project downtown

Appendix D: Alternatives Analysis Memo

Prepared for the City of Littleton | February 2024

Littleton

Pinyon Environmental, Inc.

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CONCEPTUAL ALTERNATIVES

The development of **conceptual alternatives** in the downtown core was informed by input from Littleton staff, stakeholders, LDDA, City Council, and the community from the first phase of outreach completed in Fall 2023. Three alternatives were presented to the stakeholders and community for additional feedback. This section provides documentation of key design elements, opportunities/challenges, parking impacts, and traffic analysis impacts of each alternative.

Alternative 1 - Chicane on Main

The **Chicane on Main alternative** addressed all project goals; however, Placemaking and Activation were the focus to create comfortable places for people to dwell and enjoy historic Littleton. This alternative includes a chicane on Main Street to slow vehicle speeds and create enhanced pedestrian gathering spaces for visitors. Sidewalks and amenity zones would be improved on Alamo Avenue and protected bicycle lanes installed on Prince Street.

The Chicane on Main Alternative is defined by **three big ideas,** illustrated in the plan view.

Big Idea ① Chicane on Main Street creates dynamic social spaces activating the street.

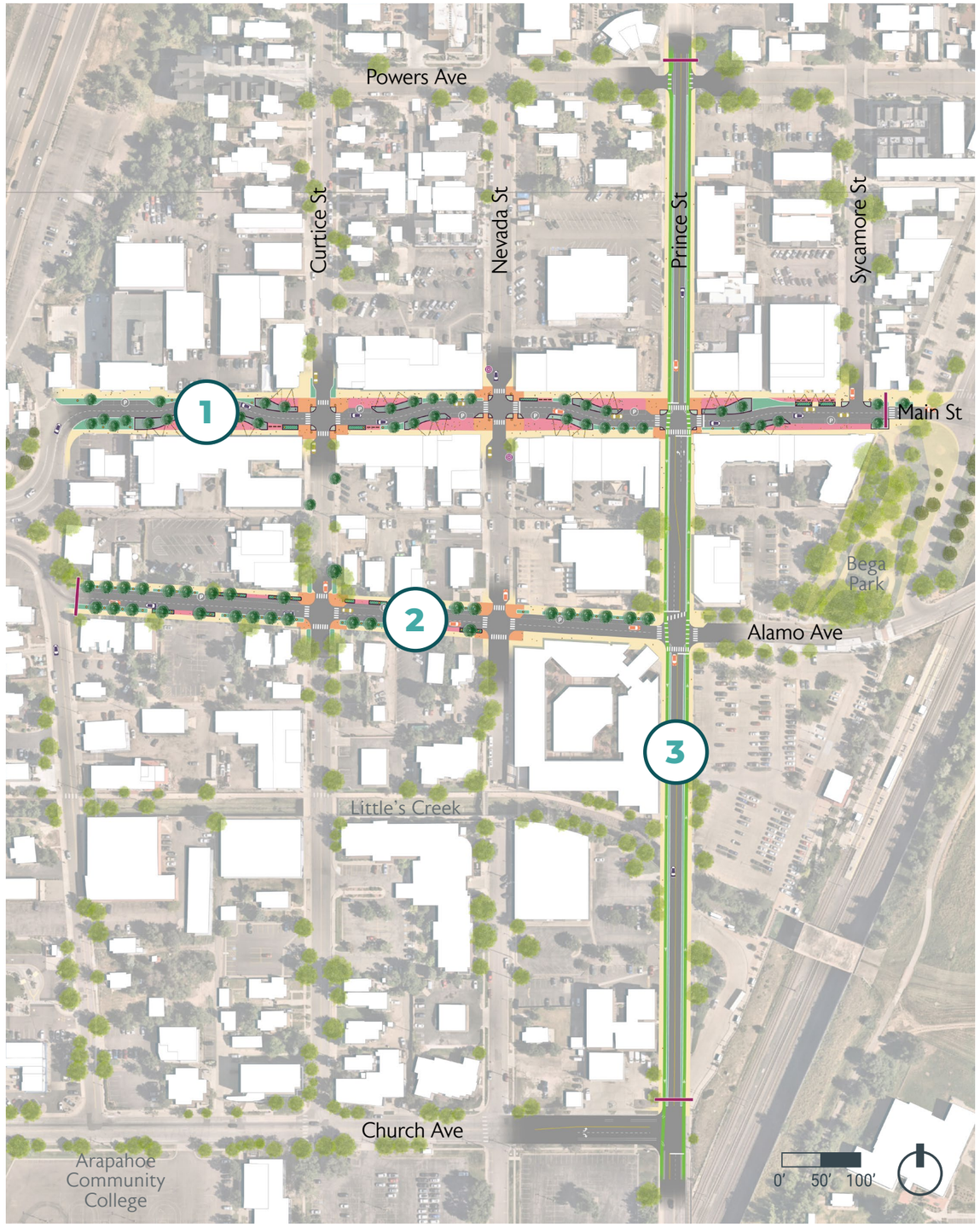
Big Idea ② Enhanced streetscape on Alamo Avenue creates inviting and comfortable pedestrian experiences.

Big Idea ③ Prince Street mobility and traffic calming enhancements link the downtown core to the north and south ends of downtown.

Considerations

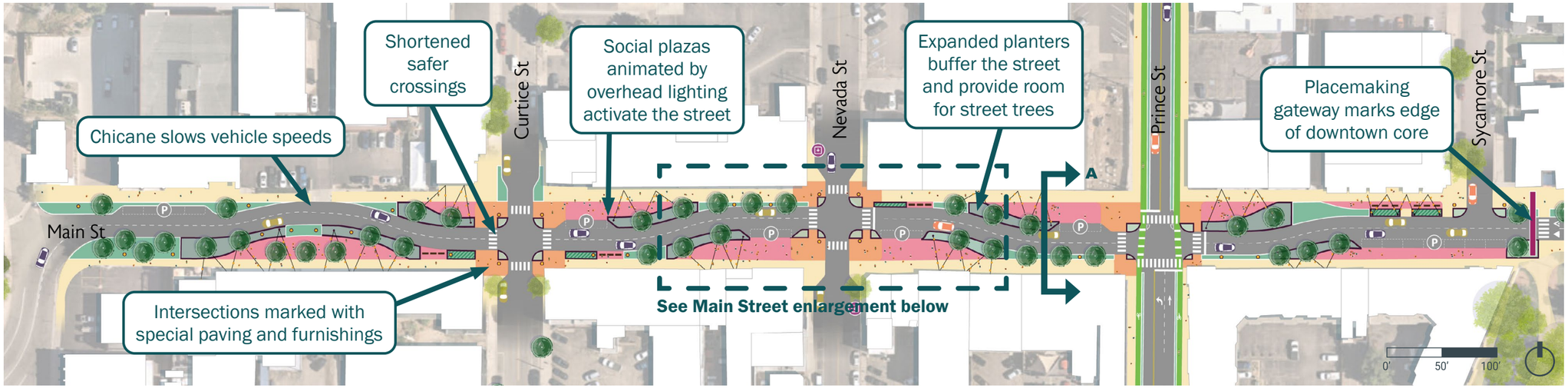
- Increased pedestrian space and opportunities for green infrastructure on Main Street.
- Slow vehicle speeds on Main Street due to horizontal deflection.
- Shortens pedestrian crossing distances at Main Street intersections.
- Narrows travel lanes and expands pedestrian space on Alamo Avenue.
- The protected bicycle facility on Prince Street provides a high comfort bicycle facility from Santa Fe Drive to Church Street.
- Removes parking on Main Street.
- Removes exclusive northbound right turn lane at Alamo Avenue & Prince Street.
- Removes exclusive southbound right turn lane at Alamo Avenue & Prince Street.
- Limited east/west bicycle connections in the Downtown core.

Figure 1: *Plan View - Chicane Alternative Big Ideas*



Big Idea 1

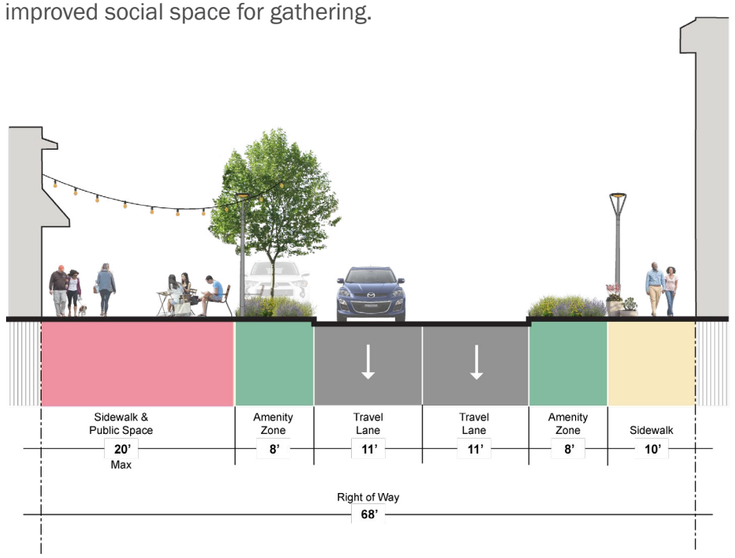
Chicane on Main Street creates dynamic social spaces activating the street.



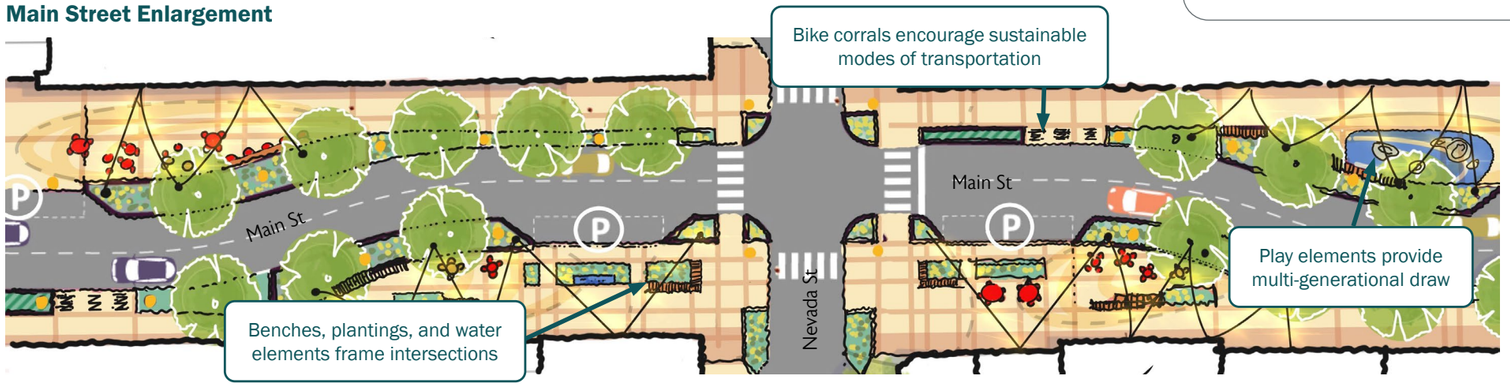
Legend

- New trees
- Existing trees
- Parking
- Pick up/drop off areas
- String lights
- Light poles
- Sidewalk improvements
- Social space
- Special paving
- At grade amenity zone plantings
- Raised planters (ornamental)
- Raised planters (water quality)
- Bike lane
- Gateway

Section A illustrates enhanced amenity zones, wider sidewalks, and improved social space for gathering.



Main Street Enlargement



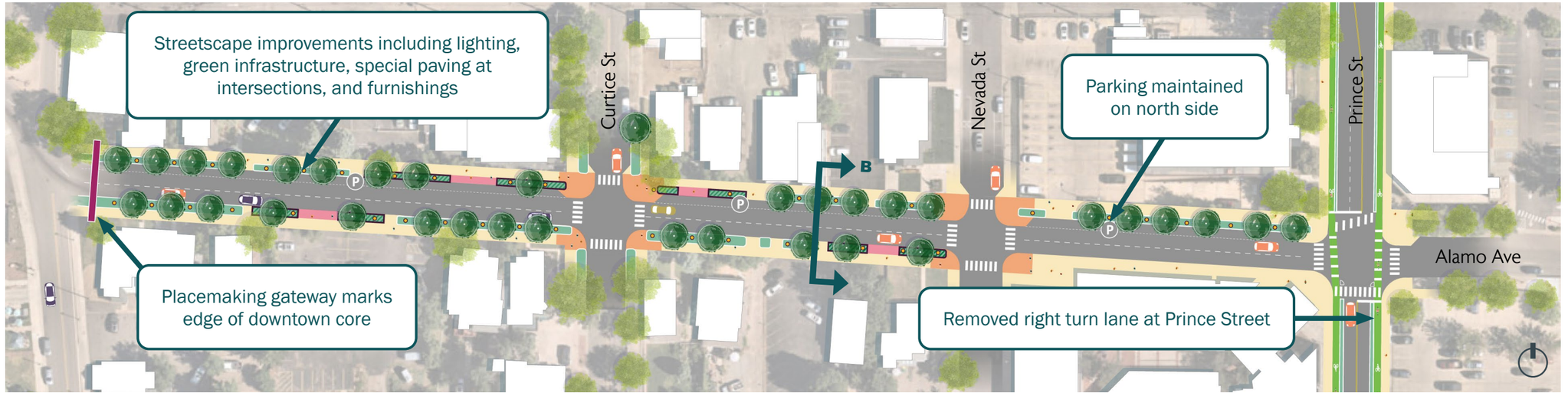
Precedent: Social spaces buffered by vegetation create comfortable places to rest and gather.

