

State of Practice Review of Tactical Curb Extensions, including Facilities with Mural Art

(Paper 25-001483)

Download summary ->



Nathan McNeil, Sirisha Kothuri Portland State University
Wesley Kumfer, Sarah O'Brien, University of North Carolina



This review documents existing knowledge and practice on curb extensions, including permanent, tactical, and tactical curb extensions with mural art. The paper presents a synthesis of findings from a curb extension literature review and an agency scan conducted through an online survey. The findings from this scan will be beneficial for agencies who are seeking to install tactical curb extensions with and without mural art.

Permanent curb extensions



Tactical (quick-build) curb extensions



Tactical curb extensions with mural art



Conclusions

Existing research through this review and scan suggests that mural art curb extensions can be effective from a safety standpoint; however more rigorous study is needed.

- Most agencies surveyed installed permanent (89%) and tactical curb extensions (83%), while about half (54%) have installed tactical curb extensions with mural art.
- Primary reasons for installing permanent curb extensions are to reduce motorist speeds, improve safety, reduce pedestrian crossing lengths, and increase visibility.
- Low costs and ability to quick-build and test installations were commonly cited for tactical curb extensions.
- For tactical curb extensions with mural art, improving aesthetics and community livability through the addition of art were frequently mentioned.
- Very few rigorous studies exist of safety and curb extensions, particularly across multiple contexts or jurisdictions.
- Of the studies that exist, generally positive impacts were seen including increased vehicle yielding, reduced speeds, and reductions in pedestrian crossing distance and time.
- Very few tactical curb extension studies (with or without mural art) contained any type of control or specific measures to isolate the impact of specific elements of the designs.
- Some logistical and other challenges also exist for installing tactical curb extensions with mural art such as
 - Lack the staff capacity to maintain mural artwork
 - Fear that it could distract drivers
 - Concern about the ability of people with vision or mobility impairments to safely navigate the crossings

INTRODUCTION

- Curb extensions are geometric safety treatments that seek to improve pedestrian safety.
- No crash modification factors currently exist for curb extensions.
- Due to high cost and limited resources, agencies are increasingly using tactical curb extensions with flexible posts and paint.
- Often considered temporary or pilot projects.
- Some agencies are experimenting with coloring the curb extension areas with a single color.
- Addition of mural art is an emerging trend that provides color and art into the streetscape.

METHODS

- Agency scan to determine types and rationale for curb extension installations.
- Literature review to determine research on curb extensions.

