



Appendix D

Bus Stop Guidelines

Memorandum

Envision My Ride: Bus Priority Study

Technical Memorandum | Task 5.2 Bus Stop

Guidelines – FINAL

May 18, 2022

1 INTRODUCTION

Successful transit service depends on a variety of factors, including, but not limited to: land use, density, accessibility, and convenience. The purpose of this document is to introduce bus stop typologies, with associated recommended amenities, which can be configured based on these factors, as well as provide guidance in locating bus stops and future bus stop balancing efforts

Additionally, while this guide makes general recommendations regarding factors such as bus stop placement, amenities and amenity placement, ultimately factors such as site conditions, operational practices, and safety concerns will determine final design and implementation on a stop-by-stop, case by case basis.

2 BUS STOP TYPOLOGY

The bus stop is the first point of contact with the transit system for customers. A bus stop with inadequate amenities could hinder and deter passengers from accessing the transit network. The following section establishes amenity guidelines for facilities based upon various metrics including ridership, land use, equity, and accessibility. The typology document is designed around four bus stop levels: Standard Bus Stop (Level 0), Enhanced Stop Pair (Level 1), Mobility Plaza (Level 2), and Mobility Centers (Level 3), including their standard amenities, recommended locations along the route, and high-level design. Table 1 provides a comparison of each bus stop typology and its associated amenities; specific design renderings are provided in Appendix A. The Standard Bus Stop, broken into three types based on physical amenities (Type A, Type B, Type C), is designed to be applied to general bus stops throughout the CATS network and is discussed in further detail on page 2. The Enhanced Stop Pair, Mobility Plaza, and Mobility Center (collectively referred to as Mobility Hubs) are designed specifically for application along bus priority corridors.

Table 1. Amenities by Stop Level & Type

Stop Amenity	Standard Bus Stop (Level 0)			Mobility Hubs		
	Type A	Type B	Type C	Enhanced Stop Pair (Level 1)	Mobility Plaza (Level 2)	Mobility Center (Level 3, Types A, B, C)
5'X10' OR 5'X15' SHELTER			●	●	●	●
BENCH		●	●	●	●	●
SIMME SEATS		●	●			
TRASH RECEPTOR	●	●	●	●	●	●
BICYCLE RACK			●	●	●	●
SCOOTER & E-BIKE STORAGE					●	●
BUS STOP MARKER: SIGNPOST WITH SIGN	●	●	●			
BUS STOP MARKER: PYLON				●	●	●
SIDEWALK WAYFINDING				●	●	
BOARDING & ALIGHTING AREA	●	●	●	●	●	●
CROSSWALK IMPROVEMENTS			●	●	●	●
OPERATOR RESTROOM						●
BUS & SIDEWALK BULB				●	●	
BUS BAY						●
OFFBOARD FARE PAYMENT						●
PUBLIC WIFI ¹				●	●	●
MICROTRANSIT PICKUP/DROPOFF AREA						●
LIGHTING	●	●	●	●	●	●
INFORMATION KIOSKS					●	●

● Recommended Amenity

2.1 Typology by Level

The legend in Figure 1 is applicable to the bus stop diagram illustrated throughout each bus stop typology.



Figure 1. Legend for Stop Diagrams

¹ Not illustrated in Appendix A

Standard Bus Stop (Level 0)

The standard bus stop (Figure 2) which is further divided into three sub-categories, functions as the default system wide. A standard bus stop can be found at numerous intermediate points along bus routes, and it represents the minimum required amenities for bus passengers. Compared to the other typologies, this stop is presented as a single unit (as opposed to a pair or set of multiple) for maximum flexibility, though they should still be implemented in pairs when not one one-way streets. Situations that justify this stop level include:

- Local/Neighborhood shuttle bus stops
- On collectors, one-way streets, or similar traffic limitations
- Between activity centers
- At lower population and employment density land uses. The following activity density (population + employment) of a stop location is a good preliminary indicator for each sub-type:
 - Type A: <10 people + jobs / acre
 - Type B: 10-30 people + jobs / acre
 - Type C: >30 people + jobs / acre

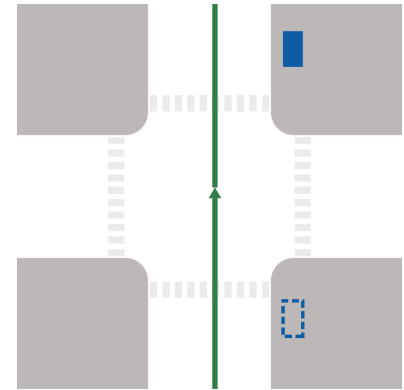


Figure 2. Standard Bus Stop Diagram (Level 0)

Enhanced Stop Pair (Level I)

The enhanced stop pair (Figure 3) is the first major upgrade to bus stops along the bus priority corridors. Presented as a pair of opposite direction stops (preferably far-side), this stop level is appropriate for:

- Bus Priority corridors or high-ridership bus stops (>25 passengers per day)
- Within proximity to major activity generators

Implementation of this stop level would also include the construction and/or upgrading of standard pedestrian safety amenities, including crosswalks and pedestrian-priority signalization if not already present.

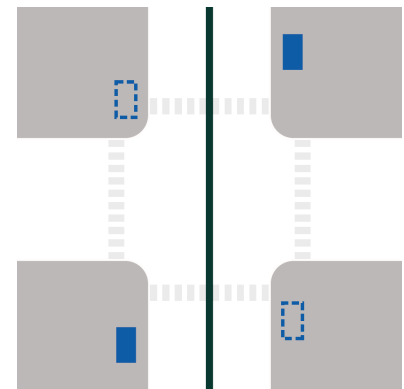


Figure 3. Enhanced Stop Pair Diagram (Level I)

Mobility Plaza (Level II)

The Mobility Plaza (Figure 4) is essentially two sets of enhanced stop pairs treated as a singular unit at intersecting bus priority corridors or high-frequency routes. Conditions that could justify this bus stop level include:

- Intersection of Bus Priority Corridors
- Intersection of two major arterials
- Intersection of high-ridership local neighborhood route/shuttle and bus priority corridor

Implementation of this stop level would also include the construction and/or upgrading of standard pedestrian safety amenities, including crosswalks and pedestrian-priority signalization if not already present.

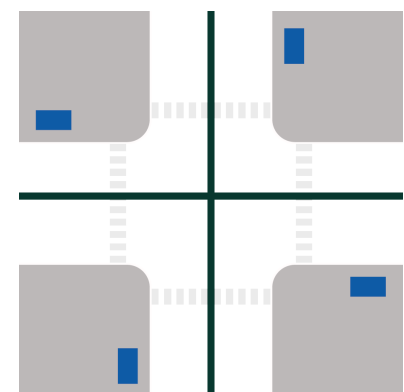


Figure 4. Mobility Plaza Diagram (Level II)

Mobility Center (Level III)

The Mobility Center is the highest stop level and is largely like the Mobility Plaza in terms of stop amenities. Its major defining feature is an off-street location, which enables it to serve more buses and serve as a layover/end of route facility. Conditions that could justify the stop level include:

- Type A: Transfers to LYNX Light Rail or Bus Rapid Transit (BRT) stations, commuter buses, or other regional connections
- Type B: Major bus transfer locations, route termini, and/or major activity centers
- Type C: Availability of a park and ride facility

Figure 5, Figure 6, and Figure 7 are conceptual diagrams for Mobility Centers in three different contexts (Types A, B, and C), though these contexts are not necessarily mutually exclusive. As shown in Table 1, unlike the three types of Standard Bus Stops, in which amenities vary according to available resources, all three types of Mobility Centers should contain the same amenities even if they need to be deployed in different locations or quantities based on local conditions. That is, the three types of Mobility Centers reflect *different kinds of intermodal connections* (light rail, BRT, buses, park and rides, or some combination of two or more) rather than different kinds or levels of amenities.

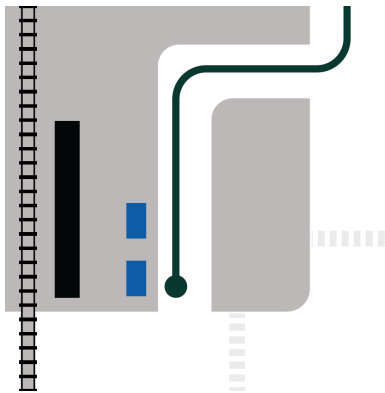


Figure 5. Mobility Center at Light Rail Station (Type A)

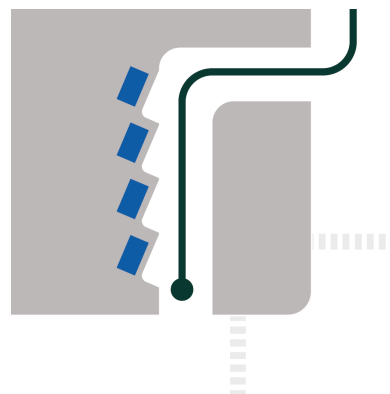


Figure 6. Mobility Center at Bus Transfer Center (Type B)

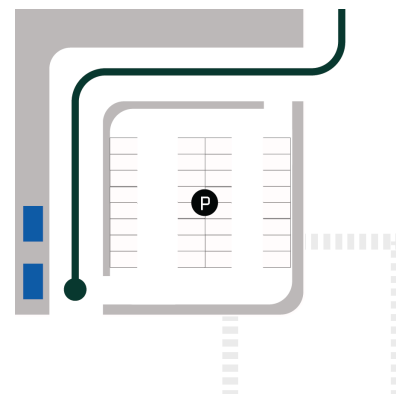


Figure 7. Mobility Center at Park and Ride Facility (Type C)

Bus Stop Amenity Spatial Constraints

The typical layouts shown for Levels 0, I, and II in the Appendix A reflect ideal sidewalk and right-of-way conditions in which there are few limitations on amenity placement due to ample sidewalk space. In reality, and as shown in the diagrams below, in many locations either incremental extensions of sidewalk-adjacent concrete paving areas or elimination/downsizing of certain amenities may be necessary for ADA-compliant clearances until the areas in question can be rebuilt to the ideal conditions shown in the Appendix A. Ideally, the prerequisite improvements for ideal conditions would be codified and triggered whenever any redevelopment adjacent to the bus stop occurs such that the adjacent developers could pay for and construct the necessary improvements.

Figure 8, Figure 9, and Figure 10 illustrate different opportunities for expanding sidewalk-adjacent concrete paving areas.

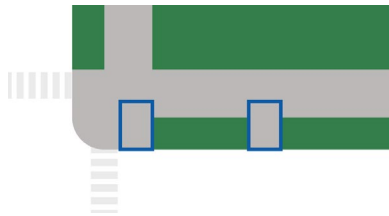


Figure 10. Depicts a scenario in which boarding and alighting areas were fitted into a curbside planting strip that cannot be paved over as part of any sidewalk

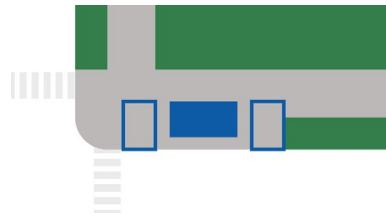


Figure 9. Depicts how the space between boarding and alighting areas is paved so a shelter can be inserted into the space without obstructing the narrow sidewalk.

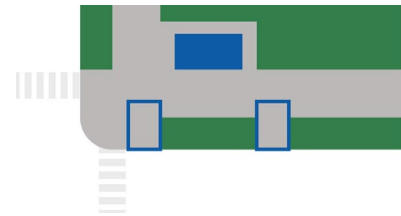


Figure 8. Depicts how a shelter pad was added off the sidewalk on the frontage grounds of the adjacent property (with cooperation from the property owner).

Typology Evaluation

Table 2 on the next page summarizes the scoring system that is recommended to serve as a guide for a quantitative first round assessment of a bus stop, followed by a more in-depth site-specific review of the bus stop and adjusting the typology of the bus stop to the surrounding context as needed.

