Expanding Capacity on Union Pacific's Sunset Route

William W. Hay Seminar Series

March 28, 2008

David Connell, AVP Engineering Construction, UPRR

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Note to The Adobe .pdf Version

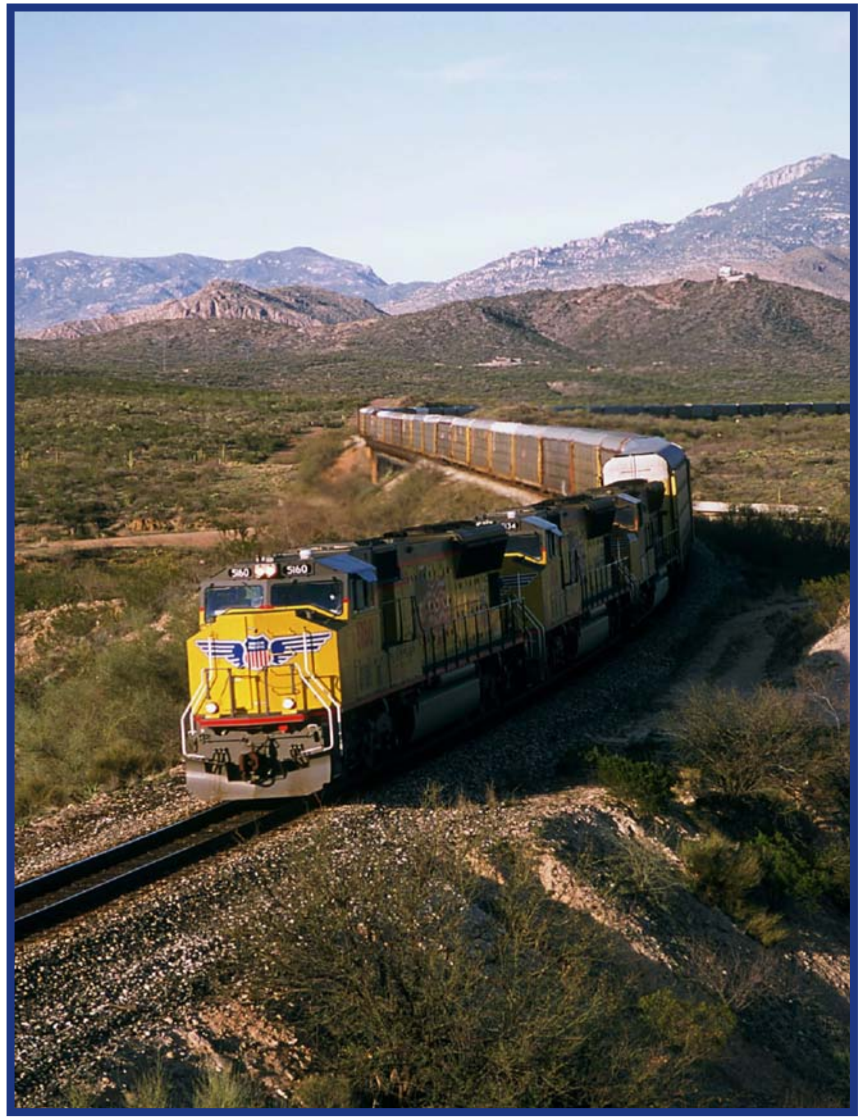
The original version of this presentation includes movies, animation, and other features. This “original version” will be presented by David Connell at the live seminar on March 28, 2008.

This presentation version posted to the university file sharing site has been modified into an Adobe .pdf version that excludes the additional features. This has been done in order to ensure ease of printing and to avoid potential Powerpoint version conflicts on the computers of presentation attendees who will be calling in to the seminar.

The presentation text is unchanged.

Overview

- **Union Pacific Network**
- **Sunset History**
- **Growing Demand**
- **Acceleration Strategy**
- **Constructing for Velocity and Durability**
- **Construction Challenges**



UP Network Overview

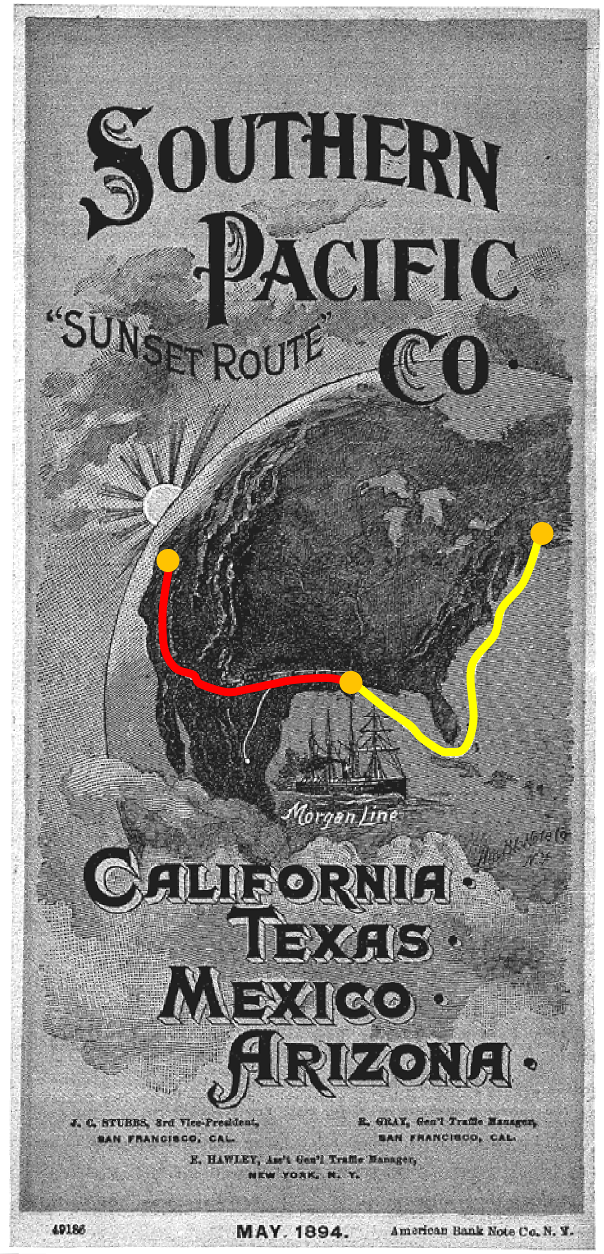
3 Regions / 21 Service Units

Fast Facts

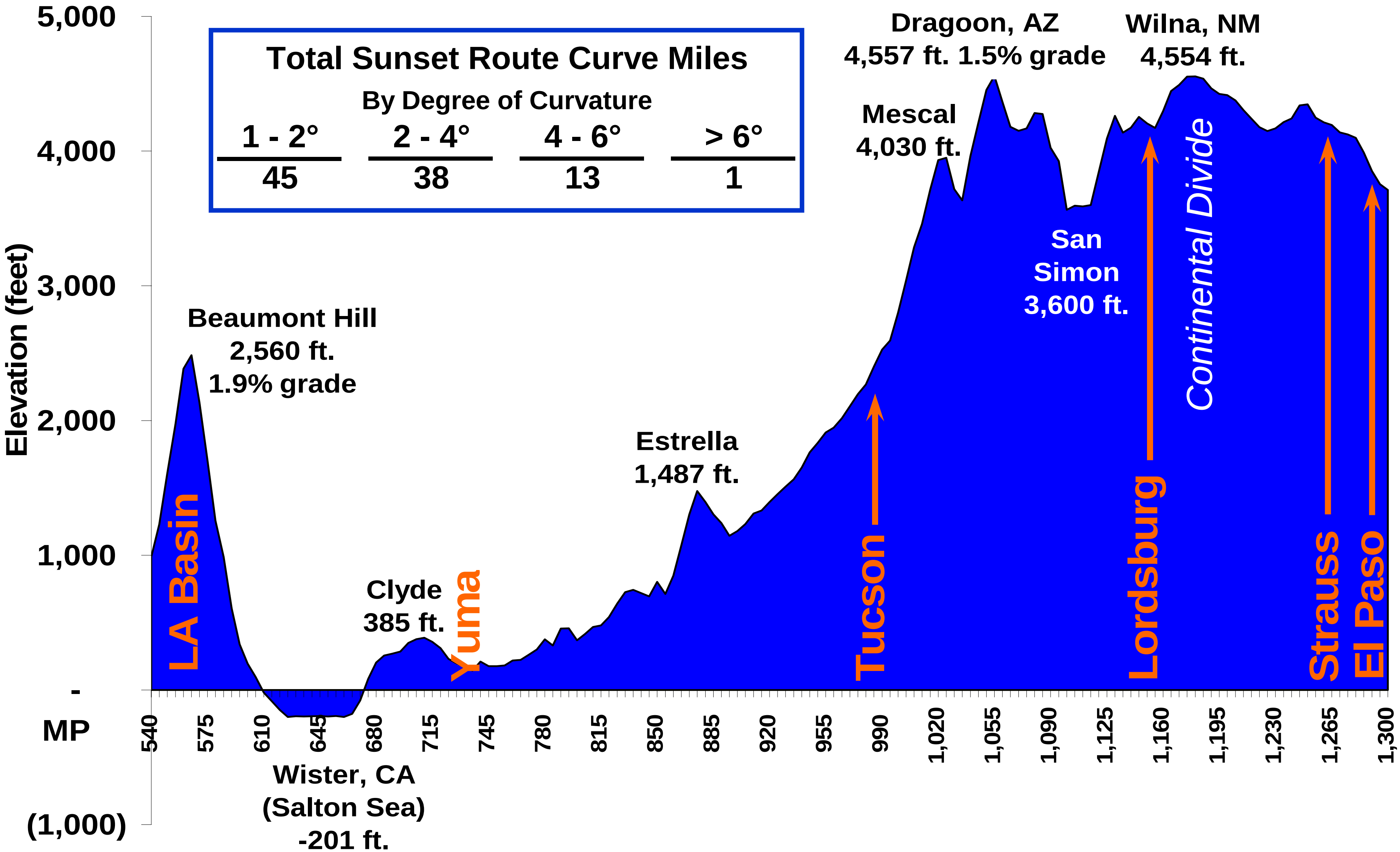
• Commodity Revenue	$16.3 B
• Miles of Track	32,300 in 23 States
• Miles of Bridges	415
• Employees	50,000+
• Annual Payroll	$3.7 B
• Customers	25,000
• Locomotives	8,500
• Freight Cars	104,700

The Original Sunset Route

- **Entire Sunset Corridor stretched between New Orleans and San Francisco**
- **Los Angeles to El Paso (1876-1881)**
- **Provided connection (via steamship) between San Francisco and New York**
- **Freight balance originally *east to west* - moving freight to where the "Sun Sets in the West"**



