CASCADIA HIGH SPEED RAIL CORRIDOR: TIER 1 EIS

PUBLIC OUTREACH WEBINAR #4:

FINAL SUMMARY

September 30, 2021

Study Objectives

- Assessment of the technical, fiscal, environmental and economic review and approval requirements for developing the Portland to Seattle High Speed Rail Corridor.
- An analysis of the market, operational and environmental requirements associated with the project.
- An estimate of operating and capital cost of the project.
- Financial and Economic Analysis of the returns of the project.
- High level Environmental Analysis key issues.

Summary of Proposed Alternatives

- **"Do Nothing"** – Existing Amtrak service continues at 79-mph on existing rail line using conventional trains.
- **Alternative 1 (Higher-Speed Improved Infrastructure)** – Improves the existing diesel service and raises the top speed to 110-mph. The option would include CHSR's originally-proposed improvements to the BNSF alignment from Portland to Lakewood; north of Lakewood, the alignment would be upgraded and shared with Sounder commuter trains.
- **Alternative 2 (Ultra High-Speed Low Infrastructure)** – Same alignment as Alt 1 but electrified for tilting trains. This alignment permits only short stretches of 220-mph: it is more characteristic of a 160-mph alignment.
- **Alternative 3 (Ultra High-Speed High Infrastructure)** – A brand new end-to-end alignment with improved geometry would allow operations of electric trains at sustained 220-250 mph top speeds.

High Speed Rail Technology

- Talgo 110-125-mph diesel train

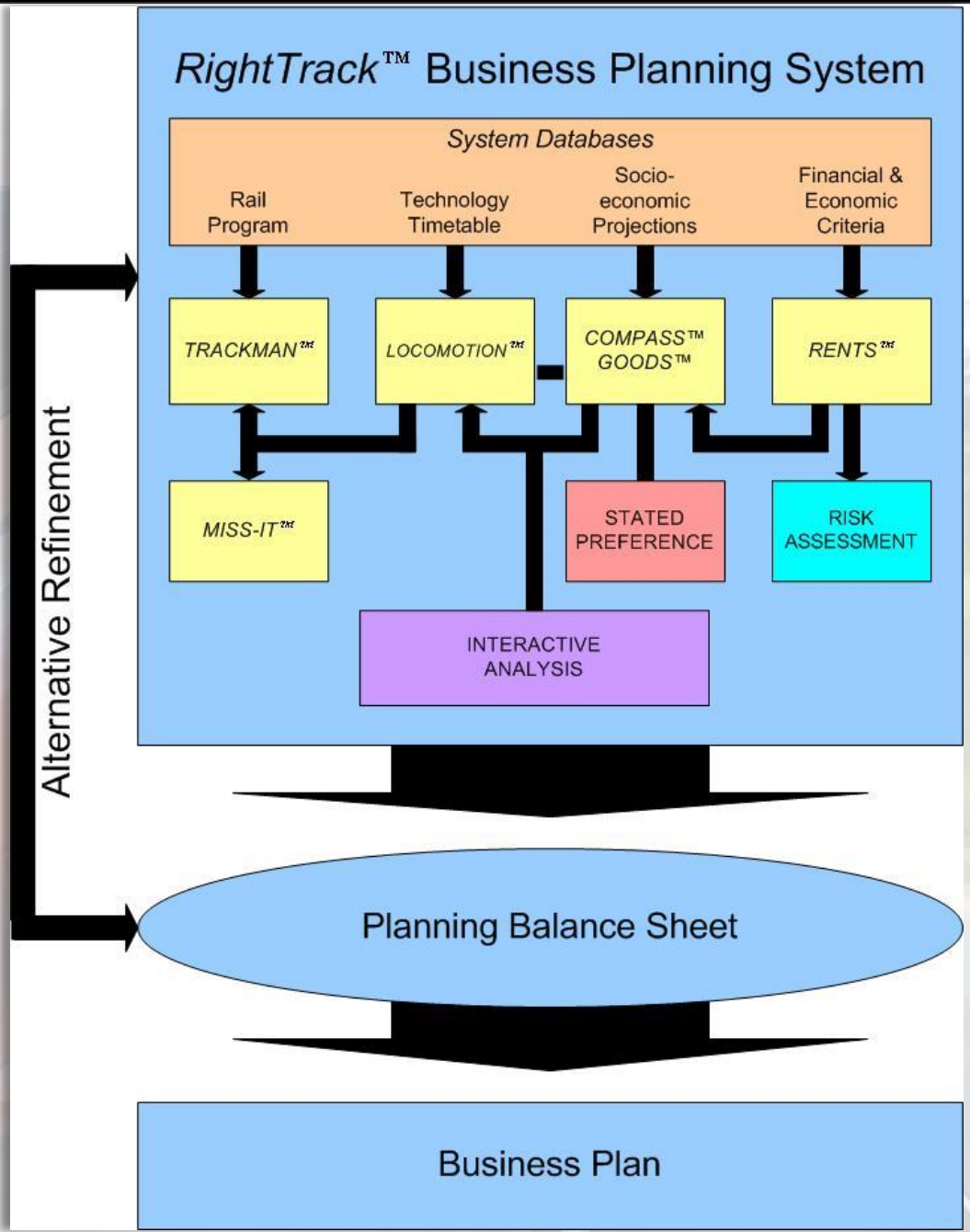
- Acela 160-mph electric train

- New Chinese Train 240-mph electric train

High Speed Rail = Comfortable travel for work, relaxing or play

RightTrack™ Business Planning System

- **The work was completed using the RightTrack™ System that provides a comprehensive Business Planning analysis for high-speed train systems.**



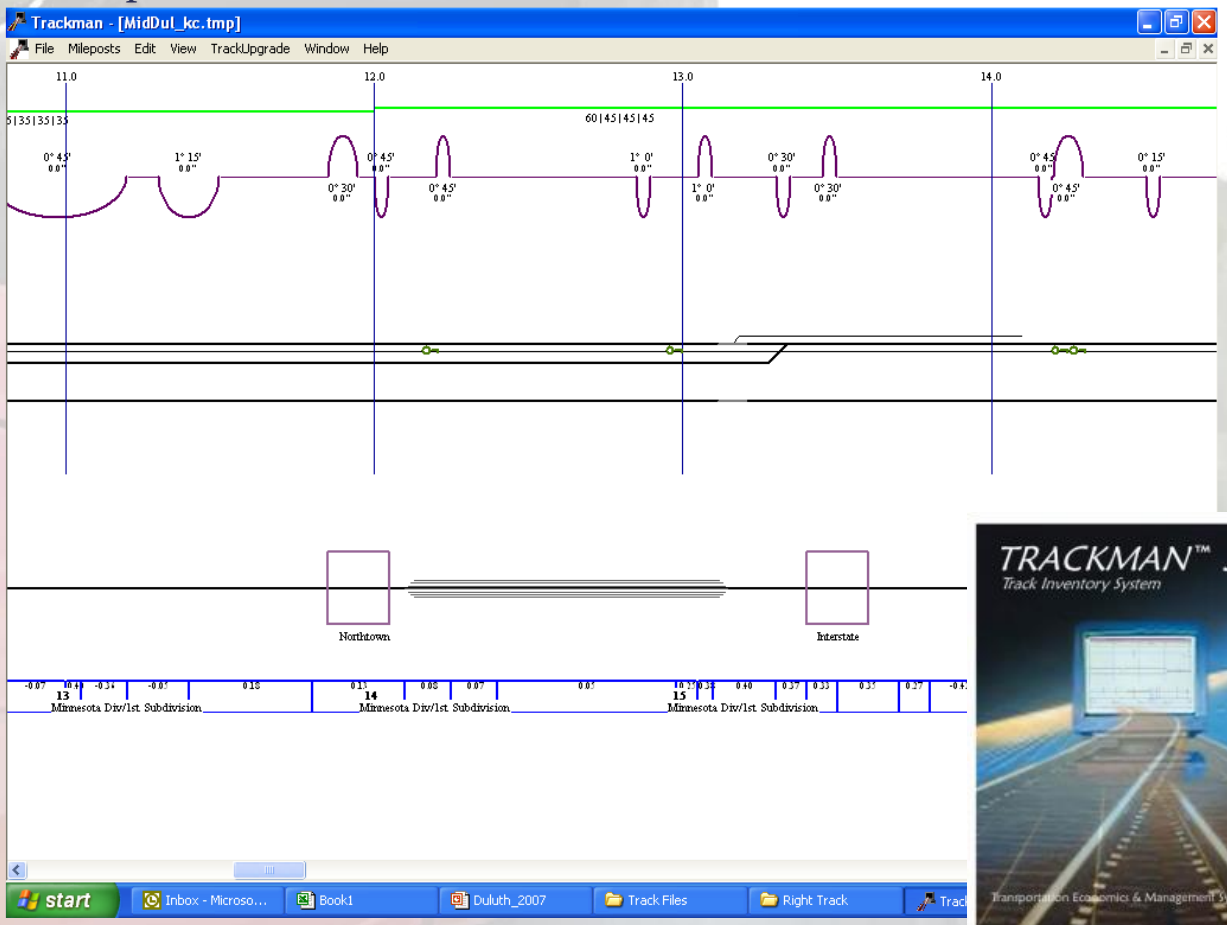
Analysis of Three Route and Technology Alternatives

TRACKMAN™ we will develop detailed information on each route

Sample Duluth Data

Key inputs: Speeds, curves, grades, spirals and other potential speed restrictions.

