Cal-B/C Training Module 9e

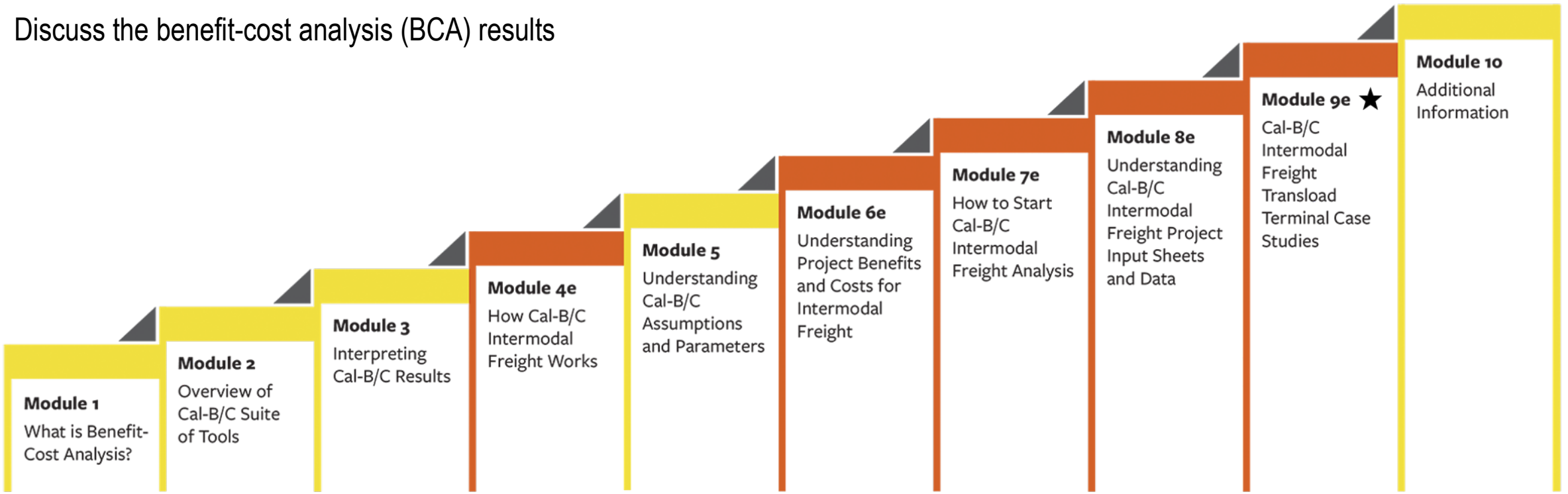
Cal-B/C Intermodal Freight (IF) Case Study – New Transload Terminal at Port

01

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



★ *This module is covered in this presentation*

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

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

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

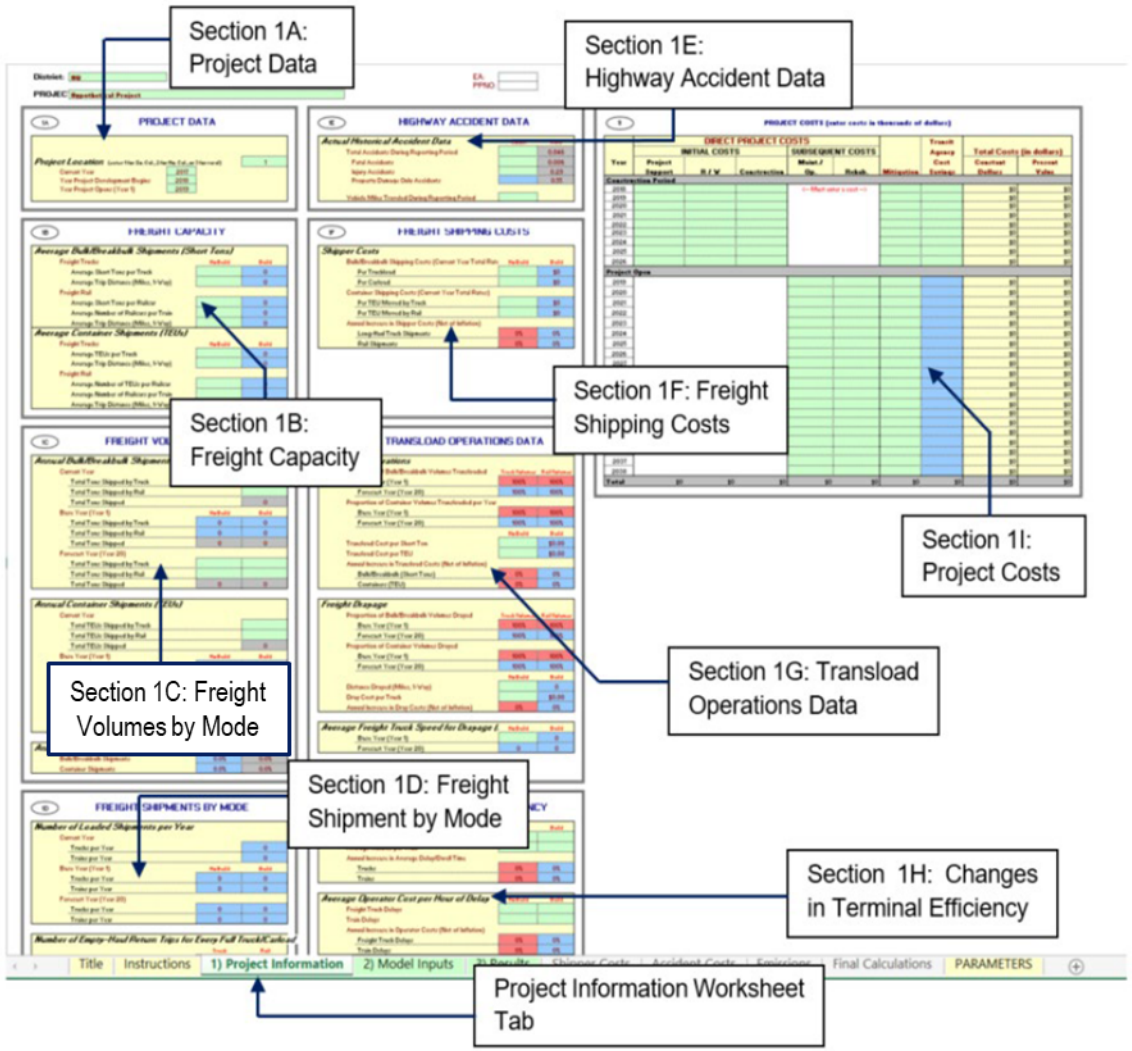
- Required for all projects

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

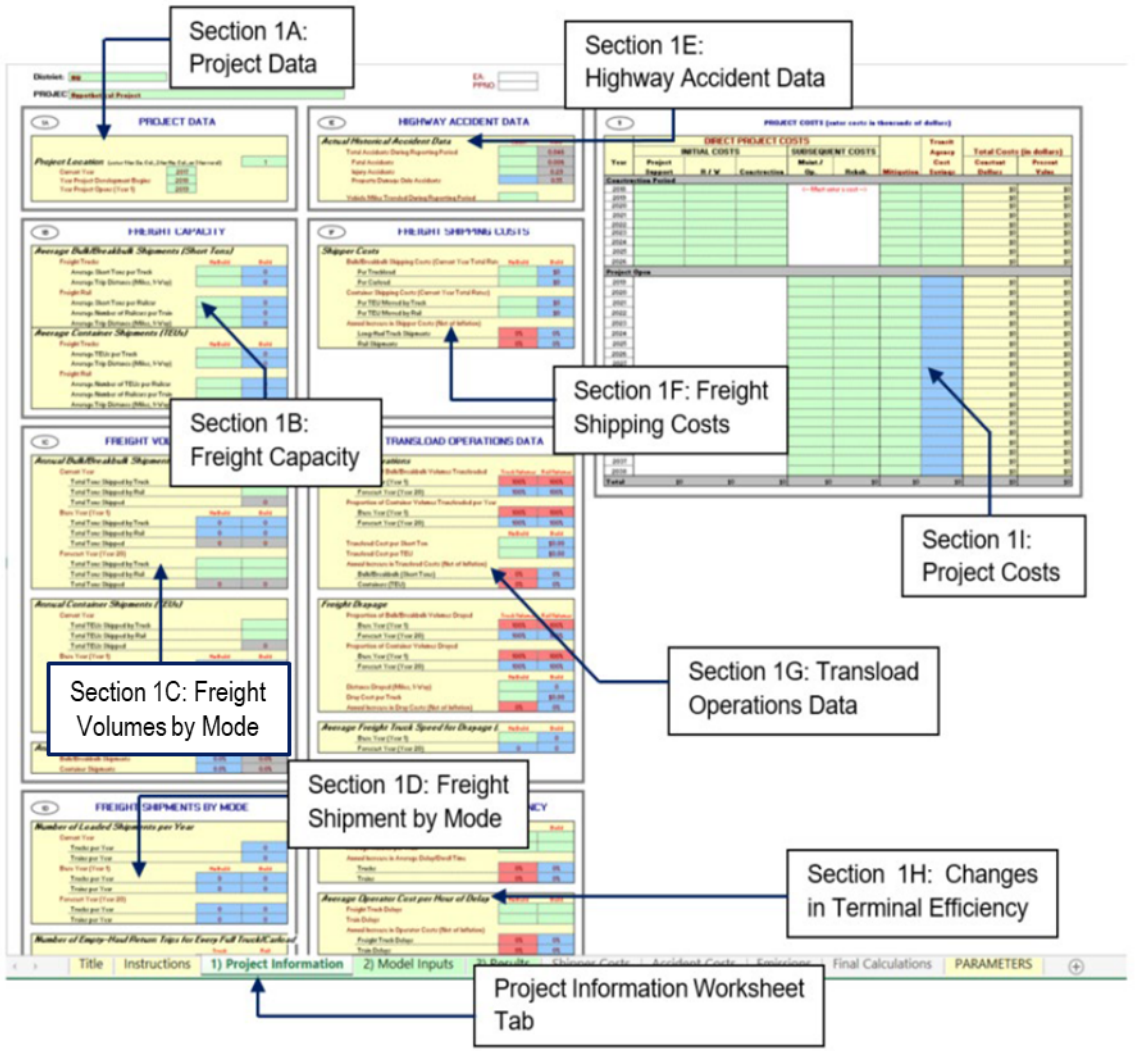
- Calculated values for total number of trucks and trains
- Number of empty-haul returns
- Average truck speeds (for emissions benefits)

