



Cal-B/C Training Module 9d

Cal-B/C Park-and-Ride (PnR) Case Study

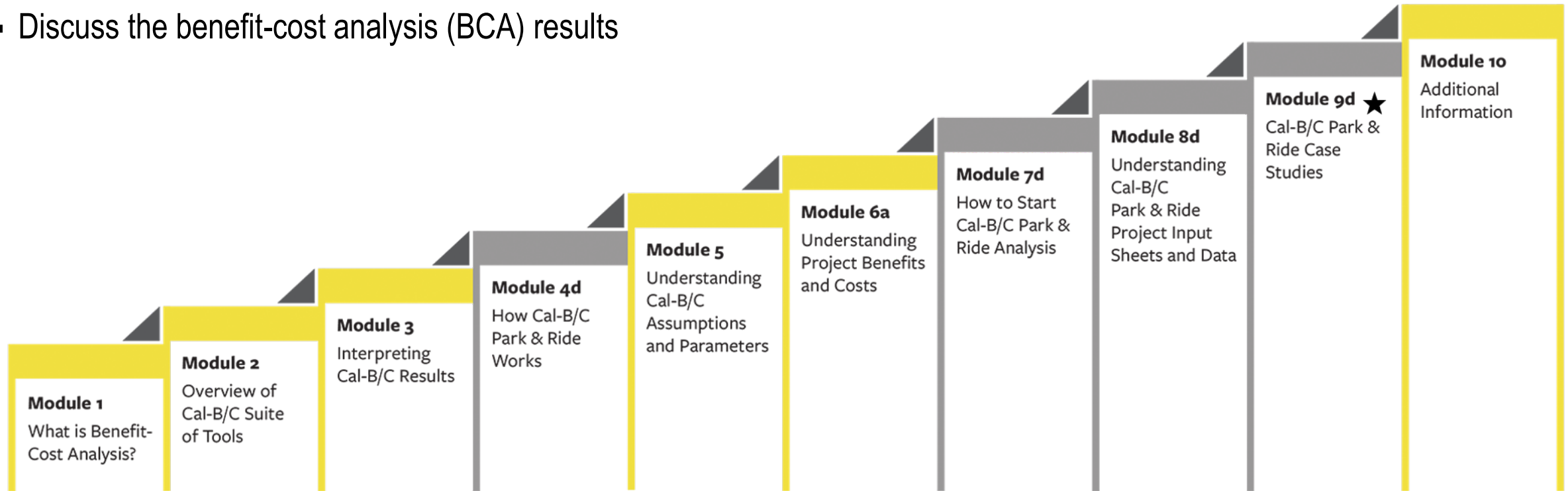


01

About This Module

This module will...

- Walk you through a hypothetical project – a new Park-and-Ride Lot Project
- Provide details on where to get data to input into the example
- Discuss the benefit-cost analysis (BCA) results



★ *This module is covered in this presentation*

Previous Modules...

- **Module 1** provided a basic introduction to benefit-cost analysis (BCA) and a general overview of how you conduct a BCA
- **Module 2** described the Cal-B/C suite of tools, discussed the types of projects that can be evaluated, and provided guidance on which tools to use for various projects
- **Module 3** presented the Cal-B/C results and detailed what each output measure means, and explained how they are calculated
- **Module 4d** presented an overview of how Cal-B/C Park-and-Ride works including a review of all worksheets and inputs
- **Module 5d** highlighted the information in the Parameters worksheet and discussed key assumptions used by Cal-B/C
- **Module 6d** provided detailed information on how Cal-B/C Park-and-Ride calculates benefits
- **Module 7d** presented the 1-2 approach to starting a Cal-B/C Park-and-Ride analysis
- **Module 8d** discussed potential data sources that can be used in a Cal-B/C Park-and-Ride analysis

02

Project Information Worksheet

Project Description

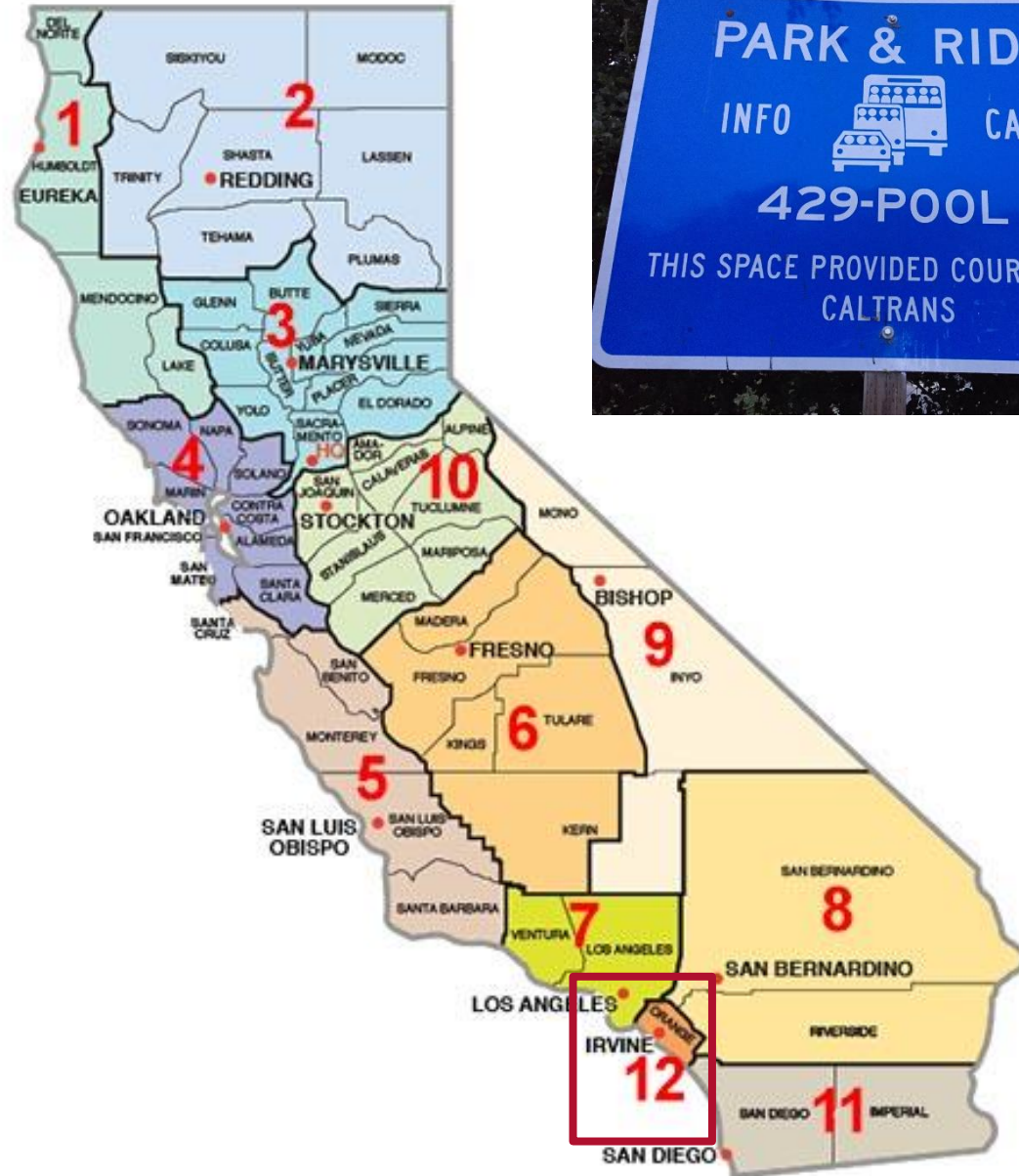
- Hypothetical preliminary planning level analysis for a new Park-and-Ride lot in Southern California