Table 2. Typology Score System

Evaluation Category	Evaluation Criteria	Scoring
Ridership	Boardings	1 point per average weekday daily boarding
	Bus Priority Corridor	50 points if on a Bus Priority Corridor and has at least 15 daily boardings
Wait Time	Transfers	5 points if stop is a transfer location between two Bus Priority Corridors or LYNX Light Rail
	Frequencies	0 points if stop is outside the Bus Priority Corridor network (longer wait times could indicate a higher need for shelter or seating)
Rider Profile	Equity Populations	10 points if stop is in predominantly minority and/or low-income area (as defined by CATS)
	Reliant Populations	10 points if stop is in area with higher-than-average elderly or persons with disability
Activity Generator	Human Service Facility	10 points if one or more of the following existing or planned facilities, are within 1,320 feet of the stop: Medical facility, hospital, dialysis clinic, social security office, or County service center
	Activity Destinations	5 points if one or more of the following existing or planned facilities, are within 1,320 feet of the stop: Public library, public school, recreation center, senior center, or supermarket/pharmacy
	Major Employer	5 points if within 1,320 feet of the stop: is an existing or planned job center with more than 50 jobs
	Operator Relief	5 points if the stop is assigned as an official relief/layover point

Based on the criteria above, the different stop levels were assigned minimum scores necessary for amenity implementation (Table 3). This methodology relies on data availability concerning ridership, service levels, transfer points, operational details, rider demographics, trip generator, and human services facilities.

Table 3. Minimum Score by Bus Stop Typology

	Standard Bus Stop (Level 0)			Mobility Hubs		
	Type A	Type B	Type C	Enhanced Stop Pair (Level 1)	Mobility Plaza (Level 2)	Mobility Center (Level 3, Types A, B, C)
Minimum Score	---	15	25	50	55	65

2.2 Bus Stop Location

Bus stops provide critical connection points between the multimodal network and bus routes, and proper location is critical to ensure safe and efficient connections. The bus stop should be in an area where typical improvements, such as a bench or shelter, can be placed in the public right of way. A bus stop location should consider potential ridership, traffic and rider safety, and bus operation elements that require site-specific evaluation. Personal security of passengers should always be at the forefront of bus stop location and amenity decisions, such as ensuring adequate lighting, waiting spaces safe from road traffic, and accessible boardings areas for all passengers.

The following section outlines the factors to be considered when siting a bus stop based upon its typology. These parameters can be based on the built environment, land use, level of service, connectivity to other transportation options, and proximity to major trip generators. While multiple conditions are presented for each bus stop typology, not all are necessary to justify a specific bus stop type.

Bus Stop Placement

In general, bus stops should be located at either the near-side or far-side of an intersection (as opposed to mid-block locations). Advantages of a far-side stop include reduced delay from a bus idling at a red signal after serving a stop, better visibility of pedestrians for other drivers, and minimizing conflicts with right-turning vehicles. However, far side stops can also create the potential for vehicles to queue behind a stopped bus into the intersection. Bus stops should be placed to minimize operational difficulties such as lane changes and weaving maneuvers of approaching vehicles. Where it is not acceptable to stop the bus in traffic and a bus pullout is warranted, a far-side stop is generally preferred. Additional situations and appropriate bus stop placements can be found in Table 4. As with other elements of the roadway, consistency of stop placement lessens the potential for operator and passenger confusion.

Table 4. Stop Placement Situations and Preferred Placement

Situation	Bus Stop Placement
Any signalized intersection where bus can stop out of travel lane	Far-side
The route alignment requires a left turn at the intersection	Far-side
There is a high volume of right turns at an intersection or immediately after a transit route turns right	Far-side
Complex roadway intersections (geometry and/or signal timing)	Far-side
Intersections with transit signal priority (TSP) implementation	Far-side
Wide shoulders or multiple lanes where vehicular traffic is controlled by a signal	Near-side or Far-side
Two lane streets where vehicles will not pass around a stopped bus	Near-side
Bus length exceeds capacity of far-side bus zone	Near-side
The route alignment requires a left turn, and it is infeasible or unsafe to locate a bus stop far-side of the intersection after the left turn	Mid-block
If blocks are too long to have all stops at intersections	Mid-block
Major transit generators not served by stops at intersections	Mid-block

Similar to the spatial constraints affecting the placement of bus stop amenities, the ideal bus stop placements shown in the Appendix A, in which Levels I and II benefit from combined bus stop/crosswalk bulbs, may not always be possible. Since

arterial roadways without curbside parking usually cannot contain bulbouts, alternate arrangements, such as nearside or farside layouts that are “flush” or that contain pull-ins, may need to be employed instead.

Figure 11 and Figure 12 illustrate different opportunities for placing bus stops in scenarios where bulbouts are not possible.



Figure 11. Depicts a scenario in which a bus stop had to remain “flush” with the roadway edge with no option for either a bulbout or pull-in. The planting strip was paved from the boarding area back to the crosswalk to accommodate placement of amenities.



Figure 12. Depicts a scenario in which a pull-in was possible by cutting into the space normally dedicated to a planting strip and setback. An off-sidewalk space was paved on the adjacent property to accommodate placement of amenities.

Stop Spacing Standards

Stop spacing should be thoroughly considered when creating new routes, modifying existing routes, or when evaluating performance issues along a route. Adequately spaced bus stops across the transit system enhance accessibility in general. **Table 5** shows CATS’ stop spacing guidelines by service type.

Table 5. Stop Spacing Guidelines

Service Type	Stop Spacing Guideline
Local and Neighborhood Shuttles	4 to 6 stops per mile
High-Frequency	4 bus stops per mile
Express	<i>As needed</i>

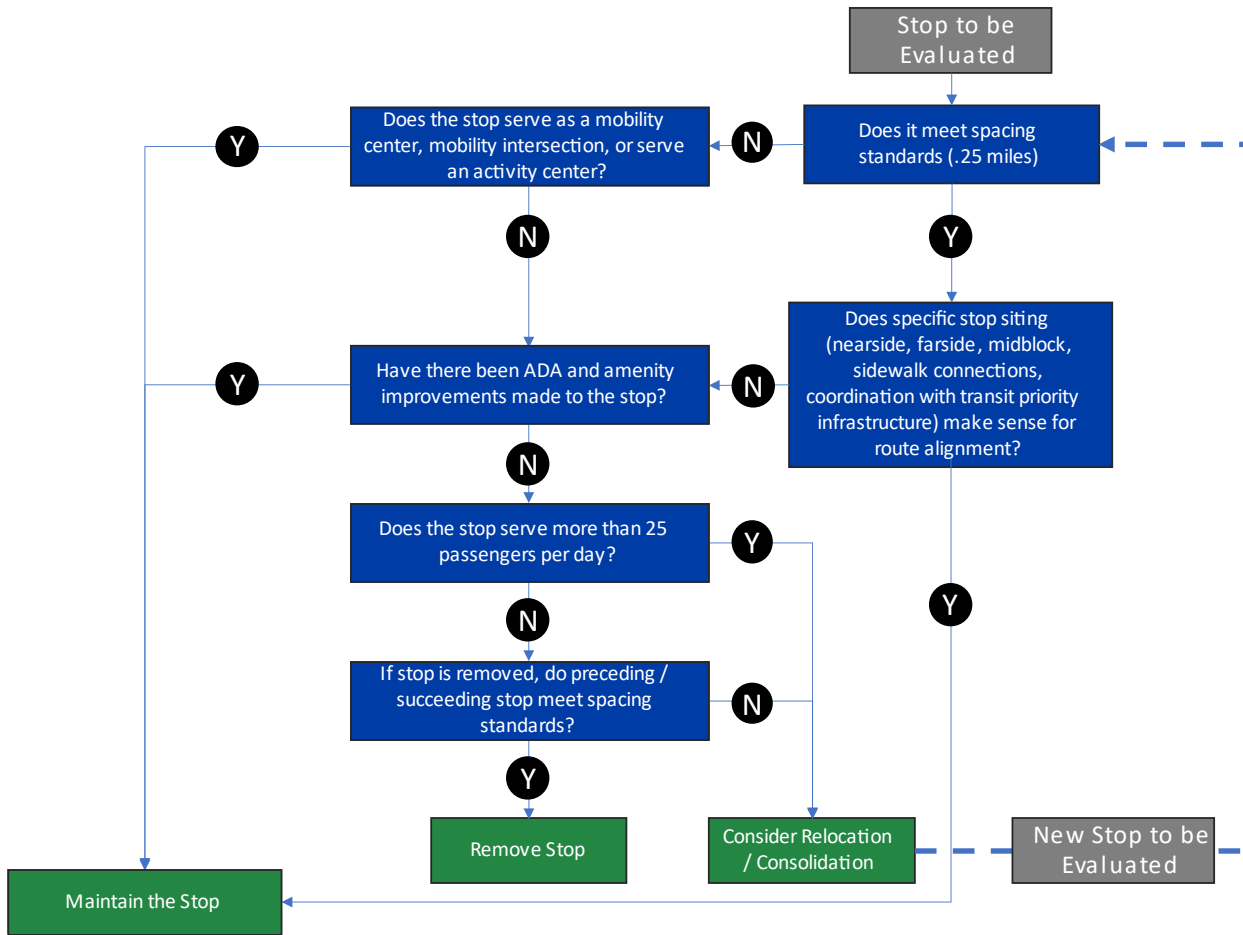
Bus Stop Balancing

Bus stop balancing can improve safety for passengers and operators, increase operational efficiency, reduce travel time, improve reliability, and create consistent and predictable spacing between stops. As CATS conducts periodic reviews of bus stop spacing, it is important to follow a consistent process to designate stops as candidates for consolidation, relocation, or retention. This systematizes the balancing process, preventing ad hoc decisions that can cause average bus stop spacing to grow more unbalanced over time.

Before considering removal and relocation of a stop that does not meet the spacing standard, its importance to the CATS network, amenities, and ridership should also be evaluated. This begins by assessing the value to the network (transfer connections), investment that has already been made to the facility (existing amenities and ADA upgrades), existing ridership, and how the removal or relocation impacts adjacent bus stops. The flowchart in Figure 13 describes the process for evaluating bus stop placement on CATS routes, with the goals of increasing safety, efficiency, and reliability.

As Bus Priority corridors are implemented, the impact of corridor stop balancing and facilities (such as Level II and Level III Mobility Hubs) on intersecting routes should be evaluated in regard to the bus stop balancing along those routes as well.

Figure 13. Bus Stop Evaluation Decision Tree



2.3 Inventory Control Guidelines

To ensure that the amenities specified in Table 1 are provided, CATS should implement an inventory control system that tracks the presence of amenities specified for each of the roughly 3,000 stops in the CATS system. The CATS Planning Department will be responsible for carrying out regular stop surveys and maintaining an updated stop amenity inventory. In addition to the presence of the required amenities, stop surveys could note amenity condition, as well as the status of ADA compliance at each stop.

Combined with weighted stop scoring based on ridership, demographics, and other factors, the inventory control system will factor into balancing priorities and the development of an improvement schedule by which stops can be brought up to their standard. Table 6 provides a high-level overview of the amenities that should be tracked.

Table 6. Bus Stop Inventory List

General Attributes	Amenities (Quantities and Conditions)	ADA Improvements	Additional Amenities (Quantities and Conditions)
Description	Shelter	Boarding Area Dimensions	Bicycle Rack
Street & Cross Street	Bench	Boarding Area Slope	Scooter & E-Bike Storage
Direction	Simme Seats	Clear Area	Sidewalk Wayfinding
Routes Served	Trash Receptor	Sidewalk Connection	Crosswalk
Facility Level (0, 1, 2, 3)	Bus Stop Marker		Operator Restroom
	Pylon		Bus & Sidewalk Bulb
	Lighting		Bus Bay
			Offboard Fare Payment
			Public Wifi
			Real-Time Information Systems

Bus stop locations and conditions affect multiple stakeholders engaged in CATS’ capital programming, planning, maintenance, and operations. Bus stops may also be affected by activities by other agencies (e.g., roadway improvements by the Charlotte Department of Transportation, developer activities in adjoining properties.) With this in mind, it is critical that CATS develop a data strategy that:

- Ensures that all in-house applications use the same standard station ID, such that information from the bus stop inventory control system may be used in Hastus, Remix, and other applications used by CATS planning, maintenance, and operations teams
- Ensures that changes made in the field to bus stop locations are regularly (and preferably, automatically) updated in other applications that use bus stop locations for operational planning (e.g., Hastus, Remix.)
- Allows changes in bus stop locations and amenities to be promptly communicated to relevant stakeholders (e.g., CATS customers, community leaders, CATS and CDOT engineering and maintenance teams.)
- Considers how other agencies and stakeholders may use information on bus stop locations and amenities (e.g., CATS asset management and state-of-good repair program, CDOT roadway programs, social service agencies, developers, and privately developed transit apps.)



