
















Barrier Options for Protected Bicycle Lanes

Selection of Bicycle Barriers is Complicated

Cycle Track Barrier Selection Matrix

DRAFT	Striped Buffer	Flexible Bollards	Turtle Bumps	Large Bumps	Oblong Low Bumps	Parking Stops	Linear Barrier	6" Cast in Place Barrier Curb	Parked Cars	Jersey Barriers	Planters	Rigid Bollards	Cast in Place Barrier Curb	Precast Barrier Curb	Raised Cycle Track (Full Recon)
															
Cost/Benefit															
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$150-3/ft. \$8k-16k/mi.	\$3-5/ft. \$15k-30k/mi.	\$2-4/ft. \$10k-20k/mi.	\$3-18/ft. \$50k-90k/mi.	\$12-24/ft. \$60k-130k/mi.	\$4-8/ft. \$20k-40k/mi.	\$4-8/ft. \$20k-40k/mi.	\$5-15/ft. \$25k-75k/mi.	\$15-60/ft. \$80k-300k/mi.	\$15-30/ft. \$80k-160k/mi.	\$15-75/ft. \$80k-400k/mi.	\$20-40/ft. \$100k-200k/mi.	\$20-40/ft. \$100k-200k/mi.	\$70-115/ft. \$400k-600k/mi.	\$1,500-5,000/ft. \$8,000k-26,000k/mi.
Cost	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★	★★	★★	★★	★★	★	★
Cyclist Perceived Safety	★	★★★★	★★★★	★★★★★	★★	★★★★	★★★★	★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Other Considerations															
Durability / Maintenance	★★	★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★★	★★★★★	★	★★★★	★★★★★	★★★★	★★★★★
Sweeping	★★★★	Depends on Width	Depends on Width	Depends on Width	Depends on Width	Depends on Width	Depends on Width	Depends on Width	★★★	Depends on Width	Depends on Width	Depends on Width	Depends on Width	Depends on Width	Depends on Width
Trash Collection	★★★★	★	★★★★	★	★★★★	★★★★★	★★★★★	★★★★★	Depends on Time of Day	★	★	★	★★★★★	★★★★★	★★★★★
Storm Water	★★★★	★★★★	★★★★	★★★★	★★★★	★★	★★★★	★★★★	★★★★★	★★	★★	★★★★	★★	★★	★
Traffic Compatibility (Motor vehicle / barrier interactions)	★★★★	★★★★	★★	★★	★★★★	★★★★	★★★★	★★★★★	★★★★	★★★★★	★★★★	★★	★★★★★	★★★★	★★★★★
Aesthetics (factoring in damage over time)	★★	★	★★	★★★★	★★	★★	★★	★★	★★	★	★★★★★	★★★★	★★★★	★★★★	★★★★
Construction Impacts	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★	★★★★★	★★★★	★★★★	★★	★★	★★★★	★
Width Required	1.5'	1.5'	1.5'	1.5'	1.5'	1/2'	1/2'	1/2'	8' if not existing	2'	3'	2'	1'	1'	0'
Notes															
General									Requires on-street parking						
Cost	Least expensive option	Good cost per foot	Very good cost per foot	Good cost per foot	Very good cost per foot	Good cost per foot	Good cost per foot	Good cost per foot	ADA parking changes, pedestrian refuge islands, and ADA ramp changes can		Spacing of planters affects cost	Utility conflicts could affect cost	Cast in place curbs are much less expensive due to reduced handling time	Custom precast curbs significantly increases cost over cast in place barriers	Reconstruction including storm water improvements is likely
Cyclist Perceived Safety	No physical element	Good vertical element	Good deterrent for motorist	Strong deterrent for motorist. Good vertical element.	Decent deterrent for motorists. Low contrast.	Good deterrent for motorist	Good deterrent for motorist	Good deterrent for motorist	Strong deterrent for motorist. Good vertical element.	Strong deterrent for motorist. Good vertical element.	Strong deterrent for motorist. Good vertical element.	Strong deterrent for motorist. Good vertical element.	Strong deterrent for motorist. Horizontal separation.	Strong deterrent for motorist. Horizontal separation.	Strong deterrent for motorist.
	Thermo / paint	Flexible bollards	Good durability	Good durability	Good durability	Good durability	Good durability	Good durability	No element to	Very durable	Need a	Good durability	Very durable	Good durability	Very durable

