Cal-B/C Training Module 8d
Cal-B/C Park-and-Ride (PnR)
Understanding Project Input Sheets and Data
About This Module
This module will...

- Build on Modules 4d and 7d to provide more details on how to get data for your benefit-cost analysis (BCA) using Cal-B/C Park-and-Ride

- Identify data sources to use for demand, operational, and project cost data
Previous Modules…

- **Module 1** provided a basic introduction on benefit-cost analysis (BCA) and a general overview of how to 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 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
  - This current module complements Module 4d
- **Module 5** highlighted the information in the Parameters worksheet and discussed key assumptions used by Cal-B/C
- **Module 6a** provided detailed information on how Cal-B/C Park-and-Ride calculates benefits
- **Module 7d** presented the approach to starting a Cal-B/C Park-and-Ride analysis
Requirements for Making Full Use of This Module

- Basic understanding of traffic engineering and transportation planning methodologies, data and terminology
- Useful to understand Park-and-Ride operational characteristics
- Working knowledge of travel demand modeling concepts and data
- Ability to navigate websites and download relevant data
- Knowledge of Microsoft Excel and data analysis features
  - Pivot tables and charting tools to manipulate data
Cal-B/C Park-and-Ride Data Entry Worksheets Overview
### Primary Cal-B/C Data Entry Worksheets

**1) Project Information**
- **Instructions:** Summary instructions on how to fill out each data item in Cal-B/C
  - Project Information:
    - Project Description/Type of Project
    - Lot Design/Park-and-Ride Demand
    - Destination Information/Travel Demand/Traffic Performance/Transit Data
    - Project Costs

**2) Results**
- **Results:**
  - BCA results
  - Itemized Benefits ($)
  - Emission Savings (Tons)
- **Travel Time:**
  - Calculates No Build and Build Person-Hours and Costs by:
    - Year
    - Facility
    - Mode
- **Vehicle Operating Costs:**
  - Calculates Highway No Build and Build Fuel and Non-Fuel Costs by:
    - Year
    - Facility
    - Mode
- **Accident Costs:**
  - Calculates No Build and Build Collision Costs by:
    - Year
    - Facility
    - Mode
- **Emissions:**
  - Calculates Running and Starting Emissions and Costs by:
    - Year
    - Facility
    - Mode
- **Final Calculations:**
  - Tabulates final results, including:
    - Net present value
    - Internal rate of return

### Parameters
- **Key default analysis parameters and assumptions for all Cal-B/C tools**
Review: Cell Color-Coding

- Cal-B/C Park-And-Ride requires few user inputs, but allows you to enter more inputs when data is available

- Cells in the worksheets are color-coded:
  - **Green** cells indicate required data
    - You must input values for Cal-B/C to work for the particular analysis being performed
    - Cal-B/C descriptions tell you what cells need to be used for a given analysis
  - **Red** cells provide default values that you can change if needed
    - For example, Cal-B/C provides default values for average vehicle occupancy (AVO)
  - **Blue** cells contain values calculated by the model for No Build and Build Scenarios
    - You can override the values in these cells if better data is available
Suggested Data Sources for Evaluations in Cal-B/C Park-And-Ride

Traffic and Transit Passenger Demand and Performance Data

- Regional travel demand model data
- 3rd party data sources
- Caltrans Performance Measurement System (PeMS)
- Caltrans Managed Lane Annual Report
- Federal Transit Administration (FTA) National Transit Database
- Transit operator schedules (for local and express buses)
- Public agency Park-and-Ride inventory data
- Other sources for data (Field data collection, crowd-sourced data)

Traffic Collision and Safety Data

- Caltrans Traffic Accident Surveillance and Analysis System (TASAS)
- California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS)
- Other Sources (e.g., Transportation Research Board publications)
Suggested Data Sources for Evaluations in Cal-B/C Park-And-Ride (cont.)

