



## **Module 4d**

### **How Cal-B/C Park-and-Ride (PnR) Works**

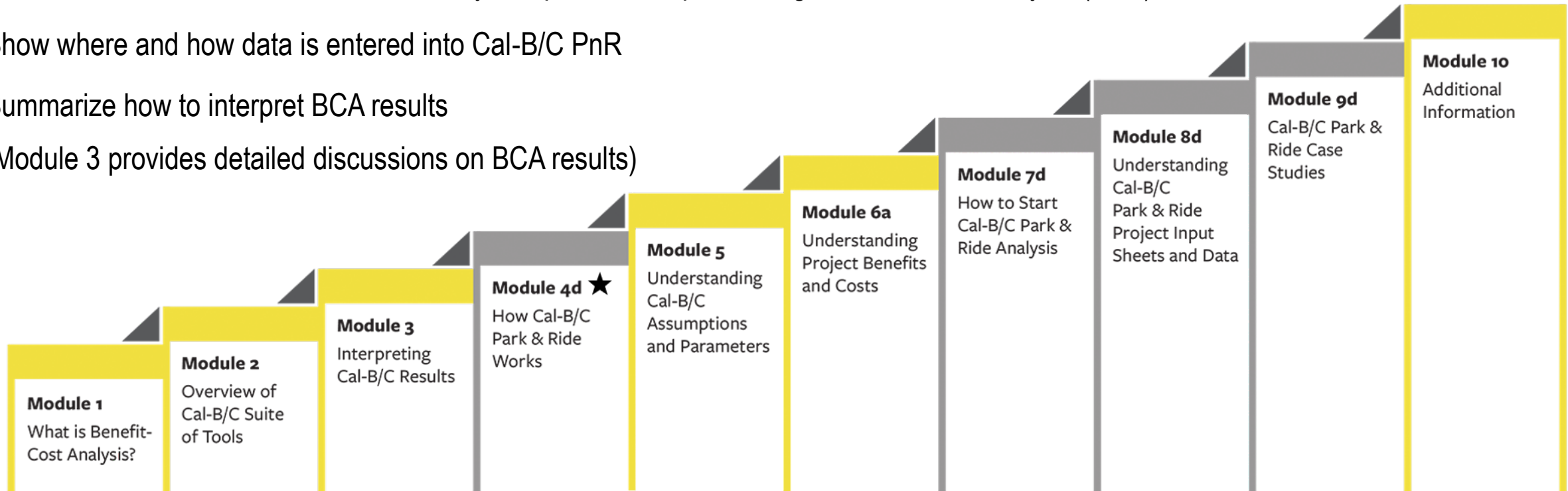


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## **About This Module**

## This module will...

- Build on Modules 1, 2, and 3 to provide an understanding of how Cal-B/C PnR works
- Help you decide if Cal-B/C PnR is the appropriate tool for your job
- Review worksheet tabs and summarize key components for performing a benefit-cost analysis (BCA)
- Show where and how data is entered into Cal-B/C PnR
- Summarize how to interpret BCA results  
(Module 3 provides detailed discussions on 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 project types
- **Module 3** presented the Cal-B/C results page, detailed what each output measure means, and explained how each measure is calculated

## Cal-B/C PnR Can Evaluate...

- Park and ride lot investments
  - New locations
  - Improved highway, transit, and/or bicycle access to park and ride lots
- Up to four user types
  - Existing and new transit riders
  - Existing and new carpoolers
- Up to nine destinations for park and ride lot users
  - Macro-enabled to enter additional destinations beyond the default 3 destinations



## Cal-B/C PnR System, User, and Data Requirements

### ▪ System Requirements

- Designed for a Windows environment, tested on Microsoft Excel 2013 and later versions
- Cal-B/C PnR file is about 600 kilobytes (KB) in size

### ▪ User Requirements

- Working knowledge of spreadsheets, particularly Microsoft Excel
- Understanding of benefit-cost analysis
- Ability to interpret results in a transportation planning context

### ▪ Data Requirements

- Percent of lot users to destinations
- Requires some understanding of origin-destination (OD) relationships at a high level

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## **Cal-B/C PnR Overview**

## Overview of Cal-B/C PnR

- Updated for the Cal-B/C suite to estimate **park and ride lot** benefits
- Set up as an **interconnected**, multi-sheet **spreadsheet**
  - **Project Information** worksheet is primary location for data entry
  - BCA results presented in the **Results** worksheet
- Estimates **five** categories of **user benefits**
  - Travel Time Savings
  - Vehicle Operating Cost Savings
  - Accident Cost Savings
  - Emission Cost Savings
  - Residual Value
- Contains **default values** and lookup tables to standardize analysis
- Calculates benefits for existing and new park and ride users traveling to specific destinations by comparing modal options

