DECEMBER 2023

RANCHO CORDOVA ROUNDABOUT FEASIBILITY STUDY REPORT

RANCHO CORDOVA
CALIFORNIA

City Council Approved on March 4, 2024

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About the Project

Roundabouts can decrease city congestion, improve traffic safety, and reduce greenhouse gas emissions. This document outlines guidance to help the City plan and implement roundabouts at future and existing locations, where feasible.

Technical Advisory Committee (TAC)

Feedback and questions from the TAC helped guide design priorities, emergency vehicle and access needs, and existing and planned transit needs.

TAC Members

Sacramento Regional Transit District (SacRT)

Folsom Cordova Unified School District

Sacramento Metropolitan Fire District

Civic Thread

Sacramento Area Bicycle Advocates

Project Goals

The City set three goals for this project:

1. Identify suitable existing locations for roundabouts.
2. Prepare planning and design guidelines for future roundabouts.
3. Develop a forward-looking roundabout priority plan for the City of Rancho Cordova.

Project Process

1/ **Screen potential roundabout locations using existing city data.**

2/ **Study top location intersections and test overlay design sketches.**

3/ **Gather input from the community and technical advisory committee and develop roundabout designs.**

4/ **Prepare City roundabout guidelines.**

Location Screening Process

To identify existing intersections in Rancho Cordova that may be good candidates for roundabouts, the project team developed a screening process that evaluated locations first by priority and then by feasibility. The screening process used data on traffic counts and travel demand forecasts, land use, roadway characteristics, demographics, and environmental characteristics.

Community Engagement

Rancho Cordova community member questions, concerns, and ideas informed project priorities and the viability of future roundabout locations.

Engagement by the Numbers

3
Public Meetings

50
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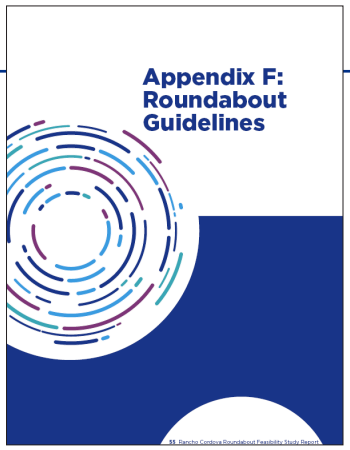
Roundabout Guidelines

As part of this project, the project team developed a guide for planning and designing future roundabouts (**Appendix F**). Based on national best practices, this guide will help support City staff, consultants, and other practitioners involved in City projects during the roundabout planning and design process. These guidelines will also help the City and partners site, plan, and move roundabouts through the project development process.



Introduction

Introduction

The City of Rancho Cordova got its start during the Gold Rush, when entrepreneurial spirits raced to extract wealth and opportunity from the landscape. Today, in its prime spot along the American River outside Sacramento, Rancho Cordova is once again a boom town. The city is one of the region's largest employers and boasts a population that has grown by almost 50 percent in 20 years.[1] The city's recent growth in population has created the need to address local transportation safety, circulation, and congestion.

This report summarizes the results of the City of Rancho Cordova Roundabout Feasibility Study, a project funded through the California Department of Transportation (Caltrans) Sustainable Transportation Planning Grant Program. The study considered roundabouts as a way to decrease city congestion, improve traffic safety, and reduce greenhouse gas emissions by identifying appropriate existing and future intersection locations for roundabouts. This document identifies the top existing locations for potential Rancho Cordova roundabout projects, offers concepts for those locations, and outlines guidance to help the City plan and implement roundabouts moving forward.

About the Project

Versatile in their size, shape, and design, roundabouts offer numerous safety and operational benefits. Their design forces low vehicle speeds, reduces conflict points for all road users, and promotes efficient traffic operations.[2] Installing roundabouts can reduce the number and severity of crashes, reduce traffic congestion, and help create a sense of place and function as a gateway into a community (**Figure 1**). And, because they don't require electrical controllers or signal operations, many roundabouts have reduced ongoing costs compared to traffic signals. Roundabouts also are resilient during natural disasters since the intersections continue to function as designed when the power goes out.

To take advantage of these safety and operational benefits, the City of Rancho Cordova studied the feasibility of building roundabouts at new and existing intersections throughout the city. Using a series of data points and community feedback, the project team evaluated and prioritized potential roundabout locations, created an implementation plan—including conceptual designs at five potential roundabout locations—and developed guidelines to help the City plan for and prioritize future roundabouts.

Figure 1. Planted Roundabout as Community Gateway (Citrus Heights, CA)

Source: Google Earth, (38.684381, -121.296489)

1 City of Rancho Cordova, "Growth by the Numbers," https://www.cityofranchocordova.org/Home/Components/News/News/4586/19.

2 FHWA, "Roundabouts," August 2023, https://highways.dot.gov/safety/intersection-safety/intersection-types/roundabouts.

Project Goals

With this project, the City set out to achieve three goals:

1. **Identify suitable existing locations for roundabouts.**
2. **Prepare planning and design guidelines for future roundabouts.**
3. **Develop a forward-looking roundabout priority plan for the City of Rancho Cordova.**

Throughout this project, the City relied on public and stakeholder feedback to help shape and refine the study.

Project Process

1/ Screen potential roundabout locations using existing city data.

2/ Study top location intersections and test overlay design sketches.

3/ Gather input from the community and technical advisory committee and develop roundabout designs.

4/ Prepare City roundabout guidelines.

Why Roundabouts?

Roundabouts are a type of circular intersection where vehicles move counterclockwise around a central island. Drivers entering the roundabout yield and wait for a gap to appear before merging into circulating traffic. This design feature means that no one movement has priority or more dedicated time over the other movements.

Roundabouts have proven safety and operational benefits:

Safer Intersections

Roundabouts can effectively decrease the frequency and severity of crashes by reducing the number of conflict points for drivers, pedestrians, and bicyclists and by reducing vehicle speeds (see **Figure 3**).