**Project Cost Data**

- Project Study Report (PSR) or other Project Initiation Document
- Project Report (PR)
- Regional Transportation Improvement Program (RTIP)
- State Highway Operations and Protection Program (SHOPP)
- FTA capital cost database
# Suggested Data Sources for Cal-B/C PnR Evaluations by Input Item

<table>
<thead>
<tr>
<th>Section Title</th>
<th>Data Input Item</th>
<th>Cell Location(s)</th>
<th>Suggested Data Sources (for required input cells; or to update Cal-B/C estimates or default values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A) Project Data</td>
<td>Type of Project</td>
<td>D11</td>
<td>Depends on proposed project</td>
</tr>
<tr>
<td></td>
<td>Project Location</td>
<td>D13</td>
<td>Depends on proposed project location</td>
</tr>
<tr>
<td></td>
<td>Length of Construction Period</td>
<td>D15</td>
<td>Project Initiation Document (PID)/Project Study Report (PSR)/Project Report (PR) or other source</td>
</tr>
<tr>
<td>1B) Park-and-Ride Lot Information</td>
<td>Lot Design - Number of Parking Spaces</td>
<td>D23</td>
<td>Depends on proposed project</td>
</tr>
<tr>
<td></td>
<td>Typical Percent Filled (for current or opening year)</td>
<td>D27</td>
<td>PnR inventory/field data collection, modeling/forecasting</td>
</tr>
<tr>
<td></td>
<td>Number of Years until Lot Reaches Capacity</td>
<td>D28</td>
<td>Modeling/Forecasting or field observations of other lots</td>
</tr>
<tr>
<td></td>
<td>Number of Bicycle/Pedestrian Users</td>
<td>D29</td>
<td>Modeling/Forecasting, field data collection, surveys</td>
</tr>
<tr>
<td></td>
<td>Average Vehicle Occupancy of Lot Users</td>
<td>D30</td>
<td>Calculated by Cal-B/C; Modeling/Forecasting; Caltrans Managed Lane Annual Report</td>
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</tbody>
</table>
## Suggested Data Sources for Cal-B/C PnR Evaluations by Input Item (cont.)

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<tr>
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<tbody>
<tr>
<td><strong>Destination Description</strong></td>
<td>Destination Name</td>
<td>M11</td>
<td>Depends on proposed project and destination</td>
</tr>
<tr>
<td></td>
<td>Distance from Park-and-Ride Lot (miles)</td>
<td>M12</td>
<td>Depends on proposed project and destination</td>
</tr>
<tr>
<td></td>
<td>Distance to Next Lot (miles)</td>
<td>M13</td>
<td>Depends on proposed project and destination</td>
</tr>
<tr>
<td></td>
<td>Parking Cost at Destination (avg $/day)</td>
<td>M14</td>
<td>3rd party data sources (i.e. Parkopedia, Google Maps)</td>
</tr>
<tr>
<td><strong>Demand for Travel to Destination</strong></td>
<td>Percent of Lot Users to Destination</td>
<td>M17</td>
<td>Modeling/Forecasting; FTA National Transit Database</td>
</tr>
<tr>
<td></td>
<td>New Transit Riders</td>
<td>M19</td>
<td>Modeling/Forecasting; FTA National Transit Database</td>
</tr>
<tr>
<td></td>
<td>Existing Transit Riders</td>
<td>M20</td>
<td>Transit operator data, Modeling/Forecasting; FTA National Transit Database</td>
</tr>
<tr>
<td></td>
<td>New Carpoolers</td>
<td>M21</td>
<td>Modeling/Forecasting</td>
</tr>
<tr>
<td></td>
<td>Existing Carpoolers</td>
<td>M22</td>
<td>PnR inventory/field data collection, Modeling/Forecasting</td>
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<tbody>
<tr>
<td></td>
<td>Highway Travel to Destination</td>
<td></td>
<td></td>
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<tr>
<td>1C) Destination Information</td>
<td>HOV Travel Time (in min)</td>
<td>M25</td>
<td>PeMS, 3rd party data (e.g., INRIX, HERE)</td>
</tr>
<tr>
<td></td>
<td>Non-HOV Travel Time (in min)</td>
<td>M26</td>
<td>PeMS, 3rd party data (e.g., INRIX, HERE)</td>
</tr>
<tr>
<td></td>
<td>Accident Rate (per million vehicle-miles)</td>
<td>M28</td>
<td>TASAS</td>
</tr>
<tr>
<td></td>
<td>Percent Fatal Accidents (Pct Fat)</td>
<td>M29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percent Injury Accidents (Pct Inj)</td>
<td>M30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transit Travel to Destination</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Express Bus</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Travel Time (in min)</td>
<td>M33</td>
<td>Transit operator data, FTA National Transit Database for average speeds by modes converted to travel times</td>
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<tr>
<td></td>
<td>Average Fare</td>
<td>M34</td>
<td>Transit operator data, FTA National Transit Database</td>
</tr>
<tr>
<td></td>
<td>Headway (in min)</td>
<td>M35</td>
<td>Transit operator data, FTA National Transit Database</td>
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<tr>
<td></td>
<td>Local Bus</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Travel Time (in min)</td>
<td>M36</td>
<td>Transit operator data, FTA National Transit Database for average speeds by modes converted to travel times</td>
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<tr>
<td></td>
<td>Average Fare</td>
<td>M37</td>
<td>Transit operator data, FTA National Transit Database, transit operator websites</td>
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<tr>
<td></td>
<td>Carpool/ Vanpool Travel to Destination</td>
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<td></td>
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<tr>
<td></td>
<td>Average Carpool Size (people/vehicle)</td>
<td>M40</td>
<td>Modeling/Forecasting; American Community Survey</td>
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<tr>
<td></td>
<td>Average Carpool Wait Time (in min)</td>
<td>M41</td>
<td>Field observations</td>
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</tr>
</thead>
<tbody>
<tr>
<td>1D) Project Costs</td>
<td>Direct Project Costs (Support, R/W, Const.)</td>
<td>W12-Y12</td>
<td>PS&amp;E, PR, PSR/PAED, RTIP/SHOPP, FTA Capital Cost database; other planning documents</td>
</tr>
<tr>
<td></td>
<td>Subsequent Costs (O&amp;M, Rehab)</td>
<td>Z12/AA12</td>
<td></td>
</tr>
<tr>
<td>Other Costs</td>
<td>Mitigation/Transit Agency Cost Savings</td>
<td>AB10/AC10</td>
<td></td>
</tr>
</tbody>
</table>
03
Park-and-Ride Lot Information - Traffic and Transit Passenger Demand and Performance Data
Regional Travel Demand Models

