TRB Session 613 (P07-0663)
Recent Investigations into Shared Railroad Corridors and Facilities
Tuesday, January 23, 2007, 7:30 PM – 9:30 PM, Hilton
Thomas R. Hickey, Gannett Fleming, Inc., presiding

Edwards AND Kelcey

ENGINEERS
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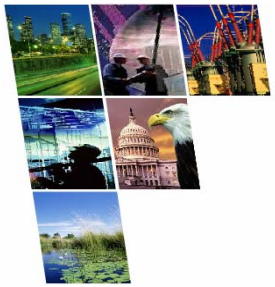
Business Case for Shared-Track Operations

Alexander Lu and David Nelson
Edwards and Kelcey

REAL WORLD CHALLENGES . . . REAL WORLD SOLUTIONS



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Acknowledgements

Research conducted for:

- **Transit Cooperative Research Program**
  Project A-27
  Shared Use of Railroad Infrastructure with Non-Compliant Public Transit Rail Vehicles

- **U.S. DOT Federal Railroad Administration**
  Office of Research and Development
  ITS Technologies for Integrated Rail Corridors
  Contract No. DTFR53-01-D-0030 (2005-06)

Shared Track Background

- Shared Track: Physically Feasible – Conventional railway and urban transit cars use similar track and infrastructure but seldom share assets.
- Growing Interest in Shared Track – As demand for urban transit services have grown in Europe and North America the interest in developing transit services that share track with existing low density freight services has grown.
- Shared Track Safety – Various disparities in the physical and operating characteristics for conventional railway and urban transit vehicle raise safety concerns about shared track.
  - Railway cars are heavier and more crashworthy
- Overseas Leadership – German transport officials have been leaders in developing transit services that share track with conventional railway operations.
- Domestic Review – U.S. transport officials have been more cautious, but are continuously evaluating their position on this issue.

Research Problem

- Explore the market and business case for domestic investment and action to develop shared track transit operations
  - Market Assessment – National breadth and scope of concurrent shared track operation opportunities
  - Business Case – What are costs and benefits of concurrent shared track operations?

Approach

- **Market Assessment**
  - Mapping Approach
  - Industry Scan
- **Business Case**
  - Historical Case Studies
  - New Starts Analysis
  - Hypothetical Case Study

Business Case for Shared-Track Operations

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Market Assessment

Research Questions:

1. Breadth of potential market for shared track transit operations on conventional rail lines?
2. Characteristics of the current and planned shared track operations?

Two Inventory Methods:

1. Mapping Approach
2. Industry Scan

Market Assessment

1. Mapping Approach *(Focus on Broad Potential)*:

Based on 1980 national inventory of potentially suitable sites for the development of public commuter transportation services on underutilized rail rights of way

Updated and expanded the 1980 methodology

- Scanned 88 largest metropolitan areas (>500K Inhabitants)
- For radial rail freight lines with low freight traffic density (<1 MGT/annum)
- Four sources
    1. Ladd's U. S. Railroad Traffic Atlas
    2. A recent standard railroad atlas
    3. GoogleEarth
    4. GoogleMAPS

Market Assessment

2. Industry Scan *(Focus on Active Corridors)*

Corridors where substantial shared track operations are:

1. Are currently conducted,
2. Are in design or construction,
3. Had been considered but were ultimately avoided
4. Are in active stages of planning and evaluation.

Sources

1. Study team's current industry experience,
2. Input from selected active members of various TRB passenger committees,
3. Review KKO's 1998 TRB survey of potential North American applications for emerging DMU technologies
4. Review ENSCO/ICF's 2005 FRA non-compliant vehicle safety study

Business Case for Shared-Track Operations

- Market Assessment
  - **Mapping Approach**
  - Industry Scan
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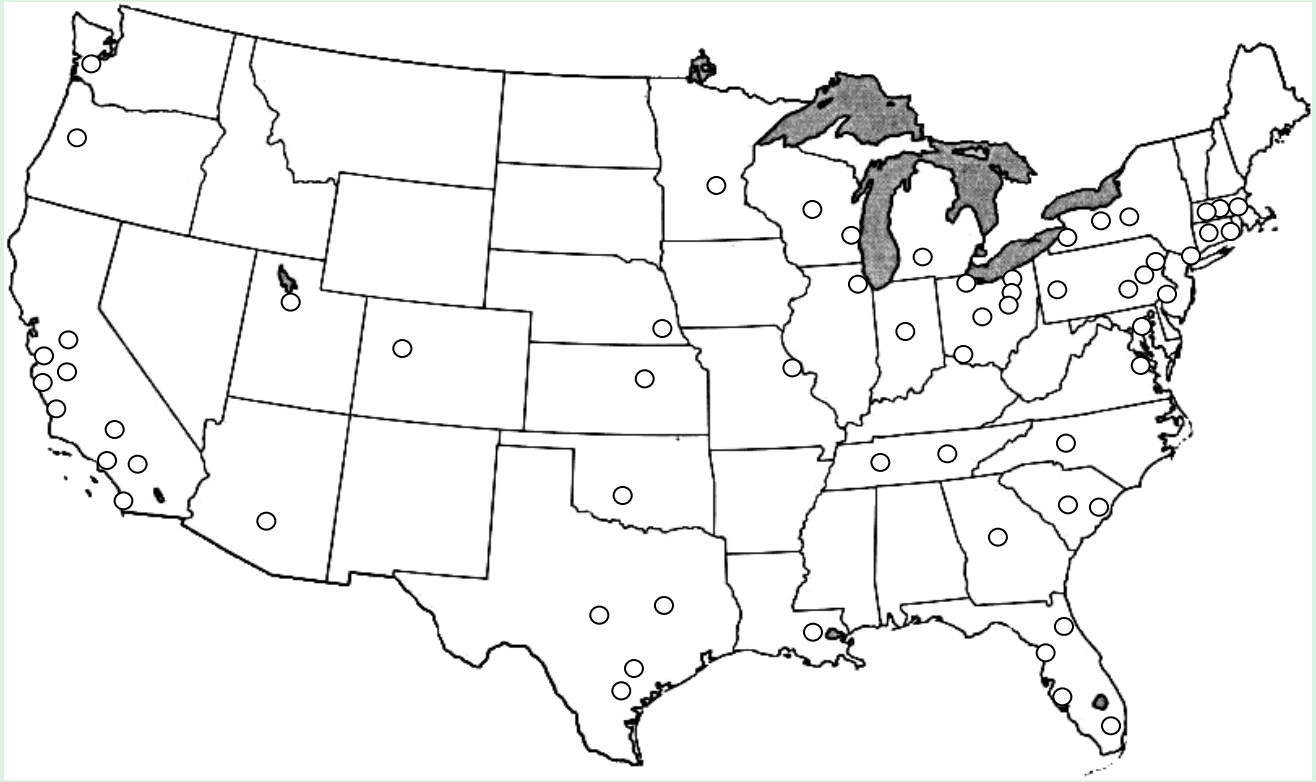
Mapping Approach Findings

Broad National Potential

165 low density freight corridors in

65 of the nation's largest 88 metropolitan areas



Business Case for Shared-Track Operations

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Industry Scan Findings

More detailed review of corridors where substantial shared track operations are:

1. Currently operated – 5
2. In design or construction – 2
3. Had been considered but ultimately avoided – 4
4. In active planning and evaluation – 8

Industry Scan Findings

5 current/recent shared-use systems

- San Diego Trolley – 1981
- Maryland MTA, Baltimore – 1988
- Utah Transit Authority – 2001
- NJ TRANSIT River LINE – 2004
- NJT Newark City Subway – 2004

Industry Scan Findings

2 in engineering design/construction

- Oceanside SPRINTER: half-hourly DMU service
- Austin Metro: 3 trains each peak period

4 Planning to avoid commingling issues

(rejected light rail or chose to exclude freight)

- Portland Tri-Met (rejected light rail)
- Triangle Transit (rejected LRT and excluded freight)
- NJT Northern Branch (rejected light rail)
- eBART (trying to exclude freight)

Industry Scan Findings

5 under Environmental Impact Review/Analysis

- MARTA Belt Line: CSX branch
- Madison, Wisconsin: Hybrid Commuter/Light Rail
- Denton DART: Extension along Katy ROW
- BART I-80 Feasibility: Capitol Corridor/wBART
- BART I-580 Corridor: Dublin-Livermore/Tracy

