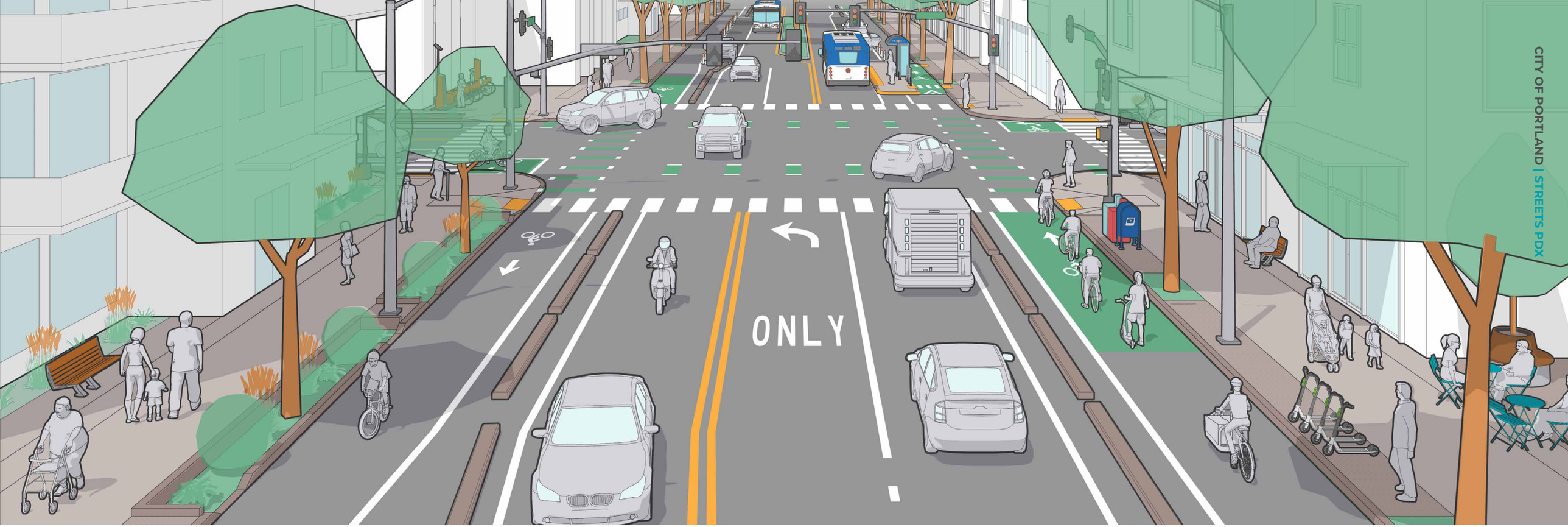
PBOT
PORTLAND BUREAU OF TRANSPORTATION

STREETS PDX

Right-of-way Tradeoff Analysis Handbook

MARCH 2023



INTRODUCTION

When a road is re-designed as part of a capital project, road reconstruction, or in some instances as part of a repaving project, PBOT needs to determine the appropriate cross-section for the street. StreetsPDX developed a decision-making process that provides PBOT with an organized and rational process for considering a roadway's context, the tradeoffs between different right-of-way uses, and guidance for what to do when there is not sufficient space to accommodate all policy-specified uses to their preferred dimensions.

This document complements the Typical Sections found in the online tool, supporting staff to consistently evaluate tradeoffs between the multiple priorities that may apply to a given street. This document has three sections:

Typical Section Selection Process Example (page 4). Describes how this document is used to support the evaluation of potential tradeoffs between available cross sections.

Analyses for each Right-of-Way Function. Each mode of transportation plus greening (street trees and stormwater) has its own page with three columns:

- Analysis of Tradeoffs. Identifies analyses to inform whether a tradeoff is acceptable. These analyses may identify that the tradeoff is of minimal impact or can be addressed through project design.
- Potential Reasons for Accepting Tradeoffs. Directs project managers to assess and attempt to overcome potential constraints to achieving a balanced cross section that meets all policy-specified uses. This step also supports consistent documentation when a constraint cannot be overcome.
- Options to Mitigate Tradeoffs. Identifies options to mitigate impacts to a mode or use, either due to a tradeoff from preferred dimensions or when a use is not accommodated on the corridor.

Analyses Tear Away. Presents all of the content from the individual pages in a single table.