Precedent: Overhead lighting to activate Main Street at all times of year.

Precedent: Spaces for play buffered with seating provide experiences for children and adults.

Big Idea 2

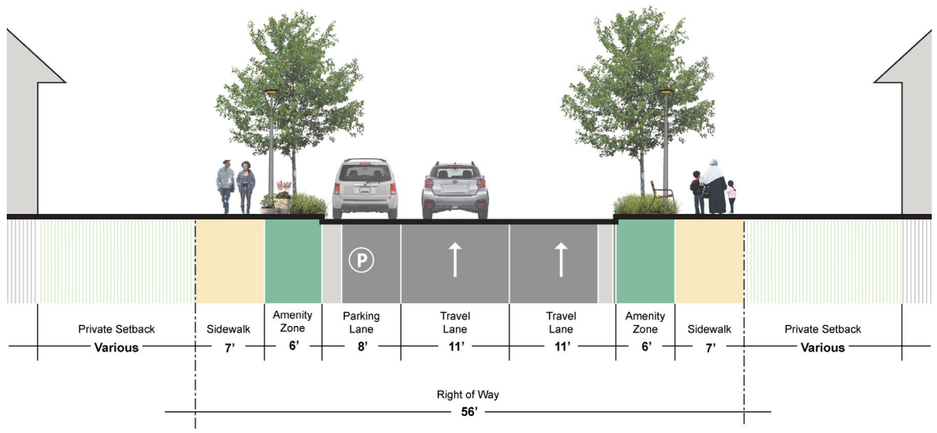
Enhanced streetscape on Alamo Avenue creates inviting and comfortable pedestrian experiences.

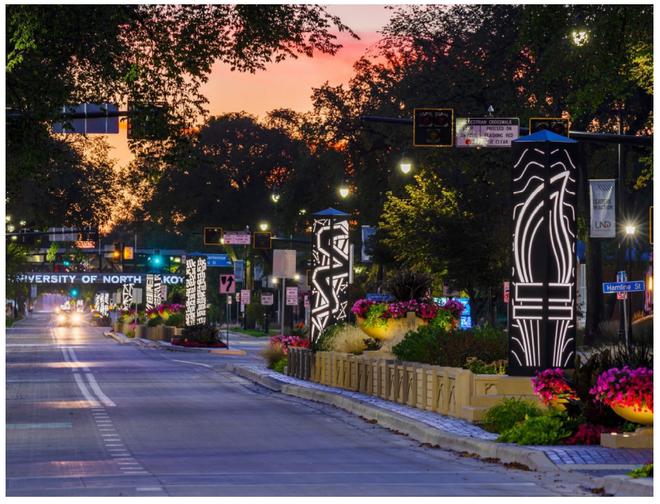


Legend

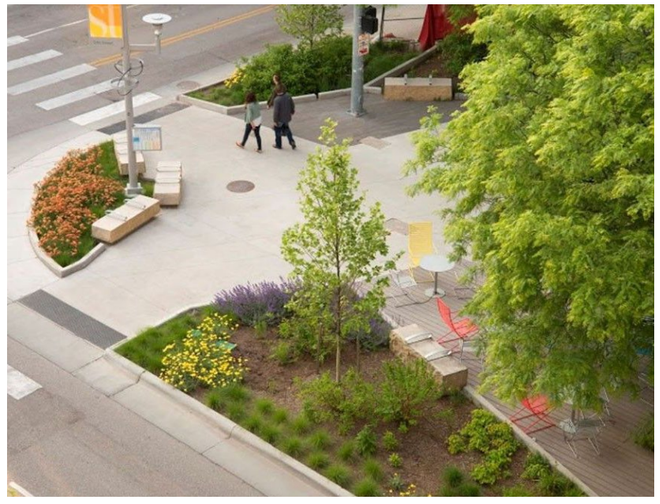
- New trees
- Existing trees
- Parking
- Pick up/drop off areas
- String lights
- Light poles
- Sidewalk improvements
- Social space
- Special paving
- At grade amenity zone plantings
- Raised planters (ornamental)
- Raised planters (water quality)
- Bike lane
- Gateway

Section B illustrates more consistent sidewalk widths and amenity zones.





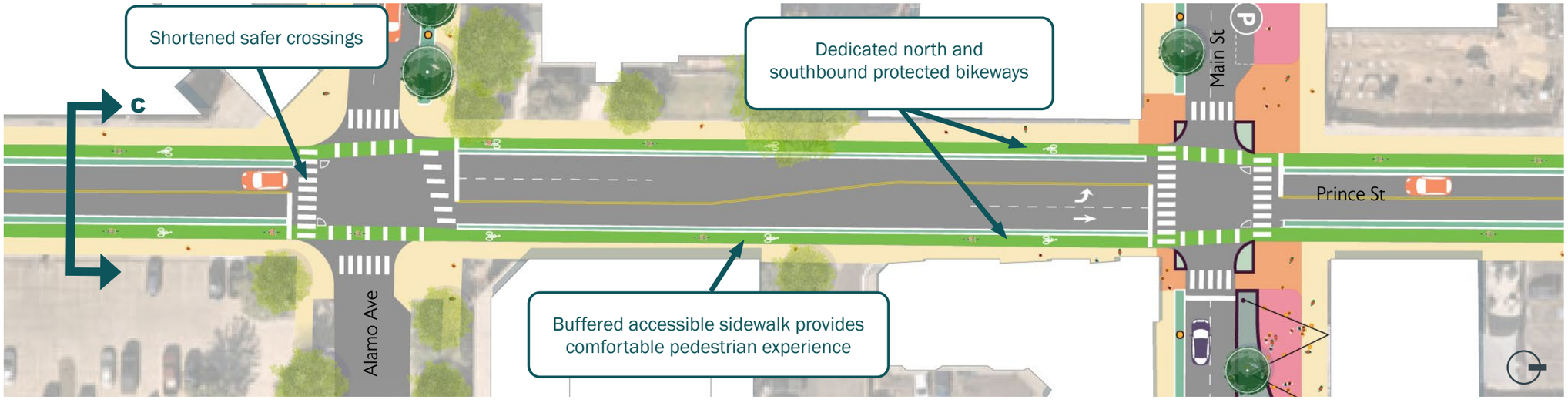
Precedent: Gateway opportunities utilizing vertical art elements.



Precedent: Intersections marked with special paving and benches.

Big Idea 3

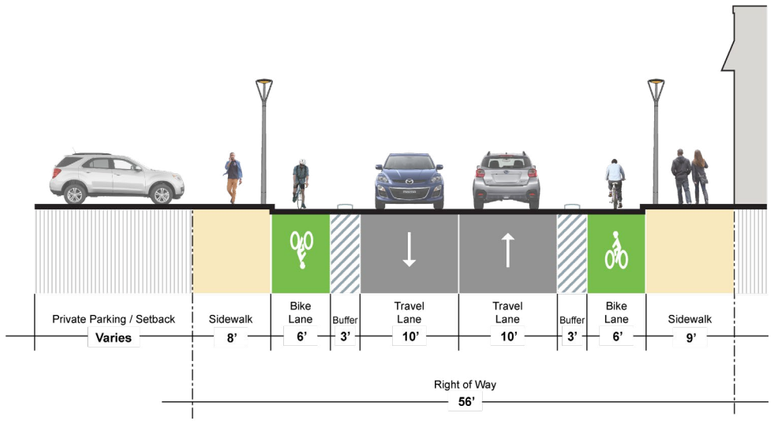
Prince Street mobility and traffic calming enhancements link the downtown core to the north and south ends of downtown.



Legend

- New trees
- Existing trees
- Parking
- Pick up/drop off areas
- String lights
- Light poles
- Sidewalk improvements
- Social space
- Special paving
- At grade amenity zone plantings
- Raised planters (ornamental)
- Raised planters (water quality)
- Bike lane
- Gateway

Section C illustrates protected buffered north and southbound bikeways.



Precedent: Opportunity to protect bike lane with artful elements or planter pots.

Precedent: Wide sidewalk next to bike lane provides dedicated space for pedestrians and bikes.

Alternative 2 - Multimodal Network

The **Multimodal Network alternative** addressed all project goals; however, Mobility and Connectivity were the focus to create a complete multimodal network in the Downtown Core. This alternative proposes removing parking along Main Street and Alamo Avenue for the installation of protected bicycle lanes, wider sidewalks, and enhanced connectivity across Santa Fe Drive to the Mary Carter Greenway. Additionally, protected bicycle lanes would be installed on Prince Street. The Multimodal Network alternative would also augment green infrastructure and placemaking elements for an improved pedestrian experience.

The Multimodal Network Alternative is defined by **four big ideas,** illustrated in the plan view.

Big Idea ① **Enhanced streetscape with protected bike lane on Main Street.**

Big Idea ② **Improved pedestrian experience on Alamo Avenue with bike lane.**

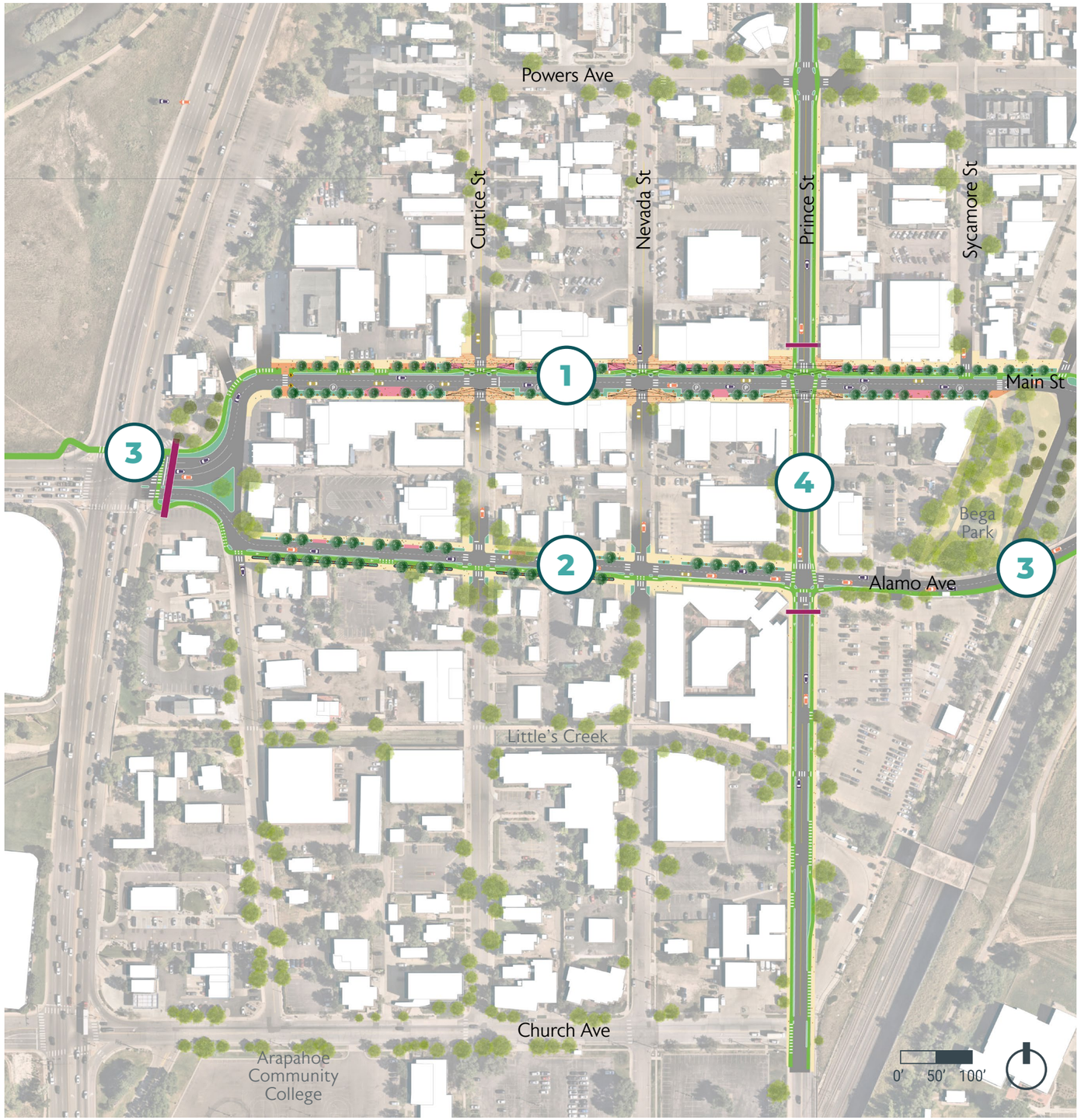
Big Idea ③ **East-West bikeway connections to existing network.**

