



Creating Safe, Dynamic Highways with Moveable Barrier Technology



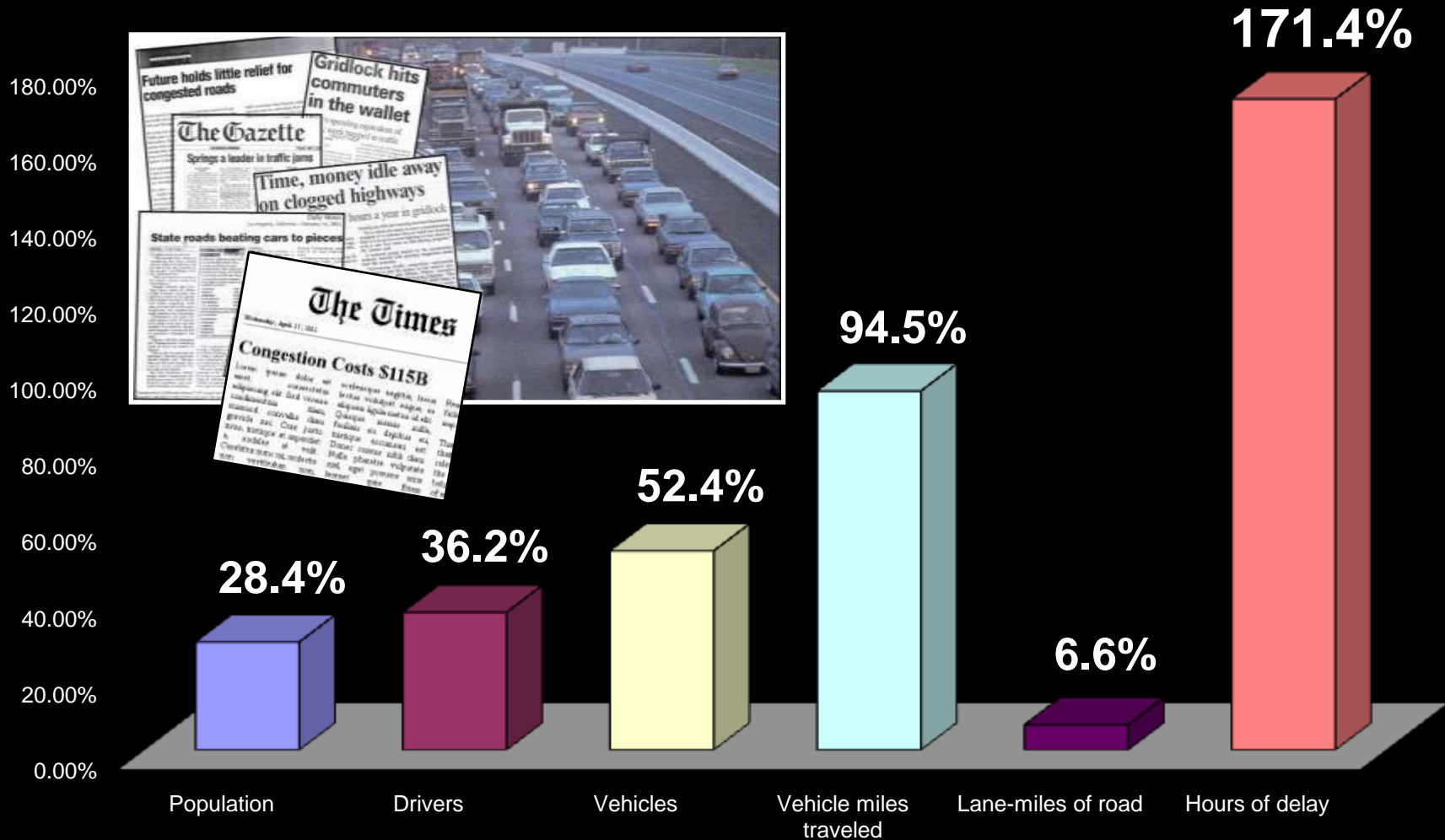
2011 Urban Mobility Report

- **5 Billion Hours Lost to Congestion Annually in the US**
- **Cost of Congestion was US \$101 Billion in 2011**



Highway Capacity vs Demand

Increase, 1982 to 2006





Building New Capacity is Time-Consuming and Expensive



- Years in Planning
- Lengthy Environmental Reviews
- Multiple Construction Seasons
- Up to US \$10 Million per Urban Lane Mile*

*FHWA. Congestion Pricing: A Primer. 2006.