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

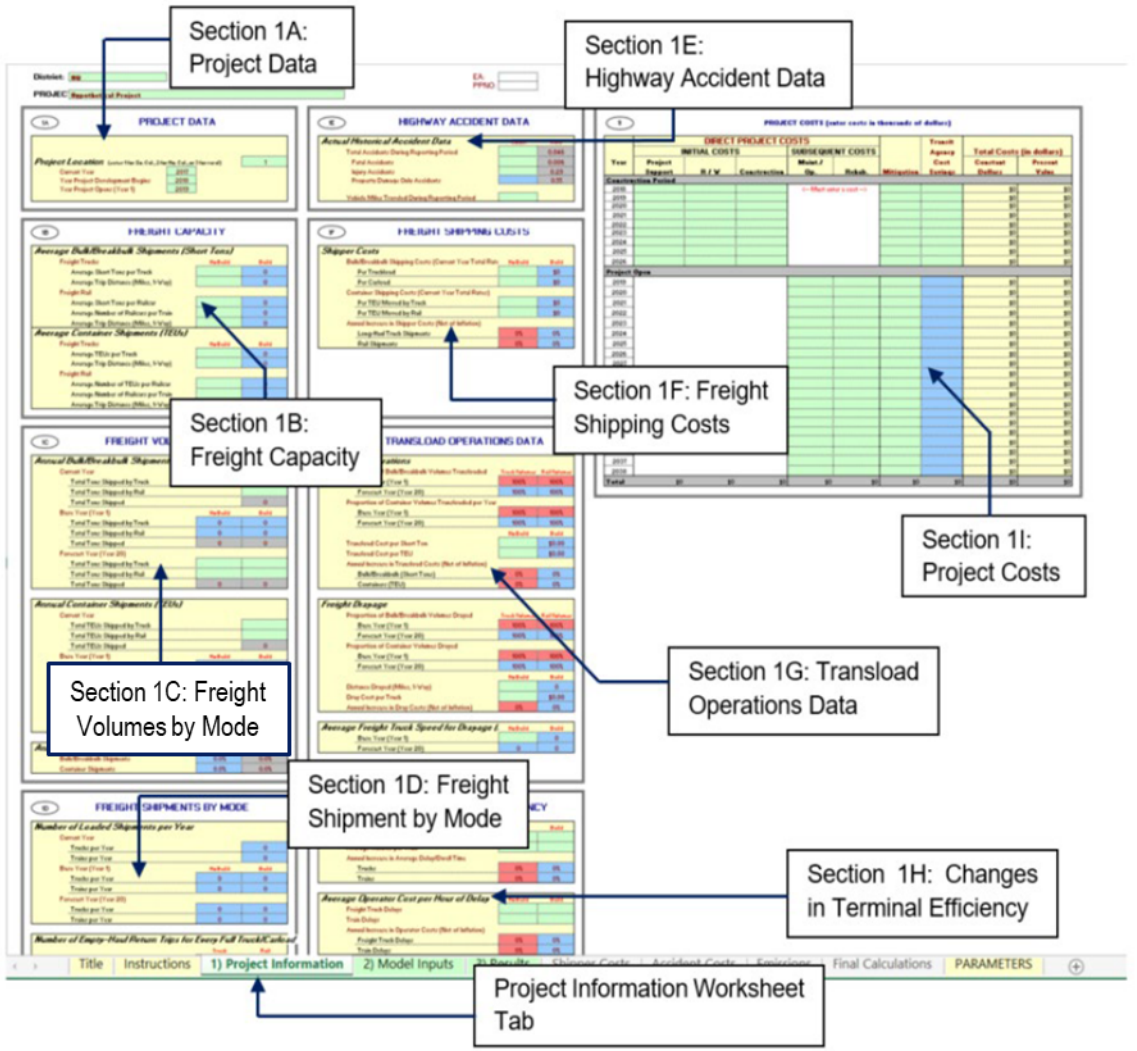
- Required data for freight projects that include changes in transloading operations or drayage

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)

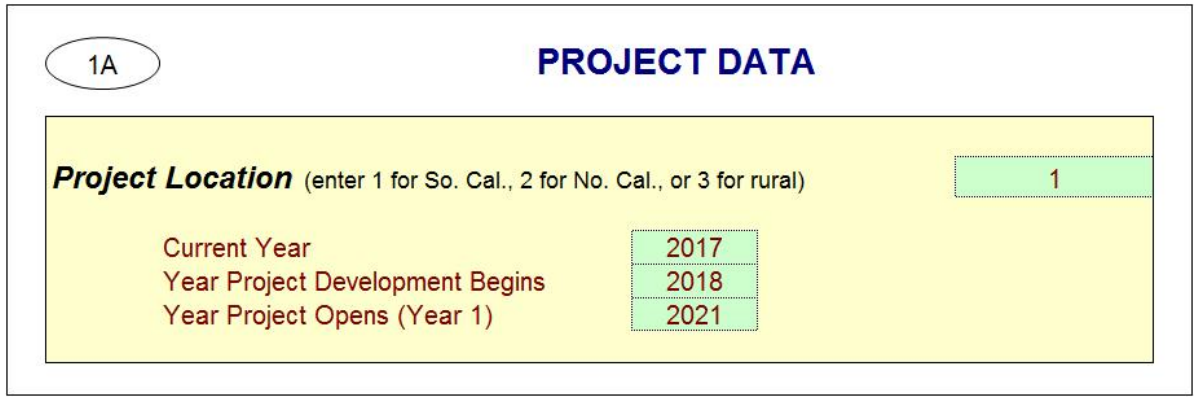
No Build Case:

- 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 Information:

- Located in Southern California
- Construction Period of 3 years (2018-2020)
- Transload terminal will open in 2021

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.

