Cal-B/C Training Module 4e

How Cal-B/C Intermodal Freight (IF) Works

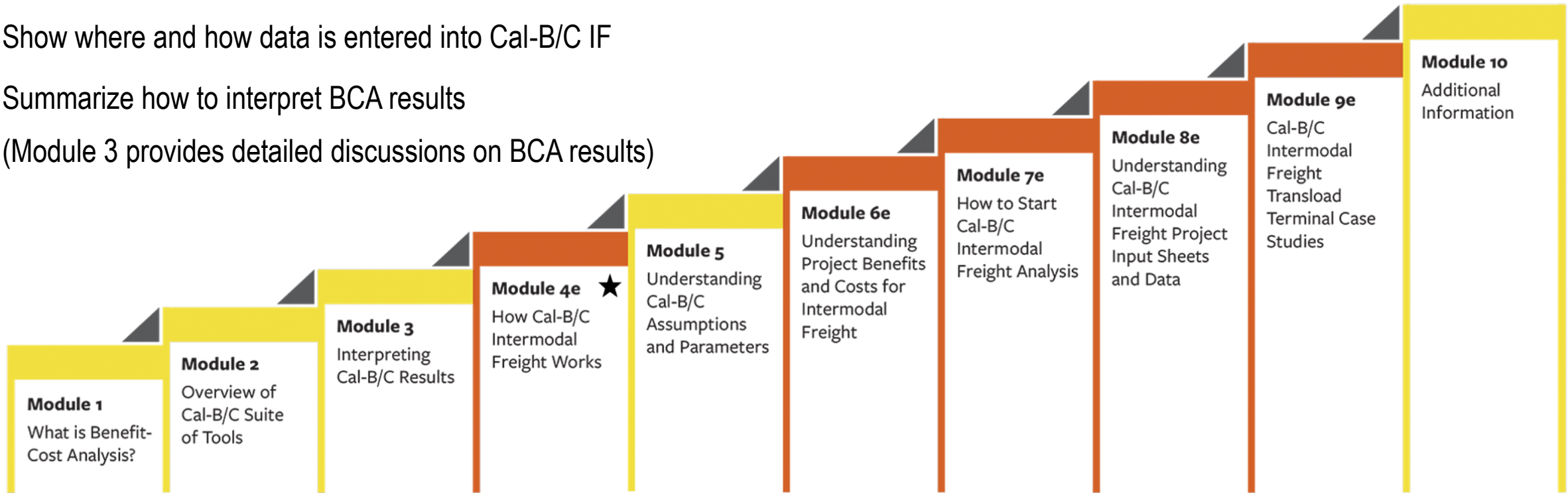
01

About This Module

This module will…

- Build on Modules 1, 2, and 3 to provide an understanding of how Cal-B/C IF works
- Help you decide if Cal-B/C IF 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 IF
- 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 projects
- 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 IF Can Evaluate…

- Modal Diversion and Freight Network Improvements
  - Rail and truck corridor capacity improvements
  - Projects enabling dedicated freight movements in unit trains
  - Loop track construction
  - Wye construction/extension
  - Rail infrastructure upgrades and enhancements
  - Other projects that divert freight movements between truck and rail
- Transload Operations and Terminal Efficiency Improvements
  - New terminal construction
  - Port/terminal capacity improvements
  - New port/terminal technology implementation

Cal-B/C IF System, User, and Data Requirements

- **System Requirements**
  - Designed for a Windows environment, tested on Microsoft Excel 2013 and later versions
  - Cal-B/C IF 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**
  - Freight volume inputs
  - Transload operations inputs
  - Terminal efficiency inputs
  - Accident rate inputs

Terminology

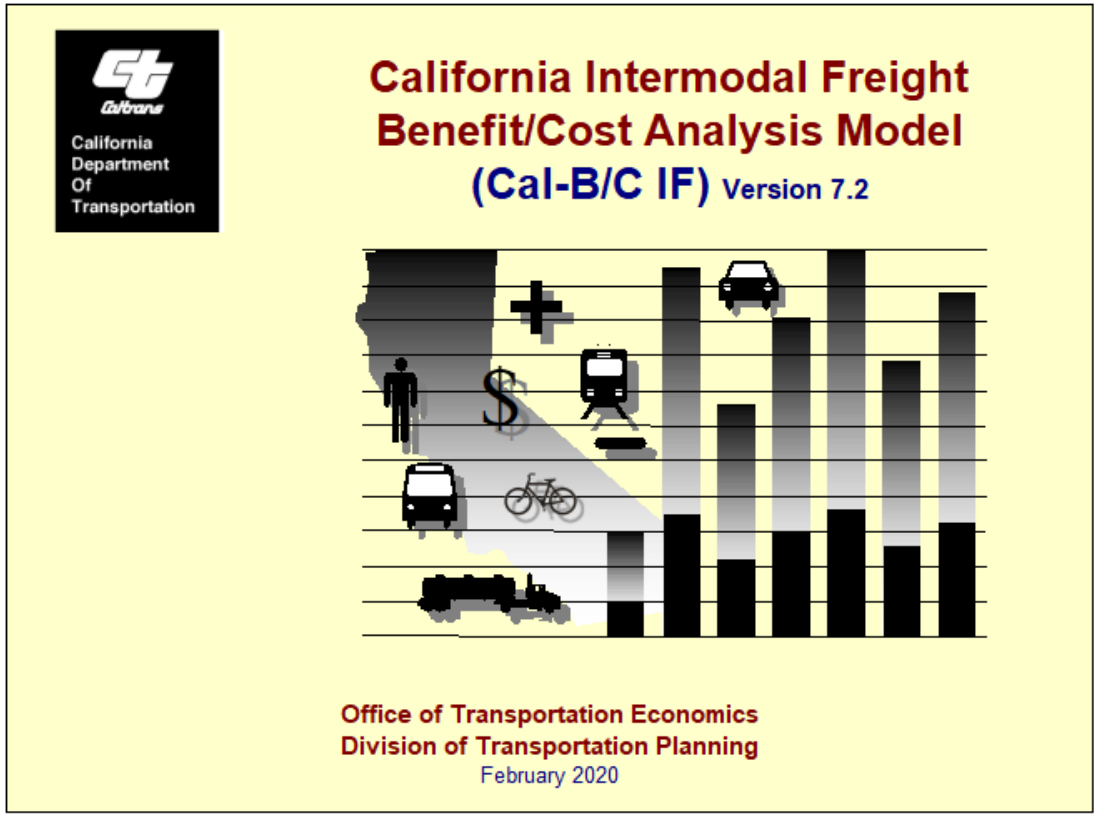
Term	Definition
Bulk	Bulk cargo is loose cargo such as grain, coal, and iron ore. Bulk freight is not unitized or packaged and typically transported in cargo holds via bulk carriers. Bulk volumes are measured in short tons in Cal-B/C IF.
Break bulk	Break bulk cargo is cargo that is unitized and loaded 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.
Short tons	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.
TEU	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.
Intermodal	Freight transportation that requires multiple modes of transportation without any handling of the freight itself when changing modes
Intermodal Train	A freight train that carries goods or commodities loaded into domestic or international shipping containers or highway semi-trailers on their own wheels.
Transload	The process of transferring a shipment from one mode of transportation to another.
Drayage	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.
Empty-haul trip	The movement of empty freight trucks and railcars.
Modal Diversion	The process of diverting freight volumes from one transportation mode to another. For instance, diverting freight shipments from trucks to rail.

02

Cal-B/C IF Overview

Overview of Cal-B/C IF

- Updated for the Cal-B/C suite to estimate **intermodal freight** benefits
- Set up as an **interconnected**, multi-sheet **spreadsheet**
  - **Project Information** and **Model Inputs** worksheet is primary location for data entry
  - BCA results presented in the **Results** worksheet
- Estimates **three** categories of **user benefits**
  - Shipper Cost Savings
  - Accident Cost Savings
  - Emission Cost Savings
- Contains **default values** and lookup tables to standardize analysis
- Calculates benefits by **project type** (i.e., modal diversion, freight transportation network improvements, transload operations and terminal efficiency improvements)

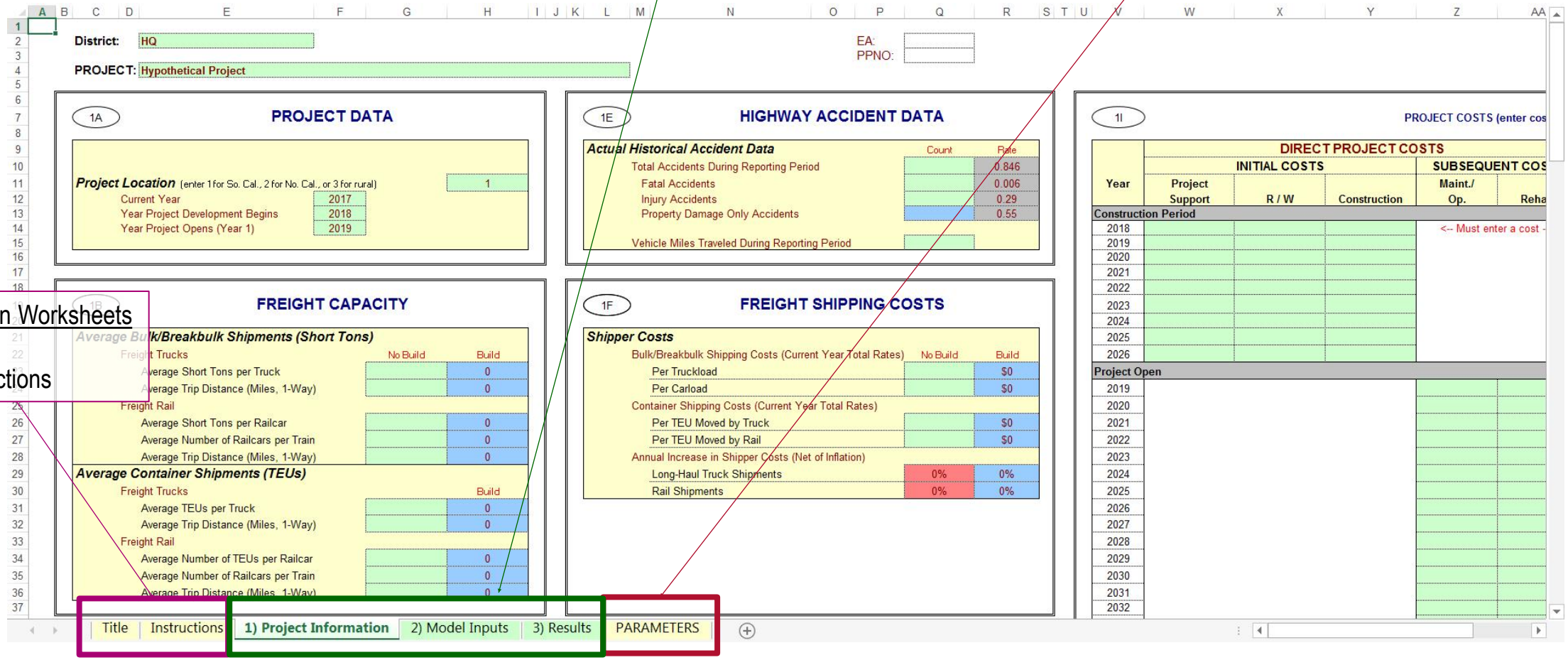


Worksheet Layout in Cal-B/C IF

Introduction Worksheets
- Title
- Instructions

Project Input & Results Worksheets
- 1) Project Information
- 2) Model Inputs
- 3) Results

Other Worksheets
- Parameters



Instructions Page in the model

CALIFORNIA LIFE-CYCLE BENEFIT/COST INTERMODAL FREIGHT ANALYSIS MODEL (Cal-B/C IF)

INTRODUCTION

This spreadsheet model provides a method for preparing a simple economic analysis of intermodal freight projects. Given input data for a project, the model calculates its life-cycle costs, life-cycle 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:

Worksheets	Contents
Instructions	General model description and assumptions
1) Project Information	Project input data
2) Model Inputs	Distance traveled by mode, shipper costs, accident rates, and idle/dwell times estimated by the model
3) Results	Summary results of analysis
Shipper Costs	Calculation of shipper cost impacts
Accident Costs	Calculation of accident cost impacts
Emissions	Calculation of emission impacts
Final Calculations	Calculation of net present value, internal rate of return, and payback period
Parameters	Economic assumptions, lookup tables, and other model parameters consistent across all Cal-B/C models

The model is designed so that the user generally needs to enter data only in the green boxes on the Project Information worksheet. The model estimates detailed shipment information and accident data for the user to review on the Model Inputs worksheet. Shipment distances are estimated from inputted freight volumes, capacity by mode and average distance to destination. Adjustments are made for the number of empty-haul trips returning to point of origin. Accidents for freight trucks are estimated from statewide averages, while accidents for rail are derived from national-level data. If available, project-specific inputs for truck accidents can be entered to override model default inputs. Summary results are shown in Results worksheet. The remaining worksheets are provided for the user to see, but the model performs the calculations automatically.

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. The model provides default values in the red boxes, which can be changed by the user, if project-specific information is available. The model calculates some values based on relationships or assumptions, with results shown in the blue boxes. These values can be changed by the user.

INSTRUCTIONS

The user can analyze most projects simply by entering relevant data on the Project Information Sheet and getting results on the Results page. The Model Inputs page allows the user to enter more detailed data to adjust estimated distances, volumes, and accidents rates, and check the various costs estimated for project.

PROJECT DATA (Box 1A)

This section provides general information about the intermodal freight project. At the top of the sheet, the user can enter information about the project, such as project name, and Caltrans district.

Project Location

1 Insert a 1, 2, or 3 for the appropriate region of California. This information is used to estimate the emission values per short ton.

Current Year

2 Enter the current year. All benefits and costs are discounted to the year entered in this cell.

Year Project Development Begins

3 Enter the first year in which initial project costs are incurred.

Year Project Opens (Year 1)

4 Enter the first year in which benefits are expected to occur.

FREIGHT CAPACITY (Box 1B)

This section allows the user to enter average capacity and distance traveled by mode and type of freight. The user is required to enter information for the type of freight and modes of transportation relevant to the project.

Average Bulk / Break Bulk Shipments (Short Tons)

5 **Average Short Tons per Truck:** Enter the average short tons hauled by a single freight truck in the no build case. The build case assumes the same capacity, but this may be adjusted by the user.