Big Idea ④ **Prince Street mobility and traffic calming enhancements link downtown core to north and south ends of downtown.**

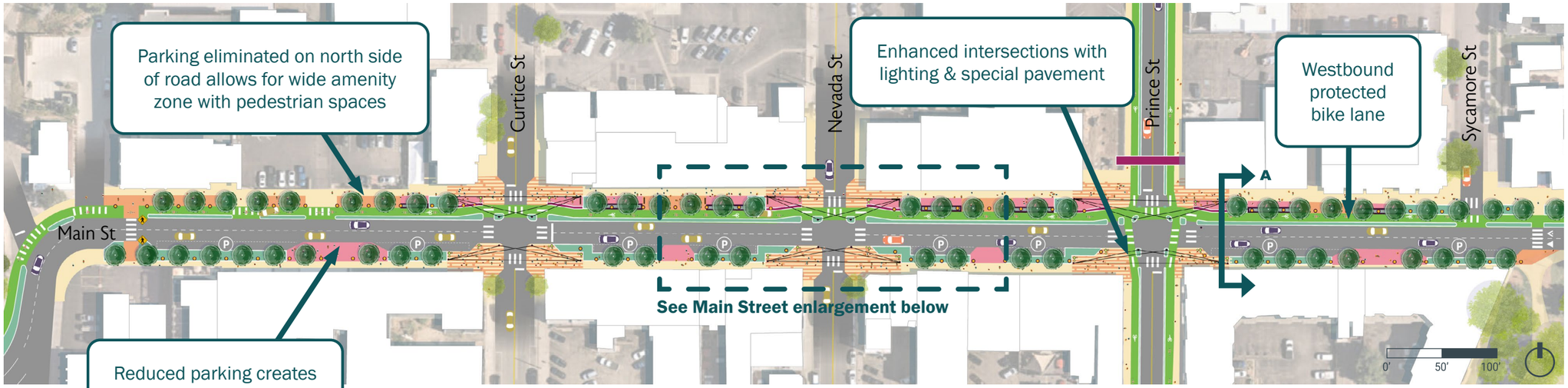
Considerations

- The protected bicycle facility on Prince Street provides a high comfort bicycle facility from Santa Fe Drive to Church Street.
- High comfort east/west bicycle facility through the downtown Core on Main Street and Alamo Avenue provides better multimodal connections.
- Curb extensions at each intersection allow for shorter pedestrian crossings and encourage slower vehicle speeds.
- Removes parking on the north side of Main Street (parking on the south side would be retained).
- Removes parking on Alamo Avenue.
- Removes parking on Prince Street.
- Removes exclusive northbound right turn lane at Alamo Avenue & Prince Street.
- Removes exclusive southbound right turn lane at Alamo Avenue & Prince Street.

Figure 2: *Plan View – Multimodal Network Alternative Big Ideas*



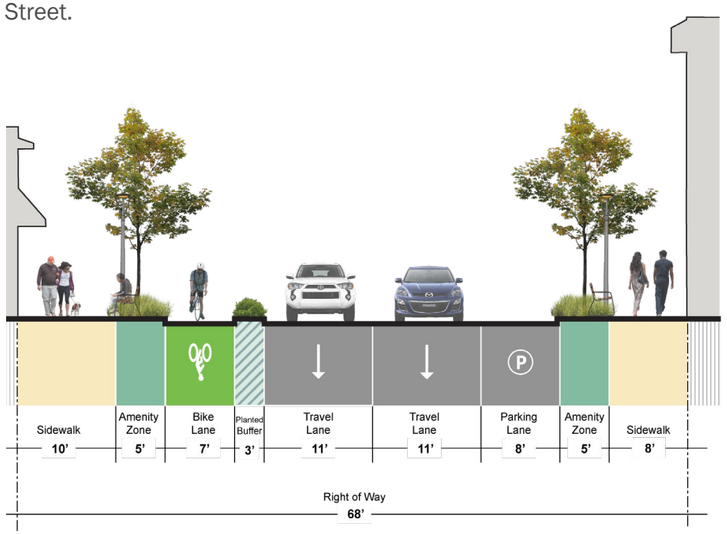
Big Idea 1 **Enhanced streetscape** with **protected bike lane** on Main Street.



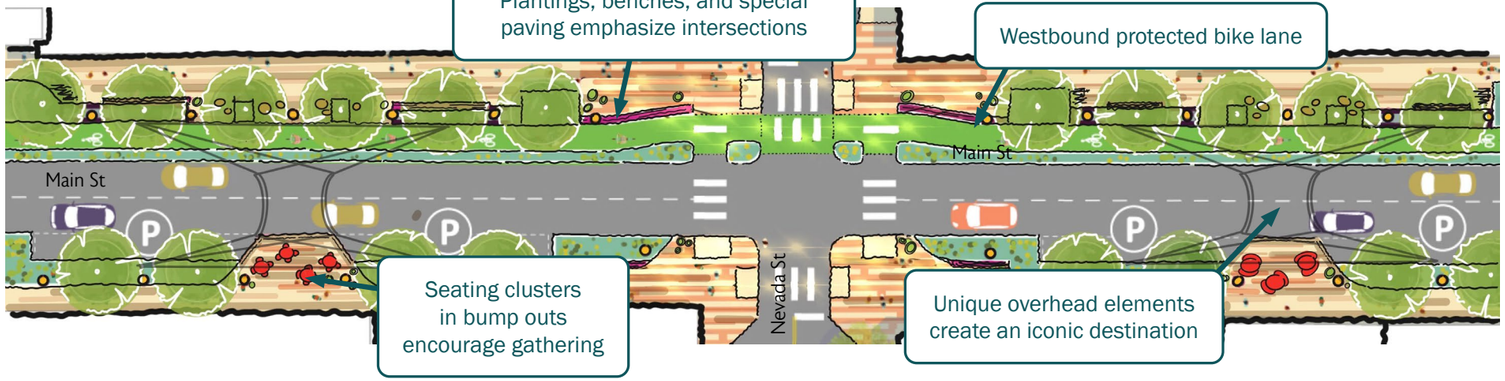
Legend

- New trees
- Existing trees
- Parking
- Pick up/drop off areas
- String lights
- Light poles
- Sidewalk improvements
- Social space
- Special paving
- At grade amenity zone plantings
- Raised planters (ornamental)
- Raised planters (water quality)
- Bike lane
- Gateway

Section A illustrates protected bike lane and wider sidewalks along Main Street.



Main Street Enlargement



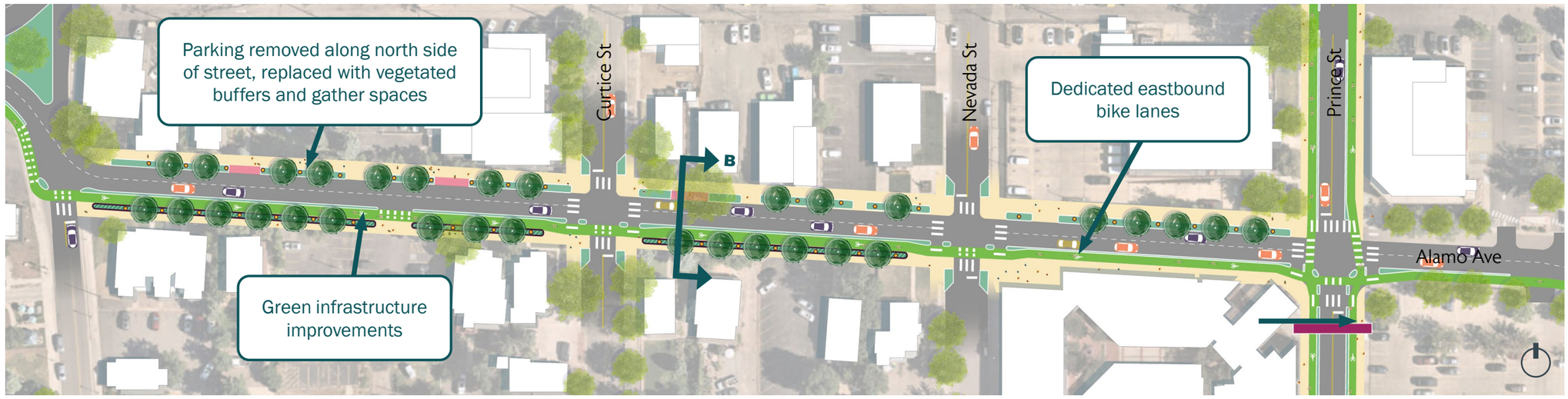
Precedent: Enhanced paving emphasizes intersections.

Precedent: Sculptural overhead element and unique lighting.

Precedent: Wide sidewalks, trees, and spaces for gathering.

Big Idea 2

Improved pedestrian experience on Alamo Avenue with bike lane.



Legend

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- Social space
- Special paving
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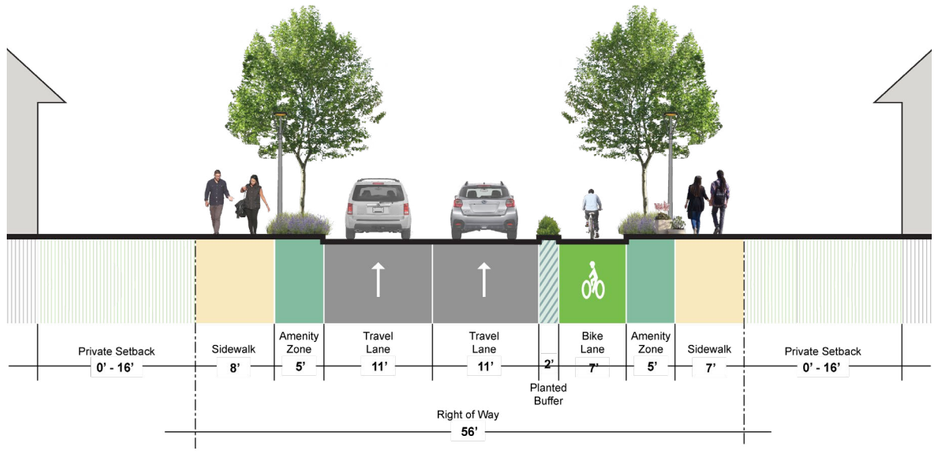
- Bike lane
- Gateway

Section B illustrates protected bike lane and enhanced amenity zones along Alamo Ave.