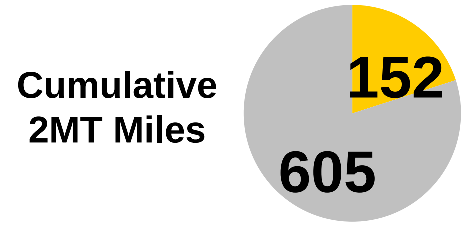
Route Characteristics



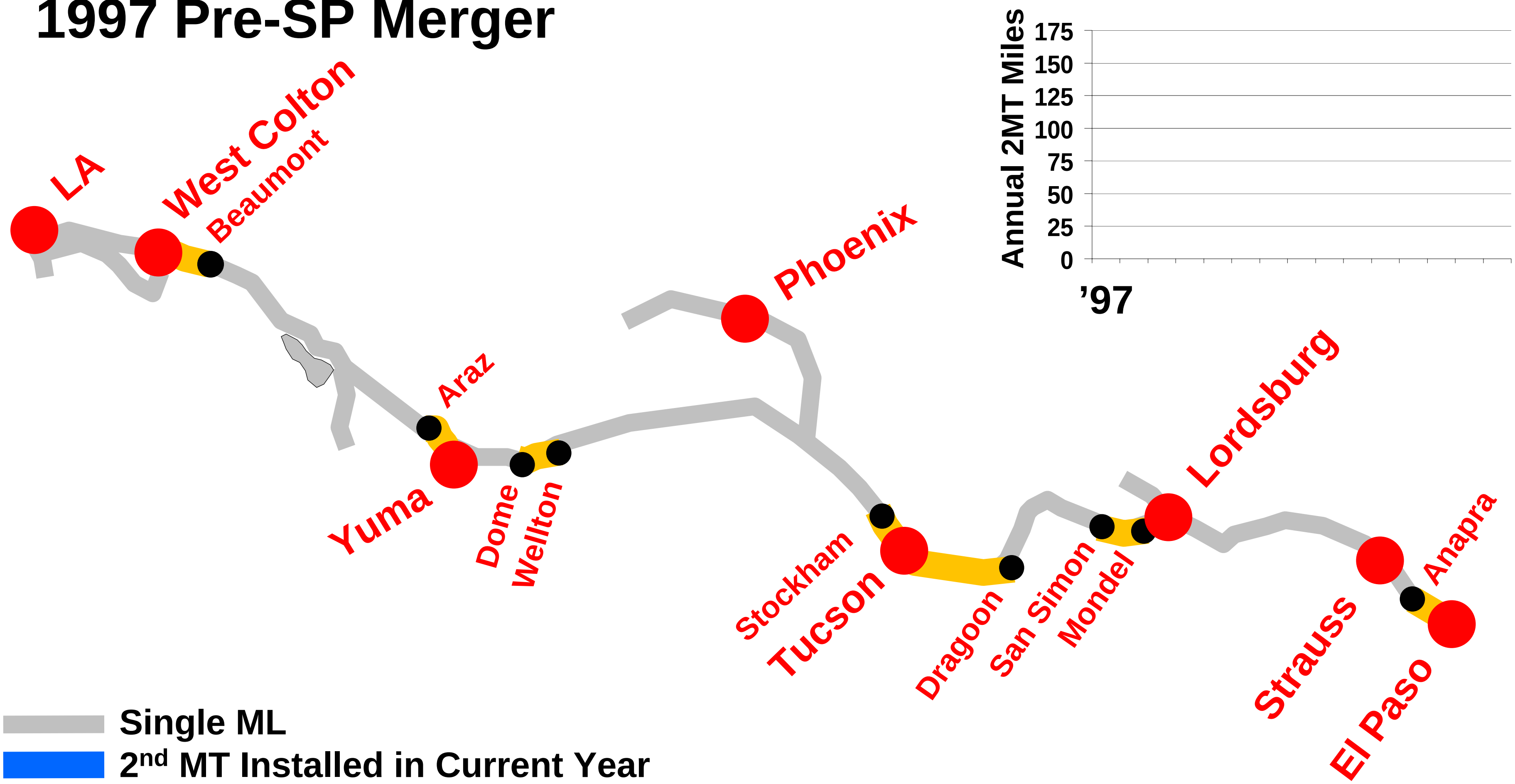
Today's Sunset Route

Sunset Route 1997-2010

2nd MT Implementation Plan



1997 Pre-SP Merger



- Single ML
- 2nd MT Installed in Current Year
- 2nd MT Installed in Prior Years

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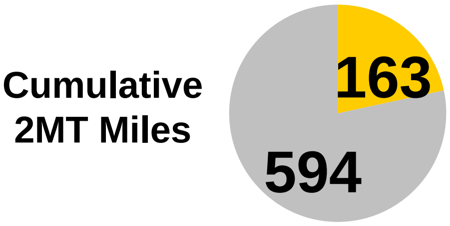
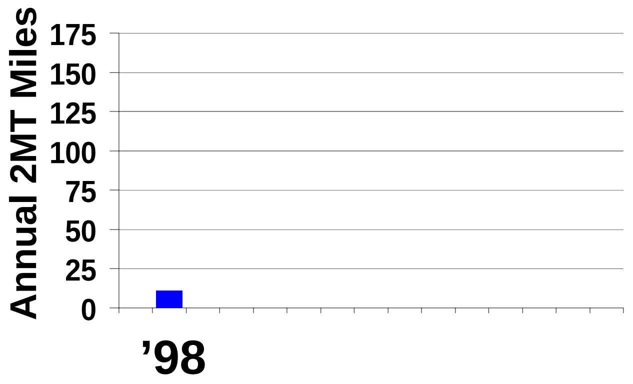
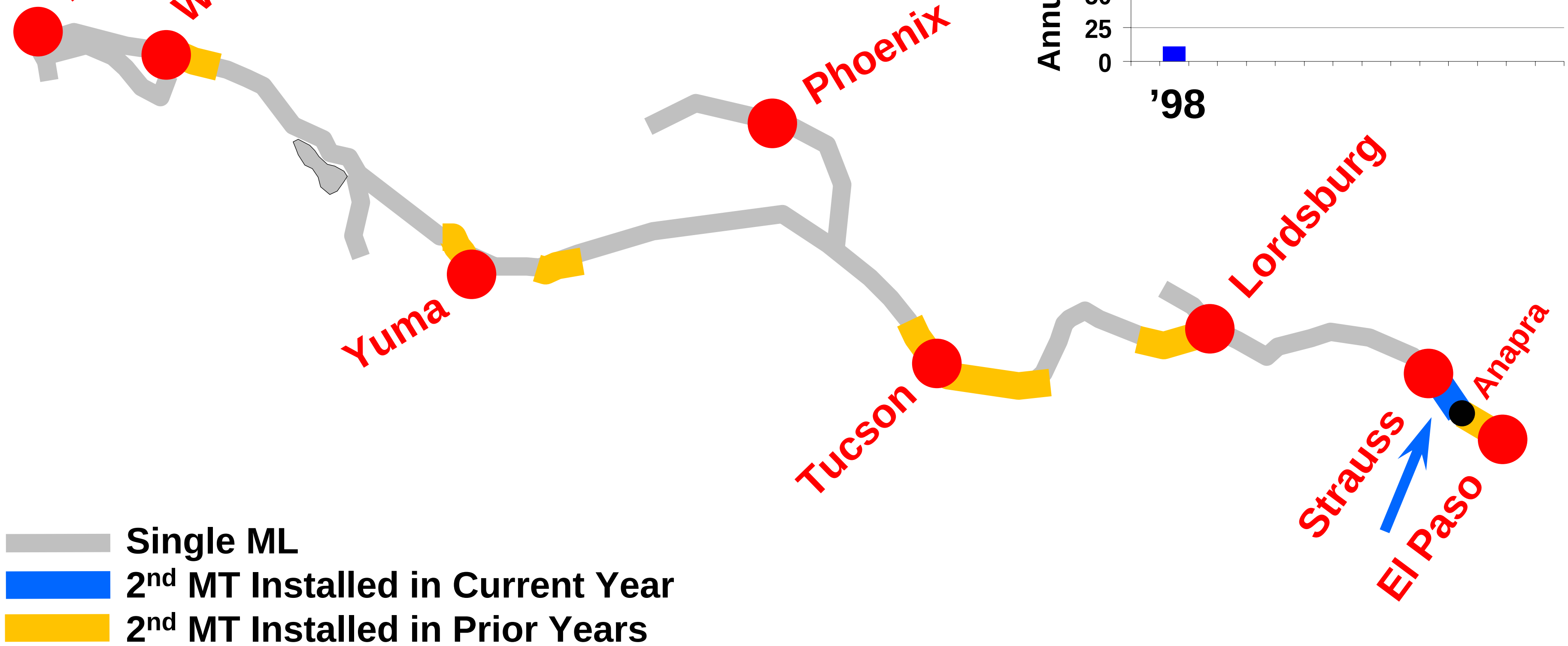
Sunset Route 1997-2010

2nd MT Implementation Plan

1998







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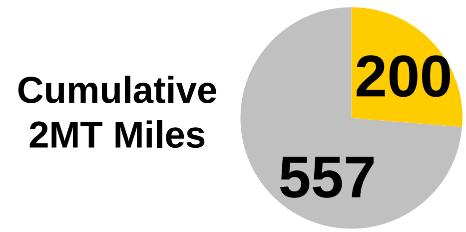
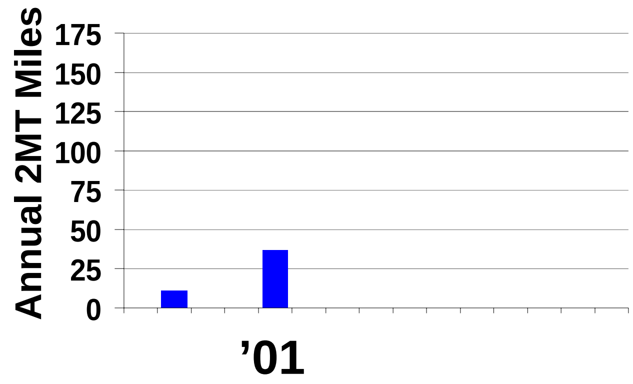
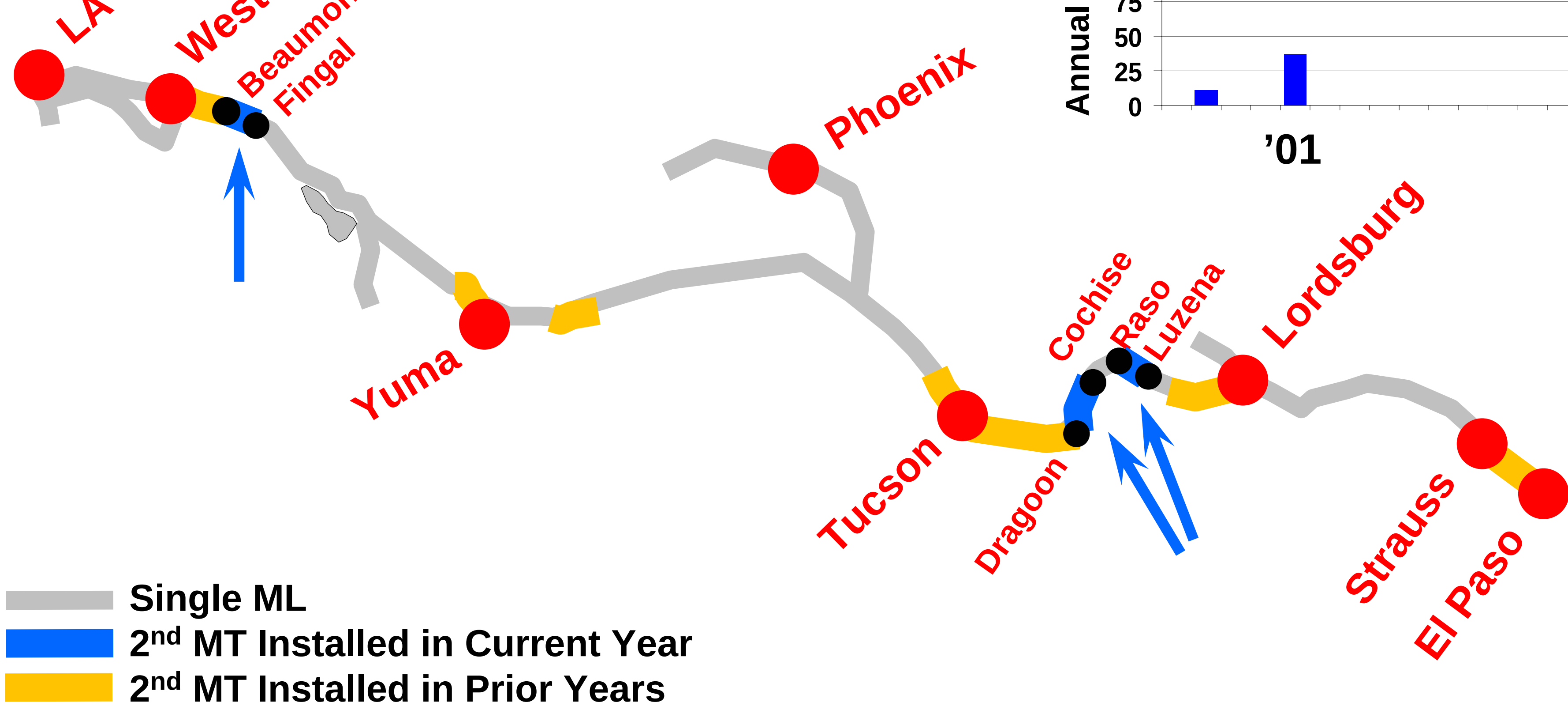