2 Types of Street Projects

- Retrofit
 - Reshaping operations of corridors quickly
 - Fulfilling network need
 - No Funding for subsurface utility reconstruction
- Reconstruction
 - Storm water system usually upgraded and design flexible
 - Significant project funding

Retrofit

Retrofit

- Find best balance of operational needs when contemplating changes to a corridor

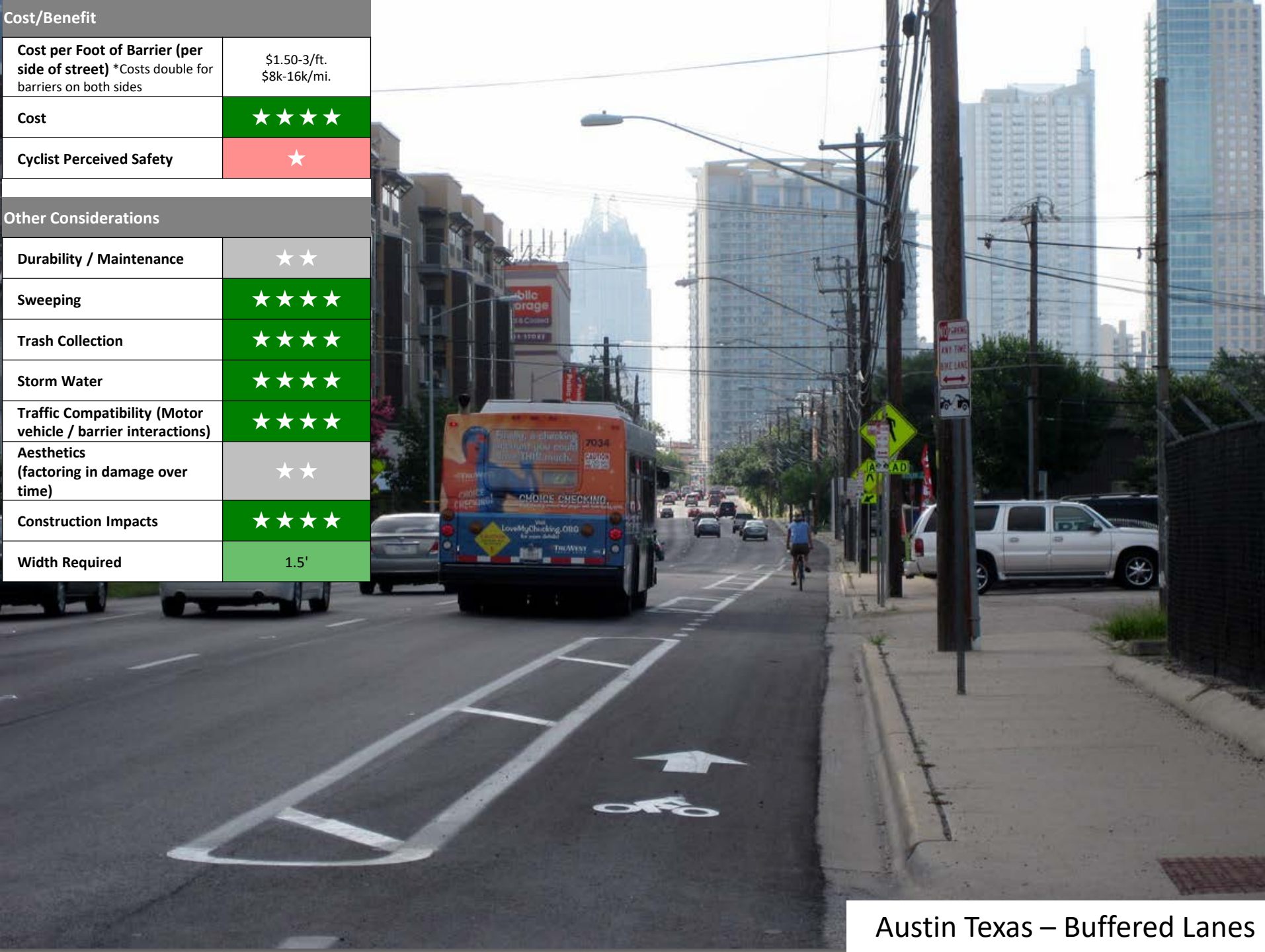
Cost/Benefit

Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$4-8/ft. \$20k-40k/mi.
Cost	★ ★ ★
Cyclist Perceived Safety	★ ★ ★