- Can help identify top destinations by examining Origin-Destination (OD) patterns
- “Select link” analysis as from travel demand model to identify top ODs on a corridor
  - Traffic demand model expertise needed for this analysis
3rd Party Data Providers

- Can provide demand data and help identify top destinations for Park-and-Ride service
- Can be used to estimate average parking lot costs at destinations (e.g. Parkopedia)
- Can be used to estimate travel times to destinations (e.g. ClearGuide in LA County)
**3rd Party Transit Navigation Apps**

- Can be used to input estimate travel times
- Can provide estimated travel time for local and express buses based on schedules
- Examples:
  - Public transit operator apps
  - Google Maps Transit
  - Apps such as Transit App, Moovit
Caltrans Performance Measurement System (PeMS)

- PeMS can be used to get travel times from pre-defined routes and corridors
- Other features can be used to estimate travel times between the Park-and-Ride lot and the destinations by facility
- Provides real-time and historical performance data in a range of presentation styles and downloadable data sets
- Data includes:
  - Speeds
  - VMT/VHT to find speeds
- Data that can be used in Cal-B/C includes:
  - HOV and Non-HOV Travel Time
- More detailed PeMS training may be needed to calculate data
- Apply for an account at [http://pems.dot.ca.gov/](http://pems.dot.ca.gov/)
PeMS – Corridors and Routes

- Corridors and Routes features on PeMS provide travel time calculations.
- PeMS Corridors and Routes are pre-defined freeway segments that PeMS remembers.
- A key benefit of corridors and routes is that they allow for travel time comparisons that can differentiate between HOV and mainline (non-HOV) lanes.
- A limitation is that PeMS only starts collecting the data after you create your route.
PeMS – Corridor Level Analysis

- Allows user to identify major corridors from PnR location to various destinations
- Select Aggregates for VMT
- Select dates
  - Fall and/or Spring
  - Non-holiday, mid-week
- Can export Aggregates to Excel or Text files
- Calculate average speeds for travel time estimates
  - Select Quantity : Q (VMT/VHT)
  - Average speed for corridor = Q = VMT/VHT
- Do opposite direction, if needed
Module 8d: Traffic and Transit Demand Data