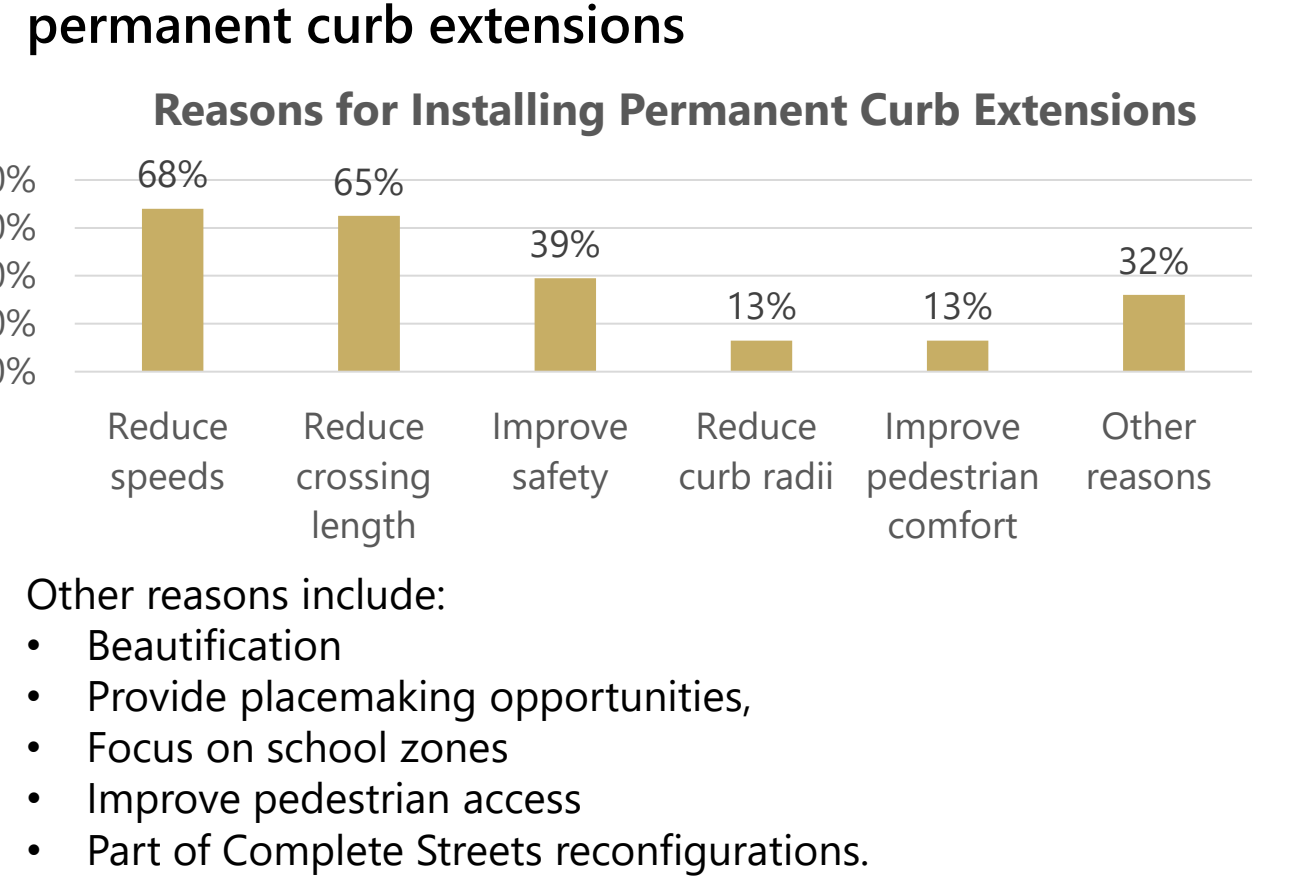
Agency Scan

- An online survey was designed and administered to practitioners at city and county agencies in the U.S.
- The survey was shared with various professional organization listservs such as National Association of City Transportation Officials (NACTO), Association of Pedestrian and Bicycle Professionals (APBP) and Institute of Transportation Engineers (ITE).
- Respondents were asked to indicate the types of curb extensions (permanent, tactical, or tactical with mural art) present in their jurisdictions.
- For each type of extension chosen, respondents were asked about the primary reasons why these types of curb extensions were installed, and to provide details on any reports or evaluations conducted of safety and performance.
- 35 unique agency responses were obtained and considered for further analysis.

