Policy & Operations Advisory Group

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Transportation Operations and Policy & Planning Divisions
7/23/2020 Department of Transportation

City of Seattle

Recap: Introduction to Signal Operations

Regulating the flow of people and goods in one of the nation's fastest growing cities

Recap: types of signal operations

Adaptive

Signals respond in real time to detected changes in traffic conditions.

Coordinated

Signals are timed with respect to other signals in a corridor or network.

Isolated

Signals operate alone and do not consider other intersections.

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Recap: signals introduction

Pedestrian timing

- Walk and flashing don't walk

Pedestrian actuation

- Push button is activated

Cycle length

- Time to serve each movement at a signal

Types of signal phasing

- Protected
- Permitted
- Pedestrian
- Bike
- Transit

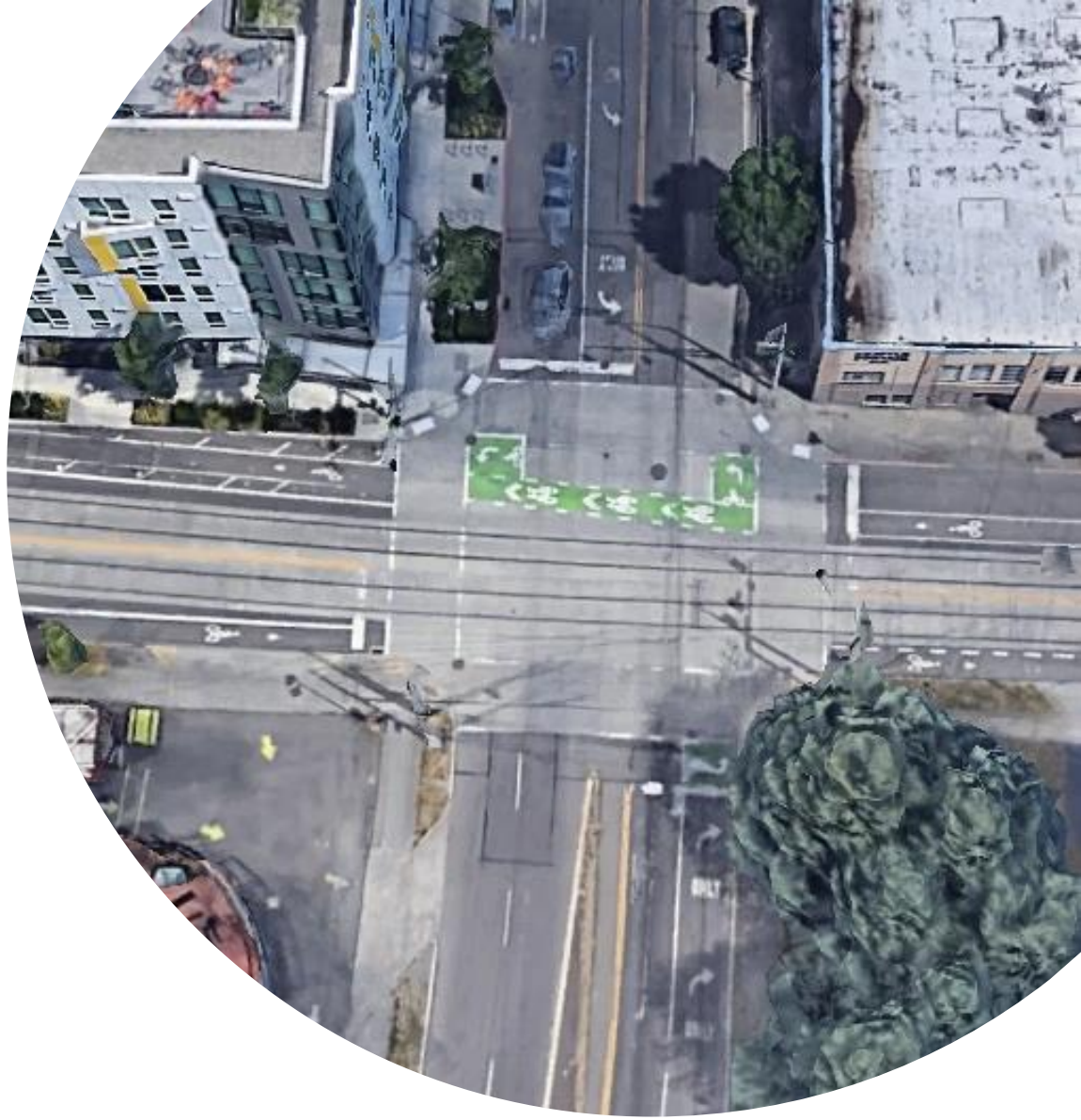
Recap: signal operation trade-offs

Operational Changes	Adding Phases	Increasing pedestrian crossing time	Adding pedestrian recall	Reducing cycle lengths
Vehicle and transit delay	Increase thru delay Reduce turning delay	Could increase	Increase	Increase congestion and queueing
Pedestrian & bike delay	Increased delay	Increases as a result of cycle length	Increase delay on main street. No change on side street	Reduces ped/bike wait times
Pedestrian accessibility	Reduces conflicts	Improves access	Improves expectations	Increases access
Conflicts	Reduced conflicts between vehicles and pedestrians and bikes	No change	Potential increase in red light running and jaywalking	Potential increase in collisions due to congestion

12th Ave & Yesler Way

Current conditions:

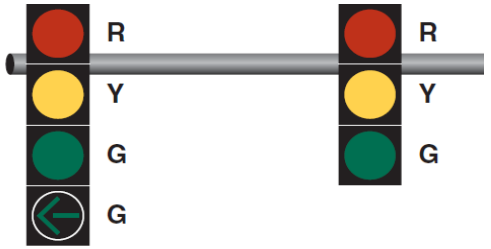
