I-15 Ontario PCC Rehabilitation Project

CPTP Conference

April 24, 2009

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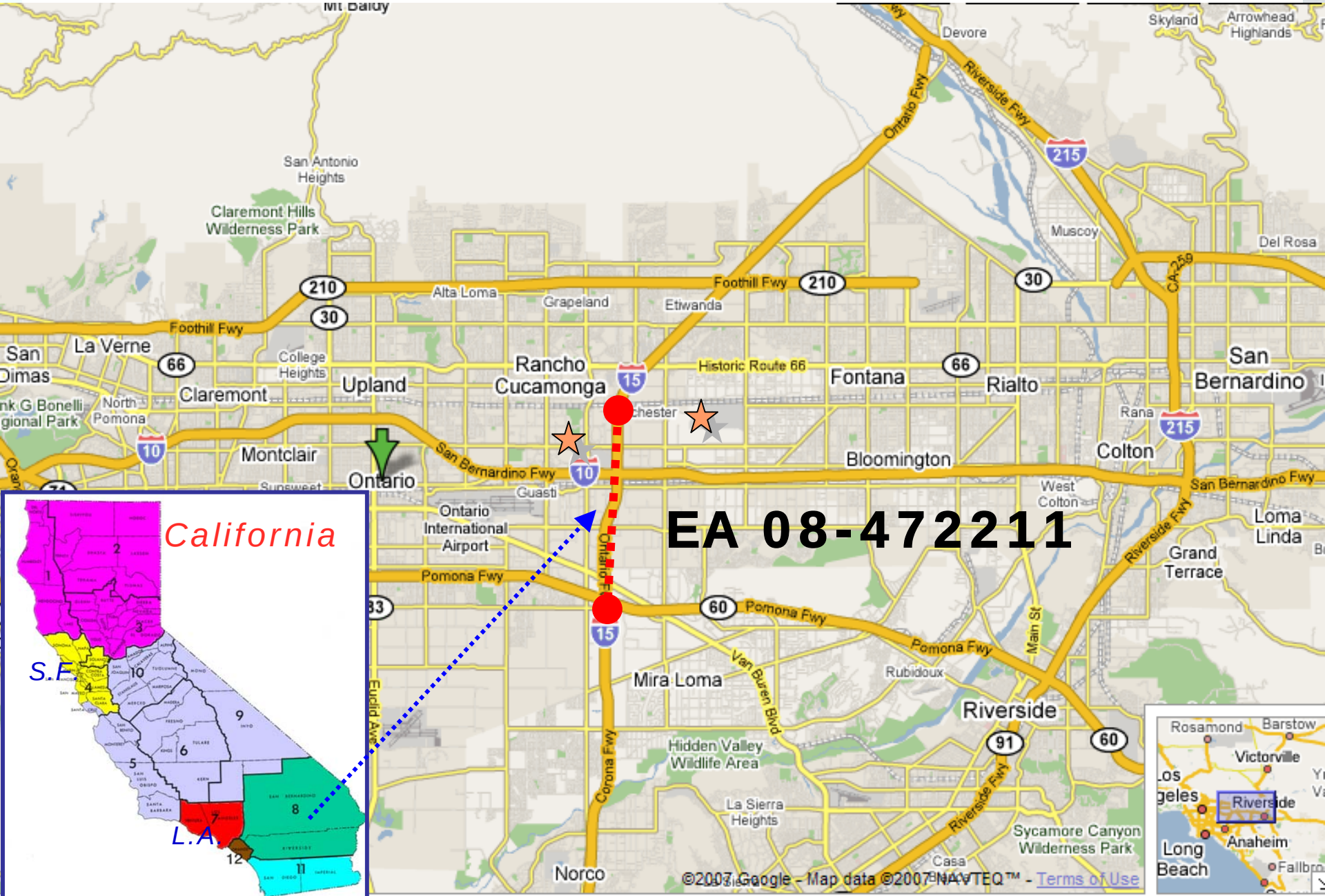
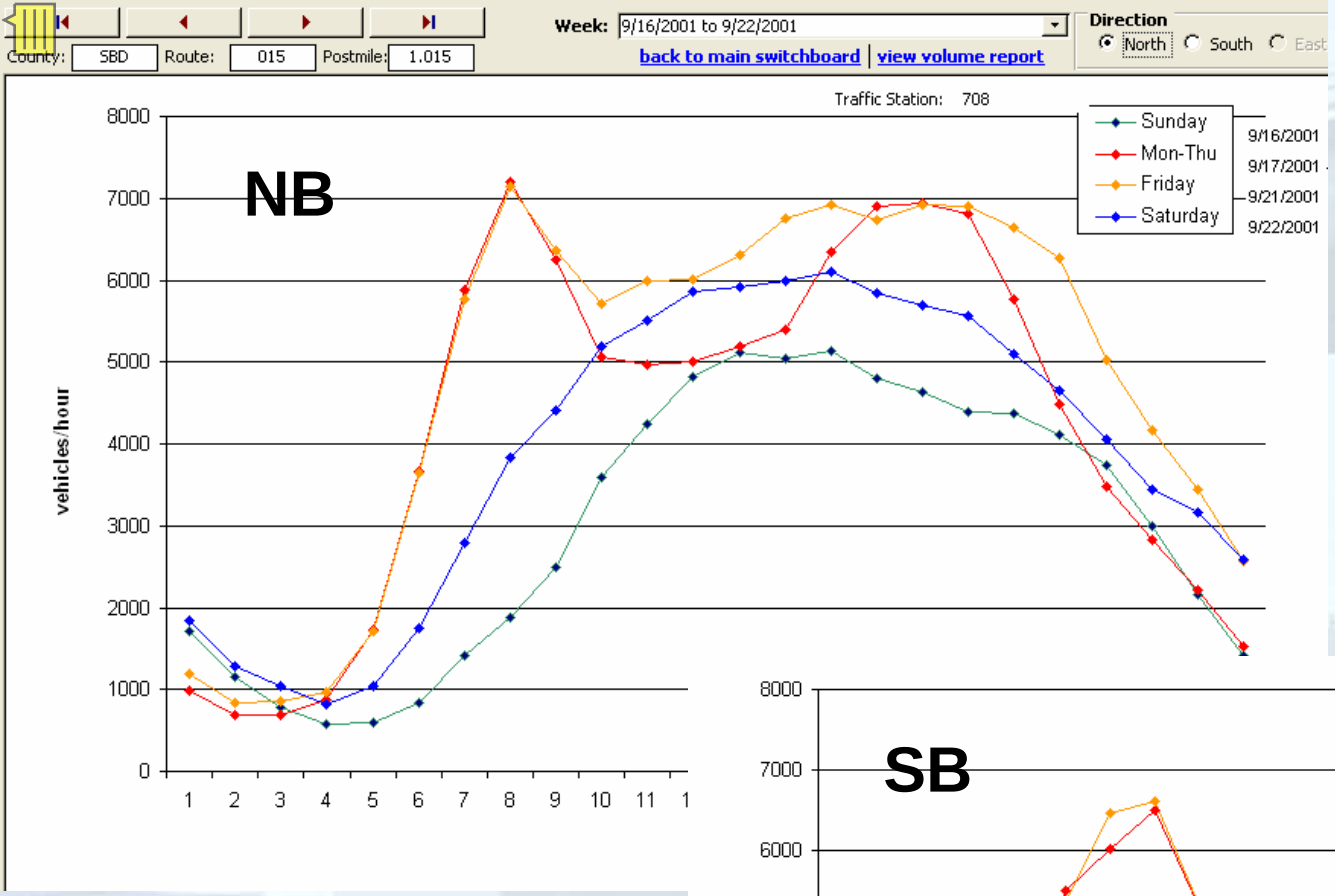
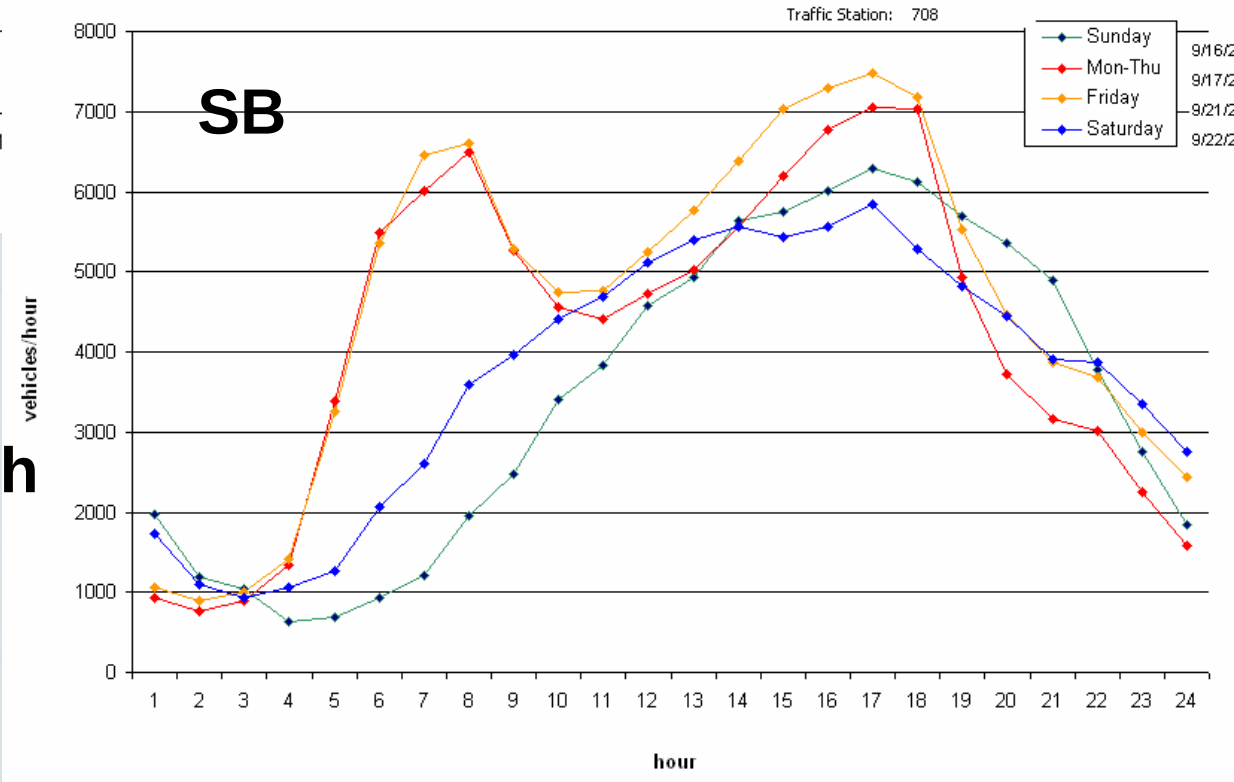
I-15 Ontario Rehabilitation Project: D8