More Attractive Streets

Roundabout central islands provide natural locations for landscape and art, which can enhance street aesthetics and help visually indicate that roadway users are entering a distinct community.

More Resilient Infrastructure

Because roundabouts typically don't have signals requiring power, they continue to function even when the power goes out, such as during an earthquake, wildfire, or other emergency.

Access Management

Roundabouts can naturally provide U-turn movements but without the delay of vehicles waiting to make a tight U-turn. This allows the installation of raised medians that restrict left turn movements across traffic, which can help make the street safer.

Lower Life Cycle Costs

Roundabouts don't need electrical controllers, signal maintenance, or retiming, and they have a longer service life than traffic signals. As a result, roundabouts can reduce municipality maintenance costs compared to a signal.[3]

Less Congestion and Reduced Emissions

When operating within their capacity, roundabouts typically result in lower travel time delays and reduced emissions compared to other intersection control types.[4] Drivers yield to circulating traffic and take turns rather than waiting for a programmed green signal. This benefit is especially helpful when traffic volume is low outside the peak periods.

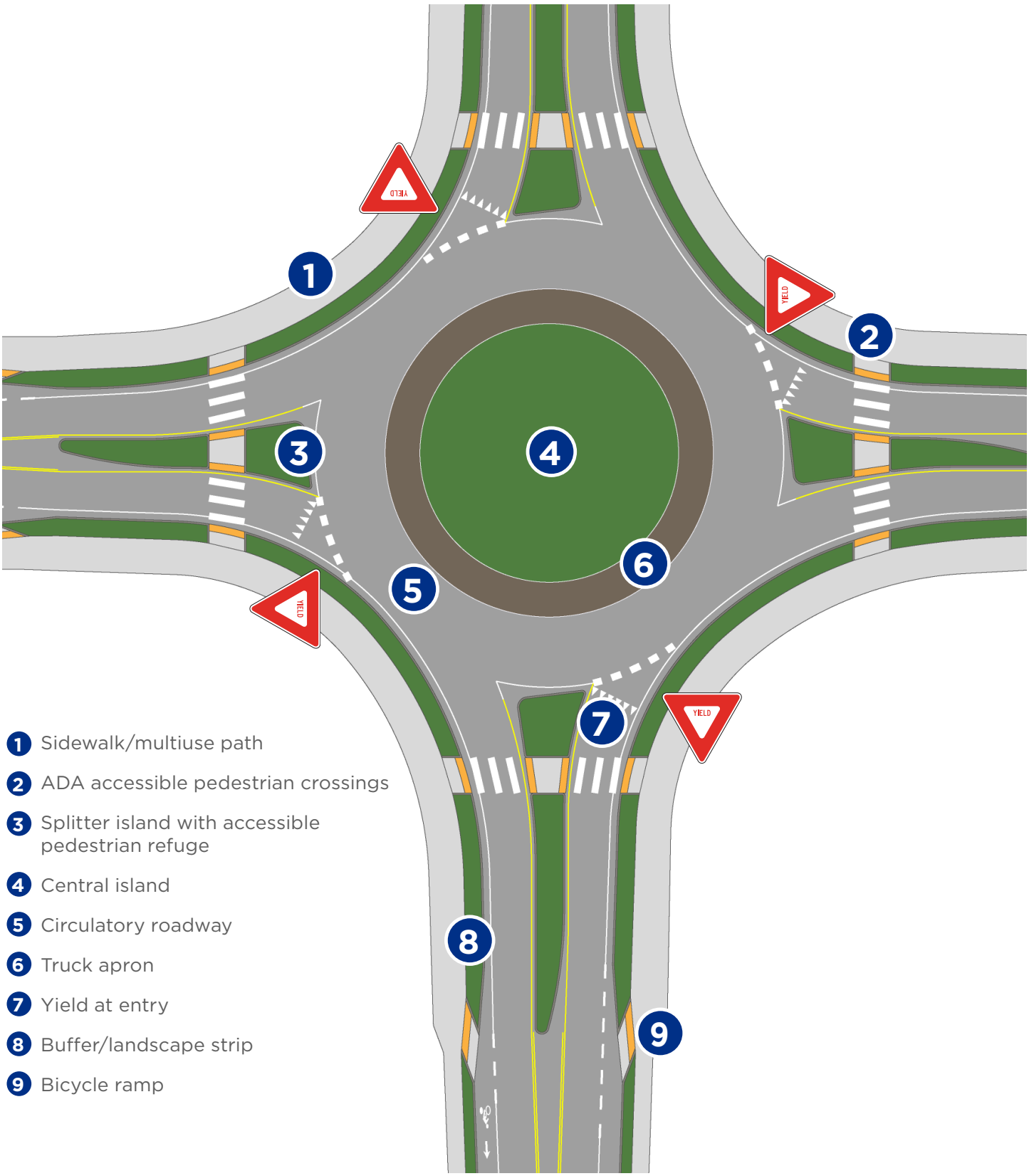
3 Niederhauser, M., B. Collins, and E. Myers. "The Use of Roundabouts: Comparison with Alternate Design Solution." Presented at the 67th Annual Meeting of the Institute of Transportation Engineers, Washington, DC, 1997.

4 National Cooperative Highway Research Program (NCHRP), *NCHRP Research Report 1043: Guide for Roundabouts* (2023), Section 2.4.2, https://nap.nationalacademies.org/catalog/27069/guide-for-roundabouts and Salamati, K., N. Rouphail, C. Frey, B. Schroeder, and L. Rodegerdts. A*ssessment of the Environmental Characteristics of Roundabouts. Vol. III of VII, Accelerating Roundabout Implementation in the United States*, publication FHWA-SA-15-071, FHWA, US Department of Transportation, 2015.

Roundabout Features

Not all circular intersections are roundabouts: roundabouts require drivers to yield on entry. **Figure 2** illustrates common features of roundabouts in the United States.