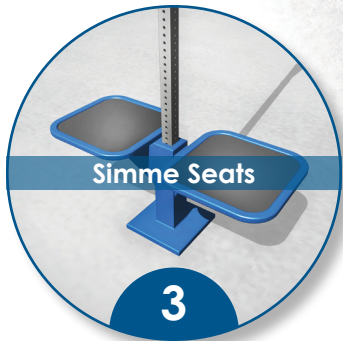
APPENDIX A

Bus Stop Typology Illustrations

A1

ENVISION MY RIDE
Bus Stop Guidelines





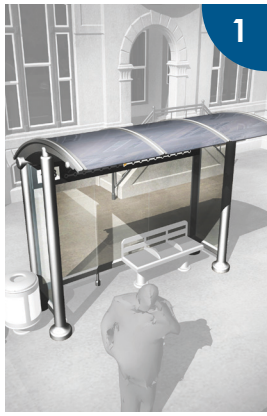
A standard bus stop is found at numerous intermediate points along bus routes, and it represents the minimum required amenities for bus passengers. The following pages show three types of standard bus stops that reflect variations in available space and resources (Type C is shown on this page).



*Not numbered on aerial.

Level 0: Standard Bus Stop

Amenity Overview (Type C)



1

5' X 10' SHELTER

Use the 10' long Tolar cantilever shelter model at standard bus stops.

Model: 25516-00 (Signature Sunset 01)

Quantity: 1 per stop

Approx. Dimensions: 5' x 10' x 9'



2

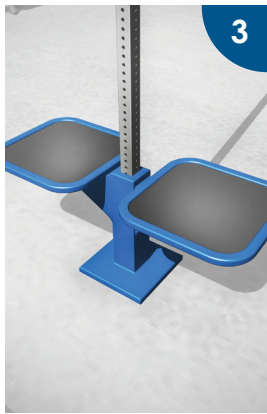
SINGLE BENCH

One bench is included inside each shelter. While a single standardized bench model is recommended for ease of procurement and maintenance, different models, sizes, and configurations can be used to accommodate varying ridership loads and neighborhood aesthetic contexts.

Model: 13023-121 (Tolar Euro)

Quantity: 1 per stop

Approx. Dimensions: 1'6" x 6' x 1'6"



3

SIMME SEATS

Add a pair of prefabricated Simme Seats to the base of the signpost at each bus stop (see right for signpost details).

Model: SS1

Quantity: 1 pair per stop

Approx. Dimensions: 1'6" x 1'6" x 1'6" ea.



4

TRASH RECEPTOR

Add a trash receptor next to each shelter.

Type: steel

Quantity: 1 per stop

Approx. Dimensions: 2' x 2' x 3'

BICYCLE RACK

Add a u-style bicycle rack to each bus stop.

Type: steel u-rack

Quantity: 1 per stop

Approx. Dimensions: 1' x 2'6" x 2'6"



5

BUS STOP SIGN

Add a 2" square signpost with a flag-mounted bus stop sign to the head of each stop. The bottom of the sign must be at least 7' above the sidewalk. Each sign should list the CATS website, stop number, and a QR code for more info.

Type: 2" steel square post

Quantity: 1 per stop

Approx. Dimensions: 2" x 2" x 10'



6

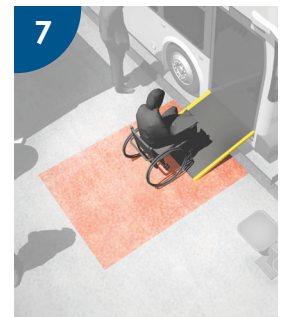
BOARDING & ALIGHTING AREA

Keep a 5' x 8' area at the head of each bus stop clear for wheelchair ramp deployment.

Type: concrete pad (painting optional)

Quantity: 1 per stop

Approx. Dimensions: 5' x 8'



7

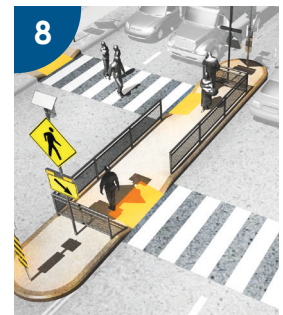
CROSSWALK IMPROVEMENTS

If signalized crosswalks with curb ramps aren't already present, either add them or consider adding RRFB (rectangular rapid flashing beacon) refuge crossings where conventional signalization isn't possible.

Type: various materials

Quantity: varies as needed

Approx. Dimensions: varies as needed



8

LIGHTING IMPROVEMENTS

If absent or inadequate, add context-sensitive lighting to improve nighttime visibility and safety. Explore solar battery power in locations where power conduits are absent.

Type: various materials

Quantity: varies as needed

Approx. Dimensions: varies as needed

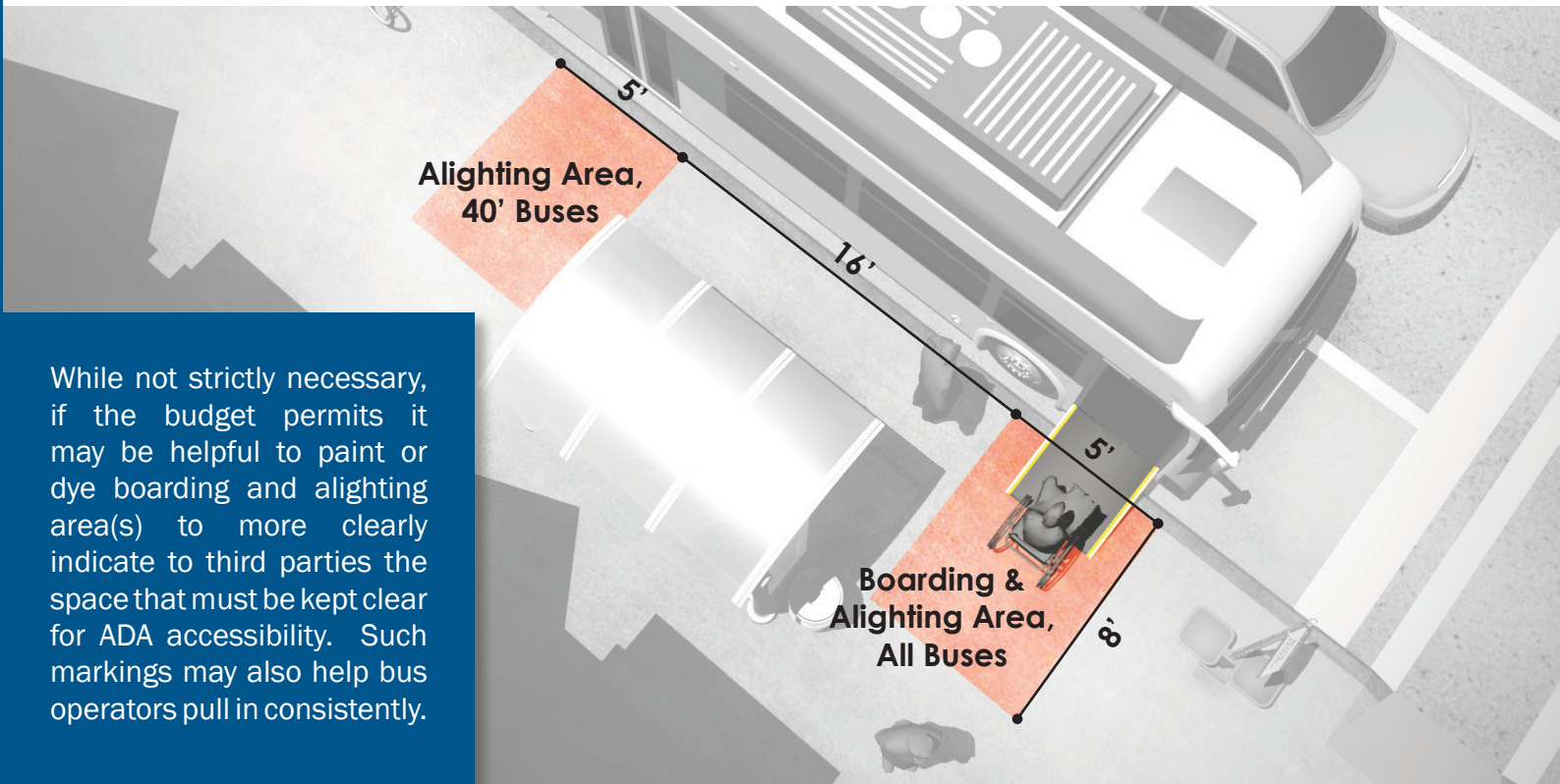


9

Level 0: Standard Bus Stop

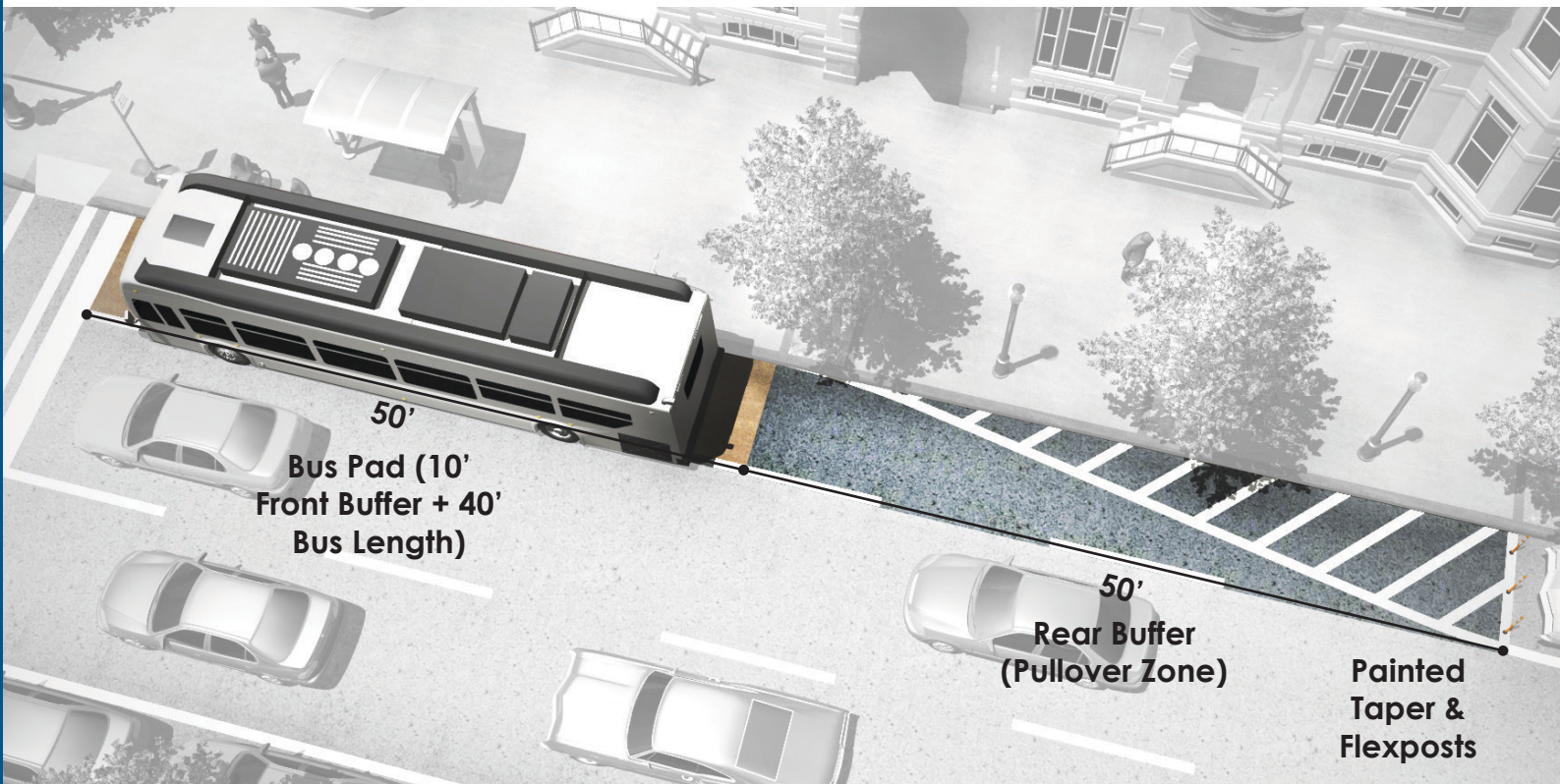
Amenity Descriptions (Type C)