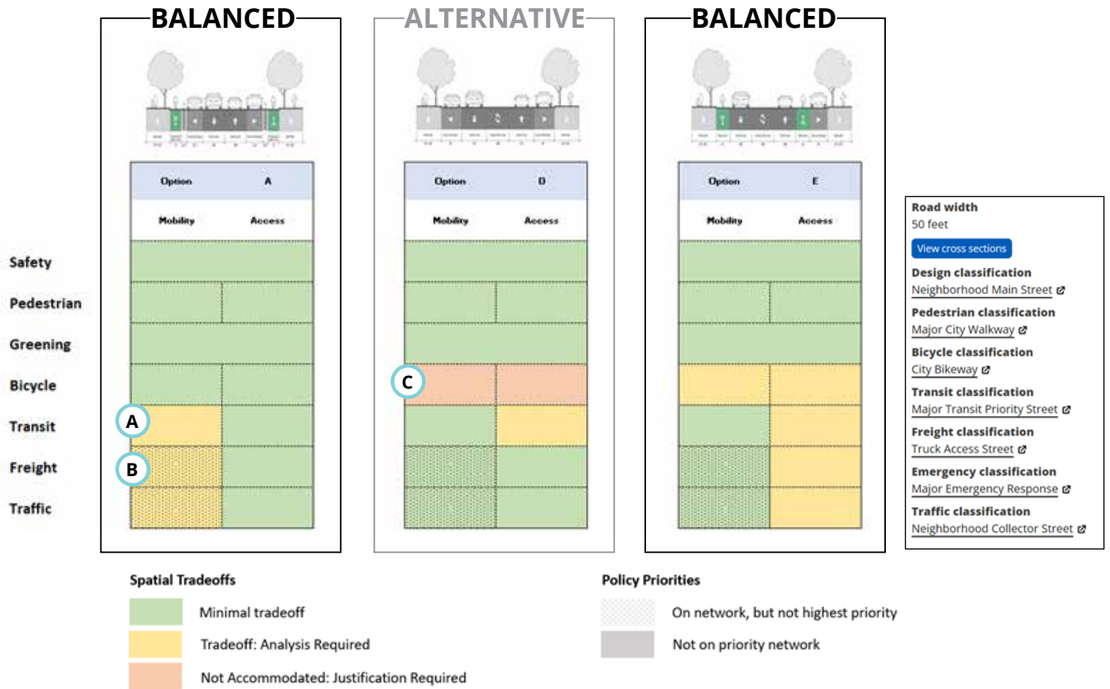
TYPICAL SECTION

SELECTION PROCESS EXAMPLE

From the available cross-section options, the PBOT project manager would like to advance and evaluate the three typical sections below. Two (Options A and E) are 'balanced' in that they can serve all of the priority modes (per the TSP). The yellow boxes indicate where there are potential tradeoffs to consider, using the guidance in this document. The middle cross section (Option D) would be considered an 'alternative' since it would not serve the street's bicycle designation. Not meeting a policy requires justification, again using the guidance in this document.

When a cell is yellow, the information in this document **1)** identifies analyses to help determine if the tradeoff (compromise) is acceptable or **2)** can be mitigated through project design.

When a cell is red, the information in this document **1)** identifies what should be analyzed to determine if the tradeoff (not meeting a policy) can be justified and **2)** identifies strategies to mitigate the tradeoff.



STEP 1

IDENTIFY the yellow and red cells

- (A) **Unshaded yellow** cell indicates a potential tradeoff to a priority mode — in this case, transit mobility (as this is a Major Transit Priority Street).
- (B) **Shaded yellow** cells indicate lower designations on the freight (Truck Access Street) and traffic (Neighborhood Collector Street) networks; potential tradeoffs that impact travel time for these modes may be acceptable to meet other policy needs of the corridor.
- (C) **Unshaded red** cell indicates that a policy is not accommodated - in this case, the bicycle mode. Not accommodating a policy priority needs to be justified to advance this cross-section.

STEP 2

EVALUATE the yellow and red cells

- **STEP 2.1** Review the **tradeoffs analysis** column. Identifies analyses to evaluate the tradeoff, for cross-section A the location and magnitude of delay experienced by transit, and the number of buses and passengers impacted.
- Does a two-lane cross section and any applicable episodic treatments (e.g., a transit queue jump) result in minimal or acceptable delay through this area?

YES — No further action required.

NO — There is unacceptable delay or the episodic treatment is infeasible.

STEP 2.2 Make note of any **potential reasons for accepting a tradeoff.** *In this example, perhaps transit only lanes are infeasible due to existing infrastructure in the curb zone that cannot be relocated.*

→ **STEP 2.3** Are any of the items listed in the **Options to Mitigate Tradeoffs** column acceptable? *In this example, consider alternatives to dedicated transit lanes that can reduce transit delay.*

- Do any of the items listed in the Option to Mitigate Tradeoffs column solve the delay issue?