3 in the earlier stages of planning

- Orlando Lynx
- Long Island Suffolk County: East End Shuttle
- Marin County, CA

Ten Operating and Advanced Systems

City	State	Length (Miles)	Daily Passenger Trains	Daily Freight Trains	Status
San Diego	CA	31.1	294	~4	Operating
Baltimore	MD	10.9	238	0	Operating
Salt Lake City	UT	12.0	158	~2	Operating
Trenton-Camden	NJ	33.0	104	~3	Operating
Newark	NJ	0.2	404	weekly	Operating
Oceanside Escondido	CA	22.0	64	~2	Construction
Austin	TX	33.0	~12	~5	Engineering
Portland	OR	14.7	~24	few	Engineering
Raleigh-Durham	NC	33	~48	many	Engineering
Northern Branch	NJ	11	~146	~2	Engineering

Nine in Planning or Feasibility

City	State	Length (Miles)	Daily Light Rail Trains	Daily Compliant Trains	Status
Atlanta	GA	~8	> 150	~2	EIS/PE
Madison	WI	~12	> 50	2-6	EIS/PE
Dallas-Denton	TX	~14	> 50	~2	EIS/PE
Antioch (eBART, S.R. 4)	CA	~14	> 50	0	EIS/PE
Hercules (wBART, I-80)	CA	~10	> 75	> 45	AA (Suspended)
Oakland-Livermore (I-580)	CA	~14	> 75	> 20	AA (Suspended)
Orlando	FL	< 60	~28	> 20	Feasibility
Suffolk County	NY	TBD	TBD	> 50	Feasibility
Marin County	CA	TBD	TBD	TDB	Feasibility

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Business Case Approach

Historical Case Studies

Illuminate business case for concurrent shared track operations:

- NJ TRANSIT River LINE
- San Diego Trolley South Line
- Tri-Met Washington County Commuter Rail

New Starts Analysis

Compare cost and mobility of shared track projects and alternatives

Hypothetical Case Study

Estimated costs of alternative operations on hypothetical rail corridor

Business Case for Shared-Track Operations

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Historical Case Studies

NJ TRANSIT River LINE, Camden to Trenton, NJ

- Full concurrent shared-track operation under active consideration

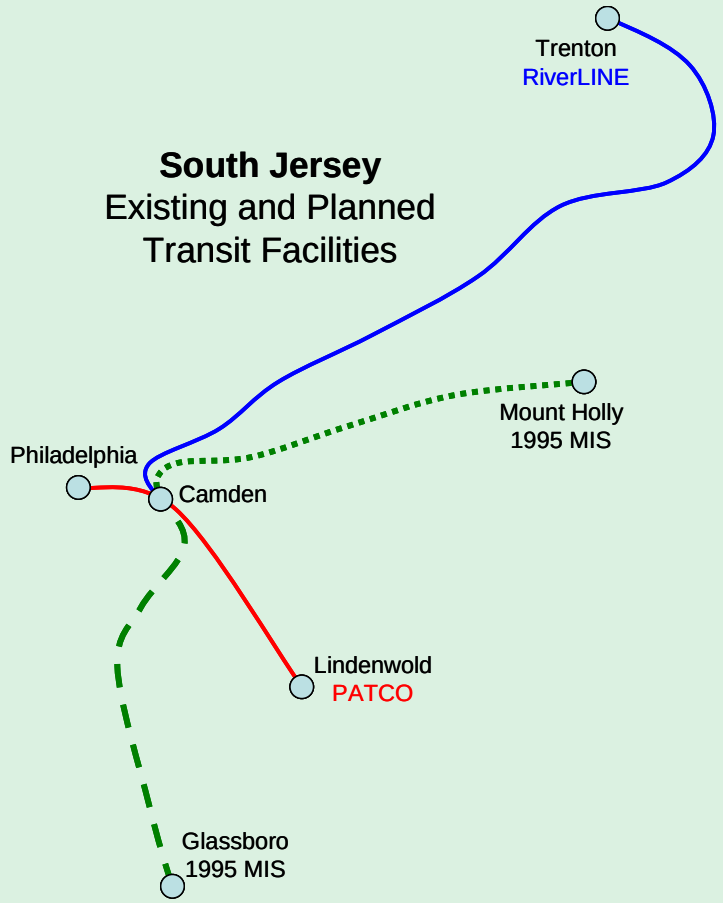
San Diego Trolley South Line, CA

- Earliest and most extensive shared-track system in current operation

Washington County Commuter Rail, Portland, OR

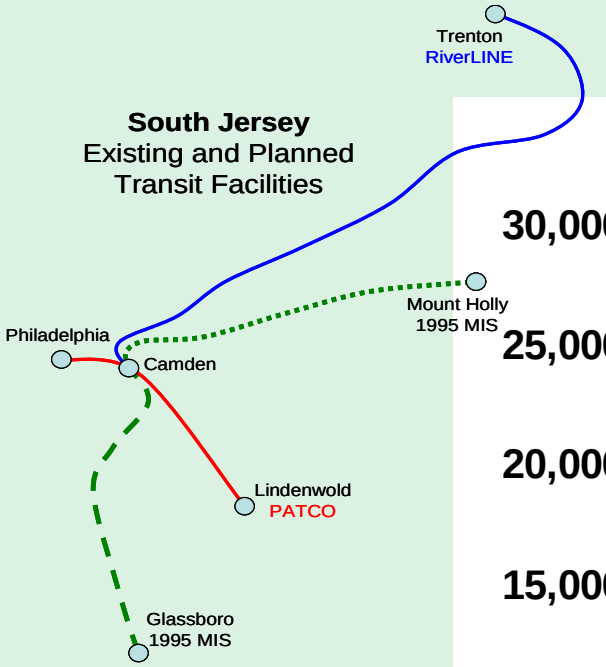
- Chose compliant equipment to avoid uncertainty and regulatory risk

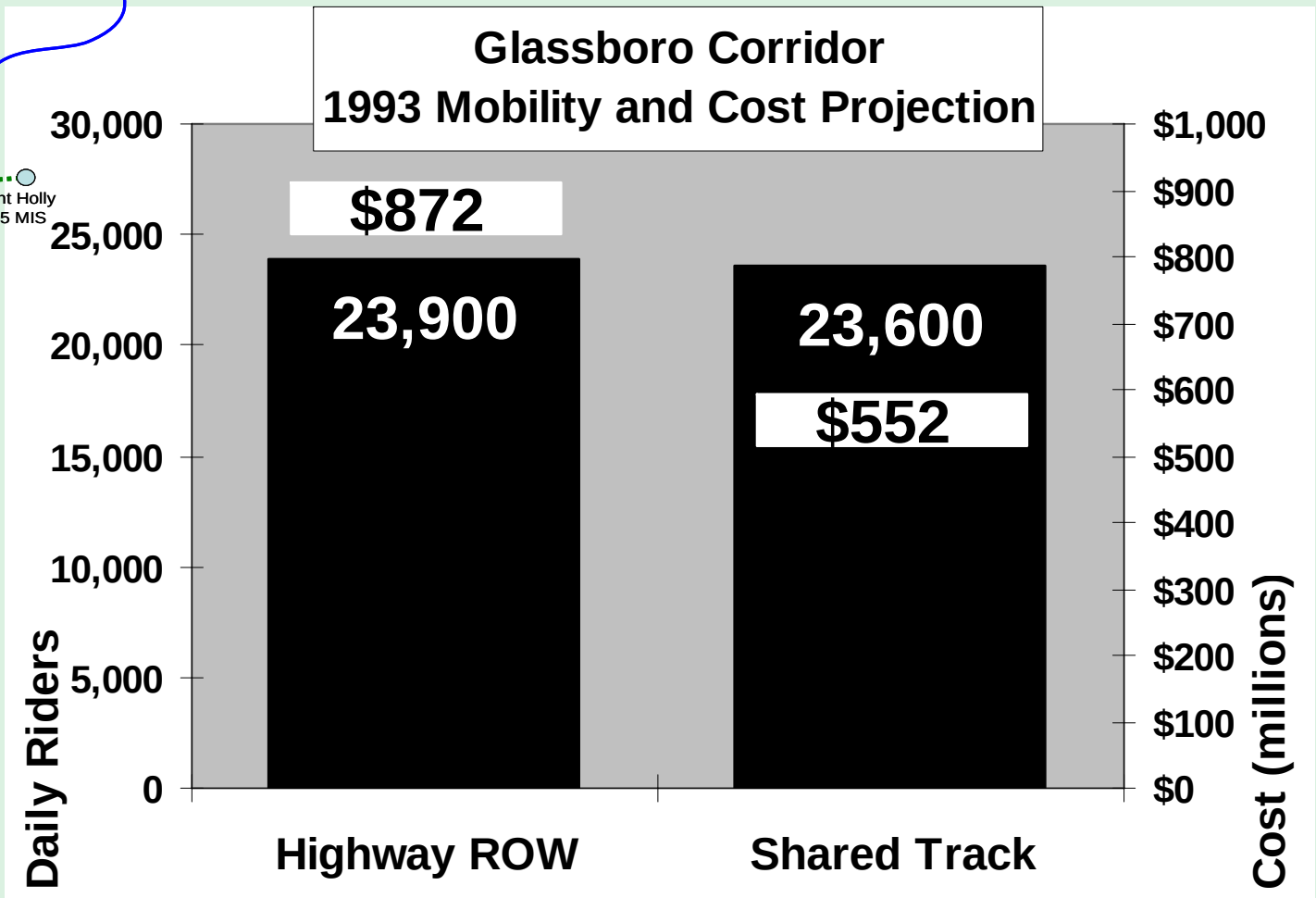
NJT: Planning the Southern New Jersey Light Rail Transit System