Other Considerations

Durability / Maintenance	★ ★ ★
Sweeping	Depends on Width
Trash Collection	★ ★ ★ ★
Storm Water	★ ★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★ ★
Aesthetics (factoring in damage over time)	★ ★
Construction Impacts	★ ★ ★
Width Required	1/2'

Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$1.50-3/ft. \$8k-16k/mi.
Cost	★★★★★
Cyclist Perceived Safety	★
Other Considerations	
Durability / Maintenance	★★
Sweeping	★★★★★
Trash Collection	★★★★★
Storm Water	★★★★★
Traffic Compatibility (Motor vehicle / barrier interactions)	★★★★★
Aesthetics (factoring in damage over time)	★★
Construction Impacts	★★★★★
Width Required	1.5'



Austin Texas – Buffered Lanes



Austin Texas – Cycle Track with Delineators



Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$3-6/ft. \$15k-30k/mi.
Cost	★ ★ ★
Cyclist Perceived Safety	★ ★ ★
Other Considerations	
Durability / Maintenance	★
Sweeping	Depends on Width
Trash Collection	★
Storm Water	★ ★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★ ★ ★ ★
Aesthetics (factoring in damage over time)	★
Construction Impacts	★ ★ ★
Width Required	1.5'

Austin Texas – Cycle Track with Delineators



Cost/Benefit

Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$4-7/ft. \$10k-20k/mi.
Cost	★ ★ ★
Cyclist Perceived Safety	★ ★

Other Considerations

Durability / Maintenance	★ ★ ★
Sweeping	Depends on Width
Trash Collection	★ ★ ★ ★
Storm Water	★ ★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★ ★
Aesthetics (factoring in damage over time)	★ ★
Construction Impacts	★ ★ ★
Width Required	1.5'

Barcelona – Traffic Bumps

Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$4-7/ft. \$10k-20k/mi.
Cost	★ ★ ★
Cyclist Perceived Safety	★ ★

Other Considerations

Durability / Maintenance	★ ★ ★
Sweeping	Depends on Width
Trash Collection	★ ★ ★ ★
Storm Water	★ ★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★ ★
Aesthetics (factoring in damage over time)	★ ★
Construction Impacts	★ ★ ★
Width Required	1.5'



Spain - Zebra Path Divider

Poor Sense of Separation – Minimal Drainage Impact



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Israel - Low Barrier Curb



India - Curb Stops as Barrier Curb with Tight Spacing



Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$4-8/ft. \$20k-40k/mi.
Cost	★ ★ ★
Cyclist Perceived Safety	★ ★ ★
Other Considerations	
Durability / Maintenance	★ ★ ★
Sweeping	Depends on Width
Trash Collection	★ ★ ★ ★
Storm Water	★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★ ★
Aesthetics (factoring in damage over time)	★ ★
Construction Impacts	★ ★ ★
Width Required	1/2'

Washington DC - Curb Stops and Flex Posts



Cost/Benefit

Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides

\$4-8/ft.
\$20k-40k/mi.

Cost

★ ★ ★

Cyclist Perceived Safety

★ ★ ★

Other Considerations

Durability / Maintenance

★ ★ ★

Sweeping

Depends on Width

Trash Collection

★ ★ ★ ★

Storm Water

★ ★ ★

Traffic Compatibility (Motor vehicle / barrier interactions)

★ ★ ★

Aesthetics (factoring in damage over time)

★ ★

Construction Impacts

★ ★ ★

Width Required

1/2'



Sweeden – Cycle Specific Traffic Curbs



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Cost/Benefit		
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides		\$4-7/ft. \$10k-20k/mi.
Cost		★ ★ ★
Cyclist Perceived Safety		★ ★ ★
Other Considerations		
Durability / Maintenance		★ ★ ★
Sweeping		Depends on Width
Trash Collection		★ ★ ★ ★
Storm Water		★ ★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)		★ ★
Aesthetics (factoring in damage over time)		★ ★
Construction Impacts		★ ★ ★
Width Required		1.5'

