



EAST-WEST PASSENGER RAIL STUDY

Public Meeting #2 – Springfield, MA
February 12, 2020

Meeting Agenda

- Presentation
 - Welcome and Introductions
 - Meeting Objectives
 - Study Overview
 - East-West Corridor Alternatives Analysis
 - Evaluation criteria
 - Ridership methodology
 - Alternatives analysis
 - Questions and Discussion
- Additional Information and Requests

Meeting Objectives

Inform

Review the purpose and goals for improving connectivity and mobility in the East – West Corridor

Provide key metrics for assessing benefits, costs and impacts of the 6 Preliminary Alternatives

Learn and Solicit Feedback from Residents and Stakeholders

Are any clarifications needed about the information presented?

East-West Study Overview

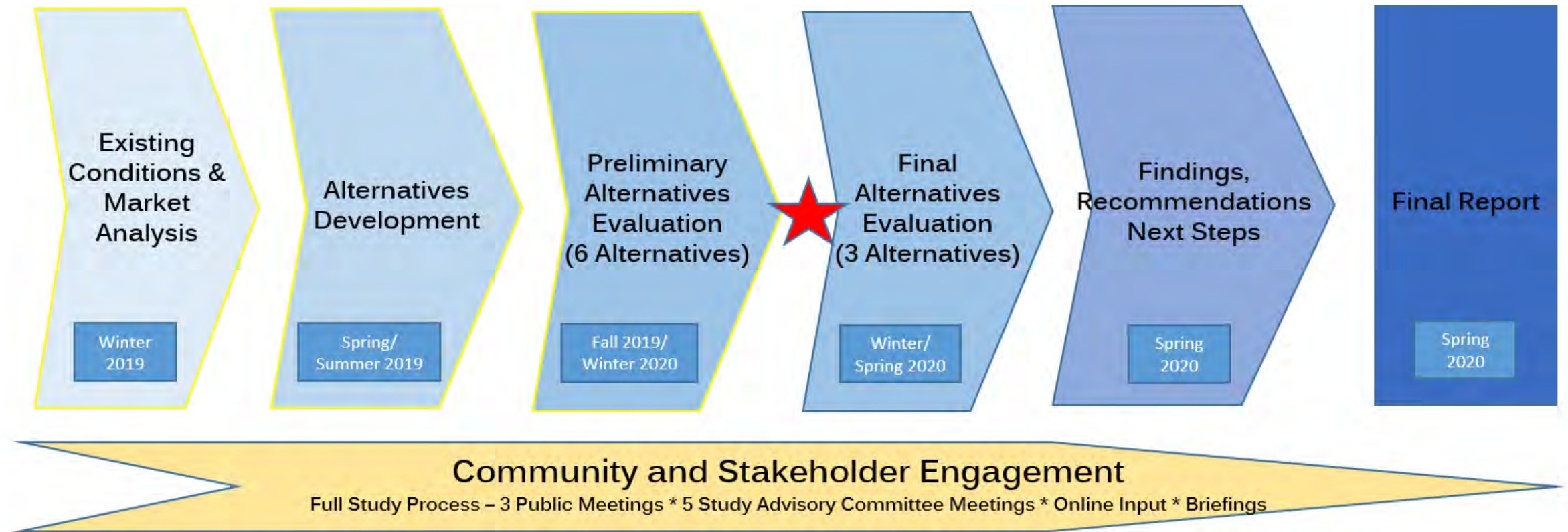
Study Purpose and Process

Existing East – West Corridor Conditions and Issues

Alternatives Development

Study Purpose and Process

Purpose: To conduct a conceptual planning study to evaluate benefits, costs, and impacts of a range of alternatives for improved connectivity and mobility in the East – West Corridor.



Goals for Service Alternatives

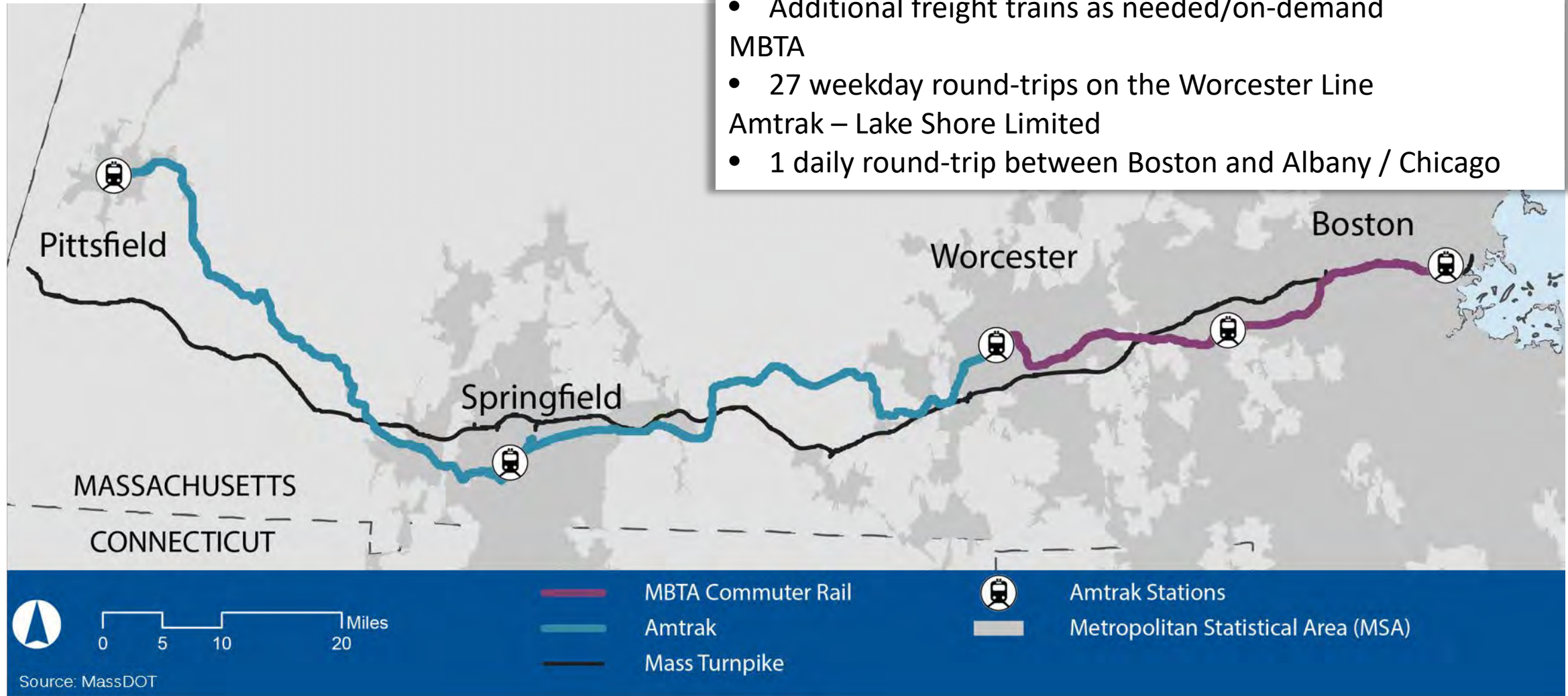
Based on input from Advisory Committee, residents, and stakeholders

- Provide better **transportation options** to/from Western MA
- Support **economic development**
- Improve attractiveness of Western MA as an **affordable place to live**
- Reduce the number of **automobile trips** along the corridor
- Reduce **greenhouse gas emissions** and **air quality impacts** from transportation

KEY CONSIDERATIONS

- Impacts to freight
- Environmental and community impacts
- Cost

Study Corridor



CSX

- 14 regularly operated freight trains each day
- Additional freight trains as needed/on-demand