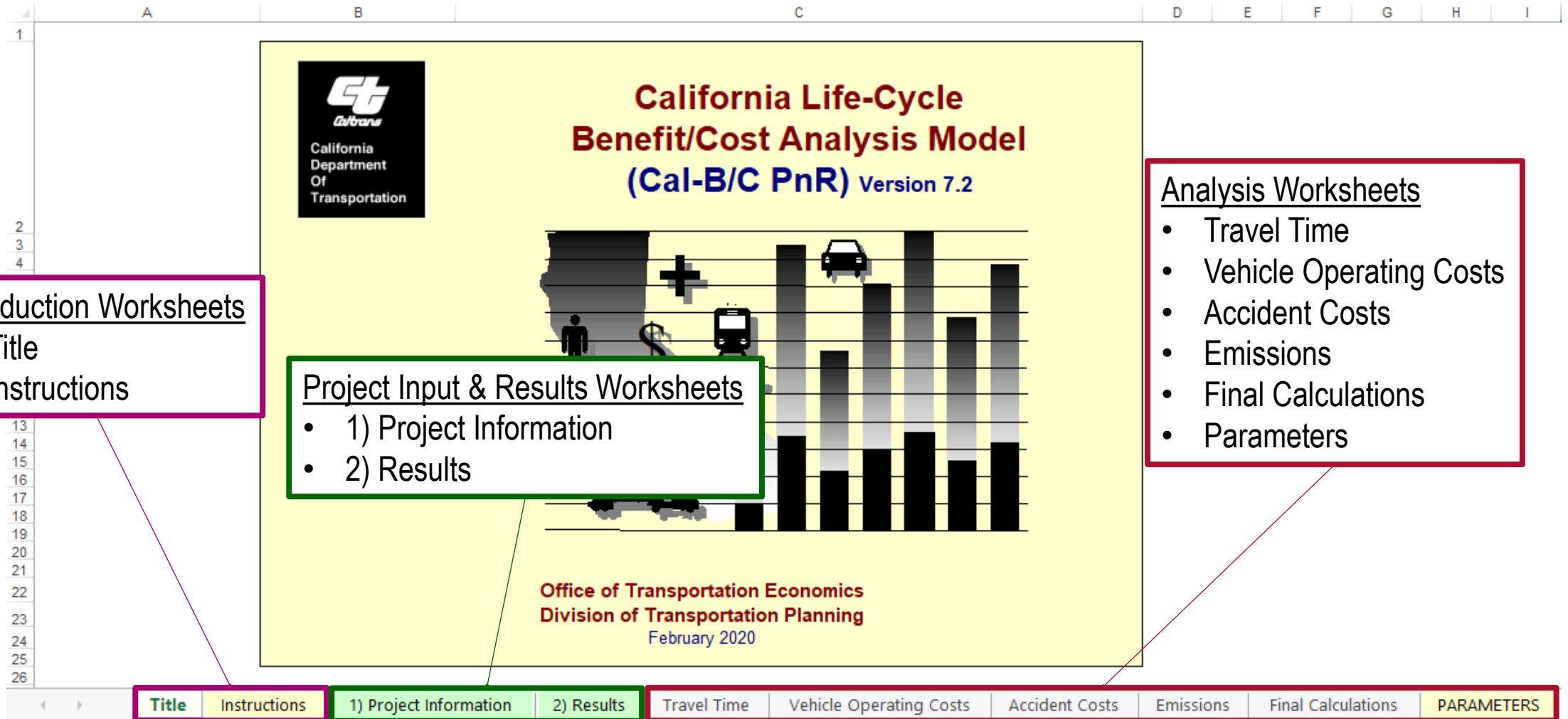
The image is a promotional graphic for the California Life-Cycle Benefit/Cost Analysis Model (Cal-B/C PnR) Version 7.2. It features the California Department of Transportation logo in the top left corner. The title is prominently displayed in red and blue text. Below the title is a stylized bar chart with icons representing various transportation modes: a person, a car, a train, a bicycle, and a truck. The chart shows varying levels of benefit or cost for each mode. At the bottom, the text identifies the Office of Transportation Economics, Division of Transportation Planning, and the date February 2020.

**California Life-Cycle  
Benefit/Cost Analysis Model  
(Cal-B/C PnR) Version 7.2**

Office of Transportation Economics  
Division of Transportation Planning  
February 2020



# Worksheet Layout in Cal-B/C PnR



# Instructions Page in the model

## BENEFIT-COST ANALYSIS OF PARK & RIDE/INTERMODAL STRATEGIES (Cal-B/C PnR)

### INTRODUCTION

This spreadsheet tool provides a method for preparing simple economic analyses for park-and-ride lot projects. Given required input data for a project, the model calculates its lifecycle costs, lifecycle benefits, net present value, benefit/cost ratio, internal rate of return, and payback period. Annual benefits are also calculated.