All the data is being captured in a consistent computerized format, to facilitate train performance and future line capacity evaluation.

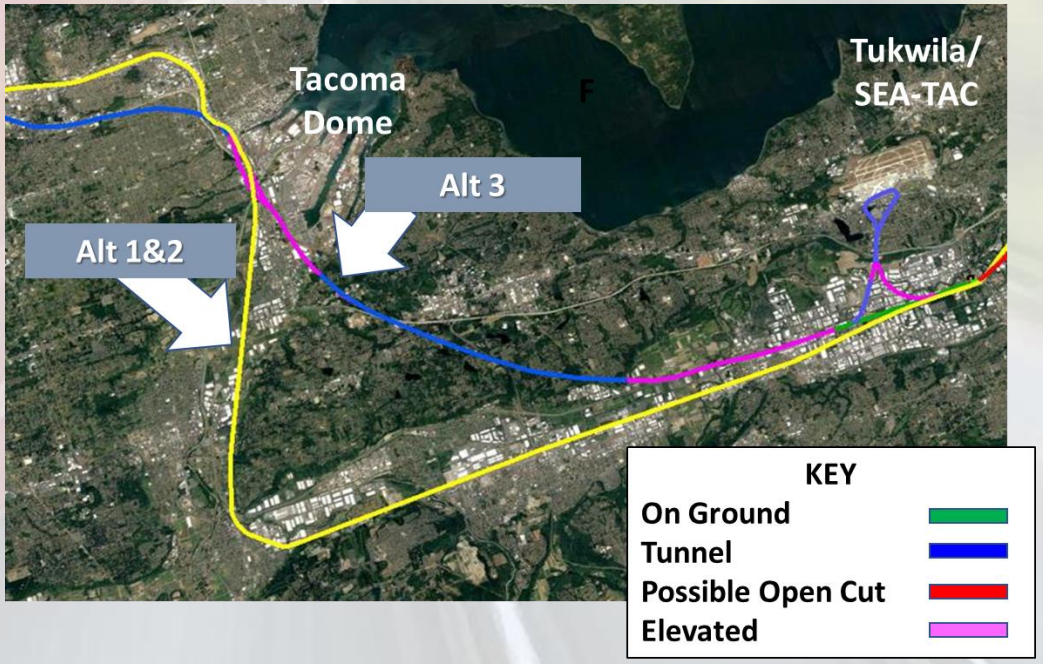


Analysis of Route Options

TRACKMAN™ was used to estimate the Engineering Capital Costs of potential routes:

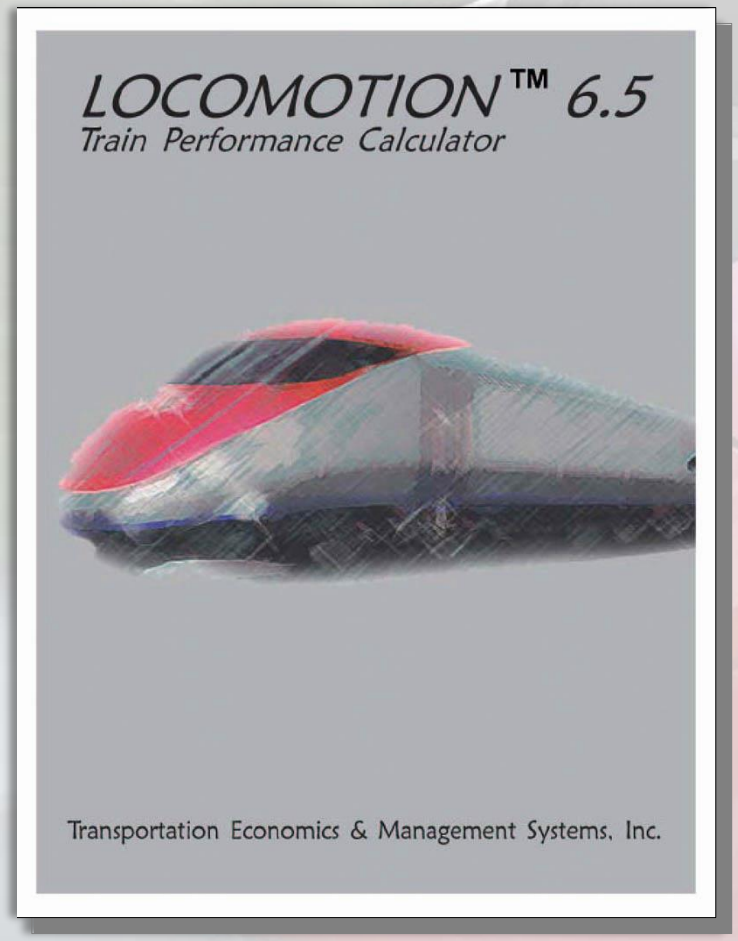
- **Field Review to Verify Conditions and Update TRACKMAN™ Track Chart and Route Data**
- **Adjust Infrastructure Unit Costs to Local Engineering Conditions**
- **Develop Specific Infrastructure Proposals and Cost Estimates for each set of track or right of way alternatives**
- **Provide Helicopter video of routes.**

For High-Speed Rail we need the shortest, straightest, least curvy route possible, as well as an exclusive right-of-way.



Analysis of Route Options

LOCOMOTION™ will estimate Rail Speeds and Timetables

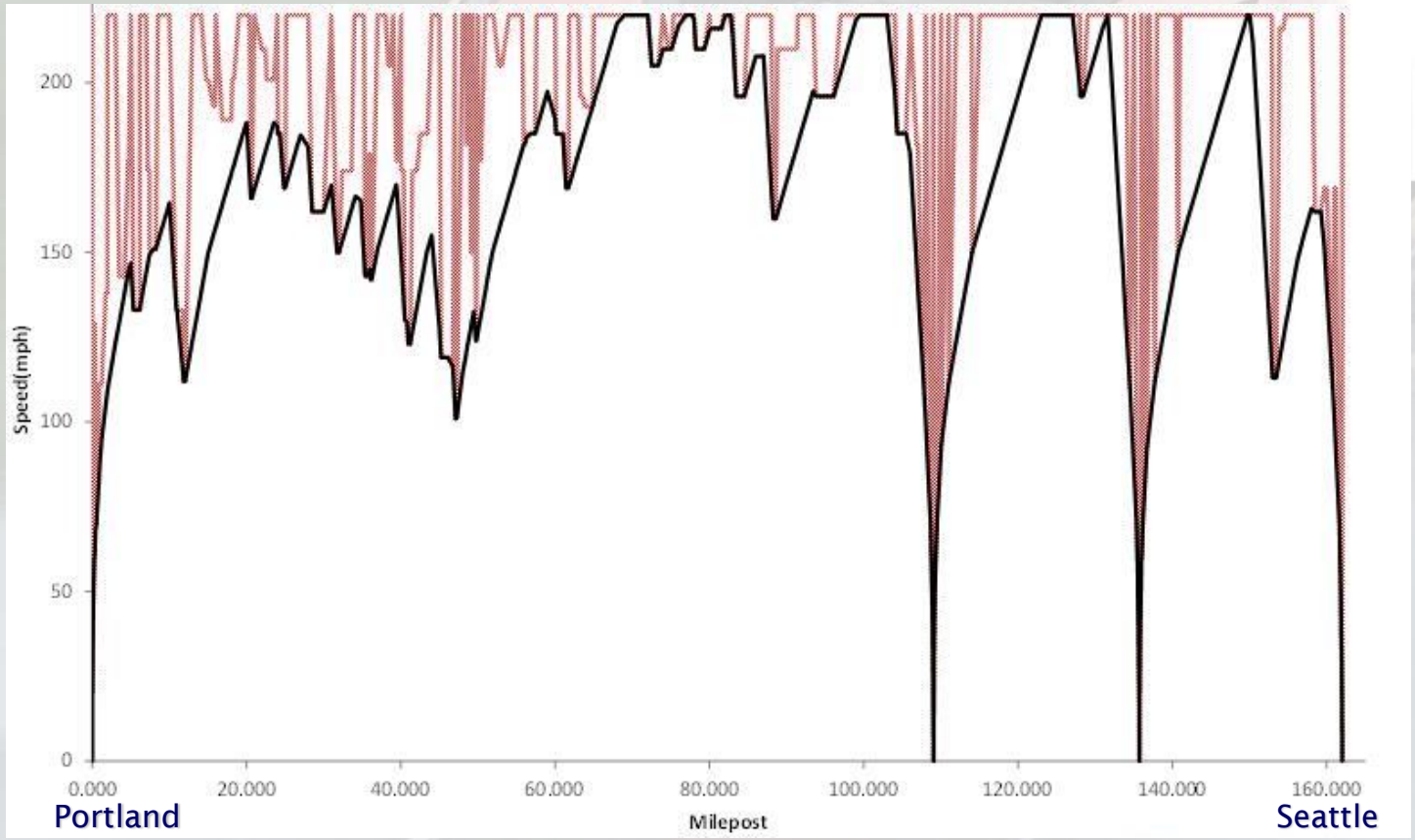


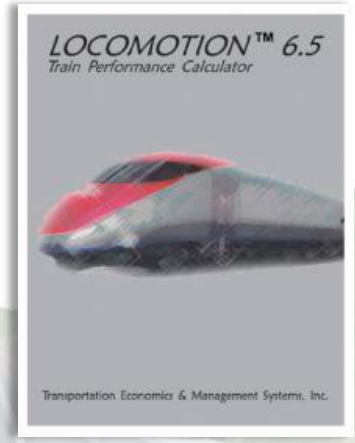
- **LOCOMOTION™** generates optimized timetables for given track infrastructure, signaling systems, and technologies. It provides milepost-by-milepost graphic output of vehicle performance based on track characteristics. It shows the effect on timetables for improving the route, using high speed rail technology.
- Because **LOCOMOTION™** takes account of other passenger and freight traffic using a right-of-way, it can develop stringline diagrams and identify the optimum vehicle path for a new service.