MBTA

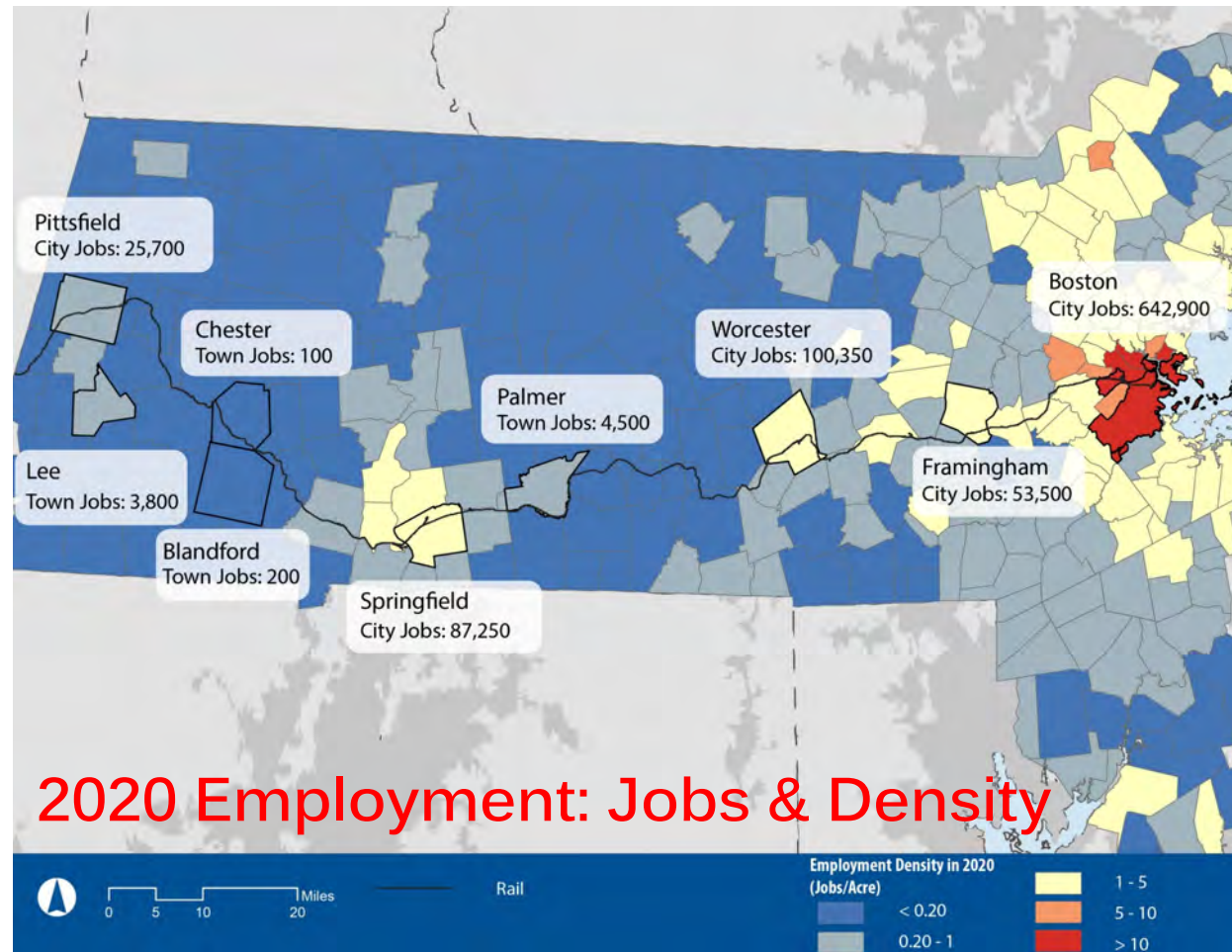
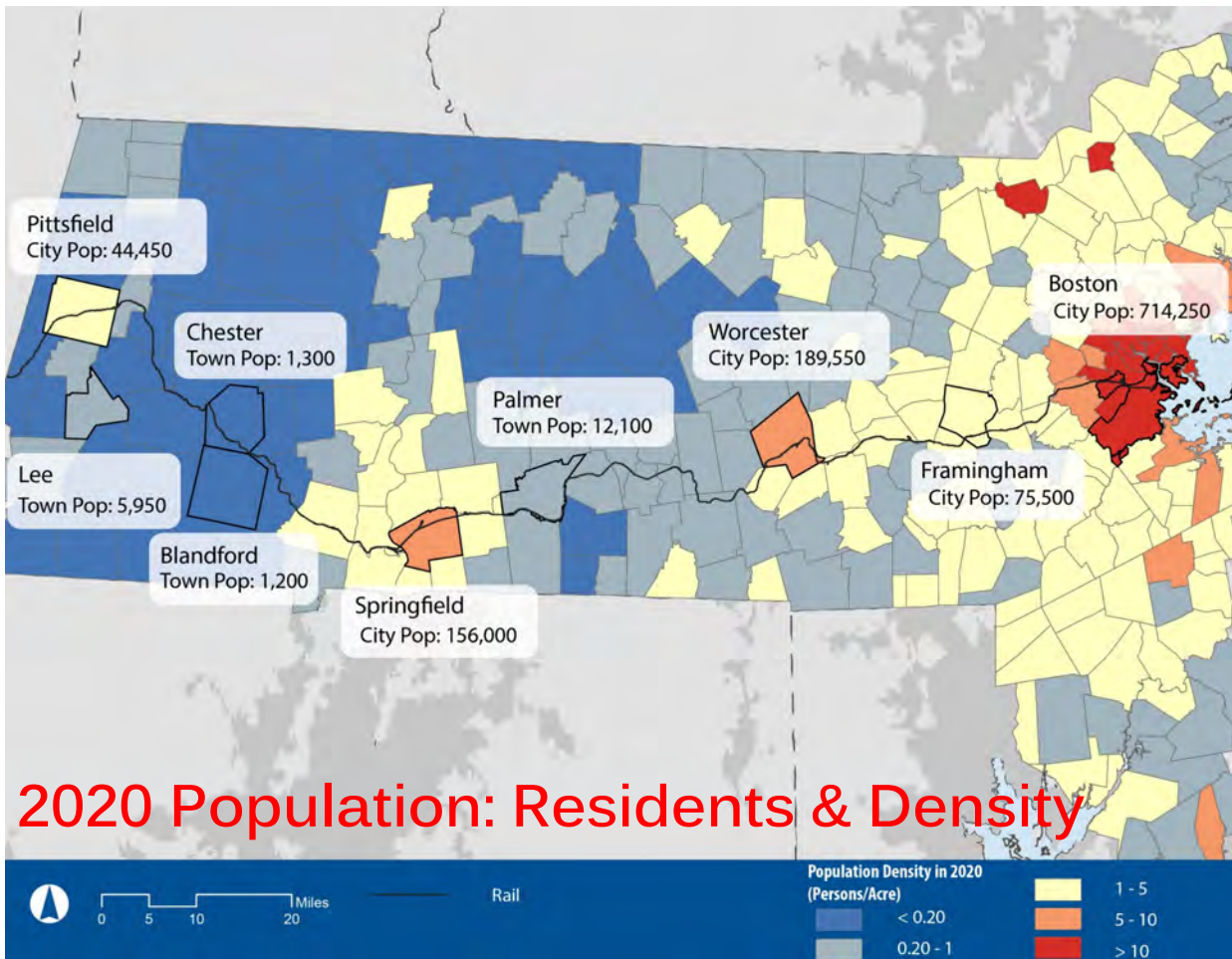
- 27 weekday round-trips on the Worcester Line

Amtrak – Lake Shore Limited

- 1 daily round-trip between Boston and Albany / Chicago

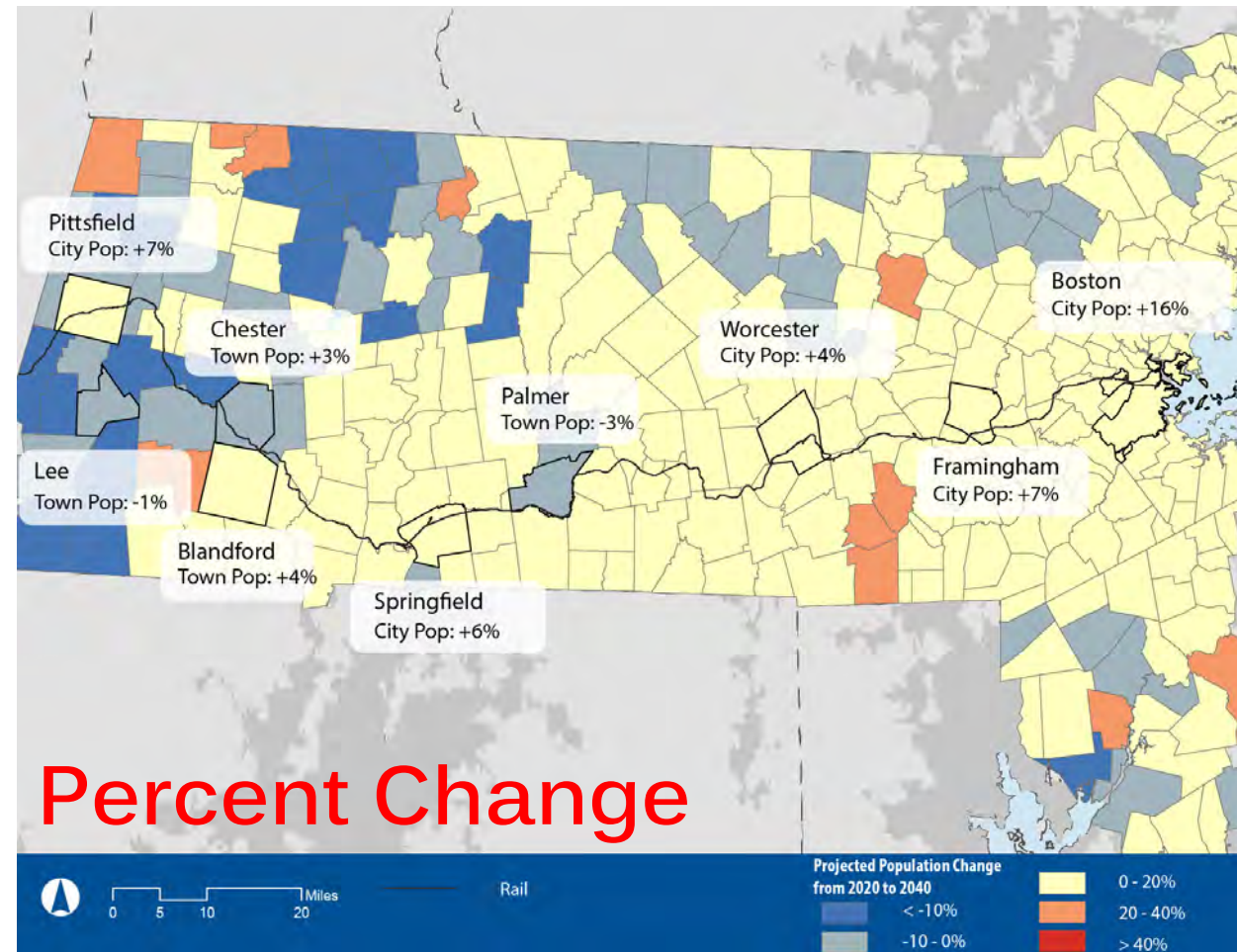
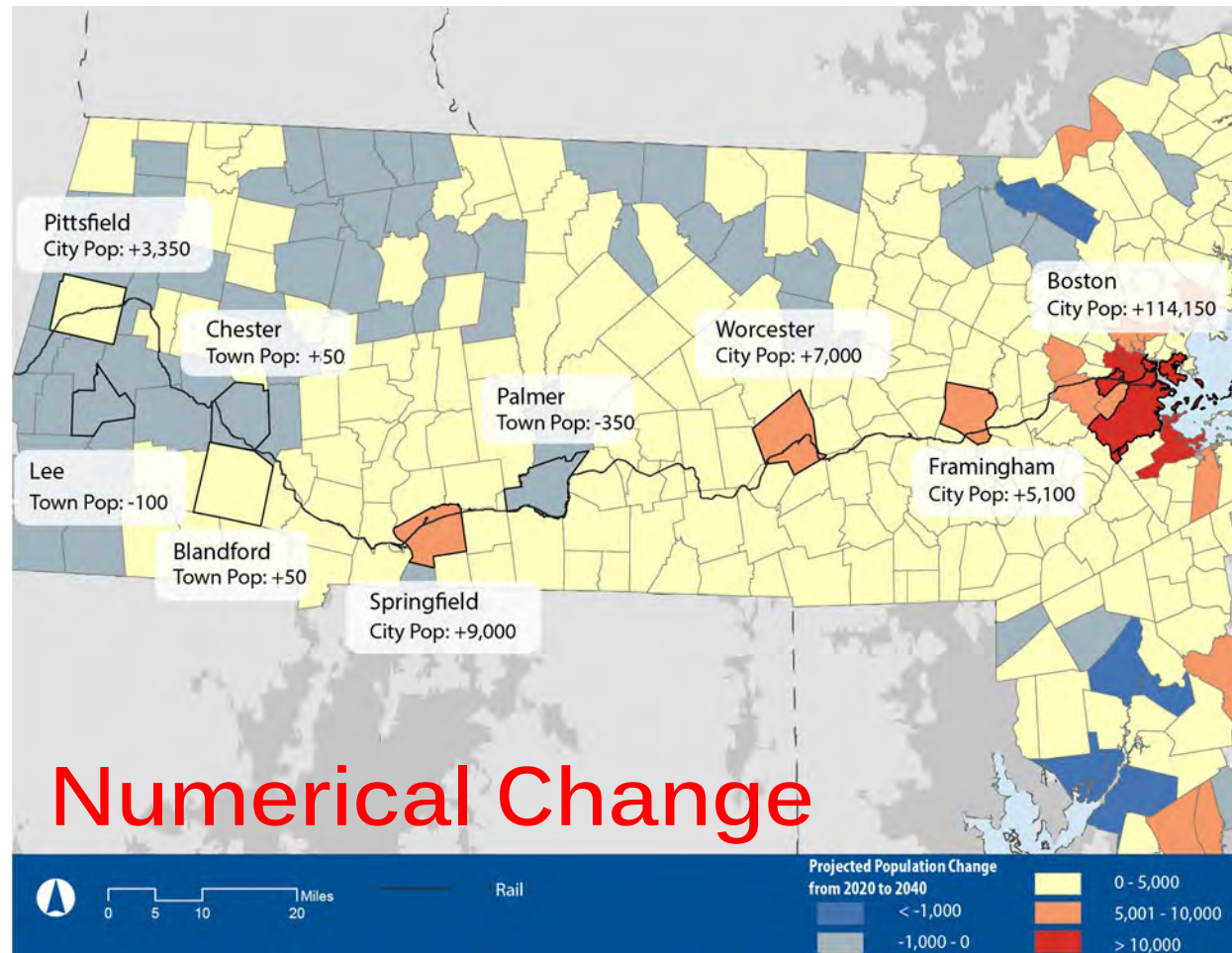
Corridor Demographics