Figure 2. Roundabout Features



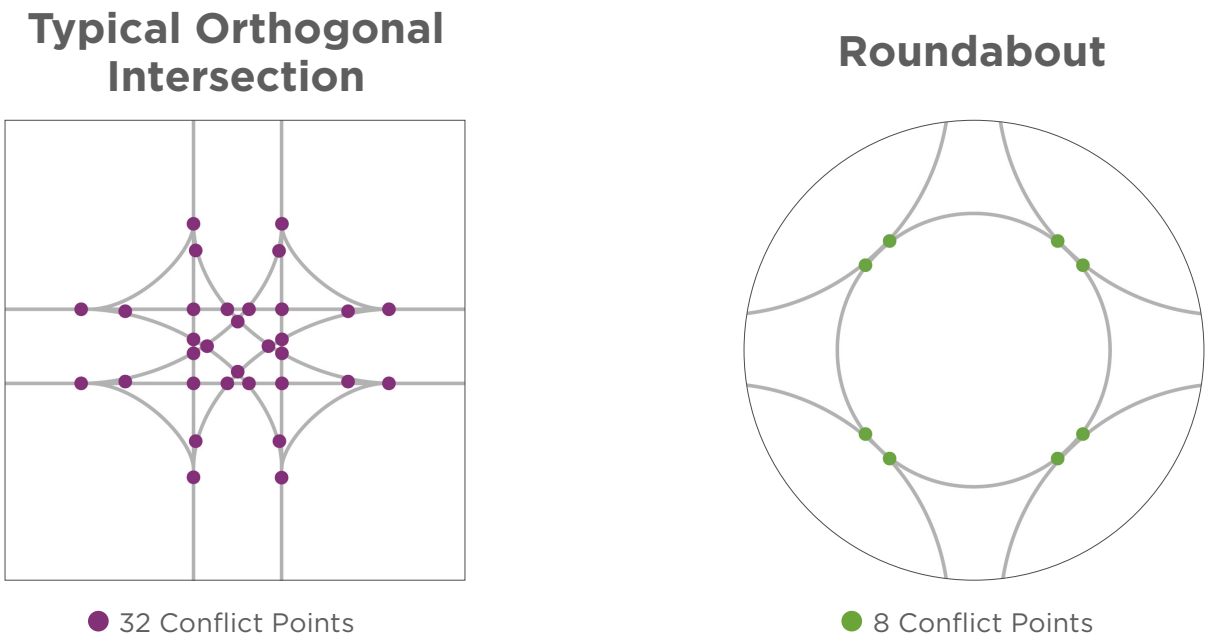
Source: Adapted from NCHRP Research Report 1043, Exhibit 2.1

Roundabouts Reduce Conflict Points

Because they reduce the number of conflict points and their potential severity, roundabouts design away potentially severe head-on and left-turn conflicts (**Figure 3**).

For more on the proven safety outcomes of roundabouts, check out https://highways.dot.gov/safety/proven-safety-countermeasures/roundabouts.

Figure 3. Comparing Conflict Points: Signalized or Stop-Controlled Intersection vs. Roundabout



Source: Adapted from NCHRP Research Report 1043, Exhibits 7.2 and 7.3.

Speed Management

A roundabout's circular design creates deflection, which naturally reduces vehicle speeds.

Vehicle speed is a critical component of intersection safety because the speed at which a crash occurs greatly influences the survivability of that crash—particularly for vulnerable road users like bicyclists and pedestrians. Roundabouts save lives by keeping speeds low. In a roundabout, every movement is controlled by forcing drivers to turn along curved paths rather than merely going straight. This deflection naturally slows drivers down (**Figure 4**).

For more on the impact and influence of speed, check out *City Limits: Setting Safe Speed Limits on City Streets* from the National Association of City Transportation Officials and *NCHRP Research Report 1043: Guide for Roundabouts*.

Well-designed roundabouts keep speeds low at entrances, conflict points, and pedestrian crossings.

Solutions to Site-Specific Challenges

Particular locations where roundabouts could provide more benefits than another intersection type share some common features. Intersections or corridors with one or more of the following features could be good candidates for a roundabout:

- Documented crash history—especially severe angle, turning, or speed-related crashes
- Drivers routinely exceed the posted or target speed
- Desired traffic calming
- Particularly low traffic volumes during non-peak hours compared to the peak hours
- Two-way stop-control with long delays on side streets
- Five or more legs of the intersection
- A high percentage of turning movements, especially left turns or U-turns
- Change in context and speed (such as at the entrance into a business district or residential neighborhood)
- A campus, neighborhood, commercial development, or urban area gateway or entrance