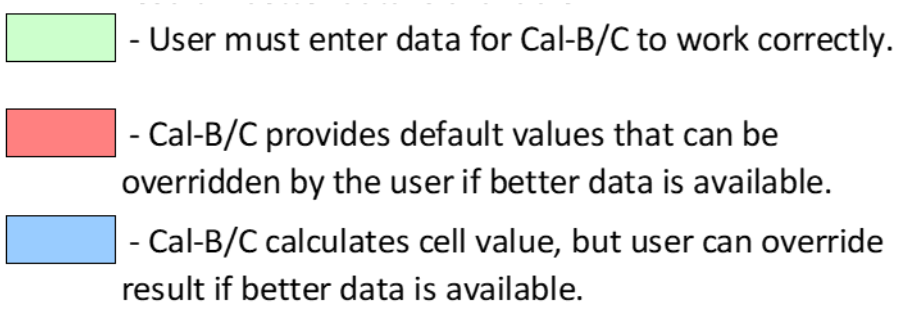
6 **Average Trip Distance (Miles, 1-Way):** Enter the average distance traveled by freight trucks to reach their destination in the no build case. The build case assumes the same one-way distance, but this may be adjusted by the user.

7 **Average Short Tons per Railcar:** Enter the average capacity of a railcar used to move bulk/break bulk commodities in the no build case. The build case assumes the same capacity, but this may be adjusted by the user.

8 **Average Number of Railcars per Train:** Enter the average number of railcars hauled by a freight train in the no build case. The build case assumes the same number of railcars, but this may be adjusted by the user.

Cell Color-Coding

- Cal-B/C IF 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: freight shipping cost data must be entered in the appropriate green cells.
- **Red** cells provide default values that can be changed if needed
  - Examples: default values for annual increase in shipping cost (net of inflation)
- **Blue** cells contain values calculated by the model for No Build and Build Scenarios



03

Project Information Worksheet

Project Information Worksheet Overview

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

1A Project Data

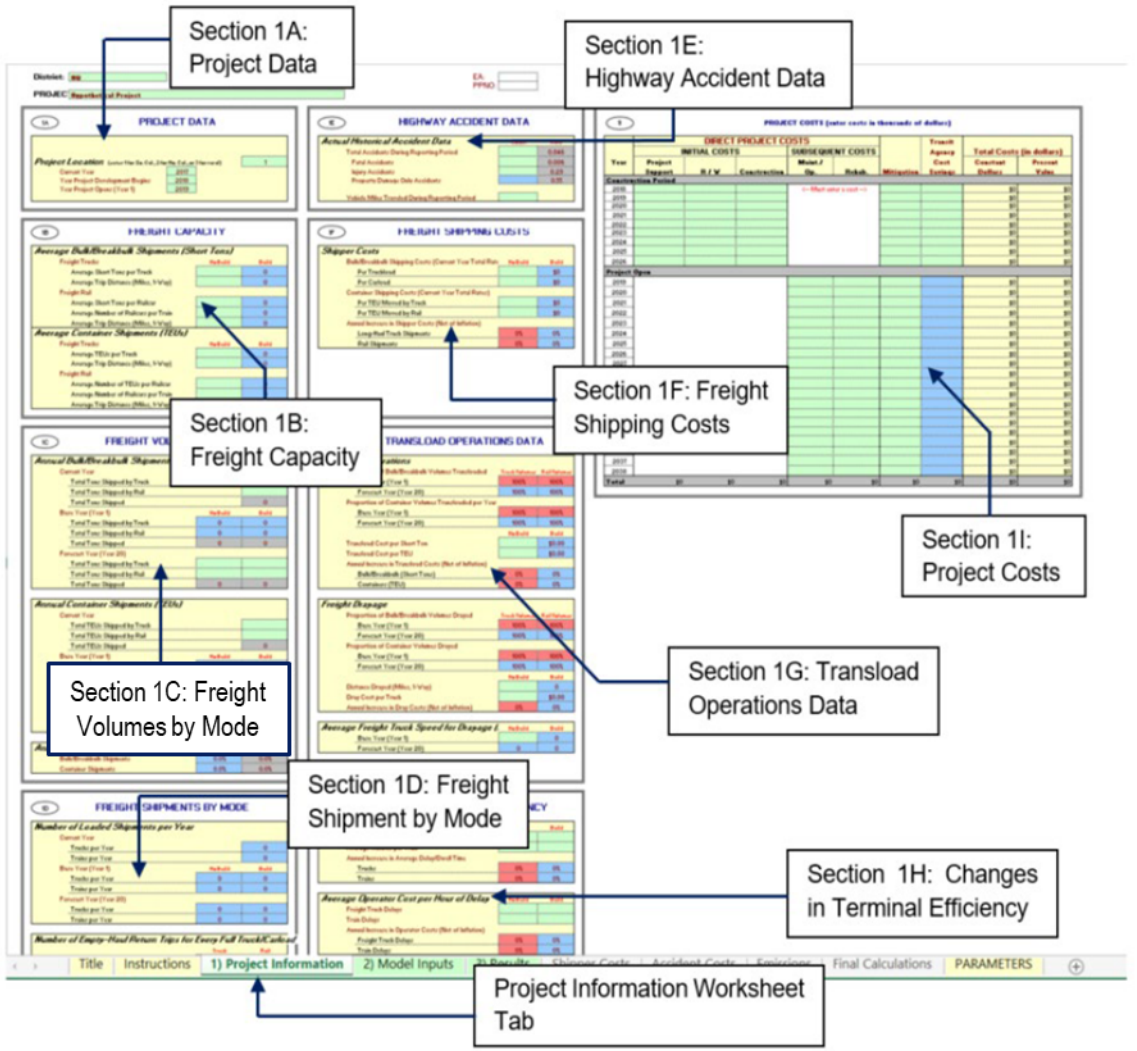
- Required for all projects

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



Project Information Worksheet Overview

1D Freight Shipments by Mode

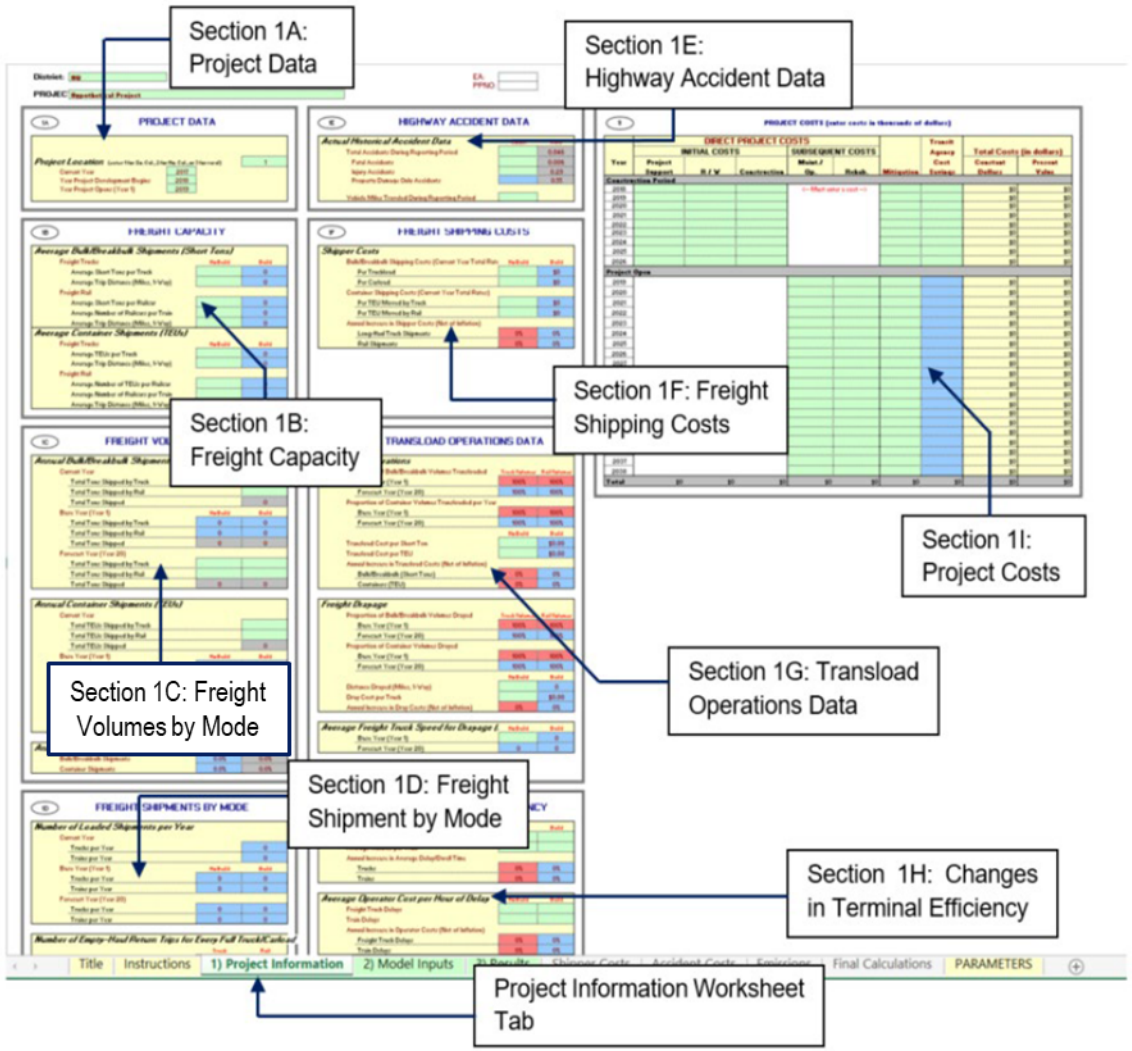
- Calculated values for total number of trucks and trains
- Number of empty-haul returns
- Average truck speeds (for emissions benefits)

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)



Project Information Worksheet Overview

1G Transload Operations Data

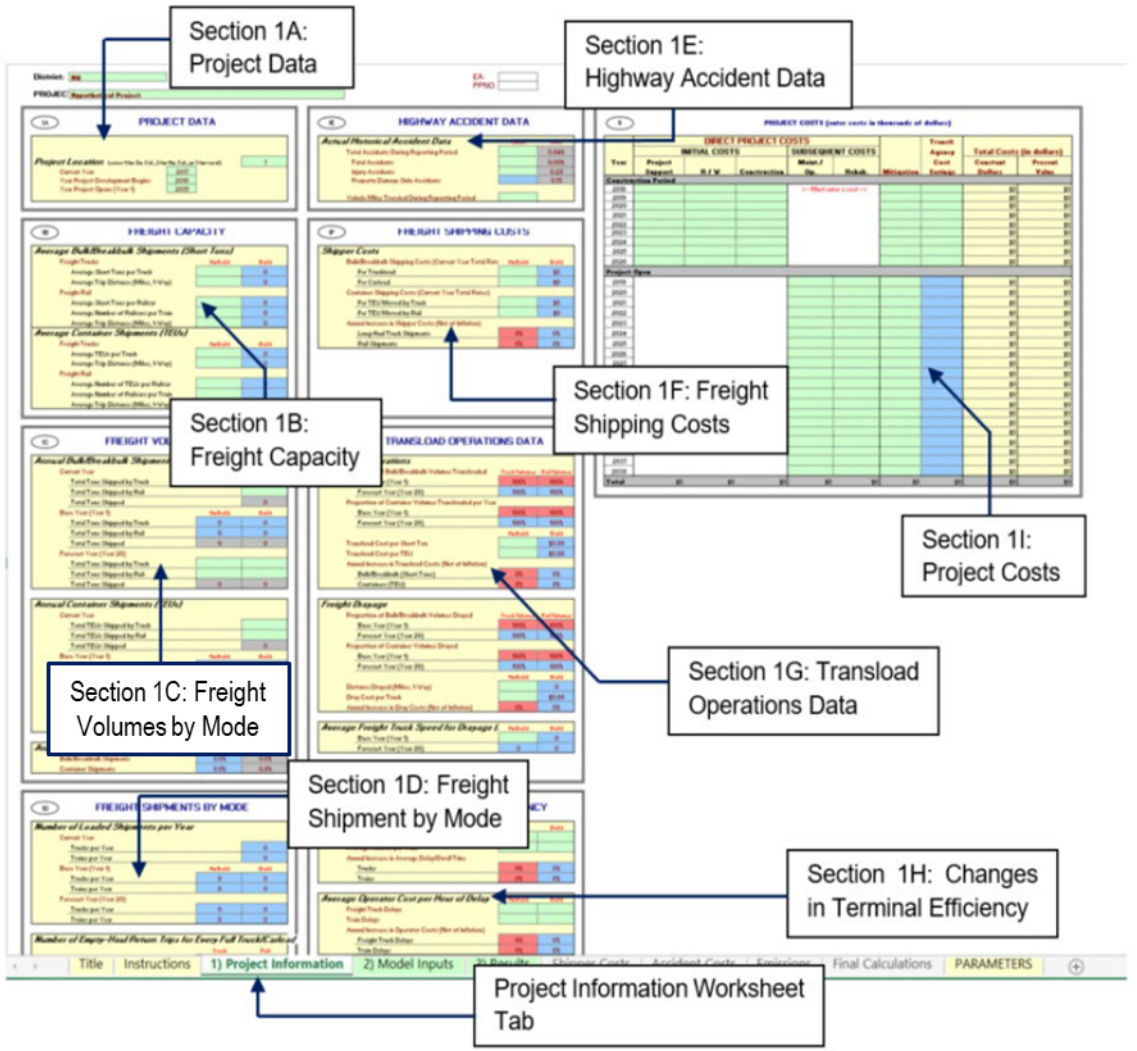
- Required data for freight projects that include changes in transloading operations or drayage

1H Changes in Terminal Efficiency

- Required data for freight projects that impact terminal efficiencies
- Captured through reduced delay or dwell time

1I Project Costs

- Required to fill in 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



1A) Project Data

Project Location

- Used to determine the appropriate accident costs and health costs of transportation emissions parameters by region