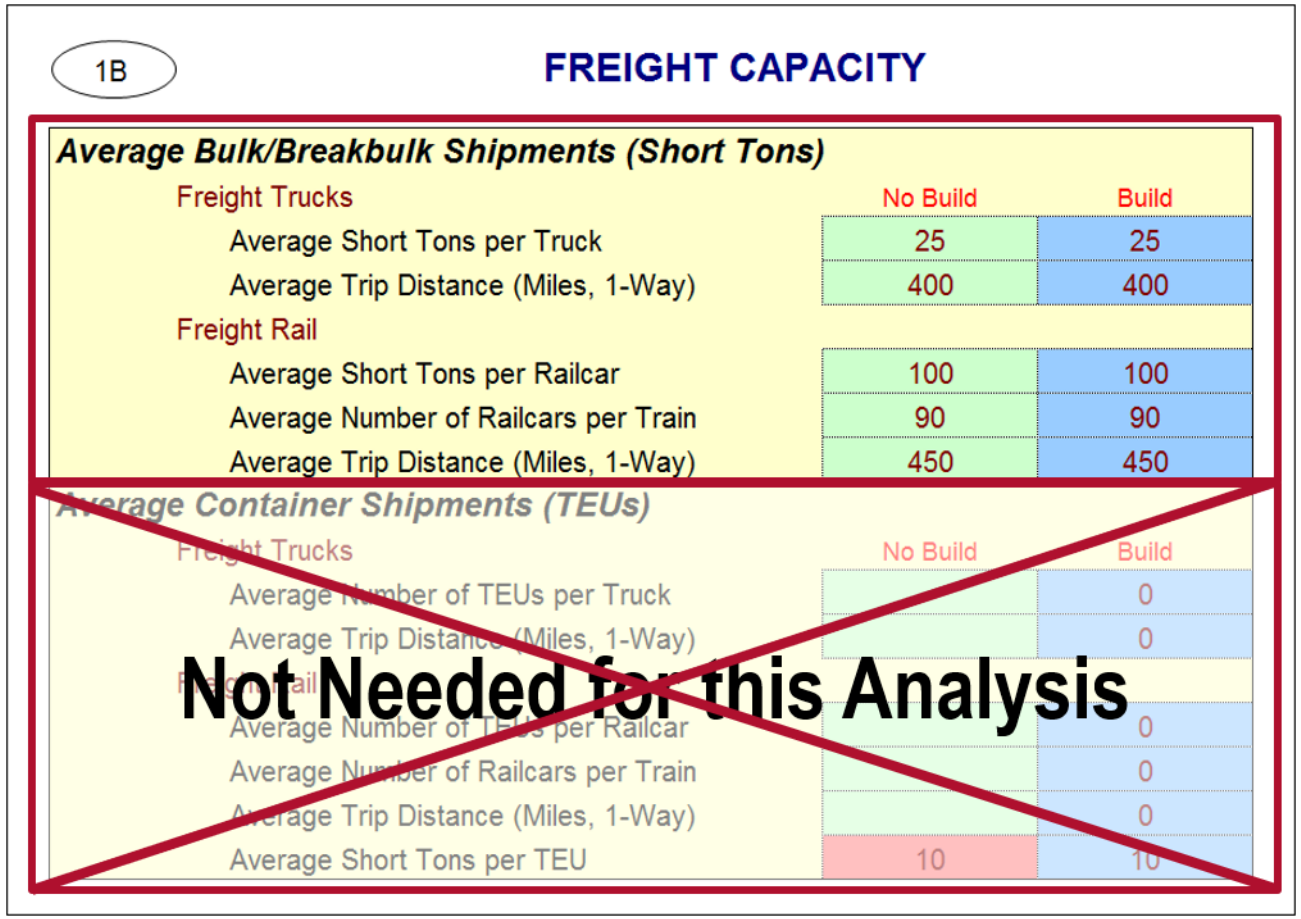
Year Project Opens

- Enter **"2021"** since the new transload terminal is slated to open in 2021.

1B) Enter Freight Capacity Data

Average Bulk/Breakbulk Shipments (Short Tons)

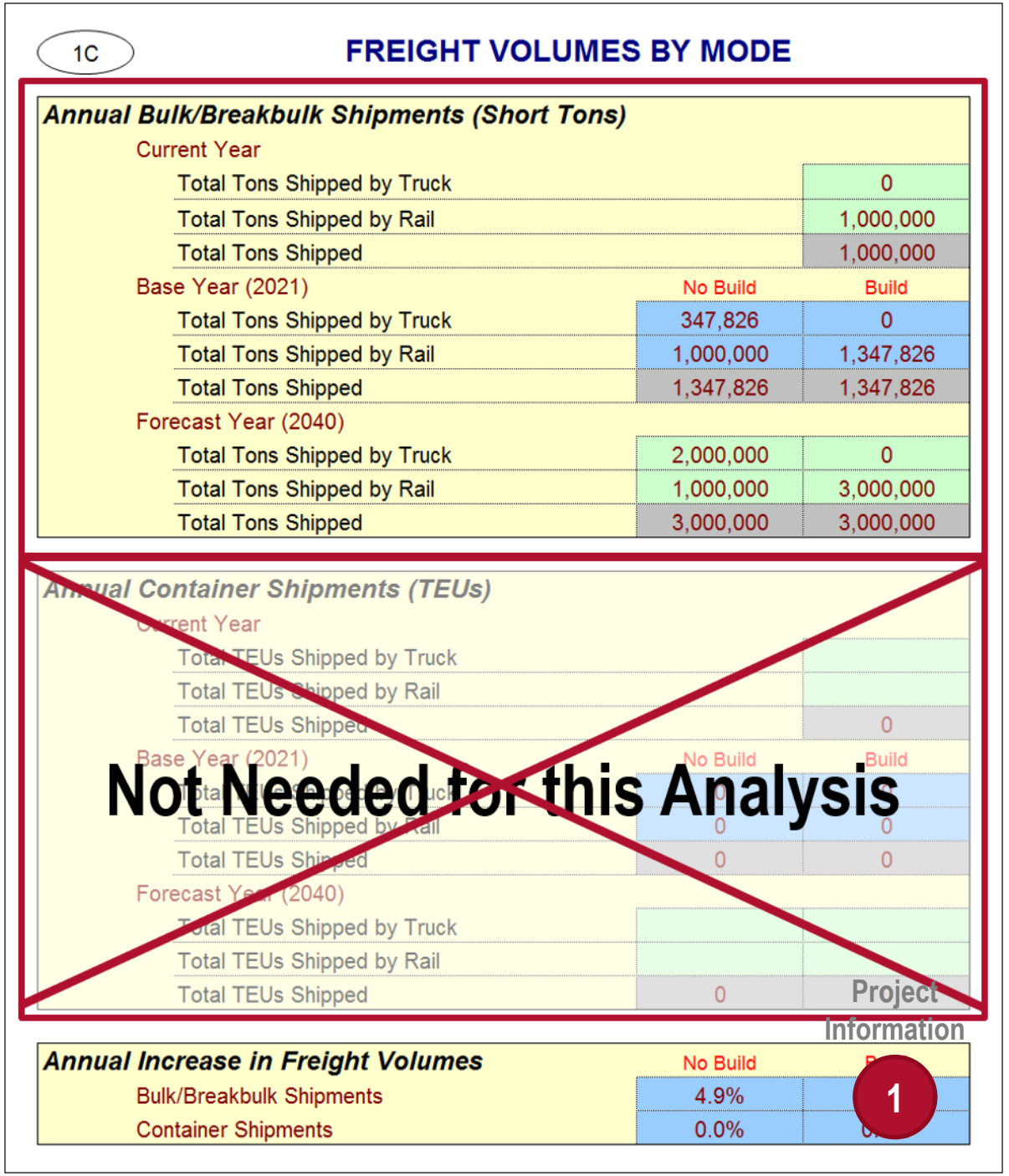
- Each truck transports "**25**" tons
- Market designations are on average "**400**" miles away by highway (one-way)
- Each railcar carries "**100**" tons with "**90**" railcars per train
- Trains transport commodities at an average of "**450**" miles to reach the market (less direct route than trucking)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



