding corridor

NORTH POINT (Before)

Eastbound- (3:56 pm, 111, All other times) Travel Time 2:50 min, Distance .72 miles, Average speed = 15 mph
Hit red light at Stockton (7 green/ 1 red)

Westbound- (3:47 pm, 111, All other times) Travel Time 5:46, Distance .72 miles, Average speed = 7.5 mph
Hit 5 red/ 3 green
Not sure why I stopped between Powell and Mason
Put Design Speeds into Synchro
• One-way or two-way?
• 111, 212, 313
• 25mph
• Transit impacts
Two-way green wave with wide bands

North Point from Polk to Stockton

212 Proposed two-way
No red lights!

Folsom

![Graph showing speed (MPH) vs. intersection, with orange and blue lines indicating before and after conditions.]

**Before**

- **Southbound**: (12:55pm, 111, all other times)
- **Travel Time**: 5:56 min
- **Distance**: 1.01 Miles
- **Traffic Lights**: 3 green, 7 red

Started with start of green at 14th

**After**

- **Southbound**: (3:20pm, 111, all other times)
- **Travel Time**: 5:18 min
- **Distance**: 0.98 miles
- **Traffic Lights**: 10 green, 0 red

Slowed down once for right turning vehicle
Lessons Learned

• Uphill design speeds vary from person to person
• Future signal timing changes can easily screw up green wave
• Transit Signal Priority expanding citywide- Mostly incompatible with green waves
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