Cal-B/C Training Module 9e
Cal-B/C Intermodal Freight (IF) Case Study – New Transload Terminal at Port
About This Module
This module will...

- Walk you through a new transload terminal project
- Provide details on where to get data to input into the example
- Discuss the benefit-cost analysis (BCA) results
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 4e presented an overview of how Cal-B/C IF works including a review of all worksheets and inputs
  - This current module complements Module 4e
- Module 5 highlighted the information in the Parameters worksheet and discussed key assumptions used by Cal-B/C
- Module 6e provided detailed information on how Cal-B/C IF calculates benefits
- Module 7e presented the 1-2-3 approach to starting a Cal-B/C IF analysis
  - This current module complements Module 7e
- Module 8e discussed potential data sources that can be used in a Cal-B/C IF analysis
## Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk</td>
<td>Bulk cargo is loose cargo such as grain, coal, and iron ore. Bulk freight is not unitized or packaged and typically transported in cargo holds via bulk carriers. Bulk volumes are measured in short tons in Cal-B/C IF.</td>
</tr>
<tr>
<td>Break bulk</td>
<td>Break bulk cargo is cargo that is unitized and loaded individually. Break bulk cargo is generally packaged (e.g., bags, boxes, barrels, etc.) and not containerized. Break bulk volumes are measured in short tons in Cal-B/C IF.</td>
</tr>
<tr>
<td>Short tons</td>
<td>Short tons/US ton is measurement of weight equal to 2,000 pounds. Used as the unit of measure for bulk/break bulk volumes in Cal-B/C IF.</td>
</tr>
<tr>
<td>TEU</td>
<td>Twenty-foot equivalent unit (TEU) refers to container freight equivalent to a 20-footlong intermodal container. For instance, a 40-foot container would be equivalent to 2 TEU's.</td>
</tr>
<tr>
<td>Intermodal</td>
<td>Freight transportation that requires multiple modes of transportation without any handling of the freight itself when changing modes.</td>
</tr>
<tr>
<td>Intermodal Train</td>
<td>A freight train that carries goods or commodities loaded into domestic or international shipping containers or highway semi-trailers on their own wheels.</td>
</tr>
<tr>
<td>Transload</td>
<td>The process of transferring a shipment from one mode of transportation to another.</td>
</tr>
<tr>
<td>Drayage</td>
<td>The transportation of goods over a short distance and usually part of a longer overall move – for instance from a port to a nearby rail yard.</td>
</tr>
<tr>
<td>Empty-haul trip</td>
<td>The movement of empty freight trucks and railcars.</td>
</tr>
<tr>
<td>Modal Diversion</td>
<td>The process of diverting freight volumes from one transportation mode to another. For instance, diverting freight shipments from trucks to rail.</td>
</tr>
</tbody>
</table>
Project Information Worksheet
1) Project Information Worksheet Overview (from Module 4e)

- The primary data entry worksheet for Cal-B/C IF
- Other worksheets should be modified if project specific information is available

1A Project Data
- Required for all projects

1B Freight Capacity
- Average capacity and distance traveled by mode and type of freight

1C Freight Volumes by Mode
- Volumes of bulk / break bulk and containers shipped by mode relevant to project
1) Project Information Worksheet Overview (from Module 4e)

1D Freight Shipments by Mode
- Calculated values for total number of trucks and trains
- Number of empty-haul returns
- Average truck speeds (for emissions benefits)

1E Highway Accident Data
- Project-specific highway accident data

1F Freight Shipping Costs
- Shipping cost information (to calculate benefits for projects that involve modal diversion)
1) Project Information Worksheet Overview (from Module 4e)

1G Transload Operations Data
- Required data for freight projects that include changes in transloading operations or drayage

1H Changes in Terminal Efficiency
- Required data for freight projects that impact terminal efficiencies
- Captured through reduced delay or dwell time
- Not needed as this project is not expected to realize any transportation efficiency improvements

1I Project Costs
- Required to fill in for each year of construction period
- Recommended to estimate O&M costs based on existing relevant transload terminal projects. O&M costs should be the difference between the No Build and Build Scenarios
New Transload Terminal at Port Project Description

Current (2017) volume of 1 million tons of imported mixed freight moving to markets an average of 400 miles away

- Anticipated to grow to 3 million tons by 2040
- All freight is break bulk (nothing is containerized)

No Build Case:

- All mixed freight (1 million tons) currently moves by rail through a transload facility at capacity. Future growth in freight volumes will have to move to market by truck.