The model is arranged by worksheets and contains the following information, data, and results:

<u>Worksheets</u>	<u>Contents</u>
Instructions	General model description and assumptions
1) Project Information	Project input data
2) Results	Summary of analysis results
Travel Time	Calculation of travel time impacts
Vehicle Operating Costs	Calculation of changes in highway vehicle operating costs and out-of-pocket costs
Accidents	Calculation of changes in highway accident costs
Emissions	Calculation of changes in highway emissions
Final Calculations	Calculation of net present value, internal rate of return, and payback period
Parameters	Economic assumptions, lookup tables, and other model parameters consistent

The model is designed so that the user generally needs to insert data only in the **green boxes** on the Project Information worksheet. Summary results are shown in Results worksheet. The remaining worksheets are provided for the user to see, but the model performs calculations automatically.

In the process of economic analysis, some generally accepted economic assumptions are necessary. These assumptions include the real and nominal discount rates, unit user costs (e.g., value of time), consumption rates (e.g., fuel consumption and vehicle emissions), and accident rates. These assumptions are given in the Parameters worksheet and should not be changed by the user.

After reading the instructions in this worksheet, the user should proceed to the Project Information worksheet and input data for the specific project in the green boxes (light gray when printed). The model provides default values in the **red boxes** (medium gray when printed). These values can be changed by the user, if information specific to the project is available. The model calculates some values based on relationships or assumptions, with results shown in the **blue boxes** (dark gray when printed). These values can be changed by the user.

### INSTRUCTIONS

The user can analyze most projects simply by inserting limited data on the Project Information sheet and getting results on the Results page.

#### **PROJECT DATA** (Box 1A)

*This section provides general information about the park-and-ride lot project. At the top of the sheet, the user can insert information about the project, such as the project name, Caltrans District, and funding information.*

#### **Type of Project**

- 1 Please select the appropriate type of park-and-ride lot project from the pull-down menu. The menu appears if user clicks on the green box next to the project type.

#### **Project Location**

- 2 Insert a 1, 2, or 3 for the appropriate region of California. This information is used to estimate the emissions benefits.

#### **Length of Construction Period**

- 3 Insert the number of construction years before benefits begin. This must be a whole number (round to the next higher integer).

#### **PARK-AND-RIDE LOT INFORMATION** (Box 1B)

*This section provides project specific information about the park-and-ride lot. If the project is constructing a new lot, no information should be entered in the no build case.*

#### **Lot Design**

- 4 Insert the number of marked parking spaces provided for the build and no build cases. If the project is expanding an existing lot, the difference between the build and no build should equal the number of new spaces.


#### **Park-and-Ride Demand**


- 5 Insert the typical percent of lot capacity expected to be used for current year (no build) and opening year (build).
- 6 Insert the estimated number of years until the lot reaches capacity for build and no build cases.
- 7 If the lot will be located next to residential uses that could supply bicycle or walk-up users, insert the estimated number of bicycle/pedestrian users for the build and no build.
- 8 Insert the average vehicle occupancy (average number of people per vehicle) of vehicles driven to the lot in build and no build cases. Model assumes 1 person per vehicle if no information is entered.

## Cell Color-Coding

- Cal-B/C PnR requires some detailed user inputs
- **Green** cells indicate required data
  - Must input values depending on analysis being performed
  - Cal-B/C descriptions tell you what cells need to be used for a given analysis
  - Example: for a highway project, highway traffic data must be entered in the appropriate green cells. Rail transit data in this case does not need to be entered
- **Red** cells provide default values that can be changed if needed
  - Examples: default values for percent trucks and average vehicle occupancy (AVO)
- **Blue** cells contain values calculated by the model for No Build and Build Scenarios

 - User must enter data for Cal-B/C to work correctly.

 - Cal-B/C provides default values that can be overridden by the user if better data is available.

 - Cal-B/C calculates cell value, but user can override result if better data is available.

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## **Project Information Worksheet**

# Project Information Worksheet

- 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 Park-and-Ride demand

## 1C Destination Information

- Required data for destination, travel demand, accident rates, transit and highway travel, and carpool/vanpool travel

The screenshot shows a spreadsheet interface with several sections highlighted by callout boxes:

- Section 1A: Project Data** (rows 10-16): Includes fields for District (HQ), Project (Hypothetical Project), Type of Project (New Park and Ride Lot), Project Location (1), and Length of Construction Period (1 years).
- Section 1B: Park-and-Ride Lot Information** (rows 22-31): 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).
- Section 1C: Destination Information** (rows 17-41): Includes Destination Description (Dest 1: OC, Dest 2: LA, Dest 3: RIV), Demand for Travel to Destination, Highway Travel to Destination, and Carpool/Vanpool Travel to Destination.
- Section 1D: Project Costs** (rows 32-64): A table for Project Costs (enter costs in thousands of dollars) with columns for Year, Project Support, R/W, Construction, Subsequent Costs (Maint./Op., Rehab., Mitigation), Transit Agency Cost Savings, and Total Costs (Constant Dollars, Present Value).