High-Traffic Urban Freeway





- 2003 ADT: 196,500
- Peak-volume: 7000/h
- 2013 ADT: 215,300
- Trucks: 6%

Project Photos

Damaged concrete pavement on freeway lanes

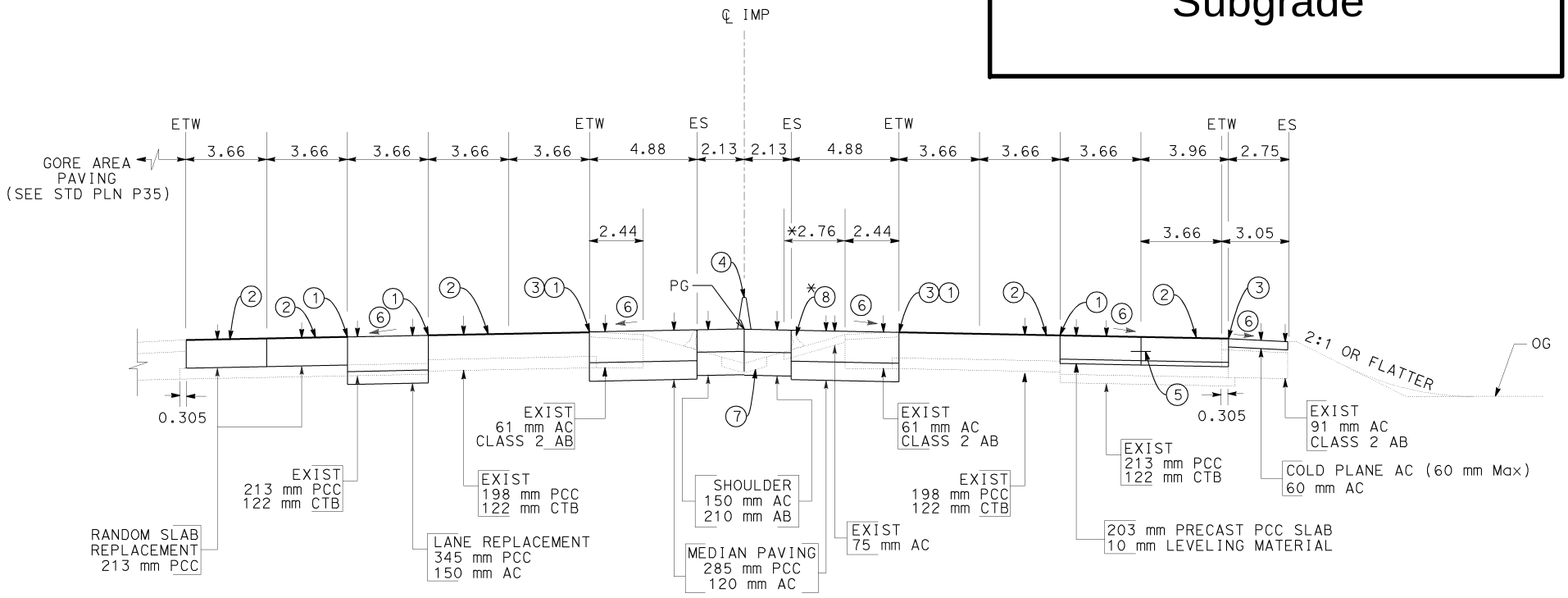
Damaged asphalt pavement on shoulder

Variety of Rehabilitation Techniques

- Concrete Materials and Mixes
  - Normal PCC
  - RSC (12-h curing-time mix)
  - FSHCC (4-h curing-time mix)
  - Precast (SuperSlab, FHWA HfL Grant)
- Closure and Detours
  - Detour on widened median (no lane closures)
  - Weekend closures: Connector areas
  - Nighttime partial closures: FSHCC (south area)
- Construction Approaches: Combination
  - Continuous-lane Reconstruction
  - Random-slab Replacement