Córdoba, Spain - Traffic Bumps



Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$4-8/ft. \$15k-30k/mi.
Cost	★ ★ ★
Cyclist Perceived Safety	★ ★ ★ ★ ★
Other Considerations	
Durability / Maintenance	★ ★ ★
Sweeping	Depends on Width
Trash Collection	★
Storm Water	★ ★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★
Aesthetics (factoring in damage over time)	★ ★ ★
Construction Impacts	★ ★ ★
Width Required	1.5'

Seville, Spain - Large Traffic Bumps



Seville, Spain - Large Traffic Bumps



Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$15-60/ft. \$80k-300k/mi.
Cost	★★
Cyclist Perceived Safety	★★★★
Other Considerations	
Durability / Maintenance	★★★★
Sweeping	★★★
Trash Collection	Depends on Time of Day
Storm Water	★★★★
Traffic Compatibility (Motor vehicle / barrier interactions)	★★★
Aesthetics (factoring in damage over time)	★★
Construction Impacts	★★★★
Width Required	8' If not existing

NYC - Parking Separated

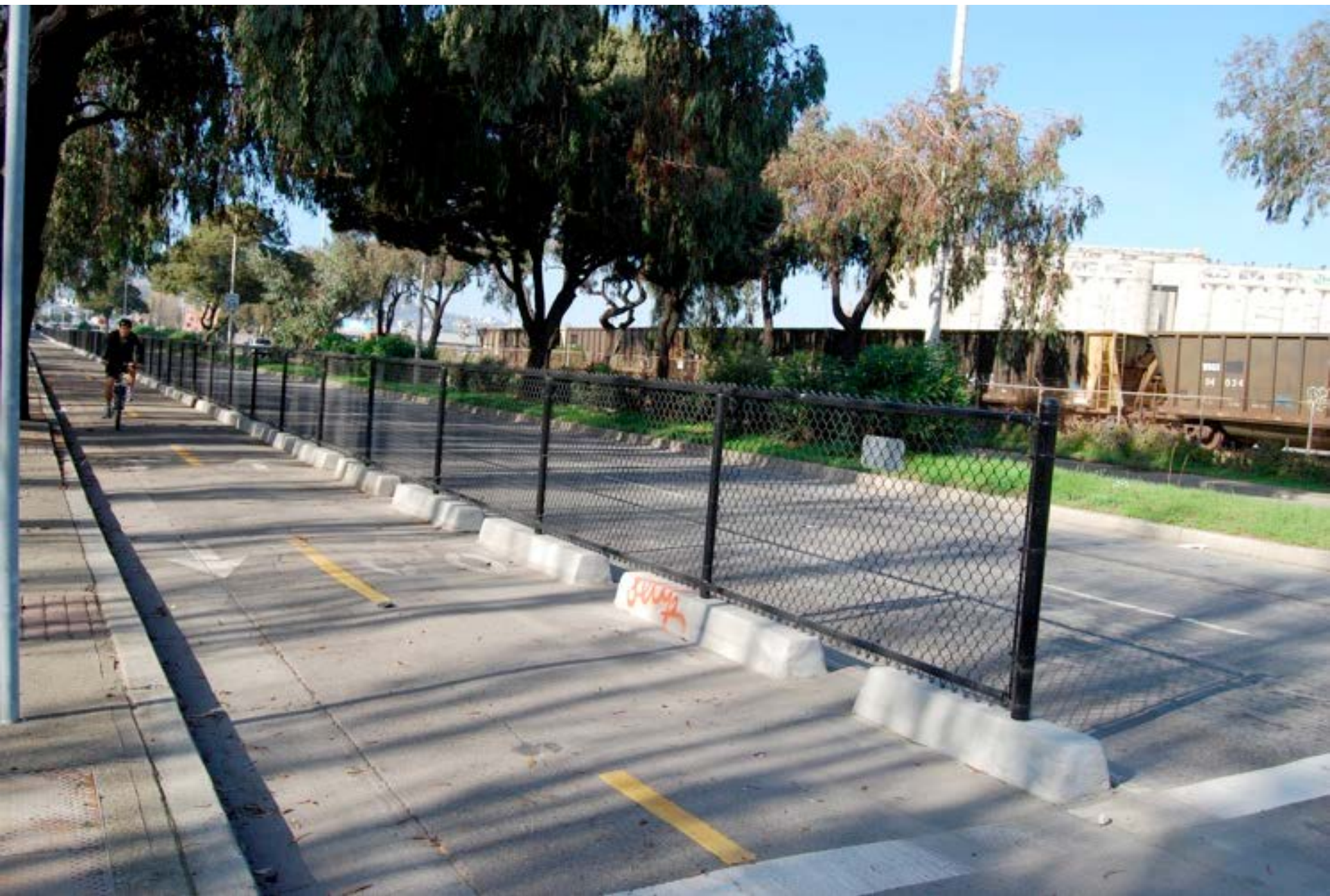