Other visible elements include a 'Prepare Model for Next Set of Destinations' button, a 'Residual Value in Year 21' field, and a 'Present Value' calculation formula.

Project Information Worksheet Tab

Macro for Additional Destinations



# 1A) Project Data

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
1																			
2	District:		HQ																
3																			
4	PROJECT:		Hypothetical Project															EA:	
5																			
6																			
7																			
8																			
9																			
10																			
11																			
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33																			

**1A PROJECT DATA**

**Type of Project**  
Select project type from list:

**Project Location** (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural):

Length of Construction Period:  years

**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 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

- Optional, but can include unique project identifiers: Caltrans District, Project Name, Expenditure Authorization (EA) number, Planning and Programming Number (PPNO)

# 1A) Project Data

## Type of Project

- Pull-down menu allows user to select one of 3 project types
  - New Park and Ride Lot
  - Park and Ride Leased Lot
  - Park and Ride Lot Expansion

## Project Location

- Used to estimate emission benefits using values appropriate for each region

## Length of Construction Period

- Years needed to construct project
- Project opening date assumed to occur at the end of the construction period

	B	C	D	E	F	G	H	I	J
1									
2	District:		HQ						
3									
4	PROJECT:		Hypothetical Project						
5									
6									
7									
8			1A	<b>PROJECT DATA</b>					
9									
10			<b>Type of Project</b>	Select project type from list					
11							New Park and Ride Lot		
12									
13			<b>Project Location</b>	(enter 1 for So. Cal., 2 for No. Cal., or 3 for rural)					
14							1		
15									
16									
17									
18									
19									
20			1B	<b>PARK-AND-RIDE LOT INFORMATION</b>					
21									
22			<b>Lot Design</b>		No Build		Build		
23			Number of Parking Spaces		0		100		
24									
25									
26			<b>Park-and-Ride Demand</b>		No Build		Build		
27			Typical Percent Filled (for current or opening year)		0%		50%		
28			Number of Years until Lot Reaches Capacity		0		3		
29			Number of Bicycle/Pedestrian Users		0		5		
30			Average Vehicle Occupancy of Lot Users		1.00		1.00		
31									
32									
33									

# 1B) Park-and-Ride Lot Information

## Lot Design

- Number of Parking Spaces
  - Data is entered for No Build and Build scenarios, as applicable for project type (new lot vs. expansion)

## Park-and-Ride Demand

- Typical percent of lot capacity expected to be used in the current year (No Build) and the opening year (Build)
- Number of years until lot reaches capacity
- Number of active transportation users
  - If the lot is located near residential areas that could supply bicycle or walk-up users
- Average Vehicle Occupancy (default value of 1 can be overwritten if better data is available)

The PnR model does not estimate demand for a park-and-ride lot based on increased capacity—this is a user input.

	B	C	D	E	F	G	H	I	J
1									
2		District:		HQ					
3									
4		PROJECT:		Hypothetical Project					
5									
6									
7									
8				<b>PROJECT DATA</b>					
9									
10				<b>Type of Project</b>					
11				Select project type from list		New Park and Ride Lot			
12									
13				<b>Project Location</b> (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural)				1	
14									
15				Length of Construction Period		1	years		
16									
17									
18									
19				<b>PARK-AND-RIDE LOT INFORMATION</b>					
20									
21				<b>Lot Design</b>					
22						No Build	Build		
23				Number of Parking Spaces		0	100		
24									
25				<b>Park-and-Ride Demand</b>					
26						No Build	Build		
27				Typical Percent Filled (for current or opening year)		0%	50%		
28				Number of Years until Lot Reaches Capacity		0	3		
29				Number of Bicycle/Pedestrian Users		0	5		
30				Average Vehicle Occupancy of Lot Users		1.00	1.00		
31									
32									
33									



## 1C) Destination Information – Destination Description

- This section holds information about the final destinations of park-and-ride users
  - The model handles only three destinations at once

### Destination Name

- For informational purposes only
- At least one destination is required

### Distance from Park-and-Ride Lot (miles)

- Distance from the lot to the destination

### Distance to Next Lot (miles)

- Distance from the new/expanded lot to the next closest lot for the destinations
- Used if the park-and-ride lot is proposed near an existing lot and may attract users from the other lot