BOARDING & ALIGHTING AREA DIMENSIONS



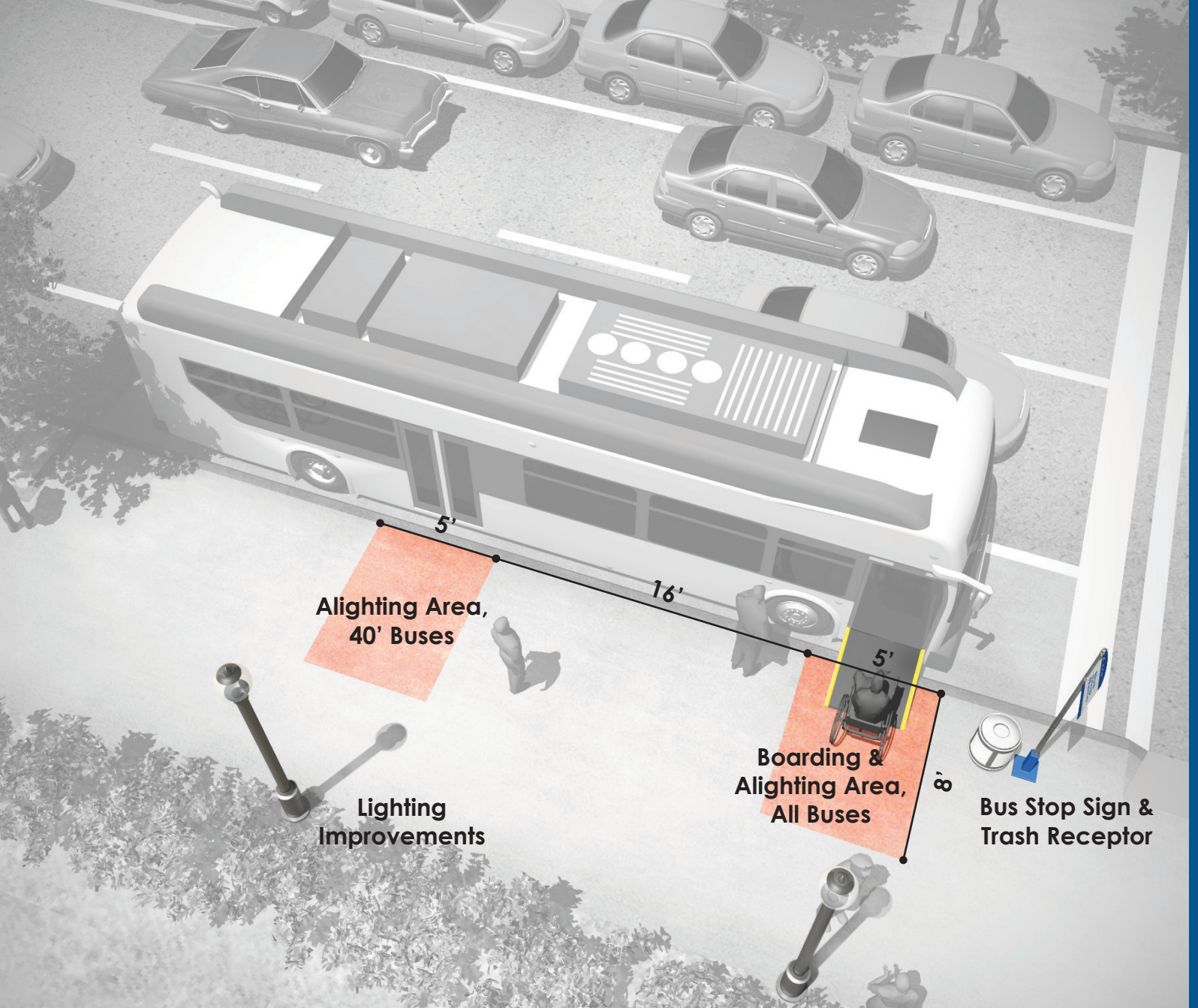
While not strictly necessary, if the budget permits it may be helpful to paint or dye boarding and alighting area(s) to more clearly indicate to third parties the space that must be kept clear for ADA accessibility. Such markings may also help bus operators pull in consistently.

BUS PAD DIMENSIONS



Level 0: Standard Bus Stop

Amenity Layout (Type C)



TYPE A ALTERNATIVE:

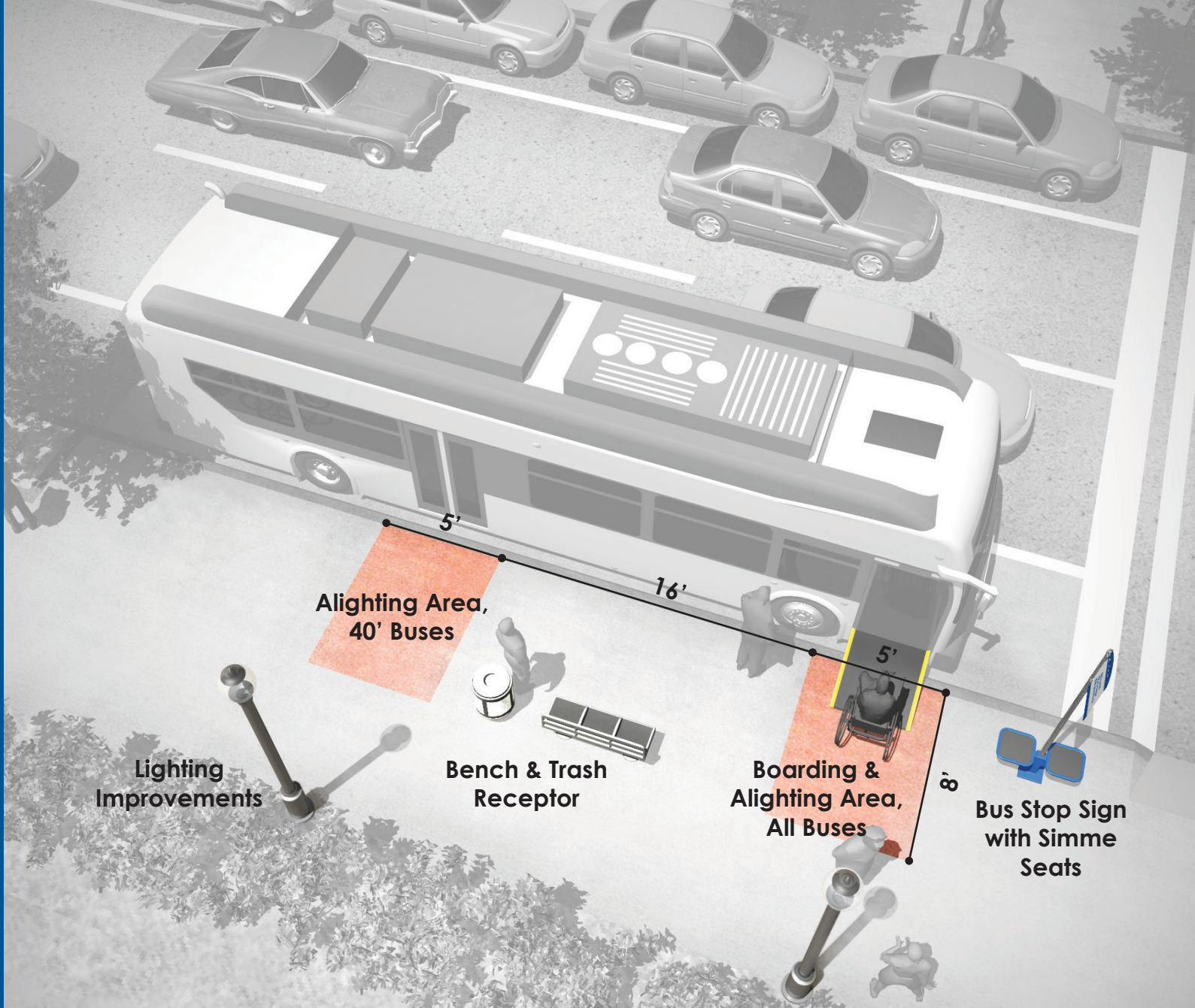
Standard Bus Stop with Bus Stop Sign, Trash Receptor, Lighting Improvements, and Boarding & Alighting Area

Since the available sidewalk space and/or agency resources may not always allow for all the amenities in the Type C layout on previous pages, a Type A alternative reduces the number of amenities at a standard bus stop to four: a bus stop sign, a trash receptor, lighting improvements, and the 5' x 8' boarding & alighting area for wheelchair ramp deployment.

The reduced amenities are more practical for deployment at a large number of stops, but the goal should still be to upgrade as many stops as possible to Type C whenever sidewalks are periodically rebuilt or as agency resources permit.

Level 0: Standard Bus Stop

Type A Alternative



TYPE B ALTERNATIVE:

Standard Bus Stop with Bus Stop Sign, Simme Seats, Bench, Trash Receptor, Lighting Improvements, and Boarding & Alighting Area

Since the available sidewalk space and/or agency resources may not always allow for all the amenities in the Type C layout on previous pages, a Type B alternative reduces the number of amenities at a standard bus stop to six: a bus stop sign with simme seats, a bench, a trash receptor, lighting improvements, and the 5' x 8' boarding & alighting area for wheelchair ramp deployment.

The reduced amenities are more practical for deployment at a large number of stops, but the goal should still be to upgrade as many stops as possible to Type C whenever sidewalks are periodically rebuilt or as agency resources permit.

Level 0: Standard Bus Stop

Type B Alternative



1

5' X 10' SHELTER

Use the 10' long Tolar cantilever shelter model at enhanced stop pairs. Incorporate public art into shelter walls, varying the design by location if possible.

Model: 25516-00 (*Signature Sunset 01*)
Quantity: 1 per stop (2 total)
Approx. Dimensions: 5' x 10' x 9'



2

PAIRED BENCHES

One bench is included with each shelter, but add a second bench next to each. While a single standardized bench model is recommended for ease of procurement and maintenance, different models, sizes, and configurations can be used to accommodate varying ridership loads and neighborhood aesthetic contexts.

Model: 13023-121 (*Tolar Euro*)
Quantity: 1 additional per stop (2+2 total)
Approx. Dimensions: 1'6" x 6' x 1'6"



3

TRASH RECEPTOR

Add a trash receptor next to each shelter.

Type: steel
Quantity: 1 per stop (2 total)
Approx. Dimensions: 2' x 2' x 3'



4

BICYCLE RACK

Add a u-style bicycle rack to each bus stop.

Type: steel u-rack
Quantity: 1 per stop (2 total)
Approx. Dimensions: 1' x 2'6" x 2'6"



5

SCOOTER & E-BIKE STORAGE

Paint a rectangle for depositing scooters and e-bikes next to each bus stop.

Type: white paint
Quantity: 1 per stop (2 total)
Approx. Dimensions: 5'6" x 18'

PYLON

Add a pylon at the intersection side of each bus stop displaying real-time arrival info and wayfinding. Each pylon should list the CATS website, stop number, and a QR code. Each pylon can also offer a public wifi connection.

Type: internally lit/powered steel or plastic
Quantity: 1 per stop (2 total)
Approx. Dimensions: 1'6" x 3' x 10'

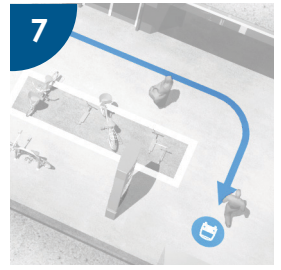


6

SIDWALK WAYFINDING

Supplement the pylons with thermoplastic sidewalk arrows pointing to the paired bus stop across the intersection.

Type: blue thermoplastic
Quantity: 1 array on each side of the crosswalk between the stop pair (2 total)
Approx. Dimensions: TBD

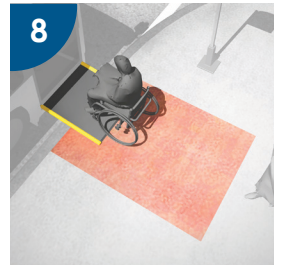


7

BOARDING & ALIGHTING AREA

Keep a 5' x 8' area at the head of each bus stop clear for wheelchair ramp deployment.

Type: concrete pad (painting optional)
Quantity: 1 per stop (2 total)
Approx. Dimensions: 5' x 8'



8

CROSSWALK IMPROVEMENTS

If signalized crosswalks with curb ramps aren't already present, either add them or consider adding RRFB (rectangular rapid flashing beacon) refuge crossings where conventional signalization isn't possible.

Type: various materials
Quantity: varies as needed
Approx. Dimensions: varies as needed



9

LIGHTING IMPROVEMENTS

If absent or inadequate, add context-sensitive lighting to improve nighttime visibility and safety. Explore solar battery power in locations where power conduits are absent.