No Build Case:

- No Park-and-Ride lot. Commuters will continue to drive.
- Highly congested highway corridor

Build Case:

- New surface Park-and-Ride Lot with 100 parking spaces in District 12
- Located near existing SR-55 and Lincoln/Nohl Ranch Road Park-and-Ride Lot
- Access to local and commuter buses (e.g. OCTA Line 71, 213, and Riverside Transit Line 149)



1) Project Information Worksheet Overview (from Module 4d)

- The primary data entry worksheet for Cal-B/C Park-and-Ride.

1A Project Data

- Required for all projects.

1B Park-and-Ride Lot Information

- Required data for lot design and expected demand
- Data such as Average Vehicle Occupancy (AVO)

1C Destination Information

- Required data for travel demand, accident rates, transit/highway travel, carpool/vanpools

1D Project Costs

- Required and common to all Cal-B/C tools

The screenshot displays the Project Information Worksheet spreadsheet with the following sections visible:

- 1A PROJECT DATA:** Includes fields for District (HQ), Project (Hypothetical Project), Project Location (1), and Length of Construction Period (1 years).
- 1B PARK-AND-RIDE LOT INFORMATION:** Includes Lot Design (Number of Parking Spaces: 0 No Build, 100 Build) and Park-and-Ride Demand (Typical Percent Filled: 0% No Build, 50% Build; Number of Years until Lot Reaches Capacity: 0 No Build, 3 Build; Number of Bicycle/Pedestrian Users: 0 No Build, 5 Build; Average Vehicle Occupancy of Lot Users: 1.00 No Build, 1.00 Build).
- 1C DESTINATION INFORMATION:** Includes Destination Description (OC, LA, RVV), Demand for Travel to Destination, Highway Travel to Destination, Transit Travel to Destination, and Carpool/Vanpool Travel to Destination.
- 1D PROJECT COSTS:** A detailed cost breakdown table showing Direct Project Costs (Initial and Subsequent) and Total Costs (Constant and Present Value) over a 20-year period.

At the bottom of the spreadsheet, the Residual Value in Year 21 is shown as \$0, and the Present Value is calculated as Future Value / (1 + Real Discount Rate)^ Year.

1A) Enter Project Data

Input Project Identifier Data (optional):

- Input unique project identifiers (optional): Caltrans District, Project Name, EA number, and PPNO

Type of Project

- Select “New Park and Ride Lot” in pull-down menu

Project Location

- Enter “1” for Southern California

Length of Construction Period

- Enter “1” for an estimated 1 year of construction.

Project Data Information:

- New Park-and-Ride lot
- Located in Southern California
- Construction Period of 1 year

District:

PROJECT:

1A **PROJECT DATA**

Type of Project Select project type from list	<input type="text" value="New Park and Ride Lot"/>
Project Location (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural)	<input type="text" value="1"/>
Length of Construction Period	<input type="text" value="1"/> years

1B) Enter Park-and-Ride Lot Information

- If this project were an expansion of a current facility, the user would provide “No Build” scenario inputs.

Lot Design

- Number of Parking Spaces:
 - Enter “100” for 100 parking spaces.

Park-and-Ride Demand

- Typical Percent Filled
 - Enter “0%” for No Build and “50%” for Build. There will be 50% of the parking spaces used in the first year of operations
- Number of Years until Lot Reaches Capacity
 - Enter “0” for No Build and “3” for Build. The lot is expected to take 3 years to reach full capacity.
- Number of Bicycle/Pedestrian Users
 - Enter “0” for No Build and “5” for Build. It is assumed that there will be five daily cyclist users.
- Average Vehicle Occupancy of Lot Users
 - Enter “1”. Model assumes 1 person per vehicle if no info is entered.