Build Case:

- A new transload terminal is constructed at the port with an industrial spur and a capacity of 4 million tons
- Expected to provide sufficient capacity to continue transporting all the commodities by rail
1A) Enter Project Data

**PROJECT DATA**

<table>
<thead>
<tr>
<th>Project Data Information:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Located in Southern California</td>
</tr>
<tr>
<td>Construction Period of 3 years (2018-2020)</td>
</tr>
<tr>
<td>Transload terminal will open in 2021</td>
</tr>
</tbody>
</table>

- **Project Location**: Enter “1” for Southern California
  - **Current Year**: Enter “2017” so benefits are discounted to 2017
  - **Year Project Begins**: Enter “2018” since the project development begins in 2018.
  - **Year Project Opens**: Enter “2021” since the new transload terminal is slated to open in 2021.
1B) Enter Freight Capacity Data

**Average Bulk/Breakbulk Shipments (Short Tons)**

- Each truck transports “25” tons
- Market designations are on average “400” miles away by highway (one-way)
- Each railcar carries “100” tons with “90” railcars per train
- Trains transport commodities at an average of “450” miles to reach the market (less direct route than trucking)
- Capacity and distance do not change between the No Build and Build scenarios

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<table>
<thead>
<tr>
<th>FREIGHT CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Bulk/Breakbulk Shipments (Short Tons)</strong></td>
</tr>
<tr>
<td><strong>Freight Trucks</strong></td>
</tr>
<tr>
<td>Average Short Tons per Truck</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>Average Trip Distance (Miles, 1-Way)</td>
</tr>
<tr>
<td>400</td>
</tr>
<tr>
<td><strong>Freight Rail</strong></td>
</tr>
<tr>
<td>Average Short Tons per Railcar</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>Average Number of Railcars per Train</td>
</tr>
<tr>
<td>90</td>
</tr>
<tr>
<td>Average Trip Distance (Miles, 1-Way)</td>
</tr>
<tr>
<td>450</td>
</tr>
<tr>
<td><strong>Average Container Shipments (TEUs)</strong></td>
</tr>
<tr>
<td><strong>Freight Trucks</strong></td>
</tr>
<tr>
<td>Average Number of TEUs per Truck</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Average Trip Distance (Miles, 1-Way)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td><strong>Freight Rail</strong></td>
</tr>
<tr>
<td>Average Number of Railcars per Railcar</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Average Number of Railcars per Train</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Average Trip Distance (Miles, 1-Way)</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

*Not Needed for this Analysis*
1C) Enter Freight Volumes Data by Mode

**Average Bulk/Breakbulk Shipments (Short Tons)**

- Enter “1,000,000” in the **Total Tons Shipped by Rail** under the **Current Year** grouping.
- For the forecasted volumes presented in the **Forecast Year (2040)** grouping, the user is expected to enter projected volumes in both the No Build and Build scenarios.
  - **No Build scenario**: Enter “2,000,000” for **Total Tons Shipped by Truck** and “1,000,000” for **Total Tons Shipped by Rail**, reflecting the need to transport commodities by truck due to capacity constraints.
  - **Build scenario**: Enter “3,000,000” for **Total Tons Shipped by Rail**, reflecting the completion of the new facility and opportunity to improve capacity.
- **Cal-B/C IF** automatically computes **Base Year (2021)** data and **Annual Increase (%) in Freight Volumes** based on data entered by the user in the green cells.
1D) Enter Data on Freight Shipments by Mode

**Number of Loaded Shipments per Year**
- Cal-B/C IF calculates the number of trains and trucks per year in the current, base and forecast years based on volumes and capacity information entered in 1B and 1C
- User may override these values if more accurate data is available

**Number of Empty-Haul Return Trips for Every Full Truck/Carload**
- All trucks and trains will return empty without carrying any return freight
- User may adjust the red boxes if this assumption changes

**Average Truck Speed**
- Trucks en route to market travel at an average of “50” miles per hour. Enter speed data for the No Build scenario for Base Year (2021).
Suggested Data Source: Freight Analysis Framework

- Data source and tool providing an overview of freight movement in the United States by all modes of transportation

- Allows the user to extract historical and future freight volumes by:
  - Commodity Type
  - Domestic Transportation Mode
  - Domestic Origin and Destination

- Output from the tool highlights the total tonnage, commodity value, and the ton-miles transported

- Tool also allows user to filter for movement type such as:
  - Total freight flow (i.e. domestic and foreign movement of goods)
  - Domestic freight
  - Import freight
  - Export freight

1E) Enter Highway Accident Data

Actual Historical Accident Data

- No recent highway accident data are available for this example
- Green cells are left blank and the state average rates will be used in estimating safety benefits.
1F) Enter Freight Shipping Costs Data

**Bulk/Breakbulk Shipping Costs**
- Truck rates to market are “$2,200” per truck
  - Estimated as $2.75 per truck mile in California, 400 miles to market, and 400 miles return
- Rail rates to market are “$2,700” per railcar
  - Estimated as $0.06 per ton-mile, 100 tons per railcar, 450 miles distance to market (rates cover the cost of return trip)
- These prices are constant and not expected to change between scenarios.
- This data may be sourced from the Project Initiation Document, Project Study Report, or other project report