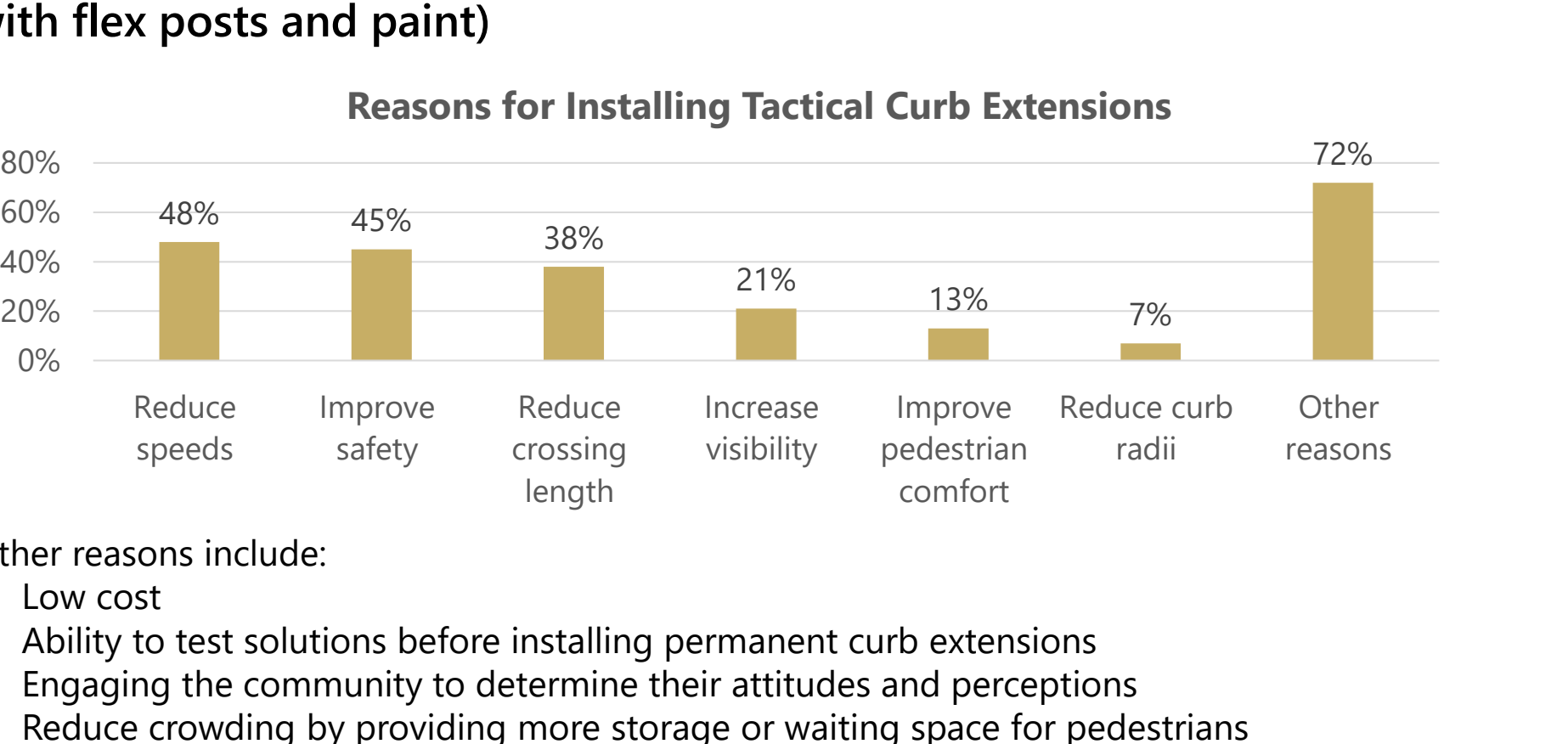
Literature Review

- Searched Transport Research International Documentation (TRID) database (<https://trid.trb.org/>) and Google Scholar (<https://scholar.google.com/>) for research containing keywords of curb extension variants ("curb extension", "bulb out", "sidewalk extension", "tactical urbanism").
- Also reviewed any related articles cited within those documents.
- A scan was undertaken for agency reports and briefs focused on tactical curb extensions (with and without mural art).

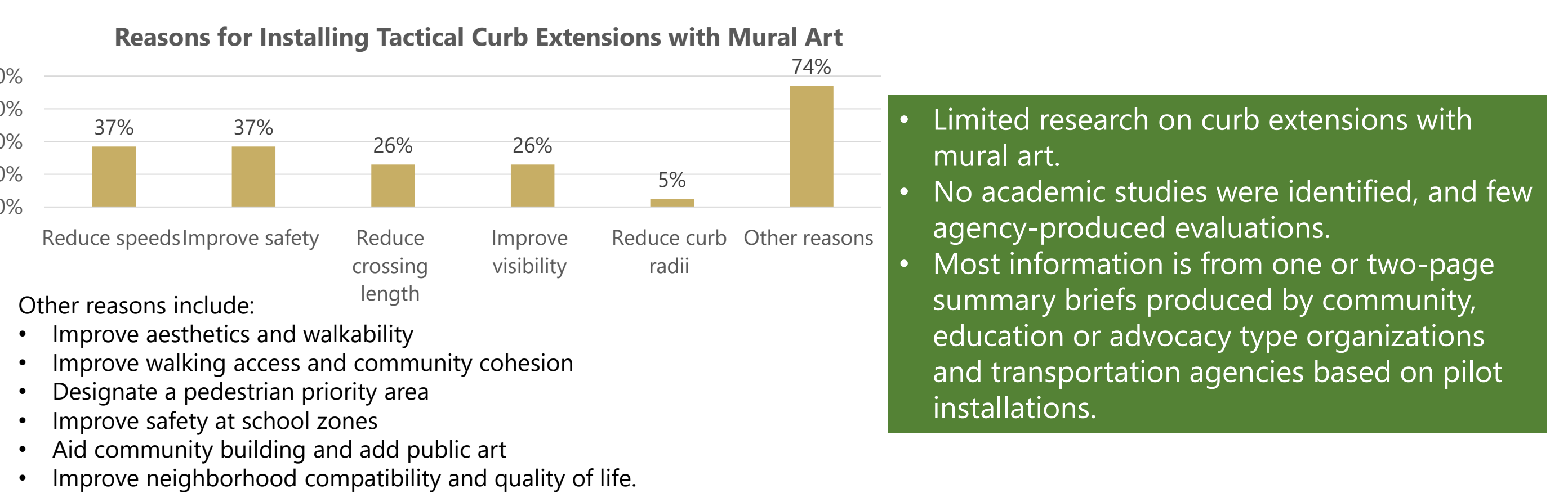
89% of agencies responding to the survey have permanent curb extensions