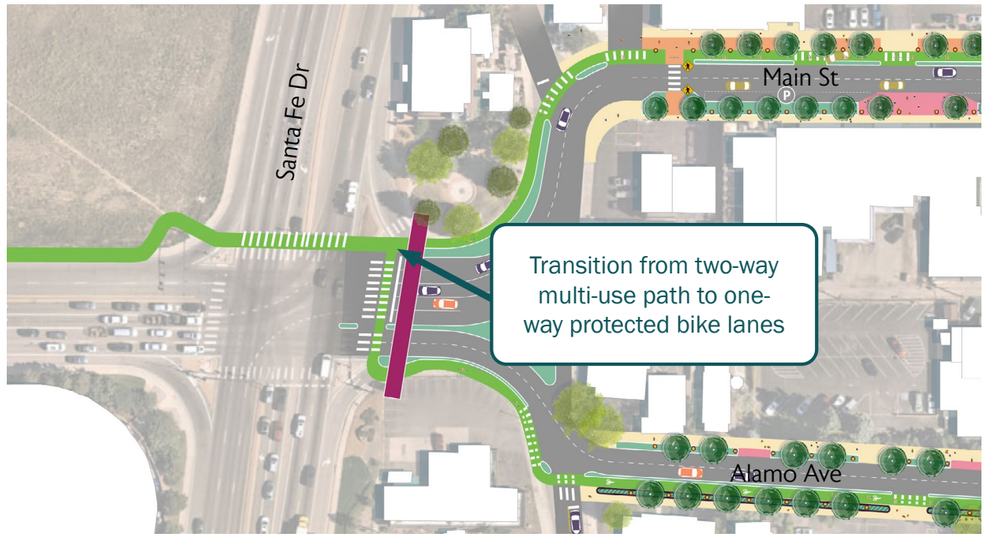


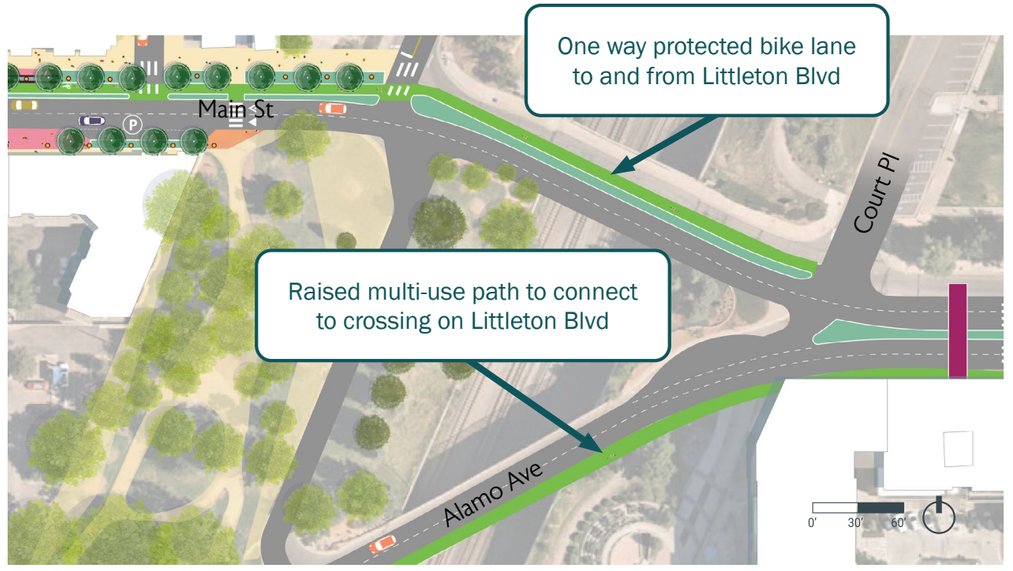
Precedent: Pedestrian spaces create comfortable pockets for respite and gathering.

Precedent: Green infrastructure frames pedestrian spaces to create inviting areas.

Big Idea 3

East-West bikeway connections to existing network.





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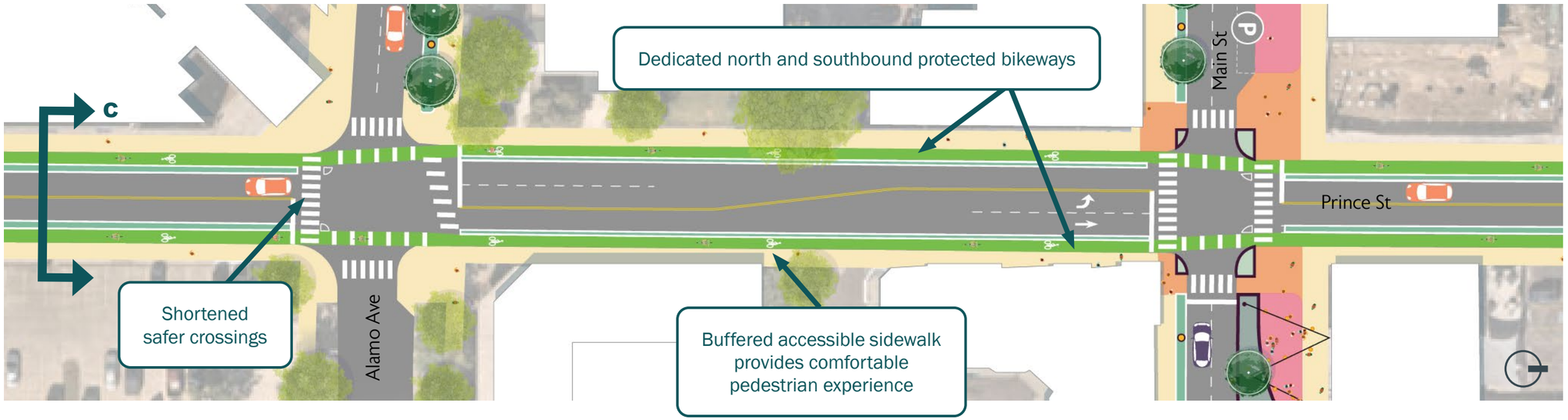
- Raised planters (water quality)
- Bike lane
- Gateway

Precedent: Gateway element welcomes visitors to downtown.

Precedent: Protected bike lane.

Big Idea 4

Prince Street mobility and traffic calming enhancements links downtown core to north and south ends of downtown.



Legend

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- Light poles
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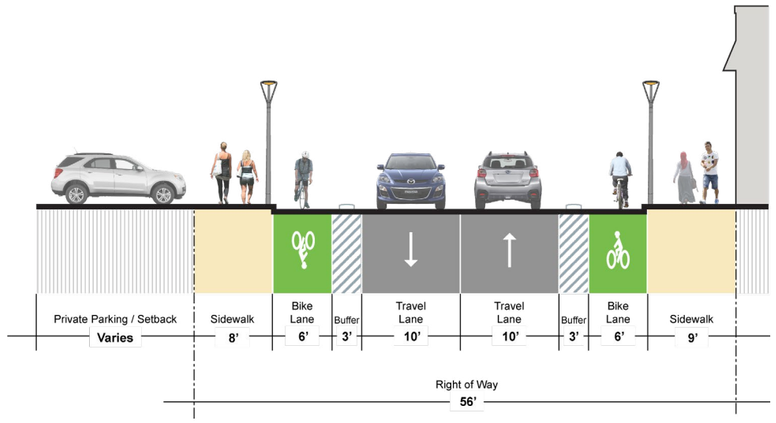
- Raised planters (water quality)
- Bike lane
- Gateway

Section C illustrates protected bike lanes.



Precedent: Pedestrian spaces create comfortable pockets for respite and gathering.

Precedent: Green infrastructure frames pedestrian spaces to create inviting areas.

Alternative 3 - Village

The **Village** alternative addressed all project goals; however, Placemaking and Activation were the focus to create comfortable and sustainable places for people to dwell and enjoy historic Littleton. This alternative enhances Main Street to include more pedestrian social spaces, temporary closure infrastructure for special events, and more comfortable crossing opportunities. Little's Creek would intersect with a shared street on Nevada Street. This would become a place for people using all modes to coexist and linger. This shared street would connect to protected bicycle lanes on Nevada Street to provide a north/south connection in the downtown core.

The Village Alternative is defined by **three big ideas**, illustrated in the plan view.

Big Idea ① Enhanced pedestrian-oriented Main Street with option for temporary closure.

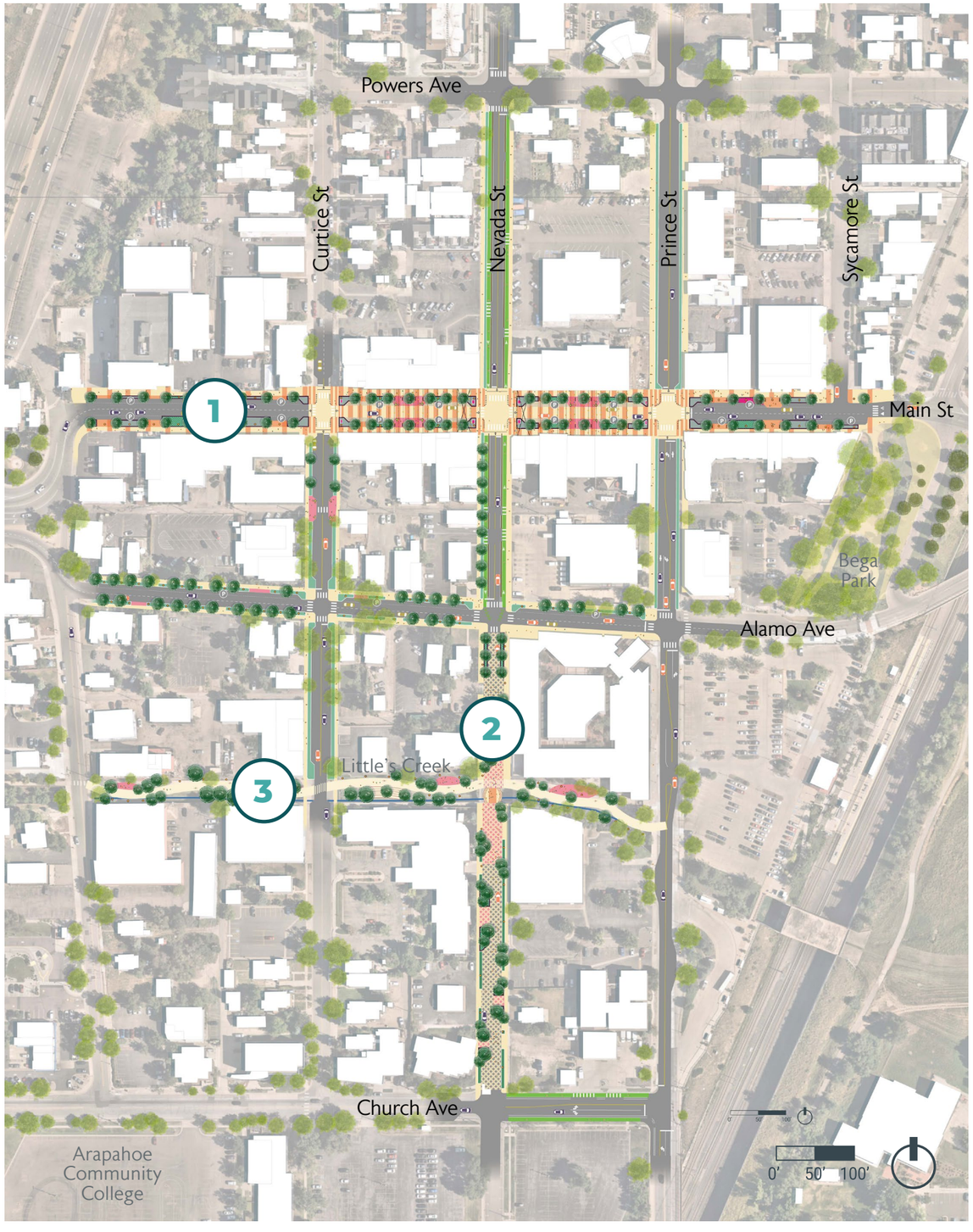
Big Idea ② Nevada Street shared street connects to Little's Creek with a focus on pedestrian experience.

Big Idea ③ Enhanced Little's Creek creates new trail experience with naturalized drainageway and social spaces for people.

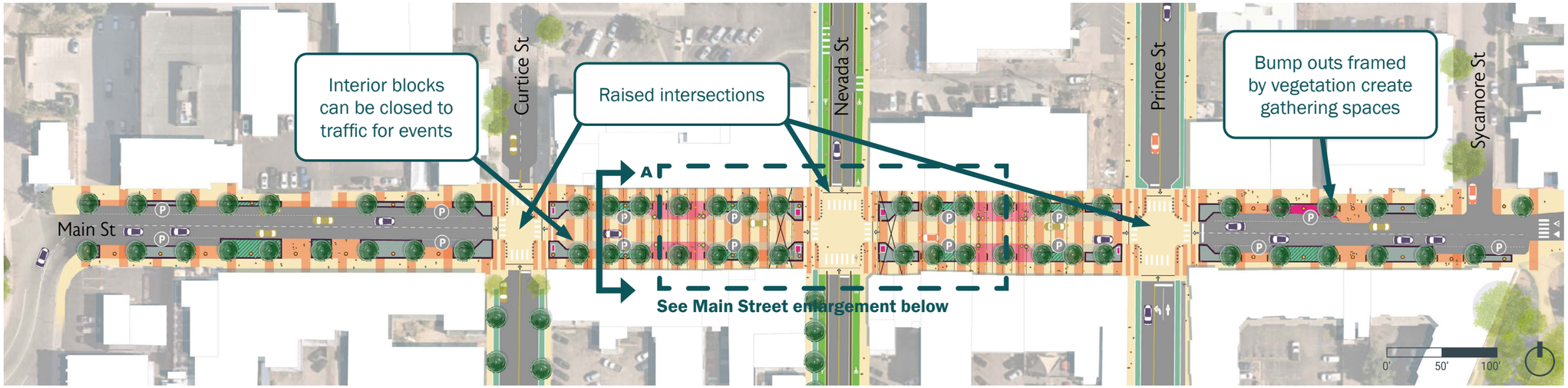
Considerations

- Due to the lack of vehicular connectivity over Little's Creek and low vehicle volumes, the blocks between Alamo Avenue and Church Street become a woonerf focusing on pedestrian and bicycle connections.
- Slows vehicle speeds on Main Street due to vertical deflection.
- Shortens pedestrian crossing distances at Main Street intersections.
- Narrows travel lanes and expands pedestrian space on Alamo Avenue.
- The protected bicycle lanes on Prince Street provide a high comfort bicycle facility from Santa Fe Drive to Church Street.
- Removes exclusive eastbound right turn lane at Main Street & Prince Street to provide more pedestrian space on Main Street.
- Parking is removed on Nevada Street to accommodate a protected bicycle facility.
- Removes exclusive northbound right turn lane at Alamo Avenue & Prince Street.
- Removes exclusive southbound right turn lane at Alamo Avenue & Prince Street.