Current Year

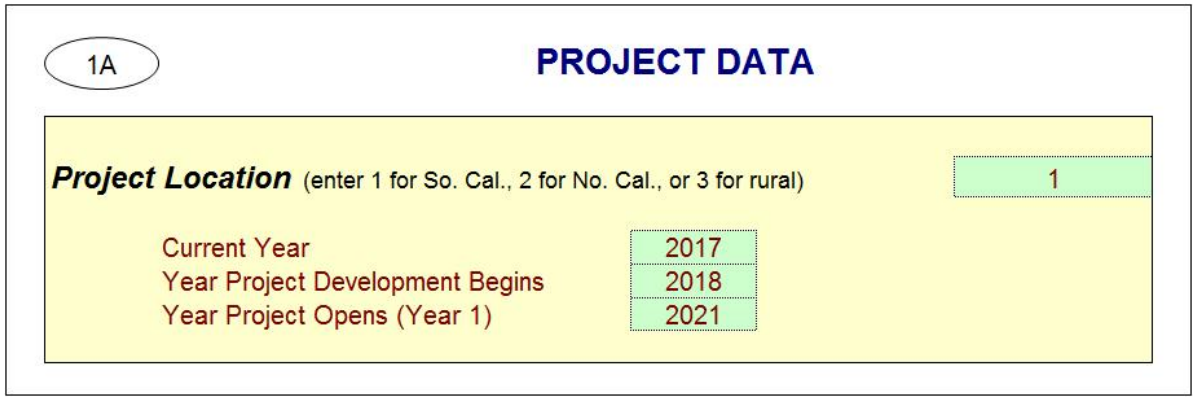
- Monetized benefits and costs are discounted to this year (i.e., this is the year used to calculate present value)

Year Project Development Begins

- The year that project development is expected to begin, or the year that project dollars will first be spent

Year Project Opens

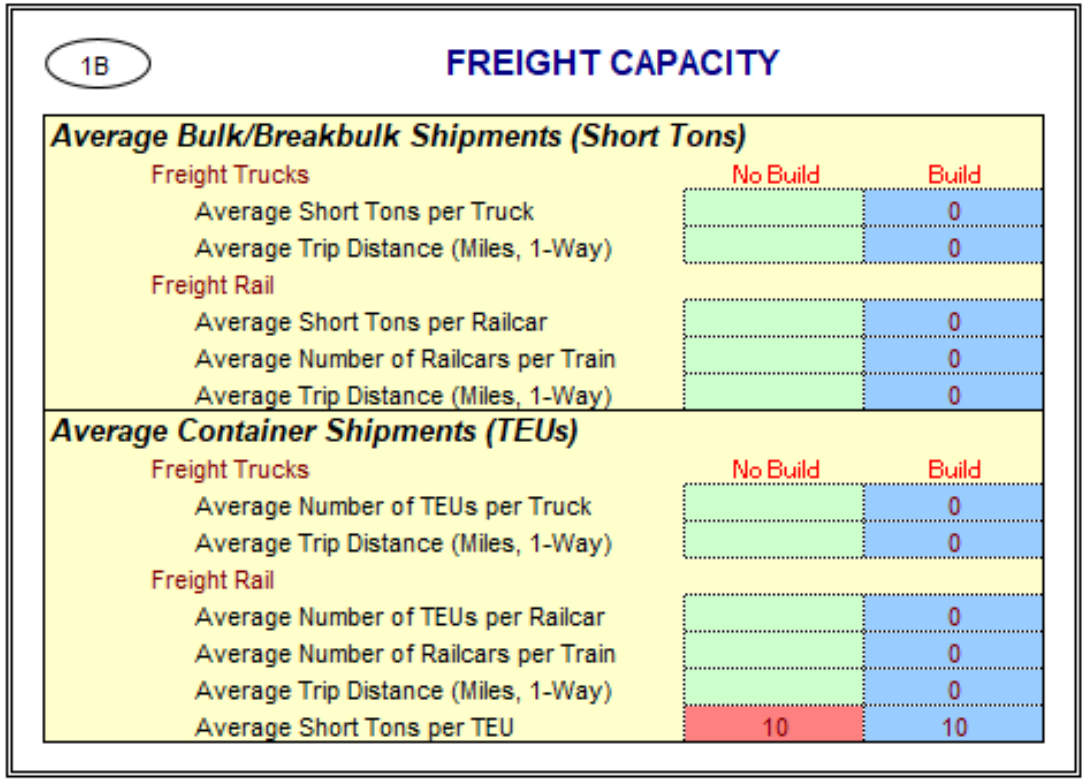
- The first full year that the project is open to the public
- Example: if construction begins in February of 2018 and will last 38 months, 2021 should be entered as the Year Project Opens



1B) Freight Capacity

Average Shipments

- Contains information on capacity and distance shipped by both truck and rail for bulk/break bulk and containers
- User must enter the input average capacity by mode and the average one-way trip distance in miles



1B

FREIGHT CAPACITY

Average Bulk/Breakbulk Shipments (Short Tons)	No Build	Build
Freight Trucks		
Average Short Tons per Truck		0
Average Trip Distance (Miles, 1-Way)		0
Freight Rail		
Average Short Tons per Railcar		0
Average Number of Railcars per Train		0
Average Trip Distance (Miles, 1-Way)		0

Average Container Shipments (TEUs)	No Build	Build
Freight Trucks		
Average Number of TEUs per Truck		0
Average Trip Distance (Miles, 1-Way)		0
Freight Rail		
Average Number of TEUs per Railcar		0
Average Number of Railcars per Train		0
Average Trip Distance (Miles, 1-Way)		0
Average Short Tons per TEU	10	10

1C) Freight Volumes by Mode

Current Year

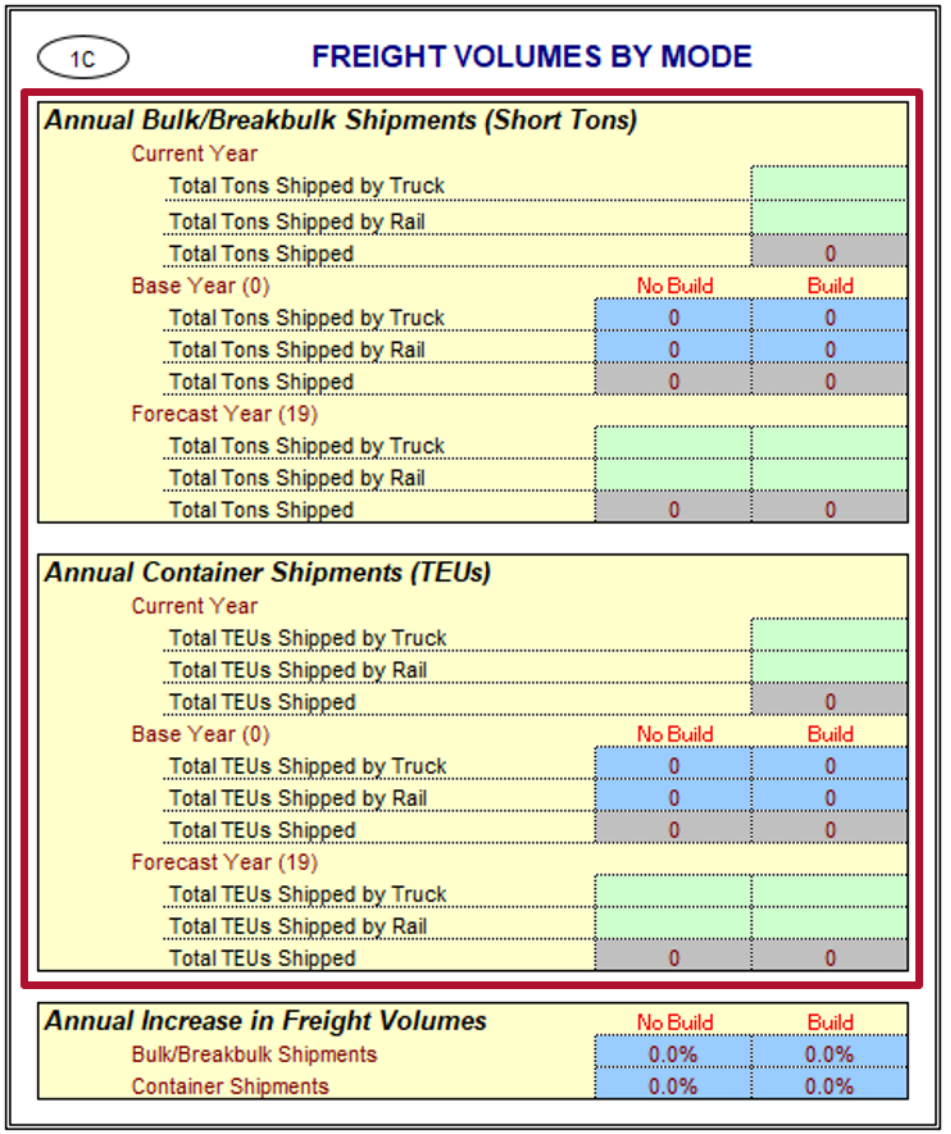
- Enter current annual volumes of freight shipped for both bulk/break bulk and container shipments by mode

Forecast Year

- Provide forecasted volumes of freight shipped for both bulk/break bulk and container shipments by mode

Base Year

- Volumes correspond to the volumes in the project opening year
- Values are calculated using the forecasted volumes and the current volumes along with the annual increases in freight volumes



1C

FREIGHT VOLUMES BY MODE

Annual Bulk/Breakbulk Shipments (Short Tons)

Current Year		
Total Tons Shipped by Truck		
Total Tons Shipped by Rail		
Total Tons Shipped		0
Base Year (0)	No Build	Build
Total Tons Shipped by Truck	0	0
Total Tons Shipped by Rail	0	0
Total Tons Shipped	0	0
Forecast Year (19)		
Total Tons Shipped by Truck		
Total Tons Shipped by Rail		
Total Tons Shipped	0	0

Annual Container Shipments (TEUs)

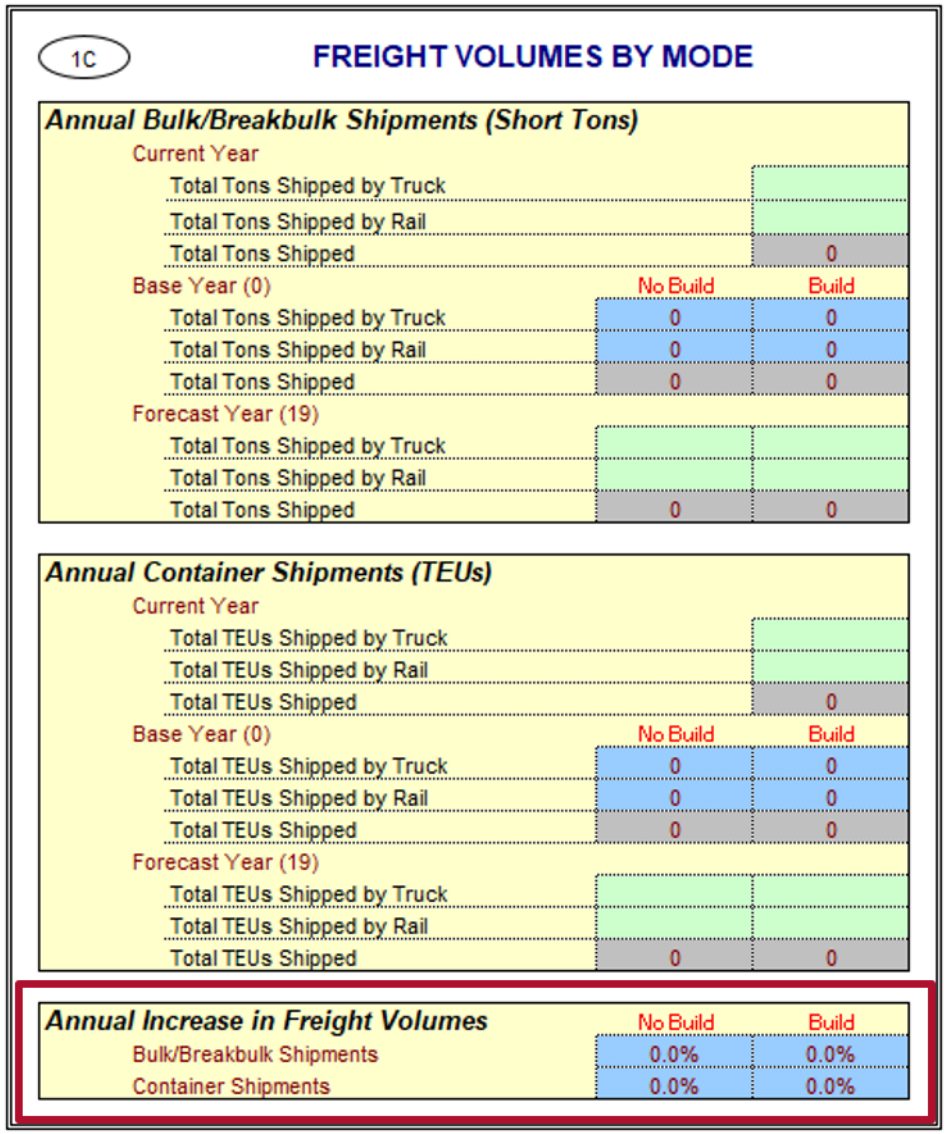
Current Year		
Total TEUs Shipped by Truck		
Total TEUs Shipped by Rail		
Total TEUs Shipped		0
Base Year (0)	No Build	Build
Total TEUs Shipped by Truck	0	0
Total TEUs Shipped by Rail	0	0
Total TEUs Shipped	0	0
Forecast Year (19)		
Total TEUs Shipped by Truck		
Total TEUs Shipped by Rail		
Total TEUs Shipped	0	0

Annual Increase in Freight Volumes	No Build	Build
Bulk/Breakbulk Shipments	0.0%	0.0%
Container Shipments	0.0%	0.0%

1C) Freight Volumes by Mode

Annual Increases in Freight Volumes

- Automatically calculated by the model using the current and forecasted year volumes
- Presented as a percentage
- User may adjust these values, however changes to the annual increase in freight volumes requires expert knowledge



1C

FREIGHT VOLUMES BY MODE

Annual Bulk/Breakbulk Shipments (Short Tons)		
Current Year		
Total Tons Shipped by Truck		
Total Tons Shipped by Rail		
Total Tons Shipped		0
Base Year (0)	No Build	Build
Total Tons Shipped by Truck	0	0
Total Tons Shipped by Rail	0	0
Total Tons Shipped	0	0
Forecast Year (19)		
Total Tons Shipped by Truck		
Total Tons Shipped by Rail		
Total Tons Shipped	0	0