Reduced Head-On and Right-Angle Crashes

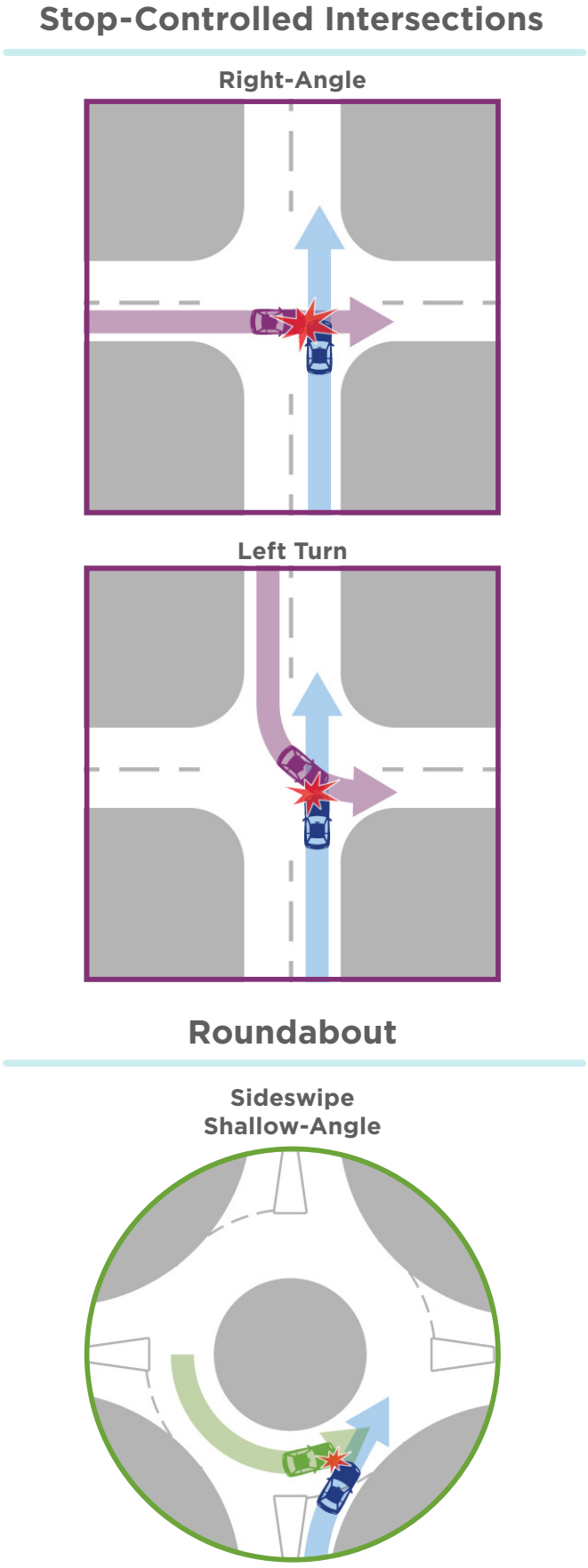
As they reduce conflict points, roundabouts also design away two types of crashes: right-angle (also called T-bone) and left-turn crashes (**Figure 4**). These two crash types are typically some of the most severe due to the angles of the collision and the resulting high levels of energy transfer involved.

Collisions that occur in a roundabout—typically sideswipe, shallow-angle, or low-speed rear-end crashes—are less severe because the collision angles reduce the impact force and because vehicles are traveling at slower speeds.

Additional Resources

- Federal Highway Association, "Roundabouts," https://highways.dot.gov/safety/proven-safety-countermeasures/roundabouts.
- NCHRP Research Report 1043: Guide for Roundabouts, 2023, https://www.trb.org/Publications/Blurbs/182939.aspx.

Figure 4. Comparing Crash Types: Signalized or Stop-Controlled Intersection vs. Roundabout

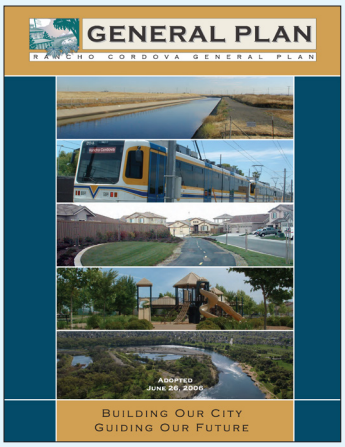


Source: Adapted from Kansas Roundabout Guide, Second Edition

Planning Context

Planning Context

The City of Rancho Cordova works hard to develop plans and policies that provide safe and efficient transportation options for everyone who lives in and visits the city. This project was developed within the City's larger planning and policy ecosystem.



General Plan

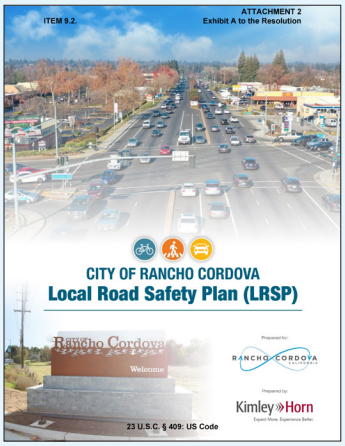
The 2006 Rancho Cordova General Plan and its subsequent updates provide a long-term vision for land use in the city. The City uses this plan as a reference for anticipated future land use and travel demand.

The travel demand needs from the General Plan influence roundabout viability and help determine whether a single-lane or multilane roundabout will be most appropriate in a given location. This roundabout feasibility study and accompanying guidelines offers the next general plan a means to incorporate and evaluate roundabouts as part of future development.

Bicycle Master Plan

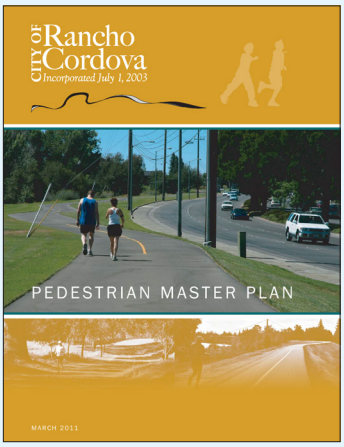
The City's 2016 Bicycle Master Plan puts the General Plan's bicycling policies and goals into action. The Bicycle Master Plan recommends infrastructure like bike lanes and paths and charts a course for implementation.

This roundabout study used the Bicycle Master Plan to design prospective roundabouts in the context of planned bicycle networks. For example, where the bicycle plan recommends separated bike lanes, this project includes those facilities in the concept design.



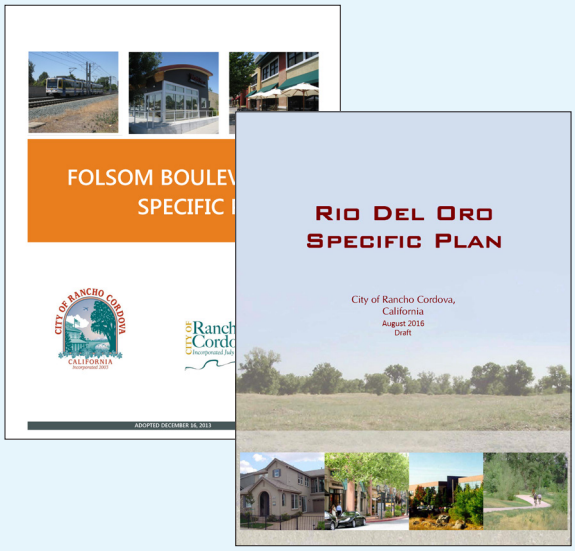
Local Road Safety Plan

The City's Local Road Safety Plan identifies emphasis areas, priority locations, and project recommendations for the City to implement to improve traffic safety. The City may reconsider these locations in light of the results of this feasibility report to determine whether roundabouts are appropriate at previously identified locations.



