Roundabout Calculation Example from HSIP Cycle 12 Call-for-projects

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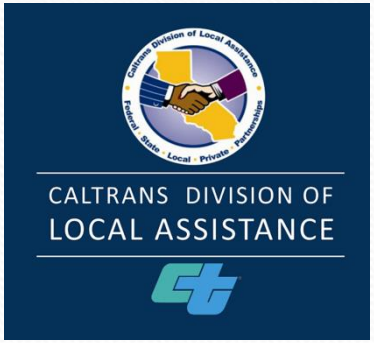


1. **Automated calculation using HSIP Analyzer**

2. **Manual calculation check**

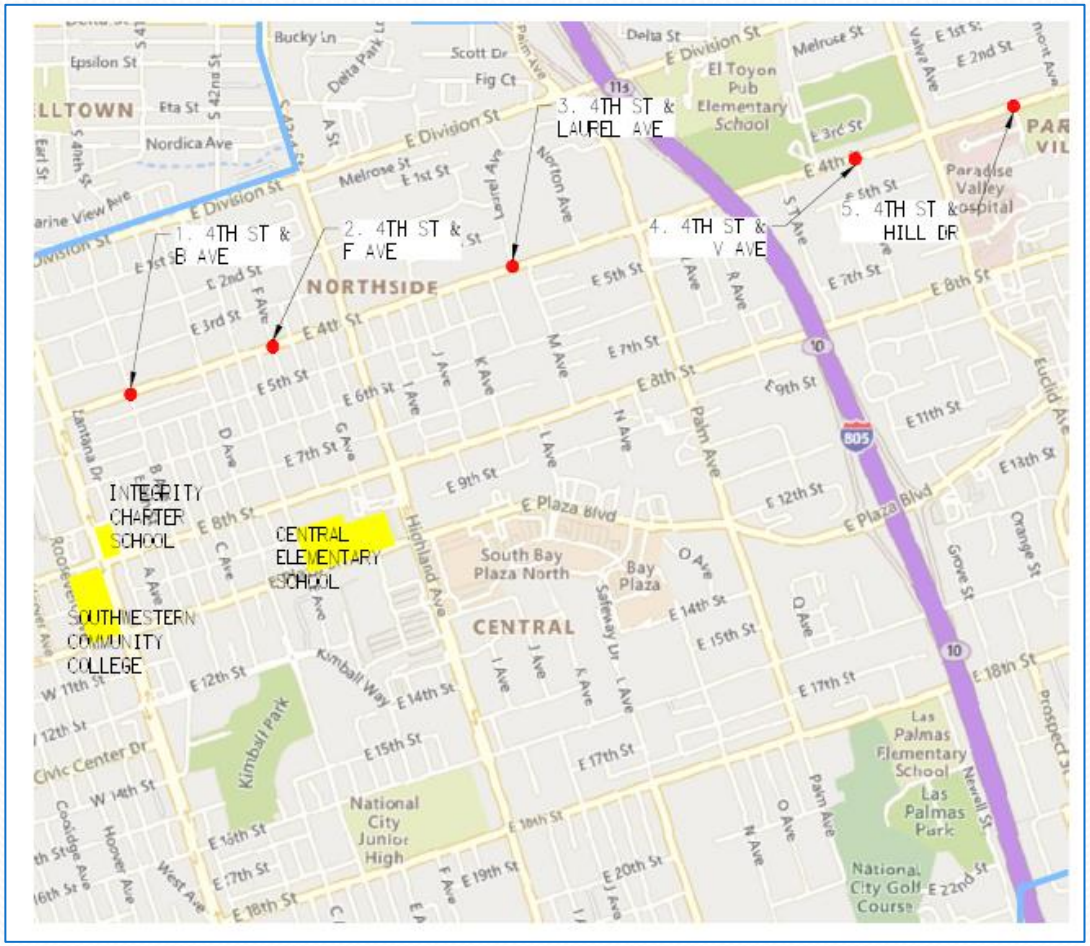
City of National City

5 mini roundabouts

4th Street corridor at the intersections

of B Avenue, F Avenue, Laurel Avenue, V Avenue, and Hill Drive.