- Two phases with permitted left-turns
- Pedestrian recall
- Bike lanes and streetcar on Yesler Way
- Near an elementary school
- High collision location
- No space for left-turn pockets on Yesler Way
- Streetcar and traffic in same lanes
- Closely spaced signals



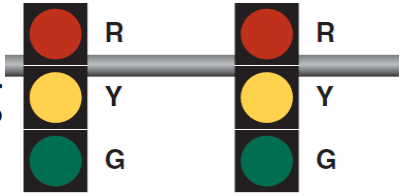
12th Ave & Yesler Way

Potential signal operation:

1. Protect eastbound and westbound left-turns



2. Maintain permissive left-turn phase and install leading pedestrian and bike intervals



3. Restrict eastbound and westbound left-turns

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12th Ave & Yesler Way trade-offs

Trade-offs (from existing)	Protected left-turns	Leading bike and pedestrian interval	Restrict left-turns
Transit delay	Increased ~50 sec per cycle	Slightly Increase ~5 sec per cycle	Reduced ~15 sec per cycle
Pedestrian & bike delay	Increased ~30 - 40 sec per cycle	Maintained	Maintained
Conflicts	Reduced (No EB/WB left turn conflicts)	Slightly Reduced (peds and bikes get a head start)	Reduced (No EB/WB left-turn conflicts)
Vehicle access	Maintained	Maintained	Reduced (215 WB left-turns in peak hour)

Traffic Signal Operations Policy Update

Purpose, policy guidance, and implementation

Purpose & objectives

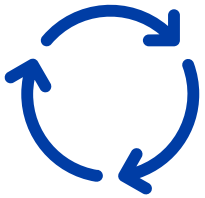
Purpose

- Develop consistent policies for signal operation city wide
- Establish a unified policy on traffic signal timing and actuation
- Support mobility and access while minimizing delay to pedestrians
- Respond to City Council Resolution 31909

Objectives

- Develop policies around improved pedestrian access
- Provide direction for signal engineers and practitioners to be consistent
- Implement equitably and based on data
- Consistent implementation based on land use