YES **NO**

STEP 3

DECIDE whether to advance cross section

- Use this analysis to explain the tradeoffs to transit, potential reasons for accepting this tradeoff and the results of any mitigations
- This information, when compared with the analyses from the other sections, may result in a decision not to move forward with this cross section.
- If the review indicates that both balanced sections are acceptable from a tradeoffs perspective, the project manager would recommend Option A since it has fewer tradeoffs (e.g., to the bike facility and access to the curb)

PEDESTRIAN

The Street Design designation and the Pedestrian Design Guide determine the standard sidewalk dimensions for a street. Capital projects are often unable to acquire right-of-way or move existing curbs (and utilities) to widen sidewalks. However, the selected cross section – including the type of use directly adjacent to the curb and the size of the road - influence both the experience of walking along the street and the amount and type of pedestrian crossings needed to meet the City's spacing standards and guidelines for crosswalk design.

ANALYSIS OF TRADEOFFS

MOBILITY

- Appropriate sidewalk widths to accommodate demand
- Encroachments into the pedestrian through zone
- Presence of furnishing zone to buffer pedestrians from adjacent traffic
- Benefit to sub-standard sidewalks of a curb zone buffer from traffic and/or designs consistent with placing furnishings in the curb zone

ACCESS

- Crossing gaps and deficiencies (per city guidelines)
  - » ADT, number of vehicle travel lanes, speed analysis
  - » Length of exposure within pedestrian crossings (in absence of enhanced crossing treatments such as median refuge islands)

POTENTIAL REASONS FOR ACCEPTING TRADEOFFS

MOBILITY

- Insufficient budget to move curbs/ acquire right-of-way; sidewalks to transition with private development
- Topography or presence of trees that are recommended for preservation

ACCESS

- Wider cross section needed to support mobility demands for other modes; design should provide crossings appropriate to roadway context

OPTIONS TO MITIGATE TRADEOFFS

MOBILITY

- Alternate buffer from travel lanes adjacent to curb tight sidewalks (e.g., bike lanes, parking or other non-travel lane curb uses such as passenger and freight loading zones, in-street bike corrals, etc.)
- Access management to reduce number of conflict points along sidewalk

ACCESS

- Enhanced crossings or traffic calming / lane reduction to ease crossings
- Signal enhancements (e.g., Pedestrian Head Start) to manage conflicting movements

GREENING

Greening functions related to tree canopy and stormwater management typically occur in the furnishing zone but can also take place in the curb zone and in some cases in center medians. In locations with adequate right-of-way width and high transportation priorities, green stormwater facilities in the furnishing zone may be preferred. The furnishing zone is the preferred place for street trees; wider furnishing zones support larger trees. Where space behind the curb is limited and there is a parking lane, stormwater facilities or tree wells can be constructed as an extension in the curb-zone and can meet multiple objectives of traffic calming, shortening pedestrian crossing distances, and increased planting areas for street trees.


Source: PBOT

ANALYSIS OF TRADEOFFS

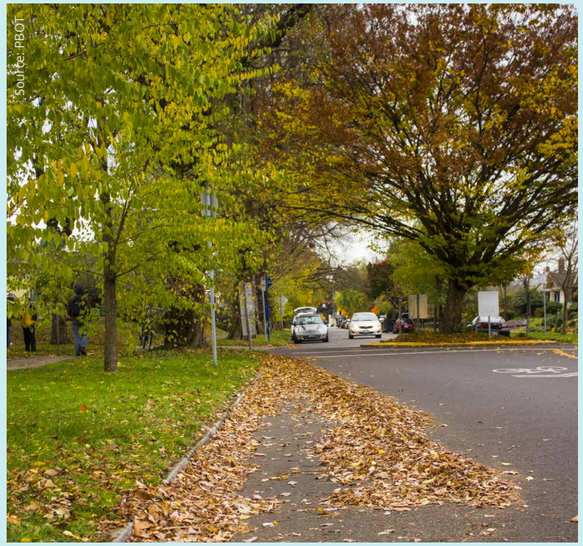
STORMWATER AND TREES

- Stormwater management manual requirements / local storm system and standard treatment
- Tree preservation and planting requirements
- Width of sidewalk furnishing zone to support street trees and/or stormwater management
- Urban heat island effects or lack of canopy in surrounding area
- Presence/absence of trees in frontage zone or on private property

POTENTIAL REASONS FOR ACCEPTING TRADEOFFS

STORMWATER AND TREES

- Curb zone not available to support additional greening functions due to mobility demands from bike/transit
- Utility conflicts (including engineering determinations that trees or surface storm facility may damage underground water or sewer line)
- Sight distance concerns related to driveways or side streets
- Presence of trees in frontage zone or on private property that are required for preservation


Source: PBOT

Note: Considerations and spatial requirements for street trees and green stormwater facilities are not the same. Refer to the specific guidance referenced on this page.