1B PARK-AND-RIDE LOT INFORMATION		
Lot Design		
	No Build	Build
Number of Parking Spaces	0	100
Park-and-Ride Demand		
	No Build	Build
Typical Percent Filled (for current or opening year)	0%	50%
Number of Years until Lot Reaches Capacity	0	3
Number of Bicycle/Pedestrian Users	0	5
Average Vehicle Occupancy of Lot Users	1.00	1.00

1C) Enter Destination Information – Destination Description

Destination Name

- Input “OC”, “LA”, and “RIV” for the top 3 destinations for Orange County, Los Angeles, and Riverside Counties

Distance from Park-and-Ride Lot (miles)

- The proposed park-and-ride lot is “15” miles from the OC destination, “42” miles from the LA destination, and “30” miles from the RIV destination

Distance to Next Lot (miles)

- Input “10” for all destinations. It is assumed that it is 10 miles from the proposed park-and-ride lot to the next park-and-ride lot, regardless of destination

Parking Cost at Destination (avg \$/day)

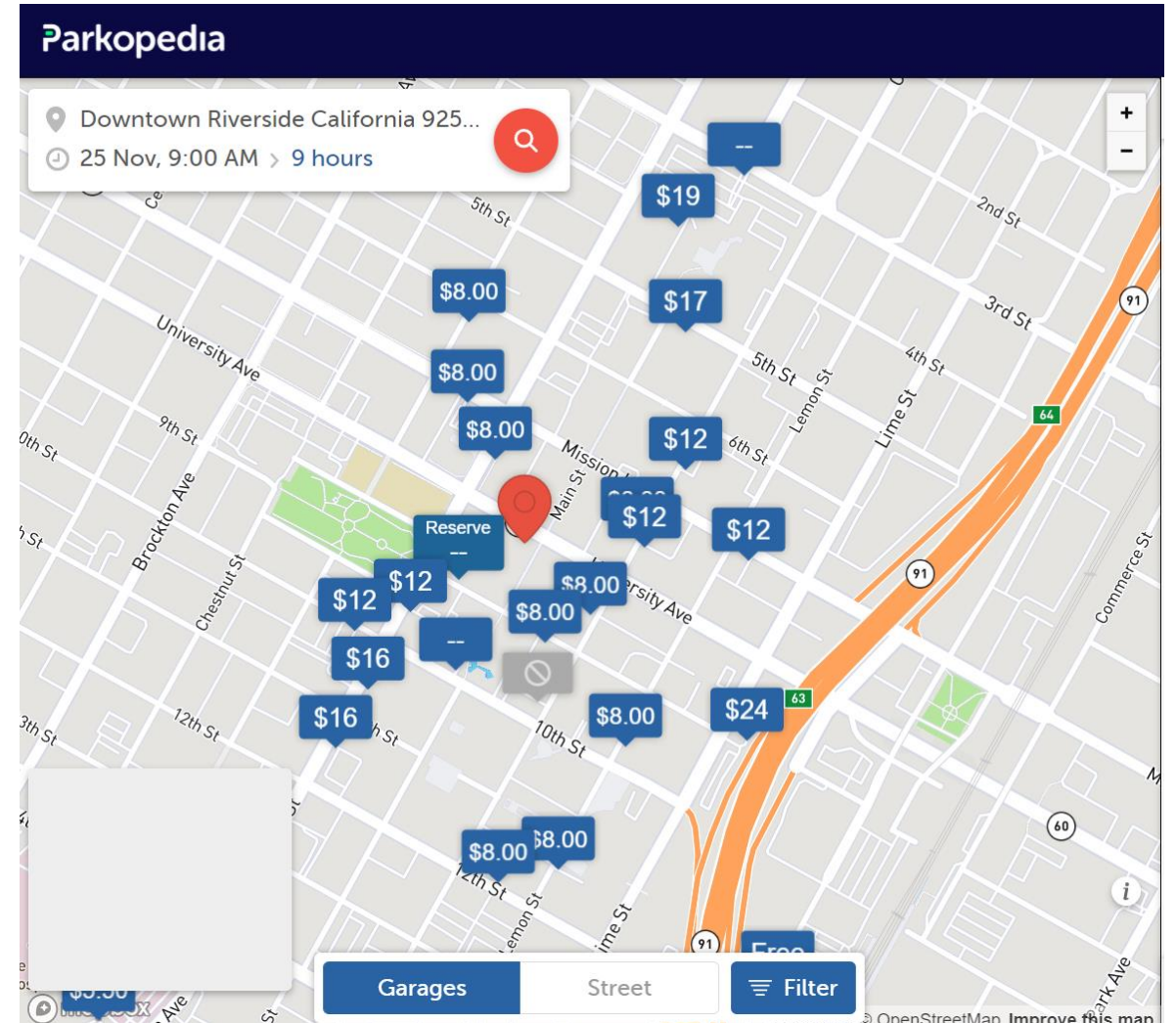
- Assume parking costs are “\$2.00” per day in OC and RIV, while parking costs in LA are assumed to be “\$5.00” per day

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)		\$2.00	\$5.00	\$2.00
Demand for Travel to Destination		Dest 1	Dest 2	Dest 3
Percent of Lot Users to Destination		35%	50%	15%
Distribution (percent)	New Transit Riders	50%	0%	0%
	Existing Transit Riders	0%	0%	0%
	New Carpoolers	50%	75%	100%
	Existing Carpoolers	0%	25%	0%
Highway Travel to Destination		Dest 1	Dest 2	Dest 3
HOV Travel Time (in min)		25.0	55.0	28.0
Non-HOV Travel Time (in min)		35.0	73.0	32.0
Accident Rate (per million vehicle-miles)		0.89	0.99	0.77
Percent Fatal Accidents (Pct Fat)		0.4%	0.4%	1.0%
Percent Injury Accidents (Pct Inj)		26.5%	28.3%	33.5%
Transit Travel to Destination		Dest 1	Dest 2	Dest 3
Express Bus	Travel Time (in min)	45.0	0.0	80.0
	Average Fare	\$6.00	\$0.00	\$0.00
	Headway (in min)	10.0	0.0	60.0
Local Bus	Travel Time (in min)	50.0	0.0	0.0
	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

1C) Enter Destination Information – Where to get Parking Costs

Using Parkopedia

- Tools like Parkopedia can be used to estimate average parking costs at a destination.
- <https://en.parkopedia.com/>



1C) Enter Destination Information – Demand for Travel to Destination

- Determined from OCTAM travel demand model output

Percent of Lot Users to Destination

- Input values must add up to 100%
- Input “35%”, “50%”, and “15%” for OC, LA, and RIV respectively.