Policy components



1. Define maximum cycle length

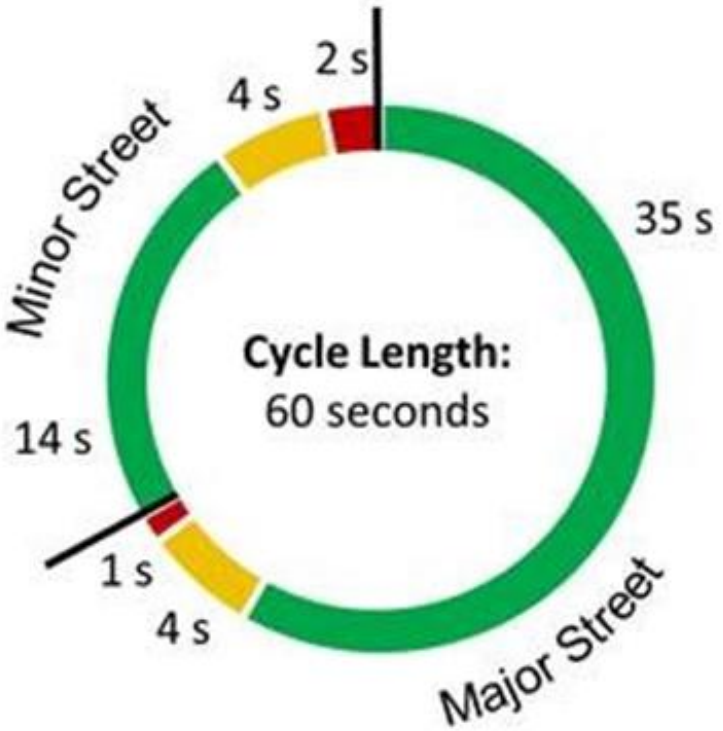
2. Increase pedestrian crossing time

3. Pedestrian actuation (push buttons)

4. Implement policy

1. Maximum cycle length

- Cycle length is the time required to complete one entire sequence of signal indications for all movements
- Our typical cycle lengths range from 60 to 120 seconds



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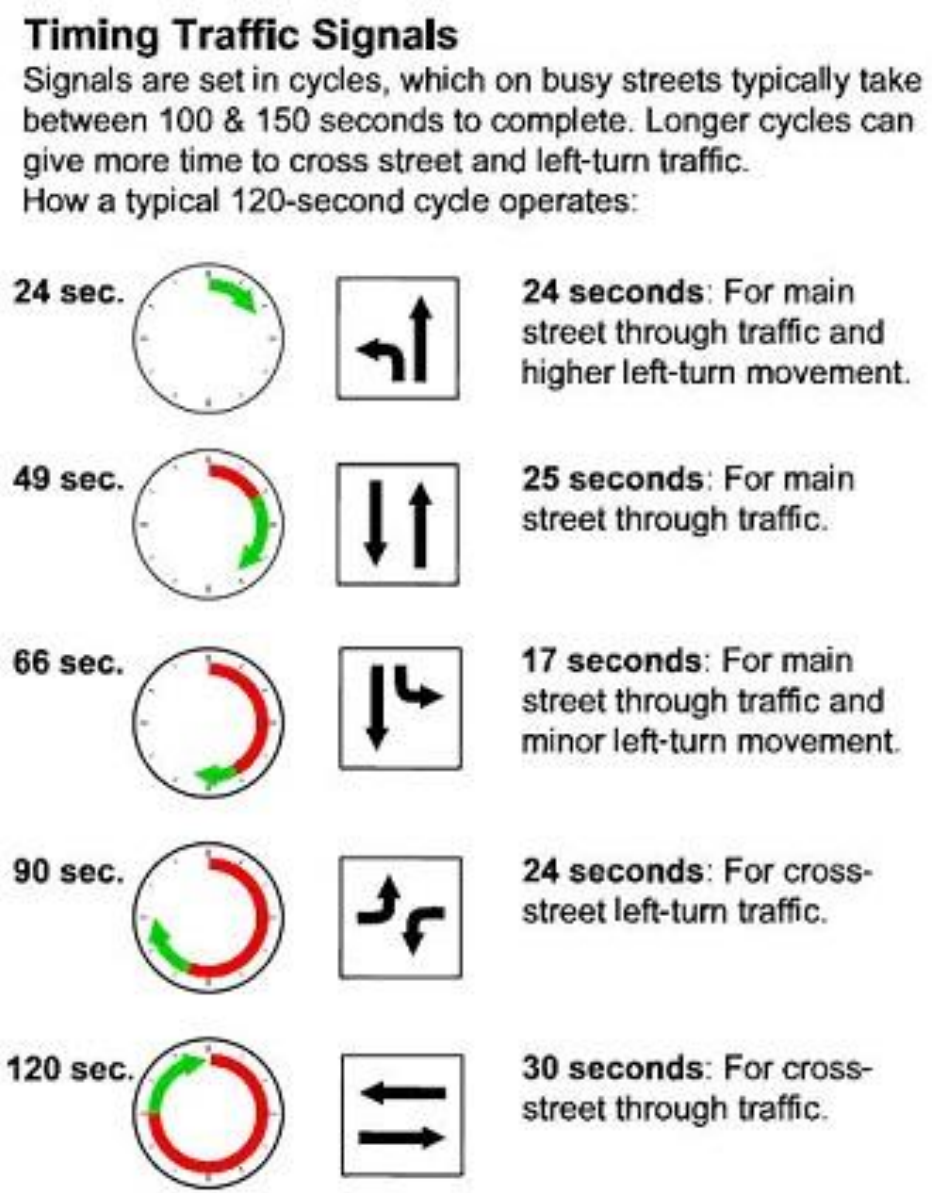
Cycle length key factors