Total cost = $838,200



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HSIP Analyzer

Version date: April 2024

HSIP Analyzer

Step 1: Select safety countermeasures

Does this application include Signalized Intersections (SI)? No

Does this application include Non-signalized Intersections (NS)? Yes

Does this application include Roadway Segments (R)? No

** Normally a BCR application only includes locations of one of the above 3 categories (SI, NS or R). Multiple categories may be selected if the application proposes corridor safety improvements or uses a systemic approach, or the applicant chooses to bundle multiple locations in the same vicinity together.*

Non-signalized Intersections (NS):

Click the check box in the 1st column to select up to 3 countermeasures.

Hide unselected countermeasures | View all countermeasures

Select	No.	Countermeasure Name
✓	7	NS07RA: Convert intersection to mini/compact roundabout (from stop or yield control on minor road) (CRF varies for All crashes; Life=20 yrs; FE=90%)

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HSIP Analyzer

Step 2: Click to generate table for project locations, enter the project locations and select countermeasures for each location. If any of the selections have been changed, you must re-click the below button to refresh.

Click to Generate Table for Project Locations Entry

CMs have been selected. Ok to proceed.

+/- Line	Location No.	Location Description (Intersection Name or Road Limit or General Description)	Click to select Countermeasures		Error Messages (must resolve)
	(Non-signalized Intersections)				
			NS07RA		
+ -	NSI_1	4th Street & B Avenue	●		
+ -	NSI_2	4th Street & F Avenue	●		
+ -	NSI_3	4th Street & Laurel Avenue	●		
+ -	NSI_4	4th Street & V Avenue	●		
+ -	NSI_5	4th Street & Hill Drive	●		

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Step 3: Click to generate tables for crash data and provide crash data. If any changes have been made in the previous two steps, you must re-click to refresh.

Click to Generate Tables for Crash Data Entry

Crash Data Periods: you may use one or two time periods. The total time periods must be between 3 and 5 years.
The crash data to be entered are combined from both periods if two periods are used.

Crash Data Period 1: from (MM/DD/YYYY): 01/01/2019 To (MM/DD/YYYY): 12/31/2021

Crash Data Period 2 : from (MM/DD/YYYY): To (MM/DD/YYYY):

Combined Crash Data Period (years) = 3

Fill out the crash data table(s) for the crash type(s) as required by the selected countermeasure(s) in Step 2.

Fill in yellow fields only. "Total" fields are calculated. Gray fields (if any) are locked as data are NOT needed for those fields.

Crash Data Table for Crash Type: ALL

No.	Location No : Description (from Step 2)	Fatal (ALL)	Severe Injury (ALL)	Other Visible Injury (ALL)	Complaint of Pain (ALL)	PDO (ALL)	Total
1	NSI_1: 4th Street & B Avenue	0	0	1	3	0	4
2	NSI_2: 4th Street & F Avenue	1	0	1	1	2	5
3	NSI_3: 4th Street & Laurel Avenue	0	0	0	1	2	3
4	NSI_4: 4th Street & V Avenue	0	0	1	0	0	1
5	NSI_5: 4th Street & Hill Drive	0	0	0	0	0	0
	Total	1	0	3	5	4	13

Additional information is required:
Since Roundabout is selected, the below additional information is required for calculating Roundabout benefit.

No.	Location No : Description (from Step 2)		Rural/Urban	Intersection Type	Lanes	ADT (Major Rd)	ADT (Minor Rd)	ADT (Total)
1	NSI_1	4th Street & B Avenue	Urban	Four-leg	1 Lane	4,835	1,000	5,835
2	NSI_2	4th Street & F Avenue	Urban	Four-leg	1 Lane	5,500	1,000	6,500
3	NSI_3	4th Street & Laurel Avenue	Urban	T	1 Lane	6,547	1,000	7,547
4	NSI_4	4th Street & V Avenue	Urban	T	1 Lane	8,015	1,000	9,015

No.	Location No : Description (from Step 2)		Rural/Urban	Intersection Type	Lanes	ADT (Major Rd)	ADT (Minor Rd)	ADT (Total)
5	NSI_5	4th Street & Hill Drive	Urban	T	1 Lane	6,991	1,500	8,491

Step 4: Click to Calculate the project benefit. If any changes have been made in the previous two steps, you must re-click to refresh.