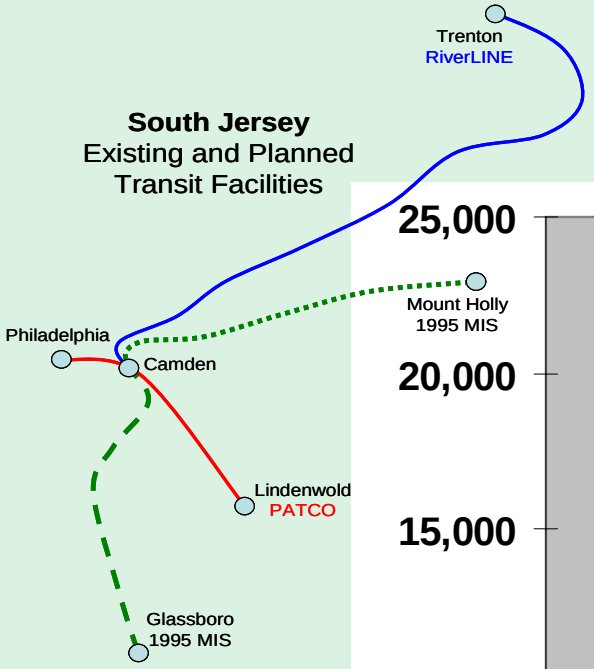
- Lindenwold (1969)
- Glassboro Study (1993)
- Mount Holly Study (1995)
- Trenton Study (1996)

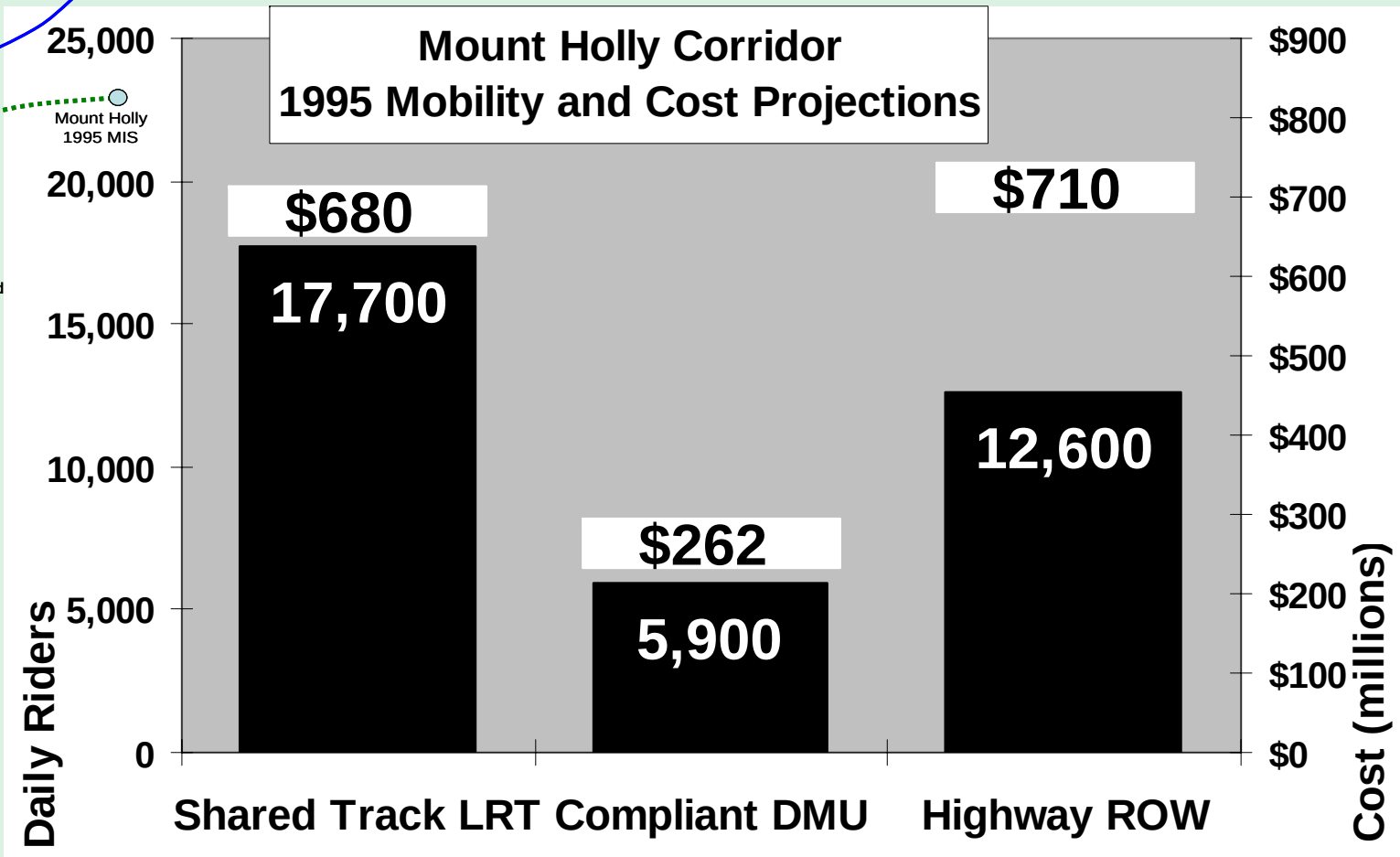
NJT: 1993 Planning Options



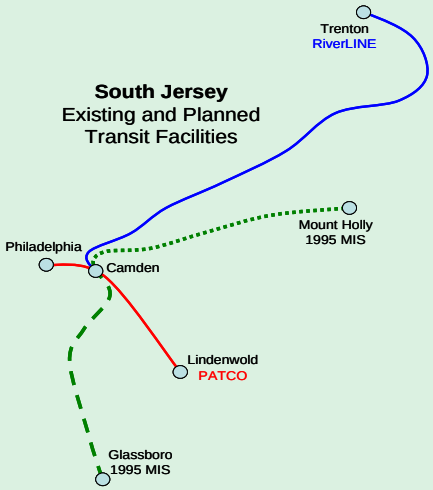


NJT: 1995 Planning Options





NJT: 2004 Operation



NJ TRANSIT River LINE Camden-Trenton

Opened 2004 (Statistics for opening year)

32 miles of shared track (temporal separation)

2 miles of street running

104 trains per day

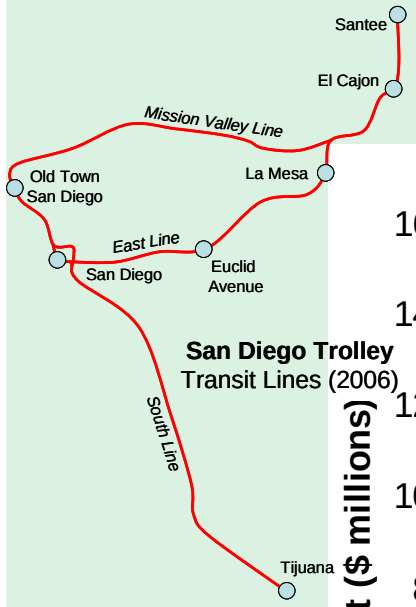
$453 million for construction and vehicles