**Annual Increase in Shipper Costs (Net of Inflation)**
- No annual increase in shipper costs net of inflation.
- User may adjust the red boxes if this assumption changes
1G) Enter Transload Operations Data

Transload Operations – Bulk/Breakbulk Volumes

- All freight moving by rail must be transloaded
- Freight moving by truck can move directly to market
- Cost of transload at current facility is \textdollar 6.00 per ton
- Cost of transload at new and more efficient facility is \textdollar 5.00 per ton
- Prices increase in line with inflation
  - No annual increase in shipper costs net of inflation.
  - User may adjust the red boxes if this assumption changes
1G) Enter Transload Operations Data

Freight Drayage – Bulk/Breakbulk Volumes

- All freight moving by rail must be drayed
- The current facility is “10” miles away
- The new facility will be “2” miles away
- Drayage costs are “$55” per truck to the current facility and “$11” to the new facility based on $2.75 per truck-mile
- Prices increase in line with inflation
  - No annual increase in shipper costs net of inflation.
  - User may adjust the red boxes if this assumption changes
1G) Enter Transload Operations Data

**Average Freight Truck Speed for Drayage**

- Average truck speed for drayage movements is “30” miles per hour
Data may provide the overview of volumes transported through the institutions

Data availability may vary by organization

- Large ports generally report annual volumes transported through the facility
- Railroad freight data may be available through annual reports

Data from organizations may reflect overall volumes transported by the organization and not necessarily reflect the volumes relevant to the project
Suggested Data Source: Bureau of Transportation Statistics

- Federal statistics agency that is the source of statistics on transportation activity, economics, and other measures of transportation
  - Statistical products are available for all modes of transportation, as well as both freight and passenger movements

- National Transportation Statistics is one of the few statistical products provided by the Bureau of Transportation Statistics
  - Includes data series that could be used to estimate factors based on national level data including:
    - Transportation Costs
    - Safety

- Granular data products are available though they may not contain the level of detail comparable to the national data
  - State Transportation Statistics
  - County Transportation Profiles

- https://www.bts.gov/browse-statistical-products-and-data
1H) Enter Changes in Terminal Efficiency Data

**Not Needed for Analysis**

- Project not expected to realize any terminal efficiency improvements

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**CHANGES IN TERMINAL EFFICIENCY**

<table>
<thead>
<tr>
<th></th>
<th>No Build</th>
<th>Build</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Delay/Dwell Time per Vehicle</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Minutes per Truck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Minutes per Dwell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Improvement in Average Delay/Dwell Time</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Trains</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>No Build</th>
<th>Build</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Operating Cost per Hour of Delay</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight Truck Delays</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Train Delays</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Annual Increase in Operator Costs (Net of Inflation)</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Freight Truck Delays</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Train Delays</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
11) Enter Project Cost Data

**Initial Costs**
- Capital Costs: $220 million over 3 years
  - $20 million in *Project Support Costs* spent from 2018 to 2020, assuming a 50% share in 2018, 25% share in 2019, and 25% share in 2020
  - $200 million in *Construction Costs* spent in 2019 and 2020, assuming a 50-50 split
  - Enter costs in thousands of dollars

**Subsequent Costs**
- Once the new facility is opened, there will be an operating and maintenance (O&M) cost of $8 million
- O&M cost will grow by $250 thousand annually due to increased freight volumes
- Enter costs in thousands of dollars
04 Model Inputs Worksheet
2) Model Inputs Worksheet

- Review this worksheet to make sure that your freight volume and transload operations inputs make sense.

- This worksheet also lists the accident rates calculated for the project in the No Build and Build scenarios. Review to ensure that the rates make sense.

- You should not adjust the blue cells directly if alternative values are to be used.
  - Identify which inputs need adjustments and use the green cells located next to the blue cells for making any changes.

- For this example, no changes are made.

- “Reason for Change” should be specified for any values overridden by user.
  - Example: Federal Highway Administration (FHWA) grant reviewers examine these cells closely and users should have citing documents ready if values are overridden.
Results Worksheet
3) Model Results

- This project has a relatively large, economically efficient 2.5 B/C ratio
- The payback period is 6 years
- Number of years it takes for the net benefits (lifecycle benefits minus lifecycle costs) to equal the initial construction costs
- Most benefits are derived from shipper cost savings from truck to rail diversion
- Transload and operational improvement benefits are presented as dis-benefits since the Build scenario involves transloading 3 million tons, while No Build scenario only transloads 1 million tons of freight to rail
3) Model Results

- Accident cost and emission cost savings are positive due to the diversion from truck to rail.

- Adjusting input variables can be done to test the sensitivity of these results:
  - What happens if shipper cost savings are not included?
  - What happens if the project costs more?

- Refer to Module 3 for more information on the Cal-B/C Results worksheet and BCA metrics.
Conclusion
In this module, you learned...

- How to perform a BCA of a hypothetical port transload terminal 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.