Annual Container Shipments (TEUs)		
Current Year		
Total TEUs Shipped by Truck		
Total TEUs Shipped by Rail		
Total TEUs Shipped		0
Base Year (0)	No Build	Build
Total TEUs Shipped by Truck	0	0
Total TEUs Shipped by Rail	0	0
Total TEUs Shipped	0	0
Forecast Year (19)		
Total TEUs Shipped by Truck		
Total TEUs Shipped by Rail		
Total TEUs Shipped	0	0

Annual Increase in Freight Volumes	No Build	Build
Bulk/Breakbulk Shipments	0.0%	0.0%
Container Shipments	0.0%	0.0%

1D) Freight Shipments by Mode

Number of Loaded Shipments per Year

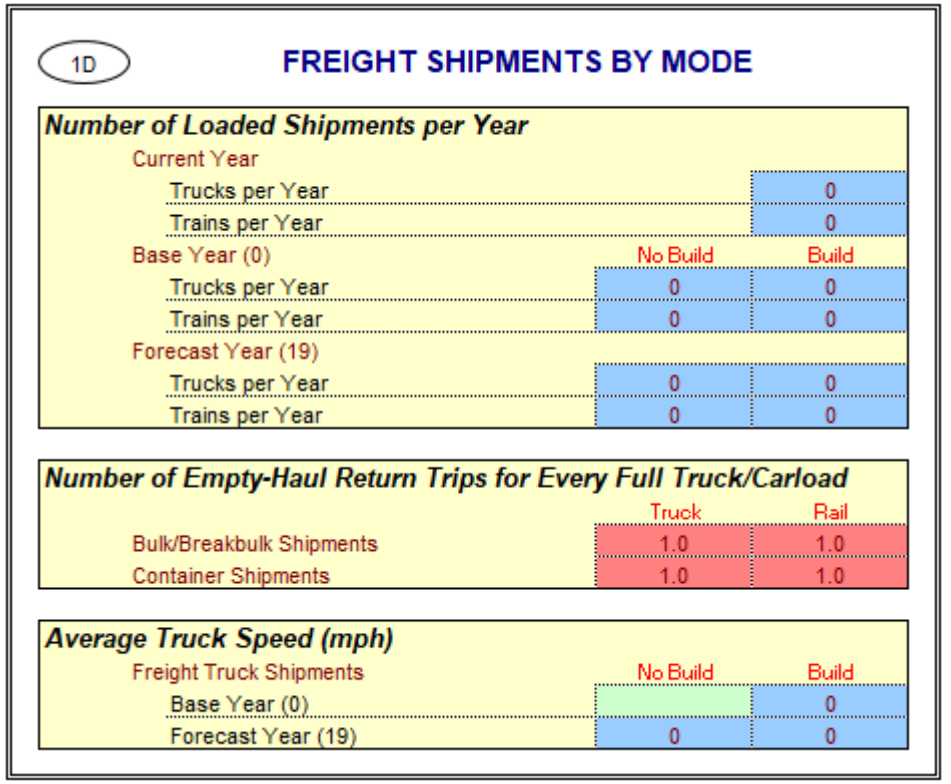
- Number of trucks and trains per year calculated by Cal-B/C IF
  - Used in determining shipper cost savings
  - Combined with average distance traveled, it provides vehicle-miles to calculate accident costs and emissions

Number of Empty-Haul Return Trips for Every Full Truck/Carload

- User may adjust the number of empty-haul return trips per full truck/carload
  - Value is an adjustment factor used to calculate accident costs and emissions

Average Truck Speed

- User needs to provide only the average truck speeds for freight trucks in the current year



1D

FREIGHT SHIPMENTS BY MODE

Number of Loaded Shipments per Year

Current Year		
Trucks per Year		0
Trains per Year		0
Base Year (0)	No Build	Build
Trucks per Year	0	0
Trains per Year	0	0
Forecast Year (19)		
Trucks per Year	0	0
Trains per Year	0	0

Number of Empty-Haul Return Trips for Every Full Truck/Carload

	Truck	Rail
Bulk/Breakbulk Shipments	1.0	1.0
Container Shipments	1.0	1.0

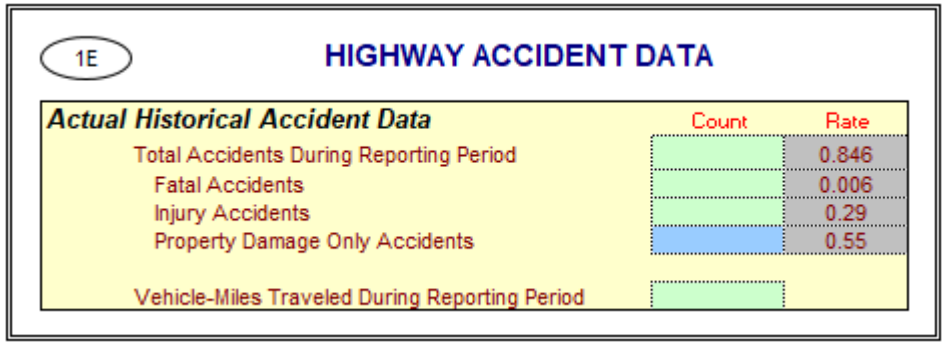
Average Truck Speed (mph)

Freight Truck Shipments	No Build	Build
Base Year (0)		0
Forecast Year (19)	0	0

1E) Highway Accident Data

Actual Historical Accident Data

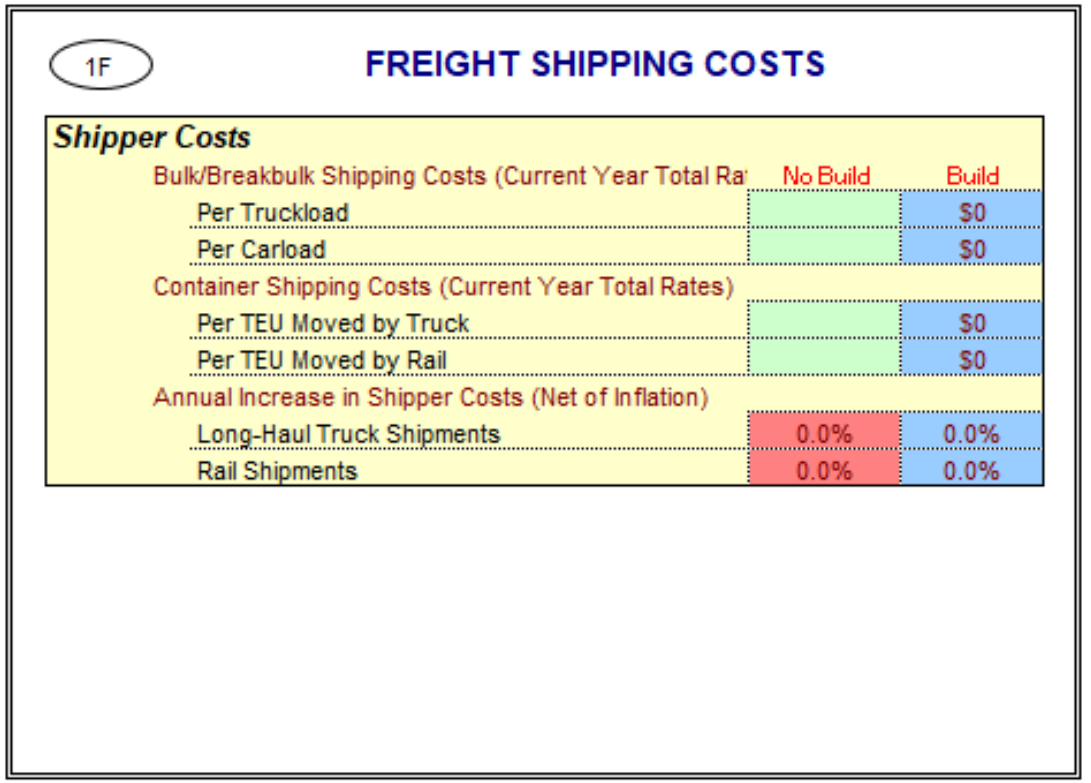
- Enter project specific data relating to accident counts under the “Count” column if available
  - State highway default accident rates from Traffic Accident Surveillance and Analysis System (TASAS) used if project specific data are not available
  - Accident rates are for **freight only**
- Enter vehicle-miles traveled (VMT)
  - VMT is used to calculate project-specific accident rates



1F) Freight Shipping Costs

Shipper Costs

- Split between bulk/break bulk and containers by mode
  - Bulk/break bulk shipping costs require data on the shipping costs per truckload and per carload
  - Containers require shipping rates per TEU moved by rail and truck
- Shipping costs used by the model also consider the annual increase in shipper costs (net of inflation)



1F

FREIGHT SHIPPING COSTS

Shipper Costs	No Build	Build
Bulk/Breakbulk Shipping Costs (Current Year Total Ra		
Per Truckload		$0
Per Carload		$0
Container Shipping Costs (Current Year Total Rates)		
Per TEU Moved by Truck		$0
Per TEU Moved by Rail		$0
Annual Increase in Shipper Costs (Net of Inflation)		
Long-Haul Truck Shipments	0.0%	0.0%
Rail Shipments	0.0%	0.0%

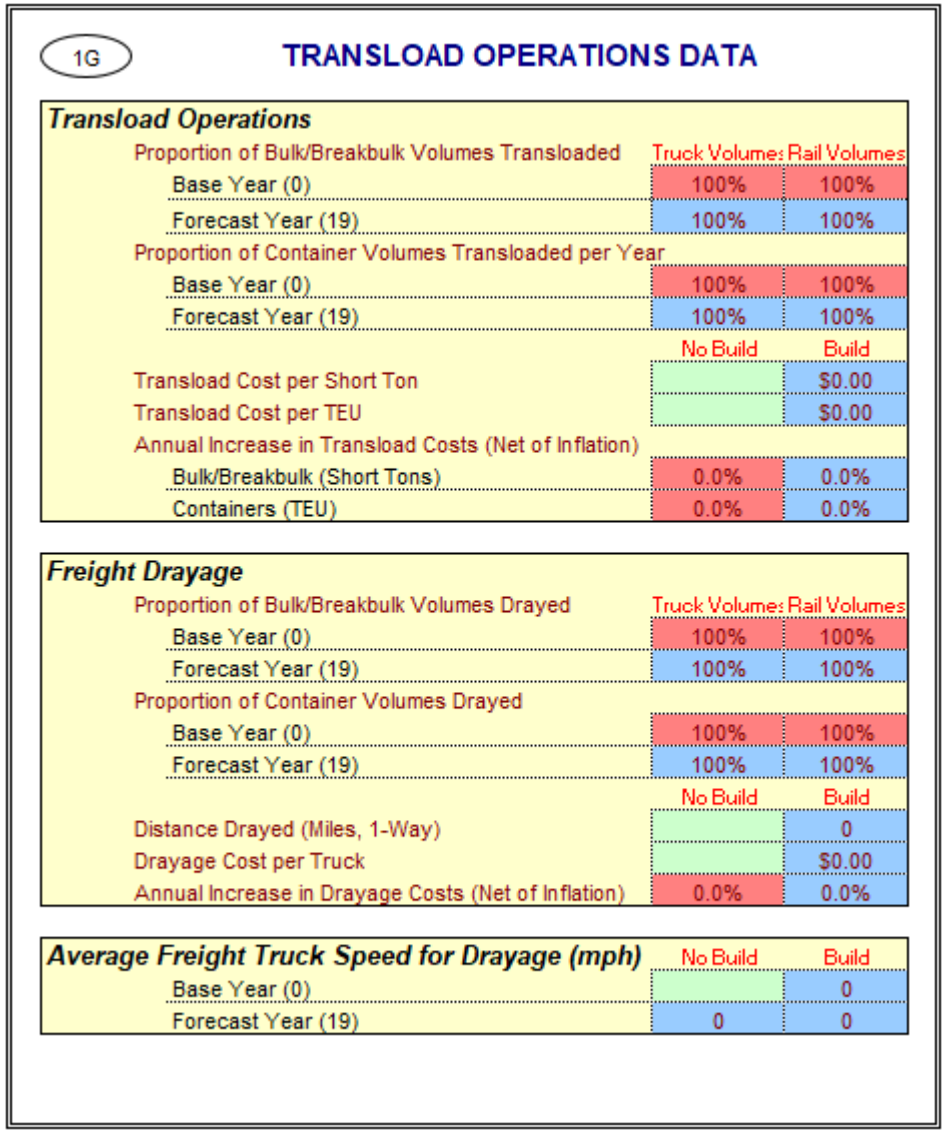
1G) Transload Operations Data

Transload Operations

- Input data on the cost per unit if transload operations are relevant to the project
- Adjust proportion of overall volume that is transloaded and the expected annual increase in costs, net of inflation, for both bulk/break bulk and containers

Freight Drayage

- Provide data regarding one-way distance drayed, the cost per truck, and the average truck speed for drayage if the project includes freight drayage



1G

TRANSLOAD OPERATIONS DATA

Transload Operations		
Proportion of Bulk/Breakbulk Volumes Transloaded	Truck Volumes	Rail Volumes
Base Year (0)	100%	100%
Forecast Year (19)	100%	100%
Proportion of Container Volumes Transloaded per Year		
Base Year (0)	100%	100%
Forecast Year (19)	100%	100%
	No Build	Build
Transload Cost per Short Ton		$0.00
Transload Cost per TEU		$0.00
Annual Increase in Transload Costs (Net of Inflation)		
Bulk/Breakbulk (Short Tons)	0.0%	0.0%
Containers (TEU)	0.0%	0.0%