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

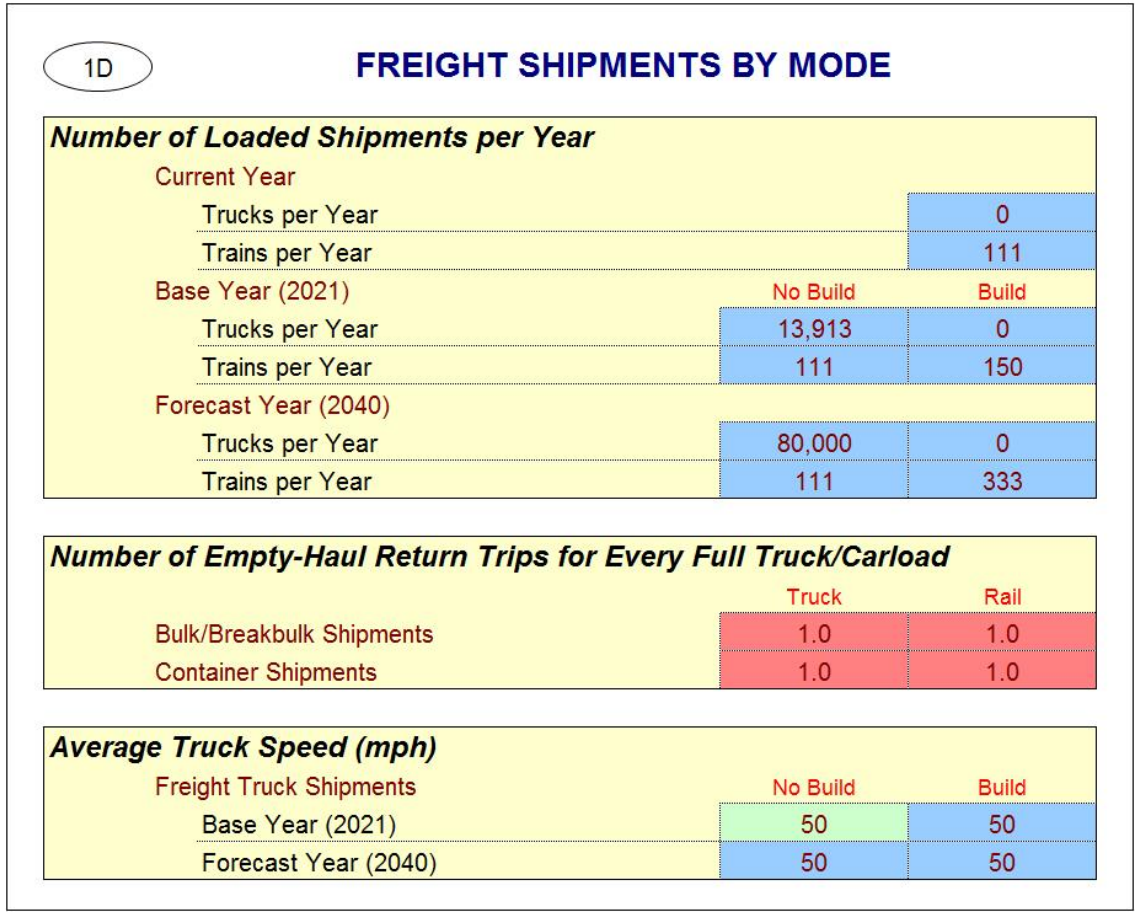
- Cal-B/C IF calculates the number of trains and trucks per year in the current, base and forecast years based on volumes and capacity information entered in 1B and 1C
- User may override these values if more accurate data is available

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)*.



1D

FREIGHT SHIPMENTS BY MODE

Number of Loaded Shipments per Year

Current Year		
Trucks per Year		0
Trains per Year		111
Base Year (2021)	No Build	Build
Trucks per Year	13,913	0
Trains per Year	111	150
Forecast Year (2040)		
Trucks per Year	80,000	0
Trains per Year	111	333

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

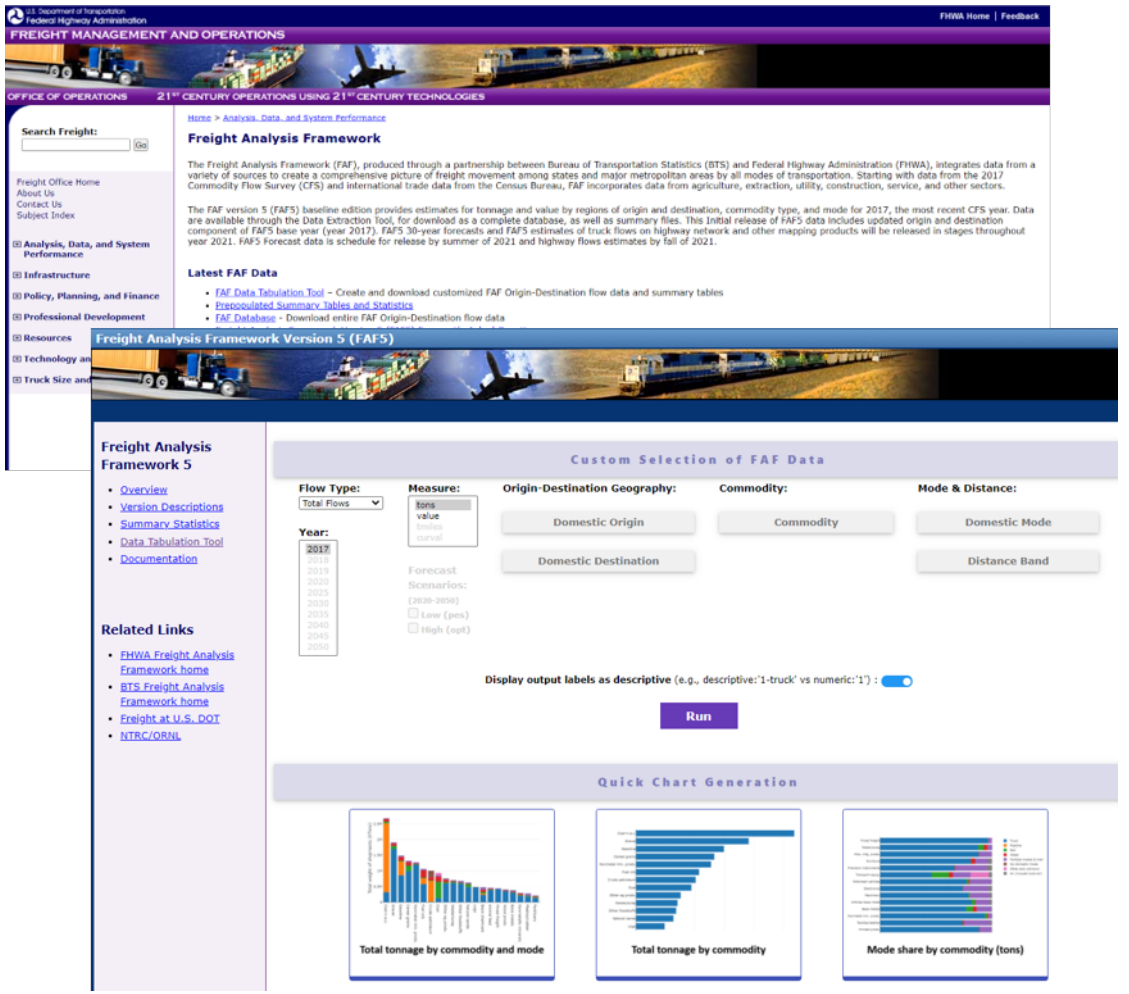
	Truck	Rail
Bulk/Breakbulk Shipments	1.0	1.0
Container Shipments	1.0	1.0

Average Truck Speed (mph)

Freight Truck Shipments	No Build	Build
Base Year (2021)	50	50
Forecast Year (2040)	50	50

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
- https://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm



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.

1E

HIGHWAY ACCIDENT DATA

Actual Historical Accident Data	Count	Rate
Total Accidents During Reporting Period		0.846
Fatal Accidents		0.006
Injury Accidents		0.29
Property Damage Only Accidents		0.55
Vehicle-Miles Traveled During Reporting Period		

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

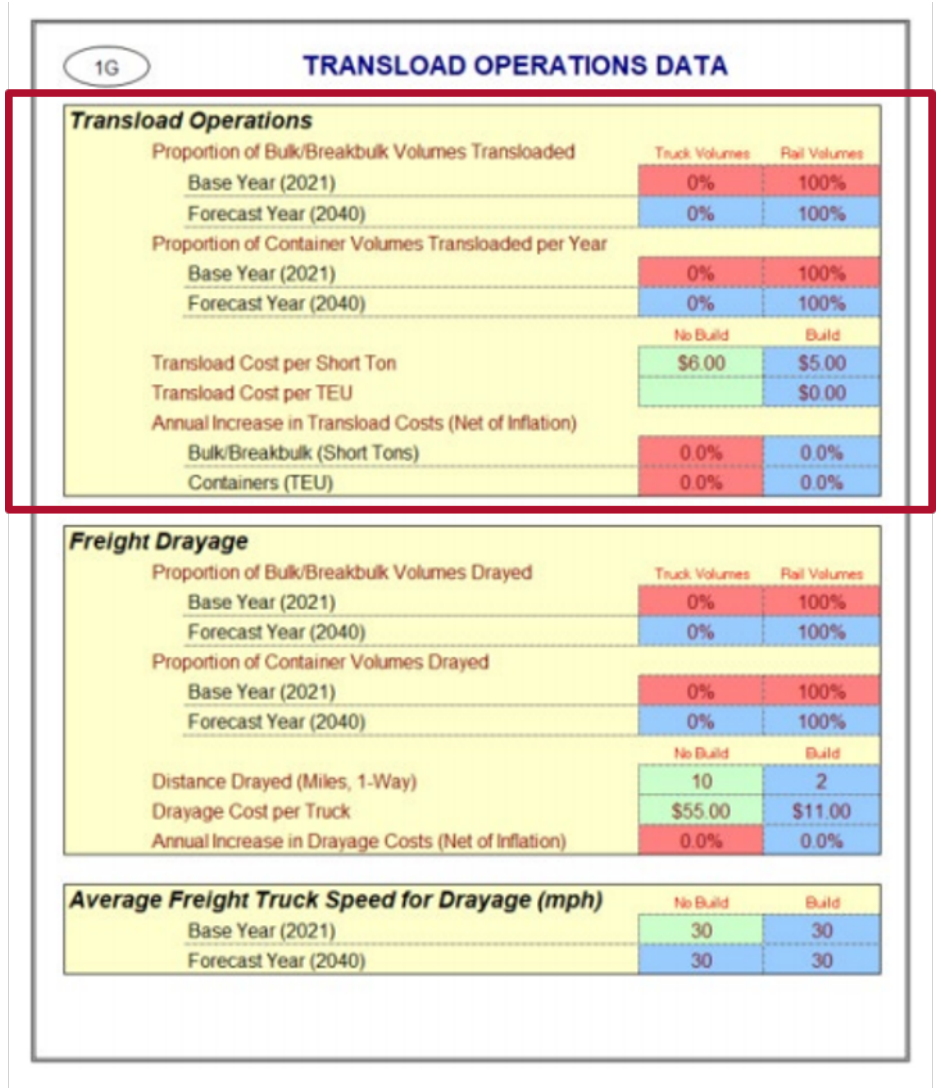
Annual Increase in Shipper Costs (Net of Inflation)