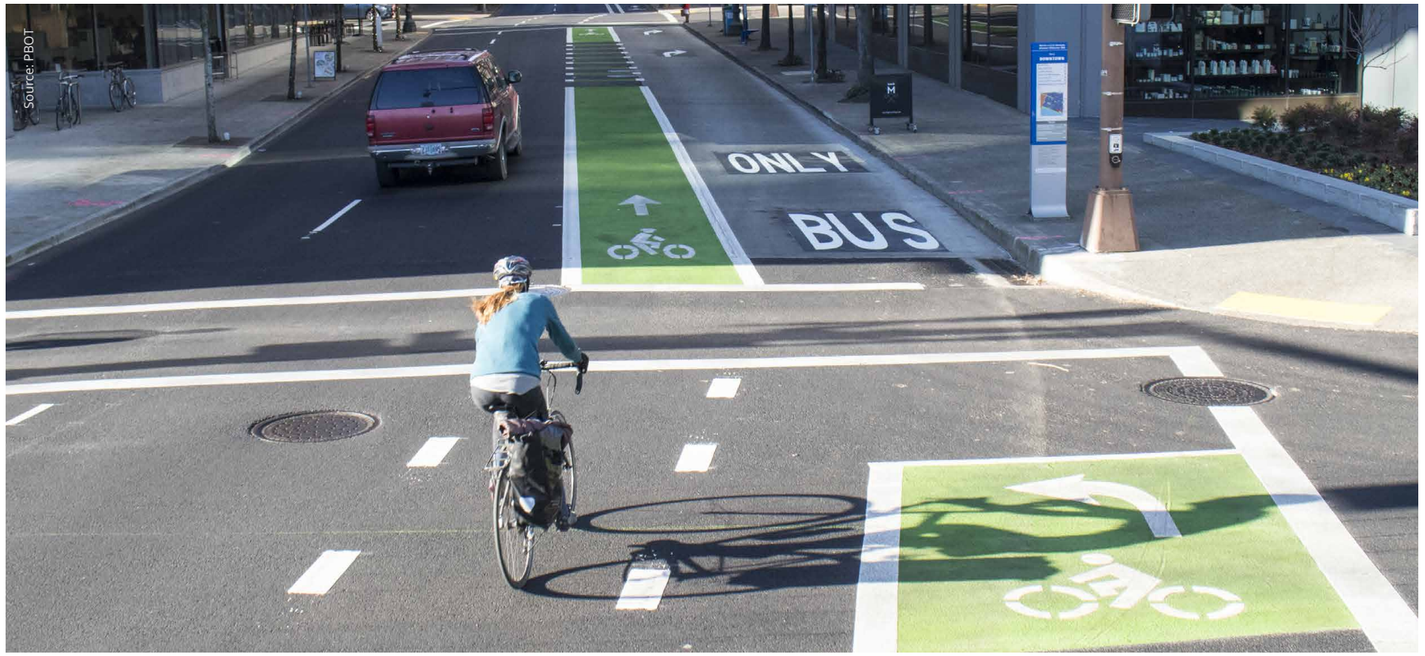
OPTIONS TO MITIGATE TRADEOFFS

STORMWATER AND TREES

- Alternatives to standard stormwater treatment
- Plant trees elsewhere in the city or pay into the Planting and Preservation Fund for the city to plant trees
- When necessary and appropriate, plant trees in stormwater facility if such facility is present or designed. Note these trees are typically smaller than if planted in the furnishing zone

BICYCLE

A street's Bicycle designation identifies its role in the city's bicycle network. Planned bike facilities create a well-spaced network of facilities for through travel, as well as provide access to destinations on a given street. Facility type is determined based on automobile speeds and volumes and when space is limited, street design should consider reducing vehicular capacity or on-street parking. When delay to transit, freight, or traffic is deemed unacceptable, consideration can be given to moving bicycles to parallel streets provided that project design considers how people traveling on bicycle will access destinations on the street.