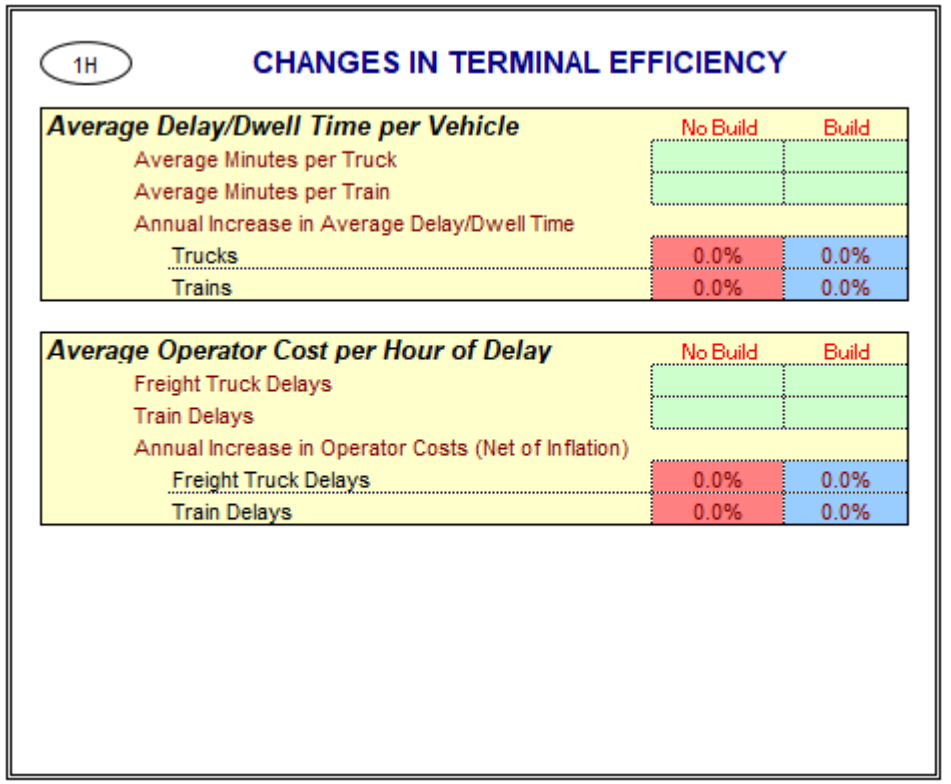
Freight Drayage		
Proportion of Bulk/Breakbulk Volumes Drayed	Truck Volumes	Rail Volumes
Base Year (0)	100%	100%
Forecast Year (19)	100%	100%
Proportion of Container Volumes Drayed		
Base Year (0)	100%	100%
Forecast Year (19)	100%	100%
	No Build	Build
Distance Drayed (Miles, 1-Way)		0
Drayage Cost per Truck		$0.00
Annual Increase in Drayage Costs (Net of Inflation)	0.0%	0.0%

Average Freight Truck Speed for Drayage (mph)	No Build	Build
Base Year (0)		0
Forecast Year (19)	0	0

1H) Changes in Terminal Efficiency

Average Delay/Dwell Time per Vehicle and Operator Cost per Hour of Delay

- Enter data on the average delay/dwell time in minutes and the cost of the delays for both modes
- User can change the annual increase in delay/dwell time and cost of delays
  - Enter negative percentage for the annual increase in average delay/dwell time if the project is expected to decrease delay/dwell time
- Leave this section blank if there are no expected changes to terminal efficiency



1H

CHANGES IN TERMINAL EFFICIENCY

Average Delay/Dwell Time per Vehicle	No Build	Build
Average Minutes per Truck		
Average Minutes per Train		
Annual Increase in Average Delay/Dwell Time		
Trucks	0.0%	0.0%
Trains	0.0%	0.0%

Average Operator Cost per Hour of Delay	No Build	Build
Freight Truck Delays		
Train Delays		
Annual Increase in Operator Costs (Net of Inflation)		
Freight Truck Delays	0.0%	0.0%
Train Delays	0.0%	0.0%

1l) Project Costs

- All project costs must be entered into seven cost columns (e.g., project support, right-of-way, construction, etc.)
- Project costs must be entered in constant dollars, in same year as economic parameters used for benefit calculations
- Costs must be entered in thousands of dollars ($1,000)
- The level of detail for cost estimates depends on where the project is in the development process

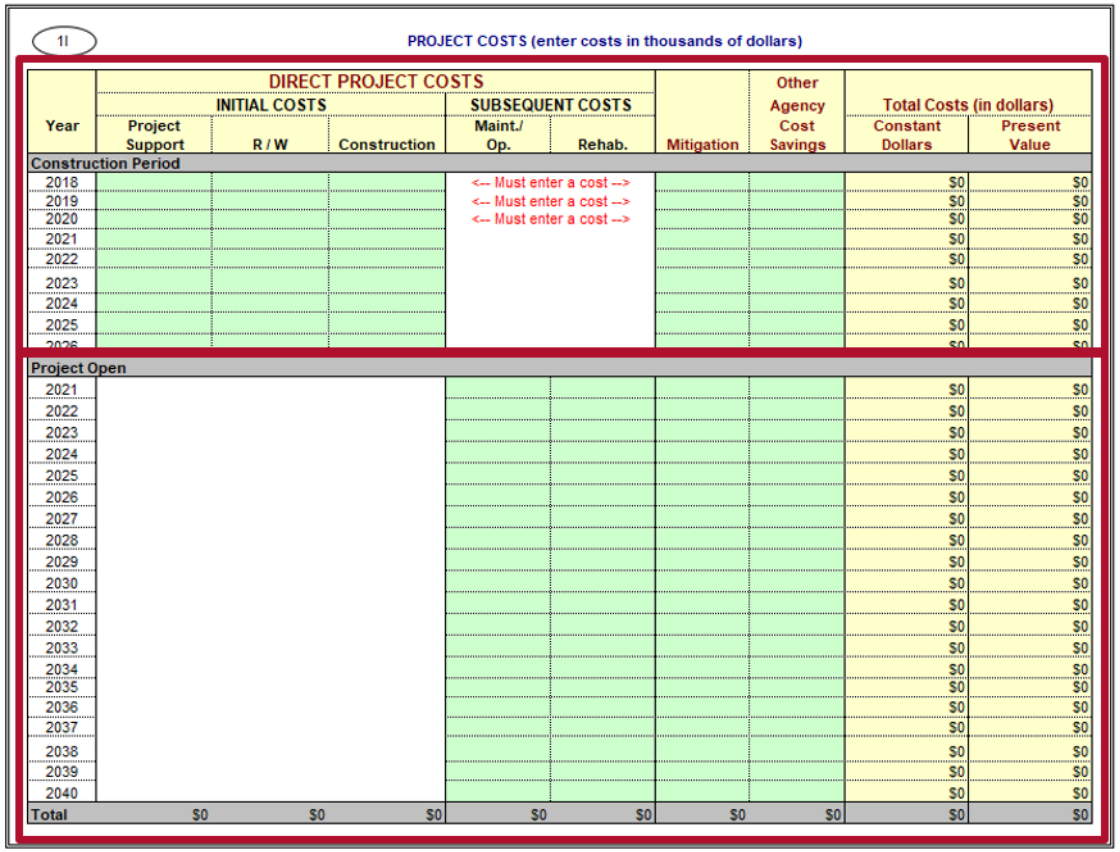
1l

PROJECT COSTS (enter costs in thousands of dollars)

Year	DIRECT PROJECT COSTS					Other Agency Cost Savings	Total Costs (in dollars)	
	INITIAL COSTS			SUBSEQUENT COSTS				
	Project Support	R / W	Construction	Maint./ Op.	Rehab.	Mitigation	Constant Dollars	Present Value
Construction Period								
2018				<-- Must enter a cost -->			$0	$0
2019				<-- Must enter a cost -->			$0	$0
2020				<-- Must enter a cost -->			$0	$0
2021							$0	$0
2022							$0	$0
2023							$0	$0
2024							$0	$0
2025							$0	$0
2026							$0	$0
Project Open								
2021							$0	$0
2022							$0	$0
2023							$0	$0
2024							$0	$0
2025							$0	$0
2026							$0	$0
2027							$0	$0
2028							$0	$0
2029							$0	$0
2030							$0	$0
2031							$0	$0
2032							$0	$0
2033							$0	$0
2034							$0	$0
2035							$0	$0
2036							$0	$0
2037							$0	$0
2038							$0	$0
2039							$0	$0
2040							$0	$0
Total	$0	$0	$0	$0	$0	$0	$0	$0

1l) Project Costs

- Up to eight (8) years of initial project costs allowed
  - Costs must be entered for each year of construction
- Following construction, the project opens, and project operating period begins



1l

PROJECT COSTS (enter costs in thousands of dollars)

Year	DIRECT PROJECT COSTS					Mitigation	Other Agency Cost Savings	Total Costs (in dollars)	
	INITIAL COSTS			SUBSEQUENT COSTS					
	Project Support	R / W	Construction	Maint./ Op.	Rehab.			Constant Dollars	Present Value
Construction Period									
2018				<-- Must enter a cost -->				$0	$0
2019				<-- Must enter a cost -->				$0	$0
2020				<-- Must enter a cost -->				$0	$0
2021								$0	$0
2022								$0	$0
2023								$0	$0
2024								$0	$0
2025								$0	$0
2026								$0	$0
Project Open									
2021								$0	$0
2022								$0	$0
2023								$0	$0
2024								$0	$0
2025								$0	$0
2026								$0	$0
2027								$0	$0
2028								$0	$0
2029								$0	$0
2030								$0	$0
2031								$0	$0
2032								$0	$0
2033								$0	$0
2034								$0	$0
2035								$0	$0
2036								$0	$0
2037								$0	$0
2038								$0	$0
2039								$0	$0
2040								$0	$0
Total	$0	$0	$0	$0	$0	$0	$0	$0	$0

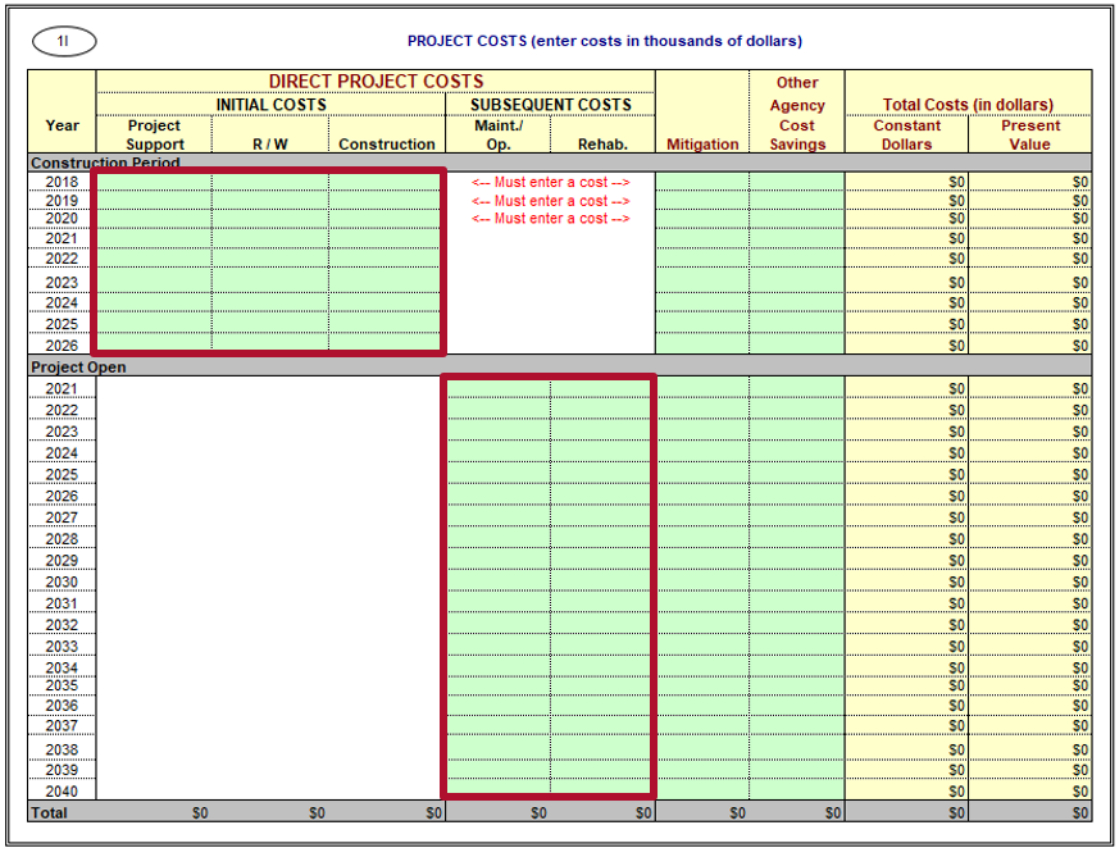
1I) Project Costs – Direct Project Costs

Initial Costs

- Project support - engineering design and management
- Right-of-Way acquisition costs
- Construction costs (including contingency)
- 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 8e discusses project cost data sources, including O&M costs



1I

PROJECT COSTS (enter costs in thousands of dollars)

Year	DIRECT PROJECT COSTS					Other Agency Cost Savings	Total Costs (in dollars)	
	INITIAL COSTS			SUBSEQUENT COSTS				
	Project Support	R / W	Construction	Maint./ Op.	Rehab.	Mitigation	Constant Dollars	Present Value
Construction Period								
2018				<-- Must enter a cost -->			$0	$0
2019				<-- Must enter a cost -->			$0	$0
2020				<-- Must enter a cost -->			$0	$0
2021							$0	$0
2022							$0	$0
2023							$0	$0
2024							$0	$0
2025							$0	$0
2026							$0	$0
Project Open								
2021							$0	$0
2022							$0	$0
2023							$0	$0
2024							$0	$0
2025							$0	$0
2026							$0	$0
2027							$0	$0
2028							$0	$0
2029							$0	$0
2030							$0	$0
2031							$0	$0
2032							$0	$0
2033							$0	$0
2034							$0	$0
2035							$0	$0
2036							$0	$0
2037							$0	$0
2038							$0	$0
2039							$0	$0
2040							$0	$0
Total	$0	$0	$0	$0	$0	$0	$0	$0