- 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 "**$6.00**" per ton
- Cost of transload at new and more efficient facility is "**$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



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TRANSLOAD OPERATIONS DATA

Transload Operations		
Proportion of Bulk/Breakbulk Volumes Transloaded	Truck Volumes	Rail Volumes
Base Year (2021)	0%	100%
Forecast Year (2040)	0%	100%
Proportion of Container Volumes Transloaded per Year		
Base Year (2021)	0%	100%
Forecast Year (2040)	0%	100%
	No Build	Build
Transload Cost per Short Ton	$6.00	$5.00
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%

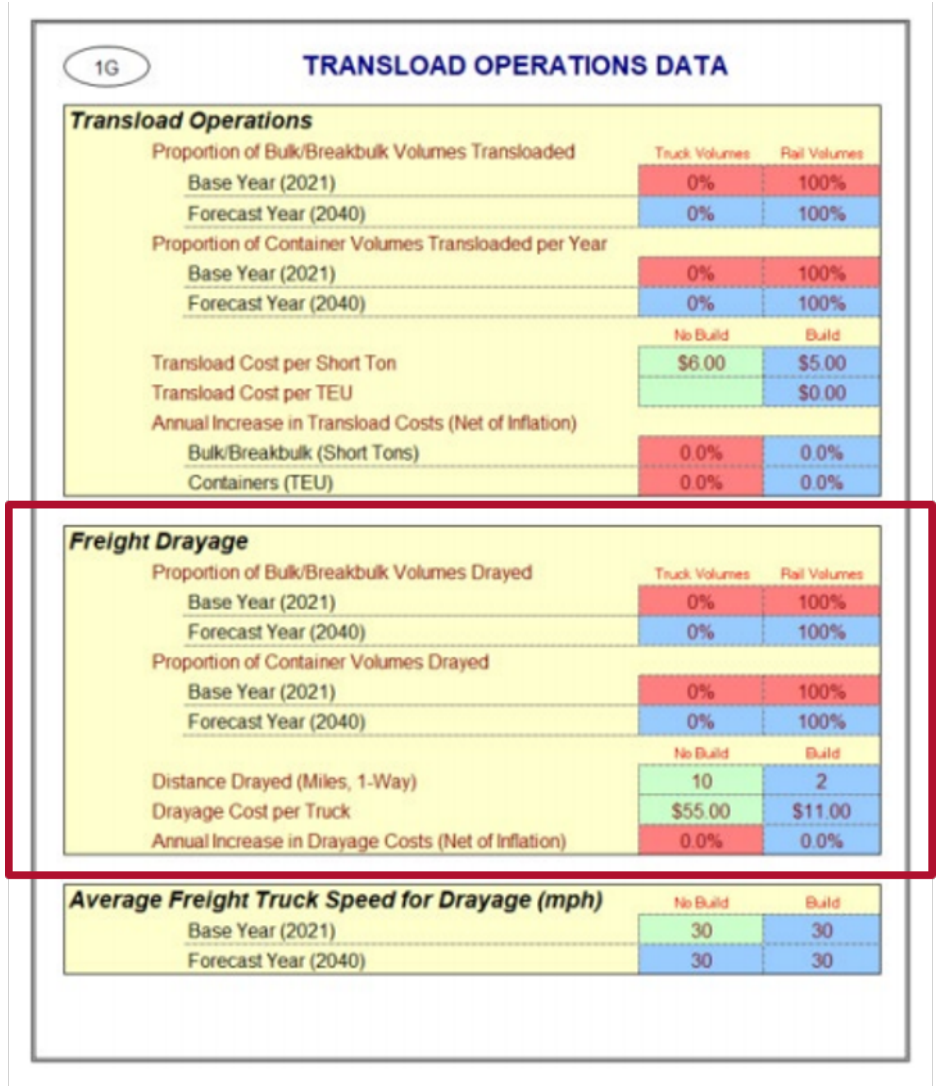
Freight Drayage		
Proportion of Bulk/Breakbulk Volumes Drayed	Truck Volumes	Rail Volumes
Base Year (2021)	0%	100%
Forecast Year (2040)	0%	100%
Proportion of Container Volumes Drayed		
Base Year (2021)	0%	100%
Forecast Year (2040)	0%	100%
	No Build	Build
Distance Drayed (Miles, 1-Way)	10	2
Drayage Cost per Truck	$55.00	$11.00
Annual Increase in Drayage Costs (Net of Inflation)	0.0%	0.0%

Average Freight Truck Speed for Drayage (mph)	No Build	Build
Base Year (2021)	30	30
Forecast Year (2040)	30	30

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

TRANSLOAD OPERATIONS DATA

Transload Operations		
Proportion of Bulk/Breakbulk Volumes Transloaded	Truck Volumes	Rail Volumes
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Proportion of Container Volumes Transloaded per Year		
Base Year (2021)	0%	100%
Forecast Year (2040)	0%	100%
	No Build	Build
Transload Cost per Short Ton	$6.00	$5.00
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 (2021)	0%	100%
Forecast Year (2040)	0%	100%
Proportion of Container Volumes Drayed		
Base Year (2021)	0%	100%
Forecast Year (2040)	0%	100%
	No Build	Build
Distance Drayed (Miles, 1-Way)	10	2
Drayage Cost per Truck	$55.00	$11.00
Annual Increase in Drayage Costs (Net of Inflation)	0.0%	0.0%

Average Freight Truck Speed for Drayage (mph)	No Build	Build
Base Year (2021)	30	30
Forecast Year (2040)	30	30