Analysis of Alternative Route Options Speed Profile

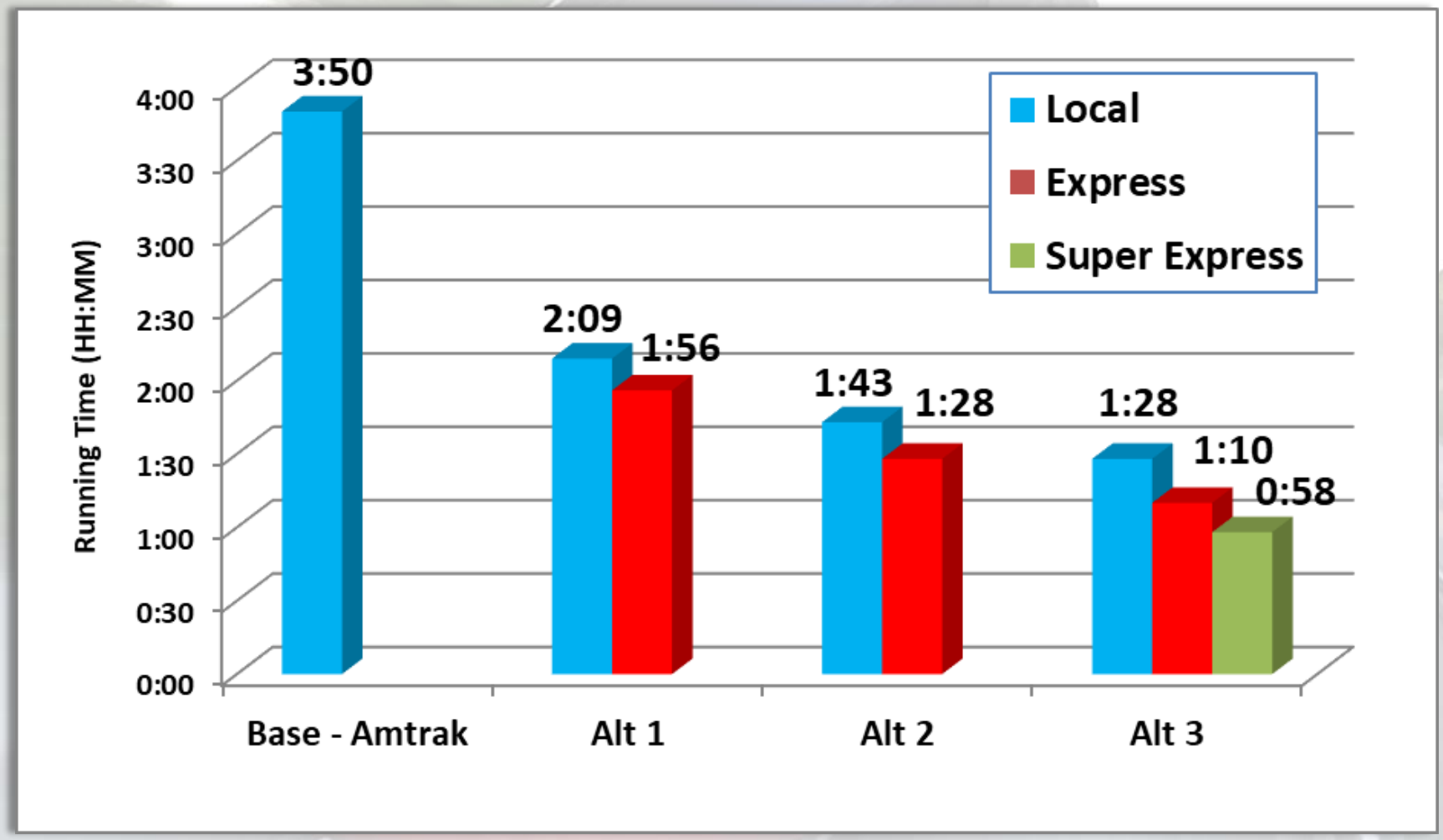
LOCOMOTION™ will assess the speed of High Speed Rail technology along different routes.

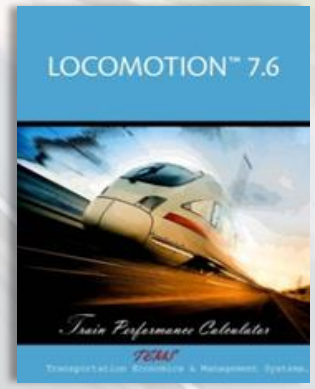
Speed Profile – Portland to Seattle
250-mph service -- 1:00 schedule