- Width of intersections and pedestrian crossing time
- Number of protected movements and separate phases
  - Multiple phase intersections typically require long cycle lengths
  - Two phase intersections can usually run short cycle lengths



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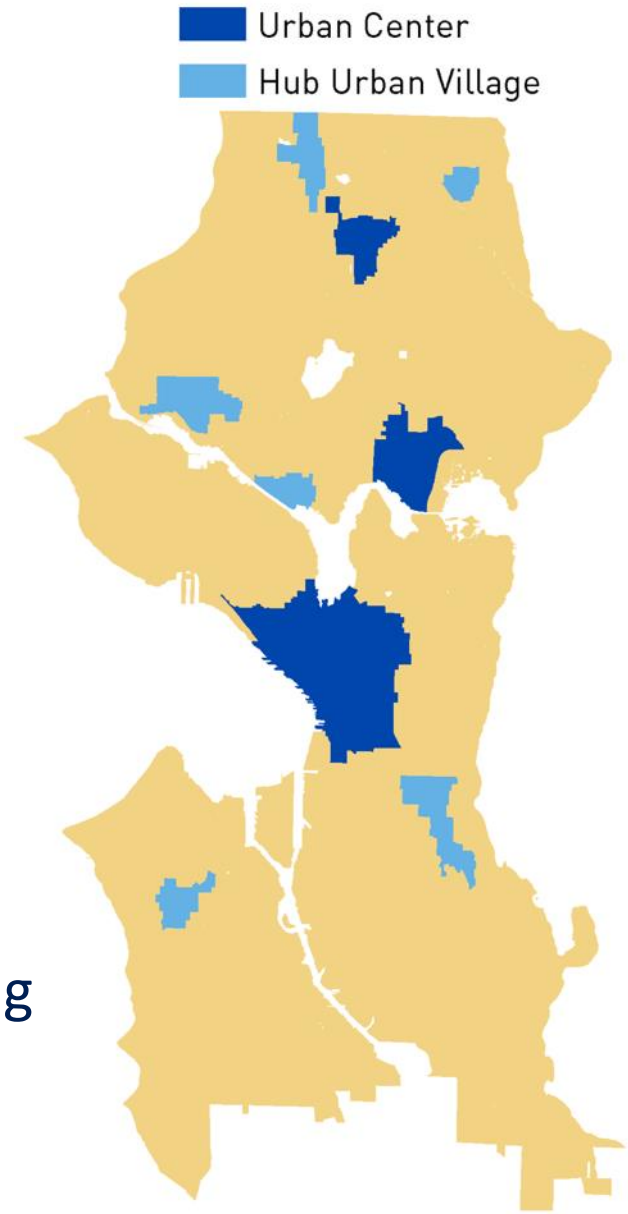
Cycle length policy

Proposed SDOT CYCLE LENGTH POLICY:

- *No greater than 100 seconds in urban centers*
- *No greater than 180 seconds in manufacturing/industrial centers*
- *In all other locations:*
  - *No greater than 120 second along minor and collector arterials*
  - *No greater than 150 seconds along principal arterials*

Goal: maintain shorter cycle lengths as feasible while allowing us flexibility to respond to incidents and events that may require special timing