Figure 3: *Plan View - Village Alternative Big Ideas*



Big Idea 1 **Enhanced pedestrian-oriented Main Street** with option for temporary closure.



Legend

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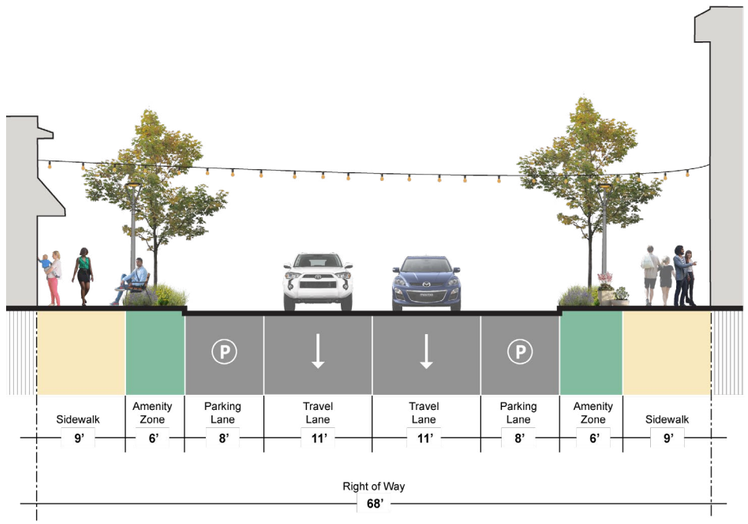
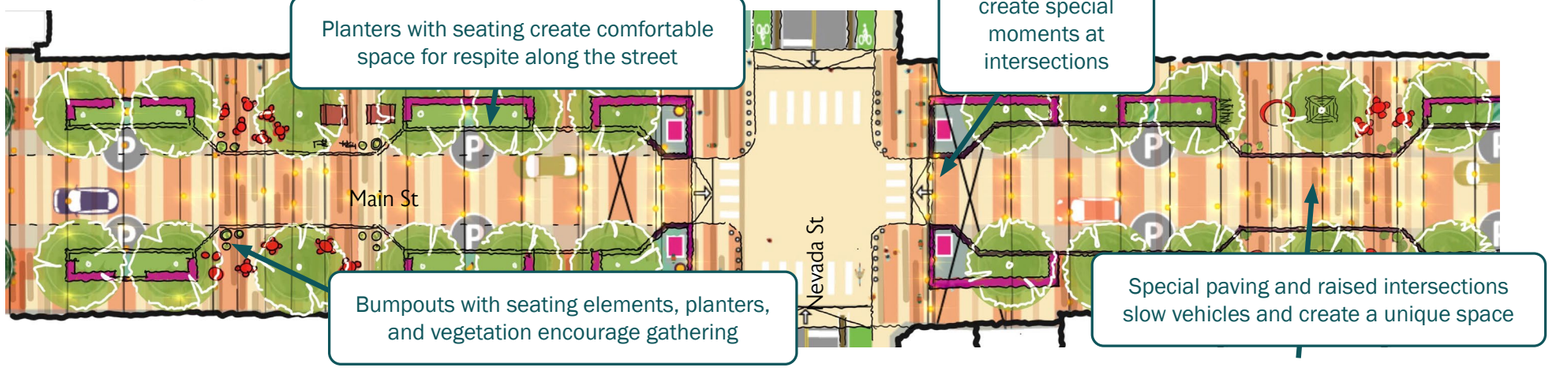
- String lights
- Light poles
- Sidewalk improvements
- Social space
- Special paving
- At grade amenity zone plantings
- Raised planters (ornamental)
- Raised planters (water quality)
- Bike lane
- Gateway

Section A illustrates improvements and creative lighting across Main Street.



Main Street Enlargement



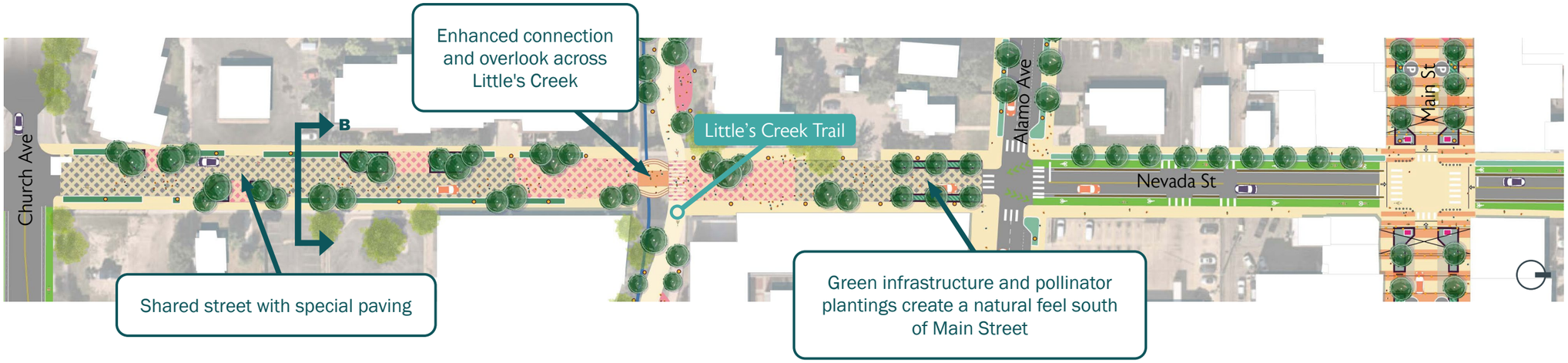
Precedent: Planters with integrated seating.

Precedent: Events along a temporarily closed street activate downtown.

Precedent: Enhanced paving along interior blocks creates a pedestrian-focused atmosphere.

Big Idea 2

Nevada Street shared street connects to Little's Creek and Arapahoe Community College with a focus on pedestrian experience.



Legend

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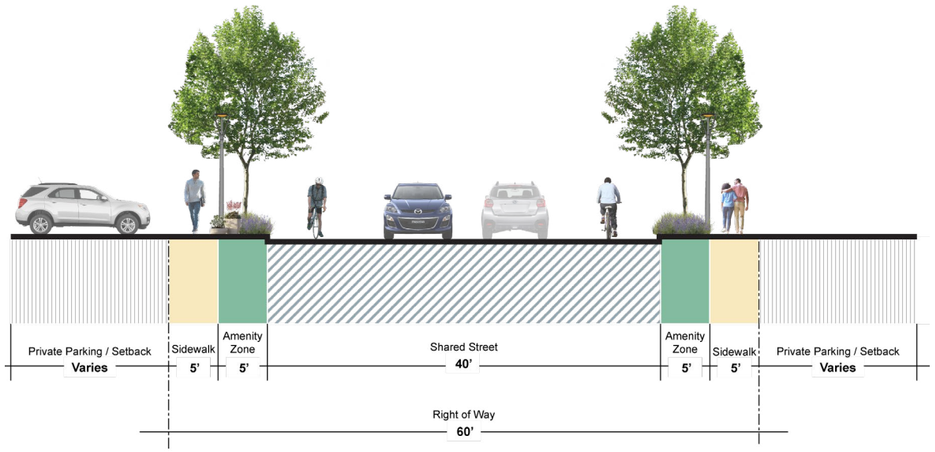
- At grade amenity zone plantings
- Raised planters (ornamental)
- Raised planters (water quality)
- Bike lane
- Gateway

Section B illustrates a shared street environment.

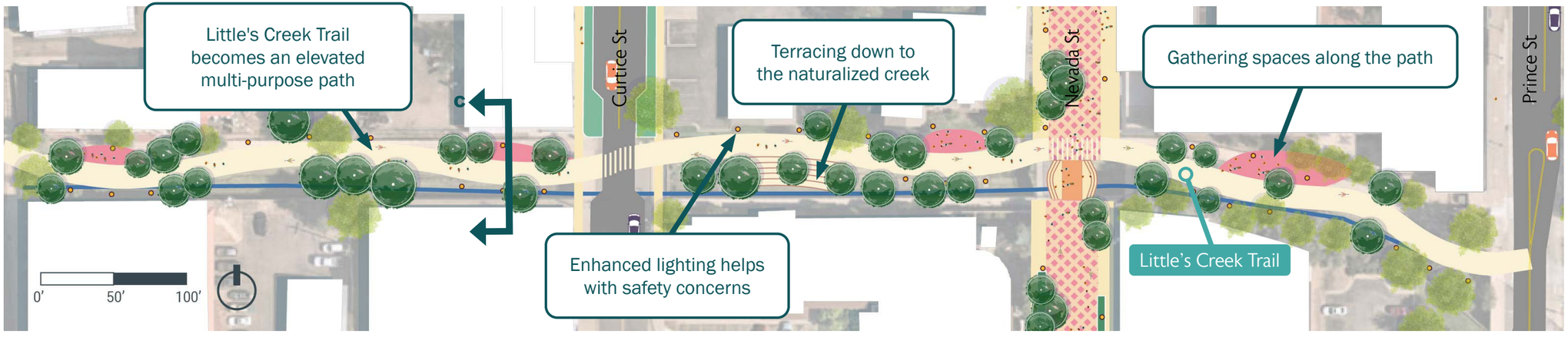


Precedent: Events activate a shared street.

Precedent: Paving, plantings, and seating elements create a consistent rhythm.

Big Idea 3

Enhanced Little's Creek creates new trail experience with naturalized drainageway and social spaces for people.



Legend

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- At grade amenity zone plantings
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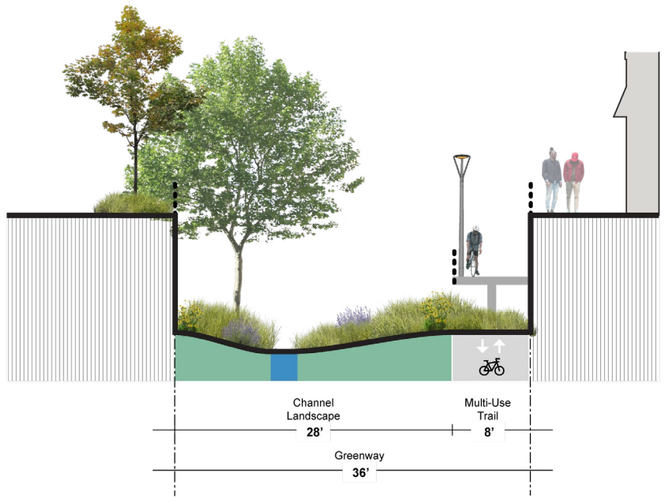
- Raised planters (water quality)
- Bike lane
- Gateway

Section C illustrates an elevated trail over Little's Creek.



Precedent: Opportunities to interact with the creek.

Precedent: Opportunities to integrate unique public art.

ALTERNATIVES ANALYSIS

The project team conducted a data-driven analysis to evaluate the costs, benefits, and impacts of the proposed mobility and streetscape improvements for each alternative developed during the planning process. Factors such as vehicular traffic, public input, parking removal, and safety were all considered. This analysis played a critical role in shaping the preferred alternative.

Public Input

After the high-level feasibility analysis, three alternatives were brought forward to the PMT, LDDA, stakeholders, the public, and City Council. Generally, the Village alternative was preferred with elements from the other alternatives.

LDDA Feedback

The project team presented the three alternatives to the LDDA early on in this phase of outreach to ensure that the alternatives aligned with the Plan of Development. The LDDA wrote a memo summarizing their comments on the three alternatives which stated, “The Village concept supports many of the goals established by the Littleton DDA. It creates a strong initial framework for the improvement of Main Street while providing for future connections, and phasing of improvements as outlined below.”

Stakeholder Feedback

Stakeholders also preferred the Village alternative due to several layers of placemaking interventions and emphasis on the larger downtown area. Most stakeholders were comfortable with the level of parking removal shown in the three alternatives, as they saw the benefit of having more pedestrian/social spaces throughout the downtown core. The group was not as enthusiastic about the Chicane alternative; they found that it fell short of the goal to pedestrianize downtown and had many negative compromises like parking loss and difficulties for large events. There were important connections in the Multimodal Network alternative, like the bike lane on Prince Street and increased pedestrian space, that the stakeholders wanted to see integrated into the Village alternative.