Distribution (percent)

- Input values must add up to 100% for each destination
- Four commuter types:
 - New Transit Riders – switch from automobile to express bus
 - Existing Transit Riders – switch from local bus to express bus
 - New Carpoolers - switch from automobile to carpool or van
 - Existing Carpoolers - switch to a park-and-ride lot that requires less driving
- For OC: enter “50%” for new transit riders and “50%” for new carpoolers
- For LA: enter “75%” for new carpoolers and “25%” for existing carpoolers
- For RIV: enter “100%” for new carpoolers

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
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Distribution (percent)	New Transit Riders	50%	0%	0%
	Existing Transit Riders	0%	0%	0%
	New Carpoolers	50%	75%	100%
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	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

1C) Enter Destination Information – Highway Travel to Destination

HOV and Non-HOV Travel Time (in min)

- HOV Travel Time: Input “25”, “55”, and “28” min for OC, LA, and RIV respectively
- Non-HOV Travel Time: Input “35”, “73”, and “32” min for OC, LA, and RIV respectively

Accident Rates

- Based on county averages from TASAS Collision Data on California State Highways
- Accident Rate (per million vehicle-miles): Input “0.89”, “0.99”, and “0.77” for OC, LA, and RIV respectively.
- Percent Fatal Accidents: Input “0.4%”, “0.4%”, and “1.0%” min for OC, LA, and RIV respectively.
- Percent Injury Accidents: Input “26.5%”, “28.3%”, and “33.5%” min for OC, LA, and RIV respectively

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
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Transit Travel to Destination		Dest 1	Dest 2	Dest 3
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	Average Fare	\$6.00	\$0.00	\$0.00
	Headway (in min)	10.0	0.0	60.0
Local Bus	Travel Time (in min)	50.0	0.0	0.0
	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

1B) Highway Design and Traffic Data – Where to get HOV and Non-HOV Travel Times

- There are multiple ways to get HOV and Non-HOV Travel Time
- Can use Corridors or Routes
- Select Facilities & Devices -> Routes -> Travel Times
 - http://pems.dot.ca.gov/?dnode=State&content=corridors&tab=cdor_list

PeMS 20.0.0
State of California

Overview | Facilities & Devices | Performance | Data Quality | Events

Facilities > Routes > Corridors

From: 10/01/2019
Min Range: 1 d
Include Days: Su Mo Tu We Th Fr Sa Holidays
Time Period: Total
Function: Mean

VIEW TABLE | EXPORT TEXT | EXPORT to XLS

District	Corridor	Fwy-Dir	State PM		Length	Mean Travel Time Total			HOV/HOT %
			From	To		HOV/HOT	Mainline	Difference	
D03	21: US-50	US50-E	0.000	25.949	54	56	61	-5	92
D03	21: US-50	US50-W	25.949	0.000	54	58	65	-7	89
D03	22A: Placer I-80	I80-E	42.67	7.421	38	37	39	-2	95
D03	22A: Placer I-80	I80-W	7.421	42.67	38	36	38	-2	95
D03	22B: Sacramento to Sutter SR-99	SR99-N	R32.124	R8.07	12	0	12	-12	0
D03	22B: Sacramento to Sutter SR-99	SR99-S	R8.07	R32.124	12	0	12	-12	0
D03	22C: Sacramento SR-99	SR99-N	0.123	R24.35	24	24	27	-3	89
D03	22C: Sacramento SR-99	SR99-S	R24.35	0.123	24	24	26	-2	92
D04	01: 880/980/24	I880-N	31.525	R31.803	12	0	14	-14	0
D04	01: 880/980/24	SR24-W	R6.152	R1.847	12	0	13	-13	0
D04	01a: 880/980/24/13	SR13-N	T9.762	5.262	4	0	4	-4	0
D04	01a: 880/980/24/13	SR13-S	4.262	9.012	4	0	5	-5	0
D04	02: I-580	I580-E	5.758	47.795	6	0	6	-6	0
D04	02: I-580	I580-W	47.865	5.828	6	0	7	-7	0

Project Information

1B) Highway Design and Traffic Data – Where to get HOV and Non-HOV Times

- Can use Hourly Summaries
- Select Performance -> Spatial Analysis -> Hourly Summaries
- Select dates
 - 1 week in Fall and/or Spring, non-holiday, mid-week
- Select HOV or Mainline
- Select VMT, then VHT
 - Average speed for route: $Q = \text{VMT}/\text{VHT}$
- Can export to Excel or Text files
- Calculate travel time estimates using postmile distances and average aggregate speeds.

PeMS 20.0.0
Freeway I405-N

Performance > Spatial Analysis > Hourly Summary

From: 10/09/2019 To: 11/11/2019

Include Days: Su Mo Tu We Th Fr Sa Holidays

Quantity: Vehicle Miles Traveled (VMT)

Function: Mean

Postmile Range (0.36 - 72.09)