83% of agencies responding to the survey have tactical curb extensions (e.g., with flex posts and paint)



54% agencies responding to the survey have tactical curb extensions with mural art



Findings from the Literature Review

We identified **six studies** focused on **permanent curb extensions**, although most were over 10 years old. Studies looking at the efficacy of curb extensions have primarily focused on crashes, driver yielding, and pedestrian delay.

- Crashes:**
- 3 of 6 studies reported on crashes or injuries. Each reported overall reductions in pedestrian crashes or injuries, including:
 - 17% fewer pedestrian injuries across 266 curb extension sites in New York City (NYCDOT 2022).
 - Crash reductions at 4 of 6 sites in New York (King 1999).
 - Study of 1 site found reduction from 4.7 ped crashes per year to just 1 crash per year (Thompson and Heyden 1991).
- Yielding:**
- 3 of 6 studies reported on vehicle yielding. Each study found mixed or non-significant results.
- Pedestrian delay:**
- 3 studies looked at pedestrian delay, with two finding reductions in delay, and one finding mixed results.

Table 1. Studies of permanent curb extensions

Study	Site information
NYC DOT (2022)	266 sites in New York, NY.
Thompson and Heyden, 1991	Nottingham, England.
King (1999)	6 sites in New York, NY
Huang and Cynecki (2000)	2 sites in Cambridge, MA, and 2 sites in Seattle, WA.
Johnson (2005)	4 sites in Albany, OR. Crossings were of one-way, 2 lane roads
van Hengel (2013)	1 site in Santa Barbara, CA

Findings from the Literature Review

We identified **seven studies** looking at **tactical curb extensions**. These were primarily agency or agency-affiliated evaluations and reports (which were not considered for the permanent curb extension review). Many of these reports do not provide methodological detail.

- Crashes:**
- Only two of the identified studies reported crash results – both finding reductions in crashes:
 - Columbus, OH found that (all) crashes in one year went from 27 down to 4 after making safety updates (including tactical curb extensions) to three intersections along one corridor (City of Columbus, Department of Public Service 2022)
 - A study in Chicago of a corridor update including tactical curb extensions found that all crashes went down 16% (Chicago DOT / FHWA 2020)
 - A third study found that pedestrian / vehicle interactions were reduced by half (SFMTA 2022).
- Yielding:**
- Five studies looked at vehicle yielding to pedestrians, with 3 finding improved yielding and one finding no significant change.
 - Reported improvements in yielding ranged from 25% (SFMTA 2021) to 42% (Chicago FHWA 2020). Another study, only looking at an after condition, found 100% yielding.
- Vehicle speeds:**
- Four reported on vehicle speeds, generally finding reductions in speed; one reported mixed results.
 - Metrics reported included average speeds (0-2 mph reductions in the Columbus study); 85th percentile speeds (2-4 mph reductions in the same study); percentage driving under 30 mph (reduced by 43% in the Chicago / FHWA study); percentage driving under 20 mph (increased by 16% in the same study); turning speeds (55% reduction in one SFMTA study from 2021); percentage of vehicles at or below the speed limit (98% in one SFMTA 2018 study).

Table 2. Studies of tactical curb extensions

Study	Site information
Portland Bureau of Transportation (2021)	Expanded 10 corners using paint & flexposts as part of COVID physical distancing initiative.
City of Columbus, Department of Public Service (2022)	Tactical curb extensions included in a set of safety improvements 3 intersections on one corridor
Chicago DOT / FHWA (2020)	Tactical curb extensions included in a set of safety improvements along a 1.5 mile stretch of Milwaukee Avenue in Chicago
SFMTA (2021)	Tactical curb extensions with khaki colored paint infill at 8 locations in SF
SFMTA (2018)	1 location in SF; Protected Intersection.
SFMTA (2022)	1 location in SF
Green, Gase, Singh and Kuo 2019	Two intersections with a painted (red) curb extension and plastic bollard

Findings from the Literature Review

We identified **eleven studies** looking at **curb extensions with mural art**, although many were focused on a single location, and produced by community organizations or centers. Most did not provide methodological detail.