PCC Cross-Section

Rapid Strength Concrete	345mm
AC Base	150mm
Subgrade	



* STA 32+50.000 TO STA 33+02.725

SOUTHBOUND

ROUTE 15

NORTHBOUND

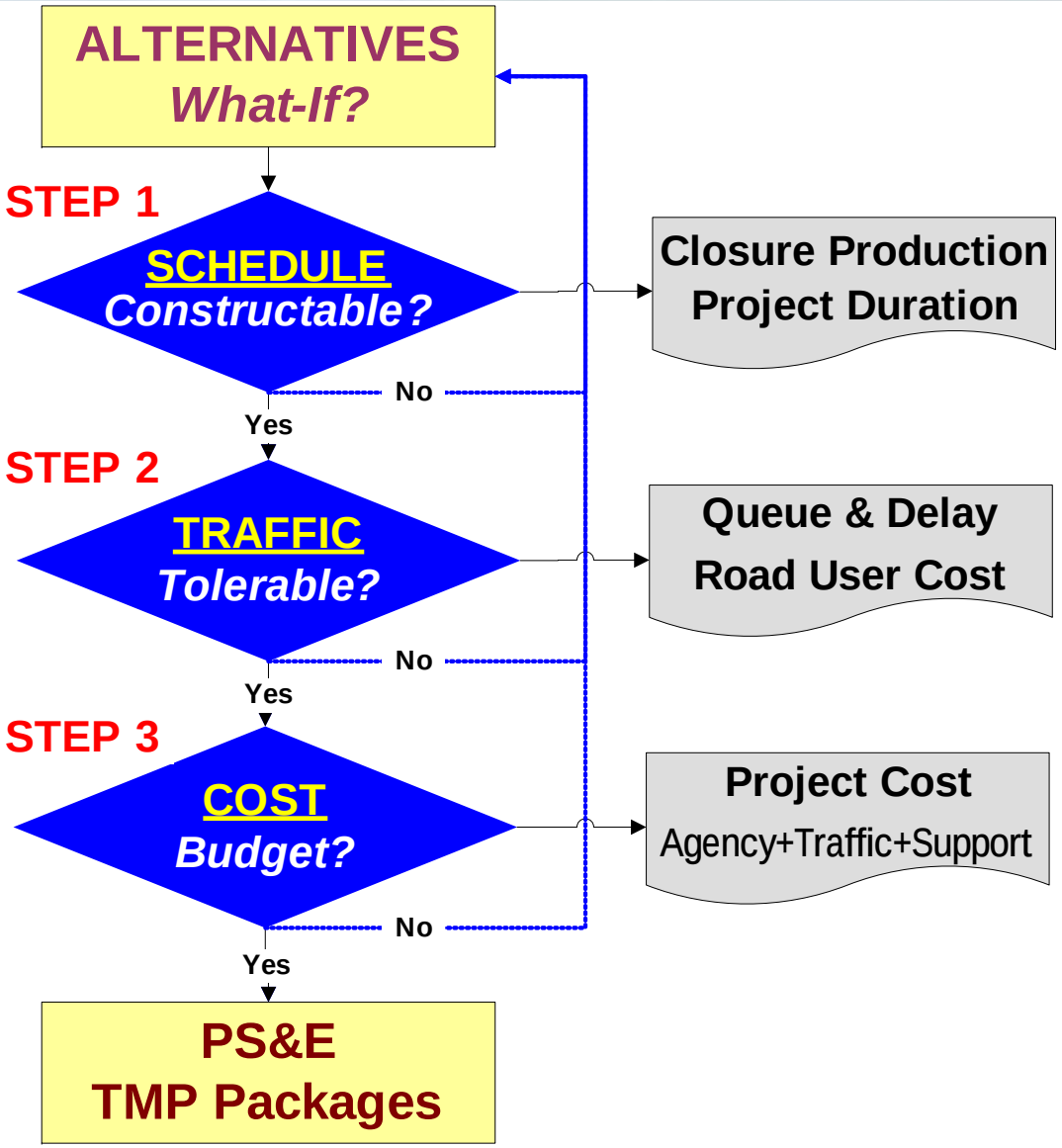
STA 32+50.000 TO STA 32+93.732

Project Objectives and Approach

- Rehabilitate pavement with long-lasting concrete (various materials & approaches)
  - Caltrans LLPRS project (30+ years)
- Minimize disruption to traffic and surrounding businesses
- Performed a detailed analysis of various alternatives, from both a RUC (delay) and Agency cost perspective
- Model (network-simulation) the construction staging to evaluate the traffic impacts
  - Mesoscopic network analysis
  - Include analysis of local arterials

Tool: CA4PRS (FHWA-Technology)