EXPORT to XLS

CA PM	VDS	Name	Type	% Observed	00	01	02	03	04	05	06
6	1211066	N OF 5	Mainline	52.4	25.2	3.07	1.47	6.74	307.39	1,024.47	1,769.11
6	1211067	N OF 5	HOV	53.0	25.56	13.26	10.07	12.55	49.56	174.23	285.63
.93	1201100	IRVINE C1	Mainline	52.3	151.10	98.18	79.79	111.53	313.02	728.37	1,295.45
.93	1208954	IRVINE C1	HOV	53.0	12.15	6.28	4.53	5.59	23.00	82.42	138.26
1.11	1201125	IRVINE C2	Mainline	35.3	245.32	155.89	121.37	153.04	385.91	881.67	1,521.23
1.11	1209043	IRVINE C2	HOV	53.0	11.51	5.55	3.63	5.12	23.56	91.29	165.77
1.57	1209090	S OF 133	HOV	0.0	17.14	7.29	4.92	5.42	28.84	120.01	242.46
1.57	1209092	S OF 133	Mainline	0.0	438.20	326.44	286.83	311.49	608.15	359.30	2,175.51
1.93	1209162	N OF 133	Mainline	34.8	158.69	93.14	78.85				23
1.93	1209163	N OF 133	HOV	53.0	12.57	5.45	3.44				55
2.35	1209176	LAGUNA CYN RD	Mainline	52.3	373.88	227.54	179.08				40
2.35	1209177	LAGUNA CANYON RD	HOV	53.0	15.45	6.76	4.27				85
2.89	1213963	SAND CANYON 1	Mainline	26.5	305.84	199.48	161.74	197.80	495.18	1,137.25	1,913.26
2.89	1213966	SAND CANYON 1	HOV	0.0	80.89	74.01	72.11	73.27	86.35	133.04	232.76
2.99	1201157	SAND CANYON	HOV	53.0	9.95	4.85	3.43	4.90	20.27	73.04	171.78
3.04	1201159	SAND CANYON	Mainline	53.0	158.97	112.65	94.45	109.99	256.97	597.18	1,073.50
3.31	1209059	N OF SAND CYN	Mainline	95.7	351.80	210.72	163.24	203.22	578.10	1,427.36	2,618.17
3.31	1209187	N OF SAND CANYON	HOV	95.7	13.47	6.40	3.97	5.58	33.10	135.35	283.01

1B) Highway Design and Traffic Data – Where to get HOV and Non-HOV Times

- Can use Time of Day Contours
- Select Performance -> Spatial Analysis -> Time of Day Contours
- Select dates
 - 1 week in Fall and/or Spring
 - Non-holiday, mid-week
- Select HOV or Mainline
- Can export Aggregates to Excel or Text files
- Calculate travel time estimates using postmile distances and aggregate speeds

PeMS 20.0.0
Freeway I405-N

Performance > Spatial Analysis > Time of Day Contours

From: 10/07/2019 To: 10/13/2019
Min Range: 2 days Max Range: 1 week

Include Days: Su Mo Tu We Th Fr Sa Holidays

Postmile Range (0.36 - 72.09): .36 - 72.09

VDS Type: Mainline HOV

Quantity: Speed

Color Map: Space Gauge
Z-Scale: Auto Min Max
View: 2-D 3-D Both
 Transpose X-Y Axes Smoothing

EXPORT to CSV

Time	Postmile (Abs)	Postmile (CA)	VDS	Speed	# Lane Points	% Observed
0:00	.37	.6	1211067	65.0	60	85.0
0:00	.7	.93	1208954	64.9	60	85.0
0:00	.88	1.11	1209043	64.9	60	85.0
0:00	1.34	1.57	1209090	64.9	60	0.0
0:00	1.7	1.93	1209163	64.9	60	85.0
0:00	2.12	2.35	1209177	65.0	60	85.0
0:00	2.66	2.89	1213966	63.5	120	0.0
0:00	2.76	2.99	1201157	64.9	120	85.0
0:00	3.08	3.31	1209187	64.9	60	85.0
0:00	3.63	3.86	1201183	65.0	60	85.0
0:00	3.8	4.03	1201209	64.9	60	85.0
0:00	4.78	5.01	1201229	65.0	60	85.0
0:00	4.82	5.05	1209075	65.0	60	0.0
0:00	5.32	5.55	1201259	65.0	60	0.0
0:00	5.51	5.74	1201281	65.0	60	85.0
0:00	5.98	6.21	1201304	65.0	60	85.0
0:00	6.62	6.85	1201331	65.0	60	85.0
0:00	6.84	7.07	1201363	64.6	60	85.0
0:00	7.57	7.73	1201397	65.0	60	85.0

1C) Enter Destination Information – Transit Travel to Destination

Express Bus

- Estimated based on transit operator schedules
- Travel Time (in min): Input “45”, “0”, and “0” min for OC, LA, and RIV respectively
- No express bus to LA or RIV from the proposed location
- Average Fare: Input “\$6.00”, “0”, and “0” min for OC, LA, and RIV respectively.
- Headway (in min): Input “10”, “0”, and “0” min for OC, LA, and RIV respectively.

Local Bus

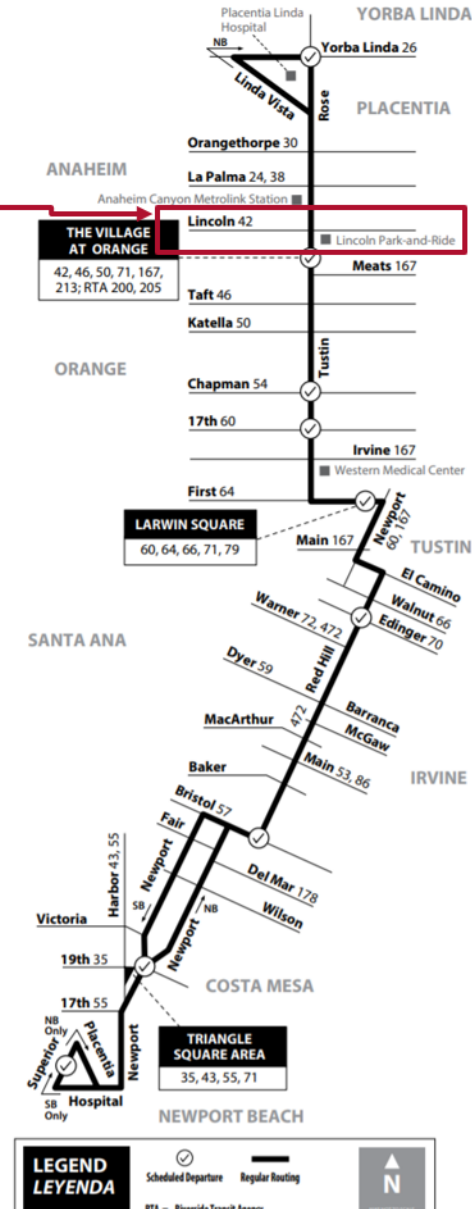
- Estimated based on transit operator schedules
- Travel Time (in min): Input “50”, “0”, and “0” min for OC, LA, and RIV respectively. There is no local bus to LA or RIV from the proposed location
- Average Fare: Input “4.00”, “0”, and “0” min for OC, LA, and RIV