### Parking Cost at Destination (avg \$/day)

- Average daily cost for parking at the destination

1C		DESTINATION INFORMATION		
<b>Destination Description</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Demand for Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Highway Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Transit Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Carpool/Vanpool Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

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

## Percent of Lot Users to Destination

- Percent of park-and-ride users (from all modes) that travel to this destination
- Sum of percentages for the three destinations must total 100%

## Distribution for each destination

- Percent of lot users that are new transit riders
- Percent of users that are existing transit riders
- Percent of users that are new carpoolers
- Percent of users that are existing carpoolers
- Sum of percentages for a given destination must total 100%

1C		DESTINATION INFORMATION		
<b>Destination Description</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Demand for Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Highway Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Transit Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Carpool/Vanpool Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

# 1C) Destination Information – Highway Travel to Destination

## HOV Travel Time (min) for each destination

- Travel time for HOVs to each destination
  - Should include travel on non-HOV lanes where HOV lanes are not available

## Non-HOV Travel Time (min) for each destination

- Travel time using non-HOV lanes to each destination

## Accident Rate (per MVM) for each destination

- Accident rates for highway travel from the park-and-ride lot to each destination
- Percent fatal and injury accidents

1C		DESTINATION INFORMATION		
<b>Destination Description</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Demand for Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Highway Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Transit Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Carpool/Vanpool Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

# 1C) Destination Information – Transit Travel to Destination

## Express Bus Travel Time, Fare, & Headway for each destination

- Average transit travel time (minutes) for express bus riders
- Average (daily) fare paid by express bus riders
  - Assume 21 workdays per month to convert from a monthly pass
- Express bus headway (time between buses, minutes)
  - The model estimates that riders wait on average one half of the headway time, and no more than 10 minutes

## Local Bus Travel Time & Fare for each destination

- Average transit travel time (minutes) for local bus riders
- Average (daily) fare paid by local bus riders
  - Assume 21 workdays per month to convert from a monthly pass

1C		DESTINATION INFORMATION		
<b>Destination Description</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Demand for Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Highway Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Transit Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Carpool/Vanpool Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5



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

## Average Carpool Size for each destination

- Average size (people per vehicle) of carpools to each destination

## Average Carpool Wait Time for each destination

- Average time (minutes) that people wait for carpools

1C		DESTINATION INFORMATION		
<b>Destination Description</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Demand for Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Highway Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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%
<b>Transit Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
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
<b>Carpool/Vanpool Travel to Destination</b>		<b>Dest 1</b>	<b>Dest 2</b>	<b>Dest 3</b>
Average Carpool Size (people/vehicle)		2.0	2.0	2.0
Average Carpool Wait Time (in min)		5.0	7.5	7.5

## 1D) Project Costs – Overview

- All project costs entered in seven cost columns
- Project costs should be entered as incremental rather than total costs
  - Incremental costs are the difference between the No Build and the Build scenarios
- Project costs must be entered in constant dollars, in the same year as the economic parameters used for benefit calculations
  - Current year in Cal-B/C models is 2016
  - Modules 5 and 6a will go into more details about year for current dollars
- Costs must be entered in thousands of dollars (\$1,000)

1D PROJECT COSTS (enter costs in thousands of dollars)

Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTAL COSTS (in dollars)	
Year	INITIAL COSTS			SUBSEQUENT COSTS		Mitigation	Transit Agency Cost Savings	Constant Dollars	Present Value
	Project Support	R / W	Construction	Maint./ Op.	Rehab.				
<b>Construction Period</b>									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
<b>Project Open</b>									
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
<b>Total</b>	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,255,000

## 1D) Project Costs – Overview

- Up to eight (8) years of initial project costs allowed
- Costs must be entered for each year of construction
  - Should be consistent with “Length of Construction Period” entered in Section 1A
- Following construction, project opens and the 20-year project operating period begins

1D **PROJECT COSTS** (enter costs in thousands of dollars)

Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTAL COSTS (in dollars)	
Year	DIRECT PROJECT COSTS			SUBSEQUENT COSTS		Mitigation	Transit Agency Cost Savings	Constant Dollars	Present Value
	Project Support	R / W	Construction	Maint./ Op.	Rehab.				
<b>Construction Period</b>									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
<b>Project Open</b>									
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
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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
<b>Total</b>	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,313,133

# 1D) Project Costs – Direct Project Costs

## Initial Costs

- Project support - engineering design and management
- Right-of-way acquisition costs
- Construction costs
- Project should incur no initial project costs in or after the project opening year

## Subsequent Costs

- Any costs incurred after the project is constructed and open
  - Operating and Maintenance (O&M) costs
  - Rehabilitation costs
- Module 8d discusses project cost sources, including O&M costs