Source: PBOT

ANALYSIS OF TRADEOFFS

MOBILITY

- Vehicular speed and volume inform facility selection
- Facility widths that allow for side-by-side riding / passing are preferred
- Frequent curbside activity and multiple travel lanes per direction increase need for protected bike lanes
- Network spacing. Presence and proximity of parallel routes; impact of alternate route on trip directness (distance, travel time)

ACCESS

- Bike access to destinations on corridor
- Safe opportunities to cross the corridor at key intersections

Source: PBOT

POTENTIAL REASONS FOR ACCEPTING TRADEOFFS

MOBILITY

- Traffic analysis indicates repurposing lanes would significantly delay other priority modes or lead to unacceptable levels of diversion onto local streets
- Parking/loading analysis does not support removal from one or both sides of street
- Parking protected bike lanes infeasible due to driveway density and sight distance considerations that reduce parking supply and the functionality of a parking buffer
- A conventional bike lane, though less desirable, may be appropriate in constrained situations with lower vehicle speeds and volumes

ACCESS

- Proximity of key destinations to side street bikeways and safe bikeway crossings

OPTIONS TO MITIGATE TRADEOFFS

MOBILITY

- Enhance parallel route and improve connections to corridor
- Reduce conflicting movements at intersections (e.g., bike-only signal phases)
- Design to slow speeds and reduce conflicts with parked vehicles
- Access management to reduce number of conflict points

ACCESS

- Improve connections from parallel route to corridor
- Improve bikeway street crossings
- Traffic calming to support 'last block' access to destinations

TRANSIT

A street's Transit designation identifies its role in the city's transit network. Transit priority treatments from the ETC Toolbox such as transit stop curb extensions or islands to allow transit to stop in lane, transit signal priority, queue bypasses, and Business Access and Transit lanes are aim make transit a rapid and reliable choice for daily transportation. A variety of data are available to identify the extent and location of delay for transit vehicles.

Source: TriMet

ANALYSIS OF TRADEOFFS

MOBILITY

- Transit delay / passenger delay / run-time variability
- Frequency / headway / # of transit lines (per hour or all day)
- Application of Enhanced Transit Corridors toolkit
- Bus/bike lane interaction
- Considerations for shared transit and freight priority lanes

ACCESS

- Transit access to the curb at stops
- Sidewalk meets ADA standards and supports ramp deployment
- Bus/bike/pedestrian interaction at transit stops
- Consider additional space for people to wait without blocking sidewalk, stop amenities, or when bicycle facilities ramp to sidewalk level at stops

POTENTIAL REASONS FOR ACCEPTING TRADEOFFS

MOBILITY

- Transit priority lanes infeasible due to existing infrastructure in curb zone
- Traffic analysis indicates repurposing lanes for transit priority would lead to significant diversion or secondary safety issues
- Impacts to transit delay due to lane reduction can be mitigated (see next column) or benefits of lane reduction outweigh impact to transit

ACCESS

- Topography or other constraints to providing sidewalks at stops

OPTIONS TO MITIGATE TRADEOFFS

MOBILITY

- Transit signal priority, turn lanes at intersections, or transit stops in lane when transit only lanes or queue bypasses are infeasible due to space constraints
- Pro-time/peak hour transit priority lanes with on-street parking allowed off-peak
- Shared bus/bike facilities when considerations can be met

ACCESS

- Provide accessible transit stops through parking removal at stops, bus length curb extensions or floating transit stops

FREIGHT & EMERGENCY RESPONSE

A street's Freight and Emergency Response designations inform the extent to which street design should accommodate truck and larger vehicle needs in balance with other modal needs. These designations, in concert with the Street Design classification, inform how street design considers the needs of trucks traveling along the street and accessing adjacent land uses.

Source: PBOT

ANALYSIS OF TRADEOFFS

MOBILITY

- Freight classifications/design vehicle
- TSP Emergency Response designation
- Truck volumes/travel time reliability
- Existing and proposed vertical constraints adjacent to travel lanes (medians, protected bike lanes)
- Considerations for shared transit and freight priority lanes

ACCESS

- Freight origins/destinations and spatial needs associated with anticipated loading activities
- On-street and off-street loading capacity

- Ability of commercial drivers to access curb cut to reach destinations
- Conflicts between freight deliveries and movement of other vehicles

POTENTIAL REASONS FOR ACCEPTING TRADEOFFS

MOBILITY

- Lane reallocation or vertical protection needed for bike/transit mobility and multimodal access to destinations
- Traffic analysis indicates that freight improvements would cause negative safety impacts for other priority modes
- Medians needed to reduce crashes
- Separation of modes to improve safety
- Speed bumps needed to reduce speeds and volumes (on lower order streets)

ACCESS

- Existing loading zones can be accommodated off-street, on one side of street, or on side streets