1l) Project Costs – Mitigation, Agency, and Total Costs

Mitigation

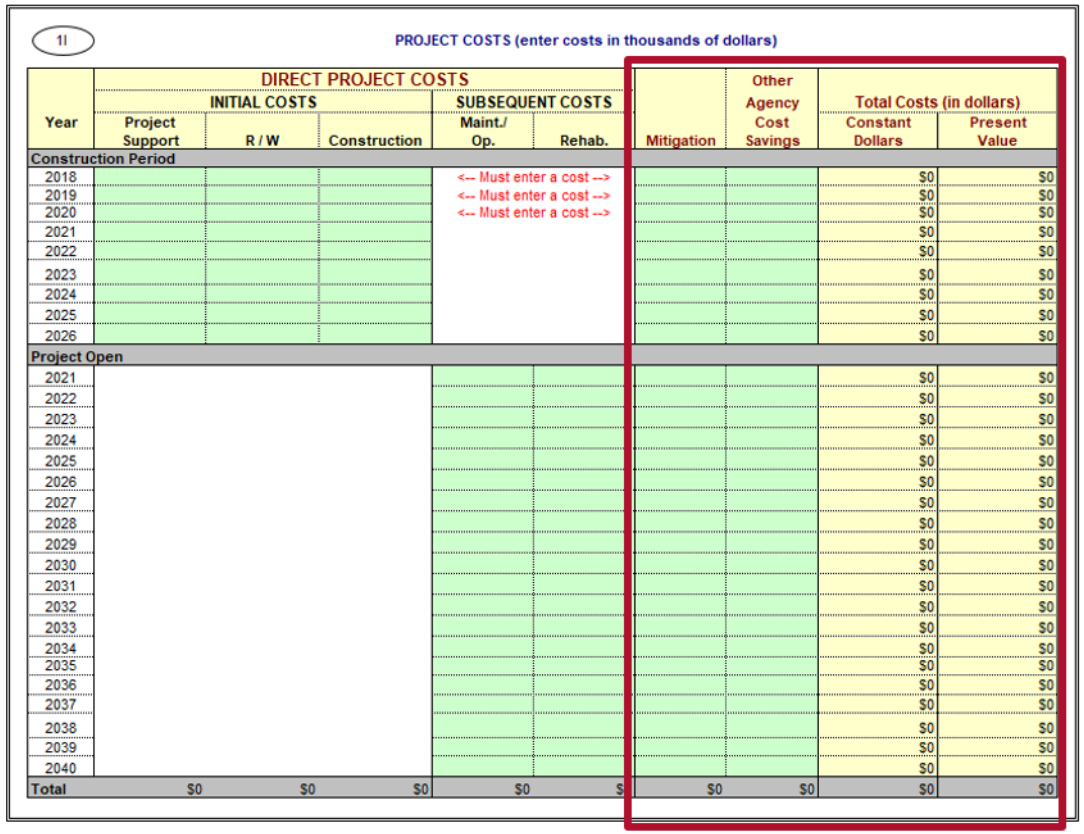
- Costs to mitigate community and environmental impacts

Other Agency Cost Savings

- Savings to agency due to efficiency improvements

Total Costs

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



1l

PROJECT COSTS (enter costs in thousands of dollars)

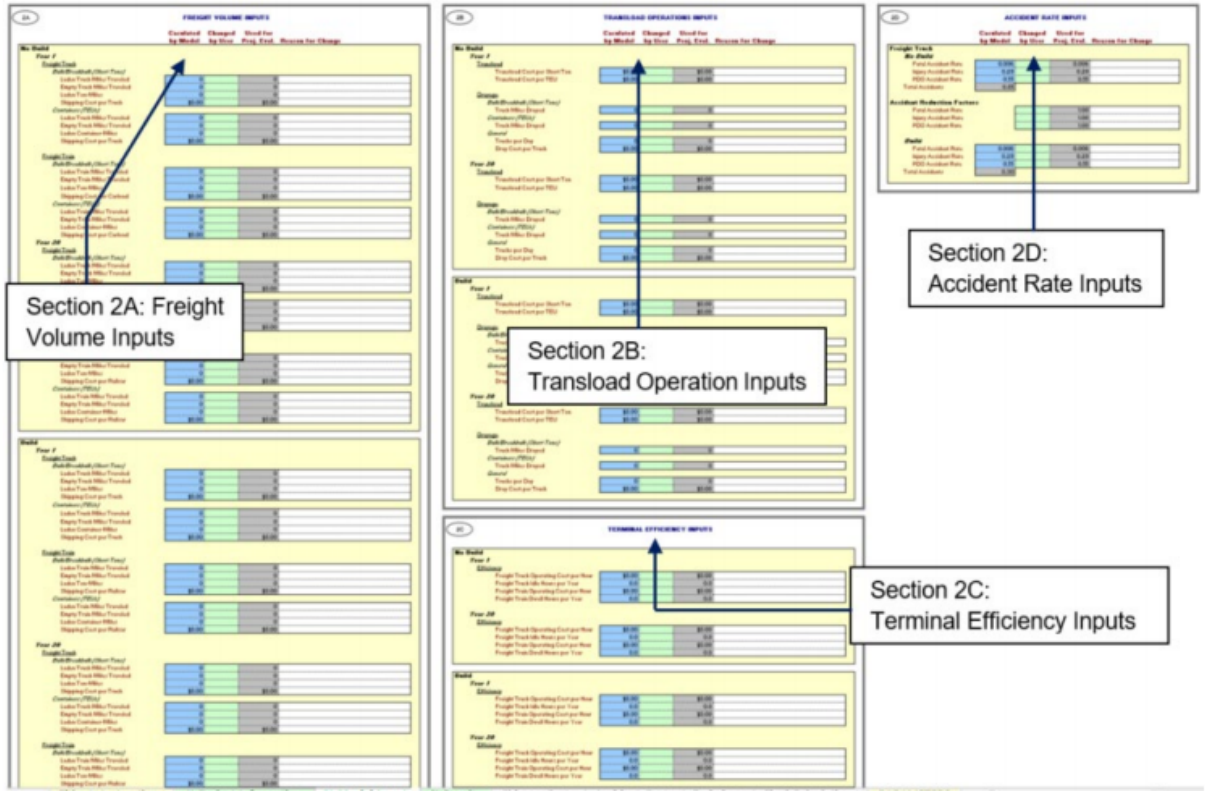
Year	DIRECT PROJECT COSTS					Mitigation	Other Agency Cost Savings	Total Costs (in dollars)	
	INITIAL COSTS			SUBSEQUENT COSTS					
	Project Support	R / W	Construction	Maint./ Op.	Rehab.			Constant Dollars	Present Value
Construction Period									
2018				<-- Must enter a cost -->				$0	$0
2019				<-- Must enter a cost -->				$0	$0
2020				<-- Must enter a cost -->				$0	$0
2021								$0	$0
2022								$0	$0
2023								$0	$0
2024								$0	$0
2025								$0	$0
2026								$0	$0
Project Open									
2021								$0	$0
2022								$0	$0
2023								$0	$0
2024								$0	$0
2025								$0	$0
2026								$0	$0
2027								$0	$0
2028								$0	$0
2029								$0	$0
2030								$0	$0
2031								$0	$0
2032								$0	$0
2033								$0	$0
2034								$0	$0
2035								$0	$0
2036								$0	$0
2037								$0	$0
2038								$0	$0
2039								$0	$0
2040								$0	$0
Total	$0	$0	$0	$0	$	$0	$0	$0	$0

04

Model Inputs Worksheet

Model Inputs Worksheet Overview

- Review this worksheet to make sure that your freight volume and transload operations input 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
- Specify “Reason for Change” 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



Model Inputs Worksheet Contents

- For Sections 2A to 2C, values are calculated for both the No Build and Build cases, the first year the project opens and the final year of the project lifecycle

2A Freight Volume Inputs

- Calculated values for laden and empty miles traveled, laden ton-miles, and shipping cost per truck and per railcar

2B Transload Operations Input

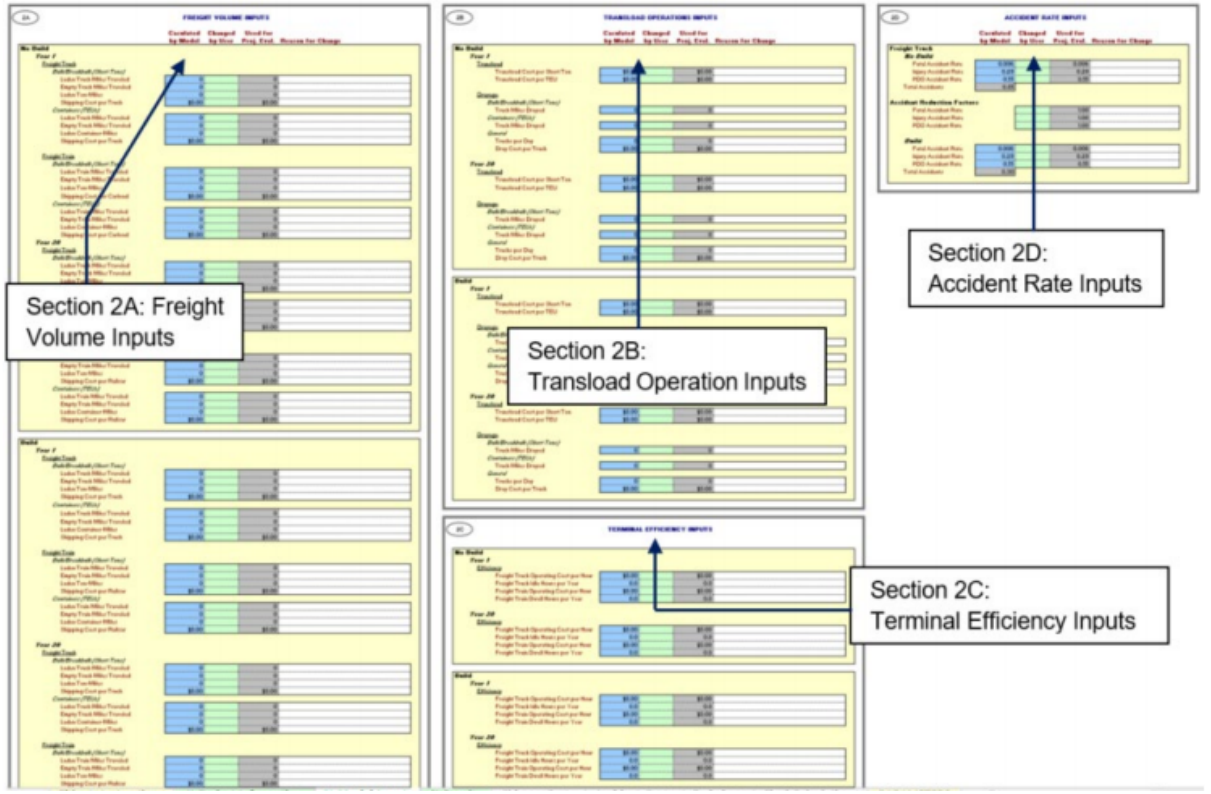
- Calculated values for transload cost per short ton and per TEU, truck miles drayed for bulk/break bulk and containers, trucks per day, and dray cost per truck

2C Terminal Efficiency Inputs

- Calculated values by mode for freight operating cost per hour and idle/dwell hours per year

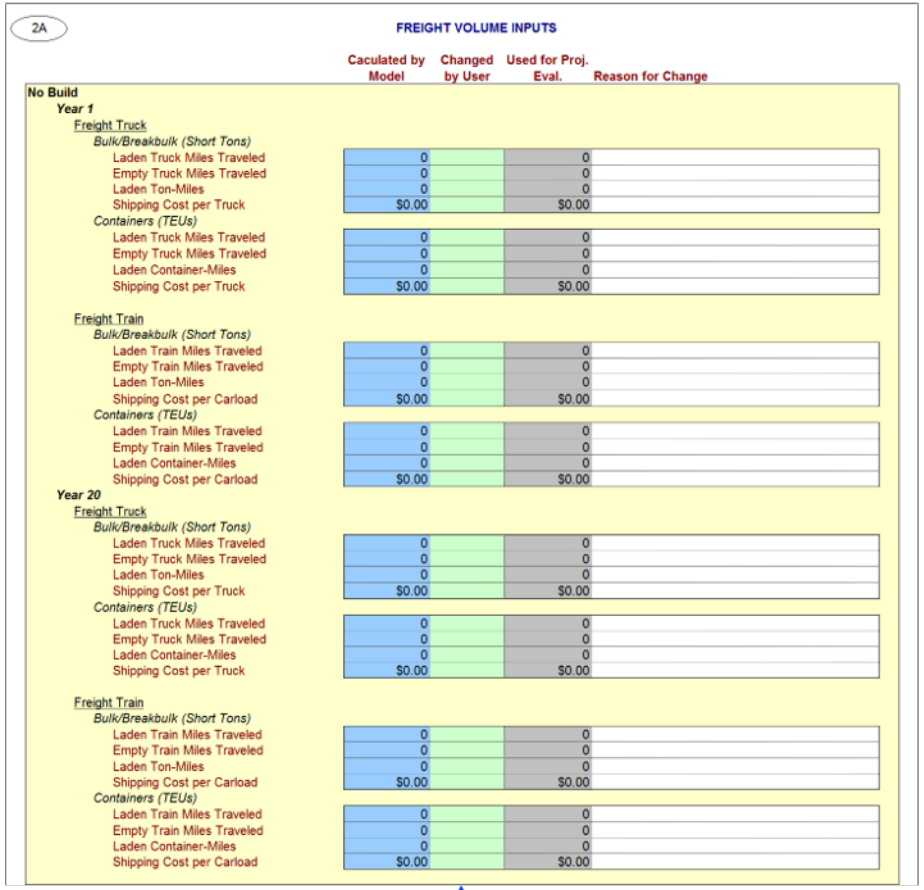
2D Accident Rates Input

- Calculated accident rates for freight trucks and accident reduction factor for each type of accident