**PeMS – Time of Day Contours**

- Another way to calculate HOV vs non-HOV travel time data is from Time of Day Contours
- Select Performance -> Spatial Analysis -> Time of Day Contours
- Select dates
  - Example: 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
Module 8d: Traffic and Transit Demand Data

PeMS – Hourly Summary

- Another way to get HOV vs non-HOV travel time data is from 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 = VMT/VHT
- Can export to Excel or Text files
- Calculate travel time estimates using postmile distances and average aggregate speeds.
Caltrans Managed Lane Annual Report

- Caltrans district offices prepare annual reports with statistics on managed facilities (e.g., express lanes, HOV lanes, HOT lanes)
- Provides vehicle classification and occupancy counts during peak travel periods for managed lanes and adjacent general purpose lanes at select locations
- Data that can be used in Cal-B/C Park-and-Ride includes:
  - AVO statistics for managed lane and adjacent general purpose lane
Module 8d: Traffic and Transit Demand Data

FTA National Transit Database (NTD)

- Estimate local and express bus speeds if no other data is available
- Estimate transit in-vehicle speeds and travel times based on other similar systems (Vehicle Service Miles/Vehicle Service Hours)
- Obtain parking facility information for existing facilities (e.g., number of parking spaces, capital expenses)
- https://www.transit.dot.gov/ntd
Bus Schedules on Similar Corridors

- Comparable locations and route lengths can be used to estimate headways and travel time by Express or Local Bus.
Some Caltrans districts and public agencies have published inventory data available. Data can be used to estimate number of parking spaces and number of bicycle/pedestrians. Examples:

- SANDAG - [https://www.icommutesd.com/commuters/ParkNRide.aspx](https://www.icommutesd.com/commuters/ParkNRide.aspx)
Field Data Collection

- Used when automatically collected data may not be available
- Travel Time Studies (Probe / Floating Vehicles)
- Vehicle Classification and Occupancy Counts
Field Data Collection - Surveys

- Park-and-Ride Surveys and Inventories
- May be needed to supplement regional travel demand models
- Can be used to estimate:
  - Top 3 destinations for a potential PnR facility
  - Number of bicycle/pedestrian users
  - Distribution of new/existing transit and carpool riders
  - Average carpool size and wait time
Traffic Collision Data
Module 8d: Traffic Collision Data

Traffic Accident Surveillance and Analysis System (TASAS) – Transportation Systems Network (TSN) Reports

- Highway inventory database which contains the current and historical collisions on the SHS
- Data/Reports accessible through Caltrans Staff
- Data that can be used in Cal-B/C includes:
  - Accident Rate (per million vehicle-miles)
  - Percent Fatal Accidents (Pct Fat)
  - Percent Injury Accidents (Pct Inj)

Statewide Integrated Traffic Records System (SWITRS)

- Database with detailed data gathered from a collision scene by CHP and local law enforcement
- California accident data by locations, dates and collision types
- Used for collision data off the State Highway System (SHS) – TASAS should be used for SHS projects
- Downloadable but requires extensive data manipulation
- Data that can be used in Cal-B/C includes:
  - Accident Rate (per million vehicle-miles)
  - Percent Fatal Accidents (Pct Fat)
  - Percent Injury Accidents (Pct Inj)
- https://iswitrs.chp.ca.gov/Reports/jsp/index.jsp
05

Project Cost Data
Project Costs – Direct Initial Costs

- The level of detail for cost estimates depends on where the project is in the development process

- Regional Transportation Improvement Programs (RTIP) and Caltrans State Highway Operation and Protection Program (SHOPP) have project costs broken down by “capital” and “support”, but without details

Note: Remember to enter costs in thousands of dollars (1000$). Otherwise, you will not get a correct Benefit/Cost Ratio
Project Costs – Direct Initial Costs

- Pre-planning stages are more difficult
  - Caltrans has a project cost database that has rule-of-thumb cost guides
- Cost estimates for Park-and-Ride facilities depend on the type of lot
- Other sources for Park-and-Ride initial and subsequent costs include other regional Park-and-Ride projects