Pedestrian Master Plan

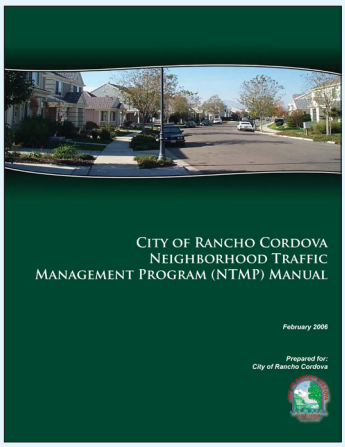
The City's 2011 Pedestrian Master Plan offers a policy framework to increase walking and improve walking conditions in the city. In addition to development patterns that support walking, the plan identifies pedestrian-supportive infrastructure improvements, such opportunities to fill sidewalk gaps, intersection and crossing improvements, street lights, and neighborhood traffic calming efforts. The Pedestrian Master Plan is a supplement to the General Plan's Circulation Element.



Specific Plans

A specific plan sets planning policies and standardizes how a particular geographic area should develop, including where development can occur, how dense that development can be, and what structures might look like. For the City's specific plans, check out the Planning Division's document library.

When developing specific plans, the City can use information in this roundabout study to identify roundabout locations before setting development constraints.



Neighborhood Traffic Management Program Manual

The City's Neighborhood Traffic Management Program (NTMP) Manual provides a framework and guidelines to help City staff, residents, developers, and other professionals select and prioritize traffic calming devices and designs for streets and neighborhood areas.

Roundabouts and traffic circles tools of the NTMP.

Community Engagement

Community Engagement

Throughout this project, the project team collaborated with Rancho Cordova community members. Their questions, concerns, and ideas informed project priorities and the viability of future roundabout locations.

For more on community engagement for this project, see **Appendix A**.

Engagement by the Numbers

3
Public Meetings

50
Attendees

88
Survey Responses

138
Total Connections

Project Website

To help connect community members with study information, the project team developed a website (**Figure 5**). The site explained the study's purpose and timeline and provided links to public meetings and presentation materials. To visit the site, check out https://www.cityofranchocordova.org/residents/new-businesses-and-projects/public-works-plans-and-projects/.

Figure 5. Roundabout Project Website

Community Meetings

The project team hosted three community meetings during this project.

October 2022, First Community Meeting:
The team introduced the project and implementation plan. The team also explained why the City is considering roundabouts and answered questions about the plan and roundabouts. This meeting was recorded, and the video remained available on the website throughout the project.

January 2023, Second Community Meeting:
The team shared their location screening process to identify the top 50 potential locations, presented nine potential roundabout locations deemed most feasible, and gathered for public input on locations.

June 2023, Third Community Meeting:
The project team shared project updates and asked for feedback on the five remaining highest ranked roundabout locations and concept designs.

For complete meeting summaries, see **Appendix A**.

Key Findings

- Safety is this community's top priority.
- Residents are excited to see landscape features in roundabout center islands.
- Rancho Cordova residents have concerns about driver behavior.
- Meeting attendees had questions about the roundabouts in future City development plans.

Online Survey

To hear from more community members about the project and different design concepts, the project team hosted an online survey, which was open during June and July in 2023 (**Figure 6**). The survey received 88 responses and asked participants about the five potential intersection locations and about different roundabout features, including landscape, public art, and bicycle and pedestrian treatments. The survey also asked Rancho Cordova community members about their priorities when it comes to roundabout implementation.

Survey respondents had positive reactions to pedestrian crossing safety elements, and ranked the following priorities for siting future roundabouts:

1/ Safety improvements

2/ Reduced traffic delay

3/ Bicycle comfort

4/ Prioritizing social equity

5/ Walking comfort

6/ Aesthetic improvements

For complete survey results, see **Appendix A**.