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
<b>Construction Period</b>									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
<b>Project Open</b>									
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
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7				\$40				40,000	30,397
8				\$40				40,000	29,228
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17				\$40				40,000	20,535
18				\$40				40,000	19,745
19				\$40				40,000	18,986
20				\$40				40,000	18,255
<b>Total</b>	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	Information



# 1D) Project Costs – Mitigation, Transit Agency, and Total Costs

## Mitigation

- Costs to mitigate community and environmental impacts

## Transit Agency Cost Savings

- Savings to transit agency due to efficiency improvements
  - Example: signal prioritization projects speed up buses, which may reduce operating hours, resulting in lower labor and other costs
  - Costs should be entered as negative numbers

## Total Costs

- Calculated automatically
- Includes project cost in constant dollars and present value for each year
- Values are in total dollars and not in thousands of dollars like other columns

1D PROJECT COSTS (enter costs in thousands of dollars)									
Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTAL COSTS (in dollars)	
Year	DIRECT PROJECT COSTS			SUBSEQUENT COSTS		Mitigation	Transit Agency Cost Savings	Constant Dollars	Present Value
	Project Support	R / W	Construction	Maint./ Op.	Rehab.				
<b>Construction Period</b>									
1			\$550					\$550,000	\$550,000
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
<b>Project Open</b>									
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
<b>Total</b>	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	Project Information

# 1D) Project Costs – Residual Value

## Residual Value

- Residual value is counted as a project benefit
- Cal-B/C calculates this value as the sum of the right-of-way costs
- Can be overridden by user if better information is available
- Include any lot improvements that remain after the 20-year lifecycle

Enter all project costs (in today's dollars) in columns 1 to 7. Costs during construction should be entered in the first eight rows. Project costs (including maintenance and operating costs) should be net of costs without project.

1C DESTINATION INFORMATION				1D PROJECT COSTS (enter costs in thousands of dollars)								
Destination Description				INITIAL COSTS			SUBSEQUENT COSTS			Transit Agency Cost Savings	TOTAL COSTS (in dollars)	
Dest 1	Dest 2	Dest 3	R / W	Construction	Maint./Op.	Rehab.	Mitigation	Constant Dollars	Present Value			
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												
Percent of Lot Users to Destination	35%	50%	15%									
Transit Travel to Destination												
Travel Time (in min)	45.0	0.0	80.0									
Average Fare	\$6.00	\$0.00	\$0.00									
Carpool/Vanpool Travel to Destination												
Average Carpool Size (people/vehicle)	2.0	2.0	2.0									
Average Carpool Wait Time (in min)		7.5	7.5									

Residual Value in Year 21 (in thousands of dollars) **\$0**

Residual Value in Year 21 (in thousands of dollars) **\$0**

Present Value = Future Value (in Constant Dollars) / (1 + Real Discount Rate) \* Year

## Entering Additional Destinations

- The model contains a macro that allows the user to enter additional destination data
- To enter data for the next set of three destinations:
  - Enter all the information through Section 1D
  - *Save an interim version of the model manually*
  - Click button “Prepare Model for Next Set of Destinations”
  - Model will prompt to “save as”; enter the file name for the model with the next set of destinations
  - Enter data for 2<sup>nd</sup> set of destinations in Section 1C
- The model has the capacity for nine destinations
  - The user can enter the additional destination data by running the macro and entering data for two additional sets of destinations

Enter all project costs (in today's dollars) in columns 1 to 7. Costs during construction should be entered in the first eight rows. Project costs (including maintenance and operating costs) should be net of costs without project.

Col. no.	DIRECT PROJECT COSTS			SUBSEQUENT COSTS			Transit Agency Cost	TOTAL COSTS (in dollars)	
	(1)	(2)	(3)	(4)	(5)	(6)		Constant Dollars	Present Value
10								\$550,000	\$550,000
11								0	0
12								0	0
13								0	0
14								0	0
15								0	0
16								0	0
17								0	0
18								0	0
19								0	0
20								0	0
Total	\$0	\$0	\$550	\$800	\$0	\$0	\$0	\$1,350,000	\$1,093,613

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

	Dest 1	Dest 2	Dest 3
Average Fare	\$0.00	\$0.00	\$0.00
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

	Dest 1	Dest 2	Dest 3
Average Carpool Size (people/vehicle)	2.0	2.0	2.0

Residual Value in Year 21 (in thousands of dollars) \$0

Present Value = Future Value (in Constant Dollars) / (1 + Real Discount Rate)^ Year

04

## **Results Worksheet**

## 2) Model Results

- Life-Cycle Costs
- Life-Cycle Benefits
- Net Present Value
- Benefit/Cost Ratio
- Rate of Return on Investment
- Payback Period
- Itemized Benefits
- Person-Hours of Time Saved
- VMT Reduction
- Emissions Reduction