2001



Sunset Route 1997-2010

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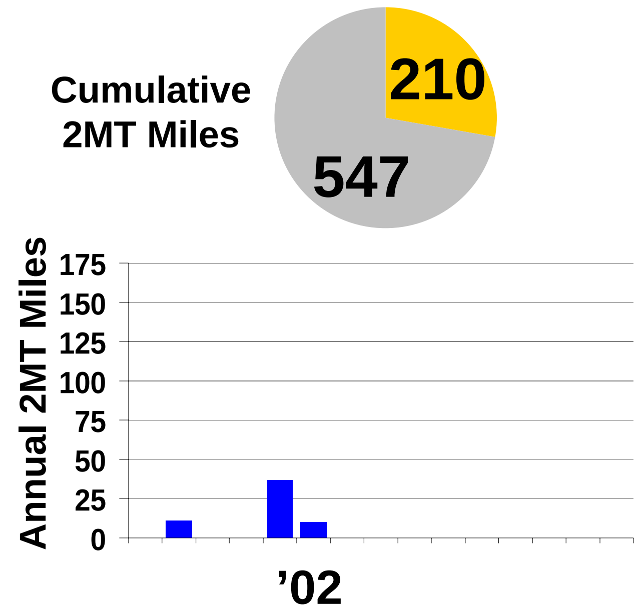

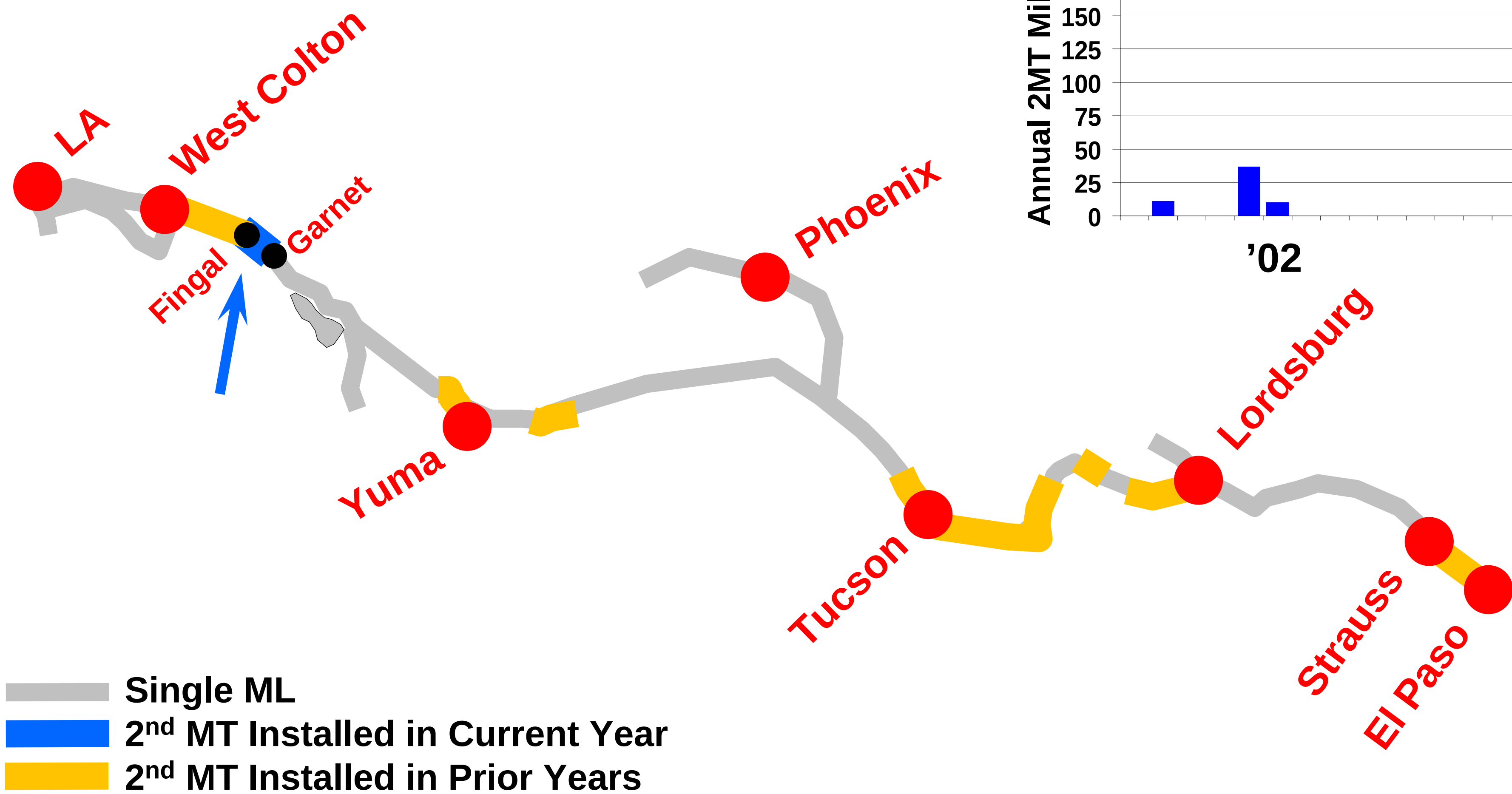

Sunset Route 1997-2010

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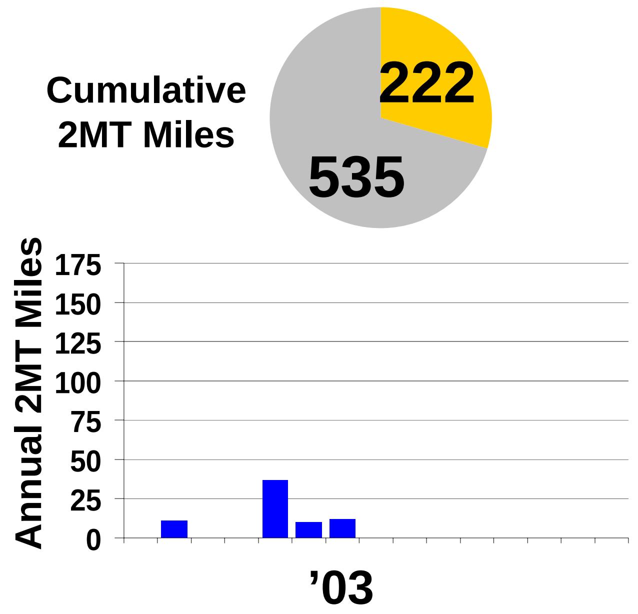
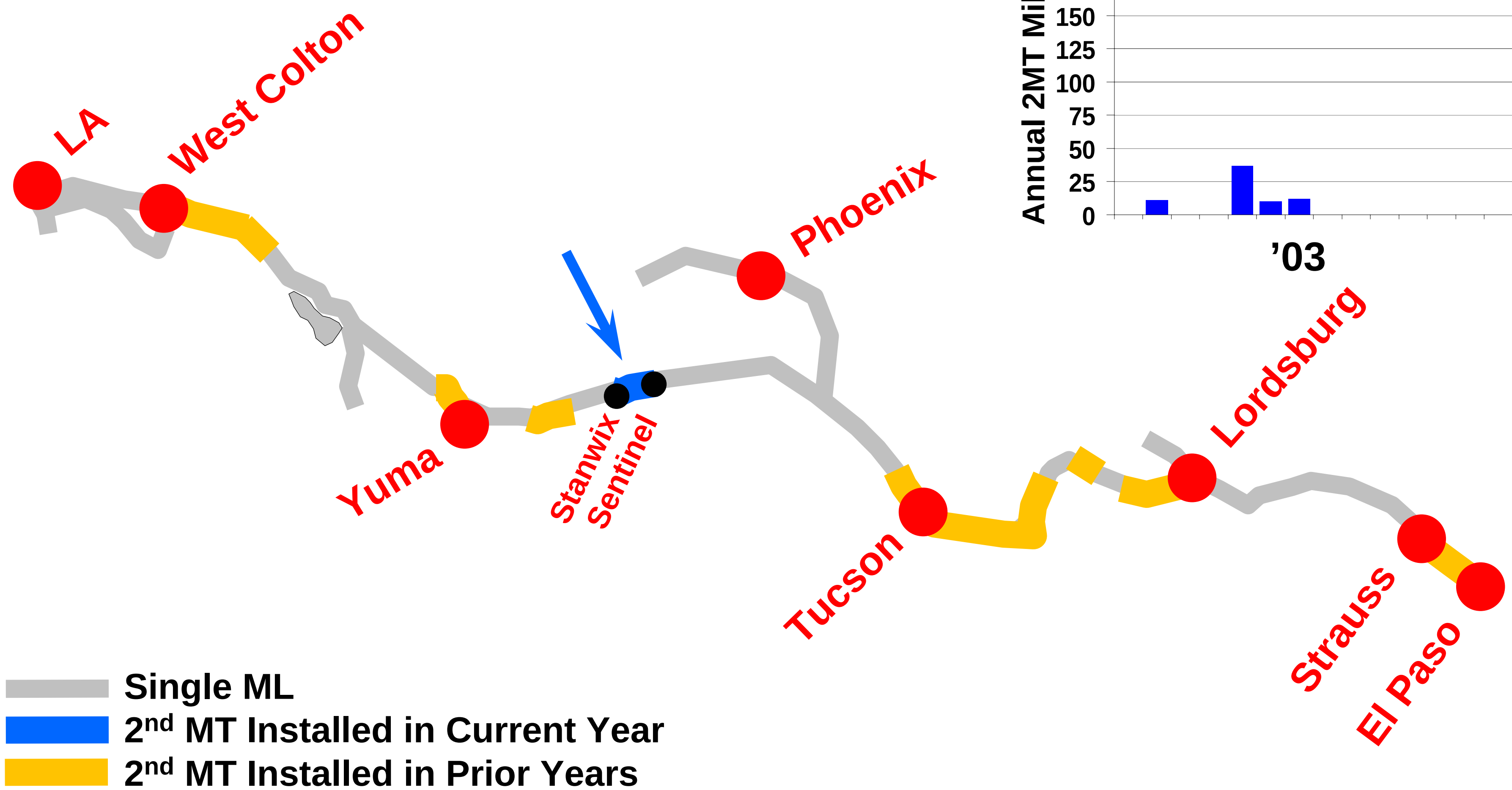
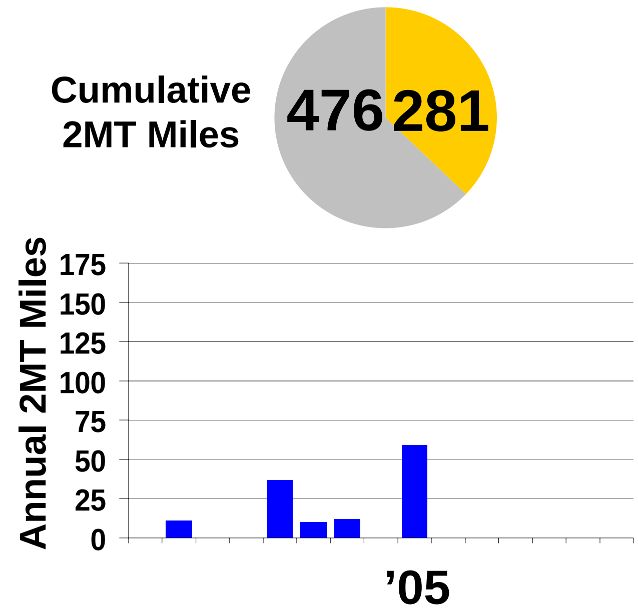