Public Feedback

Members of the public were invited to comment on the alternatives through many venues: an online StoryMap and survey, a virtual public meeting, and an in-person open house. These events were promoted through the project website, social media, email blasts, flyers, yard signs, and bookmarks distributed throughout downtown.

The majority of the public preferred the Village alternative for similar reasons as the stakeholders. They supported Main Street being raised to slow traffic and the opportunity to temporarily close it down for events. The public also wanted to see more multimodal connections, like the bike lane on Prince Street and increased pedestrian space, brought over from the Multimodal Network alternative. Many people liked the shared street on Nevada Street and how it connects to Little's Creek Trail.

Stakeholders discussing the Chicane concept

Members of the public at the Open House

Parking Impact Analysis

A detailed parking analysis was conducted for the core area to assess how many on-street parking spaces would be repurposed under each of the three alternatives. The figures in this section compare the number of remaining on-street spaces for each alternative to the existing number of spaces. The analysis accounted for current marked buffers between spaces on Main Street and Alamo Avenue, ensuring an accurate count of remaining capacity. The 1,096 existing off-street parking spaces were not included, as they will remain unaffected.

Figures 5, 7, and 9 show the existing parking occupancy for Thursday at Noon, which was the busiest parking time among the data collected in summer 2023.

Additionally, this analysis does not incorporate parking management strategies, which include programs and policies aimed at promoting efficient use of parking and curbside resources. These strategies will be identified through a separate process.

Alternative 1 – Chicane on Main Street

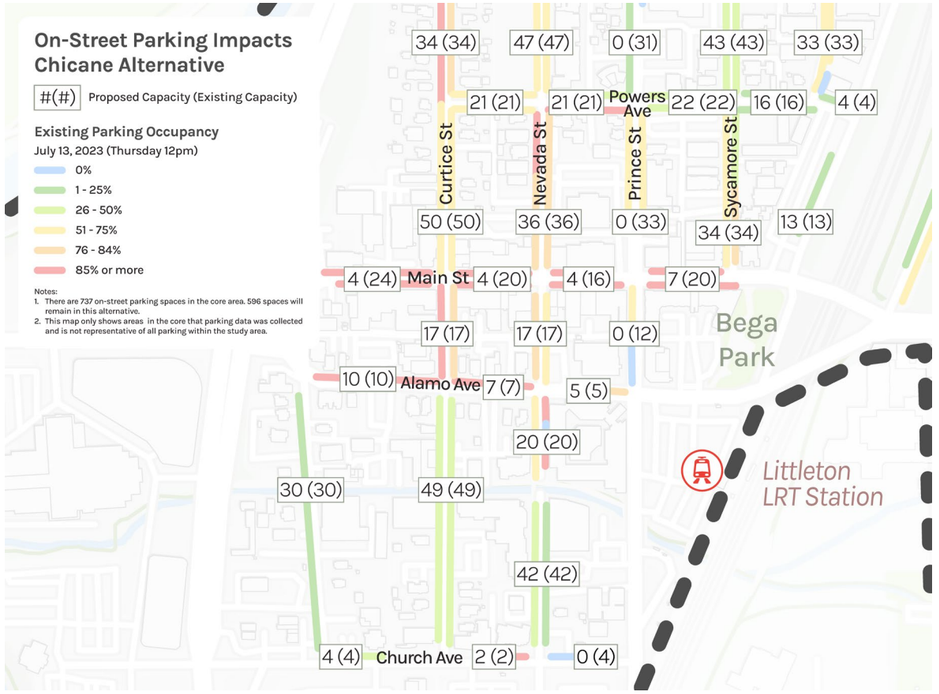
Currently, there are 737 on-street parking spaces in the core area. The Chicane alternative would remove approximately 141 spaces, leaving 596 spaces for public use. Most of the spaces being repurposed are on Main Street, Alamo Avenue, and Prince Street and will become a chicane and bike lanes. There is existing capacity on streets a block or two away from those where parking is being repurposed.

Figure 4: *On-Street Parking Impacts in Core Area - Chicane on Main Alternative*

Location	Existing # of Spots	% of Total On-Street Spots	Proposed# of Spots	Average 5AM Occupancy	Average 12PM Occupancy	Average 6PM Occupancy
Main and Alamo	102	14%	**41**	2%	95%	96%
Prince St	76	10%	**0**	5%	40%	47%
Elsewhere in Core	559	76%	**555**	15%	53%	53%
Total	**737**	**100%**	**596**	**12%**	**57%**	**58%**

Note: Occupancy data was collected in July 2023. Weekday and weekend counts were averaged for this table.

Figure 5: *Parking Impacts – Chicane Alternative*



Alternative 2 – Multimodal Network

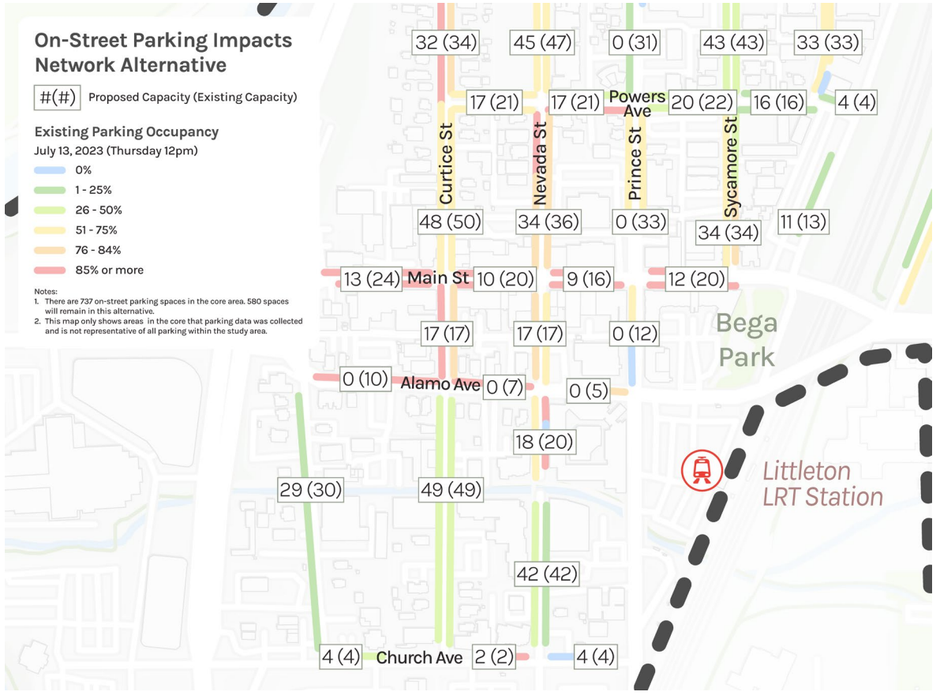
Currently, there are 737 on-street parking spaces in the core area. The Multimodal Network alternative would remove approximately 157 spaces, leaving 580 spaces for public use. Most of the spaces being repurposed for bike lanes are on Main Street, Alamo Avenue, and Prince Street. There is existing capacity on streets a block or two away from those where parking is being repurposed.

Figure 6: *On-Street Parking Impacts in Core Area – Multimodal Network Alternative*

Location	Existing # of Spots	% of Total On-Street Spots	Proposed# of Spots	Average 5AM Occupancy	Average 12PM Occupancy	Average 6PM Occupancy
Main and Alamo	102	14%	**44**	2%	95%	96%
Prince St	76	10%	**0**	5%	40%	47%
Elsewhere in Core	559	76%	**536**	15%	53%	53%
Total	**737**	**100%**	**580**	**12%**	**57%**	**58%**

Note: Occupancy data was collected in July 2023. Weekday and weekend counts were averaged for this table.

Figure 7: *Parking Impacts – Network Alternative*



Alternative 3 – Village

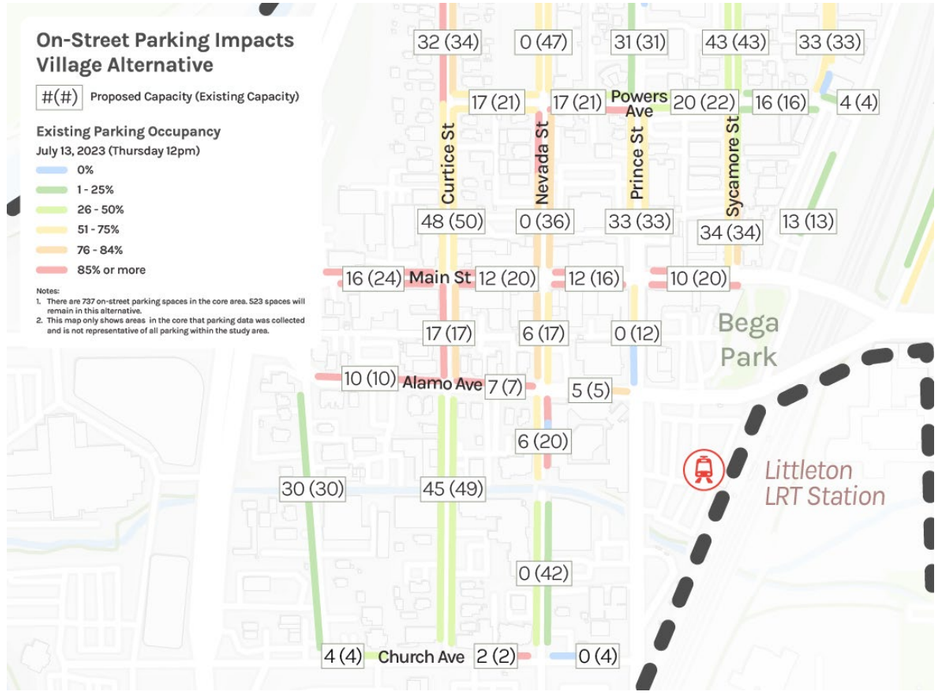
Currently, there are 737 on-street parking spaces in the core area. The Village alternative would remove approximately 214 spaces, leaving 523 spaces for public use. Most of the spaces would be repurposed for the shared street and bike lanes are on Nevada Street. There is existing capacity on streets a block or two away from those where parking is being repurposed.

Figure 8: *On-Street Parking Impacts in Core Area – Village Alternative*

Location	Existing # of Spots	% of Total On-Street Spots	Proposed# of Spots	Average 5AM Occupancy	Average 12PM Occupancy	Average 6PM Occupancy
Main and Alamo	102	14%	**72**	2%	95%	96%
Prince St	76	10%	**64**	5%	40%	47%
Elsewhere in Core	559	76%	**387**	15%	53%	53%
Total	**737**	**100%**	**523**	**12%**	**57%**	**58%**

Note: Occupancy data was collected in July 2023. Weekday and weekend counts were averaged for this table.

Figure 9: *Parking Impacts – Village Alternative*



Traffic Impact Analysis

A traffic analysis was performed on the core area to determine the impact of each alternative on vehicle operations.

Alternative 1 – Chicane on Main Street

Turn lane configurations would be updated at Main Street & Prince Street and Alamo Avenue & Prince Street to accommodate a protected bicycle facility on Prince Street. The traffic analysis impacts are described in this section. **Appendix B** displays the traffic analysis reports exported from Synchro.

Main Street & Prince Street

Figure 10 describes the lane configuration updates assumed at Main Street & Prince Street to accommodate a protected bicycle facility on Prince Street. The exclusive southbound right turn lane was removed and combined into a southbound through/right lane. The westbound right turn lane was removed to shorten the pedestrian crossing distance on the east leg. There were no updates to southbound lane configurations. **Figure 11** describes the results from the traffic analysis to determine the impact at the intersection. There were minimal impacts on traffic operations due to the updated southbound lane configurations. Southbound approach delay increased by approximately three to six seconds for each peak period and westbound approach delay increased by approximately four to eight seconds for each peak period. The overall intersection delay remained approximately the same.