1G) Enter Transload Operations Data

Average Freight Truck Speed for Drayage

- Average truck speed for drayage movements is "**30**" miles per hour

1G

TRANSLOAD OPERATIONS DATA

Transload Operations		
Proportion of Bulk/Breakbulk Volumes Transloaded	Truck Volumes	Rail Volumes
Base Year (2021)	0%	100%
Forecast Year (2040)	0%	100%
Proportion of Container Volumes Transloaded per Year		
Base Year (2021)	0%	100%
Forecast Year (2040)	0%	100%
	No Build	Build
Transload Cost per Short Ton	$6.00	$5.00
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
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Proportion of Container Volumes Drayed		
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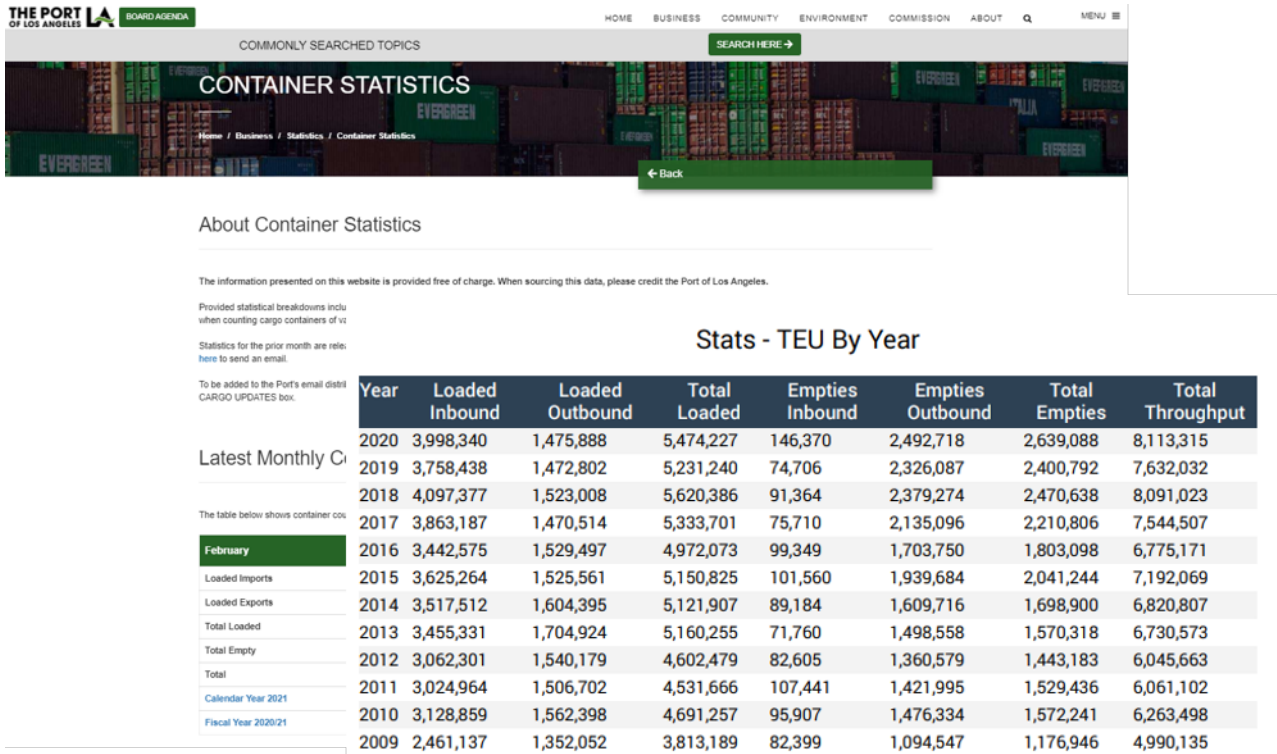
Distance Drayed (Miles, 1-Way)	10	2
Drayage Cost per Truck	$55.00	$11.00
Annual Increase in Drayage Costs (Net of Inflation)	0.0%	0.0%
Average Freight Truck Speed for Drayage (mph)	No Build	Build
Base Year (2021)	30	30
Forecast Year (2040)	30	30

- 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

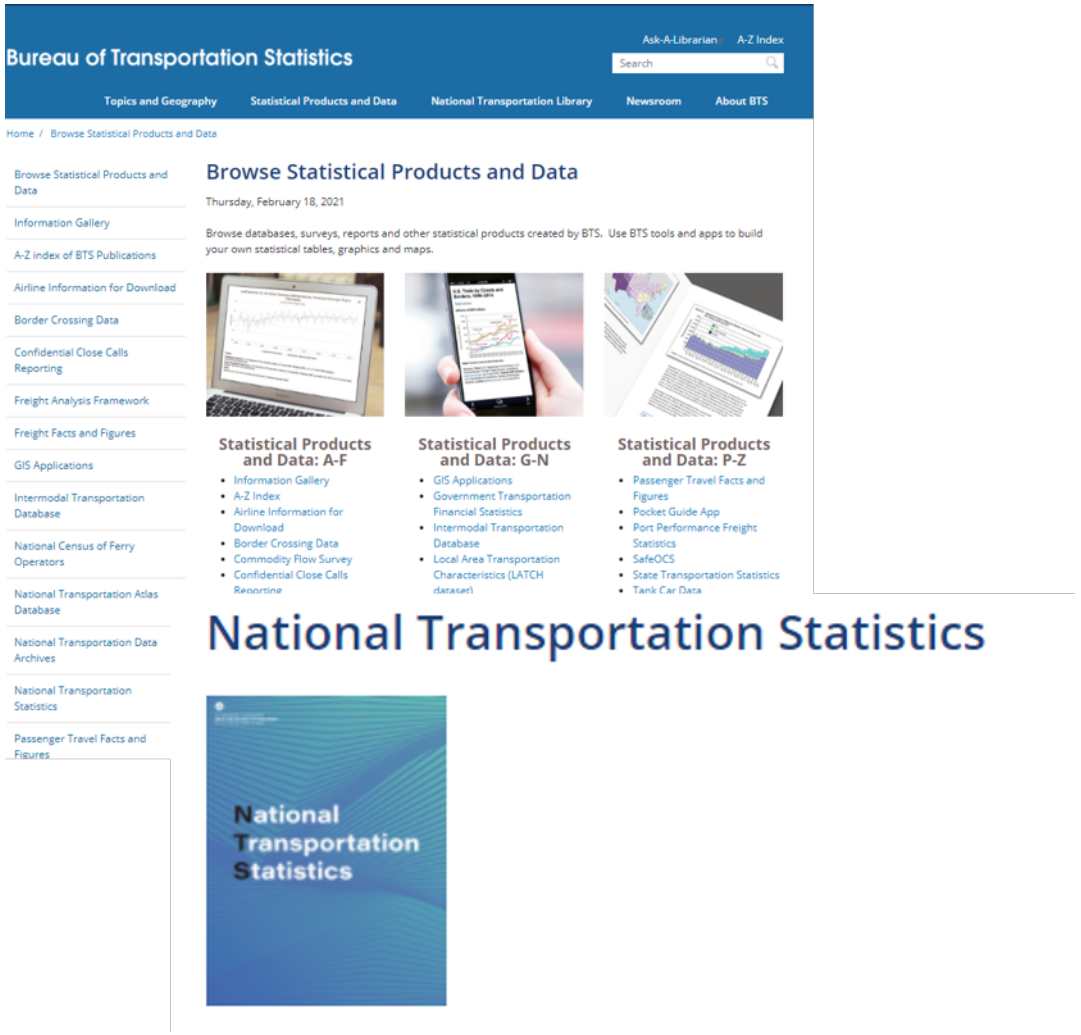


Stats - TEU By Year

Year	Loaded Inbound	Loaded Outbound	Total Loaded	Empties Inbound	Empties Outbound	Total Empties	Total Throughput
2020	3,998,340	1,475,888	5,474,227	146,370	2,492,718	2,639,088	8,113,315
2019	3,758,438	1,472,802	5,231,240	74,706	2,326,087	2,400,792	7,632,032
2018	4,097,377	1,523,008	5,620,386	91,364	2,379,274	2,470,638	8,091,023
2017	3,863,187	1,470,514	5,333,701	75,710	2,135,096	2,210,806	7,544,507
2016	3,442,575	1,529,497	4,972,073	99,349	1,703,750	1,803,098	6,775,171
2015	3,625,264	1,525,561	5,150,825	101,560	1,939,684	2,041,244	7,192,069
2014	3,517,512	1,604,395	5,121,907	89,184	1,609,716	1,698,900	6,820,807
2013	3,455,331	1,704,924	5,160,255	71,760	1,498,558	1,570,318	6,730,573
2012	3,062,301	1,540,179	4,602,479	82,605	1,360,579	1,443,183	6,045,663
2011	3,024,964	1,506,702	4,531,666	107,441	1,421,995	1,529,436	6,061,102
2010	3,128,859	1,562,398	4,691,257	95,907	1,476,334	1,572,241	6,263,498
2009	2,461,137	1,352,052	3,813,189	82,399	1,094,547	1,176,946	4,990,135
2008	3,189,363	1,687,052	4,876,415	112,911	1,498,491	1,611,402	6,487,816
2007	3,704,592	1,574,241	5,278,834	100,309	1,933,323	2,033,632	7,312,465
2006	3,719,681	1,290,843	5,010,523	102,782	2,177,061	2,279,843	7,290,366
2005	3,346,054	1,221,418	4,567,472	133,756	2,008,588	2,142,344	6,709,816
2004	2,987,973	1,007,913	3,995,886	124,006	1,659,955	1,783,960	5,779,846
2003	2,370,364	897,145	3,267,509	107,715	1,206,221	1,313,936	4,581,445
2002	2,450,747	855,202	3,305,949	42,627	1,174,749	1,217,376	4,523,325
2001	2,420,683	952,843	3,373,525	34,419	1,055,033	1,089,452	4,462,977
2000	2,456,189	1,044,198	3,500,387	53,091	1,047,175	1,100,266	4,600,652
1999	2,282,708	979,647	3,262,354	60,490	1,024,855	1,085,345	4,347,699
1998	2,096,902	973,598	3,070,500	108,197	918,943	1,027,139	4,097,639
1997	1,806,734	1,107,492	2,914,225	93,884	496,616	590,500	3,504,725
1996	1,547,578	1,081,722	2,629,299	179,252	258,618	437,869	3,067,169
1995	1,353,320	1,036,213	2,389,533			453,969	2,843,502