Portland to Seattle Running Times

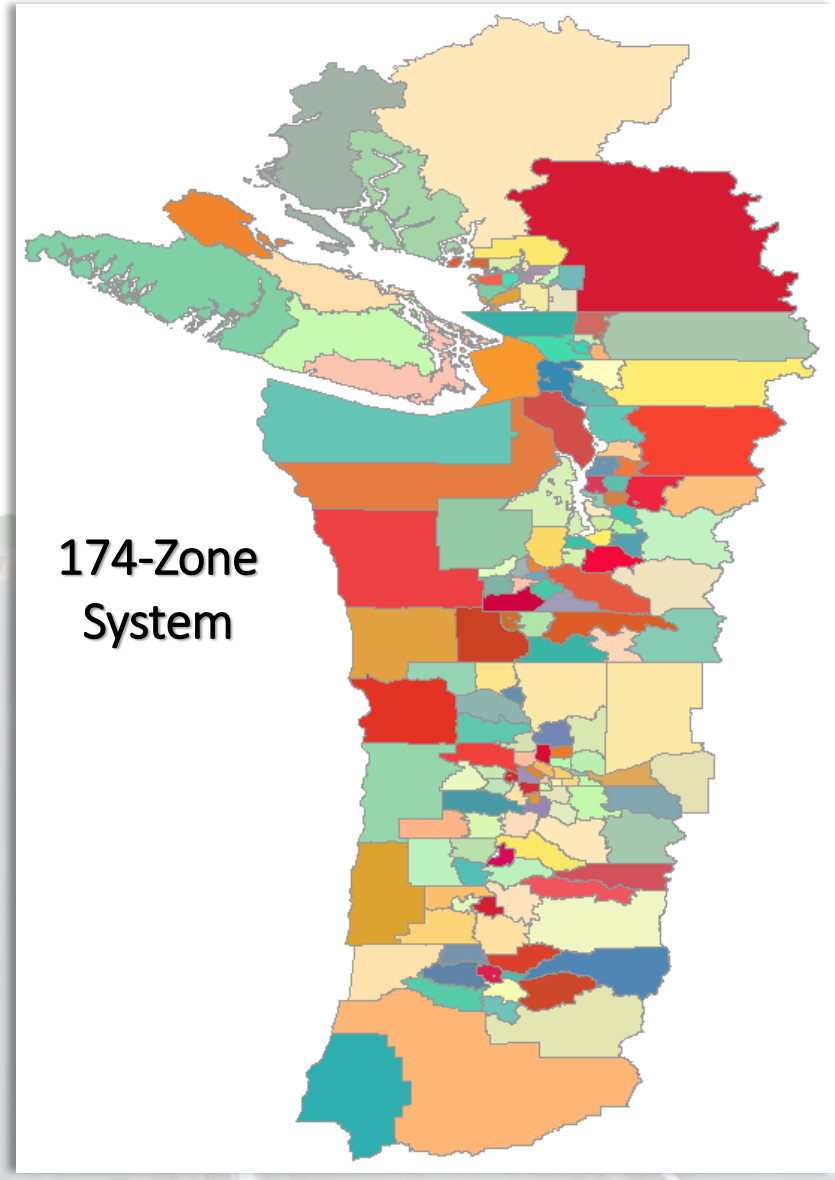




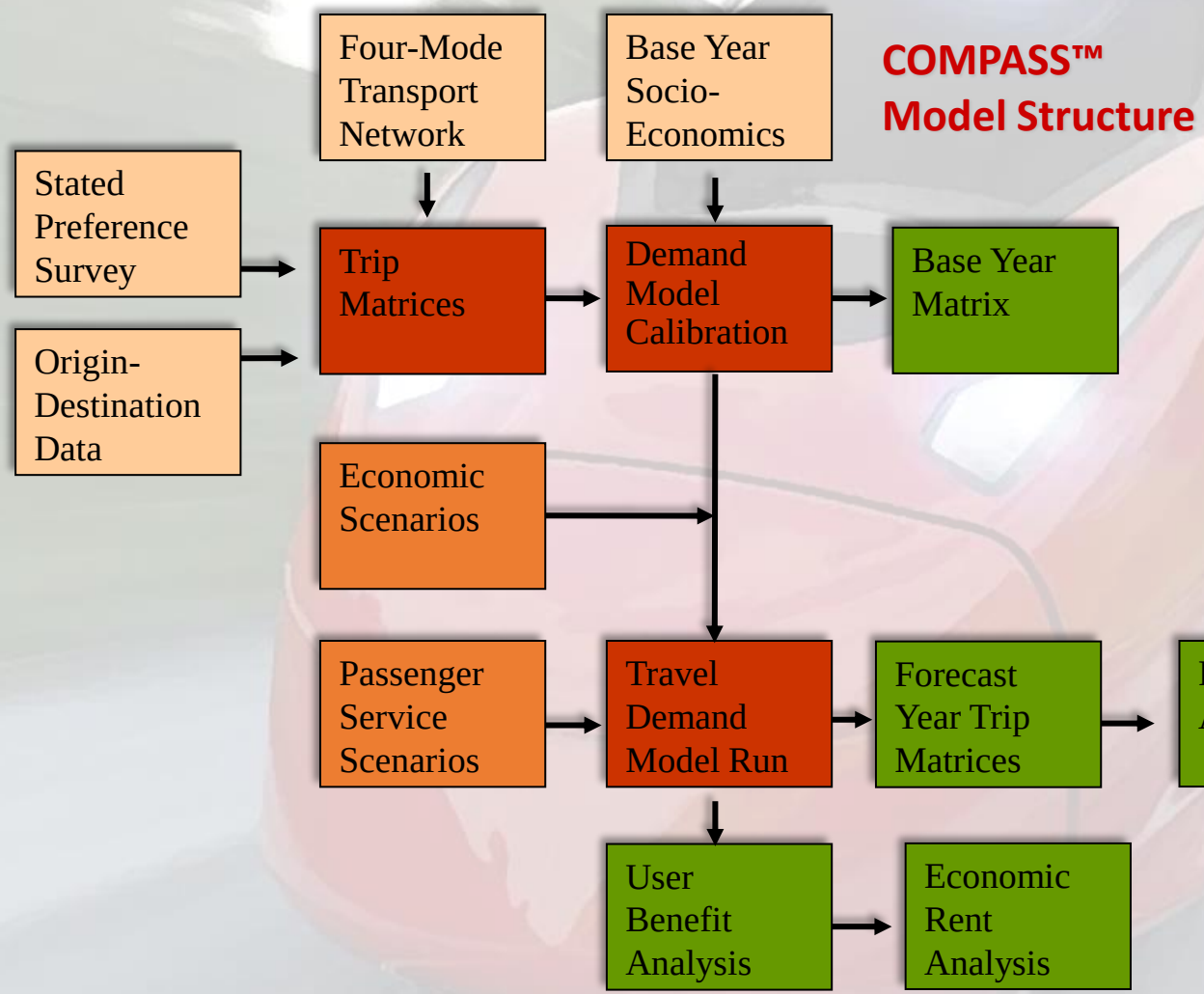
Market Databases

Database: The market database consists of four components:

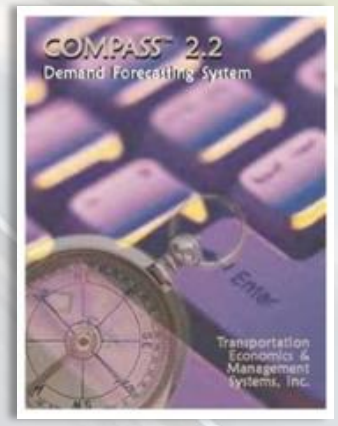
1. **Origin / Destination Data** – Traffic movements by mode and purpose (business, commuter, special interest, tourist).
2. **Socioeconomic Data** – Population, Employment and Income by zone.
3. **Network Data** – Comprehensive modal networks will be developed for each mode of intercity travel (auto, rail and bus).
4. **Stated Preference Data** – The data will be derived from recent high speed rail surveys completed by TEMS.



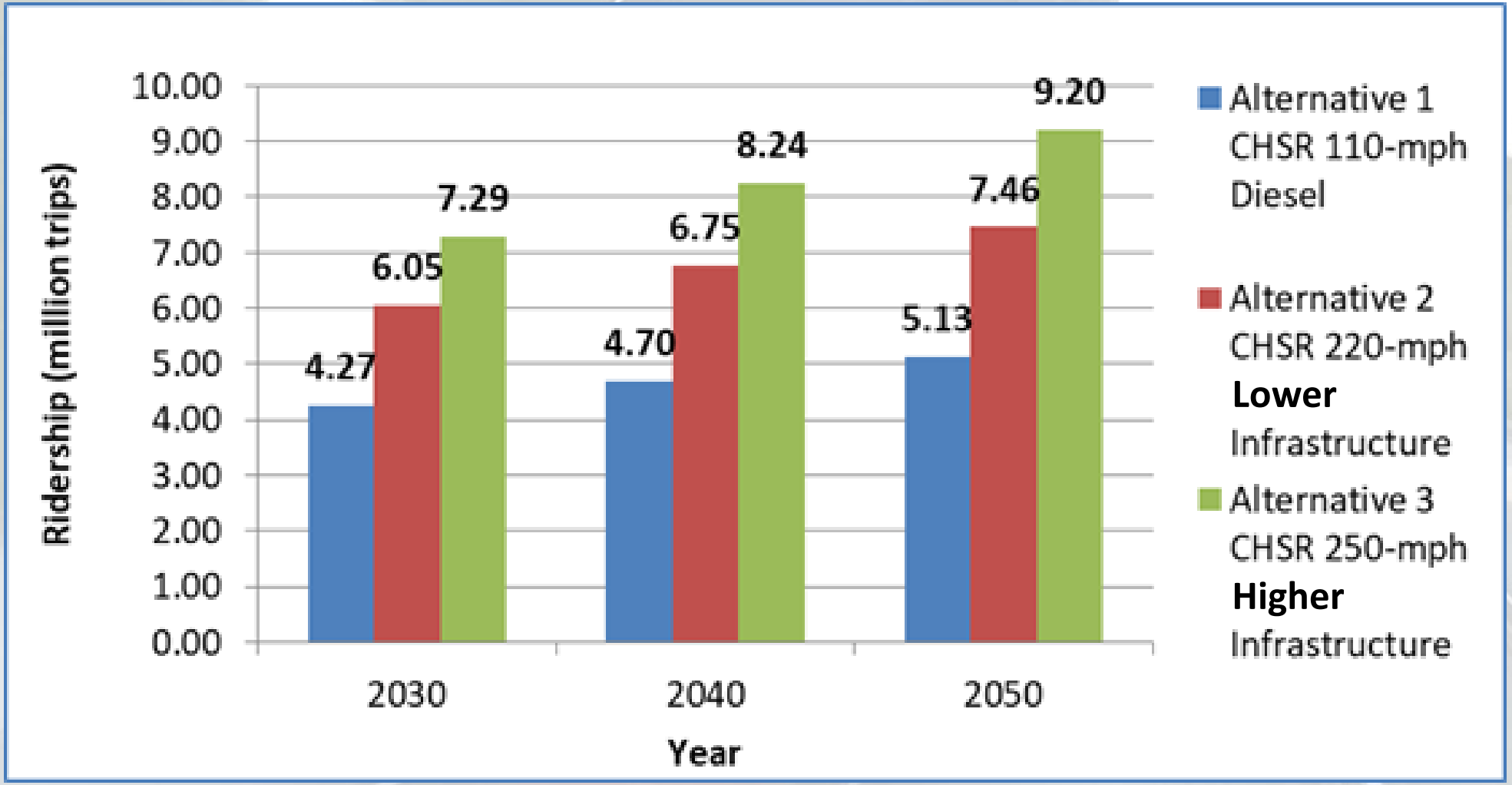
Estimate Passenger Demand Revenue for the High-Speed Rail Service