Community Survey Voices

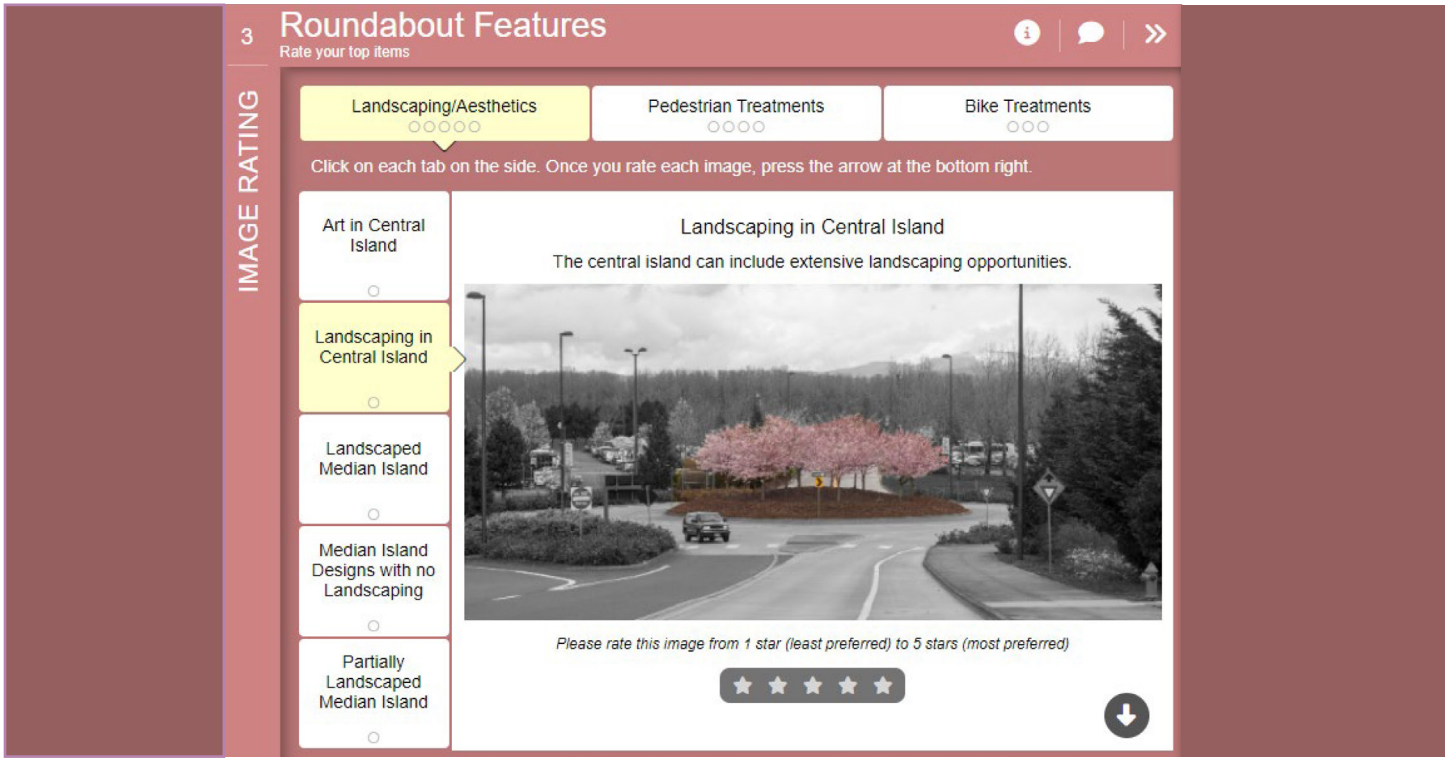
Life is a short trip. People need to slow down and stay safe. Roundabouts are an innovative way to increase safety for all.

I like the look and feel of roundabouts; they add value to cities' aesthetics.

Safety is the number one priority.

More than half of survey respondents indicated that safety was their top priority.

Figure 6. Sample Survey Question



Source: Metroquest

Technical Advisory Committee

Throughout the project, feedback and questions from the Technical Advisory Committee (TAC) helped guide design priorities, emergency vehicle and access needs, and existing and planned transit needs. The team began collaborating with the TAC in September 2022 and provided subsequent updates throughout the project. The TAC reviewed and gave valuable feedback on this report.

TAC Members

Sacramento Regional Transit District (SacRT)

Folsom Cordova Unified School District

Sacramento Metropolitan Fire District

Multimodal Advocacy Groups

Civic Thread

Sacramento Area Bicycle Advocates

Location Screening

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To identify existing intersections in Rancho Cordova that would be good candidates for roundabouts, the project team developed a screening process that evaluated locations first by priority and then by feasibility. The screening process used data on traffic counts and travel demand forecasts, land use, roadway characteristics, demographics, and environmental characteristics. Below is a summary of the screening process.

The screening revealed locations with the most potential benefit and deprioritized locations where right-of-way constraints would be too great to build, such along local roadways.

For a complete discussion of both the priority screening and feasibility screening process, see **Appendix B**.

What Data Did We Use?

Transportation Data

- Roadway functional classification
- Posted speed limits
- Number of lanes
- Existing intersection control type
- Existing and proposed bikeway classification
- Transit lines and stops
- Existing and projected traffic volumes
- Crash history

Land Use Data

- Planning areas
- Zoning opportunities and constraints

Demographic, Socioeconomic, and Environmental Data

- Social equity indicators
- Hazard risk

Priority Screening

To understand what locations would most benefit from a roundabout, the project team began a priority screening process of all city intersections. The first step was to remove intersections that met one or more of the follow criteria:

- Had vehicle travel volumes higher than the estimated capacity for a two-lane roundabout.
- On a state highway or exclusively on neighborhood streets.
- Had six or more total lanes.[5]

The project team then screened the remaining intersections according to locations that were appropriate for roundabouts and locations that reflected City priorities.

To identify locations that aligned with City priorities, the project team examined:

- **Safety**—The frequency and severity of crashes at intersections over a five-year period.
- **Social equity**—How disadvantaged, underserved or burdened the area is according to two indicators: the CalEnviroScreen and Healthy Places Index (see **Appendix B**).
- **Modal priority**—Whether a location was along an existing or planned bike lane or bike route (increased priority); whether it was within 250 feet of a transit stop (increased priority); and whether it was on a designated STAA truck route (decreased priority).
- **Land use opportunities and constraints**—Whether the intersection area may have fewer property conflicts (due to being on undeveloped land or City-owned parcels, for example) and whether it avoids potentially sensitive land uses (such as a creek or other waterway).
- **Natural hazard risk**—The likelihood of impacts from wildfire, flood, or earthquake according to the Federal Emergency Management Agency's National Risk Index.

These factors alerted the project team to potential design challenges, how the intersection might grow and change over time, and whether a roundabout might slow traffic or need further speed management treatments.

The list of screened locations was then prioritized using a system that placed a heavier emphasis on intersections with identified safety concerns (**Figure 7**). Safety is the City's—and community's—top priority, and this weighting scheme prioritizes roundabouts in locations that could benefit most. From this list of prioritized projects, the team identified the top 50 locations, which represented the intersections with the greatest potential to reap the many benefits of a roundabout.