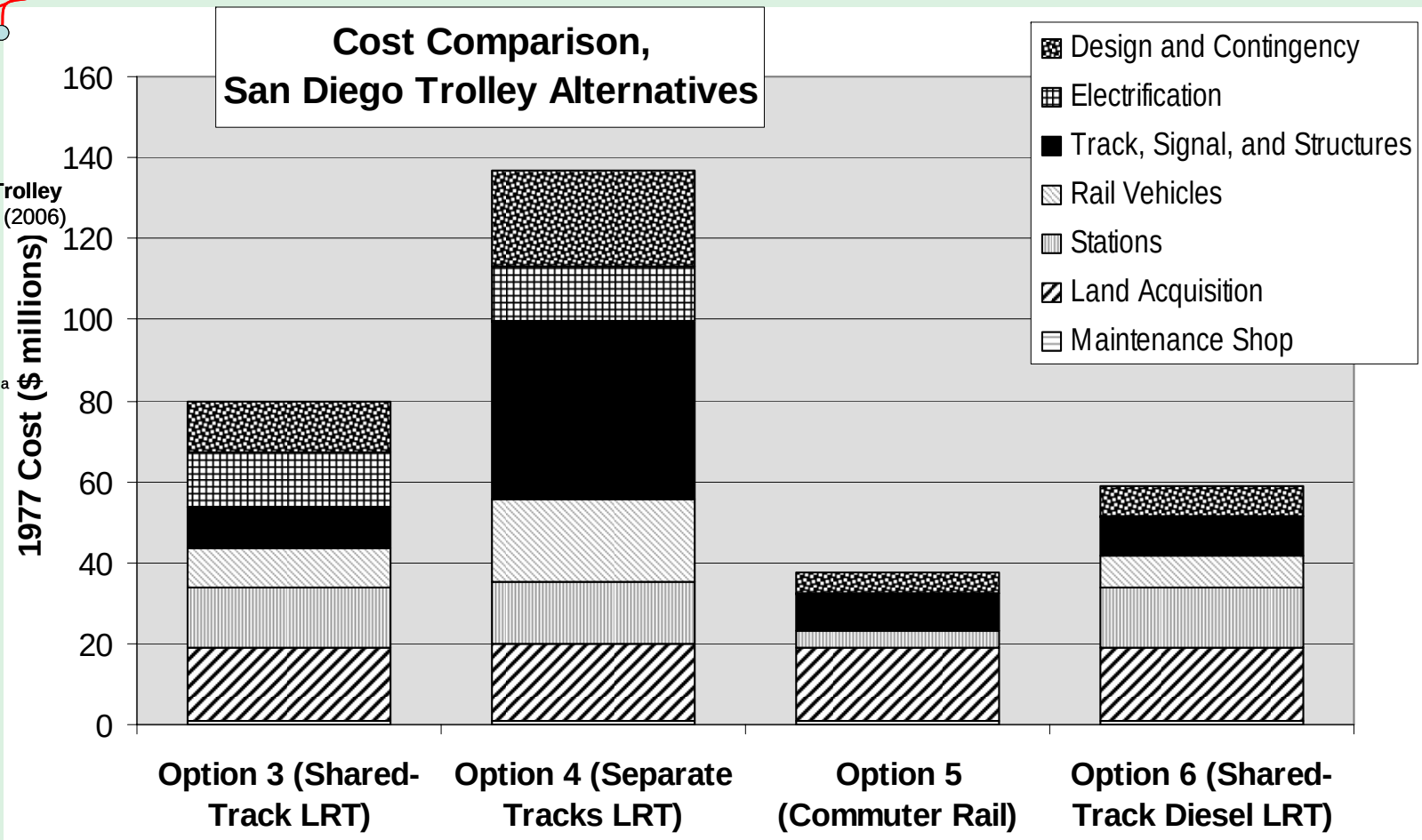
6,400 typical weekday riders

San Diego Trolley South Line

- Mid 70's planning considered wide range of transit options.
- Shared track light rail selected due to:
  - Suitable approved equipment
  - Costs
    - Capital
    - Operating
  - Street running for downtown distribution

San Diego Trolley South Line (1977)





San Diego Trolley South Line

Opened 1981 (Statistics for opening year)

14 miles of shared track

2 miles of street running

94 trains per day

$68 million for construction and vehicles

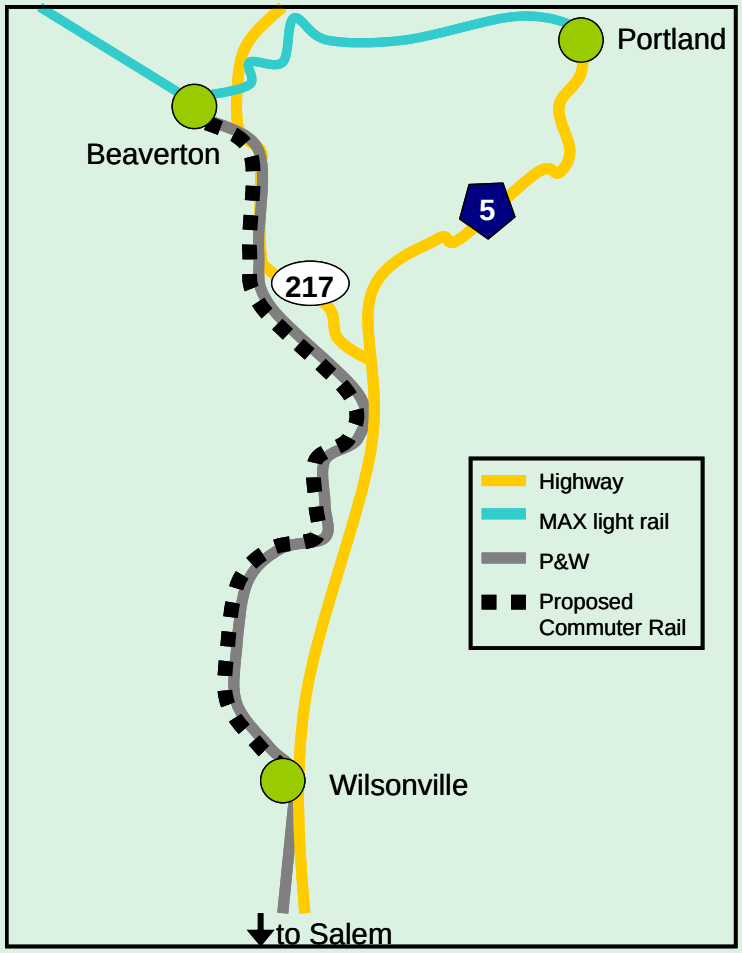
11,300 typical weekday riders

Concurrent shared track from 1981 to 1998

Temporal separation 1998 to 2001

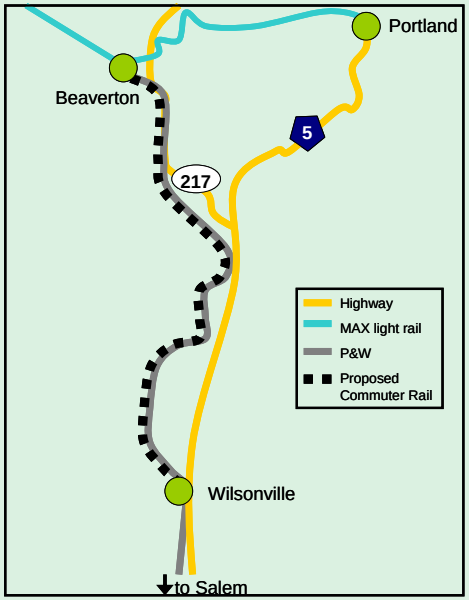
Limited concurrent track sharing initiated under "Scripted Temporal Separation" 2001

Washington County Commuter Rail



- Rapidly growing Oregon suburban corridor with congested radial highways
- Parallel freight railway identified as potential transit route
- Possible extension of Portland Tri-Max into suburban corridor

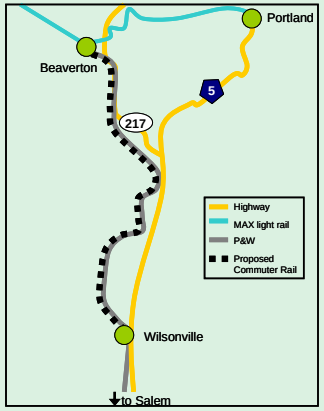
Washington County Commuter Rail



Tri-Max Light Rail extension briefly considered but rejected.