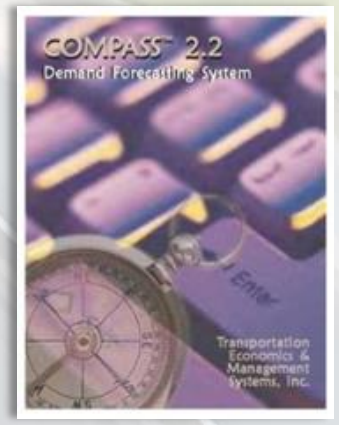


- **Investment Grade Discrete Choice Model**



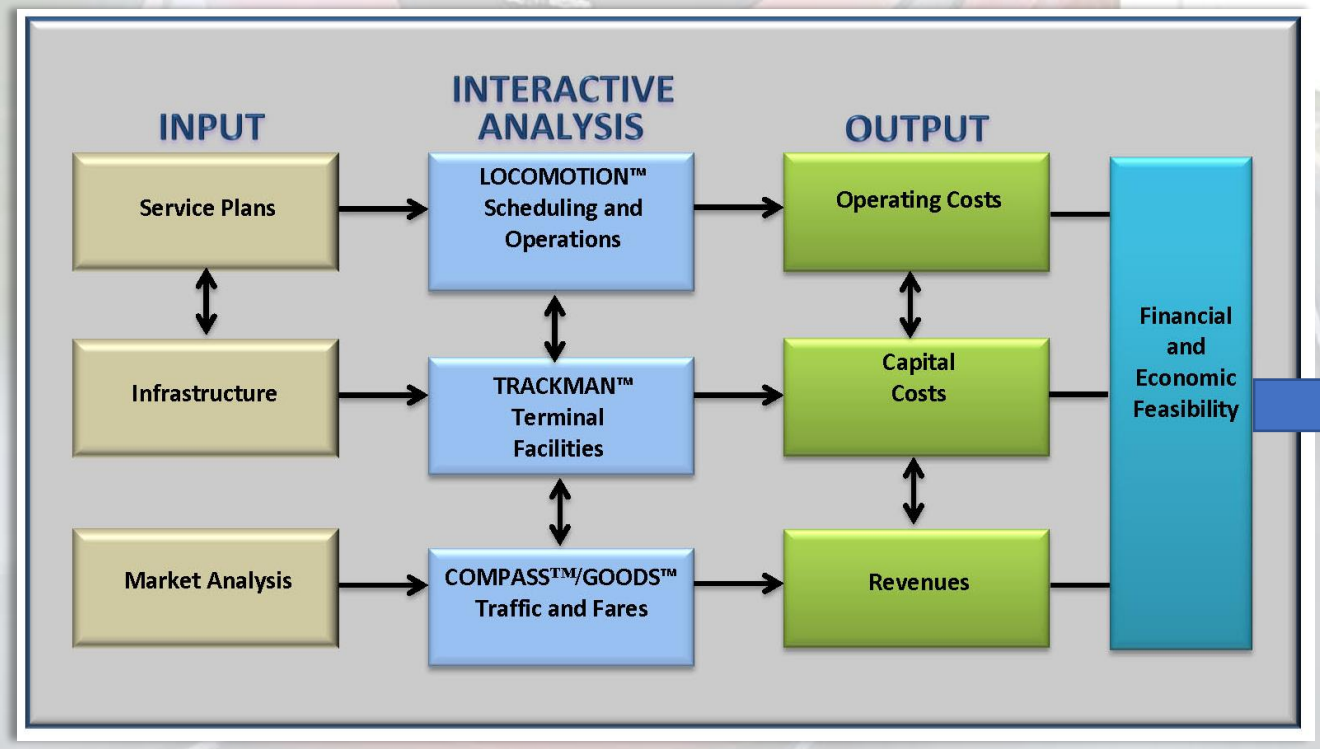
Portland – Seattle Corridor High Speed Rail Ridership Forecast





Interactive Analysis

- TEMS uses an Interactive Analysis in order to develop the Service Development Plan for each Alternative. This includes evaluation of routes, vehicles, operations, ridership and revenue, engineering and capital and operating costs.



Capital Costs

- Technology and Right-of-Way Costs
  - Vehicles
  - Types of structure
  - Land and right-of-way
  - Structures and guideway
  - Signals and communications
  - Electric supply
  - Passenger and Freight Stations/Terminals
  - Highway, rail, river crossings
  - Farm crossings (if needed)
  - Fencing (if needed)
- Support Facilities
  - Overhaul/Maintenance
  - Cleaning

Unit Capital Costs are derived from actual project results and then adjusted to local conditions

Key Engineering Infrastructure

- A key issue is the degree of infrastructure development that would optimize the system from a financial, economic and environmental perspective.
- In terms of the optimum infrastructure, consideration needs to be given to both capital cost and from the perspective of the environment, the trade-off of tunneling, cut and fill, at-grade construction and elevated guideway.

Tunneling significantly reduces environmental impacts and requires far less mitigating measures

Tunnel - $230M/mile

Elevated Guideway - $123M/mile

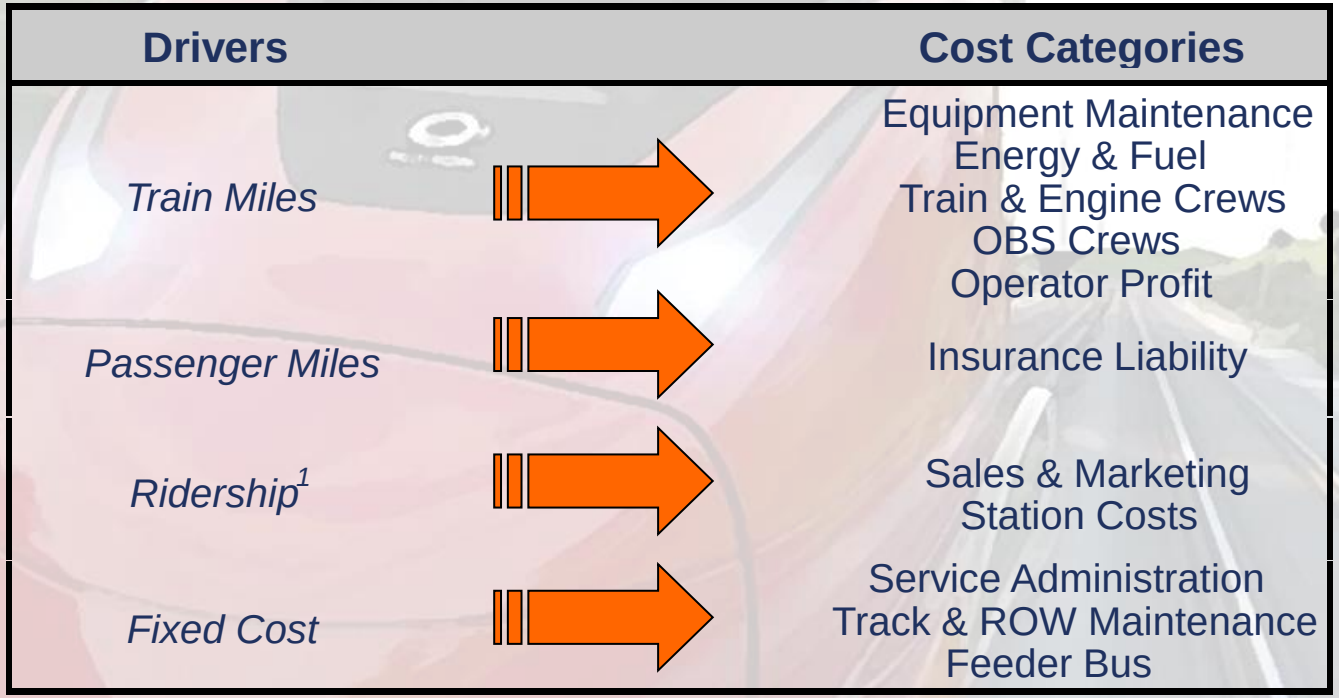
Cut and Fill - $25M/mile

CHSR Capital Costs (2021 dollars Millions)

Infrastructure Type	Alternative #1			Alternative #2			Alternative #3		
	Miles	Unit Cost	Total	Miles	Unit Cost	Total	Miles	Unit Cost	Total
Cut and Fill	16.40	$13	$213	16.40	$25	$410	31.16	$25	$779
At Grade	103.80	$13	$1,370	103.80	$25	$2,595	30.11	$25	$753
Flyover	34.70	$78	$2,702	34.70	$123	$4,268	60.94	$123	$7,496
Tunnel	18.40	$149	$2,742	18.40	$230	$4,232	43.49	$230	$10,003
Equipment + Stations			$1,000			$1,000			$1,200
Placeholder						$550			$550
TOTAL	**173.30**		**$8,027**	**173.30**		**$13,055**	**165.70**		**$20,780**
Cost per Mile ($Mill)	**$46.32**			**$75.33**			**$120.71**		
Plus Airport Loops			**$990**			**$1,500**			**$1,500**
TOTAL w/AIRPORTS			**$9,017**			**$14,555**			**$22,280**