Construction Analysis for Pavement Rehabilitation Strategies



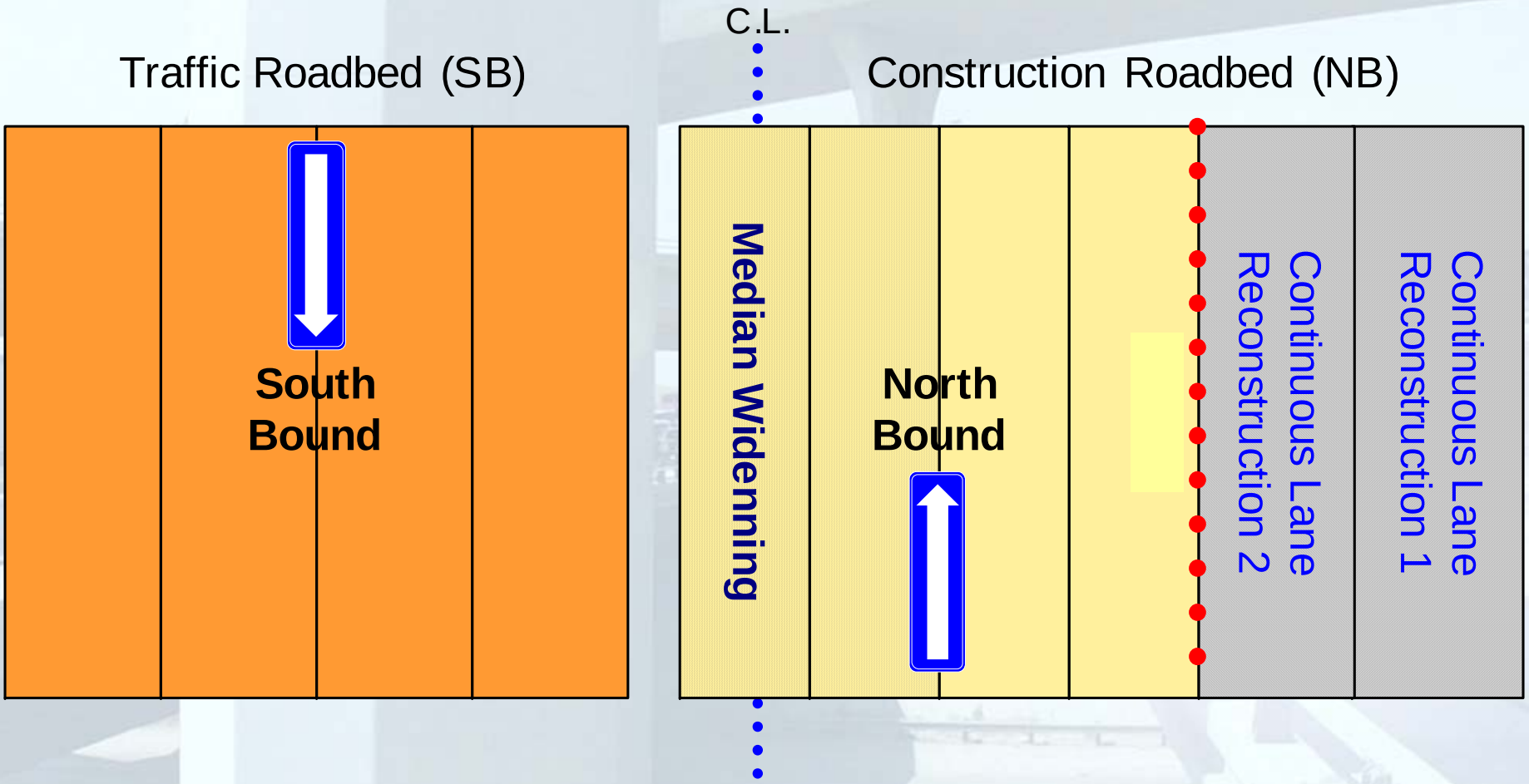
State DOTs: FHWA Free-license

More Information Exhibit & Brochure

Staging Alternatives Compared

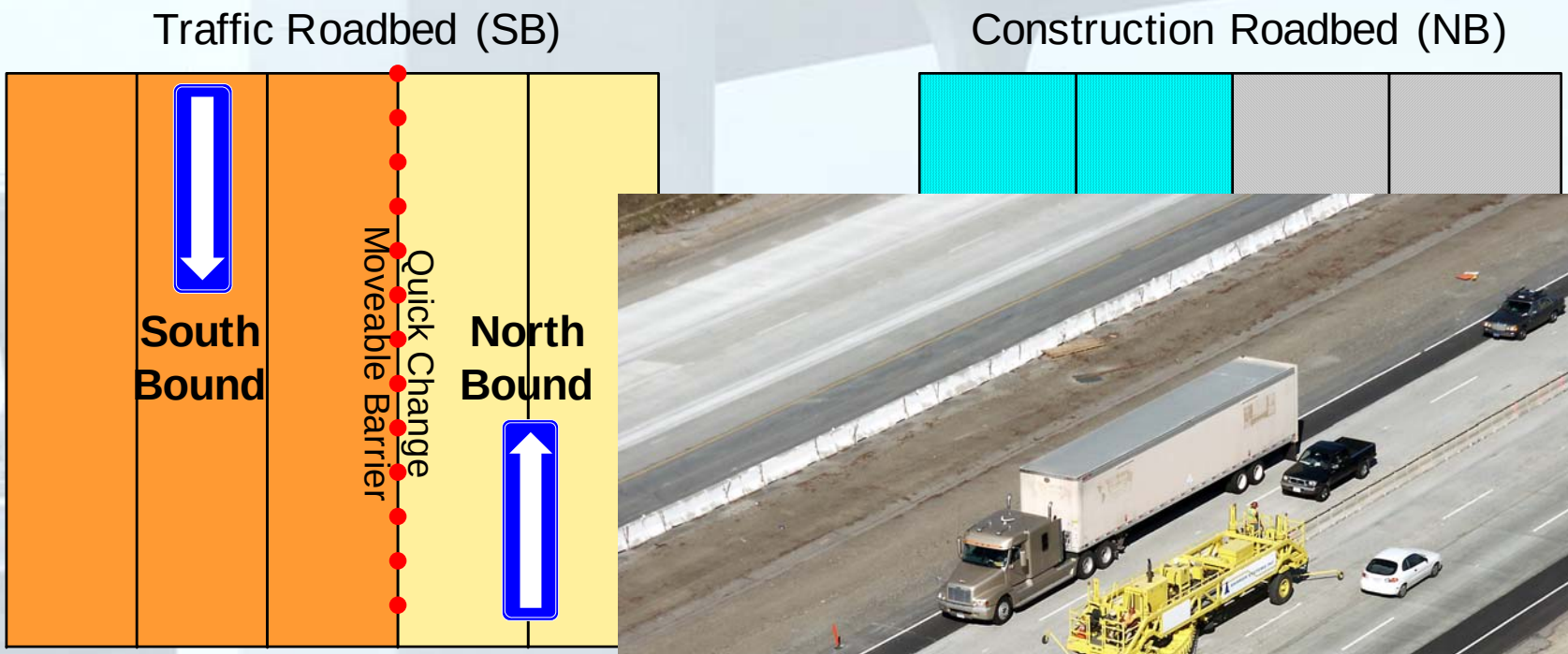
ID	Scenario	Construction Window	Closure Scheme
1	Original	55-hour Weekend + Weekdays	Median + Structure Widening
2	VA By-pass	55-hour Weekend	Split Detour
3	Rapid Rehab 1	55-hour Weekend	Full closure One roadbed
4	Rapid Rehab 2	Progressive Continuous	Full closure One roadbed
5	Traditional	8-hour Nighttime	Partial closure
6-1	Long-life CSOL	55-hour Weekend	Full closure One roadbed
6-2	Traditional AC Overlay	8-hour Nighttime	Partial closure

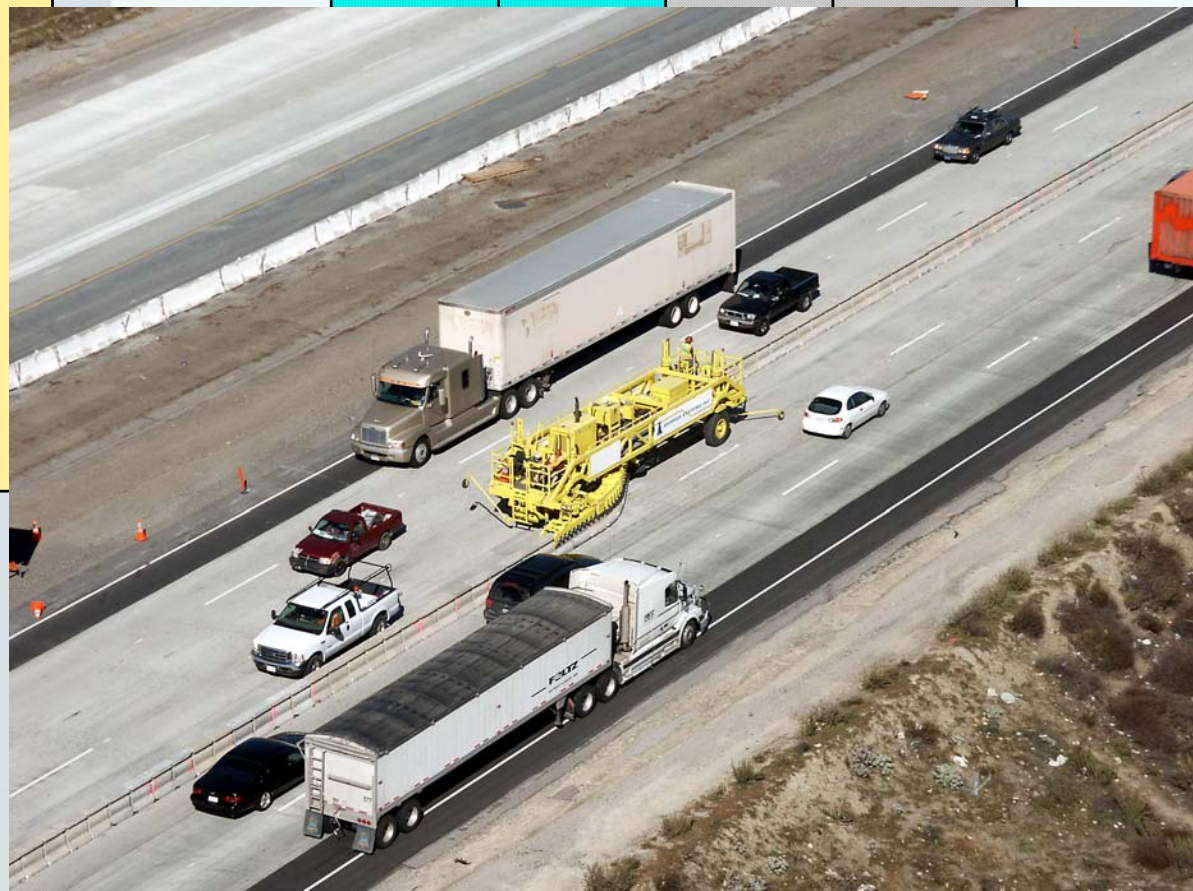
Alt 1: VA-study Original (Detour on Widened Median)