Type: various materials
Quantity: varies as needed
Approx. Dimensions: varies as needed



10

BUS & SIDEWALK BULB

Build bus stop bulbs at both farside stops and integrate into crosswalk bulbs.

Type: concrete
Quantity: 1 per stop (2 total + crosswalks)
Approx. Dimensions: 90' long (60' length for articulated buses + 10' for rear buffer + 20' for front taper)

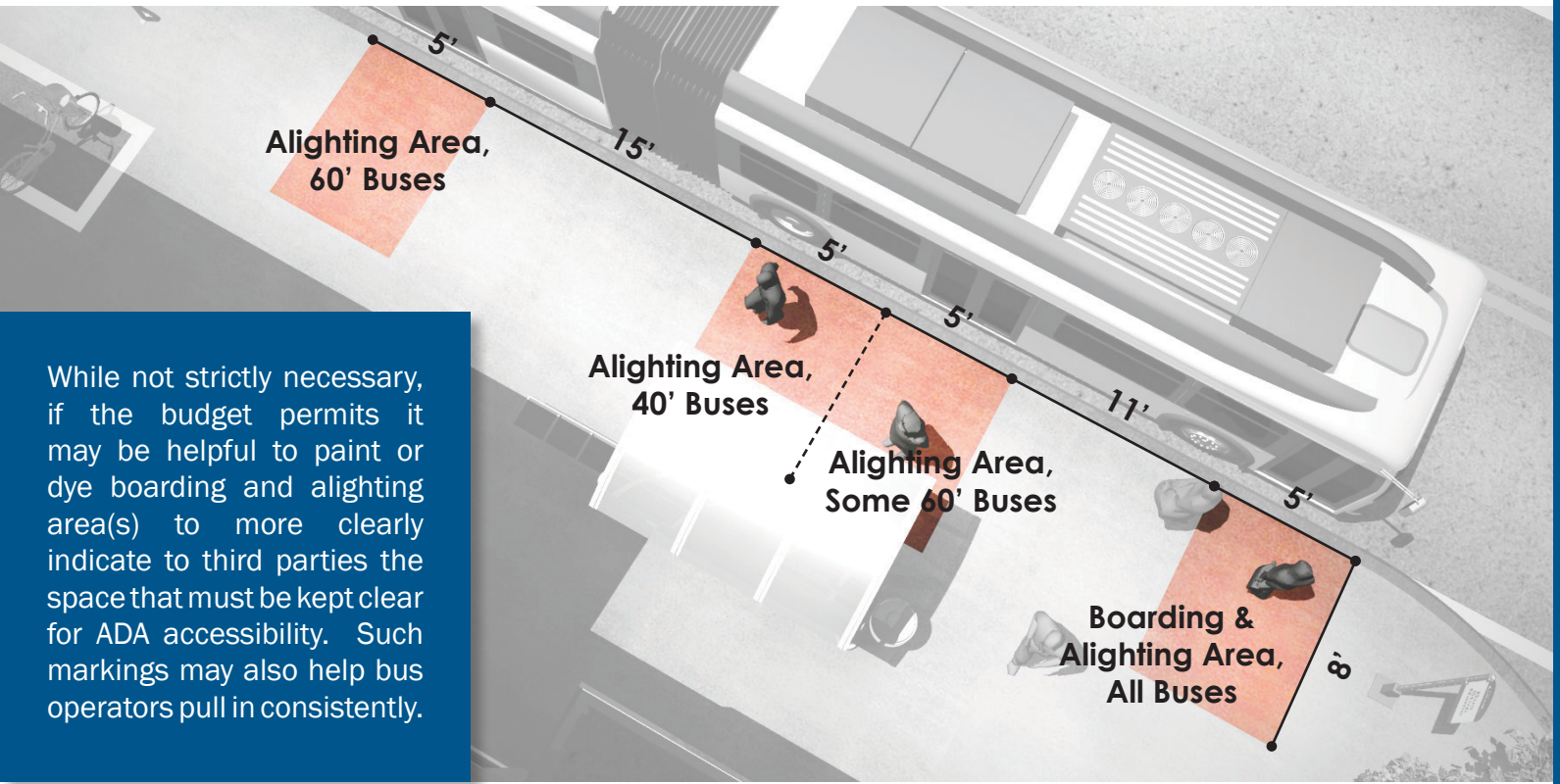


11

Level I: Enhanced Stop Pair

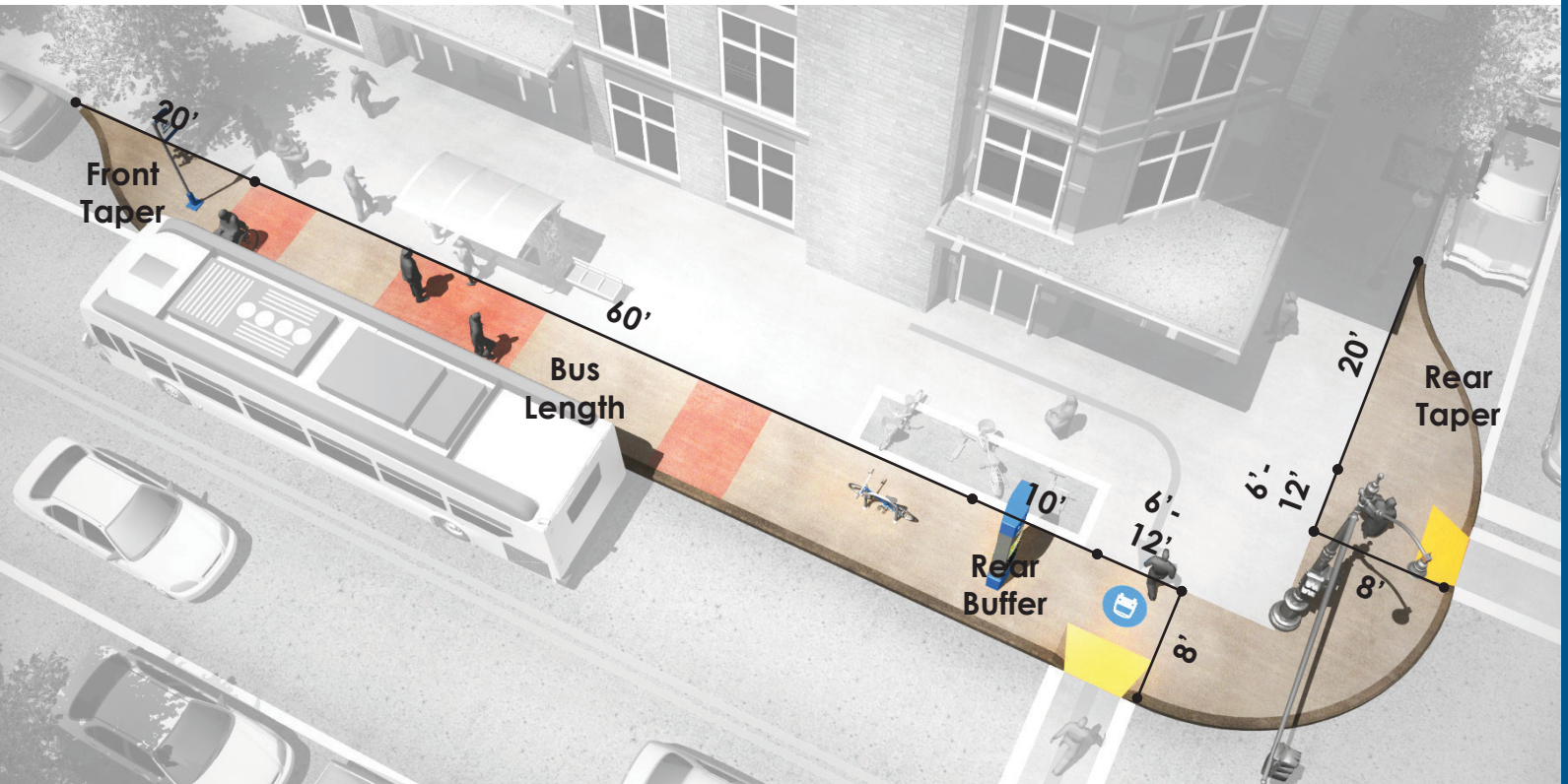
Amenity Descriptions

BOARDING & ALIGHTING AREA DIMENSIONS



While not strictly necessary, if the budget permits it may be helpful to paint or dye boarding and alighting area(s) to more clearly indicate to third parties the space that must be kept clear for ADA accessibility. Such markings may also help bus operators pull in consistently.

BUS & SIDEWALK BULB DIMENSIONS



Level I: Enhanced Stop Pair

Amenity Layout



5' x 15' Shelter

1



Paired Benches

2



Trash Receptor

3



Bicycle Rack

4



Scooter & E-Bike Stor.

5



Pylon

6



Sidewalk Wayfinding

7



Boarding & Alighting Area

8



Information Kiosk

9



Lighting Improvements*

10



Crosswalk Improvements*

11



Bus & Sidewalk Bulb*

12

*Not numbered on aerial.

HIGH-FREQUENCY BUS ROUTE

HIGH-FREQUENCY BUS ROUTE

Transit Signal Priority (TSP)

A Mobility Plaza consists of four farside bus stops that serve as transfer points between the intersection of two high-frequency bus routes. The bus stop amenities on this page are provided as a minimum; see next page for amenity descriptions.



Level II: Mobility Plaza

Amenity Overview



1

5' X 15' SHELTER

Use the 15' long Tolar cantilever shelter model at Mobility Plaza bus stops. Incorporate public art into shelter walls, varying the design by location if possible.

Model: Signature Sunset 14 (Tolar)
Quantity: 1 per stop (4 total)
Approx. Dimensions: 5' x 15' x 9'



2

PAIRED BENCHES

One bench is included with each shelter, but add a second bench inside each. While a single standardized bench model is recommended, different models, sizes, and configurations can be used to apply to varying neighborhood aesthetic contexts.

Model: 13023-121 (Tolar Euro)
Quantity: 1 additional per stop (4+4 total)
Approx. Dimensions: 1'6" x 6' x 1'6"



3

TRASH RECEPTOR

Add a trash receptor next to each shelter.

Type: steel
Quantity: 1 per stop (4 total)
Approx. Dimensions: 2' x 2' x 3'

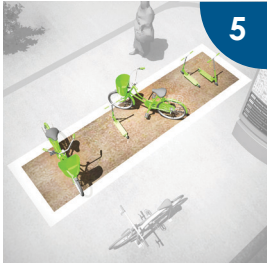


4

BICYCLE RACK

Add a u-style bicycle rack to each bus stop.

Type: steel u-rack
Quantity: 1 per stop (4 total)
Approx. Dimensions: 1' x 2'6" x 2'6"



5

SCOOTER & E-BIKE STORAGE

Paint a rectangle for depositing scooters and e-bikes next to each bus stop.

Type: white paint
Quantity: 1 per stop (4 total)
Approx. Dimensions: 5'6" x 18"

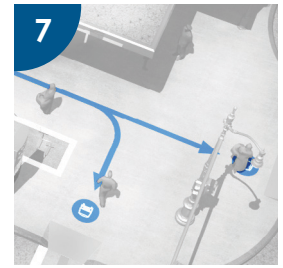


6

PYLON

Add a pylon at the intersection side of each bus stop displaying real-time arrival info and wayfinding. Each pylon should list the CATS website, stop number, and a QR code. Each pylon can also offer a public wifi connection.

Type: internally lit/powerd steel or plastic
Quantity: 1 per stop (4 total)
Approx. Dimensions: 1'6" x 3' x 10'

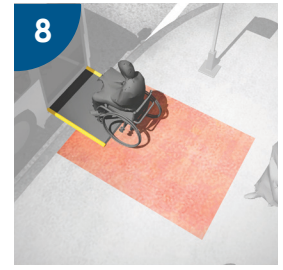


7

SIDEWALK WAYFINDING

Supplement the pylons with thermoplastic sidewalk arrows pointing to the transfer bus stops across the intersection.

Type: blue thermoplastic
Quantity: 1 array at each corner (4 total)
Approx. Dimensions: TBD



8

BOARDING & ALIGHTING AREA

Keep a 5' x 8' area at the head of each bus stop clear for wheelchair ramp deployment.

Type: concrete pad (painting optional)
Quantity: 1 per stop (4 total)
Approx. Dimensions: 5' x 8'



9

INFORMATION KIOSK

Add an information kiosk at the most visible entrance point to the Mobility Plaza displaying supplemental content *distinct* from the real-time arrivals and wayfinding on the nearby pylons. Each kiosk can also offer a public wifi connection.