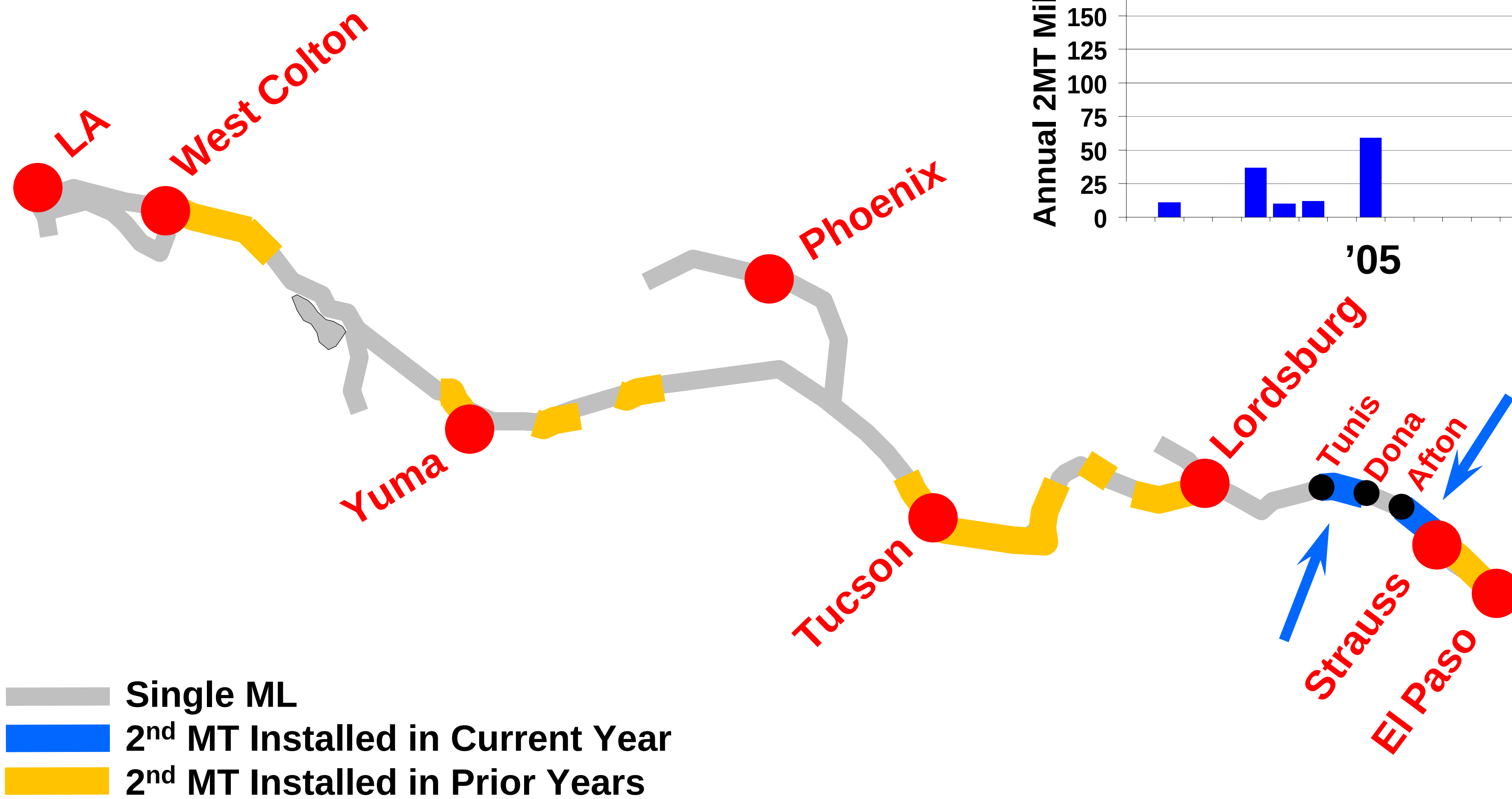


Sunset Route 1997-2010

2nd MT Implementation Plan

2005





Sunset Route 1997-2010

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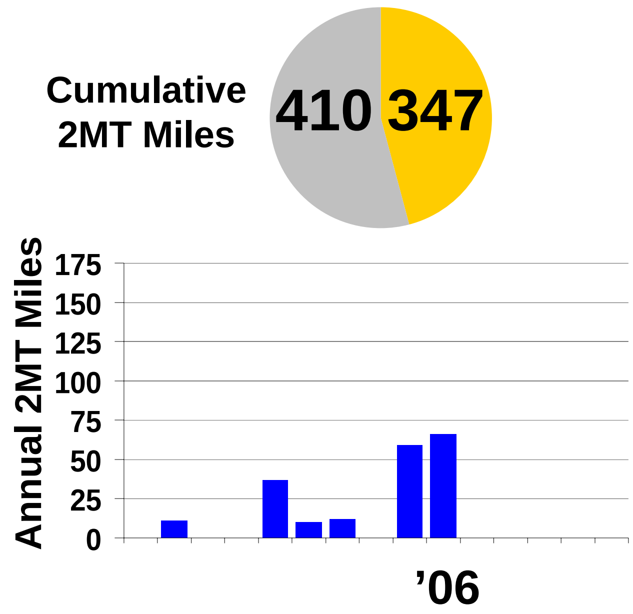
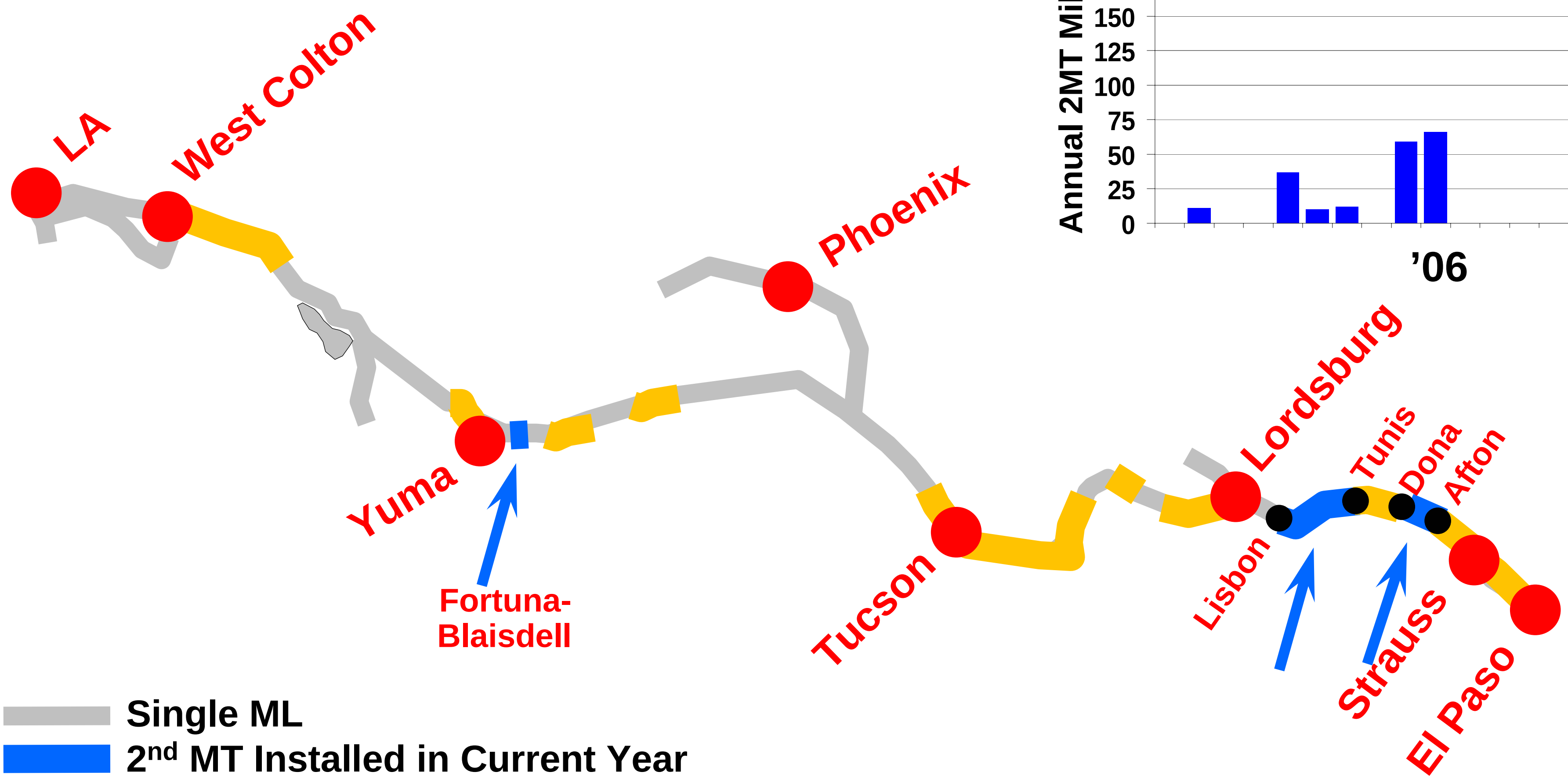
2006