Alt 3,4: Rapid-Rehab Concept

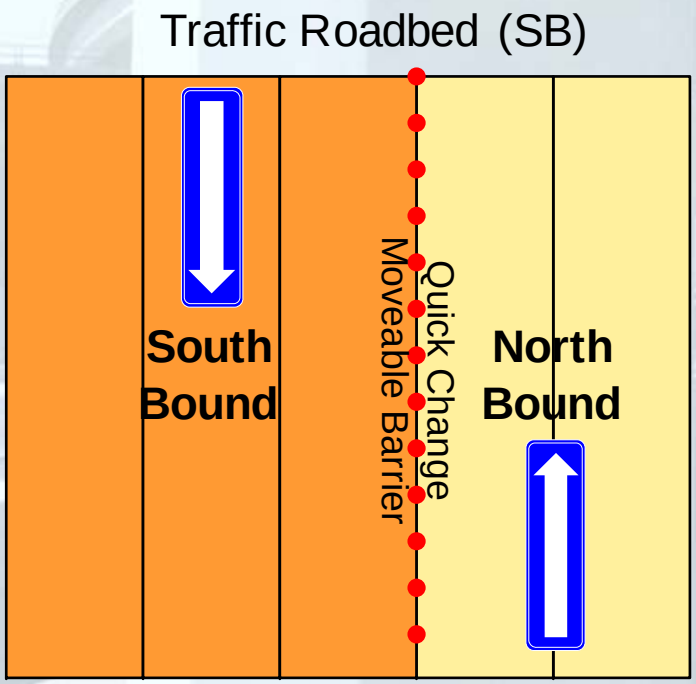
55-hour Weekend / Continuous Full-closure

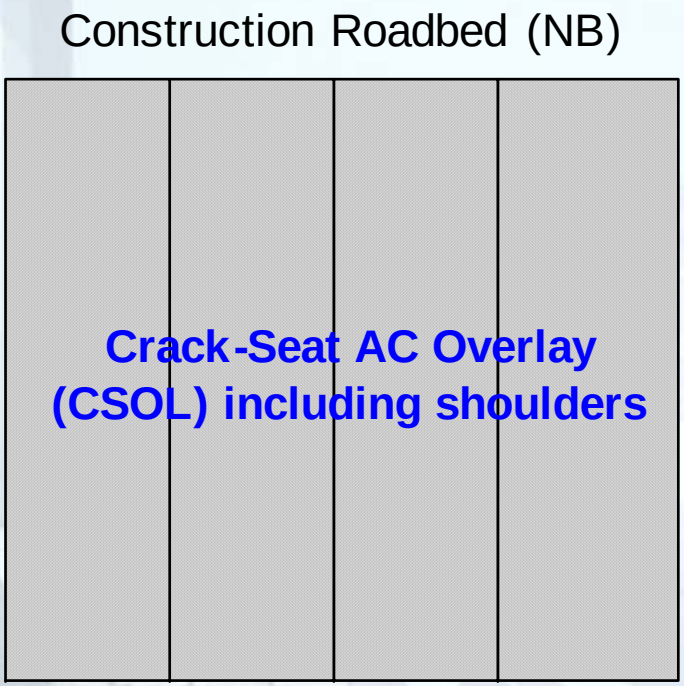




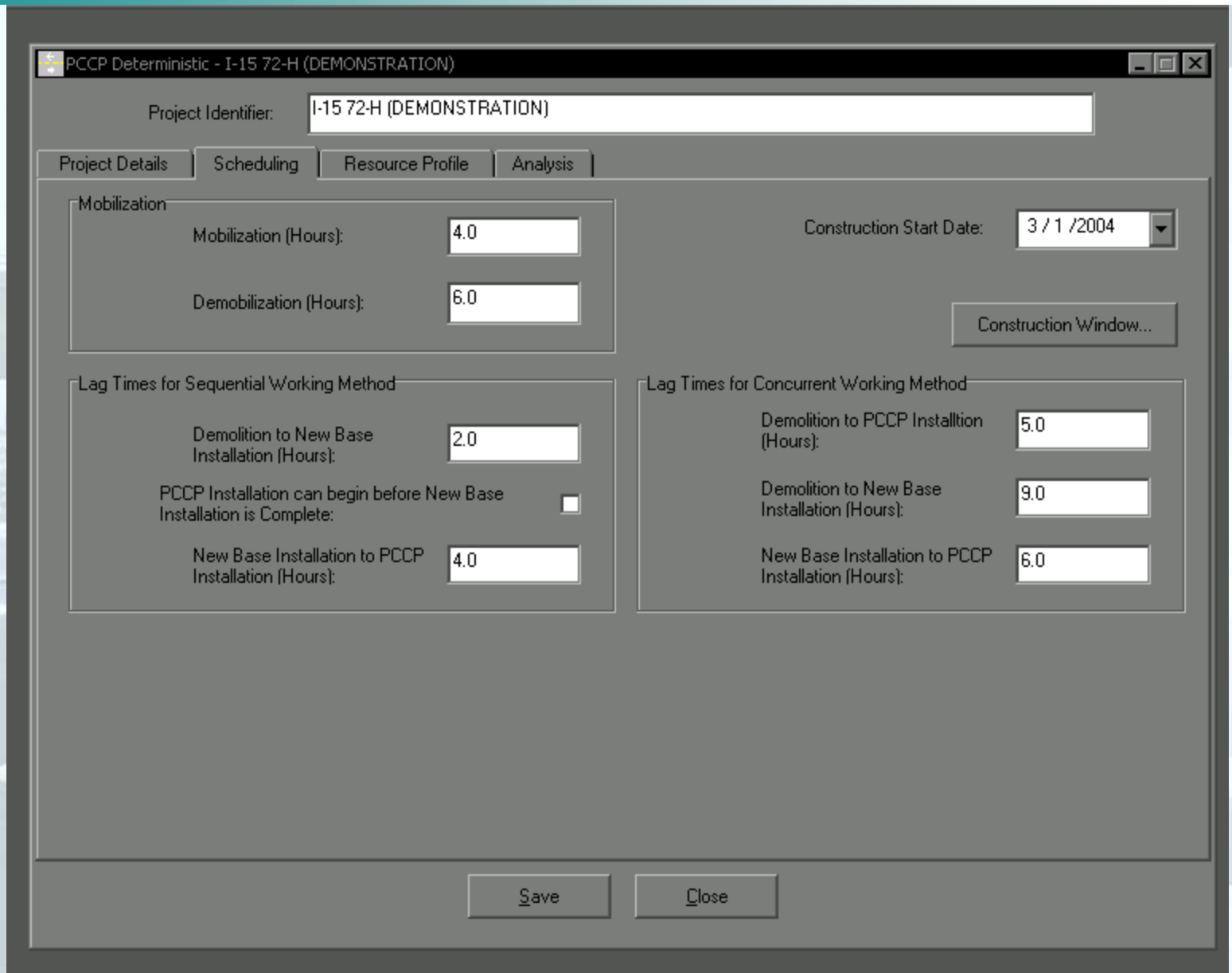
Alt 6-1, 6-2: CSOL (AC Overlay)