OPTIONS TO MITIGATE TRADEOFFS

MOBILITY

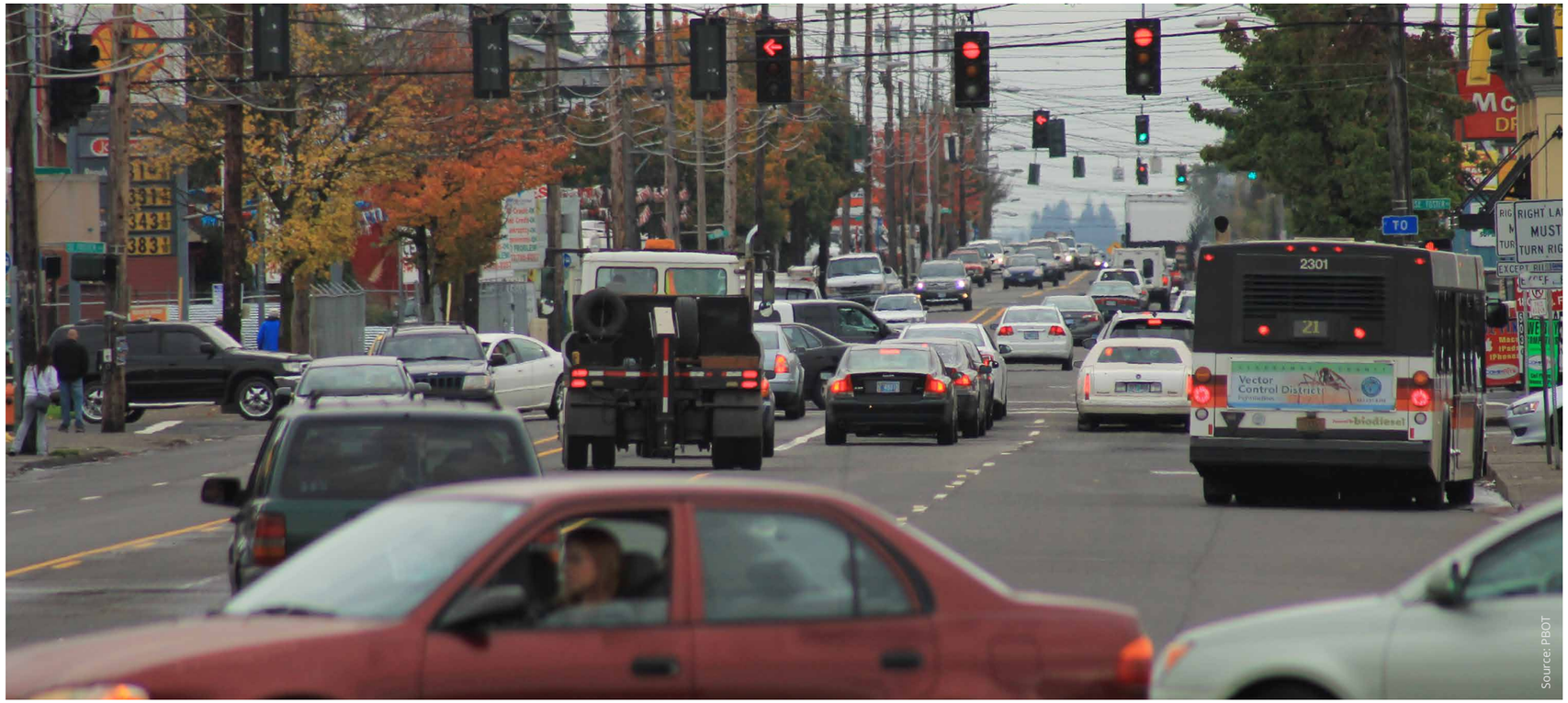
- Transit/freight shared lane, if appropriate based on TSP classifications
- Install protection (e.g., jersey barrier) between travel lane and bike lane/path
- Mark conflict areas with vulnerable road users
- Make any speed bumps "fire friendly"

ACCESS

- Metered parking to encourage turnover
- Designated or time-based loading zones
- 5-minute parking zones for delivery pickups/drop-offs

TRAFFIC

A street's Traffic designation identifies its role in supporting the movement of motor vehicles. Most road projects aim to advance city policies that call for improving safety and providing more equitable transportation options that allow Portlanders to utilize a variety of safe, efficient, convenient, and affordable modes of transportation. Alternative designs evaluate tradeoffs to vehicle movement or storage and consider mitigations to allow roads to continue to serve existing needs.