2020 Population and Employment



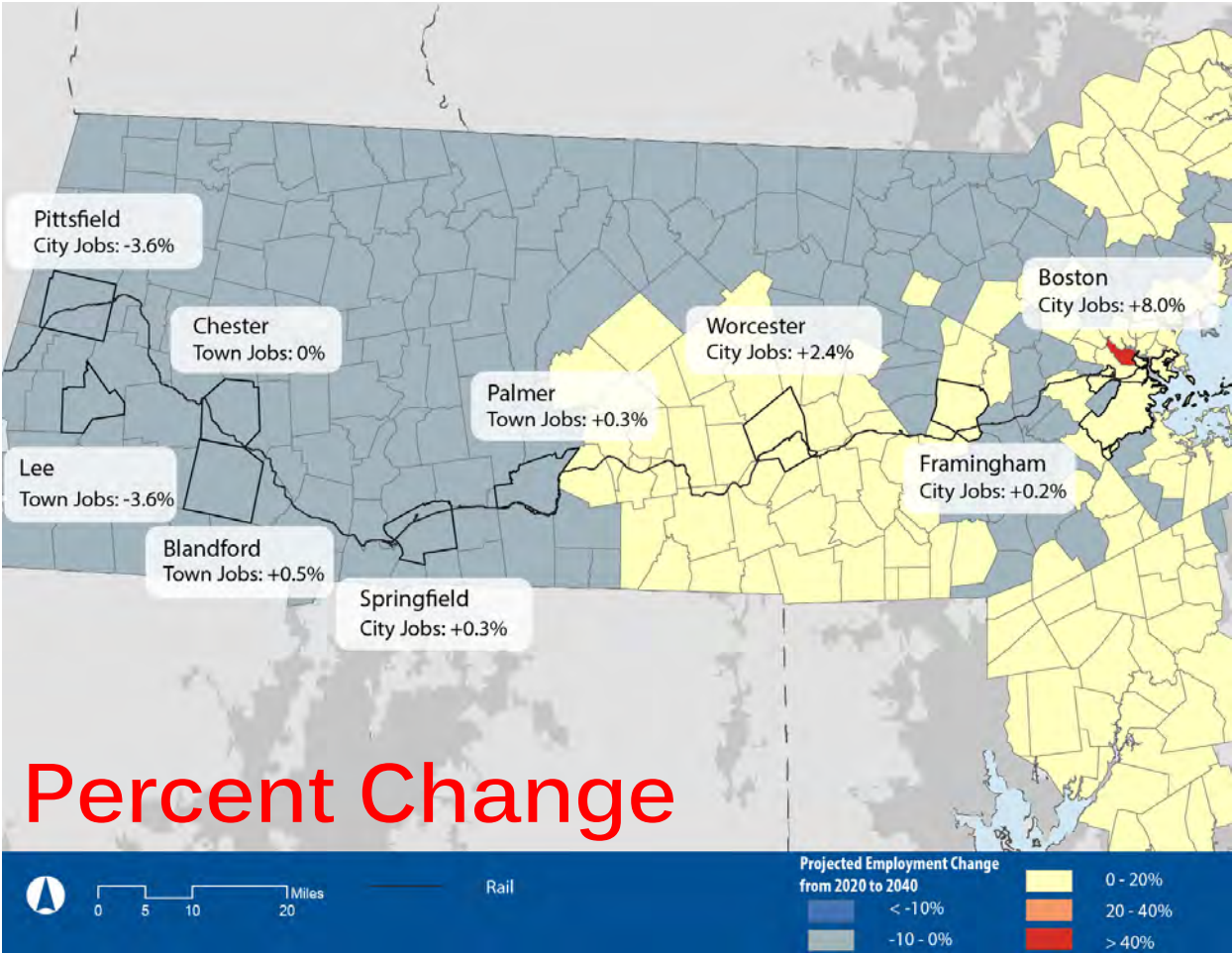
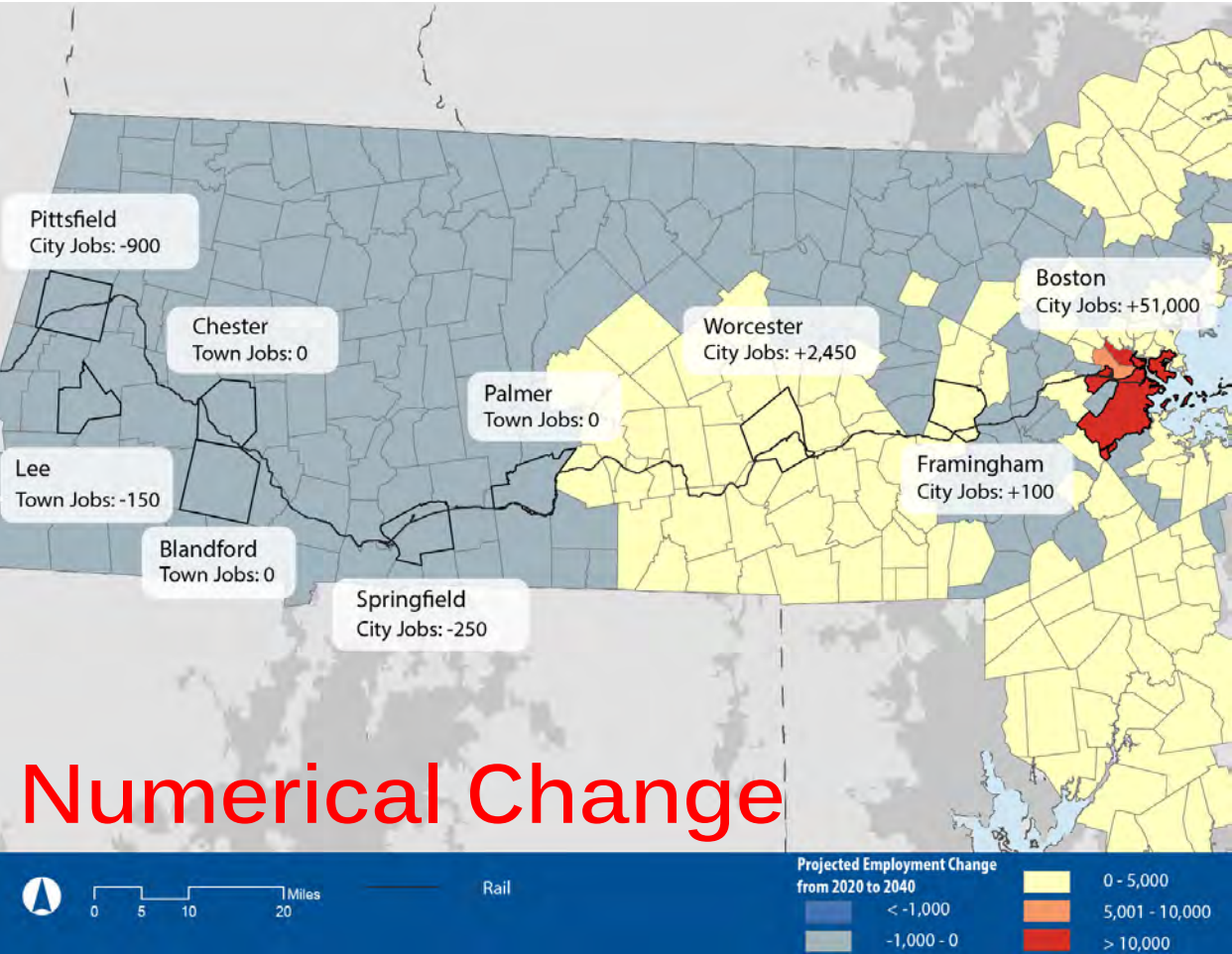
Source: MPO Long-Range Transportation Plans, 2019 Demographic Projections

2020 to 2040 Population Change for Future No-Build



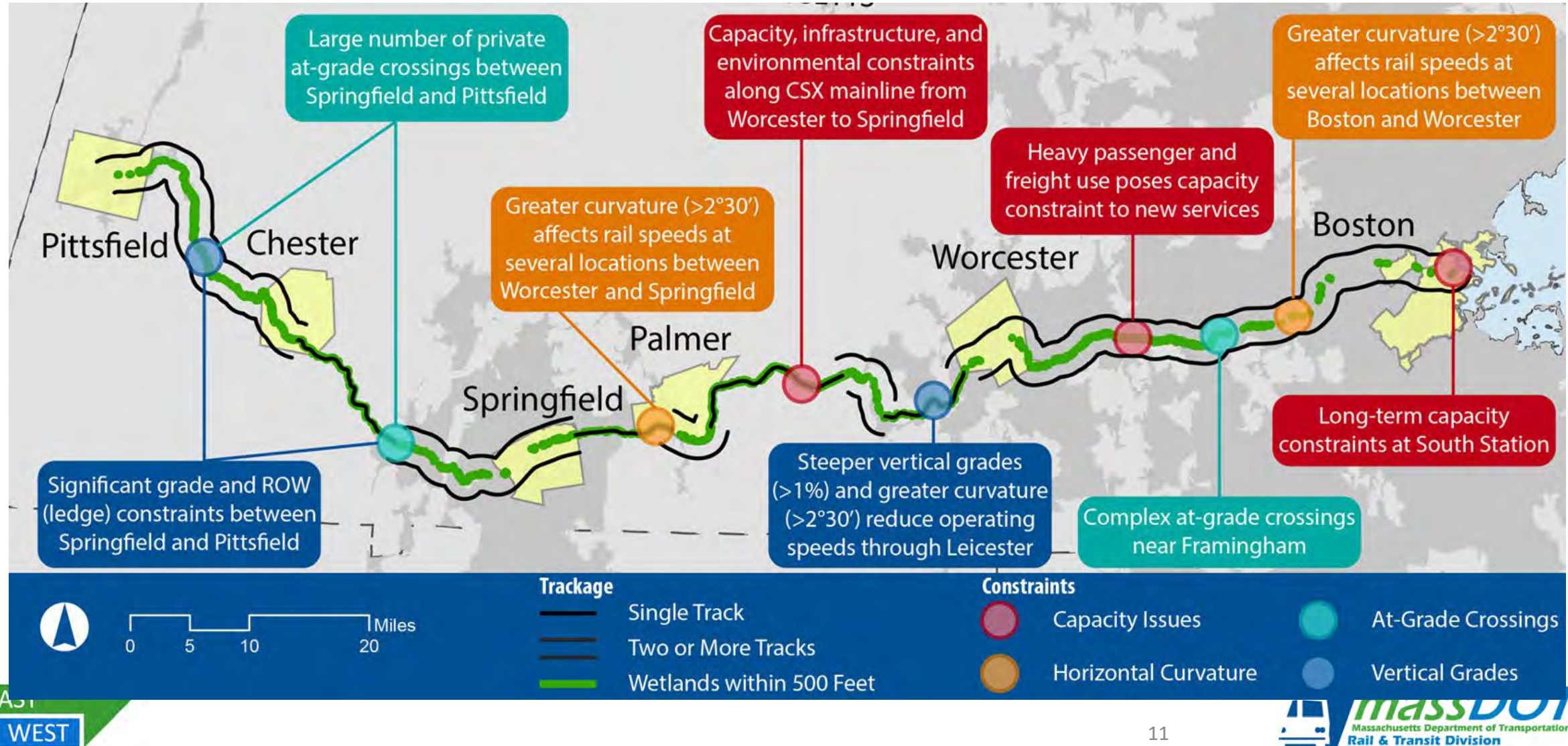
Source: MPO Long-Range Transportation Plans, 2019 Demographic Projections