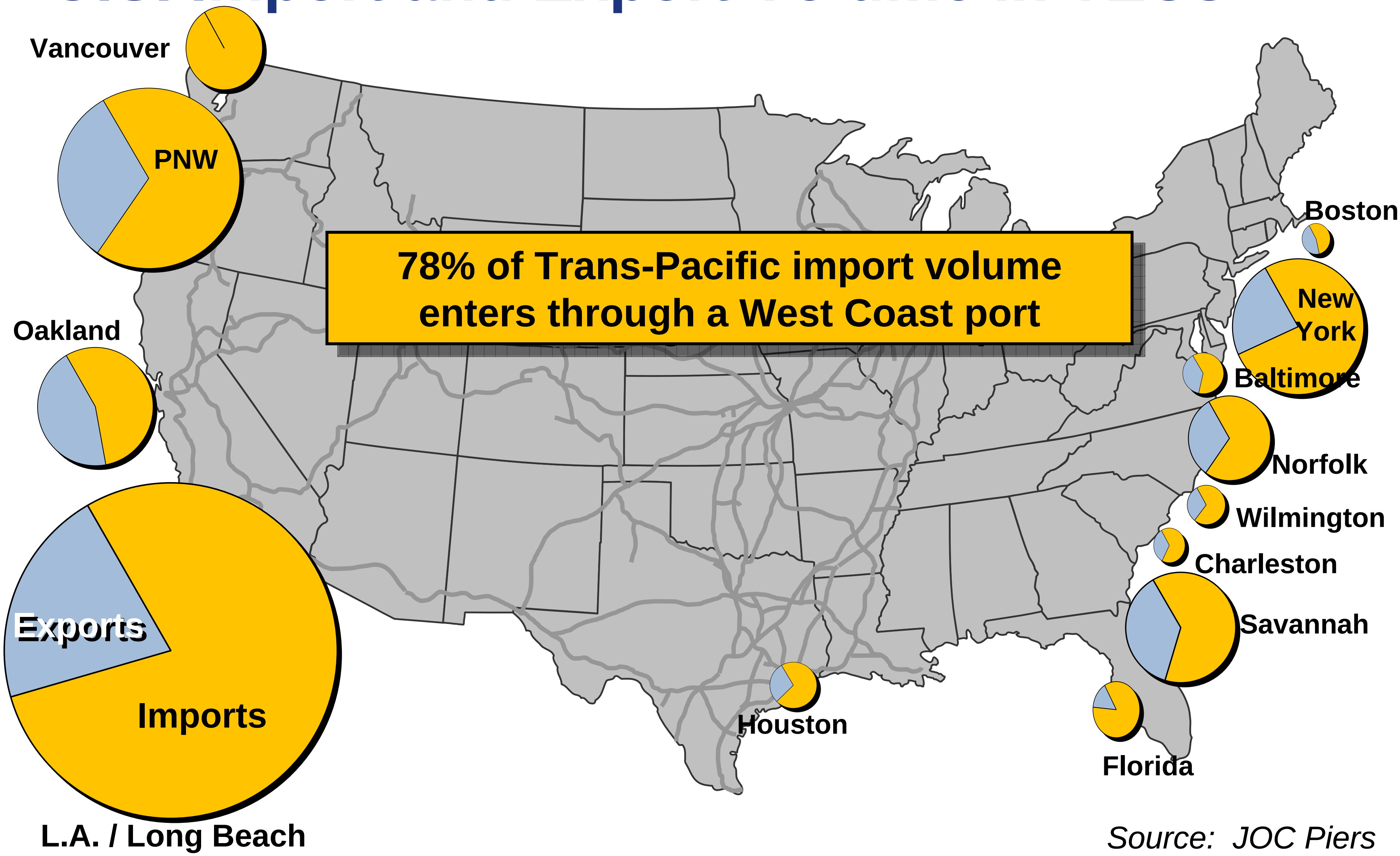


Single ML

2nd MT Installed in Current Year

2nd MT Installed in Prior Years

U.S. Import and Export Volume in TEUs



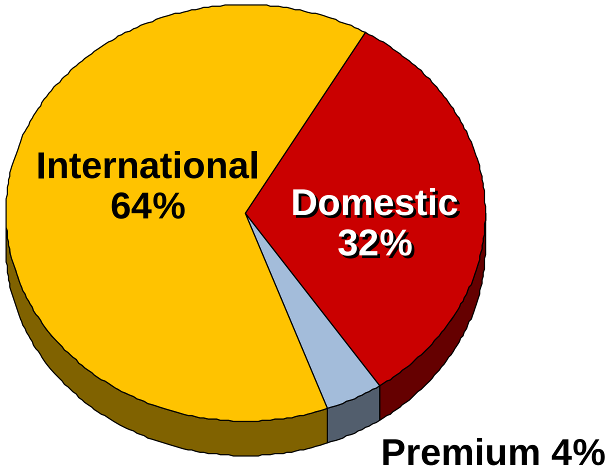
78% of Trans-Pacific import volume enters through a West Coast port

Source: JOC Piers

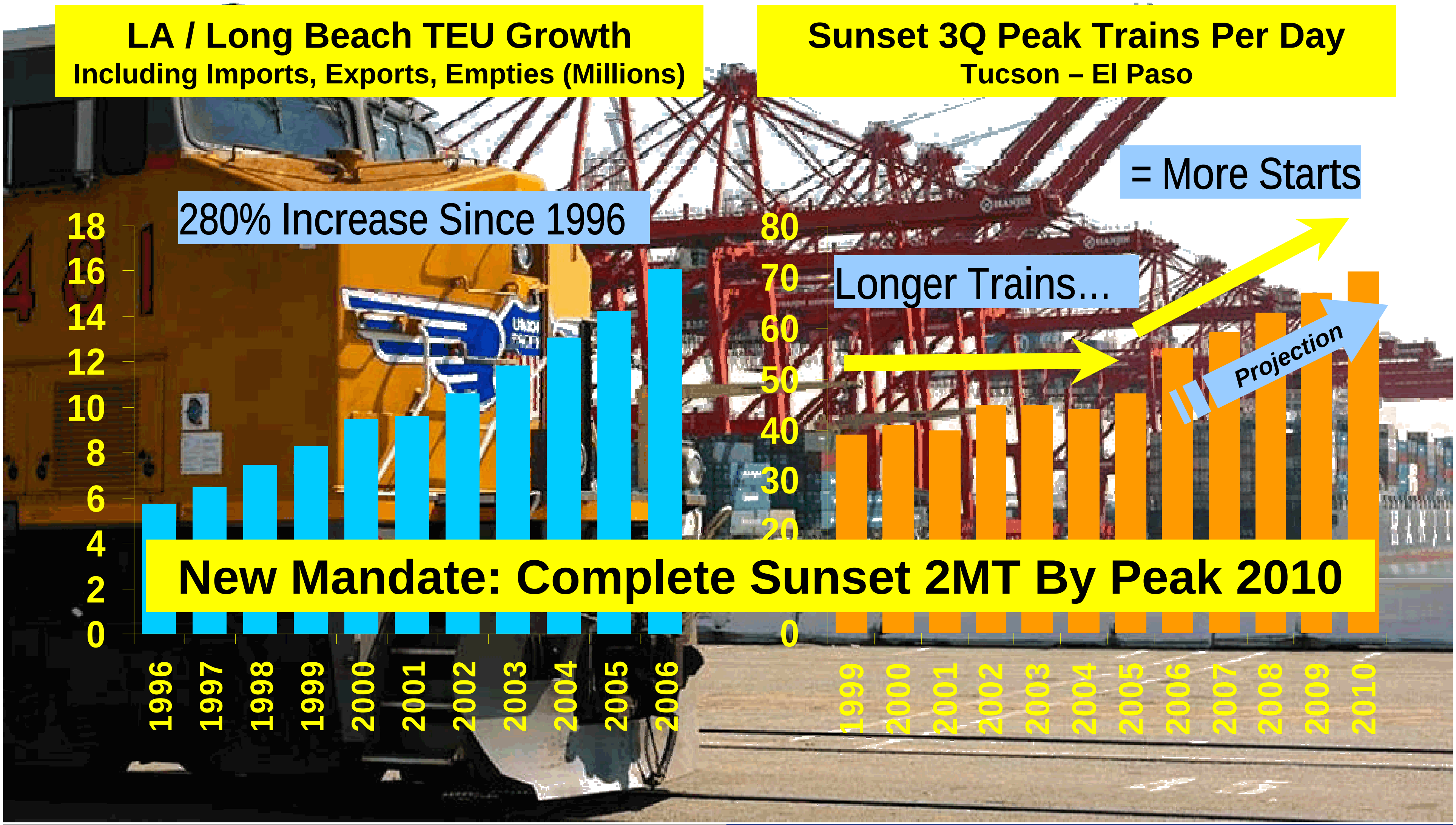
Intermodal Products
2006 Revenue = $2.8 Billion

2006 Lane Density

2006 Units



Sunset Corridor Intermodal Growth



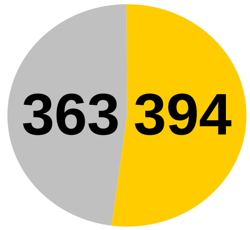
Determining the Delivery Process

	Design-Bid-Build	Design-Build	Accelerate Design-Bid-Build
Timing	5-7 Years ✗	3 Years ✓	3-4 Years ✓
Construction	UP ✓	Contract ✗	Contract: Grading UP: Track & Sig ✓
Design	UP ✓	Contract ✓	Contract ✓
Permits	UP Manages ✓	Contract ✗	UP Manages ✓

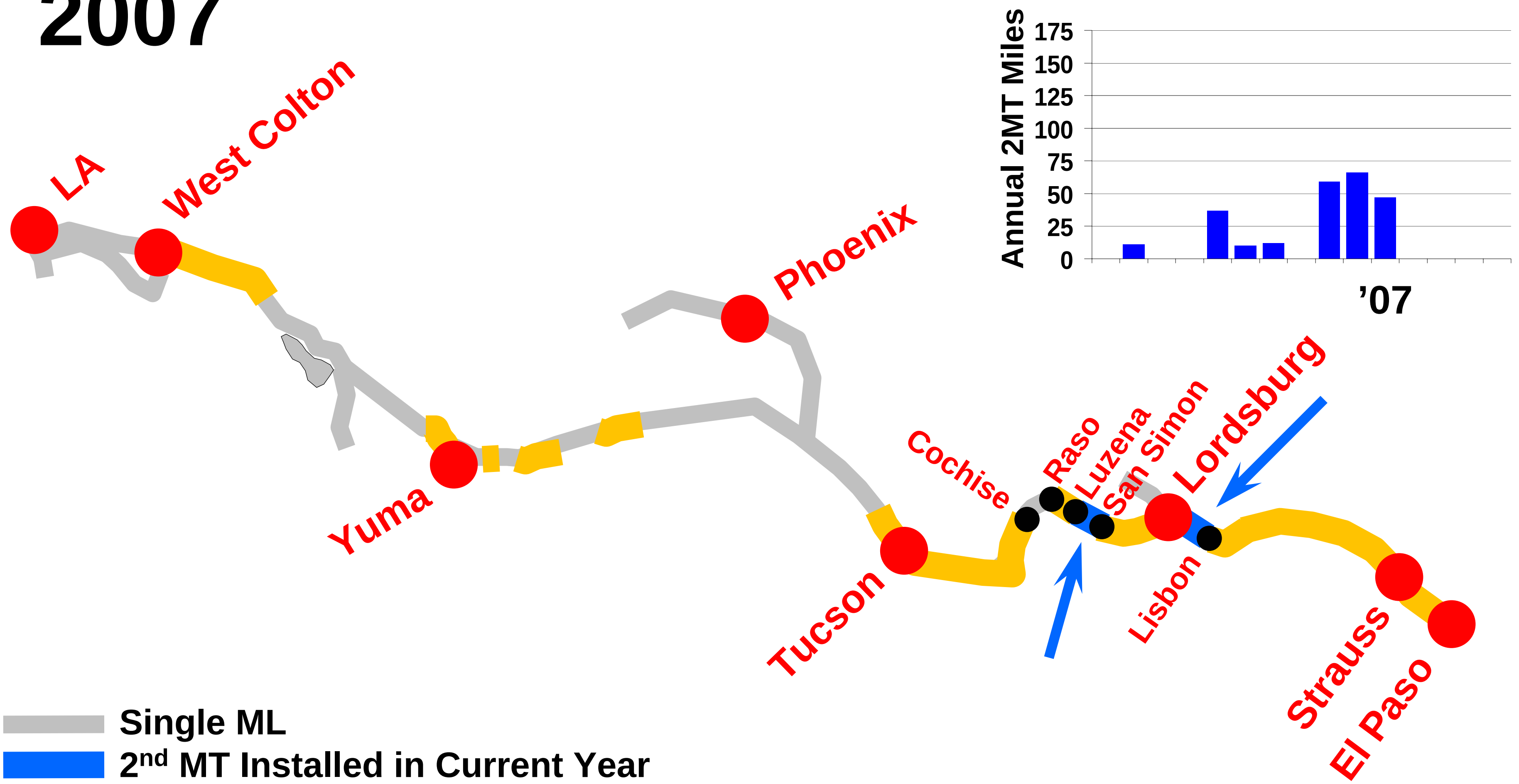
Accelerated Design-Bid-Build Selected

Sunset Route 1997-2010

Accelerated Design-Bid-Build Plan



2007



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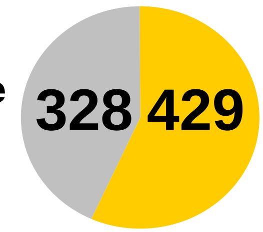
Sunset Route 1997-2010