2		INVESTMENT ANALYSIS SUMMARY RESULTS																																																																
<table border="1"> <tr> <td>Life-Cycle Costs (mil. \$)</td> <td>\$1.1</td> </tr> <tr> <td>Life-Cycle Benefits (mil. \$)</td> <td>\$7.1</td> </tr> <tr> <td>Net Present Value (mil. \$)</td> <td>\$6.0</td> </tr> <tr> <td>Benefit / Cost Ratio:</td> <td>6.5</td> </tr> <tr> <td>Rate of Return on Investment:</td> <td>64.9%</td> </tr> <tr> <td>Payback Period:</td> <td>2 years</td> </tr> </table>		Life-Cycle Costs (mil. \$)	\$1.1	Life-Cycle Benefits (mil. \$)	\$7.1	Net Present Value (mil. \$)	\$6.0	Benefit / Cost Ratio:	6.5	Rate of Return on Investment:	64.9%	Payback Period:	2 years	<table border="1"> <thead> <tr> <th rowspan="2">ITEMIZED BENEFITS (mil. \$)</th> <th>Total Over</th> <th>Average</th> <th colspan="2"></th> </tr> <tr> <th>20 Years</th> <th>Annual</th> <th colspan="2"></th> </tr> </thead> <tbody> <tr> <td>Travel Time Savings</td> <td>\$0.5</td> <td>\$0.0</td> <td colspan="2"></td> </tr> <tr> <td>Veh. Op. Cost Savings</td> <td>\$4.9</td> <td>\$0.2</td> <td colspan="2"></td> </tr> <tr> <td>Accident Cost Savings</td> <td>\$1.4</td> <td>\$0.1</td> <td colspan="2"></td> </tr> <tr> <td>Emission Cost Savings</td> <td>\$0.3</td> <td>\$0.0</td> <td colspan="2"></td> </tr> <tr> <td>Residual Value</td> <td>\$0.0</td> <td></td> <td colspan="2"></td> </tr> <tr> <td><b>TOTAL BENEFITS</b></td> <td><b>\$7.1</b></td> <td></td> <td colspan="2"></td> </tr> <tr> <td>Person-Hours of Time Saved</td> <td>55,897</td> <td>2,795</td> <td colspan="2"></td> </tr> <tr> <td>VMT Reduction</td> <td>22,408,719</td> <td>1,120,436</td> <td colspan="2"></td> </tr> </tbody> </table>				ITEMIZED BENEFITS (mil. \$)	Total Over	Average			20 Years	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	\$0.0				<b>TOTAL BENEFITS</b>	<b>\$7.1</b>				Person-Hours of Time Saved	55,897	2,795			VMT Reduction	22,408,719	1,120,436		
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<p><i>Should benefit-cost results include:</i></p> <p>1) Induced Travel is not considered</p> <p>2) Vehicle Operating Costs? (y/n) <input type="text" value="Y"/> <small>Default = Y</small></p> <p>3) Accident Costs? (y/n) <input type="text" value="Y"/> <small>Default = Y</small></p> <p>4) Vehicle Emissions? (y/n) <input type="text" value="Y"/> <small>Default = Y</small> includes value for CO<sub>2</sub>e</p>		<table border="1"> <thead> <tr> <th rowspan="2">EMISSIONS REDUCTION</th> <th colspan="2">Tons</th> <th colspan="2">Value (mil. \$)</th> </tr> <tr> <th>Total Over 20 Years</th> <th>Average Annual</th> <th>Total Over 20 Years</th> <th>Average Annual</th> </tr> </thead> <tbody> <tr> <td>CO Emissions Saved</td> <td>21</td> <td>1</td> <td>\$0.0</td> <td>\$0.0</td> </tr> <tr> <td>CO<sub>2</sub> Emissions Saved</td> <td>6,274</td> <td>314</td> <td>\$0.2</td> <td>\$0.0</td> </tr> <tr> <td>NO<sub>x</sub> Emissions Saved</td> <td>1</td> <td>0</td> <td>\$0.1</td> <td>\$0.0</td> </tr> <tr> <td>PM<sub>10</sub> Emissions Saved</td> <td>0</td> <td>0</td> <td>\$0.0</td> <td>\$0.0</td> </tr> <tr> <td>PM<sub>2.5</sub> Emissions Saved</td> <td>0</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>SO<sub>x</sub> Emissions Saved</td> <td>0</td> <td>0</td> <td>\$0.0</td> <td>\$0.0</td> </tr> <tr> <td>VOC Emissions Saved</td> <td>1</td> <td>0</td> <td>\$0.0</td> <td>\$0.0</td> </tr> </tbody> </table>				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 <sub>2</sub> Emissions Saved	6,274	314	\$0.2	\$0.0	NO <sub>x</sub> Emissions Saved	1	0	\$0.1	\$0.0	PM <sub>10</sub> Emissions Saved	0	0	\$0.0	\$0.0	PM <sub>2.5</sub> Emissions Saved	0	0			SO <sub>x</sub> Emissions Saved	0	0	\$0.0	\$0.0	VOC Emissions Saved	1	0	\$0.0	\$0.0																	
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- Model results and how to interpret them were discussed in more detail in Module 3