Figure 10: *Main Street & Prince Street Lane Configuration Assumptions – Chicane Alternative*

Direction	Existing Lane Configurations	Proposed Lane Configurations	Impact
Northbound	1 EA Through Lane 1 EA Left Only Lane	1 EA Through Lane 1 EA Left Only Lane	**No Changes**
Southbound	1 EA Through Lane 1 EA Right Only Lane	1 EA Through-Right Lane	**Lane Removal**
Westbound	1 EA Left-Through Lane 1 EA Through Lane 1 EA Right Only Lane	1 EA Left-Through Lane 1 EA Right-Through Lane	**Lane Removal**

Figure 11: *Main Street & Prince Street Traffic Analysis Results – Chicane Alternative*

	AM Peak				PM Peak				SAT Peak			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
WBL	22.8	C	23.3	C	24.6	C	25.5	C	25.7	C	27.1	C
WBT	22.2	C	0	A	23.7	C	0	A	24.6	A	0	A
WBR	18.2	C	22.6	C	18.5	C	24.4	C	18.8	C	25.7	C
NBL	15.3	B	15.5	B	15.6	B	16	B	12.8	B	13.2	B
NBT	1.1	A	1.1	A	1.1	A	1.1	A	0.4	A	0.4	A
SBT	21.8	C	0	C	23.7	C	0	A	19.2	B	0	A
SBR	18.6	B	22.6	C	19.8	B	25.1	C	17.4	B	20.7	C
OVERALL	**17.9**	**B**	**18.1**	**B**	**19.3**	**B**	**20.4**	**C**	**19.3**	**C**	**20.9**	**C**

Alamo Avenue & Prince Street

Figure 12 describes the lane configuration updates assumed at Alamo Avenue & Prince Street to accommodate a protected bicycle facility. The exclusive northbound right turn lane would be removed and combined into a northbound through/right lane. There were no updates to eastbound or southbound lane configurations. **Figure 13** describes the results from the traffic analysis to determine the impact at the intersection. There were marginal impacts to traffic operations due to the updated northbound lane configurations. Northbound approach delay increased by approximately five to thirteen seconds across the peak periods. Overall intersection delay increased by approximately three seconds. There were also approximately five seconds increase in delay for the southbound left turn movement as the updated lane configurations likely would serve less vehicles and there would be less of a gap in traffic during the southbound left permitted phase.

Figure 12: *Alamo Avenue & Prince Street Lane Configuration Assumptions – Chicane Alternative*

Direction	Existing Lane Configurations	Proposed Lane Configurations	Impact
Northbound	1 EA Through Lane 1 EA Right Only Lane	1 EA Through-Right Lane	**Lane Removal**
Southbound	1 EA Through Lane 1 EA Left Only Lane	1 EA Through Lane 1 EA Left Only Lane	**No Changes**
Eastbound	1 EA Left-Through Lane 1 EA Right-Through Lane	1 EA Left-Through Lane 1 EA Right-Through Lane	**No Changes**

Figure 13: *Alamo Avenue & Prince Street Traffic Analysis Results – Chicane Alternative*

	AM Peak				PM Peak				SAT Peak			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
EBL	37.3	D	37.3	D	39.8	D	39.8	D	34	C	34	C
EBT	0	A	0	A	0	A	0	A	0	A	0	A
EBR	33	C	33	C	36.6	D	36.6	D	31.4	C	31.4	C
NBT	31.4	C	0	A	26.2	C	0	A	24.3	C	0	A
NBR	28.2	C	41.3	D	24.3	C	34.9	C	23.8	C	29.5	C
SBL	14.6	B	19.2	B	10.4	B	15.2	B	9.3	A	12.3	B
SBT	0.5	A	0.4	A	0.3	A	0.3	A	0.2	A	0.2	A
OVERALL	**28.2**	**C**	**31**	**C**	**26.4**	**C**	**29.5**	**C**	**24.8**	**C**	**26.3**	**C**

Alternative 2 – Multimodal Network

Turn lane configurations would be updated at Main Street & Prince Street to remove the westbound right-turn lane to accommodate curb extensions at the intersection. The traffic analysis impacts are described in this section. **Appendix B** displays the traffic analysis reports exported from Synchro.

Main Street & Prince Street

Figure 14 describes the lane configuration updates assumed at Main Street & Prince Street to accommodate a protected bicycle facility. The exclusive southbound right turn lane was removed and combined into a southbound through/right lane. There were no updates to westbound or southbound lane configurations. **Figure 15** describes the results from the traffic analysis to determine the impact at the intersection. There were minimal impacts to traffic operations due to the updated southbound lane configurations. Southbound approach delay increased by approximately three to six seconds for each peak period and westbound approach delay increased by approximately four to eight seconds for each peak period. The overall intersection delay remained approximately the same.

Figure 14: *Main Street & Prince Street Lane Configuration Assumptions – The Multimodal Network*

Direction	Existing Lane Configurations	Proposed Lane Configurations	Impact
Northbound	1 EA Through Lane 1 EA Left Only Lane	1 EA Through Lane 1 EA Left Only Lane	**No Changes**
Southbound	1 EA Through Lane 1 EA Right Only Lane	1 EA Through-Right Lane	**Lane Removal**
Westbound	1 EA Left-Through Lane 1 EA Right-Through Lane 1 EA Right Only Lane	1 EA Left-Through Lane 1 EA Right-Through Lane	**Lane Removal**

Figure 15: *Main Street & Prince Street Traffic Analysis Results – The Multimodal Network*

	AM Peak				PM Peak				SAT Peak			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
WBL	22.8	C	23.3	C	24.6	C	25.5	C	25.7	C	27.1	C
WBT	22.2	C	0	A	23.7	C	0	A	24.6	A	0	A
WBR	18.2	C	22.6	C	18.5	C	24.4	C	18.8	C	25.7	C
NBL	15.3	B	15.5	B	15.6	B	16	B	12.8	B	13.2	B
NBT	1.1	A	1.1	A	1.1	A	1.1	A	0.4	A	0.4	A
SBT	21.8	C	0	C	23.7	C	0	A	19.2	B	0	A
SBR	18.6	B	22.6	C	19.8	B	25.1	C	17.4	B	20.7	C
OVERALL	**17.9**	**B**	**18.1**	**B**	**19.3**	**B**	**20.4**	**C**	**19.3**	**C**	**20.9**	**C**

Alamo Avenue & Prince Street

Figure 16 describes the lane configuration updates assumed at Alamo Avenue & Prince Street to accommodate a protected bicycle facility. The exclusive northbound right turn lane was removed and combined into a northbound through/right lane. There were no updates to eastbound or southbound lane configurations. **Figure 17** describes the results from the traffic analysis to determine the impact at the intersection. There were marginal impacts to traffic operations due to the updated northbound lane configurations. Northbound approach delay increased by approximately five to thirteen seconds across the peak periods. Overall intersection delay increased by approximately three seconds. There was also approximately five seconds increase in delay for the southbound left turn movement as the updated lane configurations likely would serve less vehicles and there would be less of a gap in traffic during the southbound left permitted phase.

Figure 16: *Alamo Avenue & Prince Street Lane Configuration Assumptions – The Multimodal Network*

Direction	Existing Lane Configurations	Proposed Lane Configurations	Impact
Northbound	1 EA Through Lane 1 EA Right Only Lane	1EA Through-Right Lane	**Lane Removal**
Southbound	1 EA Through Lane 1 EA Left Only Lane	1 EA Through Lane 1 EA Left Only Lane	**No Changes**
Eastbound	1 EA Left-Through Lane 1 EA Right-Through Lane	1 EA Left-Through Lane 1 EA Right-Through Lane	**No Changes**

Figure 17: *Alamo Avenue & Prince Street Traffic Analysis Results – The Multimodal Network*

	AM Peak				PM Peak				SAT Peak			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
EBL	37.3	D	37.3	D	39.8	D	39.8	D	34	C	34	C
EBT	0	A	0	A	0	A	0	A	0	A	0	A
EBR	33	C	33	C	36.6	D	36.6	D	31.4	C	31.4	C
NBT	31.4	C	0	A	26.2	C	0	A	24.3	C	0	A
NBR	28.2	C	41.3	D	24.3	C	34.9	C	23.8	C	29.5	C
SBL	14.6	B	19.2	B	10.4	B	15.2	B	9.3	A	12.3	B
SBT	0.5	A	0.4	A	0.3	A	0.3	A	0.2	A	0.2	A
OVERALL	**28.2**	**C**	**31**	**C**	**26.4**	**C**	**29.5**	**C**	**24.8**	**C**	**26.3**	**C**

Dismissed Options

- Two-way cycle track on Main Street.
- Two-way cycle track on Alamo Avenue.

Alternative 2 – Multimodal Network

Turn lane configurations were updated at Main Street & Prince Street and Alamo Avenue & Prince Street to accommodate a protected bicycle facility on Prince Street. The traffic analysis impacts are described in this section.**Appendix B** displays the traffic analysis reports exported from Synchro.

Main Street & Prince Street

Figure 18 describes the lane configuration updates assumed at Main Street & Prince Street. The exclusive westbound right turn lane would be removed and combined into a westbound through/right lane. There were no updates to northbound or southbound lane configurations. **Figure 19** describes the results from the traffic analysis to determine the impact at the intersection. There were minimal impacts on traffic operations due to the updated westbound lane configurations. Westbound right turn approach delay increased by approximately four to eight seconds for each peak period and the overall intersection delay remained approximately the same.

Figure 18: *Main Street & Prince Street Lane Configuration Assumptions – The Village*

Direction	Existing Lane Configurations	Proposed Lane Configurations	Impact
Northbound	1 EA Through Lane 1 EA Left Only Lane	1 EA Through Lane 1 EA Left Only Lane	**No Changes**
Southbound	1 EA Through Lane 1 EA Right Only Lane	1 EA Through-Right Lane	**No Changes**
Westbound	1 EA Left-Through Lane 1 EA Right-Through Lane 1 EA Right Only Lane	1 EA Left-Through Lane 1 EA Right-Through Lane	**Lane Removal**

Figure 19: *Main Street & Prince Street Traffic Analysis Results – The Village*

	AM Peak				PM Peak				SAT Peak			
	Existing		Proposed		Existing		Proposed		Existing		Proposed	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
WBL	22.8	C	23.3	C	24.6	C	25.5	C	25.7	C	27.1	C
WBT	22.2	C	0	A	23.7	C	0	A	24.6	A	0	A
WBR	18.2	C	22.6	C	18.5	C	24.4	C	18.8	C	25.7	C
NBL	15.3	B	15.3	B	15.6	B	15.6	B	12.8	B	12.8	B
NBT	1.1	A	1.1	A	1.1	A	1.1	A	0.4	A	0.4	A
SBT	21.8	C	21.8	C	23.7	C	23.7	A	19.2	B	19.2	A
SBR	18.6	B	18.6	C	19.8	B	19.8	C	17.4	B	17.4	C
OVERALL	**17.9**	**B**	**17.9**	**B**	**19.3**	**B**	**20**	**B**	**19.3**	**C**	**20.5**	**C**

DISMISSED ALTERNATIVES

Plaza/Shared Street on Main Street

The Plaza/Shared Street concept includes converting Main Street and Alamo Avenue to two-way streets, creating a shared street and pedestrian plaza on Main Street, and installing diversion infrastructure to restrict drivers from traveling on Main Street. This recommendation was assessed and ultimately dismissed due to significant right-of-way (ROW), historic structure, and traffic operations impacts.

Key Design Elements

Community feedback from the first round of public outreach included closing Main Street to vehicle traffic. A plaza/shared street concept would convert Main Street into a pedestrian plaza by implementing a shared street. A shared street is a low-volume, low-speed roadway where pedestrians are the primary user and vehicles are considered "guests." Uses include social and recreational spaces. Shared streets target less than 500 vehicles per day and often use specialized paving patterns or pavers to alert drivers that it is a pedestrian priority area. **Figure 20** describes key design elements within the downtown core. The following describes the improvements on Main Street and Alamo Avenue.

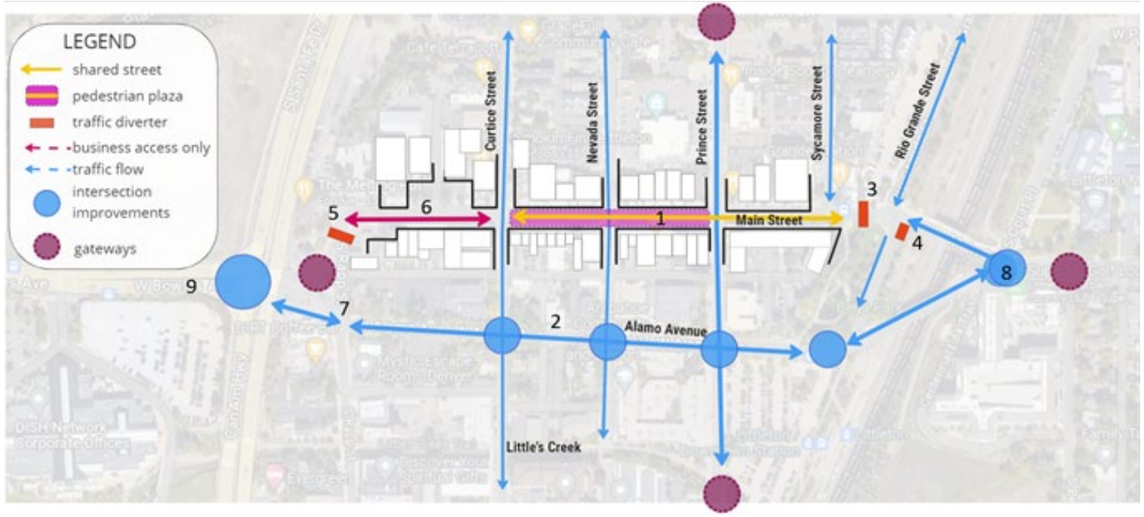
Main Street

- Shared street between Rio Grande Street and Rapp Street, including a pedestrian plaza between Curtice Street and Prince Street, enhanced streetscape, green infrastructure, and a better pedestrian experience along Main Street.
- In existing conditions, Main Street observes approximately 8,500 vehicles per day on a weekday. Shared streets target less than 500 vehicles per day. Traffic diverters are recommended to be at the east and west ends to restrict vehicles from traveling through downtown via Main Street and achieve less than 500 vehicles per day.
- Update roadway configuration to accommodate two-way traffic.