Source: PBOT

ANALYSIS OF TRADEOFFS

MOBILITY

- Multi-modal crash history
- Vehicle delay and diversion onto local streets

ACCESS

- Passenger loading activity
- ADA designated parking spots
- Parking utilization and supply

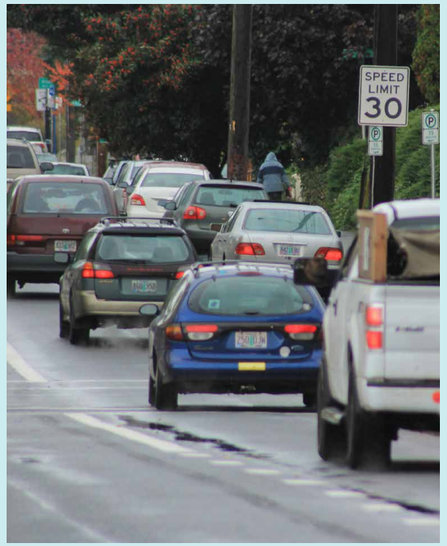
POTENTIAL REASONS FOR ACCEPTING TRADEOFFS

MOBILITY

- Improve safety / address crash history
- Improve multi-modal mobility and/or access to destinations
- Reduce delay and improve travel time reliability for transit

ACCESS

- Improve multi-modal mobility and/or access to destinations
- Reduce delay and improve travel time reliability for transit
- Existing needs can be accommodated off-street, on one side of street, or on side streets



OPTIONS TO MITIGATE TRADEOFFS

MOBILITY

- Access management to reduce delay from turning vehicles or diversion onto local streets
- Update traffic signals or signal timing
- Turn lanes at intersections

ACCESS

- Pedestrian infrastructure to support access to destinations (sidewalks, curb ramps, crossings) from relocated parking
- Manage parking to encourage more efficient use of supply
- Implement area parking permit program

ROW FUNCTION	ANALYSIS OF TRADEOFFS	POTENTIAL REASONS FOR ACCEPTING TRADEOFFS	OPTIONS TO MITIGATE TRADEOFFS
PEDESTRIAN	**MOBILITY** • Appropriate sidewalk widths to accommodate demand • Encroachments into the pedestrian through zone • Presence of furnishing zone to buffer pedestrians from adjacent traffic • Benefit to sub-standard sidewalks of a curb zone buffer from traffic and/or designs consistent with placing furnishings in the curb zone **ACCESS** • Crossing gaps and deficiencies (per city guidelines) » ADT, number of vehicle travel lanes, speed analysis » Length of exposure within pedestrian crossings (in absence of enhanced crossing treatments such as median refuge islands)	**MOBILITY** • Insufficient budget to move curbs/acquire right-of-way; sidewalks to transition with private development • Topography or presence of trees that are recommended for preservation **ACCESS** • Wider cross section needed to support mobility demands for other modes; design should provide crossings appropriate to roadway context	**MOBILITY** • Alternate buffer from travel lanes adjacent to curb tight sidewalks (e.g., bike lanes, parking or other non-travel lane curb uses such as passenger and freight loading zones, in-street bike corrals, etc.) • Access management to reduce number of conflict points along sidewalk **ACCESS** • Enhanced crossings or traffic calming / lane reduction to ease crossings • Signal enhancements (e.g., Pedestrian Head Start) to manage conflicting movements
GREENING	**STORMWATER AND TREES** • Stormwater management manual requirements / local storm system and standard treatment • Tree preservation and planting requirements • Width of sidewalk furnishing zone to support street trees and/or stormwater management • Urban heat island effects or lack of canopy in surrounding area • Presence/absence of trees in frontage zone or on private property	**STORMWATER AND TREES** • Curb zone not available to support additional greening functions due to mobility demands from bike/transit • Utility conflicts (including engineering determinations that trees or surface storm facility may damage underground water or sewer line) • Sight distance concerns related to driveways or side streets • Presence of trees in frontage zone or on private property that are required for preservation	**STORMWATER AND TREES** • Alternatives to standard stormwater treatment • Plant trees elsewhere in the city or pay into the Planting and Preservation Fund for the city to plant trees • When necessary and appropriate, plant trees in stormwater facility if such facility is present or designed. Note these trees are typically smaller than if planted in the furnishing zone
BICYCLE	**MOBILITY** • Vehicular speed and volume inform facility selection • Facility widths that allow for side-by-side riding / passing are preferred • Frequent curbside activity and multiple travel lanes per direction increase need for protected bike lanes • Network spacing. Presence and proximity of parallel routes; impact of alternate route on trip directness (distance, travel time) **ACCESS** • Bike access to destinations on corridor • Safe opportunities to cross the corridor at key intersections	**MOBILITY** • Traffic analysis indicates repurposing lanes would significantly delay other priority modes or lead to unacceptable levels of diversion onto local streets • Parking/loading analysis does not support removal from one or both sides of street • Parking protected bike lanes infeasible due to driveway density and sight distance considerations that reduce parking supply and the functionality of a parking buffer • A conventional bike lane, though less desirable, may be appropriate in constrained situations with lower vehicle speeds and volumes **ACCESS** • Proximity of key destinations to side street bikeways and safe bikeway crossings	**MOBILITY** • Enhance parallel route and improve connections to corridor • Reduce conflicting movements at intersections (e.g., bike-only signal phases) • Design to slow speeds and reduce conflicts with parked vehicles • Access management to reduce number of conflict points **ACCESS** • Improve connections from parallel route to corridor • Improve bikeway street crossings • Traffic calming to support 'last block' access to destinations