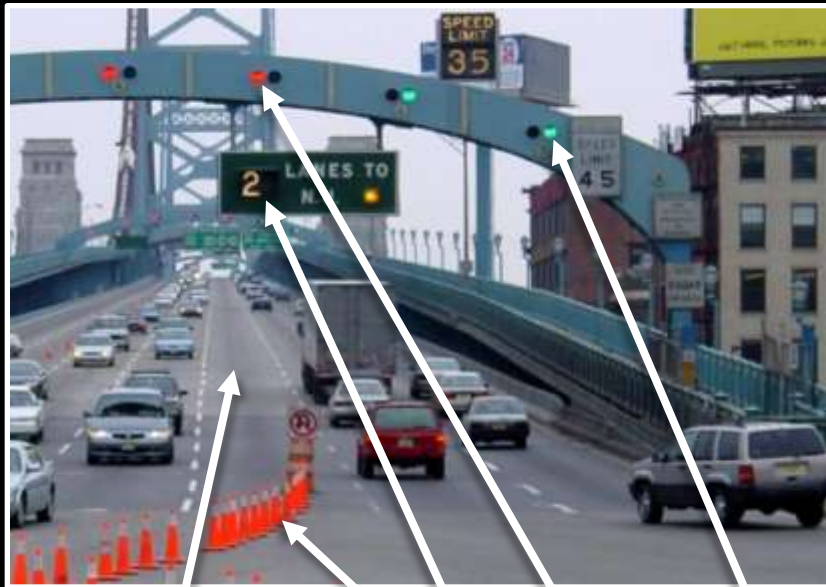
“Tidal Flow” / Directional Traffic Around the World



**Directional Traffic Allows Creative Approaches
to Congestion Mitigation through Managed Lanes**

Managed Lane Applications

Moveable Median



Contraflow Lane



**Buffer Landsafety Cones do Not Provide
Wasted Space Positive Protection**



Taking Advantage of Unused Capacity with Quickchange[®] Moveable Barrier (QMB[™])



Moveable Medians



Contraflow Lanes

**Safe Deployment • Positive Protection • All Lanes in Use
Transfer Machine & Cars are Protected by the Barrier**



Crossover Head-on Accidents

Coronado Bridge, San Diego



Before QMB3:

21 Crossovers in 3 Years,
ZERO
2 Fatalities

Auckland Harbour Bridge, NZ



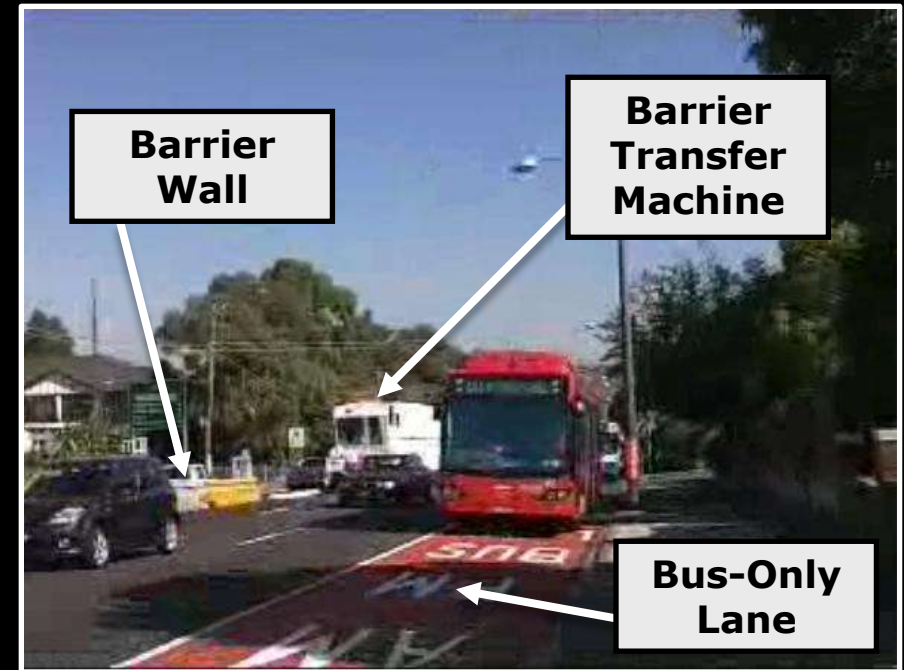
Before QMB3:

20 Crossovers in 5 Years,
ZERO
10 Fatalities

Creative Solutions for Managed Lanes



**I-15 San Diego:
Center Lanes are 3/1, 2/2, 1/3**



**Victoria Road, AU:
"Bus Only" Lanes on Arterial**



Barrier Transfer Machine

Moveable Barrier System Components

- 1m Barriers Pinned Together to Form Continuous Wall
- T-Top Lifts / Transfers Barriers
- Barriers Transferred Laterally 8 to 24 ft in One Pass
- BTM Transfers up to 10 mph (15 kph)
- VLB's = Tapers, Curves & Expansion
- ABSORB 350 Crash Cushion Protection



Moveable Barrier



VLB



ABSORB 350

Green Benefits



- Improves Air Quality
- Reduces Traffic Congestion
- Improves Fuel Efficiency & Reduces Travel Time
- Better Use of Land Resources / Minimizes Footprint
- Reduces Atmospheric CO₂ (Greenhouse Gases)
- Increases Bus Rapid Transit Capacity & Usage



Other Moveable Barrier System Benefits



- **Cost-Effective Strategy to Add Roadway Capacity**
- **Operational in Months, Not Years**
- **Positive Barrier Protection at All Times**
- **Improved Incident Management**
- **Reusable Asset, Can be Redeployed as Required**
- **Stretches Transportation Dollars!**

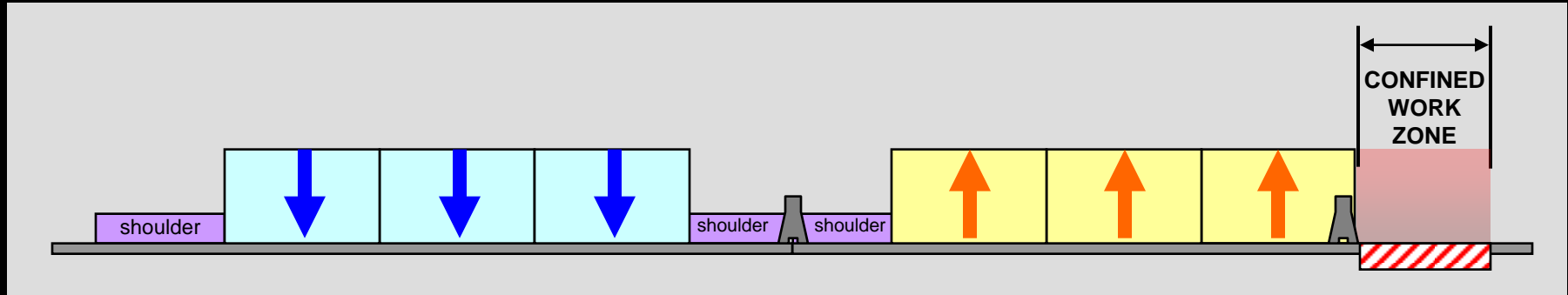


Moveable Barrier For Construction Applications

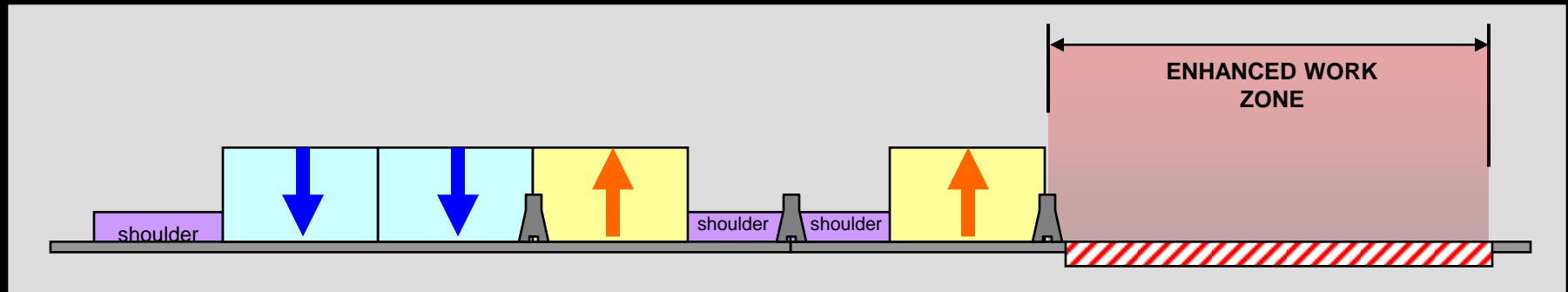


- **Provides Positive Barrier Protection at All Times**
- **Opens More Lanes for Peak Period Traffic**
- **Maximizes Work Zone Space During Off Peak Periods**
- **Accelerates, Combines, or Eliminates Construction Stages**