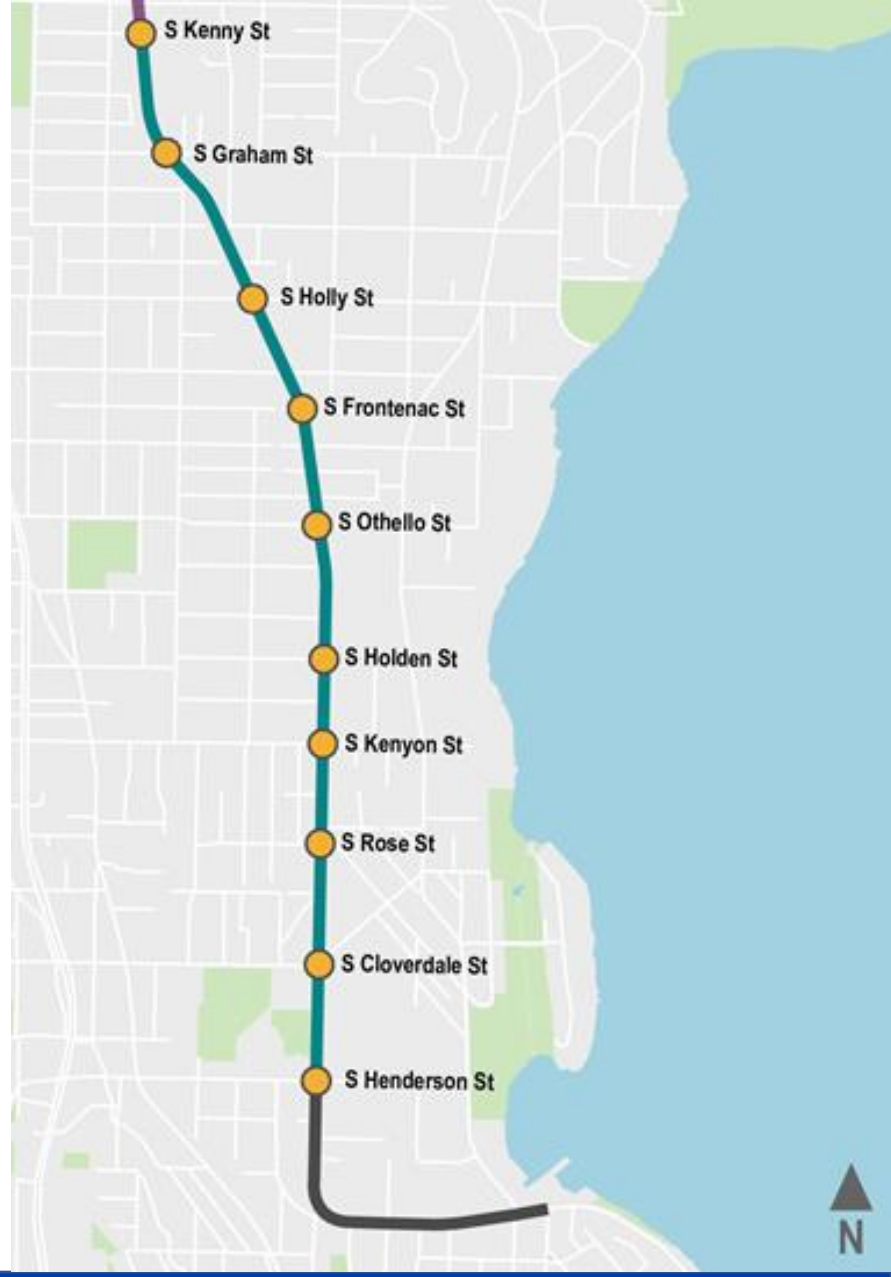


Revisiting Rainier Ave S

Rainier Ave S (S Kenny St to 52nd Ave S):

- Minimum cycle length: 76 seconds
- Actual cycle length: 90 and 45 seconds most of the day, 100 and 50 seconds in PM peak
  - 6 intersections run 90 and 100
  - 7 intersections run 45 and 50

Trade off: running a longer cycle at some intersections allows a much shorter cycle at others, reducing transit impact along Rainier.