2020 to 2040 Employment Change for Future No-Build



Existing Conditions – Physical Constraints

Key Constraints Along the Corridor



Study Background – Planning Context

- Massachusetts State Rail Plan
 - Recommended East – West Rail for further study
- Northern New England Intercity Rail Initiative (NNEIRI)
 - Multi-state passenger rail improvements study
 - Many similarities to potential East – West service
- Rail Vision
 - Range of options for enhancing MBTA commuter rail system



Study Background – Completed Projects

- Hartford Line Rail
 - Complete and operating
 - Amtrak and CT*Rail* service: New Haven – Hartford – Springfield
 - 16 daily round trips
 - Year 1 ridership estimated at 583,500
- Springfield Union Station improvements
 - Improvements to platforms, pedestrian access, station concourse, waiting areas and retail spaces
 - Final improvements – new full-length, high-level Platform C opened Jan 24, 2020



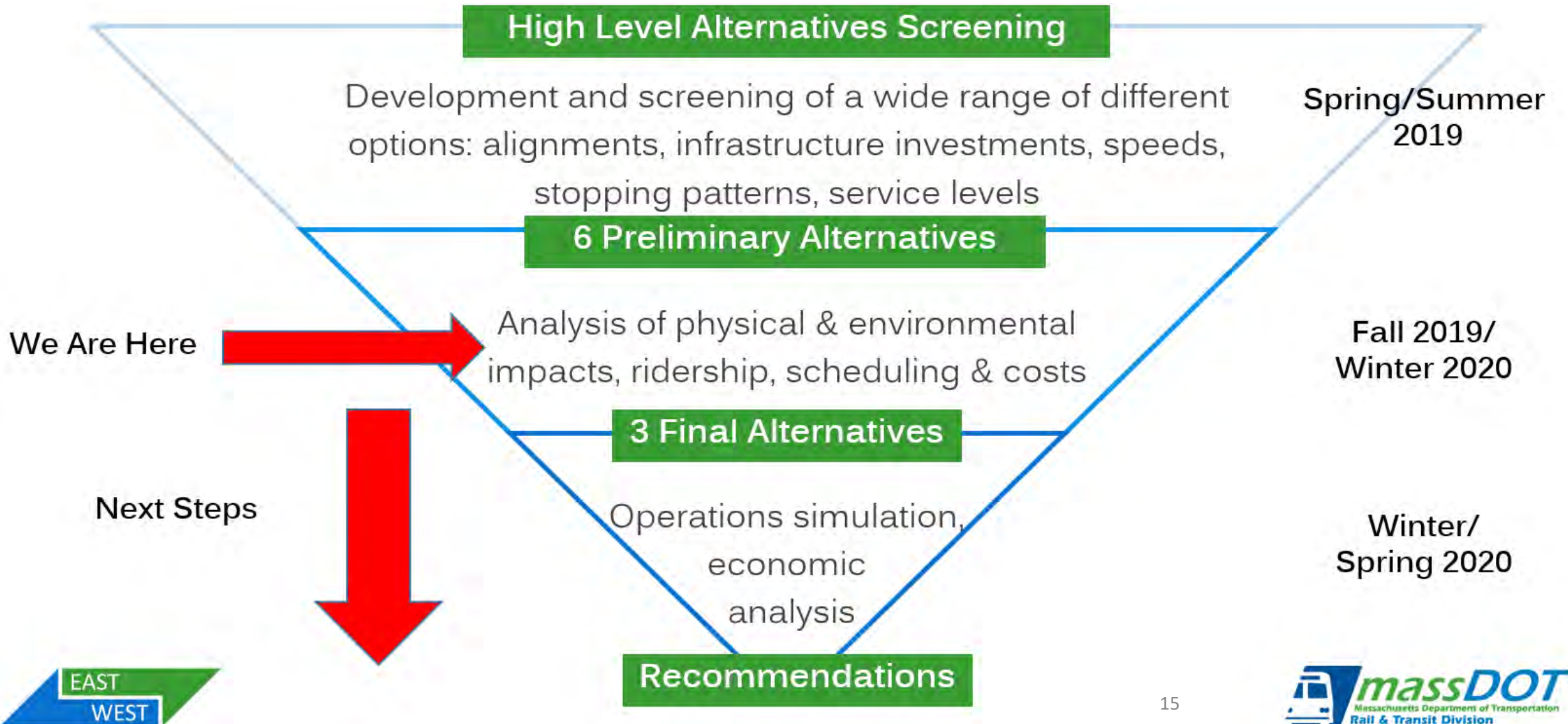
Study Background – Pending Projects

Assumed for analysis, but not funded as part of East – West project (not included in costs)

- Worcester Station Improvements
 - Feasibility and design funded in CIP
 - Track upgrades, full-accessible center platform
- South Station Expansion
 - Expand critical terminal capacity
 - 7 new tracks (20 total)
 - 4 new platforms (11 total)
- Worcester Triple Tracking
 - Third track on Worcester CR line, Framingham to Wellesley (10 miles)
 - Accessibility upgrades for 4 stations (West Natick, Wellesley Square, Wellesley Hills, Wellesley Farms)
 - New Natick Center Station currently in design as separate project
 - Improved capacity, schedule flexibility and reliability
 - Study underway per current CIP



Alternatives Development & Analysis



Alternatives Development – Key Characteristics

- **Corridor type**

- Shared corridor – service on upgraded, double-tracked CSX rail line
- Shared corridor – service on new rail infrastructure in CSX corridor
- Separate corridor – Massachusetts Turnpike/Interstate 90

- **Travel time**

- **Travel speed**

- Corridor type (shared v. separate, above)
- Curvature and grade
- Track infrastructure
- Conflicts with other rail traffic – MBTA commuter rail, CSX freight, Amtrak

- **Stopping patterns**

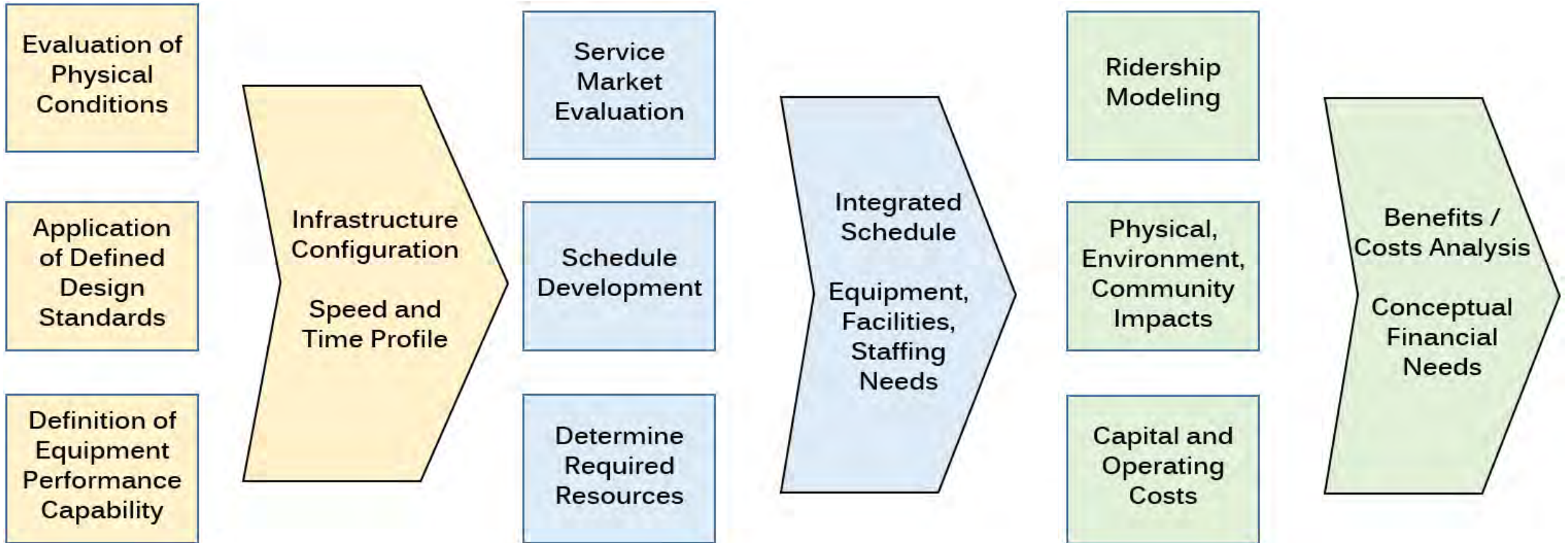
- Direct service v. transfers
- Express/limited stop v. more local stops