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)		\$2.00	\$5.00	\$2.00
Demand for Travel to Destination		Dest 1	Dest 2	Dest 3
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Distribution (percent)	New Transit Riders	50%	0%	0%
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	New Carpoolers	50%	75%	100%
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Percent Injury Accidents (Pct Inj)		26.5%	28.3%	33.5%
Transit Travel to Destination		Dest 1	Dest 2	Dest 3
Express Bus	Travel Time (in min)	45.0	0.0	80.0
	Average Fare	\$6.00	\$0.00	\$0.00
	Headway (in min)	10.0	0.0	60.0
Local Bus	Travel Time (in min)	50.0	0.0	0.0
	Average Fare	\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

1C) Enter Destination Information – Transit Travel to Destination

- Use transit operator schedules and navigation apps

Proposed Park-and-Ride Location



Monday-Saturday
NORTHBOUND To: Yorba Linda

Superior & Placentia	Newport & 19th	Red Hill & Bristol	Red Hill & Edinger	1st & Newport	Tustin & 17th	Tustin & Chapman	Village At Orange	Rose & Yorba Linda
6:00	6:09	6:19	6:32	6:40	6:47	6:56	7:06	7:25
6:40	6:49	7:00	7:14	7:25	7:34	7:43	7:54	8:13
7:25	7:34	7:45	7:59	8:10	8:19	8:28	8:39	8:58
8:09	8:18	8:29	8:43	8:55	9:04	9:13	9:26	9:46
8:54	9:03	9:14	9:28	9:40	9:49	9:58	10:11	10:31
9:39	9:48	9:59	10:13	10:25	10:34	10:43	10:56	11:16
10:24	10:33	10:44	10:58	11:10	11:19	11:28	11:41	12:01
11:09	11:18	11:29	11:43	11:55	12:04	12:13	12:26	12:46
11:54	12:03	12:14	12:28	12:40	12:49	12:58	1:11	1:31
12:33	12:46	12:56	1:11	1:25	1:35	1:44	1:58	2:19
1:18	1:31	1:41	1:56	2:10	2:20	2:29	2:43	3:04
2:03	2:16	2:26	2:41	2:55	3:05	3:14	3:28	3:49
2:48	3:01	3:11	3:26	3:40	3:50	3:59	4:13	4:34
3:33	3:46	3:56	4:11	4:25	4:35	4:44	4:58	5:19
4:18	4:31	4:41	4:56	5:10	5:20	5:29	5:43	6:04
5:03	5:16	5:26	5:41	5:55	6:05	6:14	6:28	6:49
5:48	6:01	6:11	6:26	6:40	6:50	6:59	7:13	7:34
6:39	6:48	6:58	7:13	7:25	7:35	7:44	7:55	8:16
7:24	7:33	7:43	7:58	8:10	8:20	8:29	8:40	9:01
8:09	8:18	8:28	8:43	8:55	9:05	9:14	9:25	9:46

Proposed Park-and-Ride Location

SERVICE TO / SERVICIO A	
Yorba Linda - Placentia Linda Hospital	Irvine - Costa Mesa
Placentia - Alta Vista Country Club	- Triangle Square - Pacific College
Anaheim - Anaheim Canyon Business Center - Anaheim Canyon (Metrolink Station)	- Costa Mesa High School - Orange County Department of Education
Orange - Lincoln Park-and-Ride - The Village at Orange - Orange High School	- Santa Ana Country Club - Costa Mesa Civic Center - Orange County Fairgrounds - Vanguard University - College Hospital
Santa Ana - Regional Center of Orange County - Nova Academy - Orange County Global Medical Center	Costa Mesa - Hoag Hospital
Tustin - Larwin Square - Tustin Civic Center - Columbus Tustin Middle School	

1C) Enter Destination Information – Carpool/Vanpool Travel to Destination

- Carpool size can be estimated from TDM, from U.S. Census American Community Survey, or other sources
- Wait times can be based on observed wait times at other lots

Average Carpool Size (people/vehicle)

- Assume 2 people per carpool for all destinations
- May be higher depending whether “casual carpooling” occurs to avoid tolls or express lane fees

Average Carpool Wait Time (in min)

- Can be based on observations from other lots
- Average Carpool Wait Time (in min): Input “5” for OC destination, and “7.5”, for both LA and RIV destinations

1C		DESTINATION INFORMATION		
Destination Description		Dest 1	Dest 2	Dest 3
Destination Name		OC	LA	RIV
Distance from Park-and-Ride Lot (miles)		15.0	42.0	30.0
Distance to Next Lot (miles)		10.0	10.0	10.0
Parking Cost at Destination (avg \$/day)		\$2.00	\$5.00	\$2.00
Demand for Travel to Destination		Dest 1	Dest 2	Dest 3
Percent of Lot Users to Destination		35%	50%	15%
Distribution (percent)	New Transit Riders	50%	0%	0%
	Existing Transit Riders	0%	0%	0%
	New Carpoolers	50%	75%	100%
	Existing Carpoolers	0%	25%	0%
Highway Travel to Destination		Dest 1	Dest 2	Dest 3
HOV Travel Time (in min)		25.0	55.0	28.0
Non-HOV Travel Time (in min)		35.0	73.0	32.0
Accident Rate (per million vehicle-miles)		0.89	0.99	0.77
Percent Fatal Accidents (Pct Fat)		0.4%	0.4%	1.0%
Percent Injury Accidents (Pct Inj)		26.5%	28.3%	33.5%
Transit Travel to Destination		Dest 1	Dest 2	Dest 3
Express Bus	Travel Time (in min)	45.0	0.0	80.0
	Average Fare	\$6.00	\$0.00	\$0.00
Local Bus	Headway (in min)	10.0	0.0	60.0
	Travel Time (in min)	50.0	0.0	0.0
Average Fare		\$4.00	\$0.00	\$0.00
Carpool/Vanpool Travel to Destination		Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