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Rotterdam – [Bike] Parking Separated



NYC – Public Seating



San Francisco – High Fence



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Seville, Spain – Low Fence

Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$15-30/ft. \$80k-160k/mi.
Cost	★ ★
Cyclist Perceived Safety	★ ★ ★ ★
Other Considerations	
Durability / Maintenance	★ ★ ★ ★
Sweeping	Depends on Width
Trash Collection	★
Storm Water	★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★ ★ ★
Aesthetics (factoring in damage over time)	★
Construction Impacts	★ ★ ★
Width Required	2'



NYC – Jersey Barrier



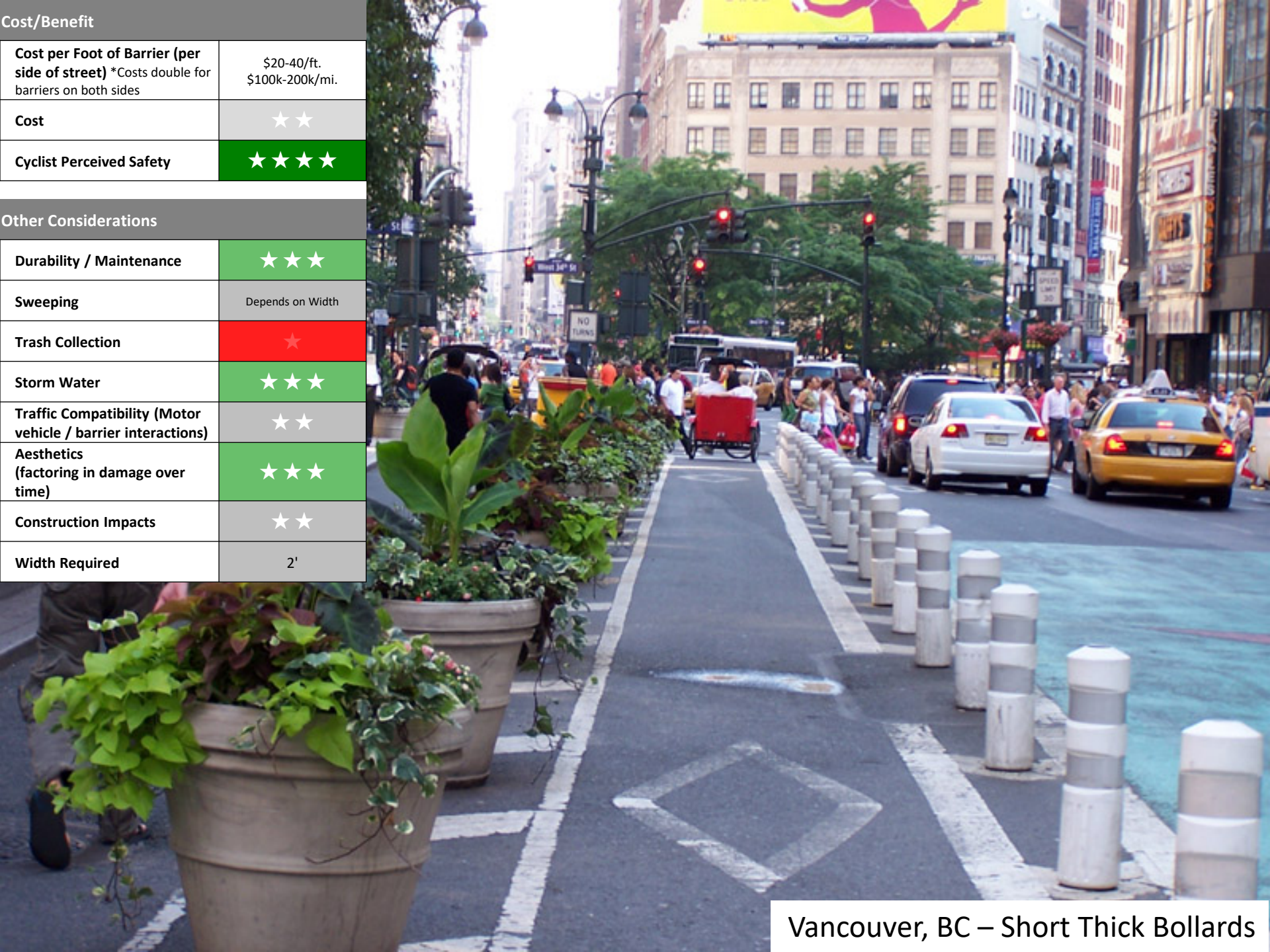
Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$15-75/ft. \$80k-400k/mi.
Cost	★ ★
Cyclist Perceived Safety	★ ★ ★ ★
Other Considerations	
Durability / Maintenance	★
Sweeping	Depends on Width
Trash Collection	★
Storm Water	★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★ ★
Aesthetics (factoring in damage over time)	★ ★ ★ ★
Construction Impacts	★ ★ ★
Width Required	3'