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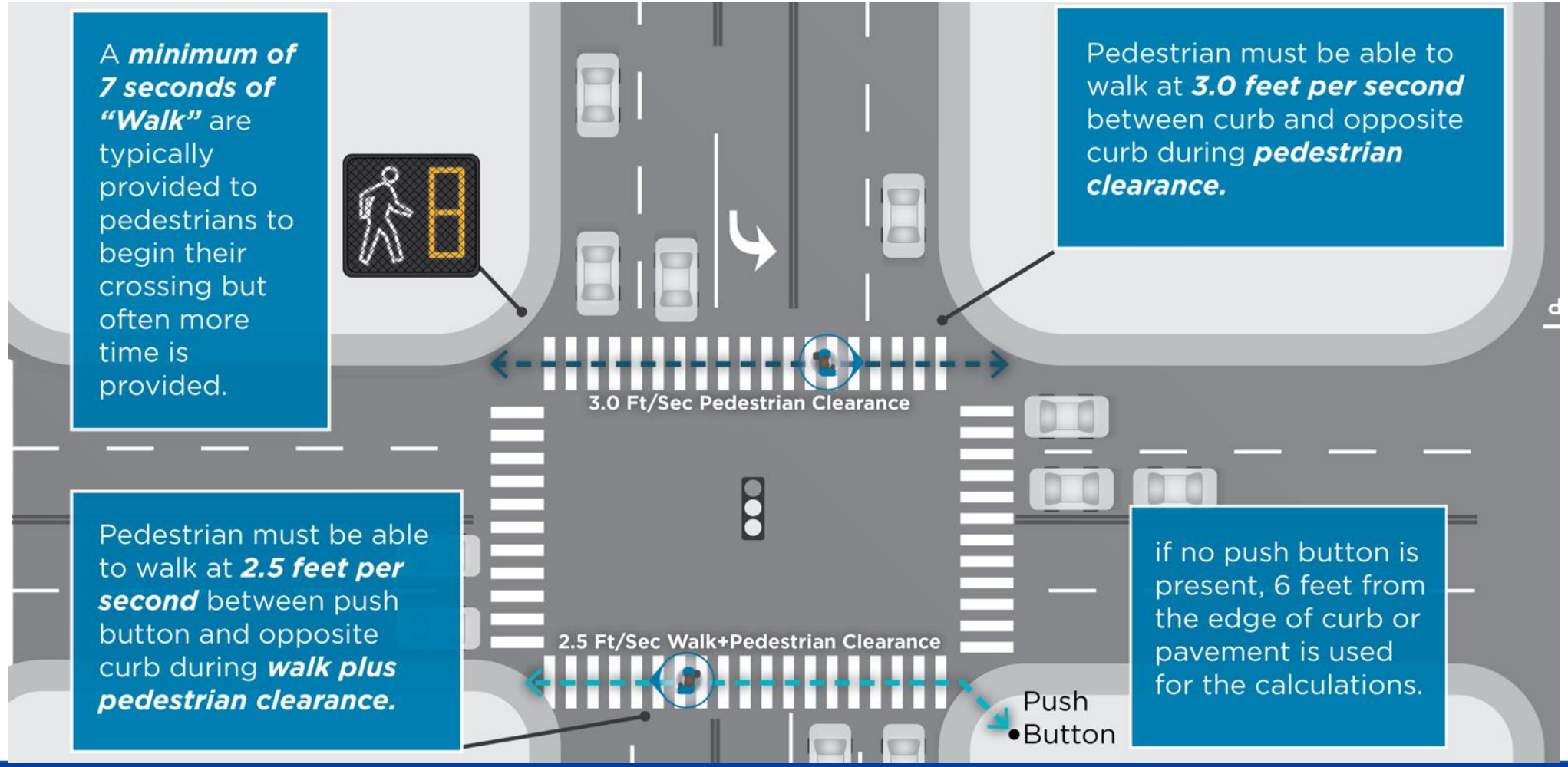
Additional trade-offs and discussion

- Reduced wait time for people walking and biking across the main street
- Reduced wait time for side streets and left-turns
- Potential for increased queueing for left-turns
- Potential increased delay for transit and freight along some corridors
- Potential increased delay for people walking and biking along the main street

2. Pedestrian crossing time



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Pedestrian crossing time policy

Pedestrian timing consists of:

- Walk: interval a pedestrian can start crossing the street
- Pedestrian Clearance: interval for a person to cross the street