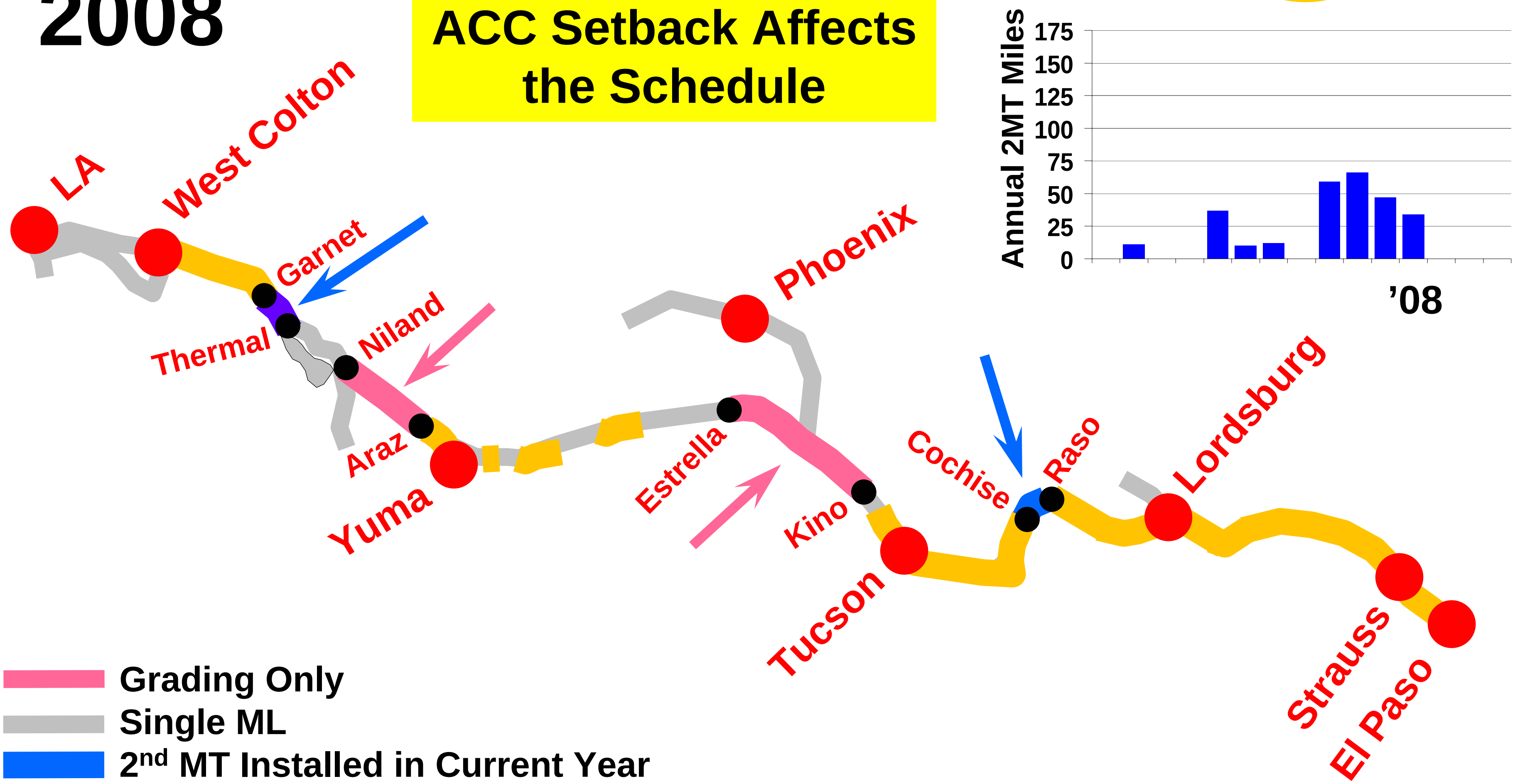
Accelerated Design-Bid-Build Plan

Cumulative 2MT Miles



2008

ACC Setback Affects the Schedule



Grading Only

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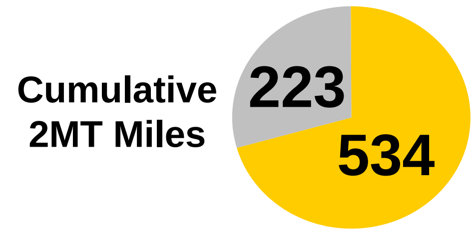
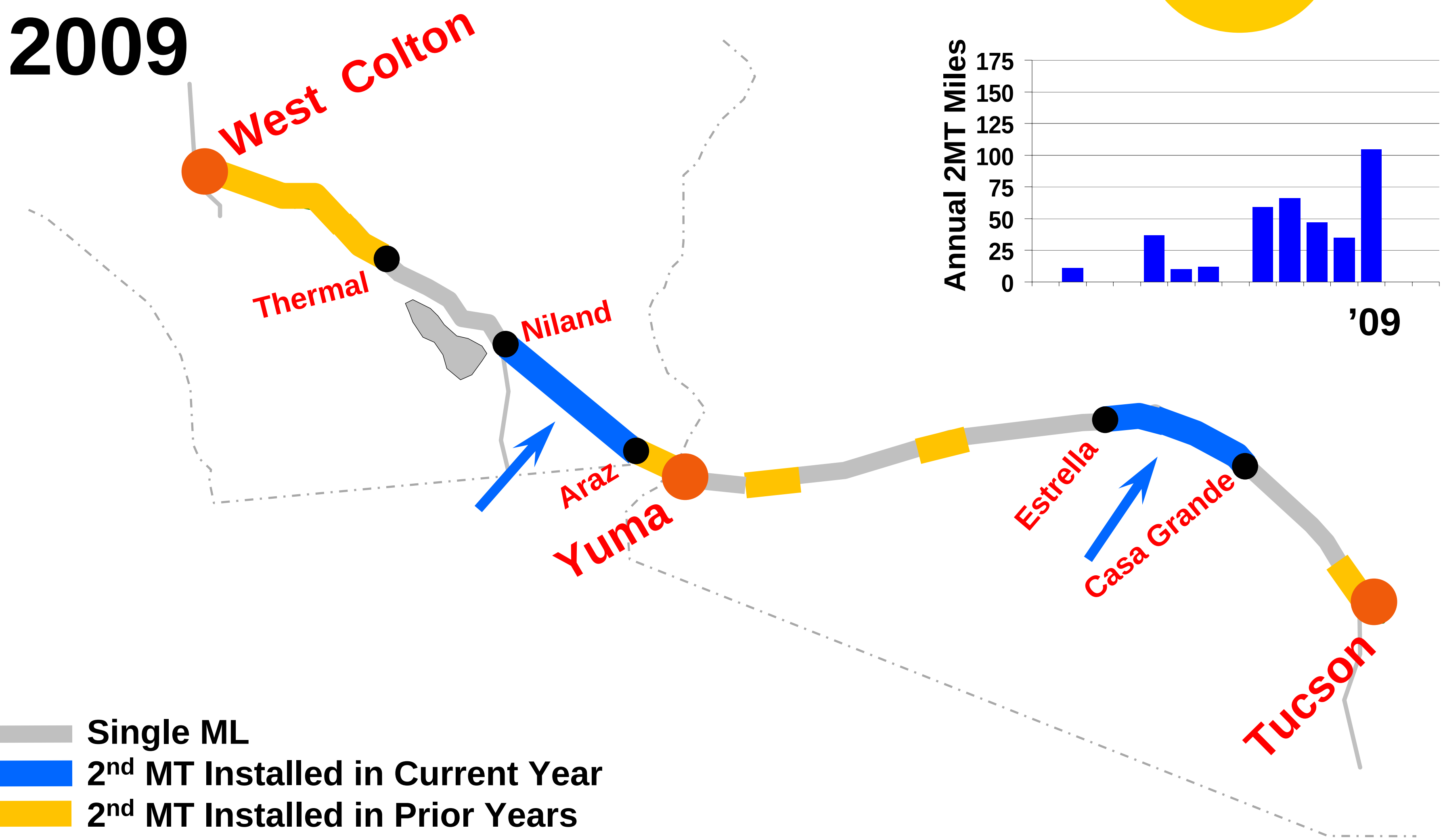
Sunset Route 1997-2010