Project Data Information:

- Capital Costs: \$550,000 or \$5,500 per space (2012\$)
- Annual Operating Costs \$40,000 (2012\$)

1D) Project Costs - Overview

1D PROJECT COSTS (enter costs in thousands of dollars)									
Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
Year	DIRECT PROJECT COSTS					Mitigation	Transit Agency Cost Savings	TOTAL COSTS (in dollars)	
	Project Support	R / W	Construction	Maint./ Op.	Rehab.			Constant Dollars	Present Value
Construction Period									
1	\$150	\$1,000	\$1,500					\$2,650,000	\$2,650,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
Project Open									

Initial Costs

- Enter the initial project costs for construction as shown: \$150,000 Project Support, \$1M R/W, and \$1.5M Construction
- Since the project is assumed to take 1 year as indicated in section 1A), 1 year of initial cost data must be entered.
- For projects in the preliminary planning phases it is not necessary to input detailed cost data.

Project Data Information:

- Capital Costs: \$550,000 or \$5,500 per space (2012\$)
- Annual Operating Costs \$40,000 (2012\$)

1D) Project Costs - Overview

Project Open									
1				\$40				\$40,000	\$38,462
2				\$40				40,000	36,982
3				\$40				40,000	35,560
4				\$40				40,000	34,192
5				\$40				40,000	32,877
6				\$40				40,000	31,613
7				\$40				40,000	30,397
8				\$40				40,000	29,228
9				\$40				40,000	28,103
10				\$40				40,000	27,023
11				\$40				40,000	25,983
12				\$40				40,000	24,984
13				\$40				40,000	24,023
14				\$40				40,000	23,099
15				\$40				40,000	22,211
16				\$40				40,000	21,356
17				\$40				40,000	20,535
18				\$40				40,000	19,745
19				\$40				40,000	18,986
20				\$40				40,000	18,255
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,093,613

Subsequent Costs

- Assume \$40,000 cost per year. Enter as “\$400” (values are in thousands of dollars).
- These cost estimates were developed from unit costs from a Caltrans Park-and-Ride Costing Tool.

Project Costs – Capital Costs - Where did they come from?

Parameters

Example review of Park-and-Ride Cost Elements from other regional studies

Type of Facility	CONSTRUCTION COST ESTIMATES PER PARKING STALL (2012\$/stall)				SQUARE FOOTAGE ESTIMATES PER PARKING STALL (SqFt/Stall)			
	Low	Middle	High	Source(s)	Low	Middle	High	Source(s)
Above Ground Multi-Level Structure	\$ 9,000	\$ 16,000	\$ 46,000	New York City Park and Ride Study	280	350	400	New York City Park and Ride Study
Below Ground	\$ 30,000	\$ 53,000	\$ 76,000	New York City Park and Ride Study	280	350	400	New York City Park and Ride Study
Leased Lot	\$ 5.00	\$ 8.55	\$ 15.00	Riverside County Transportation Commission (RCTC) Contract Lease Rates. 2012 FTIP	350	550	775	
Surface Lot	\$ 2,500	\$ 10,000	\$ 21,000	San Joaquin Council of Governments Park-and-Ride Lot Master Plan Study	350	550	775	

Element	Low	Middle	High	Source(s)
Right of Way (ROW) Average Land Cost per Acre (US 2012 Dollars)	\$ 30,000	\$ 500,000	\$ 2,000,000	Review of vacant land prices in Southern California using www.zillow.com, www.landwatch.com, and from ROW cost estimates from the 2010 FTIP.
Preliminary Engineering/Design Cost as a % of Construction Cost	5.00%	7.50%	10.00%	Valley Metro Regional Public Transportation Authority: RPTA Park and Ride Reprioritization Study
Average Annual Maintenance and Operations (M&O) Costs per Parking Stall (US 2012 Dollars)	\$ 120	\$ 400	\$ 875	Based on M&O estimates from OCTA. Typical ranges are 10-30% of Total Construction Costs according to . Park & Ride Stakeholder Survey for District 12 Project

Parameters of projects with same facility type, parking stalls, and grade levels can be used to estimate capital and O&M costs

Project Information

Project Costs – Capital Costs - Where did they come from? (cont.)

1C		Example Caltrans Cost Evaluation Tool			PARK-AND-RIDE CAPITAL COSTS		Surface Lot	
	Low Est.	Middle Est.	High Est.	User-Selection	Notes			
Right of Way Cost								
Total Acreage Needed	1.12	1.77	2.49	4.00	User-input required in green cell			
Land Cost per Acre	\$ 30,000	\$ 500,000	\$ 2,000,000	\$ 45	User-input required in green cell			
ROW Cost	\$ 33,747	\$ 883,838	\$ 4,981,635	\$ 178	Calculated automatically			
Construction Cost								
Method 2-Cost Build Up Estimated		\$ 1,754,144						
Method 2-Cost Build Up User-Defined		\$ 1,043,465						
Method 1-Average Per Stall Cost	\$ 350,000	\$ 1,400,000	\$ 2,940,000		User-input required in green cell			
Preliminary Engineering/Design (PE&D)								
PE/Design % of Construction Cost	5.0%	7.5%	10.0%					
PE/Design Cost	\$ -	\$ -	\$ -		User-input required in green cell			
Total Capital Costs								
Total Capital Costs	\$ 383,747	\$ 2,283,041	\$ 7,921,635	\$ 178	Calculated automatically			

04

Results Worksheet

2) Model Results

- This project has a high **2.4 B/C Ratio**, with an expected \$4.4 million in discounted net present value
- Payback Period is **7 years**
 - Number of years it takes for the net benefits (lifecycle benefits minus lifecycle costs) to equal the initial construction costs.
- Majority of benefits derived from Vehicle Operating Cost Savings, which reflects the projected 22.4 million VMT reduction
- Adjusting input variables can be done to test the sensitivity of these results
 - What happens if highway demand grows faster than what was input?
 - What happens if transit ridership is lower than forecast?