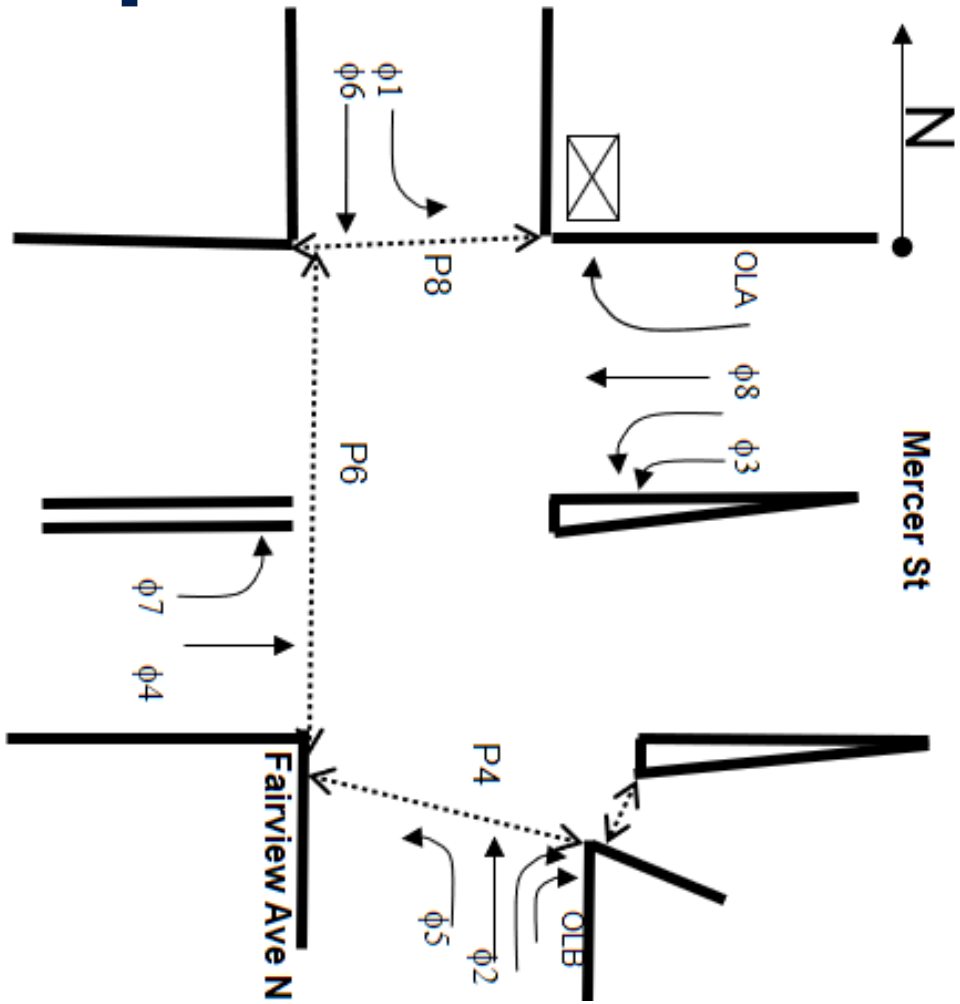
SDOT PEDESTRIAN TIMING POLICY: Pedestrians will get more time to cross all streets

- Walk is 7 seconds or greater (current practice)
- Pedestrian Clearance calculated based on a walking speed of 3 ft/sec
  - MUTCD standard is 3.5 ft/sec
  - Walking speed of 2.5 ft/sec will be used based on community request

Pedestrian crossing time: example

	Using current walking speed	Using new walking speed
Left turns	12 seconds	12 seconds
Fairview Ave N	42 seconds	51 seconds
Mercer St	32 seconds	38 seconds
Minimum cycle length	98 seconds	113 seconds

Trade-off: giving more time for pedestrians to cross the street will result in more pedestrian wait time



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Additional trade-offs and discussion

- Improved accessibility for all pedestrians
- Longer cycle lengths, especially at large or complicated intersections
- Less time for people to legally step off the curb to begin crossing
- More time allocated to the side street
- Additional delay along arterials

3. Pedestrian actuation

Pedestrian recall: walk phase comes up without pushing push button

Actuated pedestrian: push button needs to be pushed for walk phase

Type	Pedestrian Operation	Vehicle Operation
Total Recall (pre-timed)	All pedestrian movements automatically served	All or most vehicle movements automatically served for a set amount of time.
Partial Recall (semi-actuated)	Pedestrian movement along main street served automatically Pedestrian movement across main street requires pedestrian detection	Main street vehicle movement served automatically Side street vehicle movement requires vehicle detection
No Recall (fully actuated)	All pedestrian movements require pedestrian detection	All vehicle movements require vehicle detection
No Recall (pedestrian half-signal)	Pedestrian movement across main street requires pedestrian detection	Main street vehicle movement served automatically Side street vehicle traffic controlled by stop sign