- **Frequency**

- **Anticipated impacts**

Initial Alternatives Development Process

Iterative process followed for each Alternative



Public Feedback Informing Alternatives

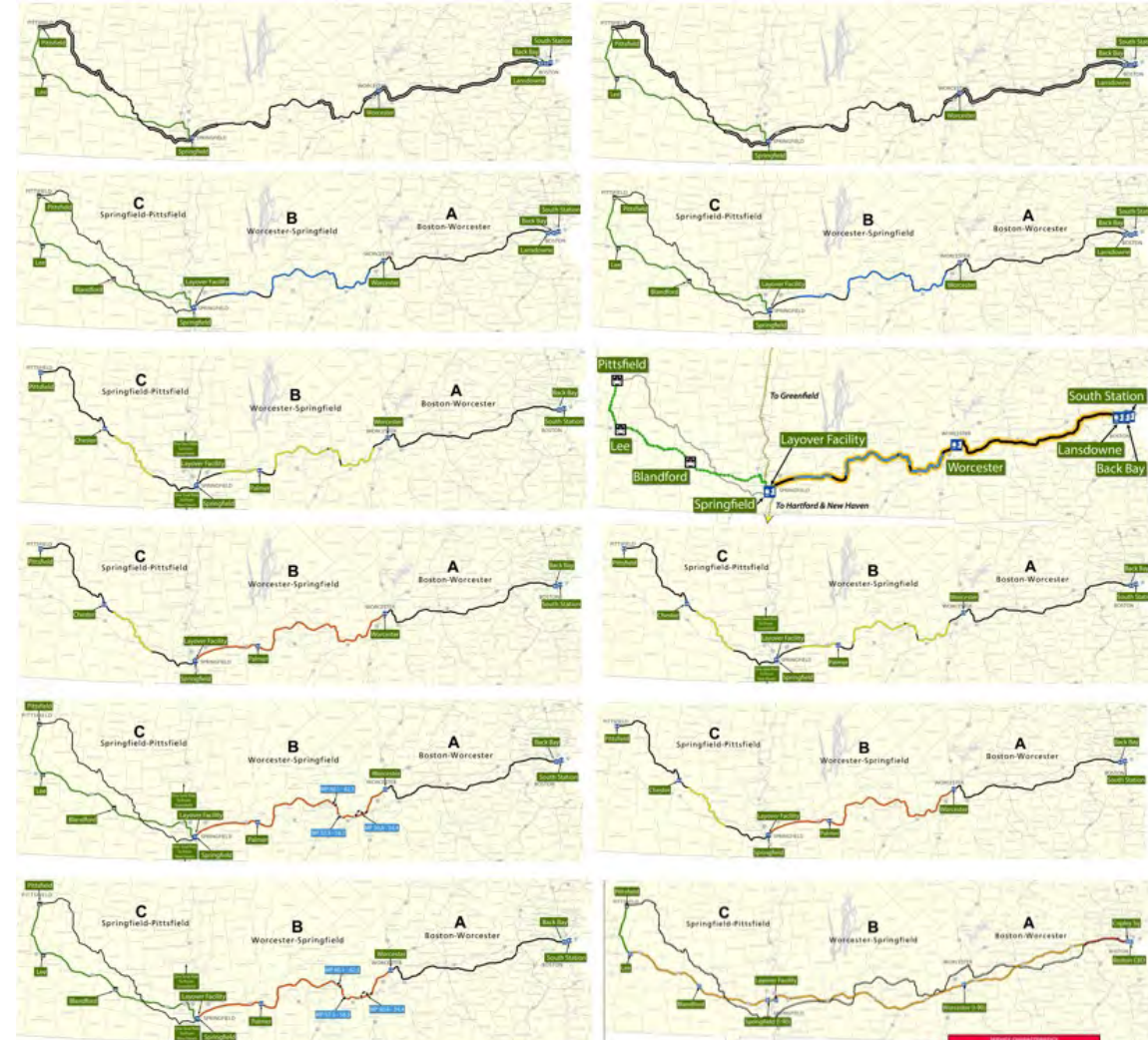
Received at Advisory Committee Meeting #1 (Dec 18, 2018), Public Meeting #1 (March 12, 2019), Advisory Committee Meeting #2 (July 23, 2019) and via email/website (~75 comments)

- Rail will spur economic development and quality of life in western MA
- Affordable homes in western MA will become more accessible to people who work in eastern MA
- Rail service should be provided to the smaller towns, such as Palmer and Chester
- Better connections between western & eastern MA are paramount, and could include bus service
- Faster service is a high priority
- Launching service sooner is more of a priority than faster service
- Frequent service (multiple trips per day) is a high priority
- Getting cars off the roads and reducing congestion on I-90 is an important benefit
- It is important to connect other western MA towns to Springfield
- Express service between Springfield and Boston is a priority
- Connections for western MA residents to Logan Airport are important
- Look at other corridors besides the existing CSX route, e.g. the Pan Am Railways “Northern Tier”
- All alternatives should provide service to Pittsfield, Western MA
- Bus is not a good option for any parts of the corridor

Alternatives Screening – Options Reviewed

<div><div></div><div>One-Seat Ride</div></div> <div><div></div><div>Transfer Required</div></div>	EAST / WEST CORRIDOR STUDY - UNIVERSE OF STOPPING PATTERNS																												<div><div></div><div>Selected MBTA Service</div></div> <div><div>B</div><div>Bus Connection or Trip</div></div>				
	POTENTIAL STATIONS ARRAYED FROM WEST TO EAST																																
SHARED / IMPROVED RAIL CORRIDOR CONCEPTS	New Haven	State St.	Wallingford	Menden	Berlin	Hartford	Windsor	Windsor Locks	Greenfield	No. Hampton	Holyoke	Pittsfield	Chester	Springfield	Palmer	Worcester	Grafton	Westborough	Southborough	Ashland	Framingham	West Natick	Natick Center	Wellesley Square	Wellesley Hills	Wellesley Farm	Abundale	West Newton	Newtonville	Boston Landing	Lansdowne	Back Bay	South Station
Springfield to Boston																																	
S-1 SPG - Base Pattern																																	
S-2 SPG - Options Pattern																																	
Pittsfield to Boston																																	
P-1 PIT - Base Pattern																																	
P-2 PIT - Options Pattern																																	
P-3 PIT - Shuttle Option																																	
Greenfield to Boston																																	
G-1 GFD - Base Pattern																																	
G-2 GFD - Options Pattern																																	
G-3 GFD - Shuttle Option																																	
New Haven to Boston																																	
N-1 NHV - Base Pattern																																	
N-2 NHV - Options Pattern																																	
N-3 NHV - Shuttle Option																																	
MBTA Extensions																																	
T-1 SPG - Base Extn.																																	
T-2 SPG - Options Extn.																																	
T-3 SPG - Shuttle Options																																	
Hybrid Rail / Bus																																	
H-1 Bus -SPG to WOR																																	
H-2 Bus -PIT to WOR																																	
H-3 Bus -GFD / PIT to WOR																																	
H-4 Bus -PIT to SPG																																	
H-5 Bus -GFD / PIT to SPG																																	
H-6 Bus in Off Peak																																	

SEPARATE HIGH-SPEED ALIGNMENT CONCEPTS	STATION LOCATIONS TO BE DETERMINED - PENDING SELECTED ALIGNMENT		Pittsfield	Lee?	Pittsfield	Lee?	Springfield	Worcester	Framingham	Back Bay	Boston
Bus Rapid Transit											
K PIT - Base Pattern			S	S	S	S	S	S	?	?	S
L PIT - Options Pattern			S	S	S	S	S	S	?	?	S
High Speed Rail											
M SPG - Base Pattern							S	?	?	?	S
N SPG - Options Pattern							S	?	?	?	S
O PIT - Base Pattern			S	S	S	S	S	?	?	?	S
P PIT - Options Pattern			S	S	S	S	S	?	?	?	S
Maglev											
Q SPG - Base Pattern							S	?	?	?	S
R SPG - Options Pattern							S	?	?	?	S
S PIT - Base Pattern			S	S	S	S	S	?	?	?	S
T PIT - Options Pattern			S	S	S	S	S	?	?	?	S



Alternatives Studied

- Service on shared, upgraded CSX rail line
 - Alternative 1 – Springfield – Worcester (transfer to MBTA)
 - Alternative 2 – Springfield – Boston (bus to Pittsfield)
 - Alternative 3 – Pittsfield – Boston
- Service on new rail line in CSX corridor
 - Alternative 4 – Pittsfield – Boston
 - Alternative 5 – Springfield – Boston (bus to Pittsfield)
- Service on new rail line in new corridor (Mass Turnpike corridor)
 - Alternative 6 – Pittsfield – Boston

In general, speed, frequency, ridership and capital cost progressively increase

East-West Corridor Alternatives Analysis

Evaluation Criteria

Ridership Methodology

Alternatives Analysis and Results

Alternatives Analysis – Evaluation Criteria

- **Ridership**

- Computer model that forecasts demand based on previously built projects, key characteristics of corridor and service:
 - Corridor demographics (residents & jobs)
 - Key service parameters (speed, frequency, stations served, direct service v. transfers)

- **Physical impacts**

- Property impacts – buildings/structures, private property, rail & road ROW
- Surrounding infrastructure – bridges, roads, utilities

- **Environmental and community impacts**

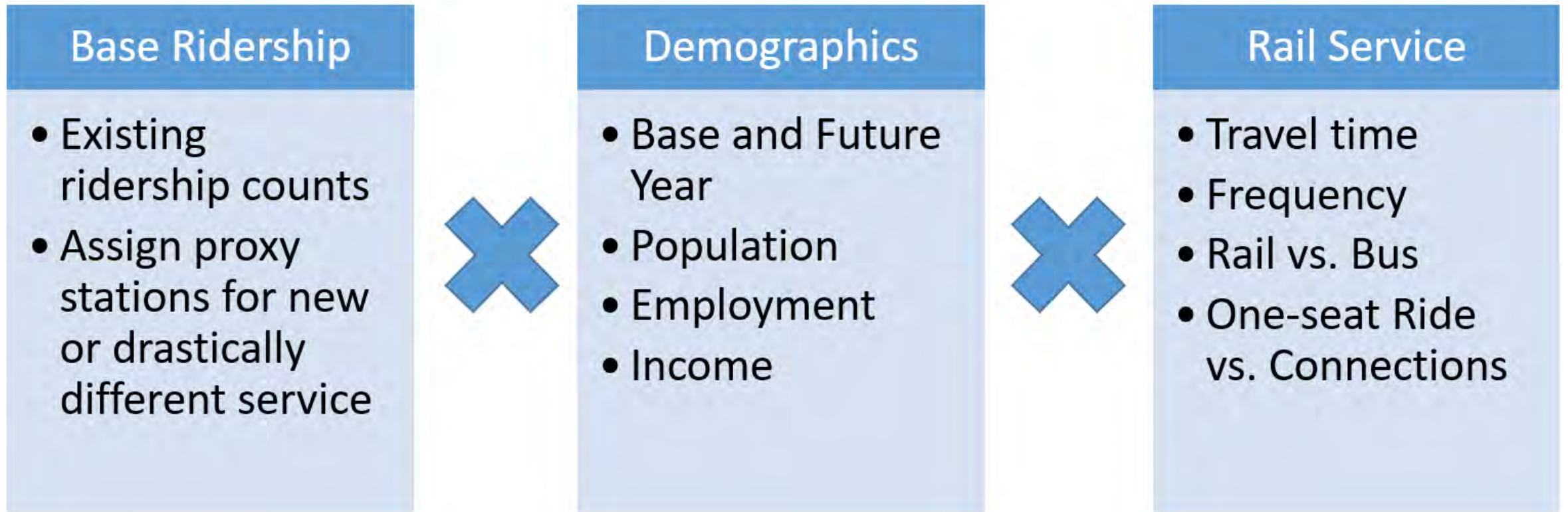
- Wetlands and natural resources impacts
- Impacts to structures

- **Costs and Benefits**

- Capital costs – railroad construction, surrounding infrastructure, trains
- Operating & maintenance costs
- Monetized benefits (travel time, environmental)

Ridership Forecasting Methodology

Incremental Ridership Model – Takes actual ridership numbers (from comparable rail services) and adjusts them based on demographic changes and rail service changes



Ridership Forecasting Methodology

Proxy stations are chosen to provide a base ridership number for new stations or stations with drastically different service, which are then scaled on both demographics and service to match new stations

Selection Criteria (in order of importance):

- **Similar** service characteristics (frequency, travel time, fare)
- **Similar** distance between stations
- **Similar** demographics

Primary stations used (to match more of a commuter-focused market):

- Springfield – Hartford
2018 Base Ridership = 75,000
- Springfield – Wallingford
2018 Base Ridership = 5,500