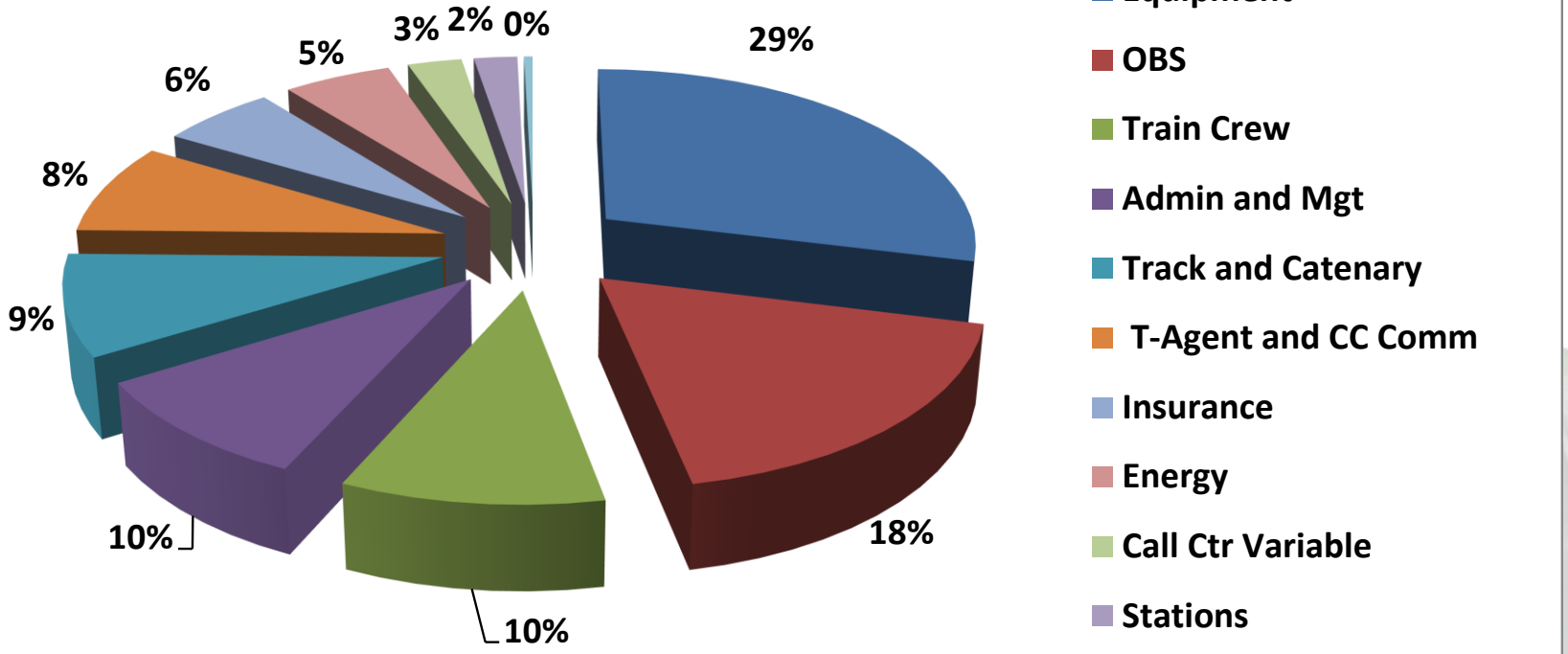
High Speed Rail Operating Costs

Framework resulted from previous multi-year, multi-state planning efforts (e.g., Northeast Corridor, MWRRI and Florida Business Plans)



[1]Station costs as well as sales and marketing are only affected minimally by ridership, so these two costs can be considered fixed for practical purposes.

Alternative 3 - 2030 Operating Costs



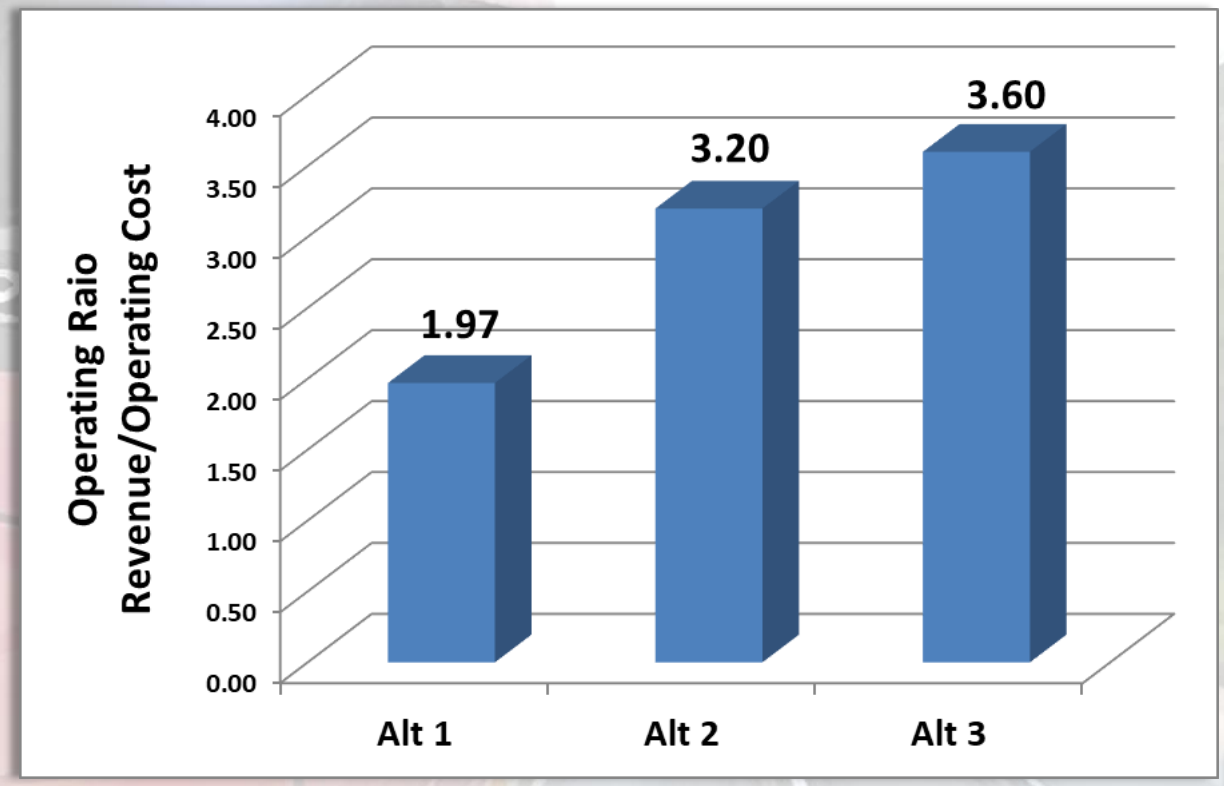
- *2030: $239 million/Year for 22 RT on a 188-Mile Corridor:*
  $92 / train mile
  . . . 9% of which is for Infrastructure maintenance

Electricity is 5% of total, and is 8th largest item

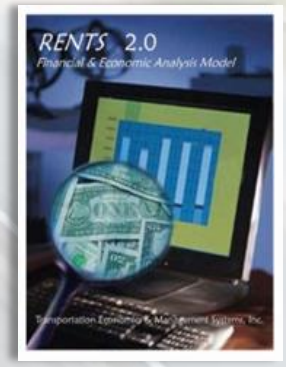
Alternative 1 - 2030: $155 million/Year for 12 RT - $110/train mile
Alternative 2 - 2030: $211 million/Year for 18 RT - $100/train mile
Alternative 3 - 2030: $239 million/Year for 22 RT - $92/train mile

CHSR Financial Results

Alternative 3 Electric High Infrastructure	3% NPV	7% NPV
Revenues		
System Passenger Revenues	$14,799.04	$6,879.69
On Board Revenues	$1,183.92	$550.37
Total Revenues	$15,982.96	$7,430.06
Total O&M Costs	$4,439.12	$2,071.11
Revenues Less Costs	$11,543.84	$5,358.95
Operating Ratio	3.60	3.59



- No Subsidy for any of the three Alternatives, this creates conditions for a public/private partnership



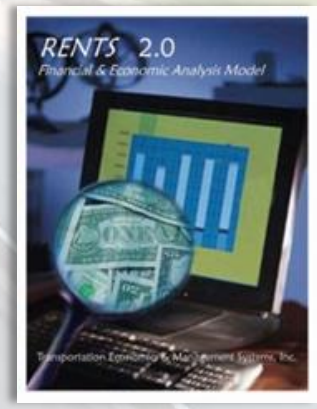
Economic Results: 3% and 7% Interest Rates

Alternative 3

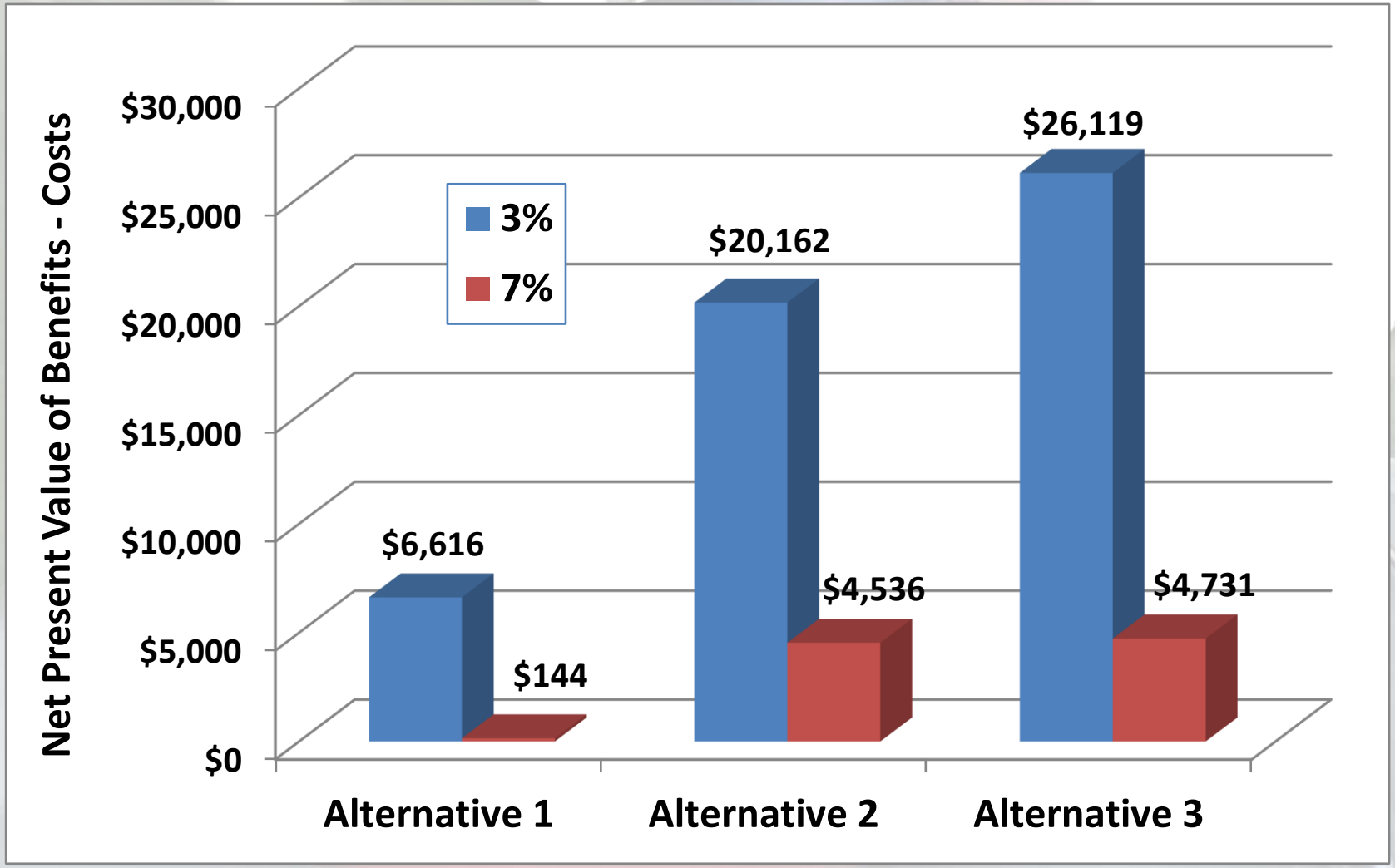
The Economic Return is very substantial showing a strong economic impact.