1. Freight unable to move into overnight period
2. Safety agencies discouraged use of non FRA-compliant equipment
3. Local officials chose to avoid regulatory uncertainty and risk

Washington County Commuter Rail



- Portland Tri-Met is constructing a compliant DMU service.
  - Peak period only
  - 30 minute headways
  - 15 route miles, five stations
  - $120 million for infrastructure and vehicles
  - ~3,500 daily passengers in 2020
- Largest projected traffic flow is end-to-end transfer at Beaverton to downtown Portland.

Business Case for Shared-Track Operations

- **Market Assessment**
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New Starts Analysis

Compared U.S. shared track systems with other rail transit systems in design and construction :

- Five light rail projects where most construction is "at-grade"
- Five light rail projects with substantial tunneling or structures
- Five new commuter rail systems
- Five shared track systems

  (one in the New Starts process & four in operation)

New Starts Analysis

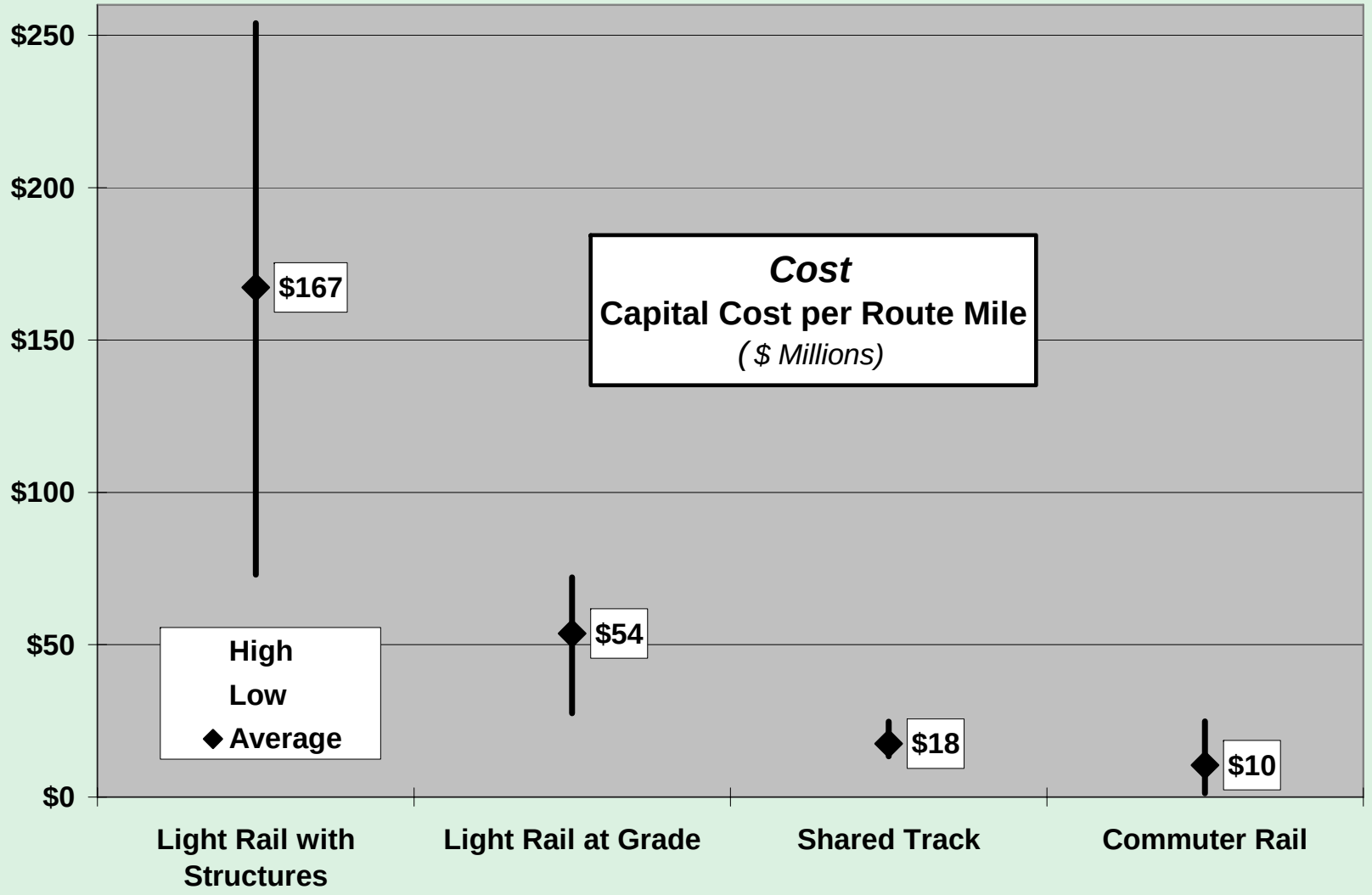
Four system classes compared on three criteria:

1. **Cost** – Capital cost per route mile
2. **Mobility** – Ridership per route mile
3. **Mobility : Cost Index**

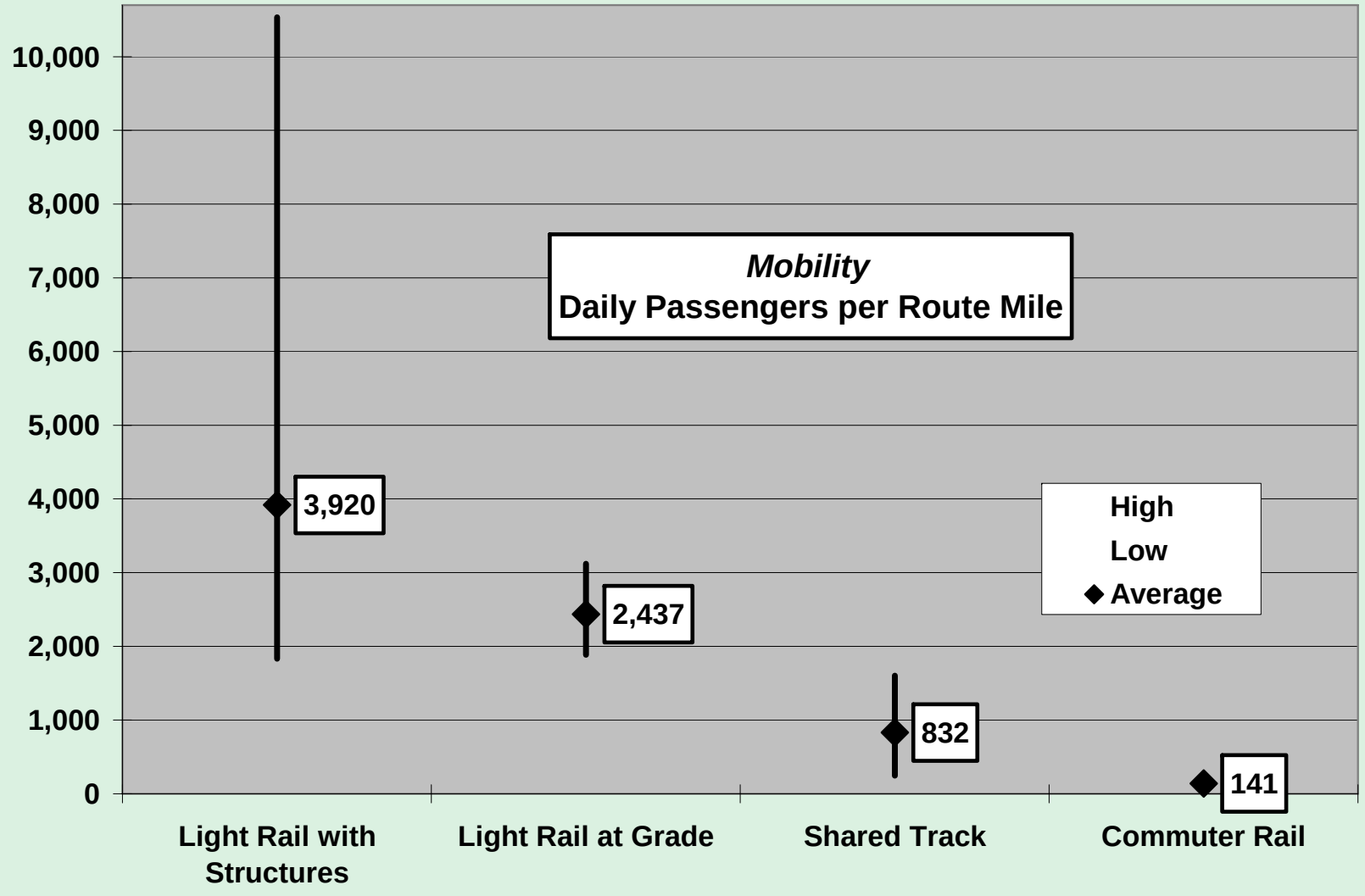
   (Ridership/Route Mile) / (Cost/Route Mile)