Ridership Forecasting – Outputs

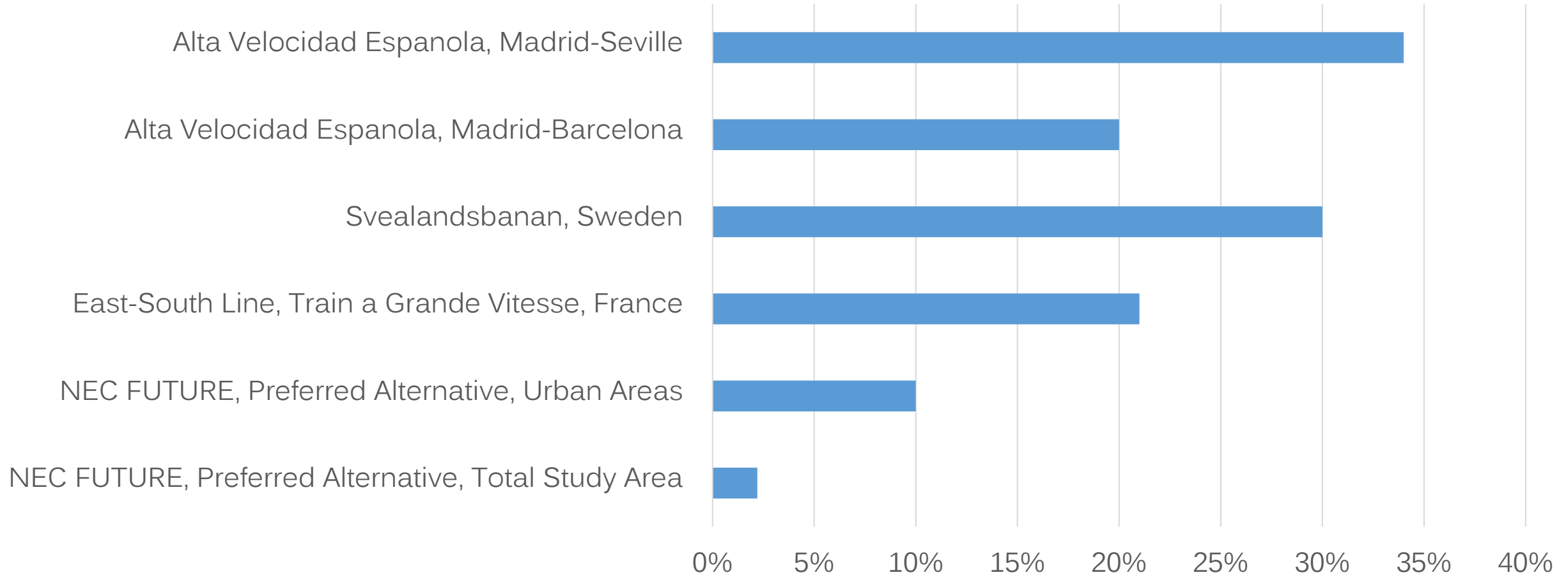
Model Forecast Ridership

- Annual bi-directional rail ridership
- Estimated using existing ridership, demographic changes, and service changes
- No land use or demographic growth induced by rail service

Induced Demand

- New trips based on overall improvement of rail transportation network
- Rural markets could see 1-5% increase in trips
- High-speed rail (HSR) projects in urban areas could see up to 20-30% increase in trips

Examples of Induced Demand for Other Rail Projects



Note: NEC FUTURE values are forecasts, the remainder are actual ridership

Who Might Ride the East – West Rail?



Regular Commuters ~10%*

- Live in Western MA
- Commute to BOS/WOR daily/near daily

* Trip purpose percentages based on 2013 NEC Future travel survey. Daily commuting % likely to increase with higher speeds, more frequent service.



Business Travelers ~26%

- | | |
|--|----------------------------------|
| Remote workers | Western MA Workers |
| • Work in BOS/WOR area | • Regular worksite in Western MA |
| • Can work remotely | • Regular travel to BOS/WOR area |
| • Travel to worksite several times monthly | |



Personal Travelers ~64%

- | | |
|--|--|
| Western MA Residents | Students |
| • Medical, shopping, entertainment travel to BOS/WOR | • Live in BOS/WOR area, school in Western MA or vice versa |
| BOS/WOR Area Residents | |
| • Tourism, entertainment travel to Western MA | |



- More reliable travel times relative to auto travel on congested highways
- Ability to work productively in transit
- Potential to reduce vehicle costs by not owning a car or second car

Alternatives Studied

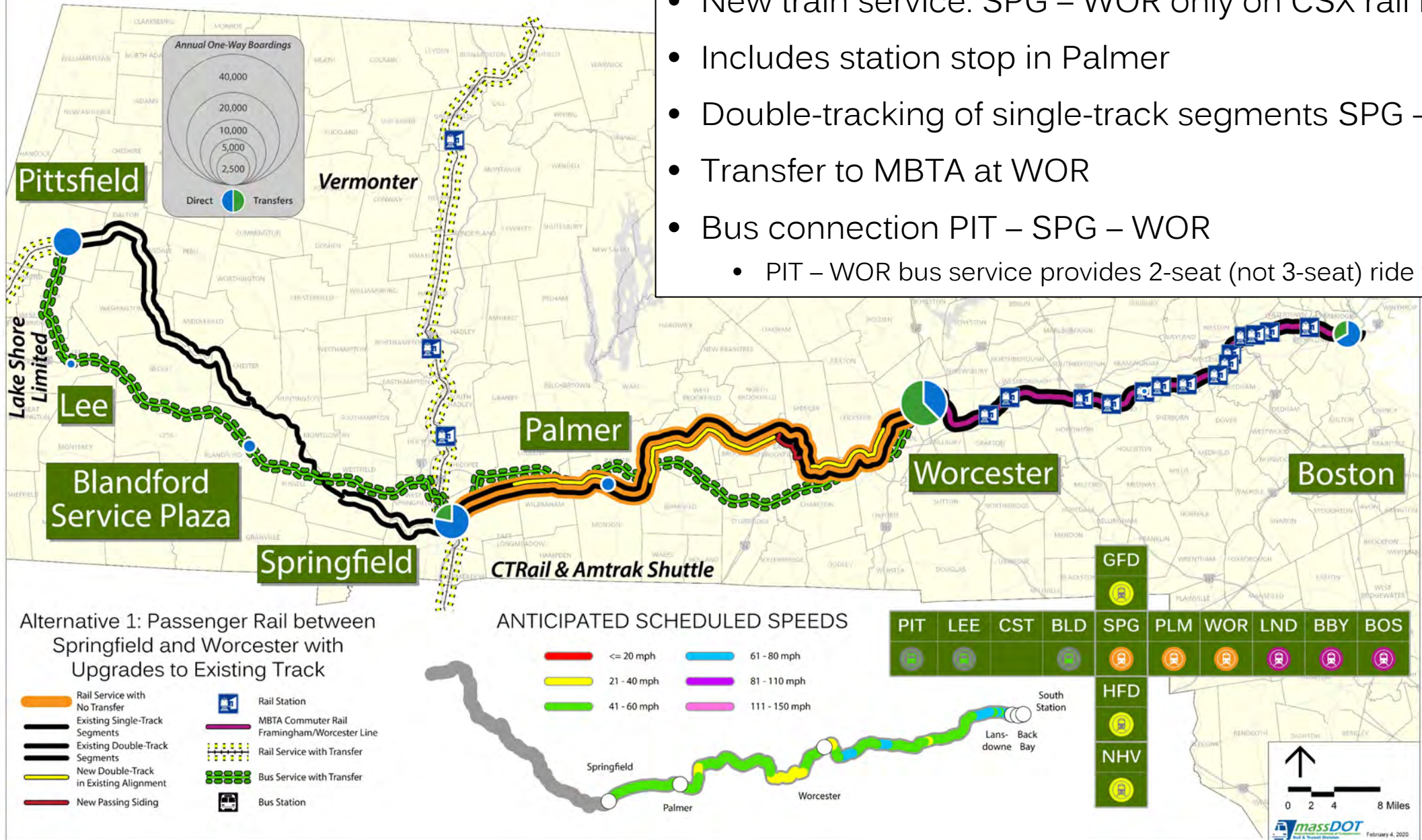
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In general, speed, frequency, ridership and capital cost progressively increase

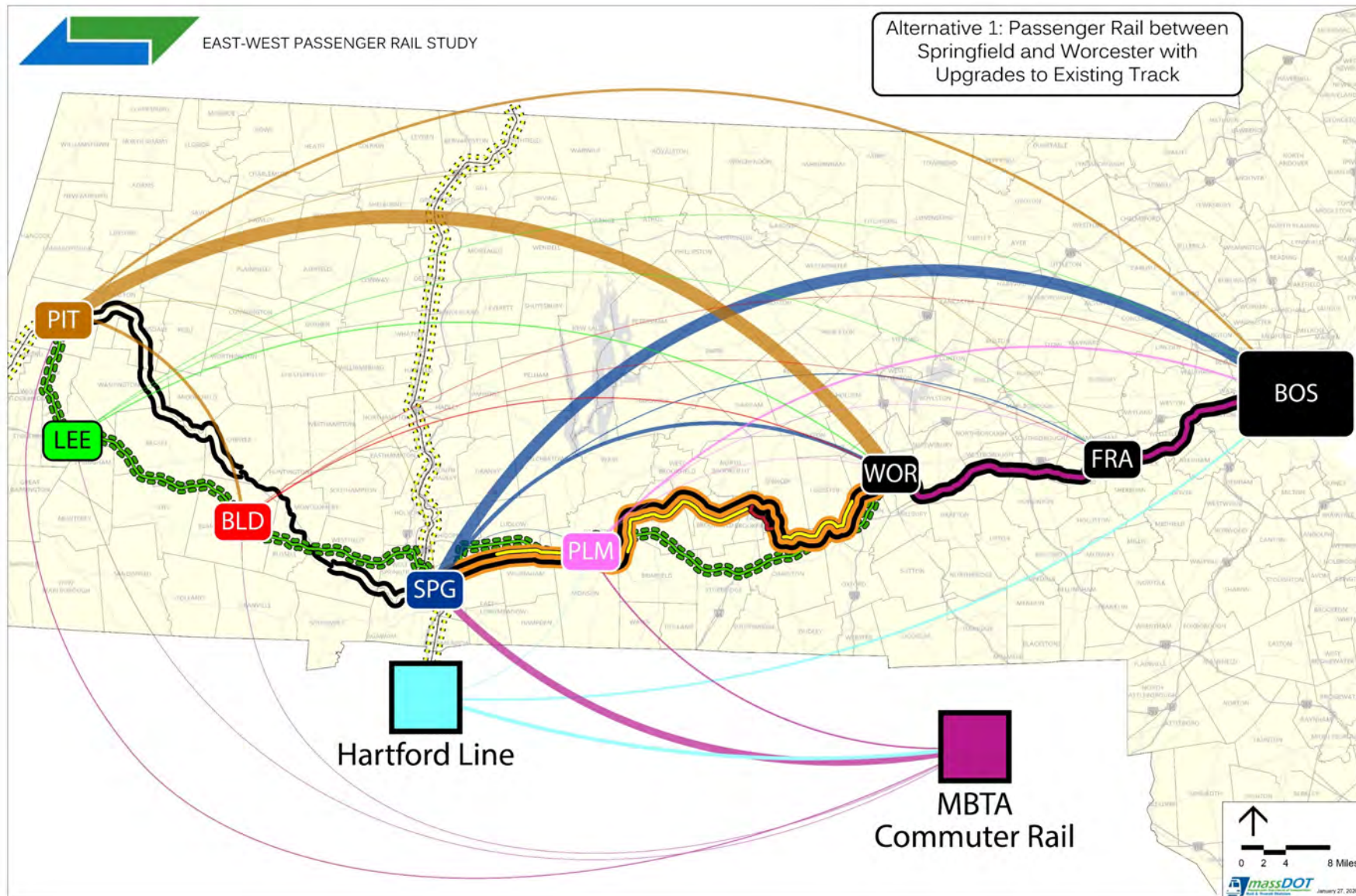


Alternative 1

- New train service: SPG – WOR only on CSX rail line
- Includes station stop in Palmer
- Double-tracking of single-track segments SPG – WOR
- Transfer to MBTA at WOR
- Bus connection PIT – SPG – WOR
 - PIT – WOR bus service provides 2-seat (not 3-seat) ride to BOS