6-1: Long-life, 6-2: Traditional

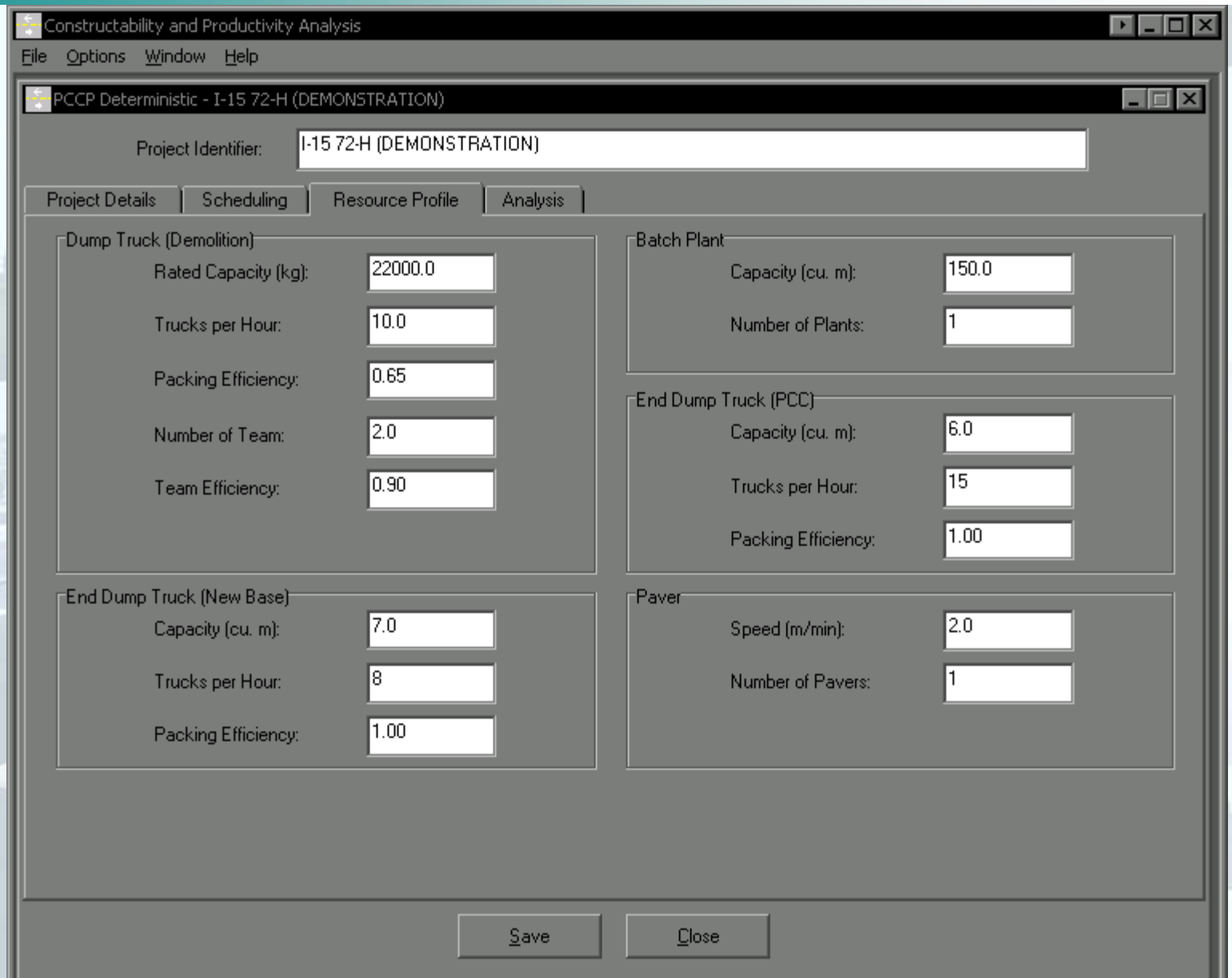




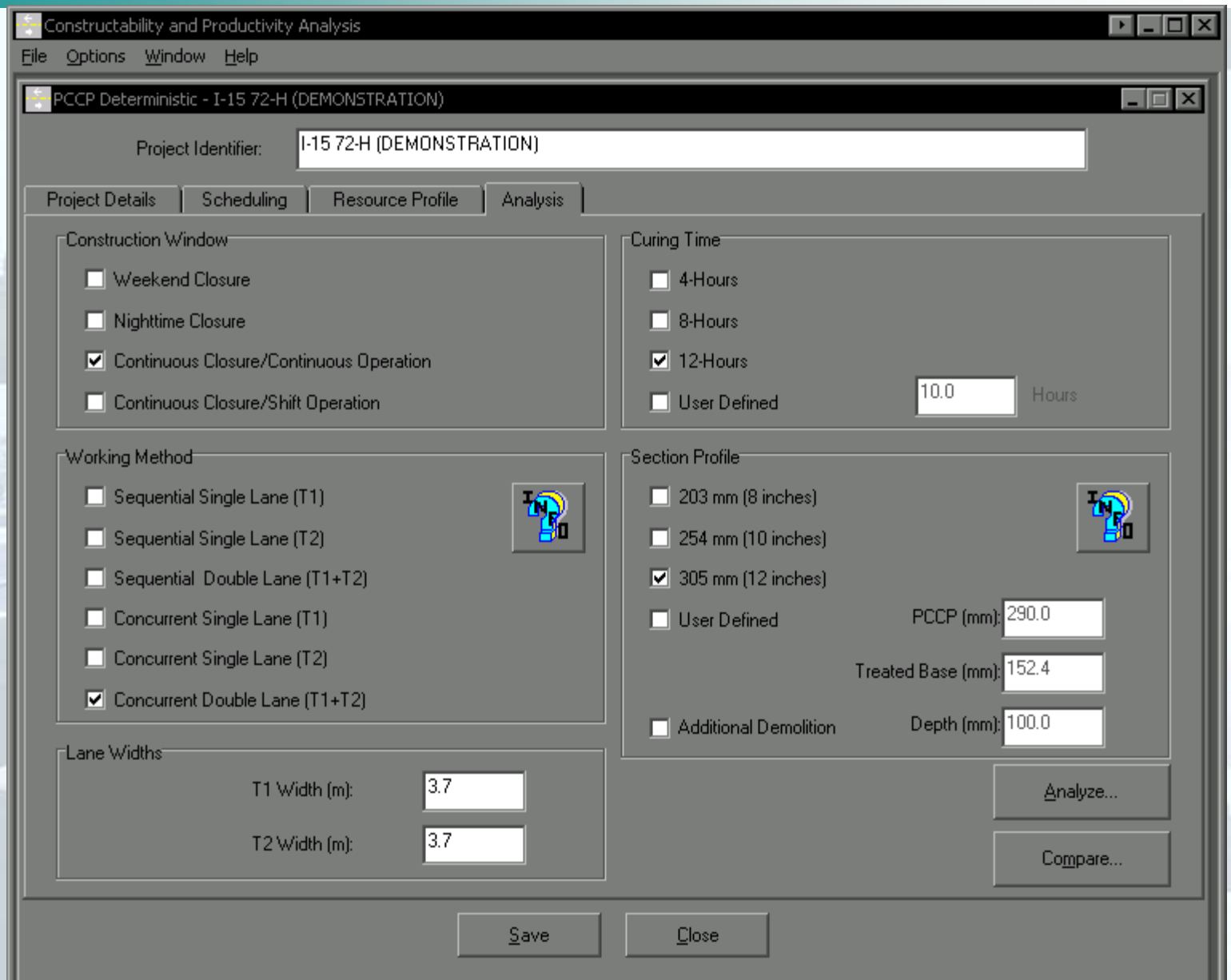
CA4PRS

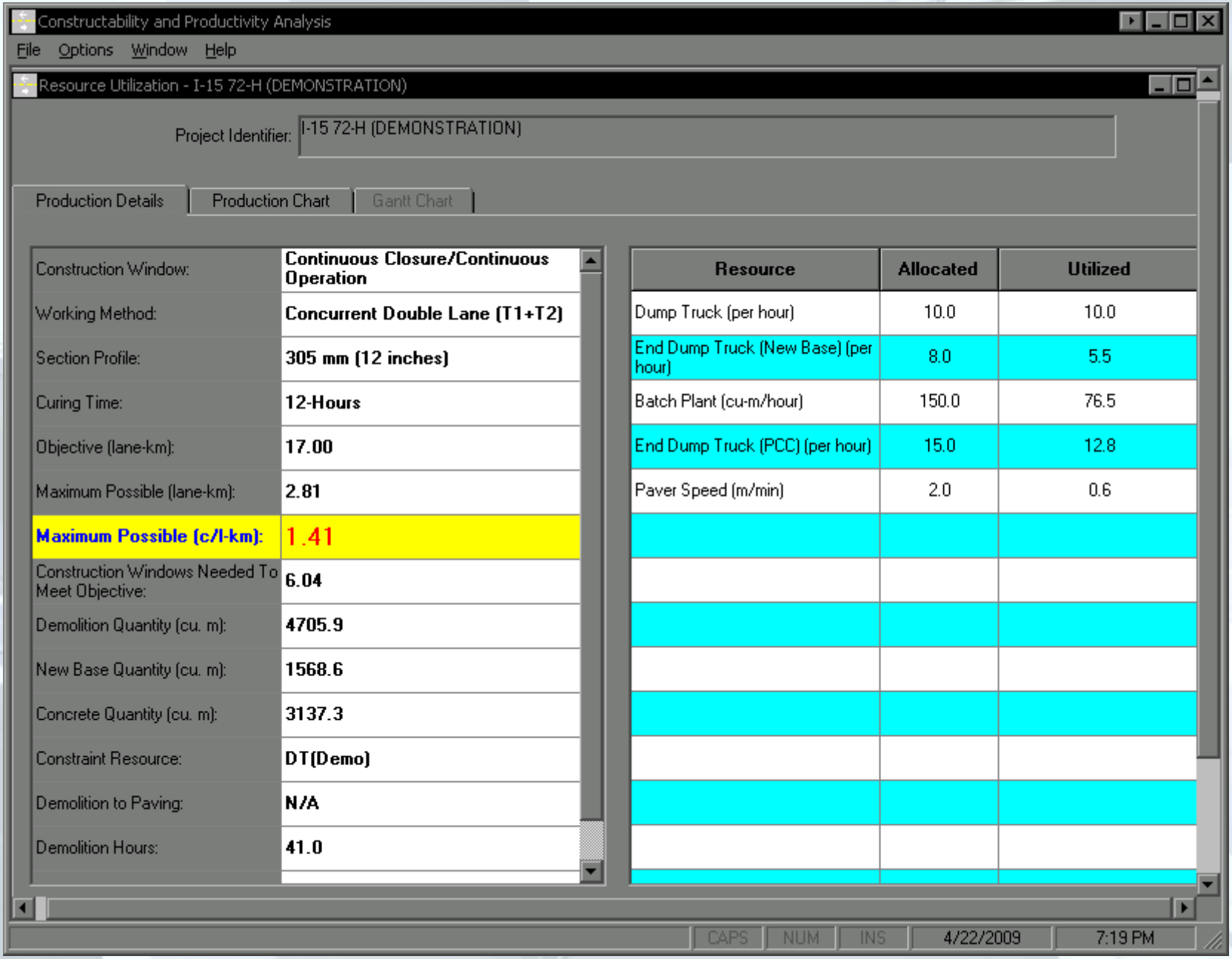

PCCP Deterministic - I-15 72-H (DEMONSTRATION)
Project Identifier:
I-15 72-H (DEMONSTRATION)
Project Details
Scheduling
Resource Profile
Analysis
Mobilization
Mobilization (Hours):
4.0
Demobilization (Hours):
6.0
Construction Start Date:
3 / 1 /2004
Construction Window...
Lag Times for Sequential Working Method
Demolition to New Base Installation (Hours):
2.0
PCCP Installation can begin before New Base Installation is Complete:
New Base Installation to PCCP Installation (Hours):
4.0
Lag Times for Concurrent Working Method
Demolition to PCCP Installtion (Hours):
5.0
Demolition to New Base Installation (Hours):
9.0
New Base Installation to PCCP Installation (Hours):
6.0
Save
Close

CA4PRS


Constructability and Productivity Analysis
File Options Window Help
PCCP Deterministic - I-15 72-H (DEMONSTRATION)
Project Identifier: I-15 72-H (DEMONSTRATION)
Project Details Scheduling Resource Profile Analysis
Dump Truck (Demolition)
Rated Capacity (kg): 22000.0
Trucks per Hour: 10.0
Packing Efficiency: 0.65