   "Daily passengers per Million capital dollars"

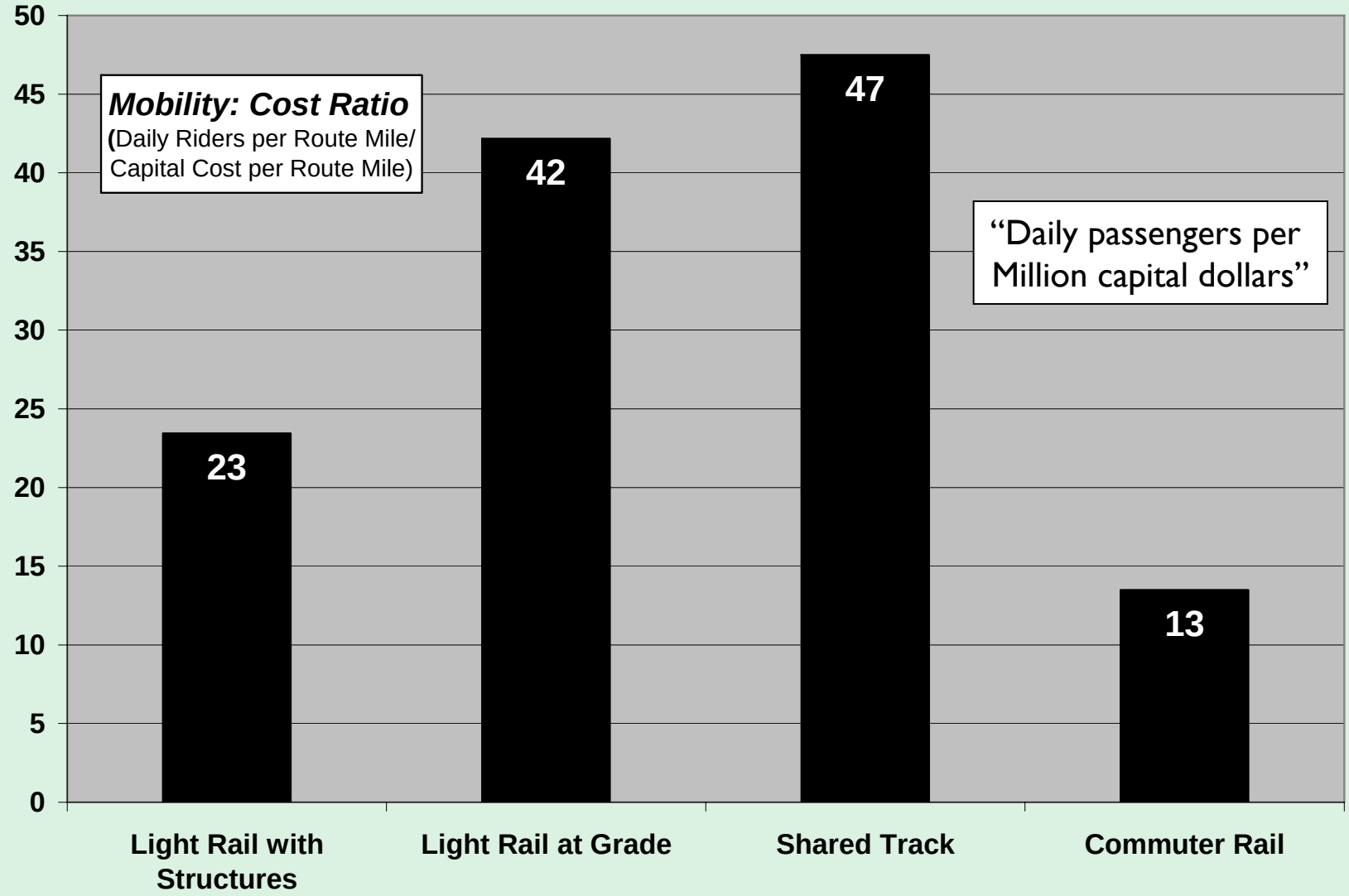
New Starts Analysis



New Starts Analysis



New Starts Analysis



New Starts Analysis

Conclusions

Shared track light rail represents a truly new *intermediate* level of transit investment.

- Much less expensive than light rail alone
  Generally one-third of the cost of stand alone light rail

- Much more mobility than new commuter rail service
  Six times greater density of mobility than commuter rail

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Hypothetical Case Study

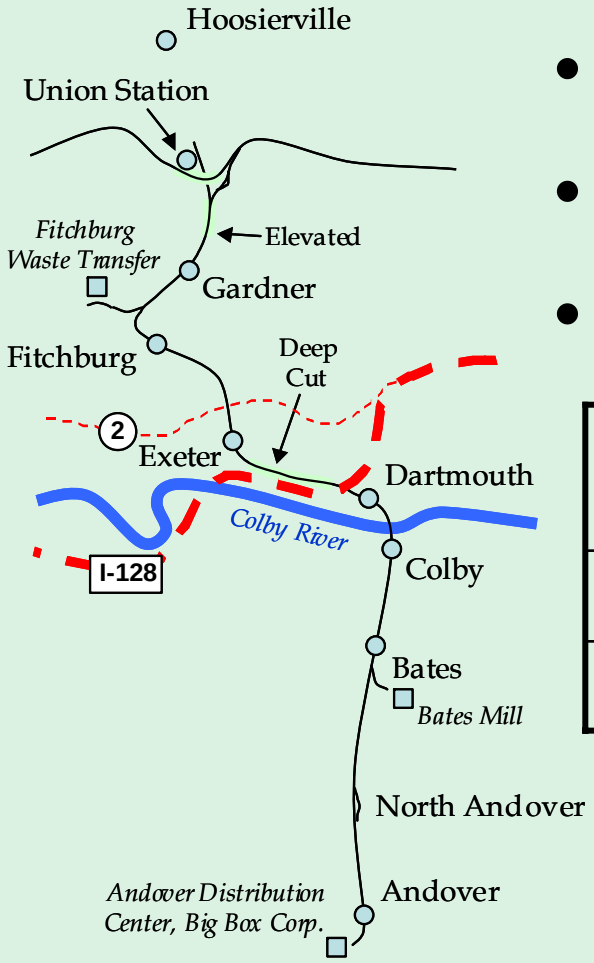
Only one of the industry scan corridors or case studies formally considered the construction cost tradeoff between building a shared track system and building a separate parallel system on shared right-of-way.

Hypothetical Case Study evaluates cost trade-offs using a hypothetical shared track line.