Alternative 1 – Ridership Patterns



- 36 weekday riders
- Transfers in SPG and WOR result in a “penalty” for attracting riders
- PIT – BOS bus ridership – 7 weekday riders

Alternative 1 – Summary

FREQUENCY	ROUND-TRIPS
Weekday	4

SERVICE PERFORMANCE	ANNUAL BOARDINGS	WEEKDAY BOARDINGS	TRAVEL TIME *
Boston (South Station + Back Bay + Lansdowne)	1,200	4	-
Framingham (Lake Shore Limited)	100	0	N/A
Worcester (Direct)	1,900	6	1:21
Worcester (MBTA Transfers)	1,950	6	-
Palmer	450	1	2:27
Springfield (Direct)	2,300	8	2:46
Springfield (Hartford Line Transfers)	650	2	-
Blandford Service Plaza	400	1	3:07
Lee	200	1	3:27
Pittsfield	2,000	7	4:02
TOTAL	11,150	36	-

* Depending on schedule, travel times may be up to 5 minutes faster or 10 minutes slower.

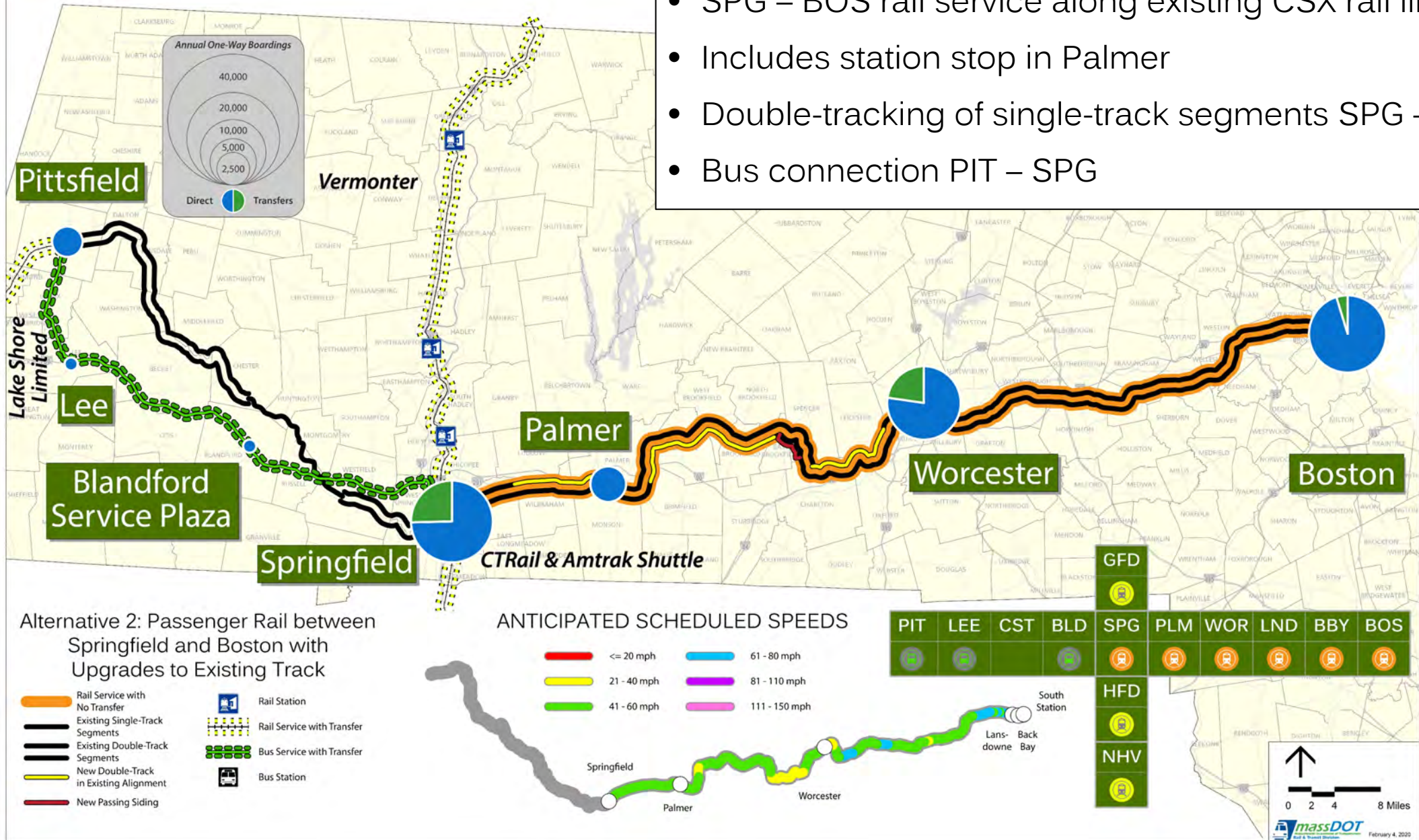
ENVIRONMENTAL IMPACTS	VALUE (SQ. FEET)
Wetlands + Open Water	49,921
Article 97 Lands	2,514
Area of Critical Environmental Concern (ACEC)	0

COMMUNITY IMPACTS	VALUE
Buildings – Residential	0
Buildings – Commercial	0
Buildings – Other	0
Buildings – TOTAL	0
Non-Rail/ROW Land (Square Feet)	337,233
Existing At-Grade Crossings	17
Improved At-Grade Crossings / New Grade Separations	0

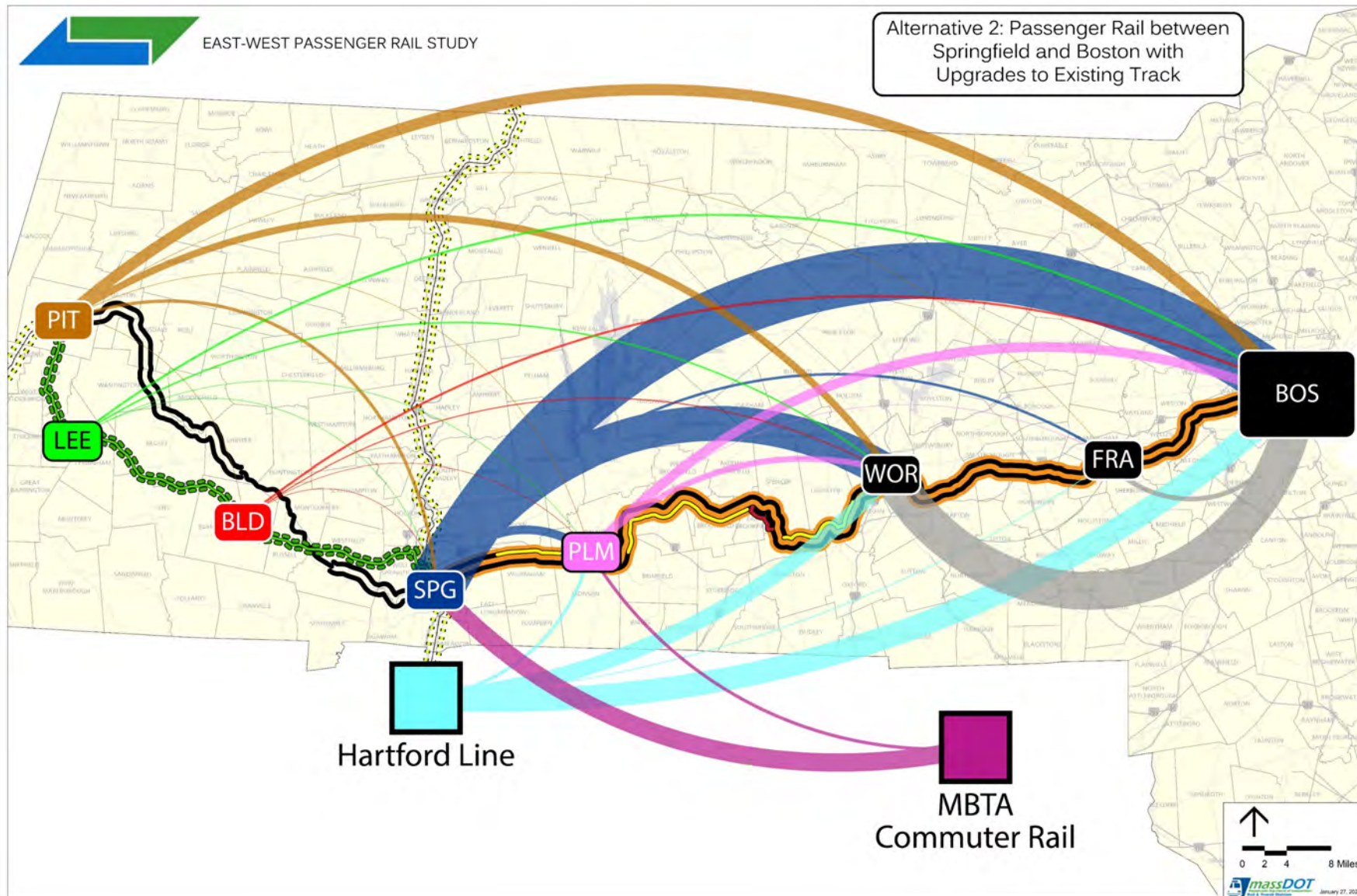
COSTS	2020 DOLLARS
Capital Costs – PIT-SPG	\$71.6 M
Capital Costs – SPG-WOR	\$1,857.8 M
Capital Costs – WOR-BOS	\$0.3 M
Capital Costs – System (Vehicles + Supporting Facilities)	\$58.8 M
Capital Costs – TOTAL	\$1,988.5 M
Construction Cost per Annual Trip	\$90,689
Annual O&M Costs	\$27.4 M

Alternative 2

- SPG – BOS rail service along existing CSX rail line
- Includes station stop in Palmer
- Double-tracking of single-track segments SPG – WOR
- Bus connection PIT – SPG



Alternative 2 – Ridership Patterns



- Ridership increases to 158 weekday riders
- Increased SPG – BOS ridership
- WOR – BOS ridership increases because faster travel than commuter rail

Alternative 2 – Summary

FREQUENCY	ROUND-TRIPS
Weekday	6

SERVICE PERFORMANCE	ANNUAL BOARDINGS	WEEKDAY BOARDINGS	TRAVEL TIME *
Boston (South Station + Back Bay + Lansdowne)	13,200	44	-
Framingham (Lake Shore Limited)	750	2	N/A
Worcester (Direct)	9,700	32	1:03
Worcester (MBTA Transfers)	2,850	9	-
Palmer	2,950	10	1:55
Springfield (Direct)	11,650	39	2:14
Springfield (Hartford Line Transfers)	3,950	13	-
Blandford Service Plaza	400	1	2:44
Lee	400	1	3:04
Pittsfield	2,150	7	3:39
TOTAL	48,000	158	-

* Depending on schedule, travel times may be up to 5 minutes faster or 10 minutes slower.