Click to Perform Benefit Calculation

Benefit Summary:

Benefit by Locations

Location No : Description	[CM1 ID]	[CM1] Benefit	[CM2 ID]	[CM2] Benefit	[CM3 ID]	[CM3] Benefit	Total Benefit
NSI_1: 4th Street & B Avenue	[NS07RA]	$6,681,216	[None]	$0	[None]	$0	$6,681,216
NSI_2: 4th Street & F Avenue	[NS07RA]	$8,351,520	[None]	$0	[None]	$0	$8,351,520
NSI_3: 4th Street & Laurel Avenue	[NS07RA]	$3,398,780	[None]	$0	[None]	$0	$3,398,780
NSI_4: 4th Street & V Avenue	[NS07RA]	$54,366	[None]	$0	[None]	$0	$54,366
NSI_5: 4th Street & Hill Drive	[NS07RA]	$0	[None]	$0	[None]	$0	$0
Total							$18,485,882

Benefit by Countermeasures

No.	Countermeasure	Benefit
1	NS07RA: Convert intersection to mini/compact roundabout (from stop or yield control on minor road)	$18,485,882
	TOTAL	$18,485,882

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Manual calculation check: 4th Street & B Avenue Roundabout

No.	Location No : Description (from Step 2)		Rural/Urban	Intersection Type	Lanes	ADT (Major Rd)	ADT (Minor Rd)	ADT (Total)
1	NSI_1	4th Street & B Avenue	Urban	Four-leg	1 Lane	4,835	1,000	5,835

Roundabout Cost/CMF Table

No.	Area ID (1 - Rural; 2-Urban)	Control (1-Stop or yield control on minor road; 2-All way Stop; 3-Signal.)	Intersection Type (1 - Four-leg; 2- T)	Roundabout (1 or 2 lanes)	Base Rate	Cost (before)	Cost (after)	CMF
1	1	1	1	1	0.23	$ 401,100	$ 64,000	0.29
2	2	1	1	1	0.15	$ 244,900	$ 59,200	0.61
3	1	1	1	2	0.23	$ 401,100	$ 64,000	0.80
4	2	1	1	2	0.15	$ 244,900	$ 59,200	0.80
5	1	1	2	1	0.16	$ 356,600	$ 64,000	0.29
6	2	1	2	1	0.18	$ 193,800	$ 59,200	0.61
7	1	1	2	2	0.16	$ 356,600	$ 64,000	0.80
8	2	1	2	2	0.18	$ 193,800	$ 59,200	0.80
9	1	2	1	1	0.60	$ 213,100	$ 64,000	1.00
10	2	2	1	1	0.21	$ 148,700	$ 59,200	1.00
11	1	2	1	2	0.60	$ 213,100	$ 64,000	1.00
12	2	2	1	2	0.21	$ 148,700	$ 59,200	1.00
13	1	2	2	1	0.36	$ 1,842,000	$ 64,000	1.00
14	2	2	2	1	0.05	$ 245,800	$ 59,200	1.00
15	1	2	2	2	0.36	$ 1,842,000	$ 64,000	1.00
16	2	2	2	2	0.05	$ 245,800	$ 59,200	1.00
17	1	3	1	1	0.50	$ 219,700	$ 64,000	0.73
18	2	3	1	1	0.27	$ 172,300	$ 59,200	0.73
19	1	3	1	2	0.50	$ 219,700	$ 64,000	1.00
20	2	3	1	2	0.27	$ 172,300	$ 59,200	1.00
21	1	3	2	1	0.24	$ 205,700	$ 64,000	0.73
22	2	3	2	1	0.21	$ 158,400	$ 59,200	0.73
23	1	3	2	2	0.24	$ 205,700	$ 64,000	1.00
24	2	3	2	2	0.21	$ 158,400	$ 59,200	1.00

1. **From Table:**
   - **Base rate: 0.15;**
   - **Cost per crash (before): $244,900**
   - **Cost per crash (after): $59,200**
   - **Crash Modification Factor (CMF): 0.61**

2. **Predicted number of crashes in the next 20 years:**
   4 crashes/3 yrs * 20 yrs * 1.2 = 32 crashes

3. **Total crash cost before:**
   32 crashes * $244,900/crash = $7,836,800

4. **Total crash cost after:**
   32*0.61 crashes * 59,200/crash = $1,155,584

5. Check crash rate:

(32*0.61)/(365*20*5,835*1.2)*1,000,000 = 0.38 > 0.15 (base rate). OK.

6. Project benefit:

$7,836,800 - $1,155,584 = $6,681,216

7. Roundabout Benefit Cost Ratio (BCR)

$6,681,216/$167,640 = 39.9

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Questions? Thank You.