Freight Volume Inputs

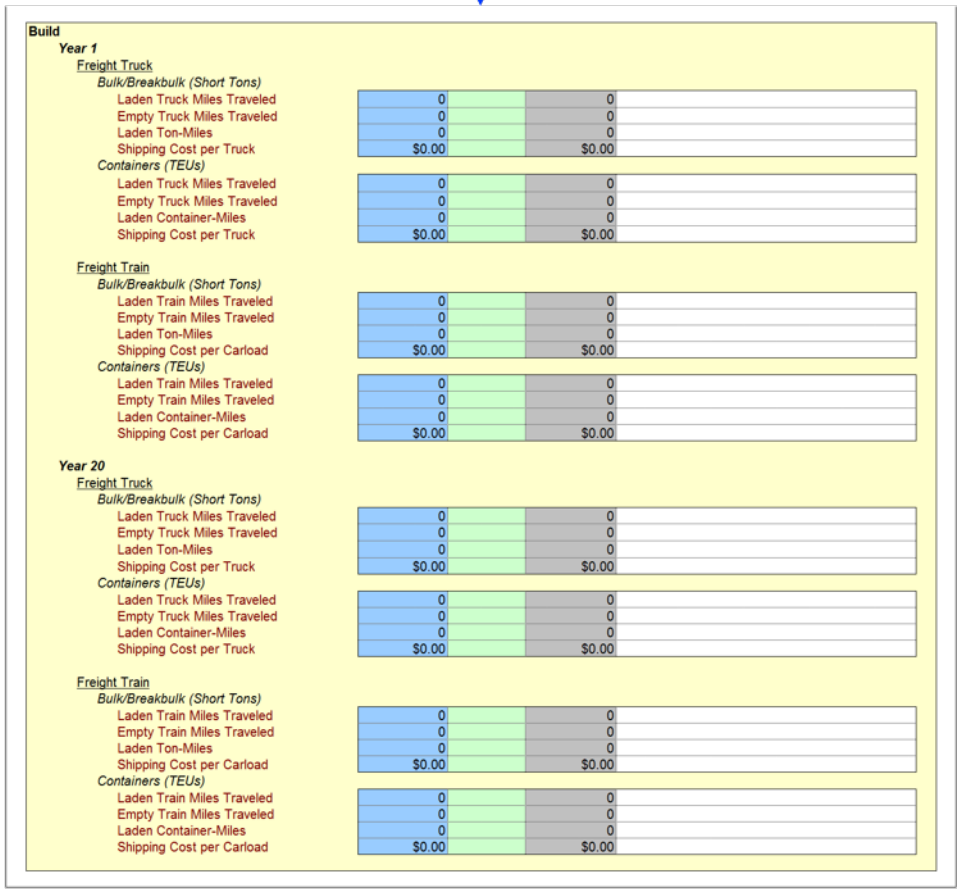
- Allows user to review the detailed trips, volumes, and shipping costs by mode and shipment type, estimated by the model



2A

FREIGHT VOLUME INPUTS

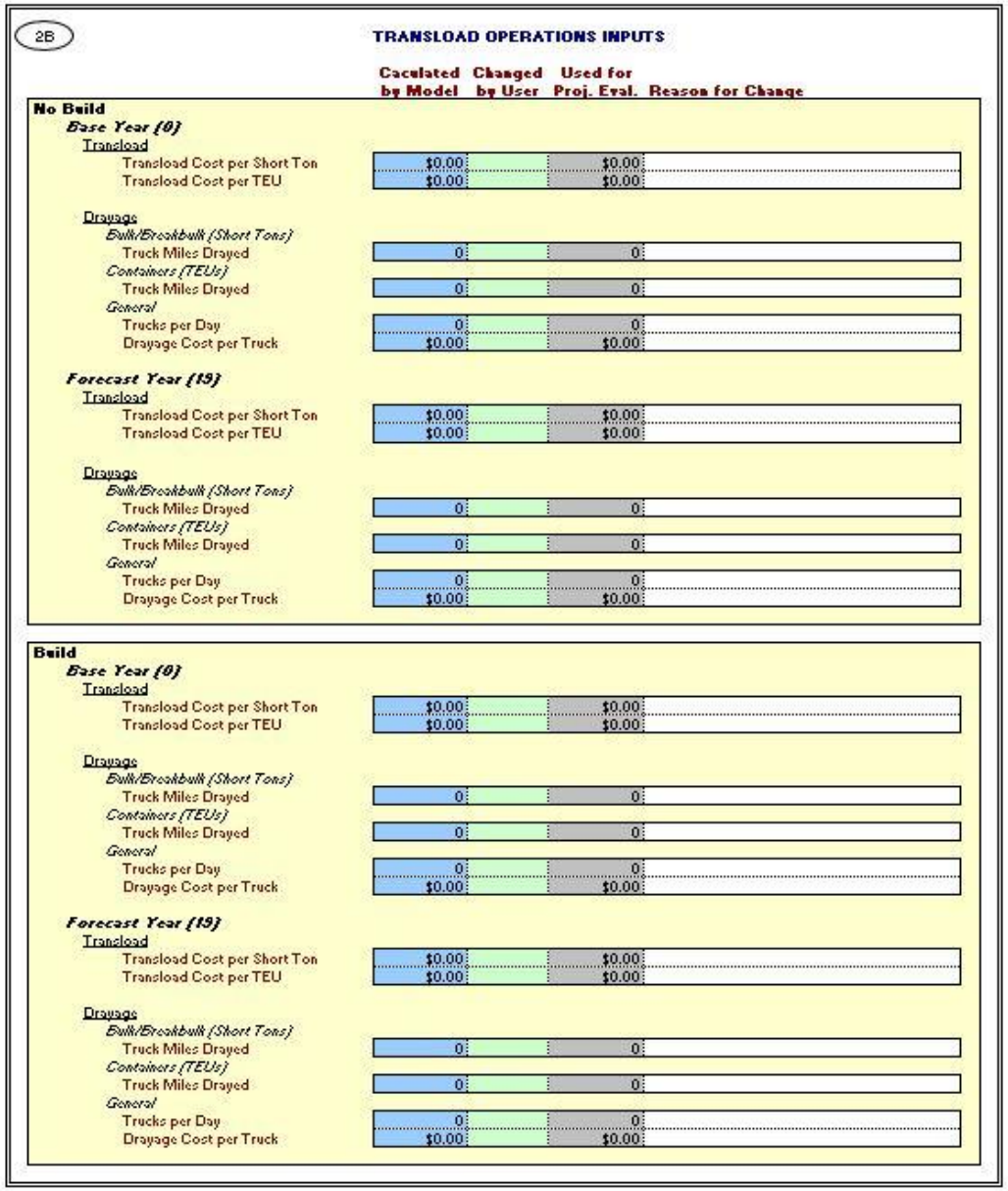
	Caculated by Model	Changed by User	Used for Proj. Eval.	Reason for Change
No Build				
Year 1				
Freight Truck				
Bulk/Breakbulk (Short Tons)				
Laden Truck Miles Traveled	0		0	
Empty Truck Miles Traveled	0		0	
Laden Ton-Miles	0		0	
Shipping Cost per Truck	$0.00		$0.00	
Containers (TEUs)				
Laden Truck Miles Traveled	0		0	
Empty Truck Miles Traveled	0		0	
Laden Container-Miles	0		0	
Shipping Cost per Truck	$0.00		$0.00	
Freight Train				
Bulk/Breakbulk (Short Tons)				
Laden Train Miles Traveled	0		0	
Empty Train Miles Traveled	0		0	
Laden Ton-Miles	0		0	
Shipping Cost per Carload	$0.00		$0.00	
Containers (TEUs)				
Laden Train Miles Traveled	0		0	
Empty Train Miles Traveled	0		0	
Laden Container-Miles	0		0	
Shipping Cost per Carload	$0.00		$0.00	
Year 20				
Freight Truck				
Bulk/Breakbulk (Short Tons)				
Laden Truck Miles Traveled	0		0	
Empty Truck Miles Traveled	0		0	
Laden Ton-Miles	0		0	
Shipping Cost per Truck	$0.00		$0.00	
Containers (TEUs)				
Laden Truck Miles Traveled	0		0	
Empty Truck Miles Traveled	0		0	
Laden Container-Miles	0		0	
Shipping Cost per Truck	$0.00		$0.00	
Freight Train				
Bulk/Breakbulk (Short Tons)				
Laden Train Miles Traveled	0		0	
Empty Train Miles Traveled	0		0	
Laden Ton-Miles	0		0	
Shipping Cost per Carload	$0.00		$0.00	
Containers (TEUs)				
Laden Train Miles Traveled	0		0	
Empty Train Miles Traveled	0		0	
Laden Container-Miles	0		0	
Shipping Cost per Carload	$0.00		$0.00	



Build			
Year 1			
Freight Truck			
Bulk/Breakbulk (Short Tons)			
Laden Truck Miles Traveled	0		0
Empty Truck Miles Traveled	0		0
Laden Ton-Miles	0		0
Shipping Cost per Truck	$0.00		$0.00
Containers (TEUs)			
Laden Truck Miles Traveled	0		0
Empty Truck Miles Traveled	0		0
Laden Container-Miles	0		0
Shipping Cost per Truck	$0.00		$0.00
Freight Train			
Bulk/Breakbulk (Short Tons)			
Laden Train Miles Traveled	0		0
Empty Train Miles Traveled	0		0
Laden Ton-Miles	0		0
Shipping Cost per Carload	$0.00		$0.00
Containers (TEUs)			
Laden Train Miles Traveled	0		0
Empty Train Miles Traveled	0		0
Laden Container-Miles	0		0
Shipping Cost per Carload	$0.00		$0.00
Year 20			
Freight Truck			
Bulk/Breakbulk (Short Tons)			
Laden Truck Miles Traveled	0		0
Empty Truck Miles Traveled	0		0
Laden Ton-Miles	0		0
Shipping Cost per Truck	$0.00		$0.00
Containers (TEUs)			
Laden Truck Miles Traveled	0		0
Empty Truck Miles Traveled	0		0
Laden Container-Miles	0		0
Shipping Cost per Truck	$0.00		$0.00
Freight Train			
Bulk/Breakbulk (Short Tons)			
Laden Train Miles Traveled	0		0
Empty Train Miles Traveled	0		0
Laden Ton-Miles	0		0
Shipping Cost per Carload	$0.00		$0.00
Containers (TEUs)			
Laden Train Miles Traveled	0		0
Empty Train Miles Traveled	0		0
Laden Container-Miles	0		0
Shipping Cost per Carload	$0.00		$0.00

Transload Operations Inputs

- Allows user to review detailed transload costs, distance drayed by shipment type, number of trucks used for drayage, and dray costs



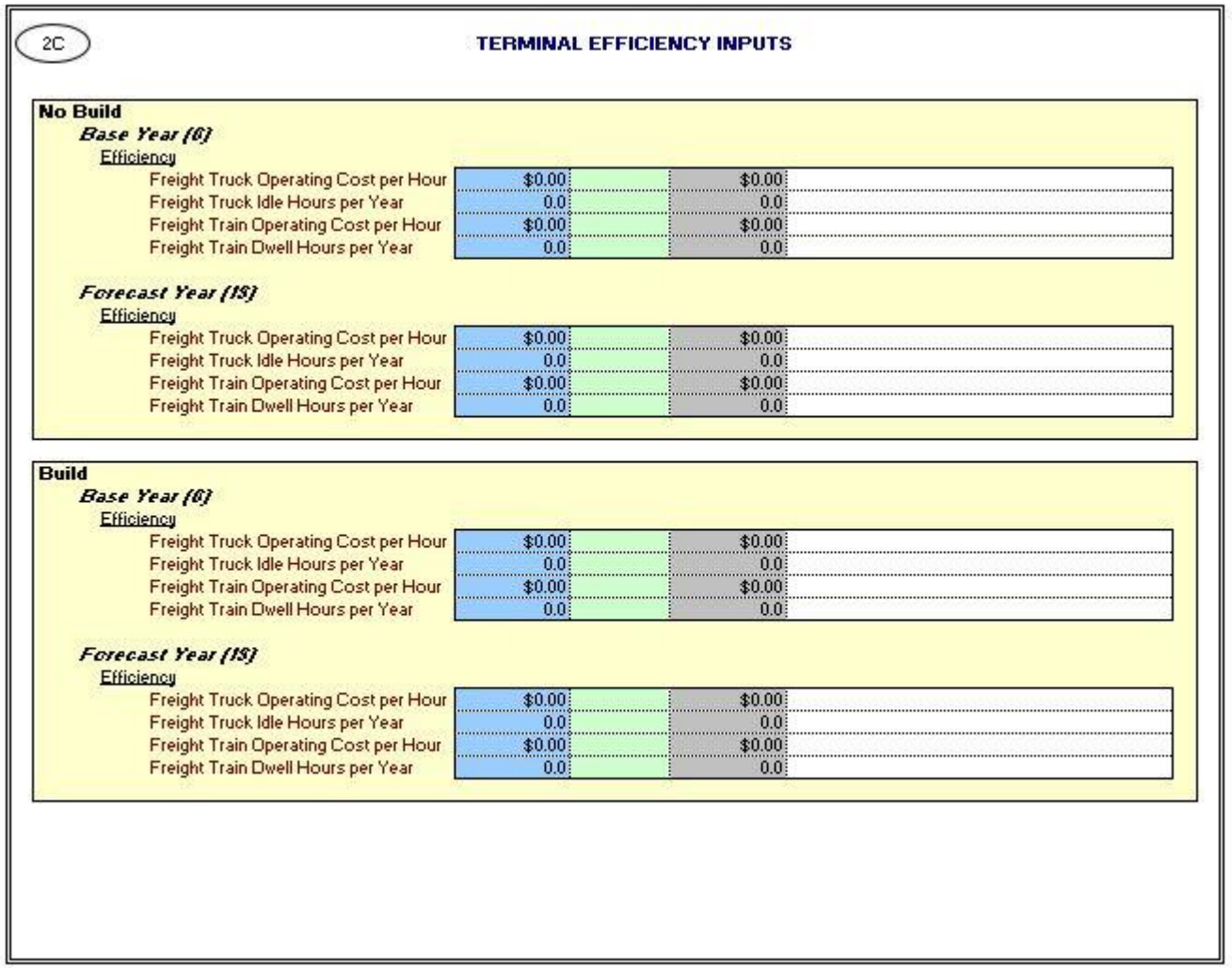
2B

TRANSLOAD OPERATIONS INPUTS

	Caculated by Model	Changed by User	Used for Proj. Eval.	Reason for Change
No Build				
Base Year (0)				
Transload				
Transload Cost per Short Ton	$0.00		$0.00	
Transload Cost per TEU	$0.00		$0.00	
Drayage				
Bulk/Breakbulk (Short Tons)				
Truck Miles Drayed	0		0	
Containers (TEUs)				
Truck Miles Drayed	0		0	
General				
Trucks per Day	0		0	
Drayage Cost per Truck	$0.00		$0.00	
Forecast Year (19)				
Transload				
Transload Cost per Short Ton	$0.00		$0.00	
Transload Cost per TEU	$0.00		$0.00	
Drayage				
Bulk/Breakbulk (Short Tons)				
Truck Miles Drayed	0		0	
Containers (TEUs)				
Truck Miles Drayed	0		0	
General				
Trucks per Day	0		0	
Drayage Cost per Truck	$0.00		$0.00	
Build				
Base Year (0)				
Transload				
Transload Cost per Short Ton	$0.00		$0.00	
Transload Cost per TEU	$0.00		$0.00	
Drayage				
Bulk/Breakbulk (Short Tons)				
Truck Miles Drayed	0		0	
Containers (TEUs)				
Truck Miles Drayed	0		0	
General				
Trucks per Day	0		0	
Drayage Cost per Truck	$0.00		$0.00	
Forecast Year (19)				
Transload				
Transload Cost per Short Ton	$0.00		$0.00	
Transload Cost per TEU	$0.00		$0.00	
Drayage				
Bulk/Breakbulk (Short Tons)				
Truck Miles Drayed	0		0	
Containers (TEUs)				
Truck Miles Drayed	0		0	
General				
Trucks per Day	0		0	
Drayage Cost per Truck	$0.00		$0.00	