Type: internally lit/powerd steel or plastic
Quantity: 1 total
Approx. Dimensions: 1'6" x 3' x 10'



10

LIGHTING IMPROVEMENTS

If absent or inadequate, add context-sensitive lighting to improve nighttime visibility and safety. Explore solar battery power in locations where power conduits are absent.

Type: various materials
Quantity: varies as needed
Approx. Dimensions: varies as needed

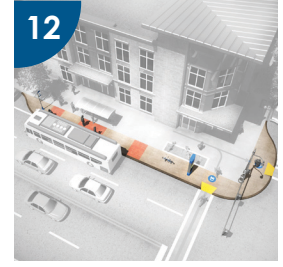


11

CROSSWALK IMPROVEMENTS

If signalized crosswalks with curb ramps aren't already present, either add them or consider adding RRFB (rectangular rapid flashing beacon) refuge crossings where conventional signalization isn't possible.

Type: various materials
Quantity: varies as needed
Approx. Dimensions: varies as needed



12

BUS & SIDEWALK BULB

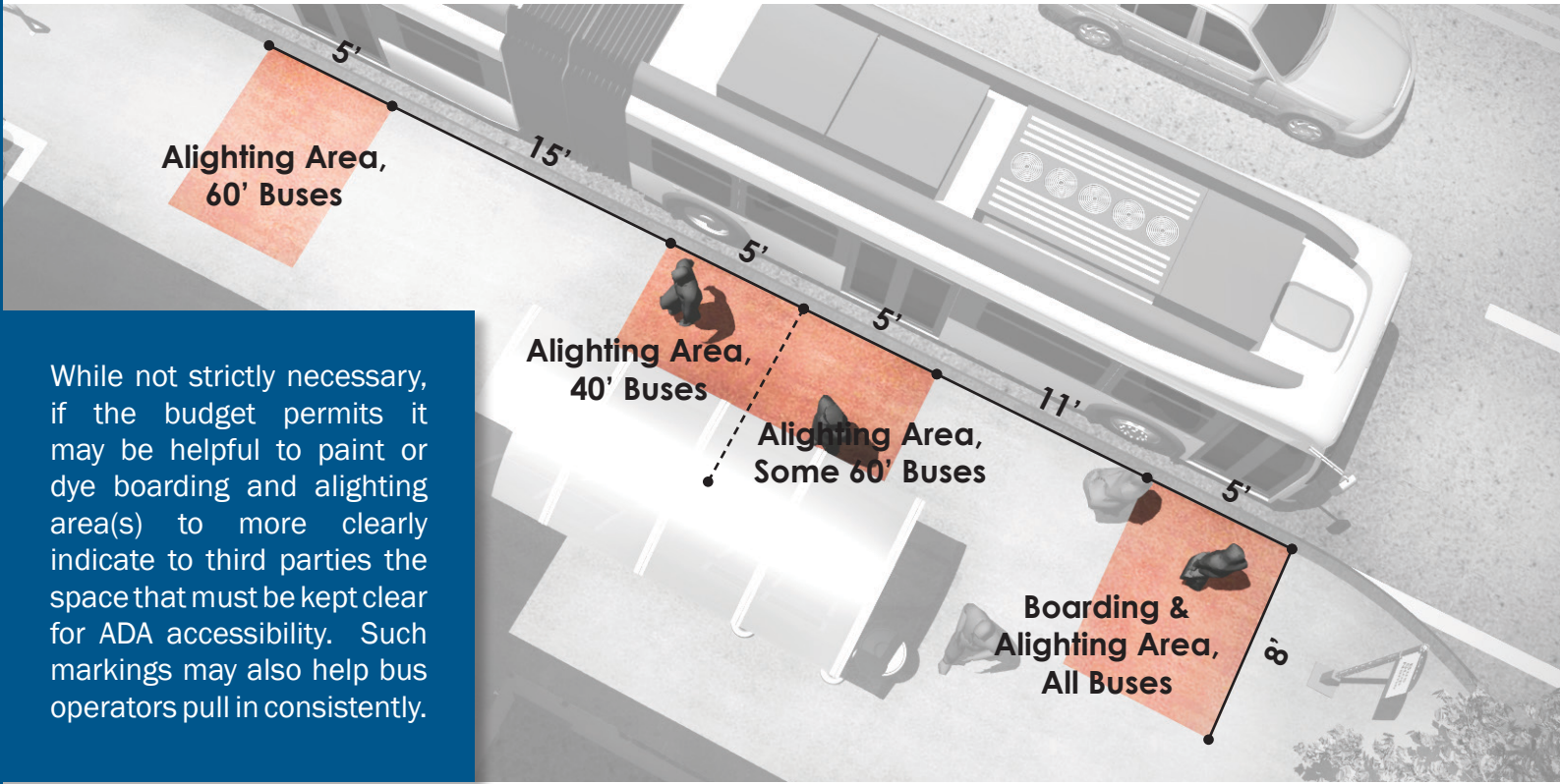
Build bus stop bulbs at all four farside stops and integrate into crosswalk bulbs.

Type: concrete
Quantity: 1 per stop (4 total + crosswalks)
Approx. Dimensions: 90" long (60' length for articulated buses + 10' for rear buffer + 20' for front taper)

Level II: Mobility Plaza

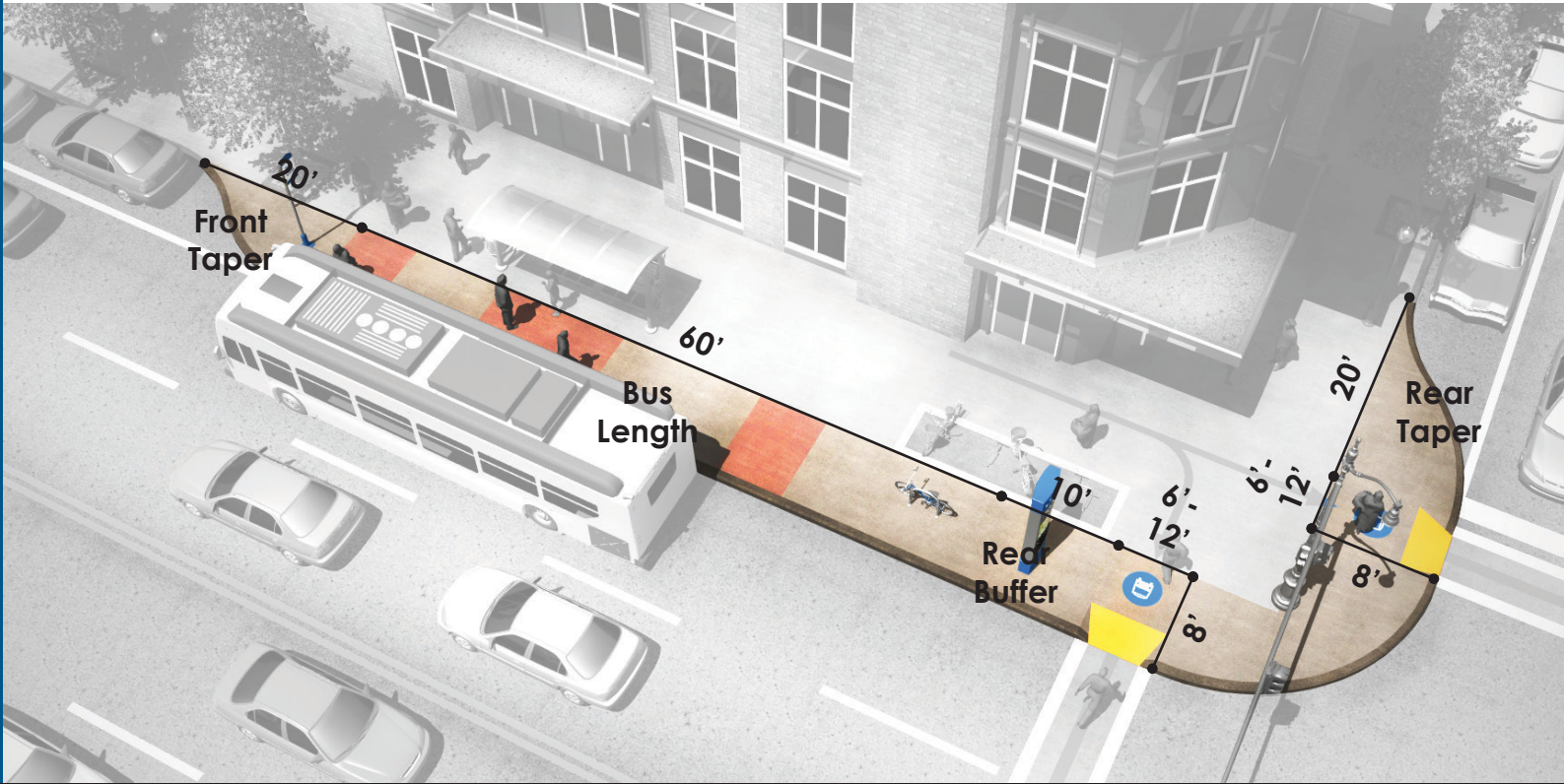
Amenity Descriptions

BOARDING & ALIGHTING AREA DIMENSIONS



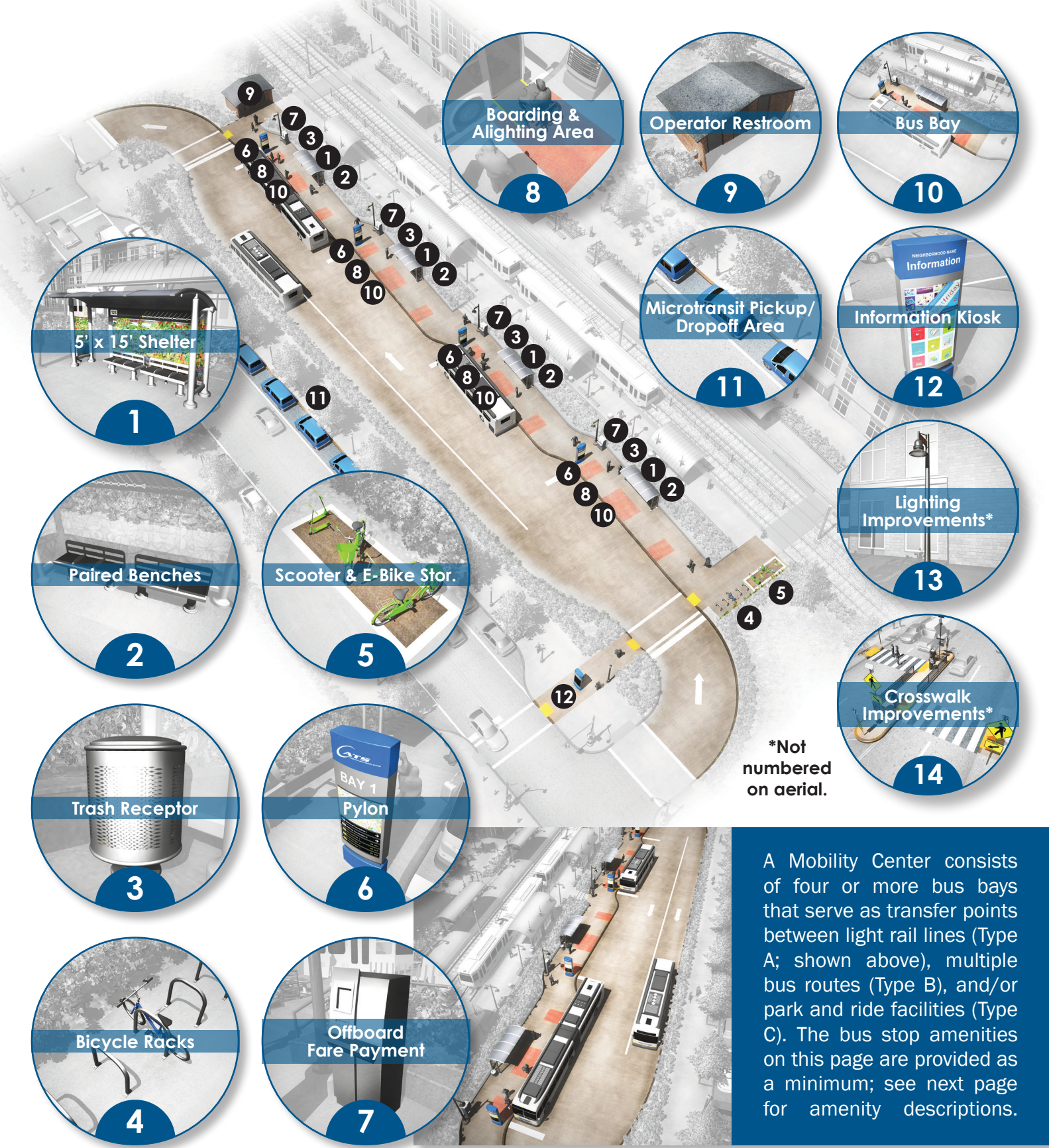
While not strictly necessary, if the budget permits it may be helpful to paint or dye boarding and alighting area(s) to more clearly indicate to third parties the space that must be kept clear for ADA accessibility. Such markings may also help bus operators pull in consistently.