Suggested Data Source: Bureau of Transportation Statistics

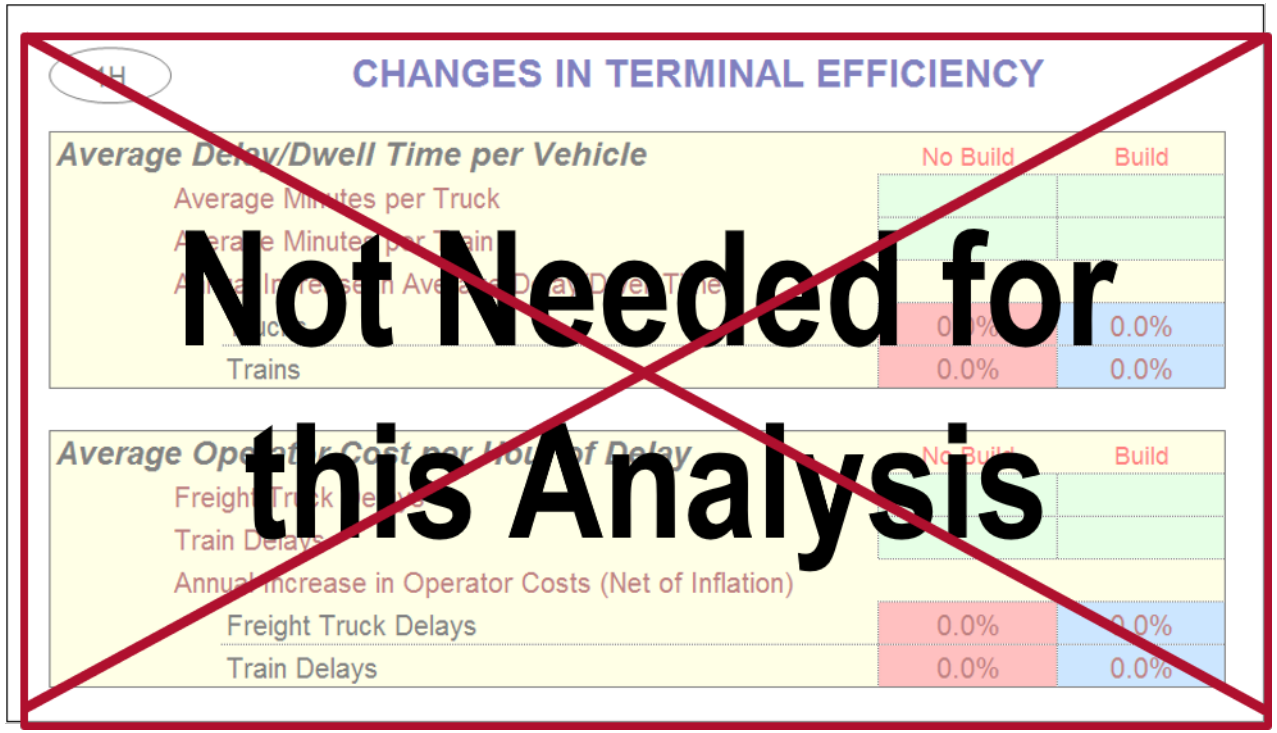
- Federal statistics agency that is the source of statistics on transportation activity, economics, and other measures of transportation
  - Statistical products are available for all modes of transportation, as well as both freight and passenger movements
- National Transportation Statistics is one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



1I) 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

1I

PROJECT COSTS (enter costs in thousands of dollars)

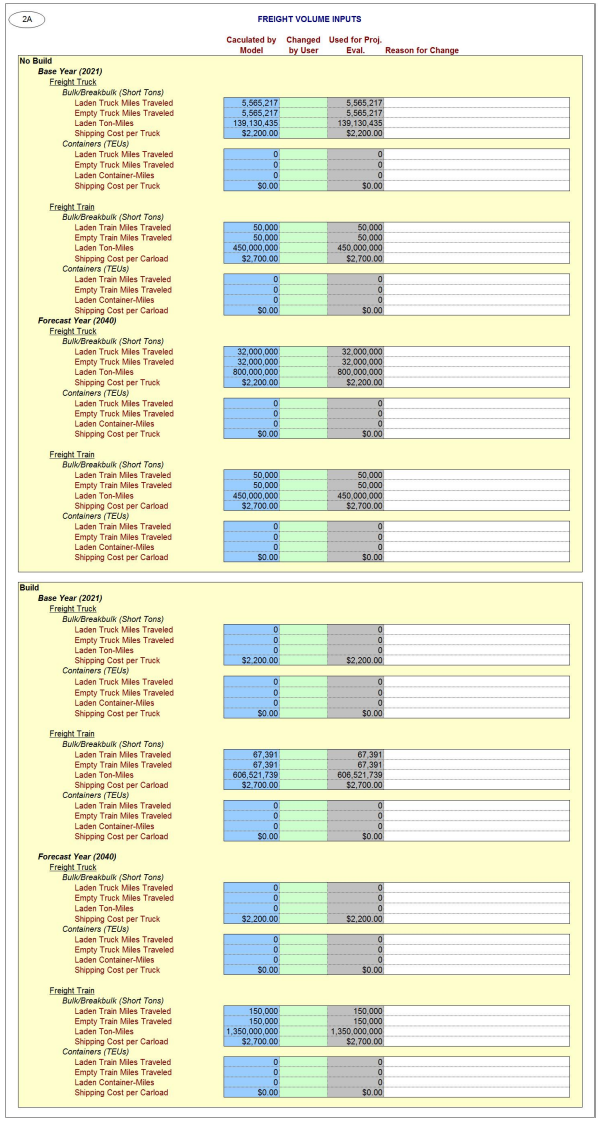
Year	DIRECT PROJECT COSTS						
	INITIAL COSTS			SUBSEQUENT COSTS			
	Project Support	R / W	Construction	Maint./ Op.	Rehab.	Mitigation	Other Agency Cost Savings
Construction Period							
2018	$10,000						
2019	$5,000		$100,000				
2020	$5,000		$100,000				
2021							
2022							
2023							
2024							
2025							
2026							
Project Open							
2021				$8,000			
2022				$8,250			
2023				$8,500			
2024				$8,750			
2025				$9,000			
2026				$9,250			
2027				$9,500			
2028				$9,750			
2029				$10,000			
2030				$10,250			
2031				$10,500			
2032				$10,750			
2033				$11,000			
2034				$11,250			
2035				$11,500			
2036				$11,750			
2037				$12,000			
2038				$12,250			
2039				$12,500			
2040				$12,750			
Total	$20,000	$0	$200,000	$207,500	$0	$0	$0