Terminal Efficiency Inputs

- Allows user to review detailed annual idle/dwell time estimates and operating cost per hour by mode



2C

TERMINAL EFFICIENCY INPUTS

No Build

Base Year (6)

Efficiency

Freight Truck Operating Cost per Hour	$0.00		$0.00
Freight Truck Idle Hours per Year	0.0		0.0
Freight Train Operating Cost per Hour	$0.00		$0.00
Freight Train Dwell Hours per Year	0.0		0.0

Forecast Year (15)

Efficiency

Freight Truck Operating Cost per Hour	$0.00		$0.00
Freight Truck Idle Hours per Year	0.0		0.0
Freight Train Operating Cost per Hour	$0.00		$0.00
Freight Train Dwell Hours per Year	0.0		0.0

Build

Base Year (6)

Efficiency

Freight Truck Operating Cost per Hour	$0.00		$0.00
Freight Truck Idle Hours per Year	0.0		0.0
Freight Train Operating Cost per Hour	$0.00		$0.00
Freight Train Dwell Hours per Year	0.0		0.0

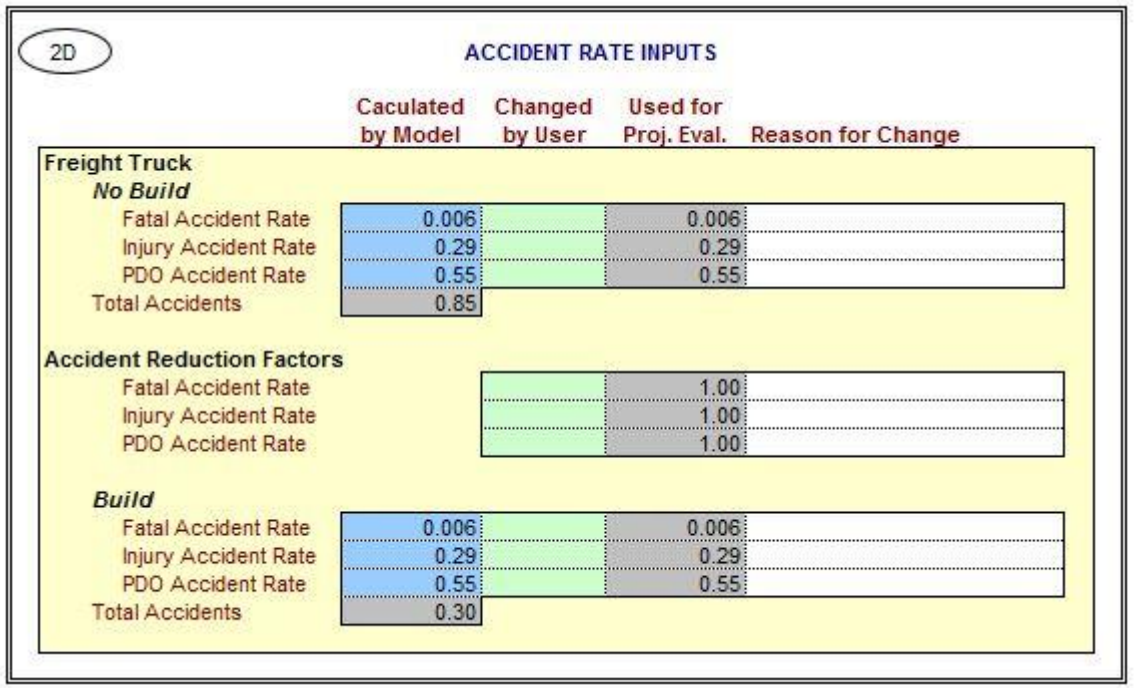
Forecast Year (15)

Efficiency

Freight Truck Operating Cost per Hour	$0.00		$0.00
Freight Truck Idle Hours per Year	0.0		0.0
Freight Train Operating Cost per Hour	$0.00		$0.00
Freight Train Dwell Hours per Year	0.0		0.0

Accident Rate Inputs

- Allows user to adjust accident rates used by the model for freight trucks



2D

ACCIDENT RATE INPUTS

	Caculated by Model	Changed by User	Used for Proj. Eval.	Reason for Change
Freight Truck				
No Build				
Fatal Accident Rate	0.006		0.006	
Injury Accident Rate	0.29		0.29	
PDO Accident Rate	0.55		0.55	
Total Accidents	0.85			
Accident Reduction Factors				
Fatal Accident Rate			1.00	
Injury Accident Rate			1.00	
PDO Accident Rate			1.00	
Build				
Fatal Accident Rate	0.006		0.006	
Injury Accident Rate	0.29		0.29	
PDO Accident Rate	0.55		0.55	
Total Accidents	0.30			

05

Results Worksheet

Model Results

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

3

INVESTMENT ANALYSIS
SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$316.3
Life-Cycle Benefits (mil. $)	$778.1
Net Present Value (mil. $)	$461.8
Benefit / Cost Ratio:	2.5
Rate of Return on Investment:	16.7%
Payback Period:	6 years

ITEMIZED BENEFITS (mil. $)	Total Over 20 Years	Average Annual
Shipper Cost Savings	$746.0	$37.3
Modal Diversion and Freight Network Improvements	$782.4	$39.1
Transload and Operational Efficiency Improvements	-$36.4	-$1.8
Accident Cost Savings	$30.3	$1.5
Emission Cost Savings	$1.8	$0.1
TOTAL BENEFITS	$778.1	$38.9

Should benefit-cost results include:

1) Shipper Costs? (y/n)	Y	Default = Y
2) Accident Costs? (y/n)	Y	Default = Y
3) Vehicle Emissions? (y/n) includes value for CO_2e	Y	Default = Y

EMISSIONS REDUCTION	Tons: Total Over 20 Years	Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	339	17	$0.0	$0.0
CO_2 Emissions Saved	439,543	21,977	$12.3	$0.6
NO_X Emissions Saved	-479	-24	-$9.6	-$0.5
PM_{10} Emissions Saved	-10	-1	-$2.1	-$0.1
$PM_{2.5}$ Emissions Saved	11	1		
SO_X Emissions Saved	9	0	$1.0	$0.0
VOC Emissions Saved	40	2	$0.1	$0.0

- Model results and how to interpret them were discussed in more detail in Module 3

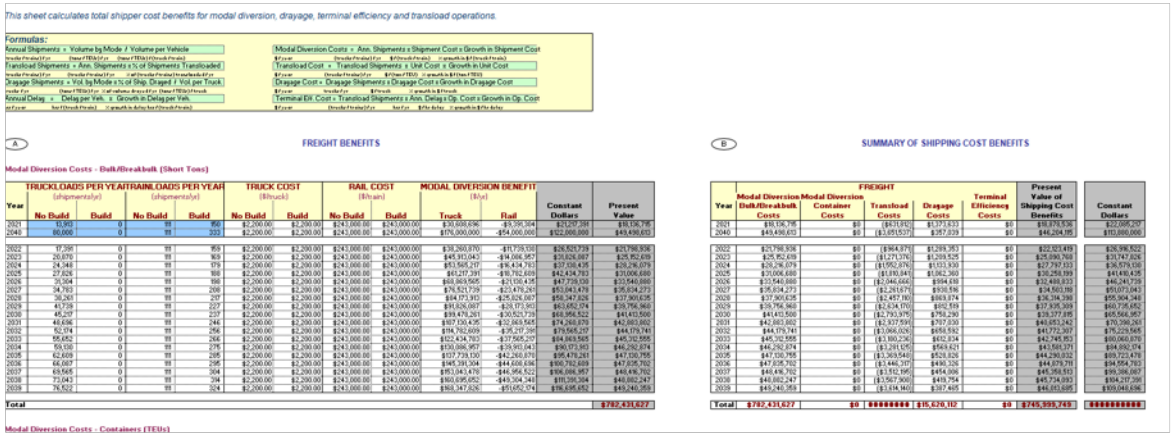
06

Additional Information

Detailed Calculations

- Discussed in more detail in Module 6c
- Produces detailed calculations for each benefit category
- Final Calculations Worksheet tabulates all the benefits and calculates the results
- Calculations provided by year and for modal diversion, drayage, terminal efficiency, and transload operations where applicable

Shipper Cost Savings

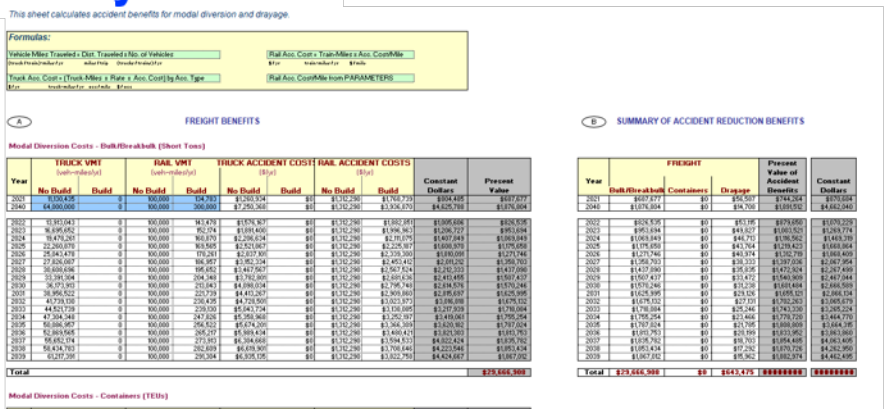

This sheet calculates total shipper cost benefits for modal diversion, drayage, terminal efficiency and transload operations.

Formulas:

FREIGHT BENEFITS

SUMMARY OF SHIPPING COST BENEFITS

Safety Benefits

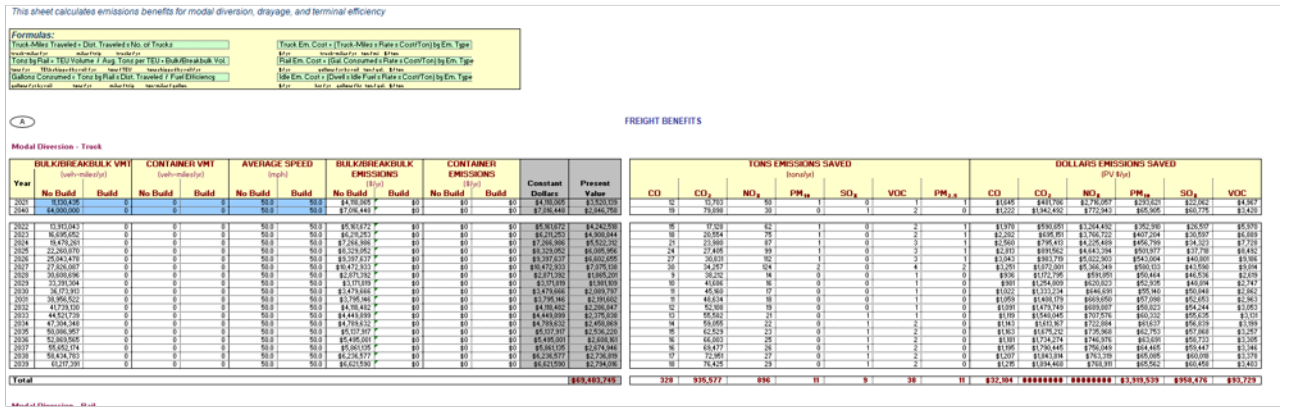

This sheet calculates accident benefits for modal diversion and drayage.

Formulas:

FREIGHT BENEFITS

SUMMARY OF ACCIDENT REDUCTION BENEFITS

Emissions Benefits


This sheet calculates emissions benefits for modal diversion, drayage, and terminal efficiency

Formulas:

FREIGHT BENEFITS

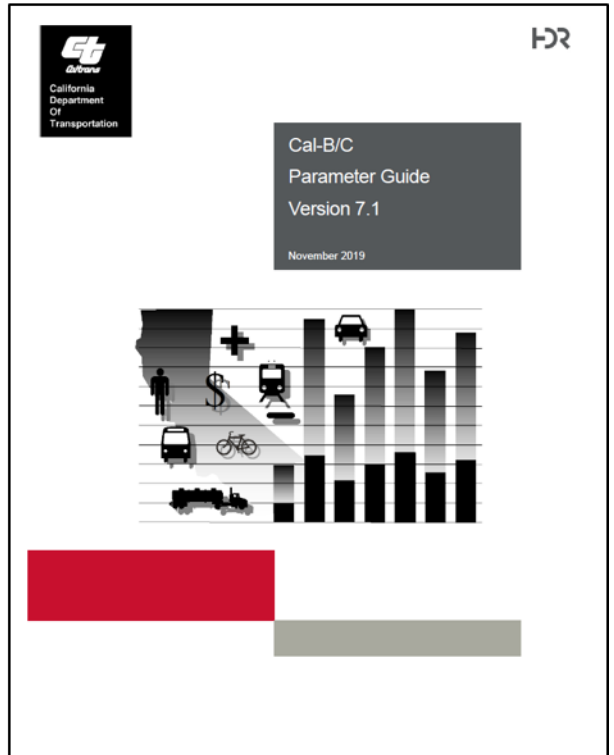
Cal-B/C IF User's Guide

- 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 for all Cal-B/C tools

User's Guide

Parameter Guide



07

Conclusion

In this module, you learned…

- What Cal-B/C IF is and were provided an overview of the tool
- How to determine if Cal-B/C IF 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 IF

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 4d** (Cal-B/C Park-and-Ride)
- 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)