Alternative 3 Electric High Infrastructure	3% NPV	7% NPV
Total User Benefits	$32,347.99	$14,531.51
Total Public at Large Benefits	$17,462.77	$8,117.85
Total Benefits	$49,810.76	$22,649.36
Capital Cost	$19,159.78	$15,812.10
O&M Costs + Cyclic Capital	$4,531.47	$2,105.77
Total Costs	$23,691.25	$17,917.87
Benefits Less Costs	$26,119.51	$4,731.48
Project Benefit/Cost Ratio	2.10	1.26

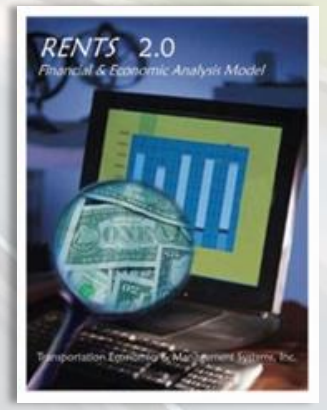
- **USDOT approved methodology**



Summary Slide 3% and 7% Net Present Values



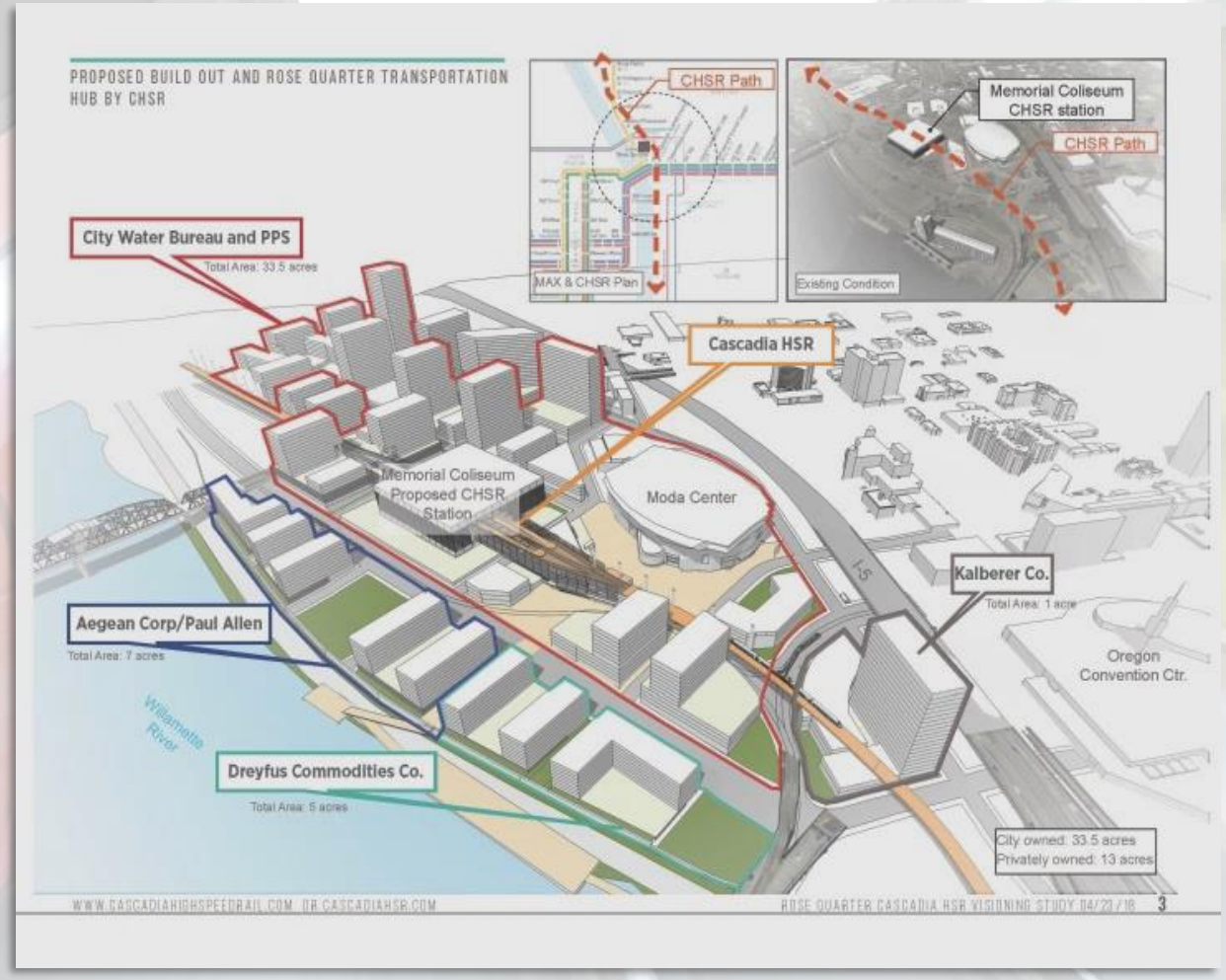
- **Alternative 3 produces largest Economic Profit**



Community Benefits over the Life of the Project

- 250,000 person years of Work
- $15.1 billion increase in Incomes
- 11.3 billion in Property Development at stations
- $5.4 billion expansion of Tax Base to Federal and State sources.

Very strong economic impact creating livable, walkable communities at stations



Environmental Analysis

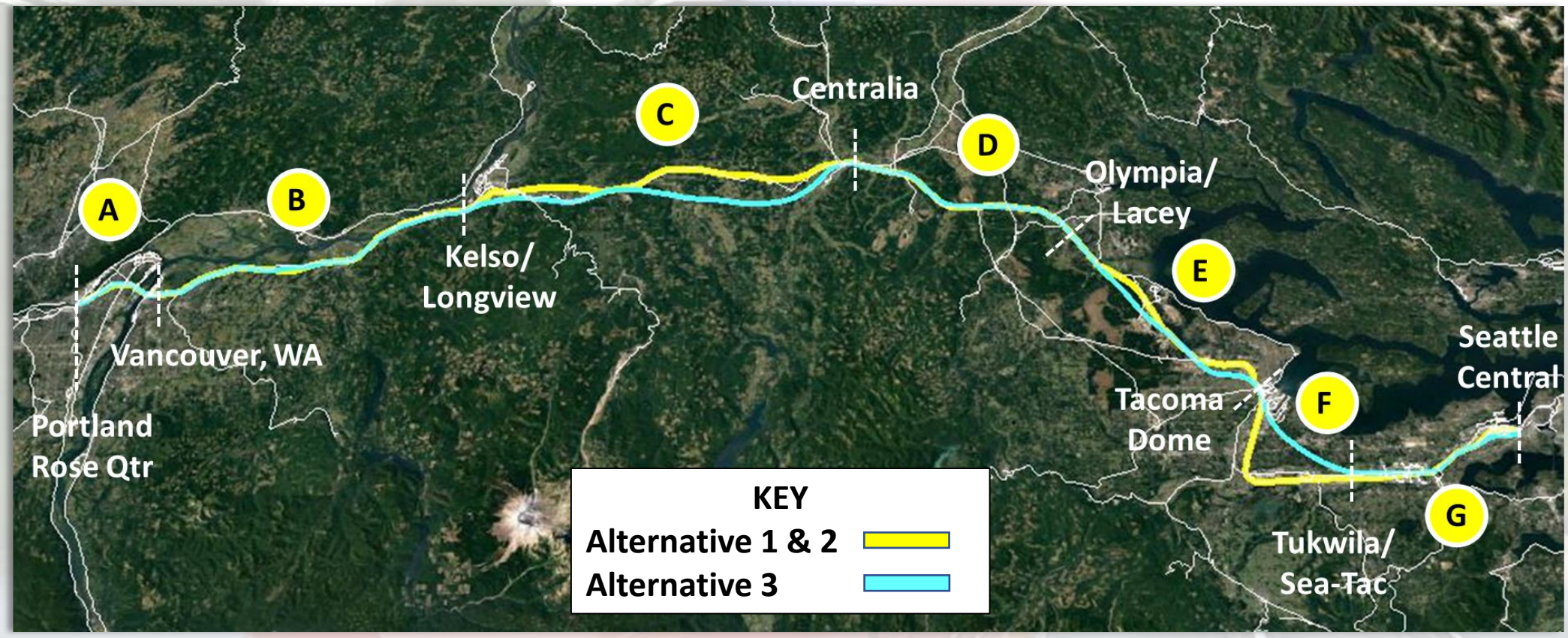
Service NEPA Level Analysis

- High Level Assessment and Mapping of the Routes
- Identification of Environmental Issues for each Route
- Classification of Areas that could be Assessed by an Environmental Assessment or a Finding of No Significant Impact (FONSI)
- Identification of Tier 2 Environmental Areas
- Preliminary Assessment of Possible Mitigation Measures