Alamo Avenue

- Update roadway configuration to accommodate two-way traffic and left-turn lanes at intersections.
- Update traffic control devices to accommodate two-way traffic and turn lanes at intersections (i.e., Curtice Steet and Nevada Street are unsignalized and Prince Street is signalized).

Figure 20: *Parking Impacts – Village Alternative*



Notes (numbers match locations in **Figure 20**)

1. Main Street would be converted to a Shared Street between Curtice Street and Sycamore Street. There would be emphasis to create a pedestrian plaza between Curtice Street and Prince Street. The roadway would convert from one-way westbound to two-way traffic.
2. Alamo Avenue between Santa Fe Drive and Court Place would be converted from one-way eastbound to two-way vehicle operations. There would be one travel lane in each direction and parking would be removed to accommodate turning lanes at the intersections.
3. Install a westbound traffic diverter at Main Street & Rio Grande Street to restrict westbound through traffic to achieve the Shared Street volume threshold of less than 500 vehicles per day.
4. Install eastbound traffic diverter at Main Street & Rio Grande Street. The Main Street bridge would remain one-way westbound.
5. Install westbound traffic diverter at Main Street & Rapp Street. This would restrict westbound traffic on Main Street approaching Santa Fe Drive due to the geometric constraints of allowing westbound traffic on both Main Street and Alamo Avenue approaching the intersection.
6. Main Street between Rapp Street and Curtice Street would be business access only. Vehicles that could not find parking in the public parking lots could exit eastbound on Main Street or southbound on Rapp Street.
7. Rapp Street & Alamo Avenue would be southbound right-turn only. Due to intersection geometry, there would be sight distance challenges making a left turn with two-way traffic on Alamo Avenue.
8. The geometry of the intersection of Main Street & Court Place would need to be updated and traffic control would likely be upgraded to a traffic signal or roundabout.
9. There are currently two eastbound through lanes at Bowles Avenue & Santa Fe Drive. Lane configurations would need to include only one through lane as the east side of the intersection would only be able to accommodate one eastbound receiving lane.

Considerations

- Main Street has limited vehicular access, making it a space that enhances pedestrian activity.
- Additional space for green infrastructure.
- The majority of the existing traffic on Main Street and Alamo Avenue is “through traffic.” There are limited additional east/west connections for diversion.
- Two-way geometric alignment at Santa Fe Drive & Bowles Avenue intersection. **Figures 21, 22, and 23** describe potential alignments of each.
- Limited east/west bicycle connections in the Downtown core.

Figures 21, 22, and 23 display potential alignment options at Santa Fe Drive & Alamo Avenue for converting Alamo Avenue to two-way. In Option A, the general alignment of Alamo Avenue remains similar to existing conditions. This condition creates a sharp S-curve at this intersection. Vehicle speeds in this area would be significantly reduced and storage capacity approaching Santa Fe Drive would be limited. This option would likely create operational challenges. A peer example of a location of an S-curve entering and exiting Main Street is in Aspen, Colorado and the City experiences significant traffic operations and travel time delays during the peak periods. Option B realigns Alamo Avenue to the south to minimize the S-curve. This would also require realigning the west leg of the intersection to allow the eastbound/ westbound approaches to approach the intersection at a 180-degree angle. Additionally, this would require right-of-way acquisition from the property on the southeast corner of Santa Fe Drive & Alamo Avenue. Option C realigns Alamo Avenue to the north to minimize the S-curve. This would require right-of-way of the property on the north side of Alamo Avenue & Rapp Street, which is designated as a historical property.

Figure 21: *Alamo Avenue & Santa Fe Drive/Bowles Avenue – Option A*

Figure 22: *Alamo Avenue & Santa Fe Drive/Bowles Avenue – Option B*

Figure 23: *Alamo Avenue & Santa Fe Drive/Bowles Avenue – Option C*

Traffic Analysis Results

A traffic analysis was performed on Alamo Avenue to determine the traffic operational impacts from the estimated traffic diversion on Main Street due to the installation of diverters at Main Street & Rio Grande Street and Main Street & Santa Fe/Bowles Avenue to reduce vehicular traffic to less than 500 vehicles per day and converting Alamo Avenue from one-way to two-way. **Figure 24** displays the westbound traffic diversion assumptions due to the diverter at Main Street & Rio Grande Street. **Figure 25** displays the traffic analysis results at Santa Fe Drive & Bowles Avenue, Alamo Avenue & Curtice Street, Alamo Avenue & Nevada Street, and Alamo Avenue & Prince Street due to the two-way traffic conversion on Alamo Avenue and estimated traffic volumes.

The delay at Alamo Avenue & Curtice Street and Alamo Avenue & Nevada Street (side street stop-controlled intersections) increased from LOS B to LOS D due to an increase in delay from the side street vehicles. Side street vehicles need to judge gaps in traffic from two directions if Alamo Avenue is converted to two-way rather than from one direction in existing conditions.

The delay at Alamo Avenue & Price Street and Santa Fe Drive & Bowles Avenue (signalized intersections) decreased in the eastbound, westbound, and overall intersection delays. Due to assumed westbound diversion to alternate east/west roadways, the westbound vehicle volumes at Santa Fe Drive & Bowles Avenue intersection are lower than existing. However, due to using Synchro (deterministic traffic modeling software), there are limitations from the traffic analysis. Uncertainties in driver behavior are not included in deterministic software tools. There are also geometric and driver behavior impacts due to the S-curve east of Santa Fe Drive & Bowles Avenue and Synchro has limitations for geometry and driver behavior inputs. Synchro is not likely the appropriate tool for this analysis and delay results would be expected to be more impactful than what the traffic model is calculating. However, no further traffic analysis was completed using alternate tools due to the poor geometric feasibility of the intersection of Santa Fe Drive & Bowles Avenue. **Appendix B** displays the traffic analysis reports exported from Synchro.

Figure 24: *Plaza/Shared Street Diversion Analysis Assumptions*

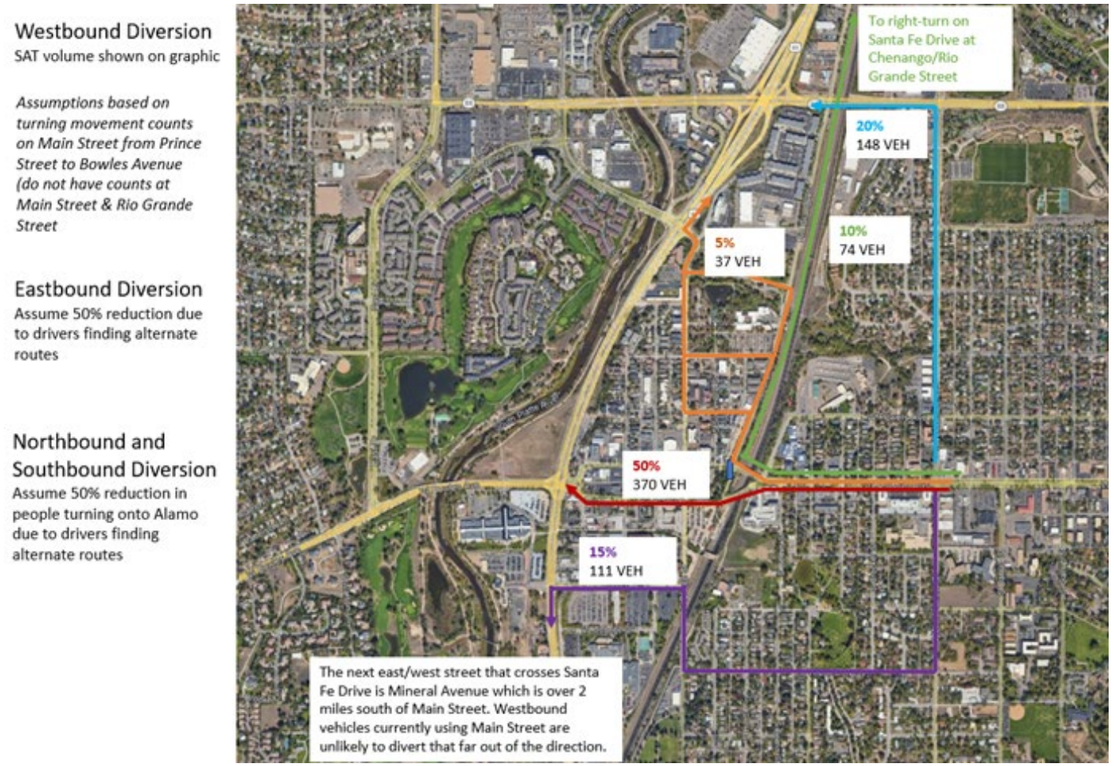


Figure 25: *Alamo Avenue Two-Way Conversion – Delay and LOS Results*

		SAT Peak			
		Existing		Alamo Avenue Two-way Conversion	
		Delay (s)	LOS	Delay (s)	LOS
Alamo Avenue & Prince Street	Eastbound	32.8	C	33.5	C
	Westbound	N/A	N/A	28.7	C
	Northbound	24.1	C	16.6	B
	Southbound	4.4	A	16.4	B
	Overall	24.8	C	24.2	C
Alamo Avenue & Nevada Street	Eastbound	N/A	N/A	N/A	N/A
	Westbound	N/A	N/A	N/A	N/A
	Northbound	13	B	26.9	D
	Southbound	13.8	B	22.5	C
	Overall	N/A	N/A	N/A	N/A
Alamo Avenue & Curtice Street	Eastbound	N/A	N/A	N/A	N/A
	Westbound	N/A	N/A	N/A	N/A
	Northbound	14.6	B	28.1	D
	Southbound	15.8	C	24.9	C
	Overall	N/A	N/A	N/A	N/A
Santa Fe Drive & Bowles Avenue	Eastbound	52.8	D	62.2	E
	Westbound	45.1	D	59.3	E
	Northbound	63.8	E	43.4	D
	Southbound	100	F	41.2	D
	Overall	71.7	E	48.2	D

Convert Main Street to Two-Way

City Council requested exploring the removal of one or both westbound travel lane(s) on Main Street to accommodate a larger pedestrian amenity zone. Project Downtown was paused for this City Council discussion regarding next steps at the July 16th Regular Meeting. The project team resumed progress to refine the Village Concept and the final plan.

The project team considered the removal of both lanes of travel on Main Street and allowing two-way traffic on Alamo Avenue for continued east-west access through downtown. The analysis did not support this solution due to current roadway configuration and geometry challenges. Due to the constraints at Santa Fe Drive & Bowles Avenue, the roadway alignment would require extensive redesign and would impact historic and private properties to accommodate this solution.

The team also posed the question of removing a travel lane on Main Street; however, this was not supported by the internal staff given the current average daily traffic volume and the potential for significant travel delays on Main Street, especially at Santa Fe Drive & Bowles Avenue where there are already high queues greater than 1,000 feet giving that intersection a very low level of service distinction. This would also require potentially significant improvements at intersections outside of the downtown core that would absorb the traffic diverted from Main Street.

South Metro Fire Rescue also had concerns about removing a travel lane on Main Street due to anticipated traffic backups and delays in getting to a structure in case of fire.

The final decision was that the removal of one or both travel lane(s) on Main Street would be significantly more costly due to the additional study, design, and capital improvements that would be required at impacted intersections outside of the downtown core to absorb traffic diverted from Main Street. These improvements would be required to be addressed in advance of any travel adjustments on Main Street, thus delaying Project Downtown construction for years and impacting LDDA progress. This would be a departure from the community desire and 12-month+ public engagement process, jeopardizing public trust in Project Downtown and future similar projects. There is still an enormous hurdle to clear with the potential parking impacts downtown, and the community has provided mixed feedback on the reduction or removal of any parking spaces on Main Street. The recommended approach for identifying options for long-term considerations allows the city and community to further understand major operational changes on Main Street through incremental implementation and additional economic and traffic impact analyses.