Number of Team: 2.0
Team Efficiency: 0.90
Batch Plant
Capacity (cu. m): 150.0
Number of Plants: 1
End Dump Truck (PCC)
Capacity (cu. m): 6.0
Trucks per Hour: 15
Packing Efficiency: 1.00
End Dump Truck (New Base)
Capacity (cu. m): 7.0
Trucks per Hour: 8
Packing Efficiency: 1.00
Paver
Speed (m/min): 2.0
Number of Pavers: 1
Save
Close

CA4PRS


Constructability and Productivity Analysis
File Options Window Help
PCCP Deterministic - I-15 72-H (DEMONSTRATION)
Project Identifier: I-15 72-H (DEMONSTRATION)
Project Details Scheduling Resource Profile Analysis
Construction Window
Weekend Closure
Nighttime Closure
Continuous Closure/Continuous Operation
Continuous Closure/Shift Operation
Curing Time
4-Hours
8-Hours
12-Hours
User Defined 10.0 Hours
Working Method
Sequential Single Lane (T1)
Sequential Single Lane (T2)
Sequential Double Lane (T1+T2)
Concurrent Single Lane (T1)
Concurrent Single Lane (T2)
Concurrent Double Lane (T1+T2)
Section Profile
203 mm (8 inches)
254 mm (10 inches)
305 mm (12 inches)
User Defined
PCCP (mm): 290.0
Treated Base (mm): 152.4
Additional Demolition
Depth (mm): 100.0
Lane Widths
T1 Width (m): 3.7
T2 Width (m): 3.7
Analyze...
Compare...
Save
Close