Life-Cycle Costs (mil. \$)		Life-Cycle Benefits (mil. \$)		Net Present Value (mil. \$)	
	\$3.2		\$7.6		\$4.4
Benefit / Cost Ratio:		2.4			
Rate of Return on Investment:		16.1%			
Payback Period:		7 years			

Should benefit-cost results include:				
1) Induced Travel is not considered				
2) Vehicle Operating Costs? (y/n)	<input type="text" value="Y"/>	Default = Y		
3) Accident Costs? (y/n)	<input type="text" value="Y"/>	Default = Y		
4) Vehicle Emissions? (y/n)	<input type="text" value="Y"/>	Default = Y		
includes value for CO ₂ e				

INVESTMENT ANALYSIS SUMMARY RESULTS					
ITEMIZED BENEFITS (mil. \$)		Total Over 20 Years	Average Annual		
Travel Time Savings		\$0.5	\$0.0		
Veh. Op. Cost Savings		\$4.9	\$0.2		
Accident Cost Savings		\$1.4	\$0.1		
Emission Cost Savings		\$0.3	\$0.0		
Residual Value		\$0.4			
TOTAL BENEFITS		\$7.6			
Person-Hours of Time Saved		55,897	2,795		
VMT Reduction		22,408,719	1,120,436		

EMISSIONS REDUCTION	Tons		Value (mil. \$)	
	Total Over 20 Years	Average Annual	Total Over 20 Years	Average Annual
CO Emissions Saved	21	1	\$0.0	\$0.0
CO ₂ Emissions Saved	6,274	314	\$0.2	\$0.0
NO _x Emissions Saved	1	0	\$0.1	\$0.0
PM ₁₀ Emissions Saved	0	0	\$0.0	\$0.0
PM _{2.5} Emissions Saved	0	0		
SO _x Emissions Saved	0	0	\$0.0	\$0.0
VOC Emissions Saved	1	0	\$0.0	\$0.0

05

Additional Information

Cal-B/C Park-and-Ride Documentation

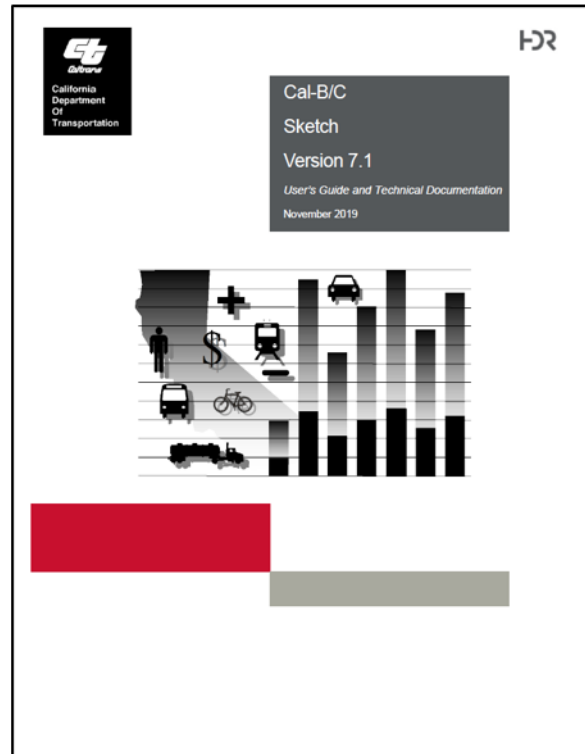
- User's Guide

- User-focused model overview with step-by-step instructions and project example
- Describes model framework, project types, and updated parameters

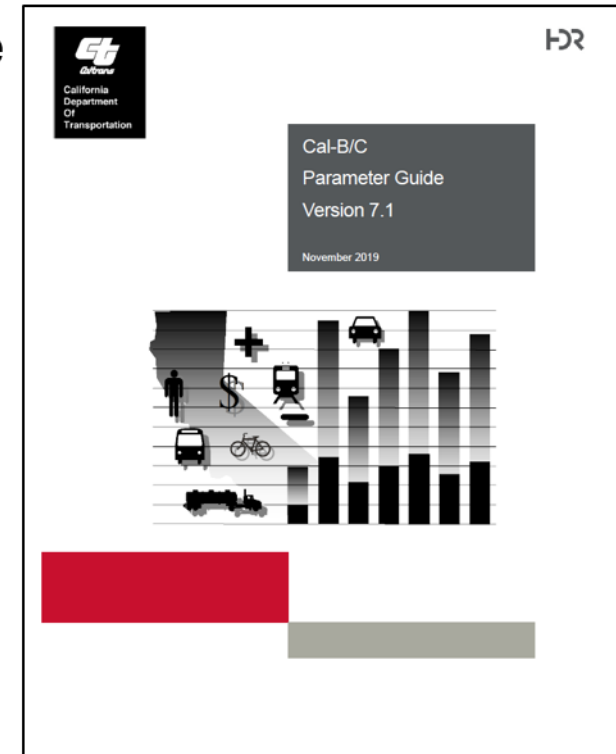
- Parameter Guide

- Describes economic values and parameters

User's Guide



Parameter Guide



06

Conclusion

In this module, you learned...

- How to perform a BCA of a hypothetical new Park-and-Ride Lot project
- What data sources can be used for this type of project
- How to review the corresponding BCA results with real numbers

What's Next?

- **Module 10** is the final module in this training series and provides additional information and data sources for BCA in Cal-B/C tools