<table>
<thead>
<tr>
<th>Type of Facility</th>
<th>Low</th>
<th>Middle</th>
<th>High</th>
<th>Source(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Ground Multi-Level Structure</td>
<td>$9,000</td>
<td>$16,000</td>
<td>$46,000</td>
<td>New York City Park and Ride Study</td>
</tr>
<tr>
<td>Below Ground</td>
<td>$30,000</td>
<td>$53,000</td>
<td>$76,000</td>
<td>New York City Park and Ride Study</td>
</tr>
<tr>
<td>Leased Lot</td>
<td>$5.00</td>
<td>$8.55</td>
<td>$15.00</td>
<td>Riverside County Transportation Commission (RCTC) Contract Lease Rates. 2012 FTIP</td>
</tr>
<tr>
<td>Surface Lot</td>
<td>$2,500</td>
<td>$10,000</td>
<td>$21,000</td>
<td>San Joaquin Council of Governments Park-and-Ride Lot Master Plan Study</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Element</th>
<th>Low</th>
<th>Middle</th>
<th>High</th>
<th>Source(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right of Way (ROW) Average Land Cost per Acre (US 2012 Dollars)</td>
<td>$30,000</td>
<td>$500,000</td>
<td>$2,000,000</td>
<td>Review of vacant land prices in Southern California using <a href="http://www.zilow.com">www.zilow.com</a>, <a href="http://www.landwatch.com">www.landwatch.com</a>, and from ROW cost estimates from the 2010 FTIP.</td>
</tr>
<tr>
<td>Preliminary Engineering/Design Cost as a % of Construction Cost</td>
<td>5.00%</td>
<td>7.50%</td>
<td>10.00%</td>
<td>Valley Metro Regional Public Transportation Authority: RPTA Park and Ride Re prioritization Study</td>
</tr>
<tr>
<td>Average Annual Maintenance and Operations (M&amp;O) Costs per Parking Stall (US 2012 Dollars)</td>
<td>$120</td>
<td>$400</td>
<td>$875</td>
<td>Based on M&amp;O estimates from OCTA. Typical ranges are 10-30% of Total Construction Costs according to Park &amp; Ride Stakeholder Survey for District 12 Project</td>
</tr>
</tbody>
</table>
Module 8d: Project Cost Data

Project Costs – Federal Transit Administration (FTA) Capital Costs Database

- Microsoft Access database that can be used to estimate order-of-magnitude costs
- Contains “as-built” costs for federally funded projects including bus rapid transit
- Uses the FTA Standard Cost Category (SCC) codes for comparisons among transit operators
Module 8d: Project Cost Data

Project Costs – Subsequent Costs

- Caltrans and regional agencies have estimates for maintenance and operating costs for various facilities
- Transit annual operating expenses can be estimated from NTD data tables
- Park and Ride revenue data may be available
- Subsequent costs should be entered as a NET increase or decrease from the No Build case
  - May be positive (e.g., increased cost for operating and maintaining the lot)
  - May be negative (e.g., avoided maintenance or rehabilitation)
Project Costs – Mitigation Costs

- Mitigation costs (in thousands of dollars) include costs to protect communities and the environment from negative impacts
  - Include wetland and community preservation as well as sound walls to reduce highway or rail transit noise
- Plans, PS&E, PR, and PSR will provide mitigation cost estimates (with details found in the appendices)
- Often these costs can be included in the “construction” costs for a project and may not need to be entered into Cal-B/C as a separate costs
  - Soundwalls and environmental mitigations are examples of mitigations that are built into the cost of projects presented in PRs
- On-going mitigation costs that continue after the project construction is completed will be included in PRs
Project Costs – Savings to Transit Agency

- For projects with a Transit Vehicle Location (AVL) TMS Strategy, Cal-B/C will estimate annual cost savings to the transit agency
  - Based on the Transit Agency Costs data entry and the Transit Travel Time and Agency Cost Savings parameters
Conclusion
In this module, you learned…

- About potential data sources for data input and project costing for Cal-B/C Park-and-Ride
- How to get data from these sources
What’s Next?

- **Modules 9d** walks through a Park-and-Ride project example showing how to perform a BCA analysis

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