Accelerated Design-Bid-Build Plan





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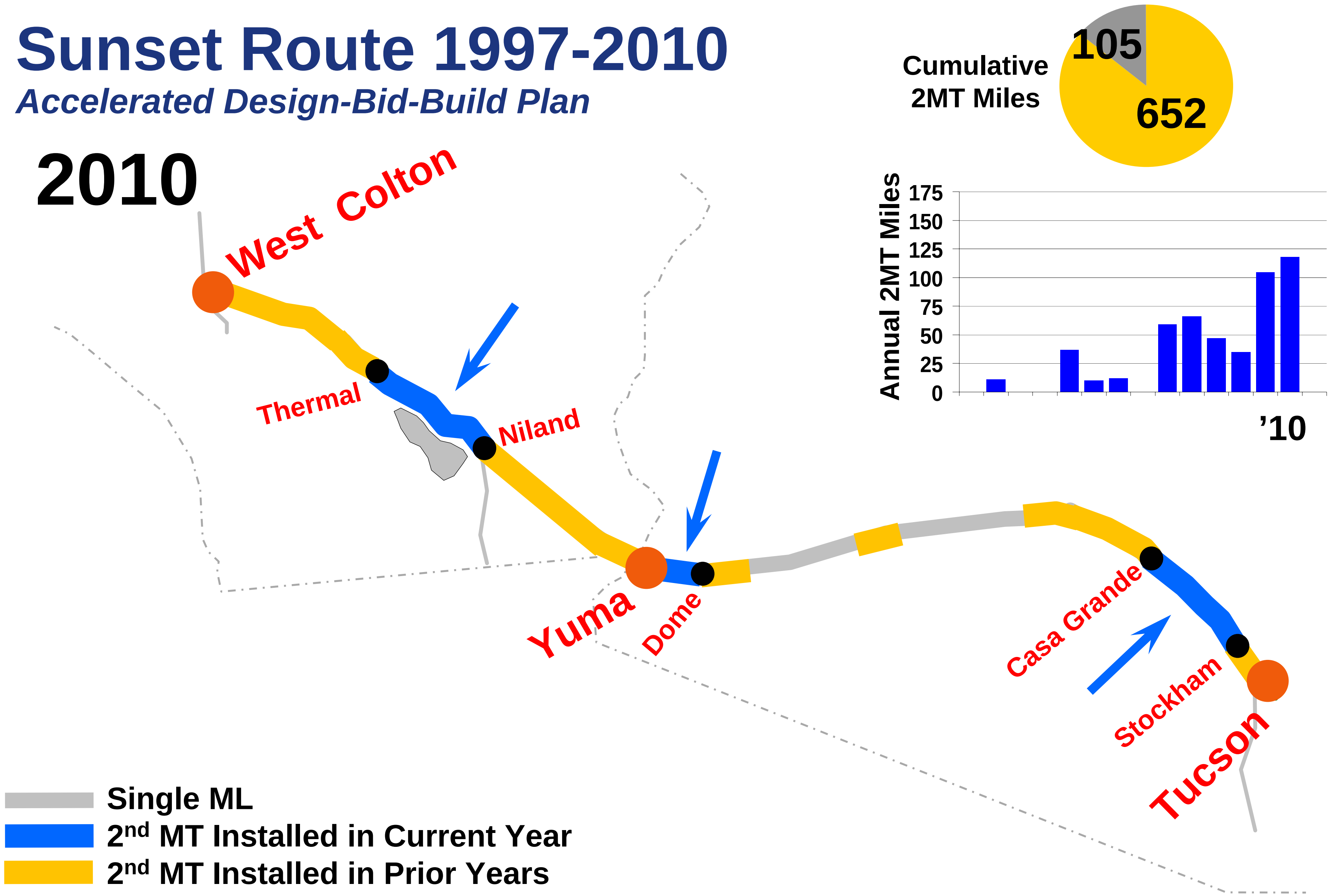
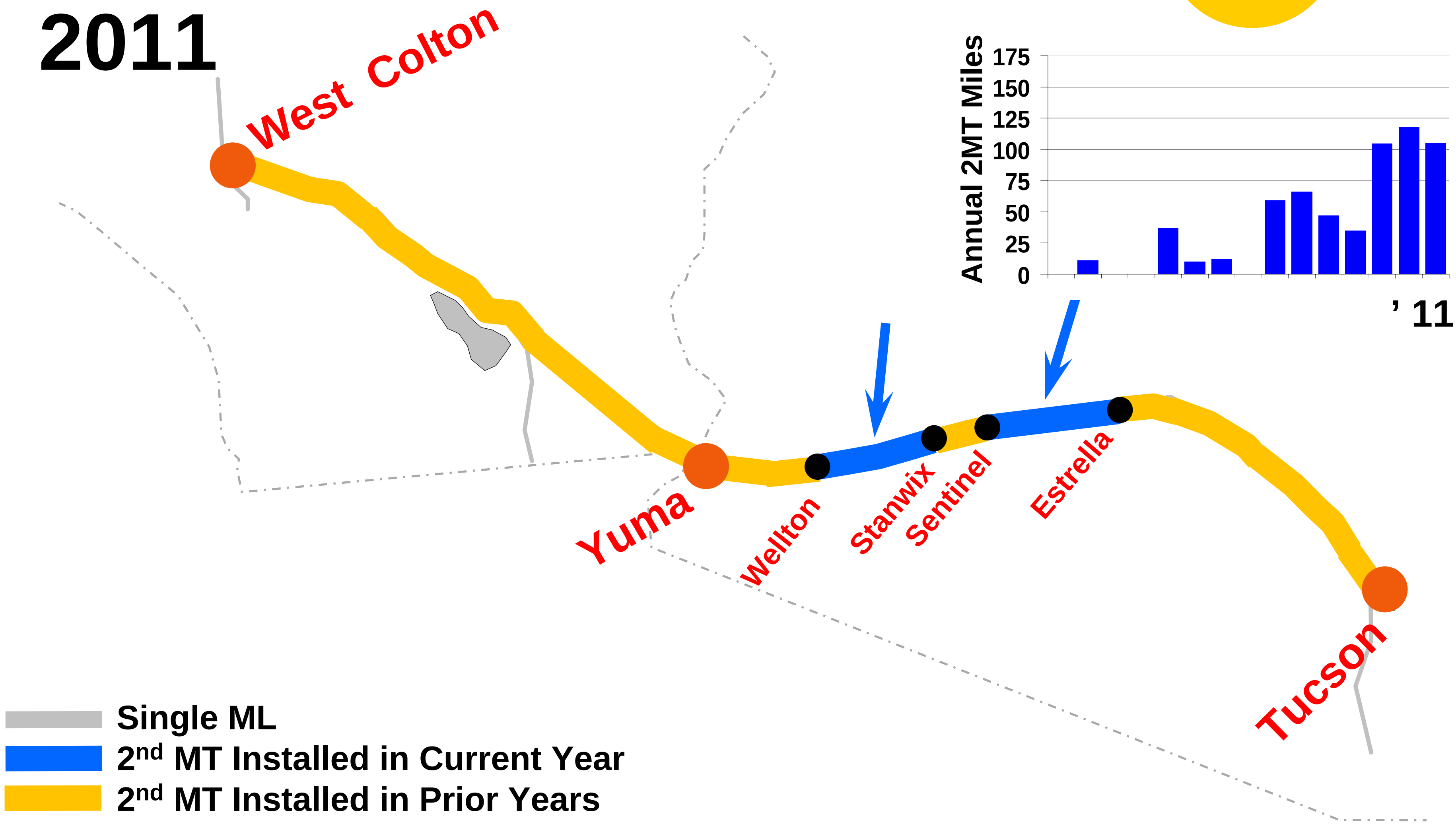


Sunset Route 1997-2010

Accelerated Design-Bid-Build Plan

Cumulative 2MT Miles

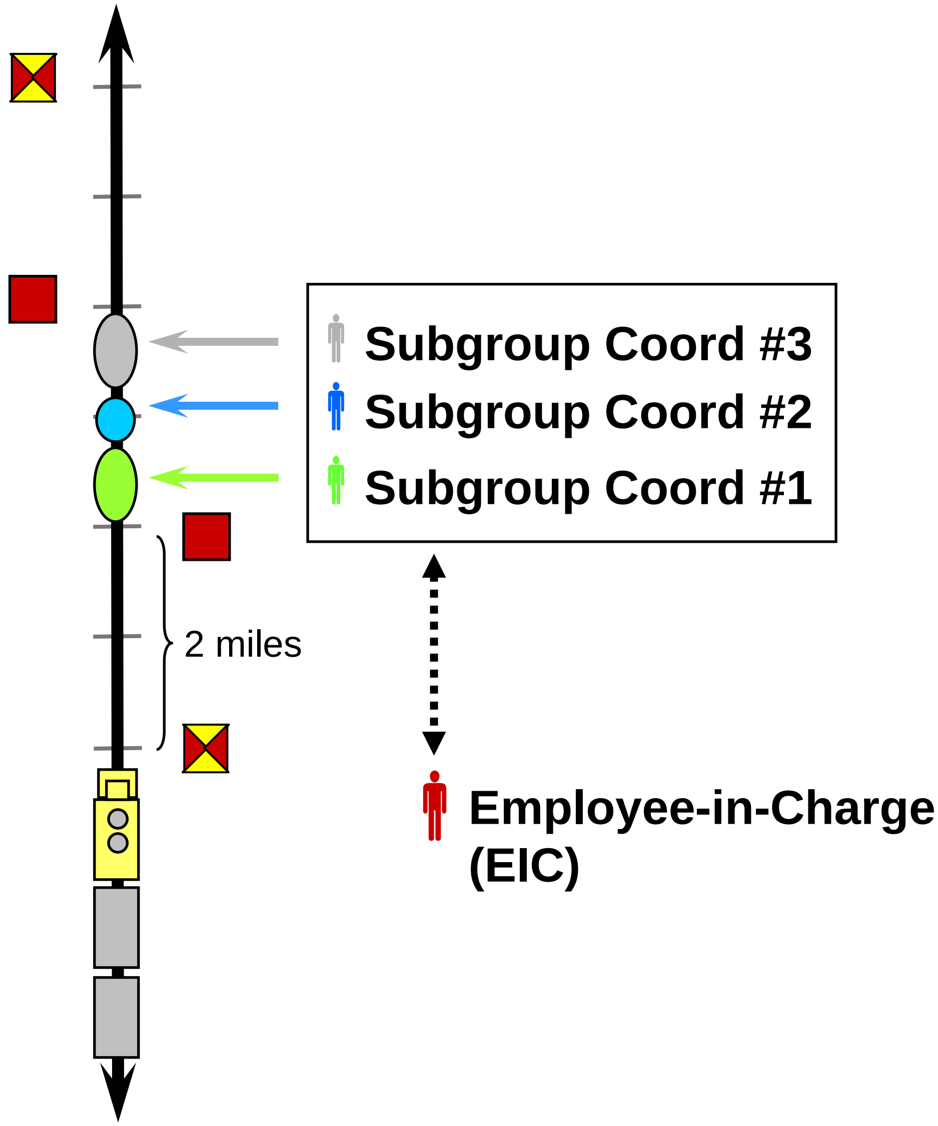
757



Sunset Design Objectives

- **Velocity**
  - 10 mile spacing between control points
  - #24 universal crossovers
  - Set-out tracks every 10 miles
  - Signal upgrade ML #1 to improved spacing, aspect progression to eliminate speed restrictions and enable 70 mph
  - Curve reduction
- **Durability / Maintainability**
  - 20 ft track centers
  - Concrete ties on 141 lb. rail
  - Premium concrete turnouts with MPFs
  - Wireless CTC code line communication, processor based CPs, and one HBD per CP
  - Replace timber bridges with culverts and concrete bridges

Protecting Construction Personnel



Grading

- **Dirt Work 101**
- **Contracted in 50-100 mile segments**
- **3.8 million yards of cut and fill**
- **Vertical controls**

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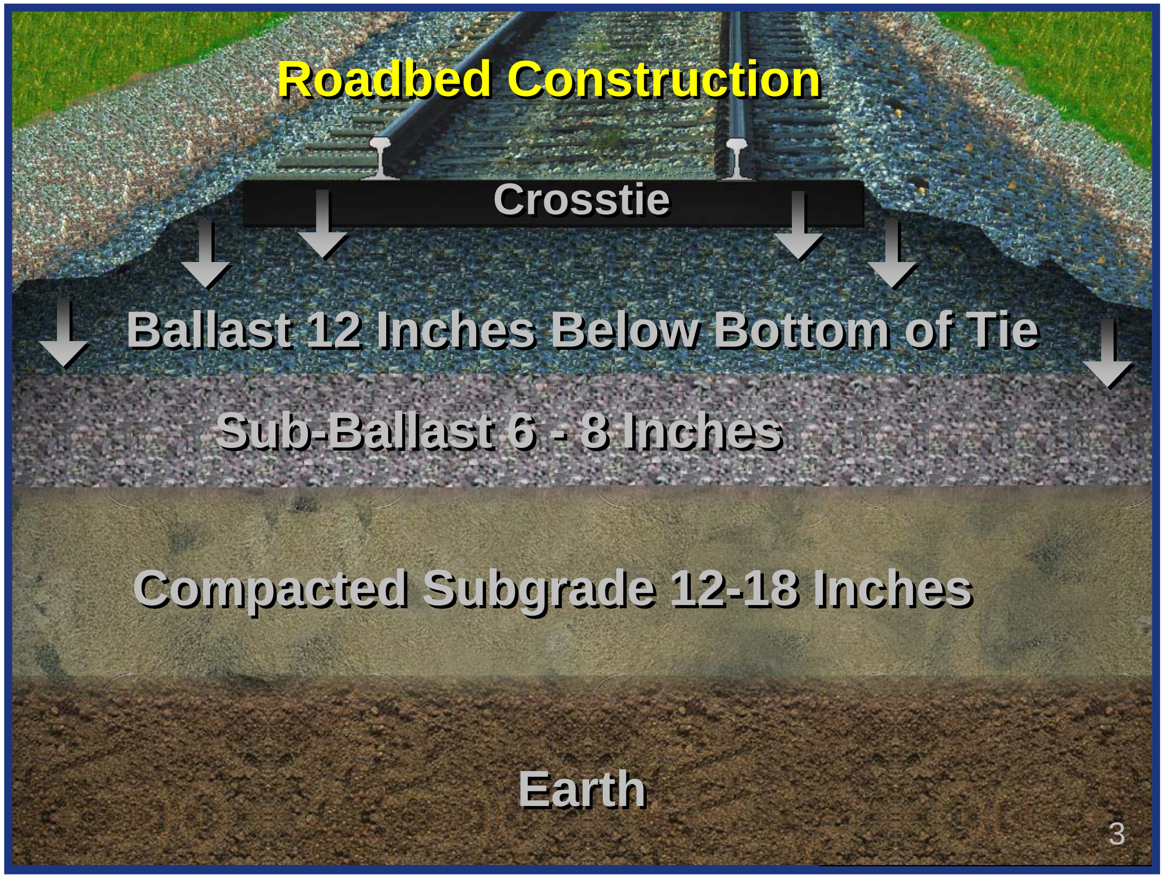
- **Subballast design**
  - **Depth**
  - **Slope**
  - **Access road**