Constructability and Productivity Analysis
File Options Window Help
Resource Utilization - I-15 72-H (DEMONSTRATION)
Project Identifier: I-15 72-H (DEMONSTRATION)
Production Details
Production Chart
Gantt Chart
Construction Window: Continuous Closure/Continuous Operation
Working Method: Concurrent Double Lane (T1+T2)
Section Profile: 305 mm (12 inches)
Curing Time: 12-Hours
Objective (lane-km): 17.00
Maximum Possible (lane-km): 2.81
Maximum Possible (c/l-km): 1.41
Construction Windows Needed To Meet Objective: 6.04
Demolition Quantity (cu. m): 4705.9
New Base Quantity (cu. m): 1568.6
Concrete Quantity (cu. m): 3137.3
Constraint Resource: DT(Demo)
Demolition to Paving: N/A
Demolition Hours: 41.0
Resource
Allocated
Utilized
Dump Truck (per hour) 10.0 10.0
End Dump Truck (New Base) (per hour) 8.0 5.5
Batch Plant (cu-m/hour) 150.0 76.5
End Dump Truck (PCC) (per hour) 15.0 12.8
Paver Speed (m/min) 2.0 0.6
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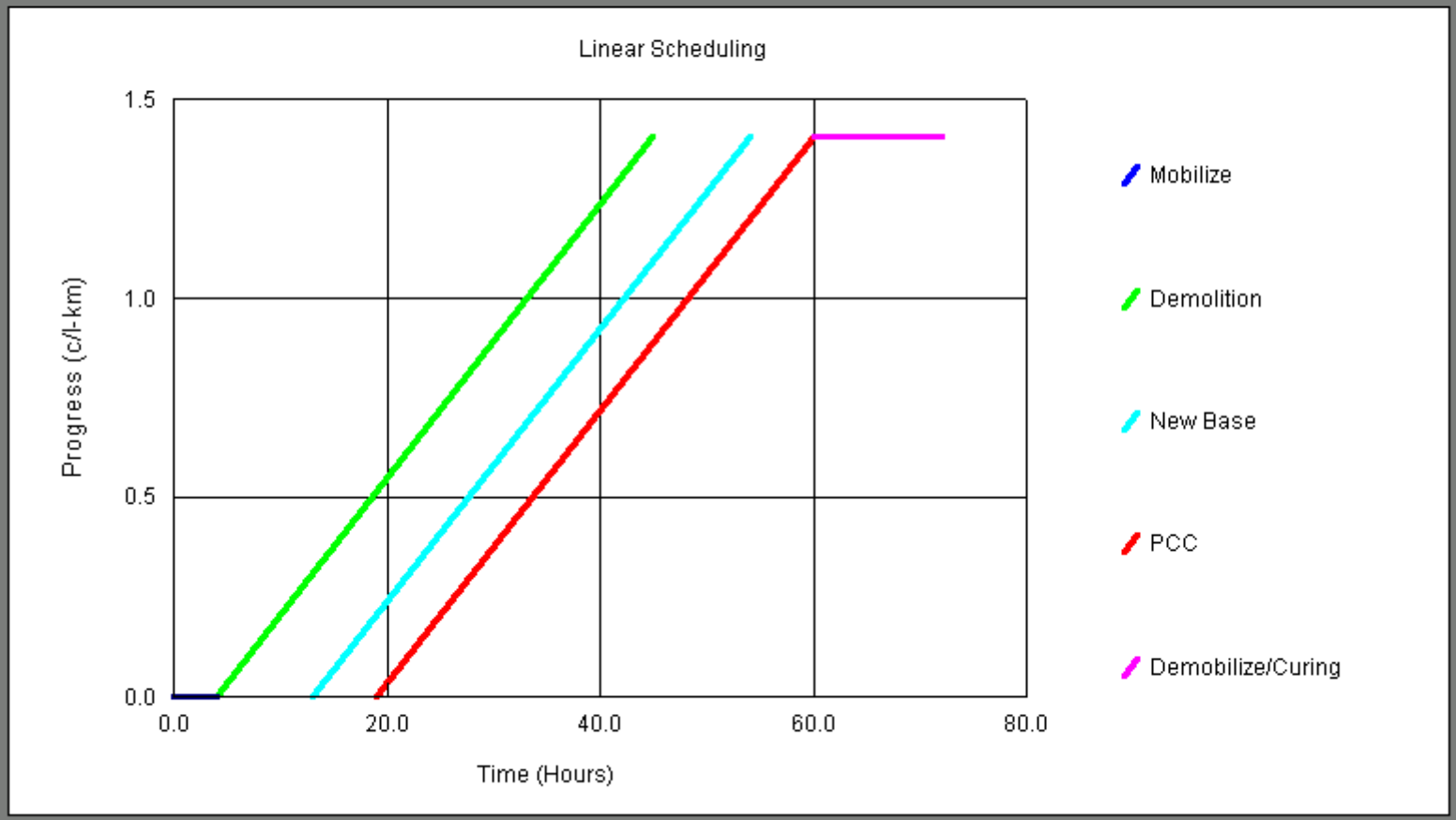
Constructability and Productivity Analysis

File Options Window Help

Resource Utilization - I-15 72-H (DEMONSTRATION)

Project Identifier: I-15 72-H (DEMONSTRATION)

Production Details | Production Chart | Gantt Chart



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Schedule-Traffic Cost Comparison

CA4PRS Analysis Summary

Scenario		Closure Duration	Traffic*		Cost ($millions)		Cost Ratio
			RUC ($M)	Delay (min)	Agency	Total**	
1	VA Original Median-Detour	35 weekends	3	16	78	79	100%
3	PCC 55-hour Weekend	35 weekends	119	363	83	123	156%
4	Progressive Continuous	8 weeks	123	363	77	118	149%
5	Traditional Nighttime	1,220 nights	133	22	88	133	168%
6	CSOL 55-hour weekend	20 weekends	69	363	60	83	105%

** With 30% demand reduction except nighttime (10%)*

*** Total cost = (1/3 RUC) + (Agency Cost)*

Project Update (On-going)

- Bid Opened: December 11, 2008
  - Contractor: Security Paving Company
  - Low Bid: $52M
  - Engineer's estimate: $68M
- Construction Schedule: 2009-2010
  - Widening: Apr 2009 to Jan 2010
  - SB Rehab: Feb 2010 to Apr 2010
  - NB Rehab: May 2010 to Oct 2010
  - Precast: Jun, Jul 2010
  - Project Completion: Nov 2010

Construction-Staging Plans

- Pave the median and bridge-structures
- Shift SB traffic two lanes over into the median.
- Rehab outside lanes on weekdays
- Rehab ramps, connectors, weaving areas on 55-hour weekend closures
- Repeat for NB side
- Construction-Staging Traffic Analysis
  - Complicated process: 26 Stages
  - Up to 32 weekend closures
  - Too costly and time-consuming to analyze all
  - Choose ones with highest potential impact

Mesoscopic Simulation: DynamEq

- Mesoscopic Network Simulation
  - Equilibrium-based Mesoscopic Model
  - Useful for very large-scale applications
  - More detail than macroscopic
  - Less work to set up than microscopic
  - Base model from SCAG
  - Count data and 67 Traffic signals
  - Lane-level geometry
  - Intensive calibration process
- Objectives: TMP Implementation
  - Plan/revise detours
  - Identify ‘problem’ intersections
  - Improve with signal timing and COZEEP
  - Compare results with observe: Construction

Q & A: Thank you!