Typical Construction Cases with Temporary Barrier

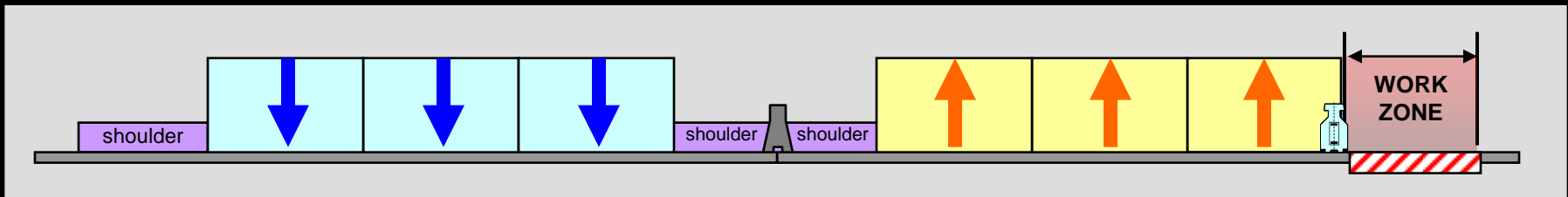


#1: Motorists have maximum protection and throughput but contractor is severely restricted. Increases construction cost and length of project.

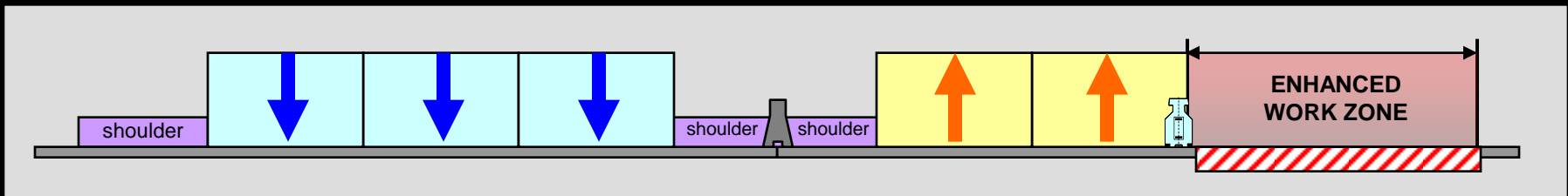


#2: Enhanced work zone speeds construction and reduces cost. Motorists are faced with substantial traffic delays.

Typical Construction Case with Moveable Barrier



#1: Motorists have maximum protection and throughput for peak traffic periods.



#2: The Contractor increases the size of the work zone during off-peak periods to speed construction and reduce cost.



Case Study: I-15 Devore “Rapid Rehab”

- **Aggressive Work Plan With 24/7 Shifts & Extended Closures**
- **Moveable Median Barrier Kept Traffic Flowing, Avoided Long Queues**
- **Construction Accelerated From 8 Months to 6 Weeks**
- **Construction Savings of More Than \$6M***

*CalTrans. “Rapid Rehab at Devore.”



St. Croix River Bridge

- Needed 3 Lanes Open in Each Direction With Only 5 Lanes Available
- Planned for 2 Construction Seasons, Completed in 1
- Construction Cost Savings >\$1M*
- User-Delay Cost Savings >\$1.5M*
- Positive Protection = No Crossovers

* Ayres Associates. Rush Hour Remedy.



Managed Lanes Summary



- Reclaim Underutilized Capacity
- Add More Lanes in the Peak Direction
- Mitigate Congestion at a Fraction of the Cost of New Construction



Construction Applications Summary



- **Reduce Congestion, Accelerate Construction, Protect the Work Zone**
- **More Lanes for Peak Traffic, Larger Work Zone During Off-Peak**
- **Real Savings in Time-Related Overhead, Project Costs, User Delay Costs, Accident Costs**



Questions / Discussion