Evaluated

1. Temporal Separation
2. Spatial Separation
3. Concurrent Shared Track

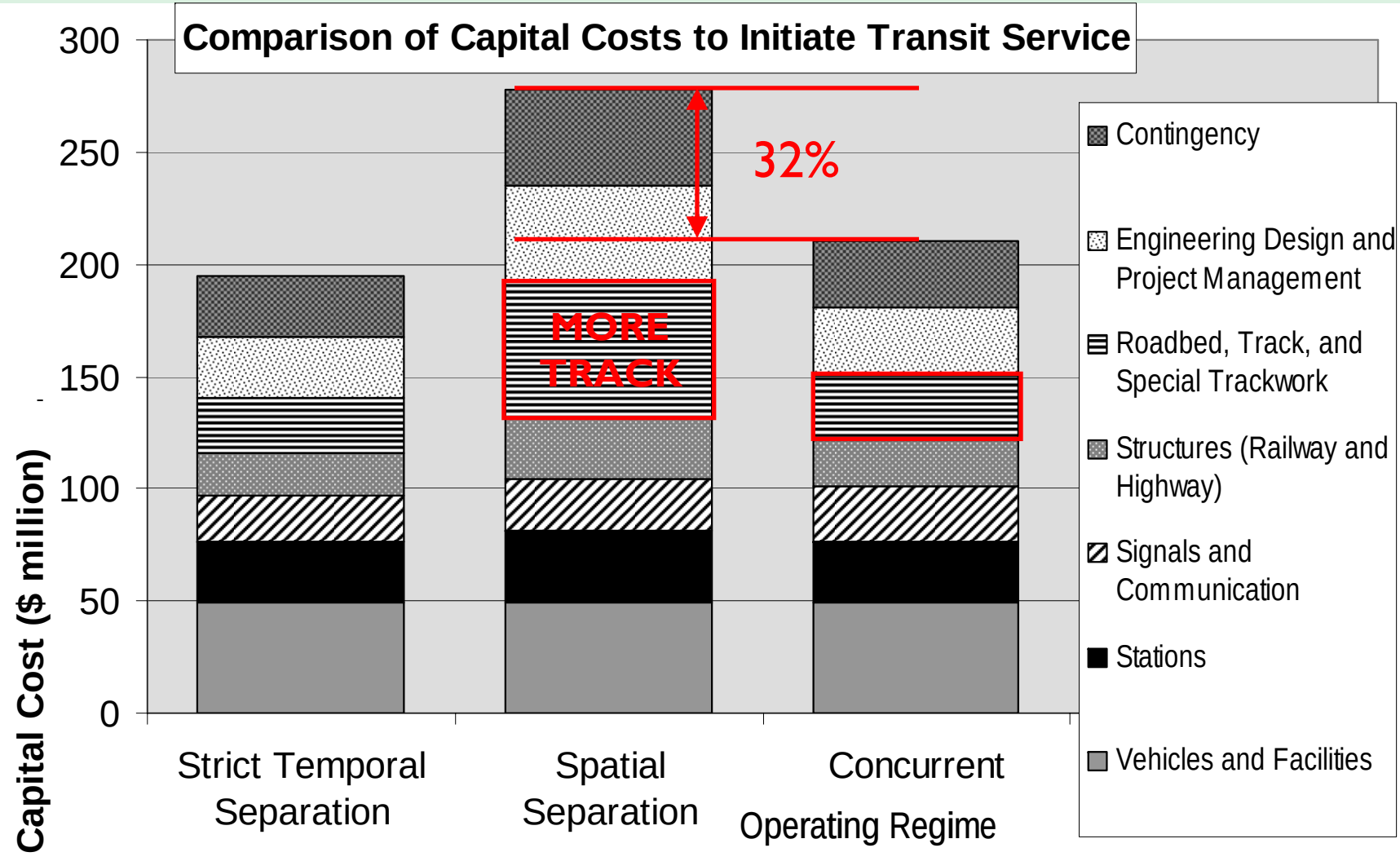
Hypothetical Case Study



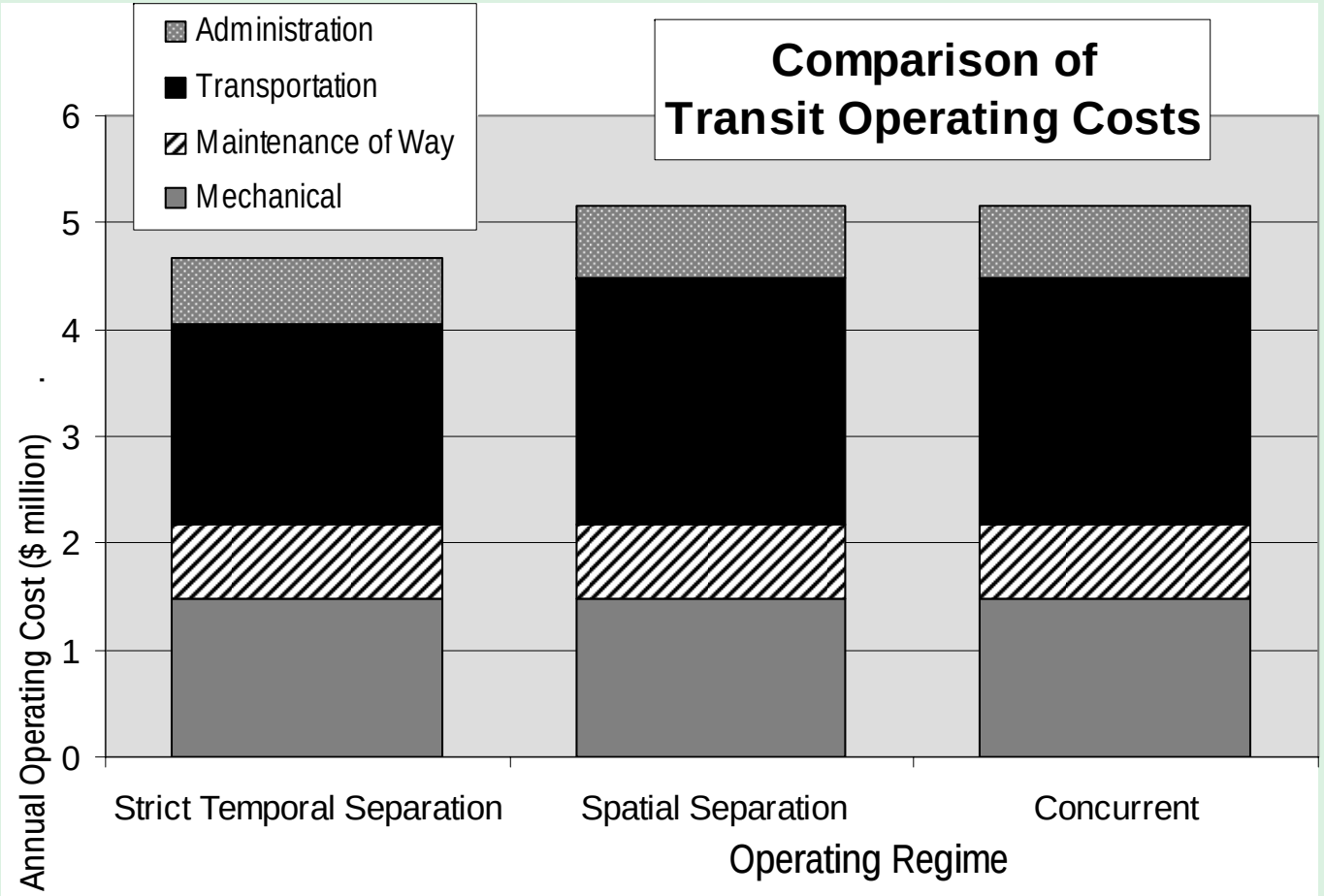
- Typical Shortline
- Medium City Transit Needs
- Three options

	Temporal Sep.	Spatial Sep.	Concurrent Shared Track
Transit Hours	6AM-7PM	5AM-1AM	5AM-1AM
Freight Restricted	6AM-7PM	None	Peak Hours