Vancouver, BC – Planter Separated



Corona, CA – Landscaping

Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$20-40/ft. \$100k-200k/mi.
Cost	★ ★
Cyclist Perceived Safety	★★★★★
Other Considerations	
Durability / Maintenance	★★★★
Sweeping	Depends on Width
Trash Collection	★
Storm Water	★★★★
Traffic Compatibility (Motor vehicle / barrier interactions)	★★
Aesthetics (factoring in damage over time)	★★★★
Construction Impacts	★★
Width Required	2'



Vancouver, BC – Short Thick Bollards

Spot Profile Adjustments at Bus Stop for Retrofit Project



Austin, TX – NYC Style Planters, Pedestrian Refuges, and Bollards

Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$5-15/ft. \$25k-75k/mi.
Cost	★ ★ ★
Cyclist Perceived Safety	★ ★ ★
Other Considerations	
Durability / Maintenance	★ ★ ★
Sweeping	Depends on Width
Trash Collection	★ ★ ★ ★
Storm Water	★ ★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★ ★ ★ ★
Aesthetics (factoring in damage over time)	★ ★
Construction Impacts	★ ★
Width Required	1/2'



Tilburg, Netherlands – Narrow Curb



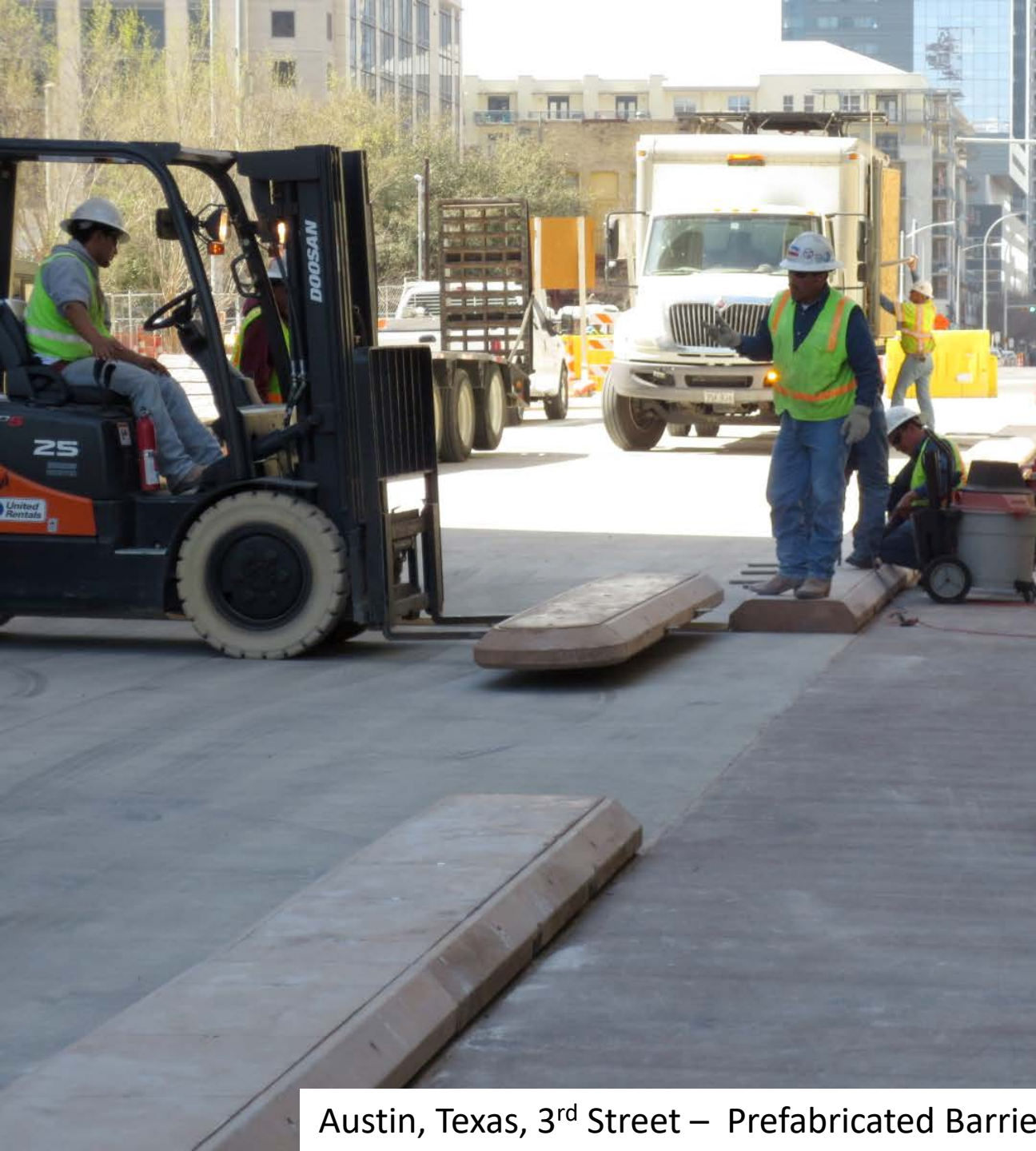
Cost/Benefit

Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$20-40/ft. \$k-k/mi.
Cost	★ ★
Cyclist Perceived Safety	★★★★

Other Considerations

Durability / Maintenance	★★★★
Sweeping	Depends on Width
Trash Collection	★★★★
Storm Water	★ ★
Traffic Compatibility (Motor vehicle / barrier interactions)	★★★★
Aesthetics (factoring in damage over time)	★★★
Construction Impacts	★ ★
Width Required	1'

Austin, Texas, Pedernales Street – Cast in Place Barrier Curbs with Breaks for Inlets and Driveways



Cost/Benefit

Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$70-115/ft. \$400k-600k/mi.
Cost	★
Cyclist Perceived Safety	★★★★

Other Considerations

Durability / Maintenance	★★★
Sweeping	Depends on Width
Trash Collection	★★★★
Storm Water	★★
Traffic Compatibility (Motor vehicle / barrier interactions)	★★★
Aesthetics (factoring in damage over time)	★★★
Construction Impacts	★★★
Width Required	1'