04

Model Inputs Worksheet

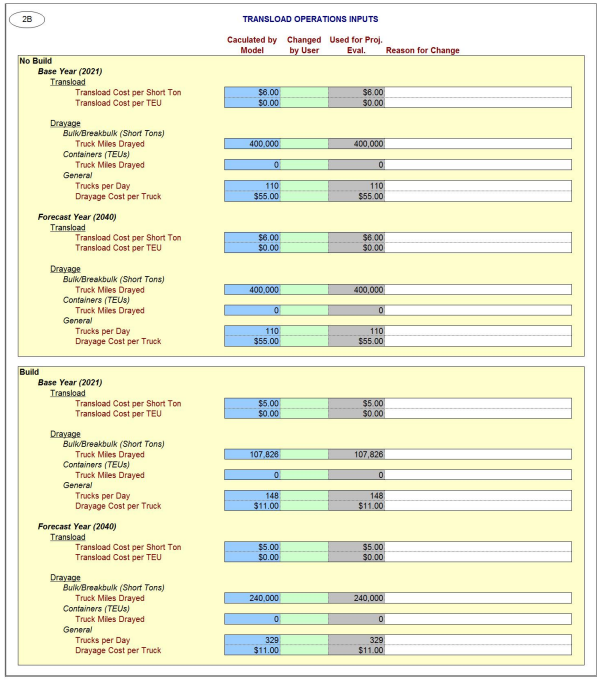
2) Model Inputs Worksheet

- 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



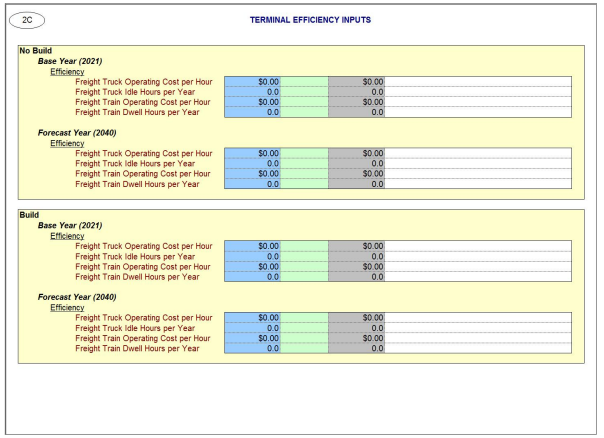
2A FREIGHT VOLUME INPUTS

	Calculated by Model	Changed by User	Used for Proj. Eval.	Reason for Change
No Build				
Base Year (2021)				
Freight Truck				
Bulk/Breakbulk (Short Tons)				
Laden Truck Miles Traveled	5,565,217		5,565,217	
Empty Truck Miles Traveled	5,565,217		5,565,217	
Laden Ton-Miles	139,130,435		139,130,435	
Shipping Cost per Truck	$2,200.00		$2,200.00	
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	50,000		50,000	
Empty Train Miles Traveled	50,000		50,000	
Laden Ton-Miles	450,000,000		450,000,000	
Shipping Cost per Carload	$2,700.00		$2,700.00	
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	
Forecast Year (2040)				
Freight Truck				
Bulk/Breakbulk (Short Tons)				
Laden Truck Miles Traveled	32,000,000		32,000,000	
Empty Truck Miles Traveled	32,000,000		32,000,000	
Laden Ton-Miles	800,000,000		800,000,000	
Shipping Cost per Truck	$2,200.00		$2,200.00	
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	50,000		50,000	
Empty Train Miles Traveled	50,000		50,000	
Laden Ton-Miles	450,000,000		450,000,000	
Shipping Cost per Carload	$2,700.00		$2,700.00	
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				
Base Year (2021)				
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	$2,200.00		$2,200.00	
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	67,391		67,391	
Empty Train Miles Traveled	67,391		67,391	
Laden Ton-Miles	606,521,739		606,521,739	
Shipping Cost per Carload	$2,700.00		$2,700.00	
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	
Forecast Year (2040)				
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	$2,200.00		$2,200.00	
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	150,000		150,000	
Empty Train Miles Traveled	150,000		150,000	
Laden Ton-Miles	1,350,000,000		1,350,000,000	
Shipping Cost per Carload	$2,700.00		$2,700.00	
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	



2B TRANSLOAD OPERATIONS INPUTS

	Calculated by Model	Changed by User	Used for Proj. Eval.	Reason for Change
No Build				
Base Year (2021)				
Transload				
Transload Cost per Short Ton	$6.00		$6.00	
Transload Cost per TEU	$0.00		$0.00	
Drayage				
Bulk/Breakbulk (Short Tons)				
Truck Miles Drayed	400,000		400,000	
Containers (TEUs)				
Truck Miles Drayed	0		0	
General				
Trucks per Day	110		110	
Drayage Cost per Truck	$55.00		$55.00	
Forecast Year (2040)				
Transload				
Transload Cost per Short Ton	$6.00		$6.00	
Transload Cost per TEU	$0.00		$0.00	
Drayage				
Bulk/Breakbulk (Short Tons)				
Truck Miles Drayed	400,000		400,000	
Containers (TEUs)				
Truck Miles Drayed	0		0	
General				
Trucks per Day	110		110	
Drayage Cost per Truck	$55.00		$55.00	
Build				
Base Year (2021)				
Transload				
Transload Cost per Short Ton	$5.00		$5.00	
Transload Cost per TEU	$0.00		$0.00	
Drayage				
Bulk/Breakbulk (Short Tons)				
Truck Miles Drayed	107,826		107,826	
Containers (TEUs)				
Truck Miles Drayed	0		0	
General				
Trucks per Day	148		148	
Drayage Cost per Truck	$11.00		$11.00	
Forecast Year (2040)				
Transload				
Transload Cost per Short Ton	$5.00		$5.00	
Transload Cost per TEU	$0.00		$0.00	
Drayage				
Bulk/Breakbulk (Short Tons)				
Truck Miles Drayed	240,000		240,000	
Containers (TEUs)				
Truck Miles Drayed	0		0	
General				
Trucks per Day	329		329	
Drayage Cost per Truck	$11.00		$11.00	



2C TERMINAL EFFICIENCY INPUTS

	Calculated by Model	Changed by User	Used for Proj. Eval.	Reason for Change
No Build				
Base Year (2021)				
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 (2040)				
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 (2021)				
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 (2040)				
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	

05

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

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

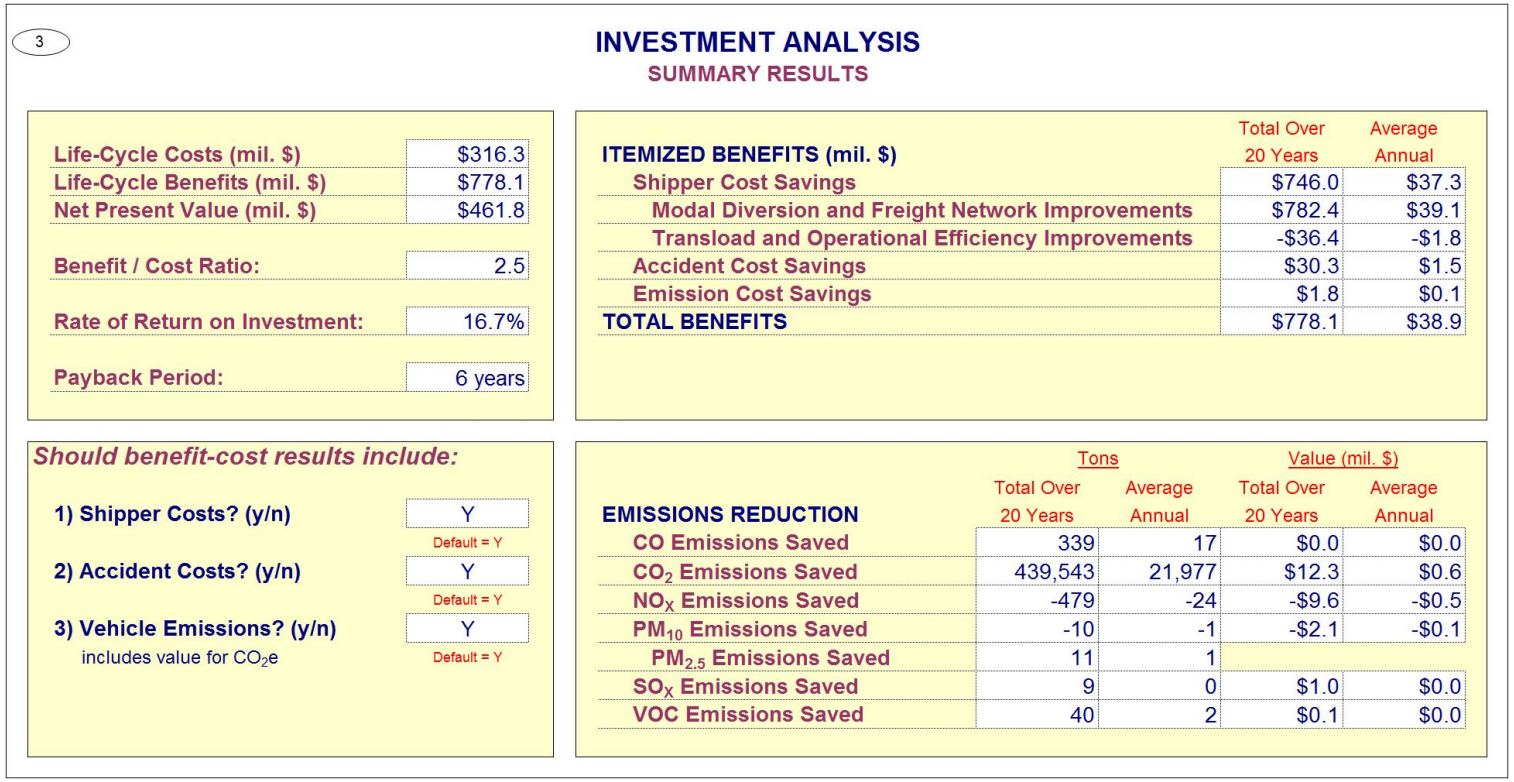
	Tons		Value (mil. $)	
EMISSIONS REDUCTION	Total Over 20 Years	Average Annual	Total Over 20 Years	Average Annual
CO Emissions Saved	339	17	$0.0	$0.0
CO_2 Emissions Saved	439,543	21,977	$12.3	$0.6
NO_X Emissions Saved	-479	-24	-$9.6	-$0.5
PM_{10} Emissions Saved	-10	-1	-$2.1	-$0.1
$PM_{2.5}$ Emissions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

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



3

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Should benefit-cost results include:

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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
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06

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