BUS & SIDEWALK BULB DIMENSIONS



Level II: Mobility Plaza

Amenity Layout



*Not numbered on aerial.

A Mobility Center consists of four or more bus bays that serve as transfer points between light rail lines (Type A; shown above), multiple bus routes (Type B), and/or park and ride facilities (Type C). The bus stop amenities on this page are provided as a minimum; see next page for amenity descriptions.

Level III: Mobility Center

Amenity Overview (Types A, B, and C)

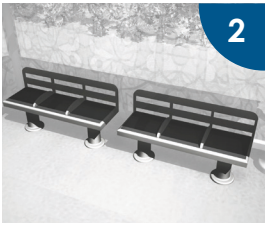


1

5' X 15' SHELTER

Use the 15' long Tolar cantilever shelter model at Mobility Center bus bays. Incorporate public art into shelter walls, varying the design by location if possible.

Model: Signature Sunset 14 (Tolar)
Quantity: 1 per bay (4 total)
Approx. Dimensions: 5' x 15' x 9'



2

PAIRED BENCHES

One bench is included with each shelter, but add a second bench inside each. See full amenity description on Page A11.

Model: 13023-121 (Tolar Euro)
Quantity: 1 additional per bay (4+4 total)
Approx. Dimensions: 1'6" x 6' x 1'6"



3

TRASH RECEPTOR

Add a trash receptor next to each shelter.

Type: steel
Quantity: 1 per bay (4 total)
Approx. Dimensions: 2' x 2' x 3'



4

BICYCLE RACKS

Add 5 u-style bicycle racks to the side of the Mobility Center.

Type: steel u-rack
Quantity: 5 racks
Approx. Dimensions: 1' x 2'6" x 2'6"



5

SCOOTER & E-BIKE STORAGE

Paint a rectangle for depositing scooters and e-bikes on the right side of the Mobility Center.

Type: white paint
Quantity: 1 total
Approx. Dimensions: 5'6" x 18'



6

PYLON

Add a pylon at the head of each bus bay displaying the bay number, real-time arrival info, and wayfinding. See full amenity description on Page A11.

Type: internally lit/powerd steel or plastic
Quantity: 1 per bay (4 total)
Approx. Dimensions: 1'6" x 3' x 10'



7

OFFBOARD FARE PAYMENT

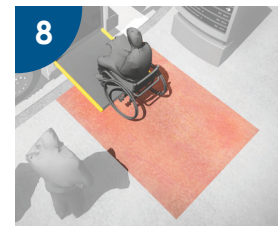
Add a ticket vending machine (TVM) at each bus bay to allow passengers to purchase fares before boarding buses.

Type: ticket vending machine (TVM)
Quantity: 1 per bay (4 total)
Approx. Dimensions: 2' x 2'6" x 6'

BOARDING & ALIGHTING AREA

Keep a 5' x 8' area at the head of each bus bay clear for wheelchair ramp deployment.

Type: concrete pad (painting optional)
Quantity: 1 per bay (4 total)
Approx. Dimensions: 5' x 8'



8

OPERATOR RESTROOM

Provide a secure operator restroom facility (2 single-occupant bathrooms and a utility closet) to the side of the Mobility Center.

Type: concrete block with brick veneer
Quantity: 1 total
Approx. Dimensions: 8' x 17'6" x 9'



9

BUS BAY

Build 4 or more sawtooth bus bays and connect them to adjacent sidewalks, park and rides, and/or light rail stations.

Type: concrete
Quantity: Minimum of 4, but based on number of connecting bus routes
Approx. Dimensions: 70' long (to accommodate both 40' and 60' buses)



10

MICROTRANSIT PICKUP/DROPOFF AREA

Build a pullout area adjacent to the driveways or parking areas for microtransit pickups and dropoffs.

Type: concrete
Quantity: 1 pullout area
Approx. Dimensions: minimum 75' long (for at least 3 midsize microtransit vans)



11

INFORMATION KIOSK

Add an information kiosk at the most visible entrance point to the Mobility Center displaying supplemental content. See full amenity description on Page A11.

Type: internally lit/powerd steel or plastic
Quantity: 1 total
Approx. Dimensions: 1'6" x 3' x 10'



12

LIGHTING IMPROVEMENTS

If absent or inadequate, add context-sensitive lighting to improve nighttime visibility and safety. See full amenity description on Page A11.

Type: various materials
Quantity: varies as needed
Approx. Dimensions: varies as needed



13

CROSSWALK IMPROVEMENTS

If signalized crosswalks with curb ramps aren't already present, either add them or consider adding RRFB (rectangular rapid flashing beacon) refuge crossings where conventional signalization isn't possible.

Type: various materials
Quantity: varies as needed
Approx. Dimensions: varies as needed

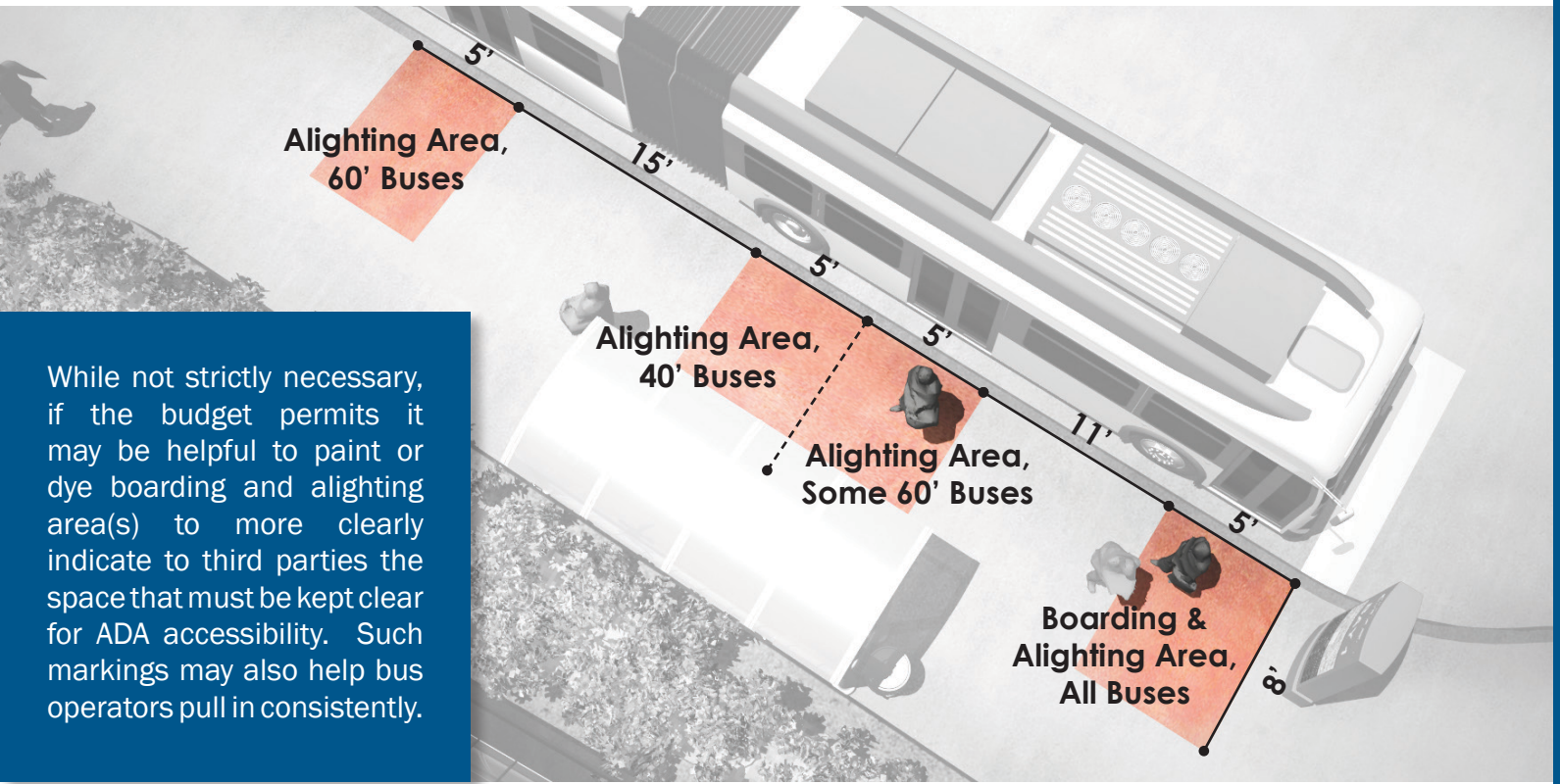


14

Level III: Mobility Center

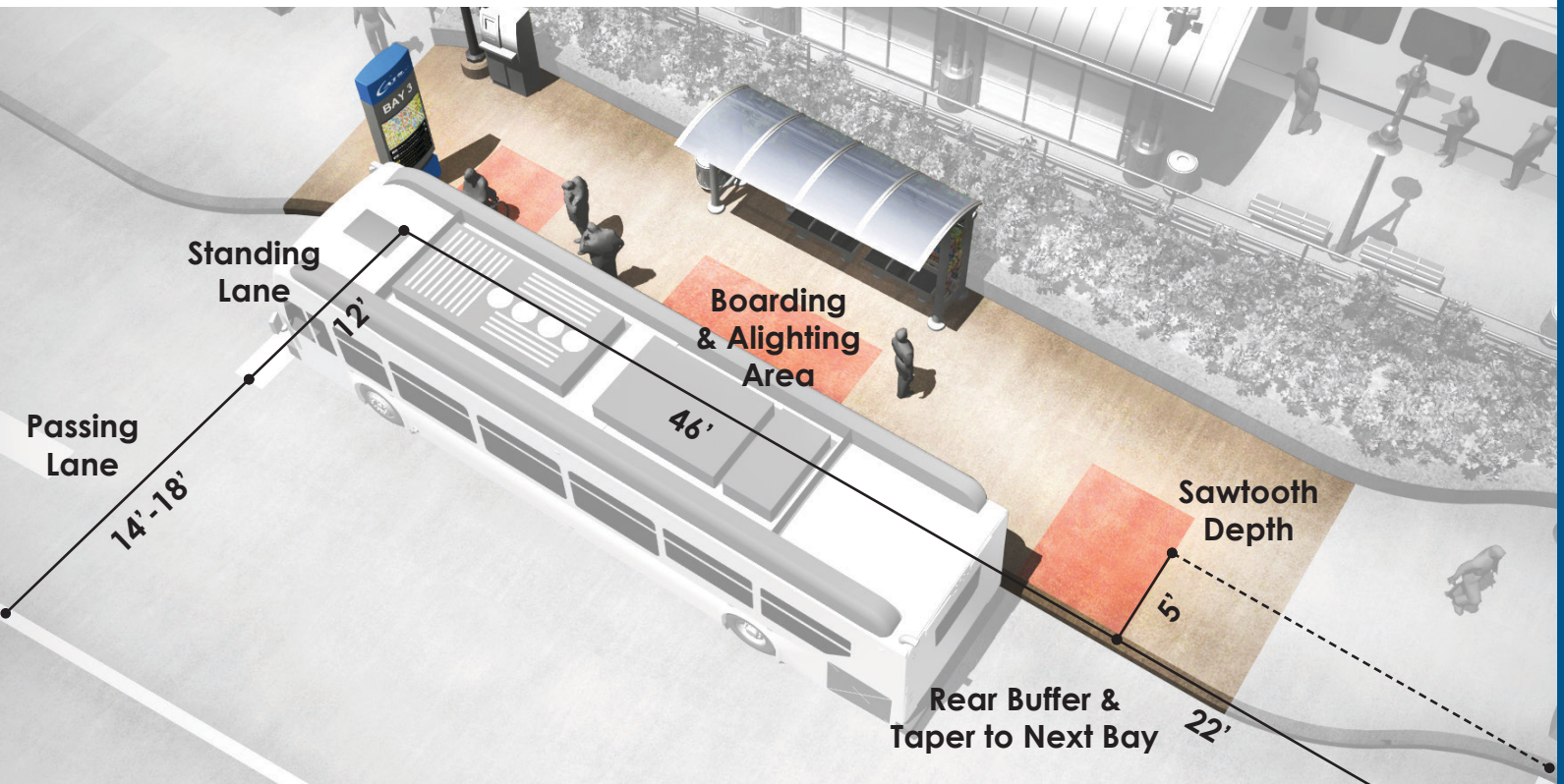
Amenity Descriptions (Types A, B, and C)

BOARDING & ALIGHTING AREA DIMENSIONS



While not strictly necessary, if the budget permits it may be helpful to paint or dye boarding and alighting area(s) to more clearly indicate to third parties the space that must be kept clear for ADA accessibility. Such markings may also help bus operators pull in consistently.