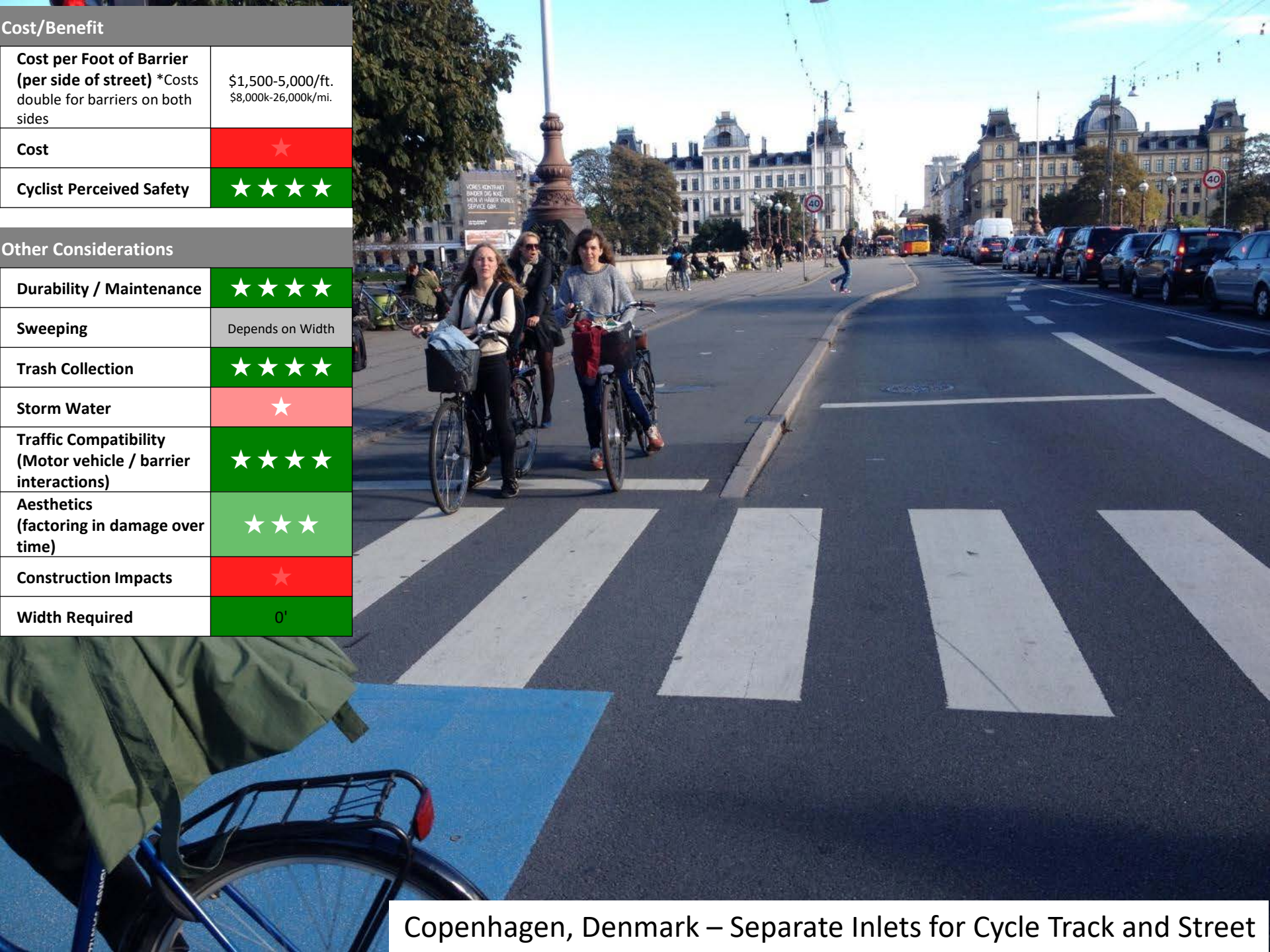
Austin, Texas, 3rd Street – Prefabricated Barrier Curb Units with Tight Spacing

Reconstruction



Portland, Oregon – Sloping Curb

Cost/Benefit	
Cost per Foot of Barrier (per side of street) *Costs double for barriers on both sides	\$1,500-5,000/ft. \$8,000k-26,000k/mi.
Cost	★
Cyclist Perceived Safety	★★★★★
Other Considerations	
Durability / Maintenance	★★★★★
Sweeping	Depends on Width
Trash Collection	★★★★★
Storm Water	★
Traffic Compatibility (Motor vehicle / barrier interactions)	★★★★★
Aesthetics (factoring in damage over time)	★★★
Construction Impacts	★
Width Required	0'



Copenhagen, Denmark – Separate Inlets for Cycle Track and Street



Paris, France – Sidewalk Level Cycle Track



Boulder – Trees

Concrete Traffic Buttons

North Loop Buttons



North Loop Buttons



North Loop Painted



North Loop

Concrete Buttons With Driveways



North Loop

Concrete Buttons More Driveways



Barton Hills



Barton Hills



Jones Road