ROW FUNCTION	ANALYSIS OF TRADEOFFS	POTENTIAL REASONS FOR ACCEPTING TRADEOFFS	OPTIONS TO MITIGATE TRADEOFFS
TRANSIT	**MOBILITY** • Transit delay / passenger delay / run-time variability • Frequency / headway / # of transit lines (per hour or all day) • Application of Enhanced Transit Corridors toolkit • Bus/bike lane interaction • Considerations for shared transit and freight priority lanes **ACCESS** • Transit access to the curb at stops • Sidewalk meets ADA standards and supports ramp deployment • Bus/bike/pedestrian interaction at transit stops • Consider additional space for people to wait without blocking sidewalk, stop amenities (per TriMet siting guidelines), or when bicycle facilities ramp to sidewalk level at stops	**MOBILITY** • Transit priority lanes infeasible due to existing infrastructure in curb zone • Traffic analysis indicates repurposing lanes for transit priority would lead to significant diversion or secondary safety issues • Impacts to transit delay due to lane reduction can be mitigated (see next column) or benefits of lane reduction outweigh impact to transit **ACCESS** • Topography or other constraints to providing sidewalks at stops	**MOBILITY** • Transit signal priority, turn lanes at intersections, or transit stops in lane when transit only lanes or queue bypasses are infeasible due to space constraints • Pro-time/peak hour transit priority lanes with on-street parking allowed off-peak • Shared bus/bike facilities when considerations can be met **ACCESS** • Provide accessible transit stops through parking removal at stops, bus length curb extensions or floating transit stops
FREIGHT AND EMERGENCY RESPONSE	**MOBILITY** • Freight classifications/design vehicle • TSP Emergency Response designation • Truck volumes/travel time reliability • Existing and proposed vertical constraints adjacent to travel lanes (medians, protected bike lanes) • Considerations for shared transit and freight priority lanes **ACCESS** • Freight origins/destinations and spatial needs associated with anticipated loading activities • On-street and off-street loading capacity • Ability of commercial drivers to access curb cut to reach destinations • Conflicts between freight deliveries and movement of other vehicles	**MOBILITY** • Lane reallocation or vertical protection needed for bike/transit mobility and multimodal access to destinations • Traffic analysis indicates that freight improvements would cause negative safety impacts for other priority modes • Center medians needed to reduce crashes • Separation of modes to improve safety and flow • Speed bumps needed to reduce speeds and volumes (on lower order streets) **ACCESS** • Existing loading zones can be accommodated off-street, on one side of street, or on side streets	**MOBILITY** • Transit/freight shared lane, if appropriate based on TSP classifications • Install protection (e.g., jersey barrier) between freight/vehicle lane and bike lane/path • Mark areas of conflict with vulnerable road users • Make any speed bumps “fire friendly” **ACCESS** • Metered parking to encourage turnover • Designated or time-based loading zones • 5-minute parking zones for delivery pickups/drop-offs
TRAFFIC	**MOBILITY** • Multi-modal crash history • Vehicle delay and diversion onto local streets **ACCESS** • Passenger loading activity • ADA designated parking spots • Parking utilization and supply	**MOBILITY** • Improve safety / address crash history • Improve multi-modal mobility and/or access to destinations • Reduce delay and improve travel time reliability for transit **ACCESS** • Improve multi-modal mobility and/or access to destinations • Reduce delay and improve travel time reliability for transit • Existing needs can be accommodated off-street, on one side of street, or on side streets	**MOBILITY** • Access management to reduce delay from turning vehicles or diversion onto local streets • Update traffic signals or signal timing • Turn lanes at intersections **ACCESS** • Pedestrian infrastructure to support access to destinations (sidewalks, curb ramps, crossings) from relocated parking • Manage parking to encourage more efficient use of supply • Implement area parking permit program

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