- Crashes/Conflicts:**
- We did not find any studies reporting on crash effects of curb extensions with mural art.
 - One study examined conflicts, including some with "high crash potential" (Bloomberg Philanthropies & Sam Schwartz 2022). At locations with mural art curb extensions (along with other changes), pedestrian / vehicle conflicts dropped at 2 locations (including dropping from 5 to 1 high crash potential conflicts at 1 location). Conflicts increased at a third location.
- Yielding:**
- Three studies looked at motorist yielding to pedestrians, with two finding improvements and one finding little change.
 - Two of the Bloomberg sites were unsignaled (locations in Pittsburgh, PA and Lancaster, PA), and yielding rates were mostly unchanged from prior to the addition of the curb extensions.
 - At three sites in Baltimore, rates of vehicles yielding to pedestrians increased significantly, going from 29% to 74% at one site (MICA Center 2021), and increasing from 40% to 68% and 35% to 85% at two locations other locations (MICA Center 2022).
- Vehicle speeds:**
- Three of the studies provided data on changes in vehicle speed, with all three finding reductions in speeds.
 - 85th percentile speed dropped from 27 to 22 mph, and 6 mph drop in average speed (Barker-Winkworth 2023).
 - Vehicle speeds decreased by 7% at peak hours Ulupono Initiative (2021a).
 - 85th percentile speeds dropped ~10% to 15% (from 40 mph to 35 mph for NB vehicles and from 34 mph to 31 mph for SB vehicles). Average speed dropped from 27 to 22 mph (NB) and 21 to 19 mph (SB) City of Fort Lauderdale (2022).
 - No studies specifically looked at turning vehicle speeds.
- Crossing Distance:**
- Four of eleven studies reported on reduced crossing distances from pedestrians, ranging from 20% reductions to 66% reductions.
- Survey data:**
- Four of the eleven studies collected some type of survey data, although sample sizes were generally quite limited.
 - Most reported increased sense of safety, and sense that cars were driving slower.
 - One study surveyed businesses, who found that changes to an intersection that included curb extensions with mural art made visiting their business more appealing for customers (Mobility Beverly Hills 2021).

Table 3. Studies of tactical curb extensions with mural art

Study	Site information
Bloomberg Philanthropies & Sam Schwartz (2022)	3 locations with mural art and curb extensions in & San Richmond, VA; Pittsburgh, PA; Lancaster, PA
Barker-Winkworth (2023)	1 location Tucson, AZ. Curb extension with mural art, along with painted (art) median and midblock crossing.
MICA Center (2022)	3 locations in Baltimore, MD
MICA Center (2021)	1 location in Baltimore, MD: Curb extension area AND crosswalk had mural art.
Graham Projects (2022)	
MICA Center (2020)	1 location in Baltimore, MD
City of Honolulu (n.d.)	King St. at Haka St. in Honolulu, HI.
Ulupono Initiative (2023)	Prospect St. at Prospect Pl., Honolulu, HI. By R.L. Stevenson Middle School.
Ulupono Initiative (2021a)	S. Paps Ave. and Ma'alo St., Kahului, HI. By Lihikai Elementary School
Ulupono Initiative (2021b)	Hailipo St. at Papiipi Rd., Ewa Beach, HI.
Mobility Beverly Hills (2021)	1 location in Beverly Hills, CA. Intersection includes a scramble signal and marked diagonal crosswalks.
City of Fort Lauderdale (2022)	Location with tactical mural buffer (bike lane) and median island (elements of tactical curb extension)

What's Next?

This review and scan will inform an upcoming study of pedestrian and motorist behavior at quick-build curb extensions

- Collect video and survey data at 25 locations in Washington, DC (5 permanent curb extensions, 5 tactical curb extensions, 5 tactical with mural art curb extensions and 10 control locations).
- Assess road user safety and comfort at these locations using metrics such as driver yielding, pedestrian use of curb extensions, driver intrusion etc.
- The study aims to develop a replicable evaluation model for other agencies or researchers to assess quick-build curb extensions.

Acknowledgements

This research was funded by the DC Department of Transportation (DDOT). We would also like to thank all the agencies who responded to our agency scan.