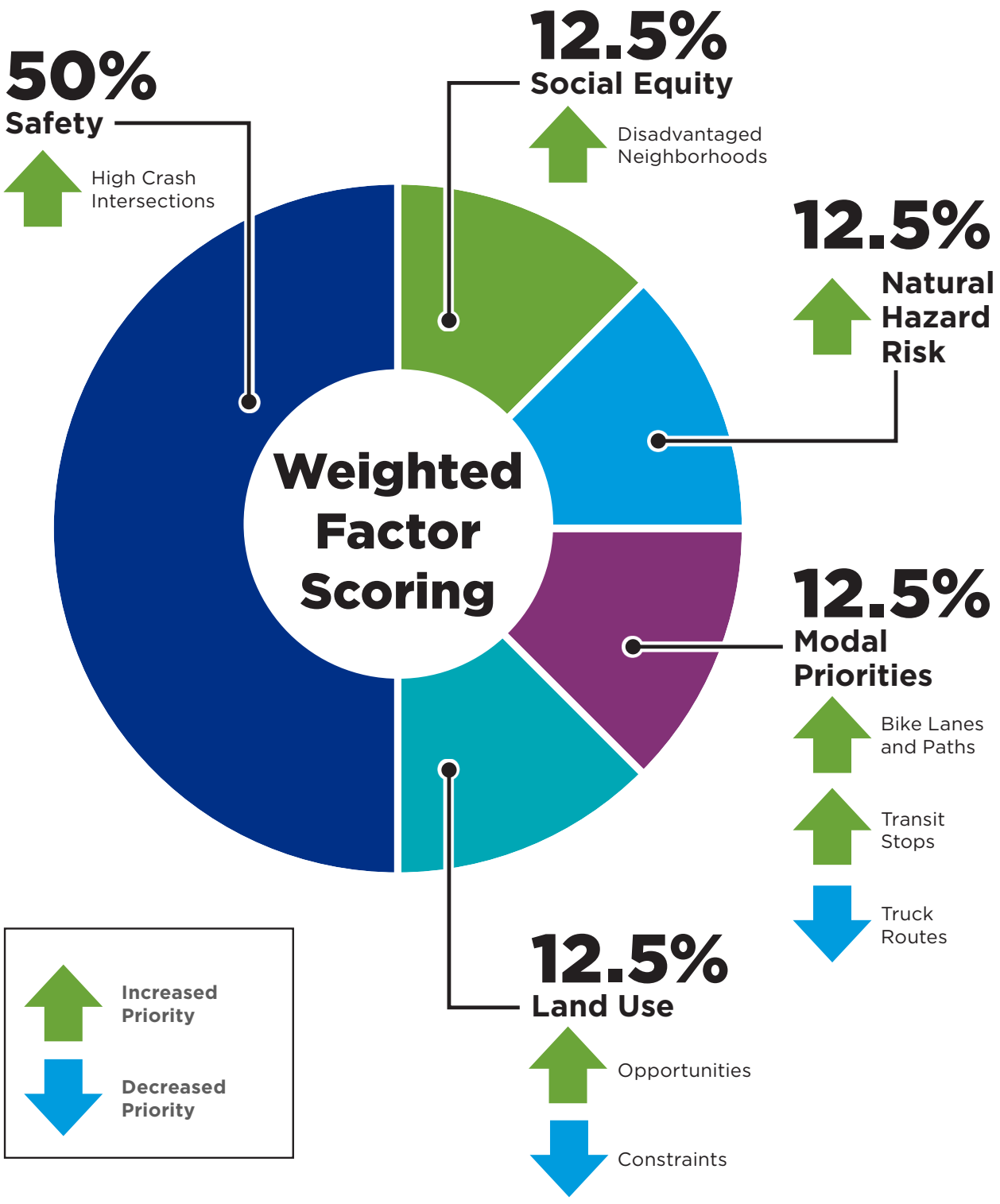
Roundabouts and Resilience

Roundabouts are a more resilient type of intersection because they do not rely on electrically-powered traffic signals to operate. This means that during times of power outages, such as in the aftermath of an earthquake, flood, or wildfire, the intersection can continue to move people and goods through the community.

To help Rancho Cordova prepare to meet the increasing uncertainty from a changing climate, the screening criteria for this project prioritized areas that would be most at-risk for natural hazards.

5 The team removed six-lane roadways from consideration because properly accommodating three lanes of circulating vehicle traffic requires a very large roundabout. Designs for roundabouts of this size are challenging to implement. Roundabouts with three circulating lanes offer fewer benefits and did not align with study goals. Smaller, one- and two-lane roundabouts are a better fit for City needs because they offer the greatest safety and operational benefits.