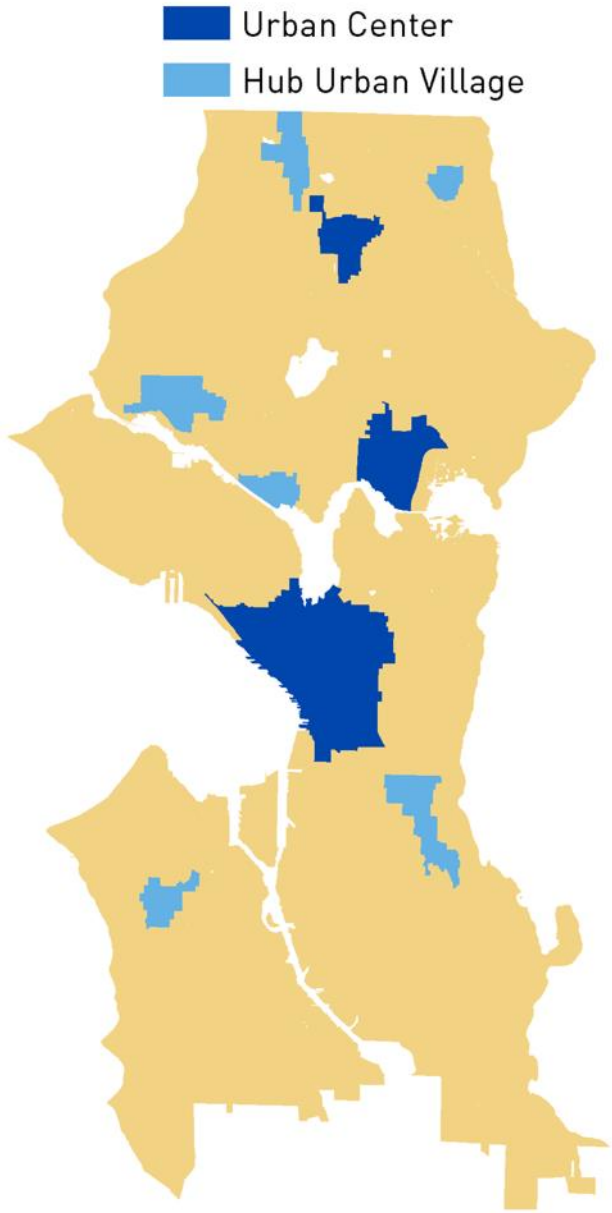
Pedestrian actuation policy

Proposed/Draft SDOT PEDESTRIAN ACTUATION POLICY:

- Provide total pedestrian recall at all intersections within Urban Centers and Hub Urban Villages unless unfeasible given intersection characteristics
  - Excludes pedestrian only signals and phases
- Use data to determine if signal should be actuated or in recall at all other location
- Pedestrian recall will be provided along the main street at the majority of intersections

Pedestrian actuation

- Signals in Urban Centers and Hub Urban Villages account for roughly 50% percent of the city's signals
- As part of COVID-19 response, we have begun implementing this policy and have added recall to over 150 additional signals in these areas (about 80% of signals now have total pedestrian recall)



Pedestrian actuation – additional thresholds

Additional thresholds for installing pedestrian recall to be determined based on study:

- Push buttons are actuated during 50% of cycles for the majority of the day
- Push buttons are actuated during 75% of the cycles during the peak hours
- Pedestrians volumes exceed 100 per hour for at least 4 hours a day
- Adjacent to a school, pedestrian volumes exceed 50 per hour for at least 2 hours a day
- Vehicle green time used for the associated vehicle phase, is within 5 seconds of the minimum needed pedestrian time

Pedestrian actuation example

5th Ave S and S Dearborn St/Seattle Blvd S

All crossings are in pedestrian recall except west crossing, with low pedestrian volumes - 8 per hour

Ped timing for west crosswalk:
walk = 11
FDW = 27
Total = 38 seconds

There are heavy transit volumes in other directions

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Additional trade-offs and discussion

- Prioritized pedestrian access and mobility in Urban Center and Hub Urban villages
- Provides more predictable operations for pedestrians
- Potential increase in travel time for all users traveling along main street
- Limits ability to run shorter cycle lengths at some intersections
- Allows for flexibility and data driven installation Citywide

4. Policy implementation

Implement these policies when:

- Install a new signal
- Modify an existing signal
- Re-time an existing corridor
- Receive a community request

Next steps

#1 – June 25	▪ Kick-off ▪ Introduction to signal operations
#2 – July 23	▪ Draft Comprehensive Traffic Signal Operations Policy: presentation and discussion ▪ Modal Integration: introduction
#3 – August 27	▪ Draft Comprehensive Traffic Signal Operations Policy: continued discussion ▪ Modal Integration: analysis
#4 – Sept 24	▪ Modal Integration: draft policy options
#5 – Oct 22	▪ Modal Integration: draft policy options and operational priority
#6 – date TBD	▪ Modal Integration: policy recommendations and discussion ▪ Wrap-up and reflections