BUS BAY DIMENSIONS



Level III: Mobility Center Amenity Layout (Type A)

MOBILITY CENTER TYPE B, EXAMPLE APPLICATION: Northlake Mall (Lower Section)

In this scenario, the existing bus stops adjacent to Northlake Commons are retrofitted with bus bays and the other passenger amenities on Page A14, effectively upgrading the bus stops into a Type B Mobility Center.

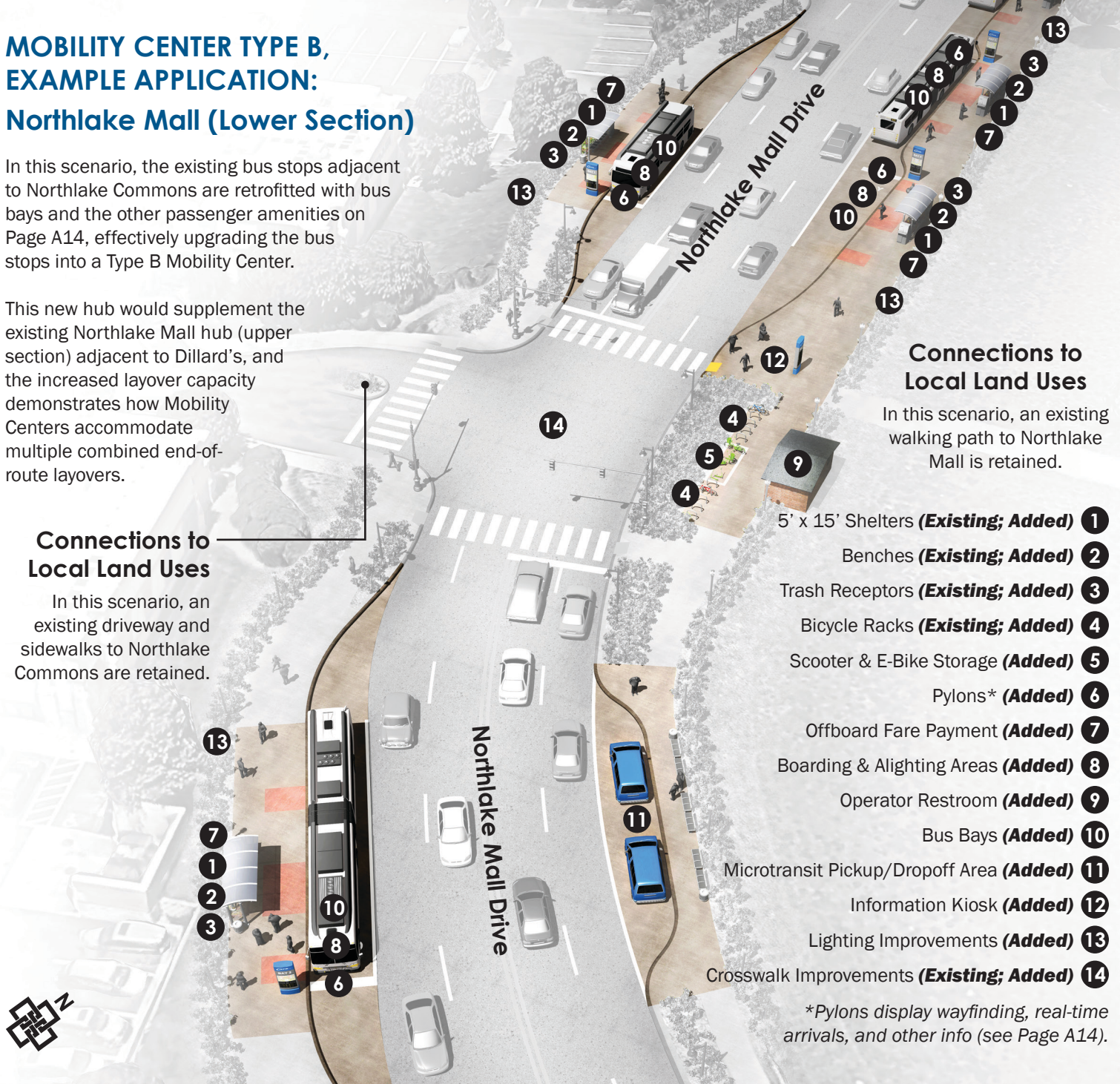
This new hub would supplement the existing Northlake Mall hub (upper section) adjacent to Dillard's, and the increased layover capacity demonstrates how Mobility Centers accommodate multiple combined end-of-route layovers.

Connections to Local Land Uses

In this scenario, an existing driveway and sidewalks to Northlake Commons are retained.

Connections to Local Land Uses

In this scenario, an existing walking path to Northlake Mall is retained.



- 5' x 15' Shelters **(Existing; Added)** 1
- Benches **(Existing; Added)** 2
- Trash Receptors **(Existing; Added)** 3
- Bicycle Racks **(Existing; Added)** 4
- Scooter & E-Bike Storage **(Added)** 5
- Pylons* **(Added)** 6
- Offboard Fare Payment **(Added)** 7
- Boarding & Alighting Areas **(Added)** 8
- Operator Restroom **(Added)** 9
- Bus Bays **(Added)** 10
- Microtransit Pickup/Dropoff Area **(Added)** 11
- Information Kiosk **(Added)** 12
- Lighting Improvements **(Added)** 13
- Crosswalk Improvements **(Existing; Added)** 14

*Pylons display wayfinding, real-time arrivals, and other info (see Page A14).

TYPE B VARIATION: Mobility Center with Connection to Multiple Other Bus Routes

The previous pages depicted a Mobility Center connecting to a light rail station (Type A), but there also are instances where a Mobility Center may connect to other bus routes instead, such as at the end of a bus route. This page illustrates such a scenario; note that to the fullest extent possible, Type B Mobility Centers should still provide the same amenities as those for Type A (see Page A14).

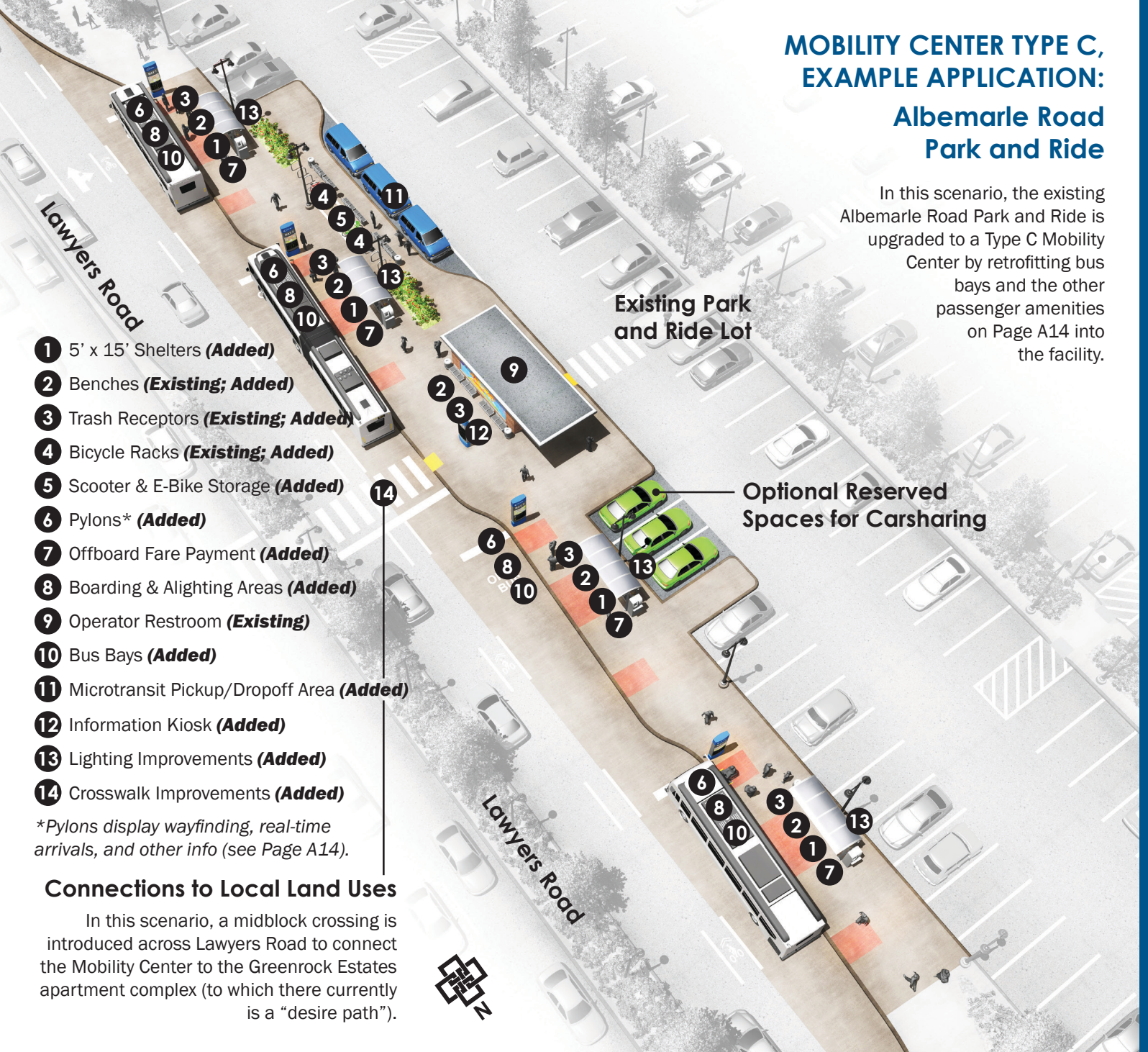
Level III: Mobility Center

Amenity Layout (Type B)

MOBILITY CENTER TYPE C, EXAMPLE APPLICATION:

Albemarle Road Park and Ride

In this scenario, the existing Albemarle Road Park and Ride is upgraded to a Type C Mobility Center by retrofitting bus bays and the other passenger amenities on Page A14 into the facility.



- 1 5' x 15' Shelters **(Added)**
- 2 Benches **(Existing; Added)**
- 3 Trash Receptors **(Existing; Added)**
- 4 Bicycle Racks **(Existing; Added)**
- 5 Scooter & E-Bike Storage **(Added)**
- 6 Pylons* **(Added)**
- 7 Offboard Fare Payment **(Added)**
- 8 Boarding & Alighting Areas **(Added)**
- 9 Operator Restroom **(Existing)**
- 10 Bus Bays **(Added)**
- 11 Microtransit Pickup/Dropoff Area **(Added)**
- 12 Information Kiosk **(Added)**
- 13 Lighting Improvements **(Added)**
- 14 Crosswalk Improvements **(Added)**

*Pylons display wayfinding, real-time arrivals, and other info (see Page A14).

Connections to Local Land Uses

In this scenario, a midblock crossing is introduced across Lawyers Road to connect the Mobility Center to the Greenrock Estates apartment complex (to which there currently is a “desire path”).

TYPE C VARIATION: Mobility Center with Connection to Park and Ride Facility

The previous pages depicted a Mobility Center connecting to a light rail station (Type A), but there also are instances where a Mobility Center may connect to a park and ride facility instead. This page illustrates such a scenario; note that to the fullest extent possible, Type C Mobility Centers should still provide the same amenities as those for Type A (see Page A14).

Level III: Mobility Center

Amenity Layout (Type C)