Figure 7. Priority Screening Weighted Factor Scoring

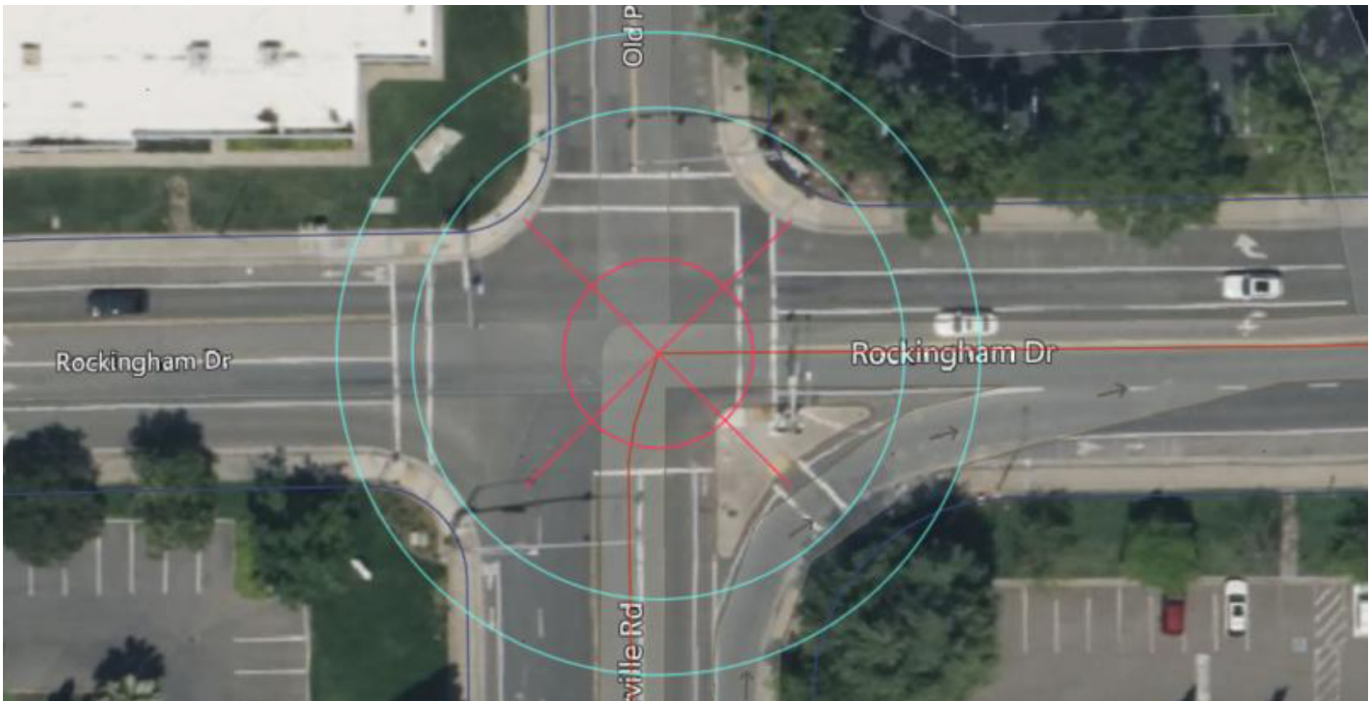


Locations were evaluated to put safety first, based on received feedback.

Feasibility Screening

To develop the list of the top 50 intersections using the safety first screening criteria, the project team placed planning-level roundabout footprints on top of aerial imagery according to national best-practice standards outlined NCHRP Research Report 1043: Guide for Roundabouts (**Figure 8**). Footprint sizes corresponded to the number of travel lanes and the types and sizes of vehicles expected to use that intersection. For more on these sketches and standard sizing, see **Appendix B** and the Rancho Cordova Roundabout Guidelines.

Figure 8. Sample Roundabout Footprint Sketch



Source: Google Earth and Kittelson & Associates, Inc.

Sketches of potential roundabouts and the space they would occupy (called footprints) were used to identify nine intersections that, upon initial review, could accommodate a new roundabout with limited right-of-way and property impacts.

Further analysis was done to assess planning and engineering feasibility and land use impacts. The analysis assessed where intersections were too constrained to build, such as where a roundabout footprint would obviously impact buildings.

This additional analysis narrowed down the list to the five most feasible locations given initial impact assessments and safety-first screening criteria (see **Appendix C**):

- Old Placerville Road and Rockingham Drive
- Old Placerville Road and Routier Drive
- Kilgore Road and Sun Center Drive
- Capital Center Drive and Disk Drive
- Mather Field Road and Peter A McCuen Boulevard

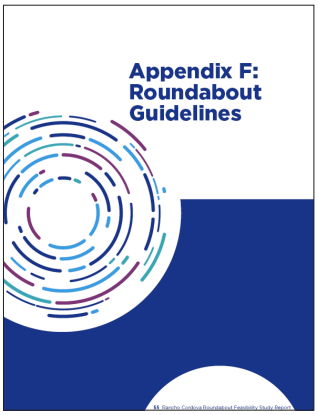
Appendix F: Roundabout Guidelines can be used to evaluate existing and proposed city intersections for roundabout feasibility.

What's Next?

What's Next?

Roundabout Guidelines

As part of this project, the project team developed a guide for planning and designing future roundabouts (**Appendix F**). Based on national best practices, this guide will help support City staff, consultants, and other practitioners involved in City projects during the roundabout planning and design process. These guidelines will also help the City and partners site, plan, and move roundabouts through the project development process.



Next Steps for Future Locations

To support more roundabouts in Rancho Cordova, the City can also:

/ Identify locations for desired roundabouts in future developments.

/ Use traffic volume forecasts to inform feasibility and design.

/ Pursue grants to fund roundabout implementation.

/ Integrate potential priority locations into upcoming specific plans.

/ Consult the NTMP for roundabouts in challenging or constrained residential locations.

Next Steps for Existing Locations

Over the course of this project, the project team identified the five feasible roundabout locations based on the safety criteria and according to existing traffic volumes, land use constraints, and screening criteria. The City can also consider the following:

1/ Using the City's updated travel demand model to determine if the proposed concepts can adequately serve projected traffic growth using **Appendix F: Roundabout Guidelines**.

2/ Continuing to gather input to understand and address community concerns.

3/ Identifying appropriate funding sources to make viable roundabouts a reality (see the funding section on the next page).

4/ Using the Rancho Cordova Roundabout Guidelines and principles from *NCHRP Research Report 1043* to develop context-appropriate designs.

Funding

There are several funding sources that can help the City pay for roundabout projects (**Table 1**). The listed funding sources have requirements and scoring systems that will determine whether the five concepts or any other potential locations could be competitive. For more information on funding sources, see **Appendix E**.

Table 1. Funding Source Summary, as of 2023

Funding Source	Frequency	Application Period
Safe Streets for All (SS4A)	Annual until Fiscal Year 2026	March–July Award Notification: October
Surface Transportation Block Grant Program	Annual	Application Due Date Varies Apportionment: October
Rebuilding American Infrastructure with Sustainability and Equity (RAISE), formerly BUILD & TIGER	Annual	December–February Award Notification: June
Congestion Mitigation and Air Quality (CMAQ) Improvement Program	Annual	Apportionment: October
Active Transportation Program (ATP)	Every 2–3 years	March–June Award Notification: October
Highway Safety Improvement Program (HSIP)	Every 1–2 Years	May–November Award Notification: March
Affordable Housing and Sustainable Communities Program	Every 1–2 years	January–April Award Notification: August
Transformative Climate Communities (TCC)	Annual	March–August Pre-Proposals due in May Award Notification: December
Sacramento Area Council of Governments (SACOG) regional funding rounds	Annual	Varies

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