Environmental Analysis

- **Review of the Three Alternatives and Capital Costs**
- **Environmental Analysis focusing on Direct Impacts**
  - Infrastructure Alternatives
  - Wetland Direct Impacts
  - Historical Structures Impact
  - Property and Right-of-Way Impacts
  - Energy Impacts
  - Congestion Time Impacts
  - Acres of Right-of Way Impact
  - Economic Impact
  - National Justice Impact

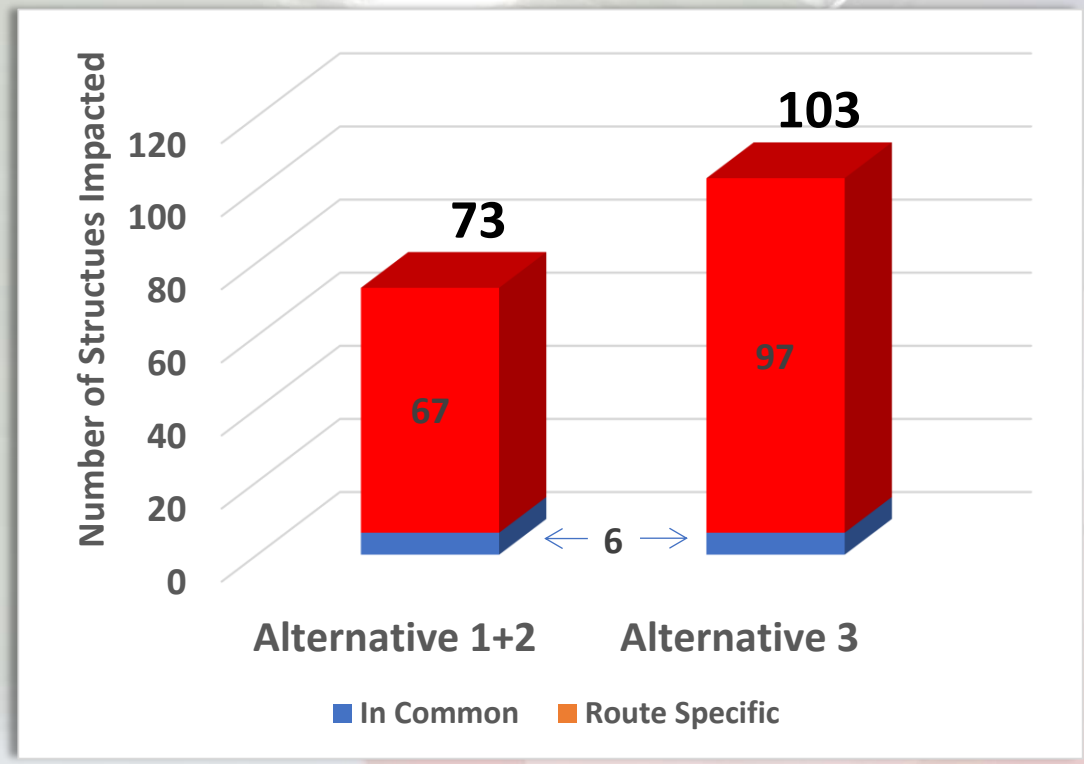
Route Analysis: Seven Segments



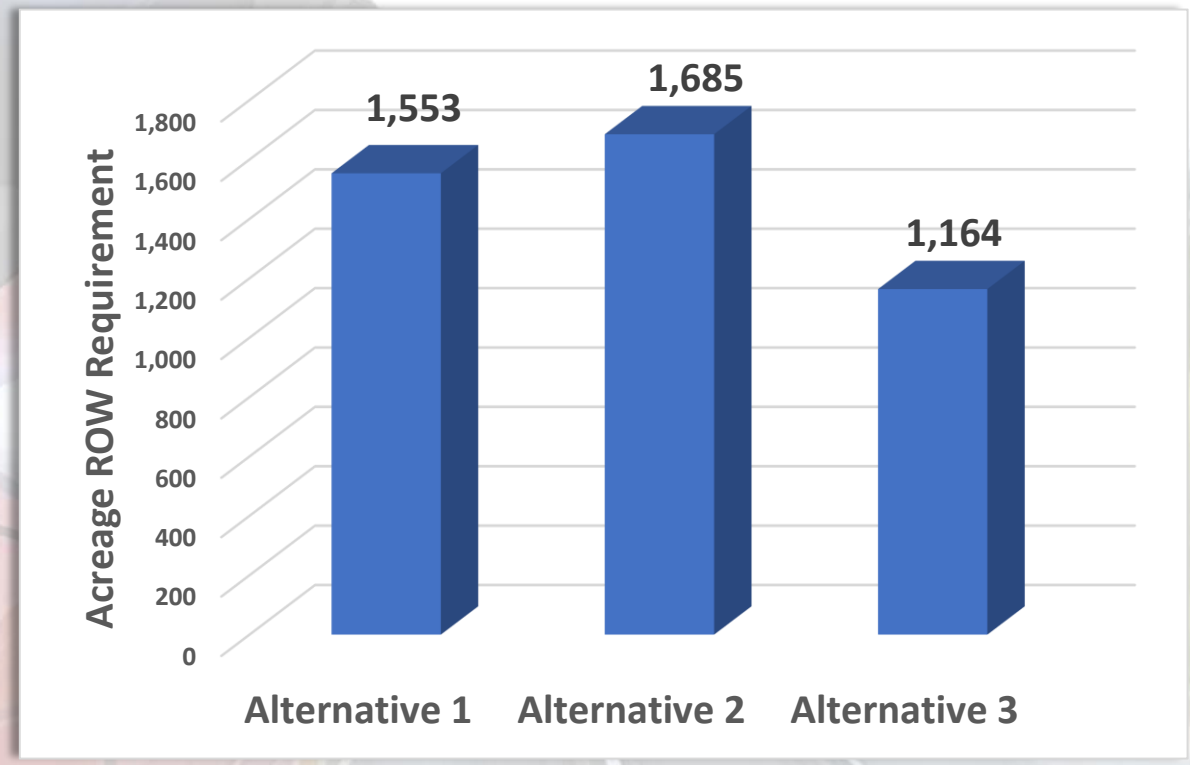
For environment analysis purposes, the route has been broken down into seven segments. This facilitates the discussion of alternatives and issues associated with the development of each segment.

Example: Property and Right-of-Way Impacts

Structures Potentially Impacted



Acreage Right-of-Way Requirement



Alternative 3 has the smallest acreage requirement due to its heavy reliance on tunnels. Alternative 3 is aligned under street or public rights-of-ways to save land purchase costs. It also makes the lease use of existing rail right-of-way.

Tier 1 EIS: Direct Impacts Summary

BEST ALTERNATIVE

Environmental Metric	Alternative #1	Alternative #2	Alternative #3
Total Route Miles	173.3	173.3	165.7
Tunnel Miles	18.4	18.4	43.5
Flyover Miles	34.7	34.7	60.9
Shared Rail Right-of-Way Miles *(40%)*	68.6 *(40%)*	68.6 *(40%)*	19.0 *(12%)*
Congestion Time Savings (millions/hours)	5.31	12.42	16.90
Energy Savings (millions of gallons of gas)	4.22	9.87	13.42
Emissions Savings (millions of tons e.g. CO_2)	0.34	0.82	1.11
Miles of Potential Wetland Impact	29.75 *(17.2%)*	29.75 *(17.2%)*	20.85 *(12.6%)*
Structures Potentially Impacted	73	73	103
Acres of Surface Right-of Way Required	1,553	1,685	1,164
Main Line CAPITAL COST ($Mill of 2021)	$8,027	$13,055	$20,780
Plus Airport Loops	$990	$1,500	$1,500
TOTAL CAPITAL COST w/AIRPORTS	$9,017	$14,555	$22,280

- Alternative 3 as shown in green has the lowest environmental impact for all factors considered except for structures potential impacted

Tier 1 EIS Study Results Summary

From a financial economic and environmental perspective, Alternative 3 is clearly the best alternative.

1. **Financially Alternative 3 provides the highest return on investment, highest operating ratio and creates the best conditions for a public/private partnership.**

2. **Due to its speed of 220 – 250 mph Alternative 3 generates the highest economic impact, cost benefit ratios and net present values. It provides the most effective means of travel in the corridor, the greatest diversion of automobile traffic, the most congestion and emission mitigation and most effective energy use.**

3. **Alternative 3 provides the greatest economic impact along the corridor and generates significant jobs and income increases. The property development benefits are over $11 billion, which will allow significant property development in each community**

4. **Alternative 3 provides the most effective environmental benefits due to the fact that much of the project can be built underground and as a result, impinges least on the property owners along the CHSR Ultra High Speed Corridor.**

Thank You