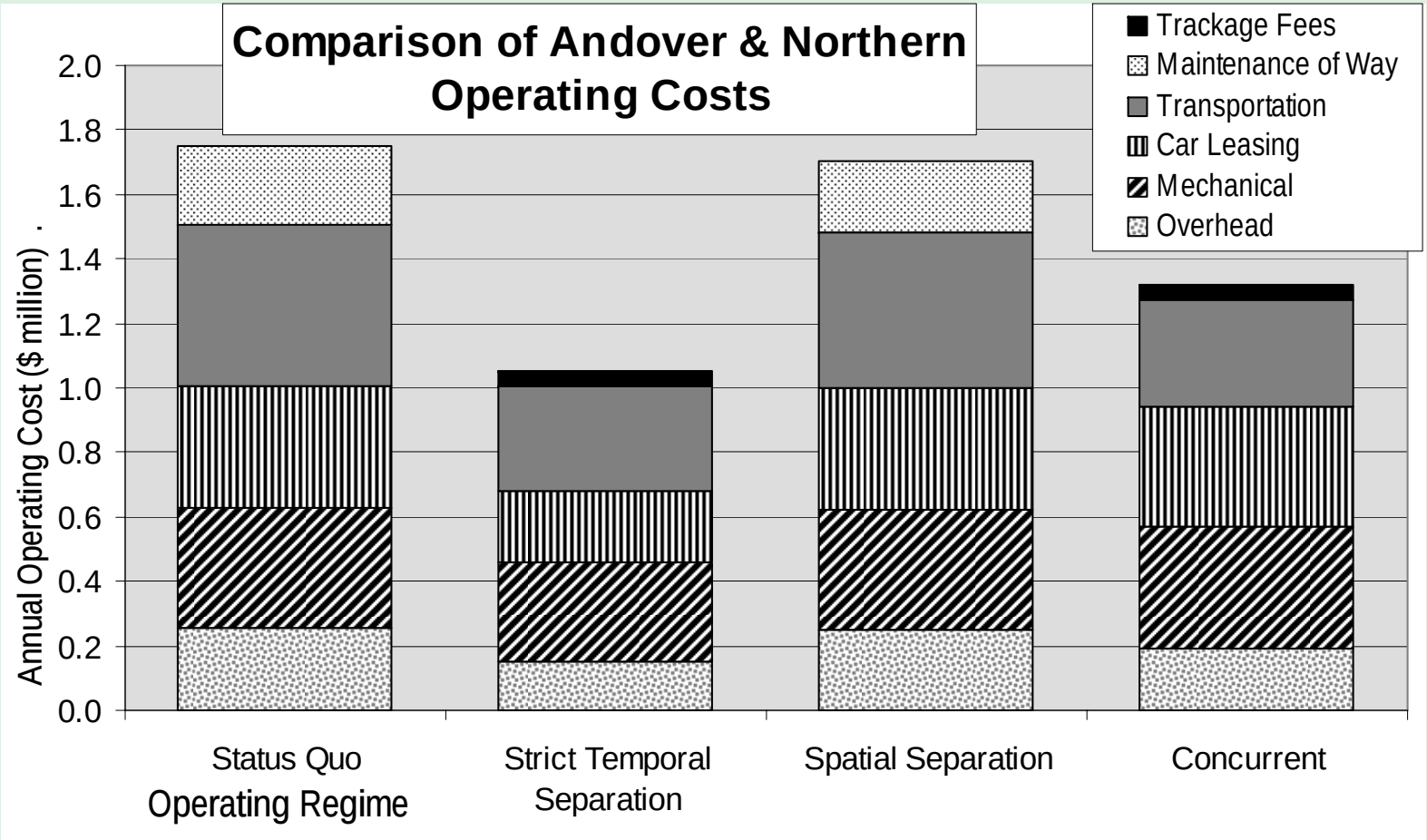
Hypothetical Case Study: Capital Costs



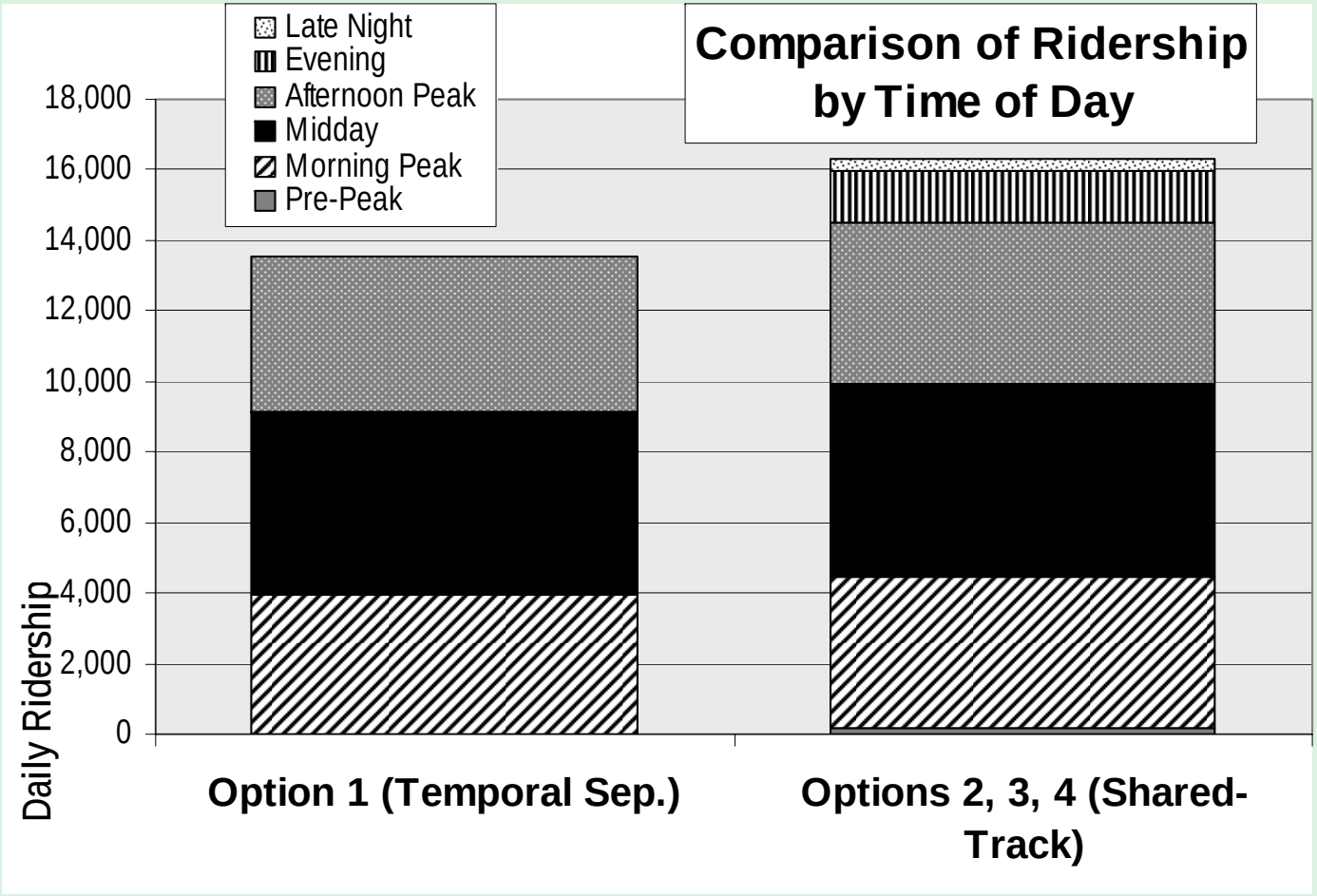
Hypothetical Case Study: Transit Operating Costs



Hypothetical Case Study: Freight Operating Costs



Hypothetical Case Study: Transit Ridership Impacts



Hypothetical Case Study: Conclusions

1. Shared track provides ~40% savings on design and construction costs compared with separate parallel systems.
2. Shared track does not substantially affect rail transit operating costs.
3. Shared track can substantially reduce freight operating costs.
4. Temporal separation, in some cases, yields a substantial adverse ridership impact.
5. Forced transfers between compliant line-haul and transit distribution modes adversely impacts ridership.

Business Case for Shared-Track Operations:

CONCLUDING OBSERVATIONS

Market Assessment

- Broad potential application
- Considerable industry interest

Business Case for Shared-Track Operations:

CONCLUDING OBSERVATIONS

Business Case

- Shared track is attractive to localities interested in providing a high level of rail transit service at an affordable cost.
- Shared track tends to cost less than a stand alone light rail system.
- Shared track tends to attract more riders than commuter rail.
- Temporal separation can have a substantial adverse impact on ridership.
- Shared track reduces cost by sharing infrastructure with freight operations.

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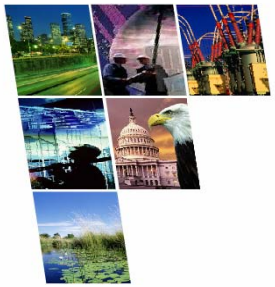

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