05

## **Additional Information**

# Detailed Calculations

- Discussed in more detail in Module 6a
- Produces detailed calculations for each benefit category
- Final Calculations Worksheet tabulates all the benefits and calculates the results
- Calculations provided by year, by destination, and by type of rider (e.g., new and existing, transit and carpool)

## Travel Time Benefits

## Vehicle Operating Cost Benefits

## Safety Benefits

## Emissions Benefits

**Emission Reduction Benefits**  
This sheet calculates changes in highway emissions.

**Formulas:**

Vehicle-Miles Traveled = Affected Length x Avg. Annual Volume Transit Em Cost = (Veh-Miles x Rate x Cost/Mile) by Em Type

Hwy Emissions Cost = (VMT x Rate x Cost/Mile) by Emissions Type

Year	ANNUAL NUMBER OF USERS (people/yr)			TOTAL AUTO VMT (veh-miles/yr)		AVERAGE HWY SPEED (mph)		RUNNING EMISSIONS (\$/yr)		STARTING EMISSIONS (\$/yr)		Constant Dollars	Present Value
	Existing Lot	New Lot	Users Benefited	No Build	Build	No Build	Build	No Build	Build	No Build	Build		
1	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
2	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
3	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
4	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
5	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
6	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
7	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
8	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
9	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
10	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
11	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
12	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
13	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
14	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
15	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
16	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
17	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
18	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
19	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
20	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Total</b>	0	0	0	0	0	0.0	0.0	\$0	\$0	\$0	\$0	\$0	\$0

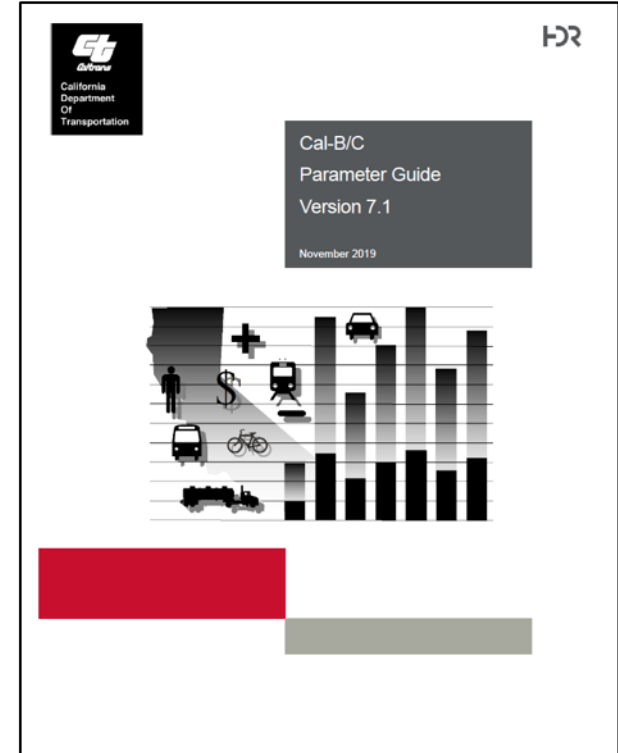


- 
- Describes economic values and parameters for all Cal-B/C tools

### User's Guide



### Parameter Guide





06

**Conclusion**

## **In this module, you learned...**

- What Cal-B/C PnR is and were provided an overview of the tool
- How to determine if Cal-B/C PnR is the right tool for your project evaluation
- Cal-B/C color-coding and worksheet layout
- Where and how data is entered into Cal-B/C PnR

## What's Next?

- Get more information on how another Cal-B/C tool works
  - **Module 4a** (Cal-B/C Sketch)
  - **Module 4b** (Cal-B/C Corridor)
  - **Module 4c** (Cal-B/C Active Transportation)
  - **Module 4e** (Cal-B/C Intermodal Freight)
- Find out more about Cal-B/C assumptions and parameters
  - **Module 5: Understanding Cal-B/C Assumptions and Parameters**
- Start an analysis!
  - **Module 7a** (Cal-B/C Sketch)
  - **Module 7b** (Cal-B/C Corridor)
  - **Module 7c** (Cal-B/C Active Transportation)
  - **Module 7d** (Cal-B/C Park & Ride)
  - **Module 7e** (Cal-B/C Intermodal Freight)