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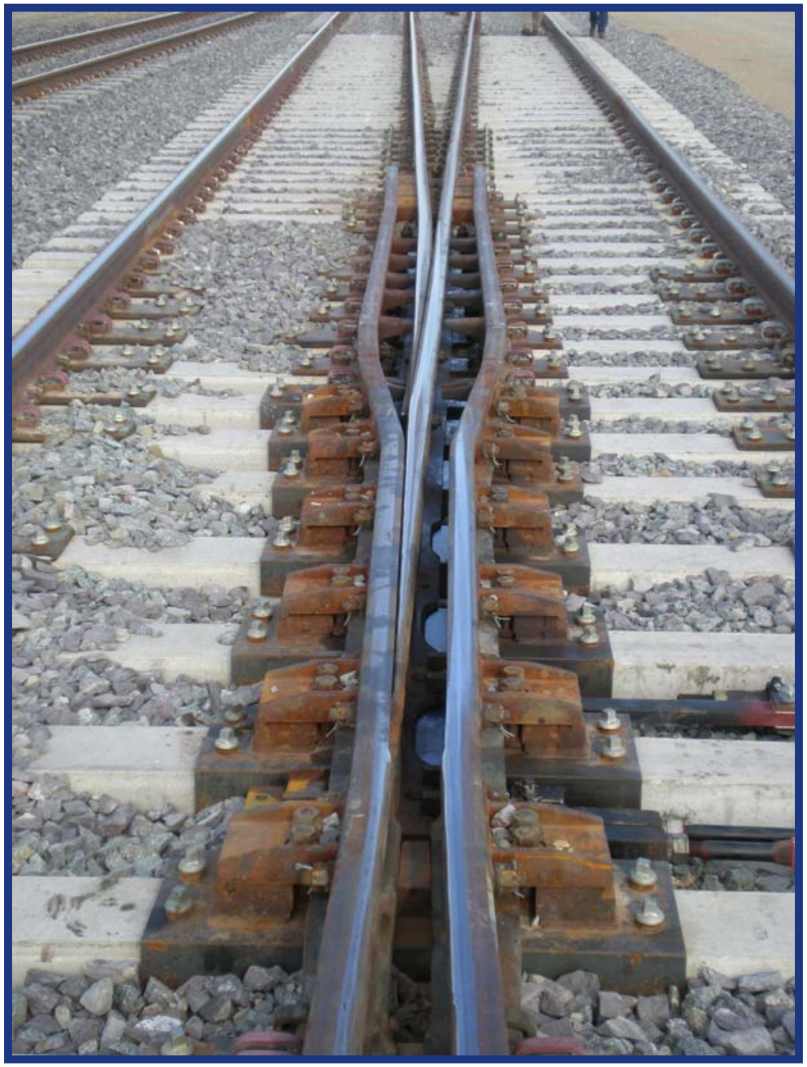
- **141RE CWR unloaded alongside existing main track**

Track Construction

- 1 million concrete ties from CXT Tucson facility
- TLM utilized to assemble components including fastener installation
- 141RE CWR unloaded alongside existing main track
- Ballasted with 40 car shuttle trains from two pits
- Surfaced in 3 lifts
- Dynamically stabilized
- Destressed by stretching

Turnout Construction

- **48 #24 concrete universal crossovers**
  - **Moveable Point Frogs**
  - **In-tie switch rodding and auxiliary throw mechanism**
  - **UP-BNSF standard**
  - **Built adjacent and rolled into position**
- **#14 concrete turnouts at sidings**
- **#11 concrete turnouts on set out tracks**
  - **All rail spring frogs**
  - **In-tie switch rodding**



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Bridges

- **142 bridges = >10,000 lf**
- **22% of existing bridges replaced with concrete ballast deck**
- **Standard bridge design**
  - **Steel H Pile**
  - **Pre-fab or cast-in-place caps**
  - **30’ concrete box girders (UP-BNSF Standard)**
- **Pilings**
  - **HP 14 x 89 Grade A588 40’**
  - **Driven to 106 ton capacity**
  - **~50-130’ depths**
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Culverts

- **791 culverts = > 130,000 lf primarily install with jack and bore process**
- **76% bridges retired and replaced with culverts per hydrology due diligence**
- **Jack and bores range from 36 to 84 Inches**
- **Corregated Metal Pipes (CMP) vs smooth steel dependent on cover and installation method**
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Construction Challenges

- **Remote Locations**
  - **Fuel**
  - **Food**
  - **Lodging**
  - **Hardware Store**
- **Water Challenges**
- **Bridge Approaches**
  - **The bump at the ends of the bridge**
  - **Compaction challenges**
  - **Flowable fill approach**

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- 70 MPH design speed
- 4 Aspect system (G, FY, Y, R)
- State-of-the-art track code system (Microtrax)
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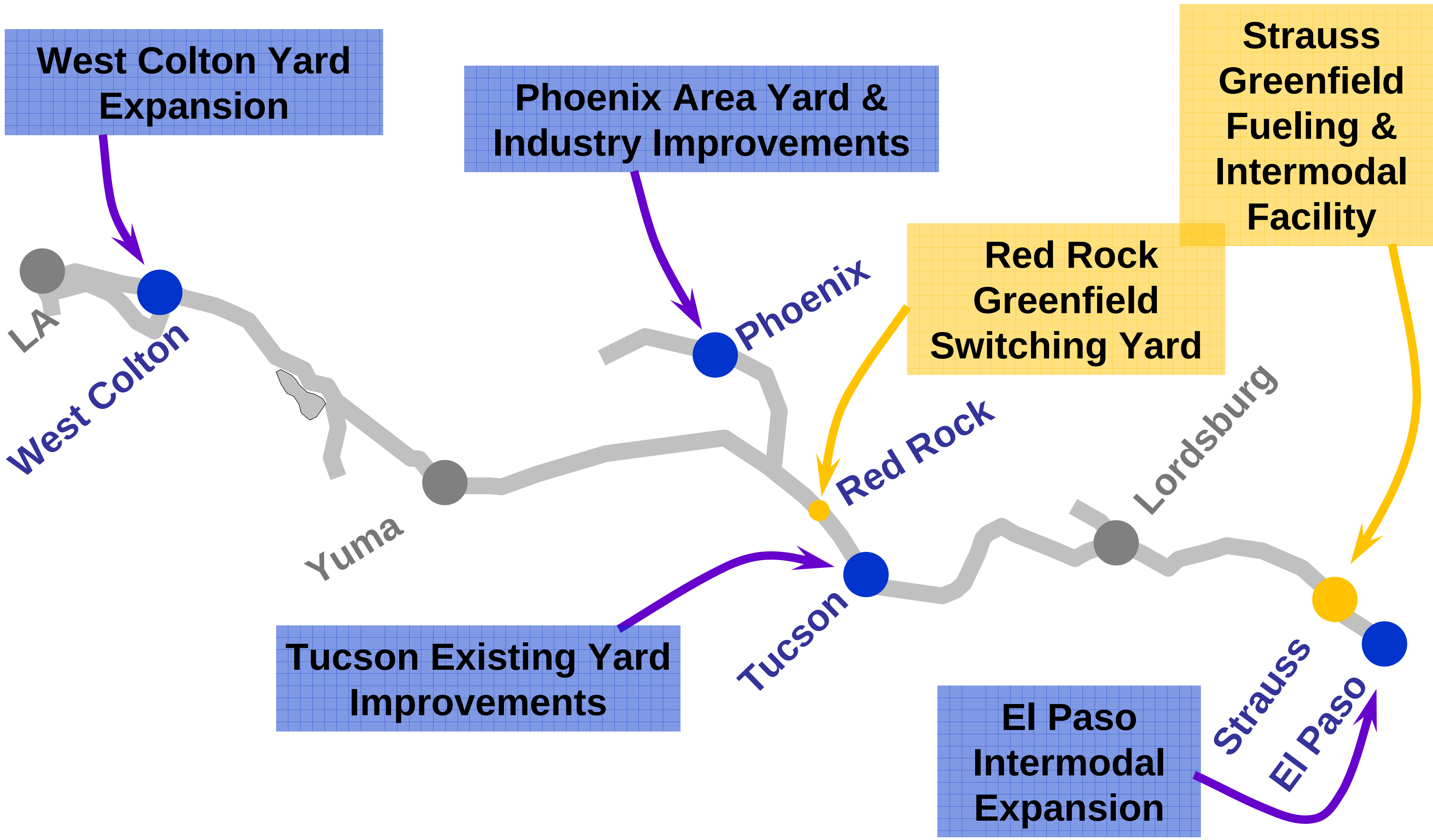
Sunset Route Facilities & Terminals Plan



Project Development Challenges

- **Tom Ogee's 5 P's of Project Development**
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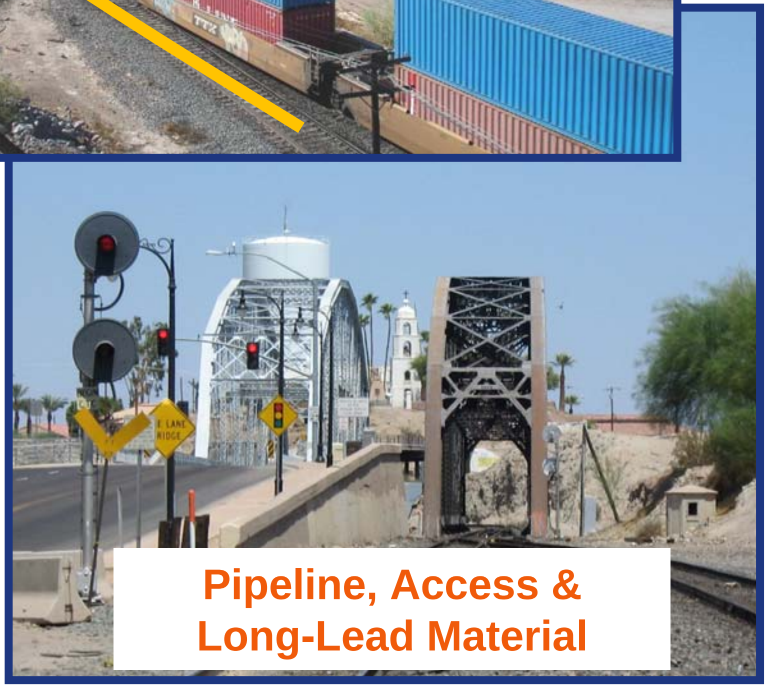

Colorado River Bridge at Yuma

6th "P" = People

UPRR Engineering	**Dave Heineman, Program Mgr** **Gary Bates, Dir Design** **Dave Orrell, Dir Construction** **John Hovanec, AVP Design** **Tom Ogee, AVP Engineering**
HDR	**Bob Yechout, Program Mgr** **Tim Bennett, Track Design** **Jeff Teig, Structures Design**
Outside Support	**H&H and Permitting: Parsons, Olsson** **Surveying: TranSystems, Hanson Wilson** **Construction: D. H. Blattner, Granite, Ragnar Benson**

UPRR Track Gangs

UPRR Signal Gangs