ENVIRONMENTAL IMPACTS	VALUE (SQ. FEET)
Wetlands + Open Water	49,921
Article 97 Lands	2,514
Area of Critical Environmental Concern (ACEC)	0

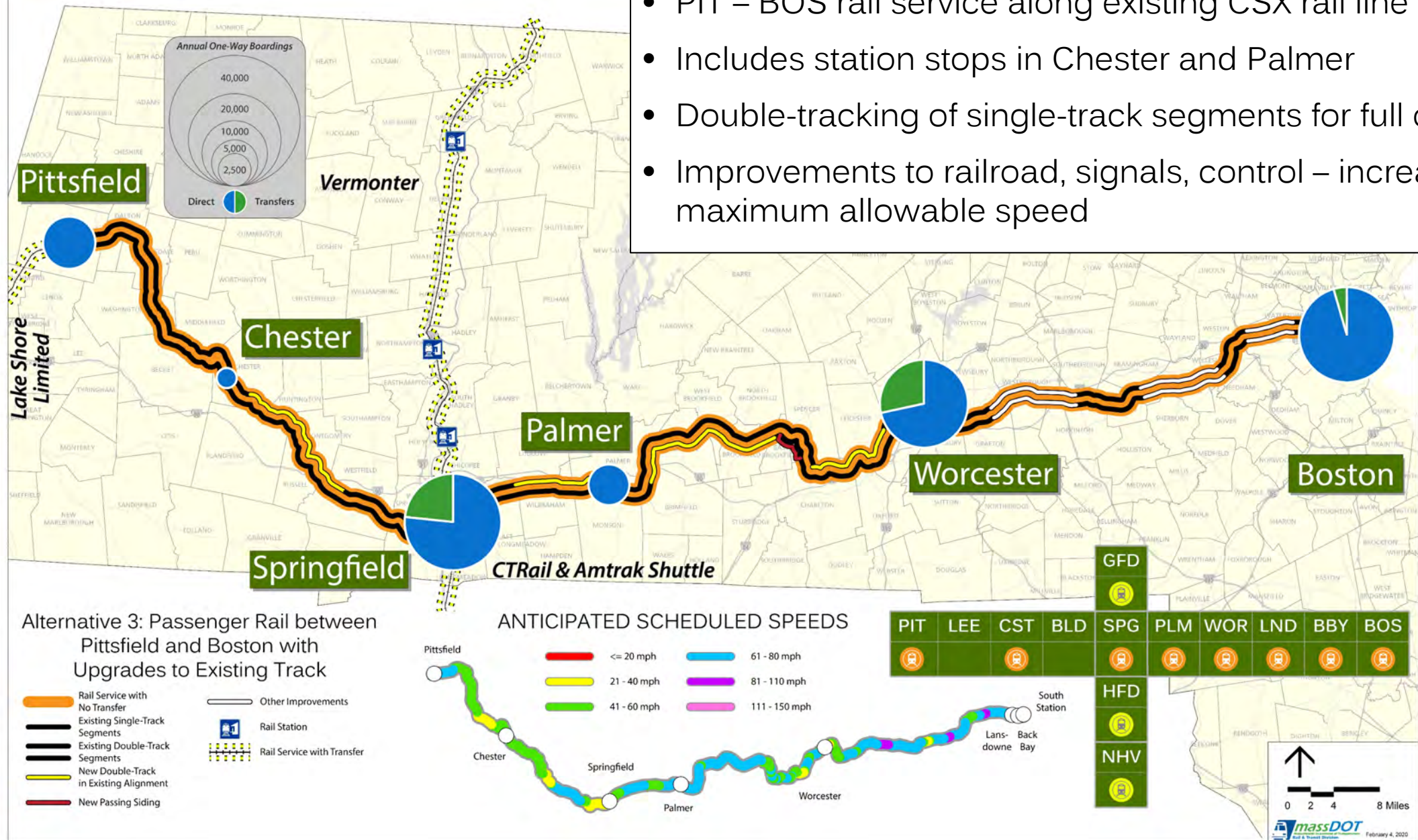
COMMUNITY IMPACTS	VALUE
Buildings – Residential	0
Buildings – Commercial	0
Buildings – Other	0
Buildings – TOTAL	0
Non-Rail/ROW Land (Square Feet)	337,233
Existing At-Grade Crossings	17
Improved At-Grade Crossings / New Grade Separations	0

COSTS	2020 DOLLARS
Capital Costs – PIT-SPG	\$71.6 M
Capital Costs – SPG-WOR	\$1,857.8 M
Capital Costs – WOR-BOS	\$0.3 M
Capital Costs – System (Vehicles + Supporting Facilities)	\$192.4 M
Capital Costs – TOTAL	\$2,122.1 M
Construction Cost per Annual Trip	\$21,067
Annual O&M Costs	\$41.8 M

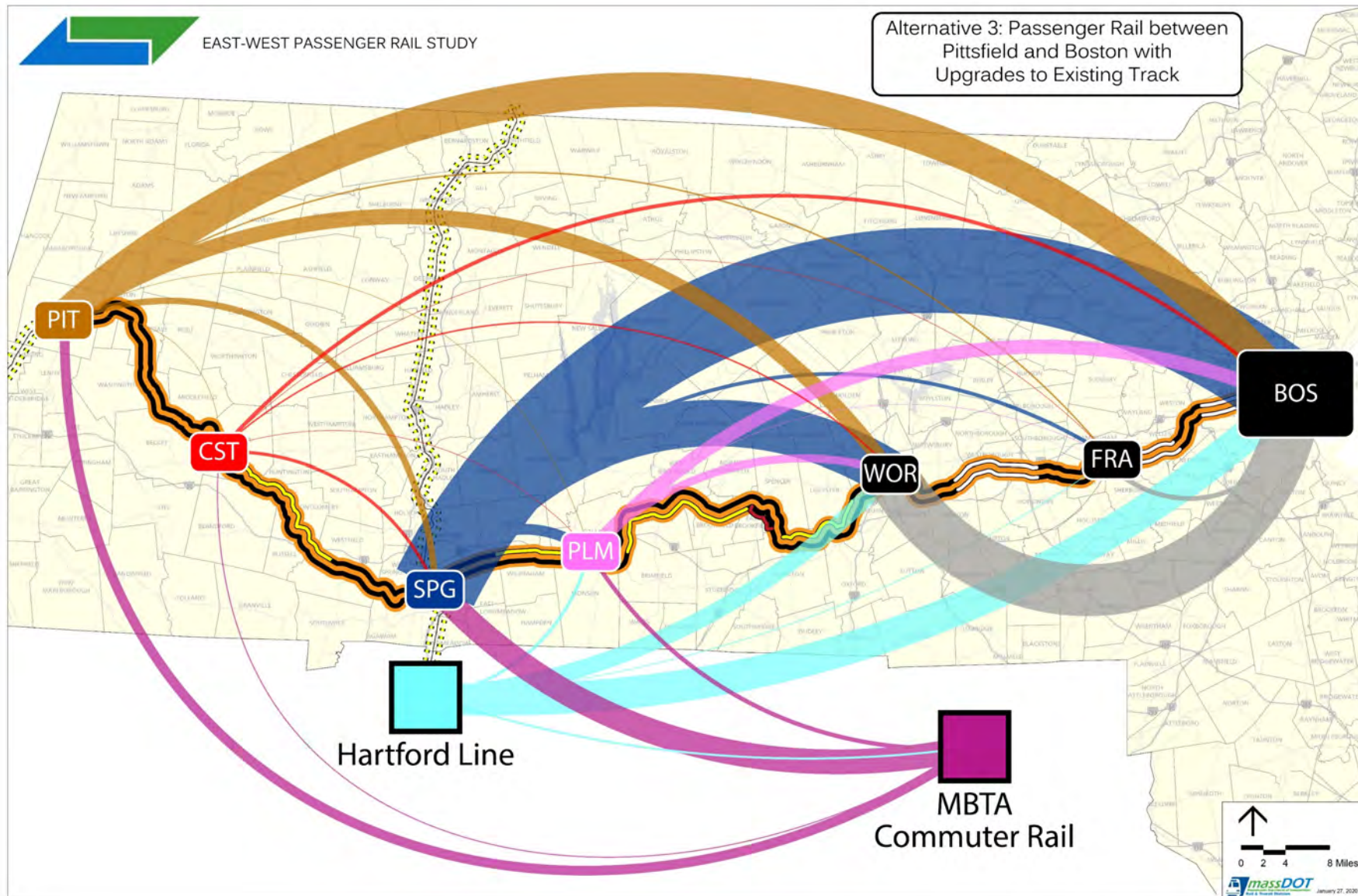


Alternative 3

- PIT – BOS rail service along existing CSX rail line
- Includes station stops in Chester and Palmer
- Double-tracking of single-track segments for full corridor
- Improvements to railroad, signals, control – increased maximum allowable speed



Alternative 3 – Ridership Patterns



- Faster travel times and rail connection to PIT
- 238 weekday riders
- Ridership at almost all stations increases +/- 50% over Alt. 2
- PIT – BOS increases 3x over Alt. 2

Alternative 3 – Summary

FREQUENCY	ROUND-TRIPS
Weekday	7

SERVICE PERFORMANCE	ANNUAL BOARDINGS	WEEKDAY BOARDINGS	TRAVEL TIME *
Boston (South Station + Back Bay + Lansdowne)	20,300	67	-
Framingham (Lake Shore Limited)	700	2	N/A
Worcester (Direct)	13,000	43	0:56
Worcester (MBTA Transfers)	5,150	17	-
Palmer	3,900	13	1:40
Springfield (Direct)	16,750	55	1:55
Springfield (Hartford Line Transfers)	5,100	17	-
Chester	950	3	2:38
Pittsfield	6,400	21	3:08
TOTAL	72,250	238	-

* Depending on schedule, travel times may be up to 5 minutes faster or 10 minutes slower.

ENVIRONMENTAL IMPACTS	VALUE (SQ. FEET)
Wetlands + Open Water	60,136
Article 97 Lands	136,511
Area of Critical Environmental Concern (ACEC)	0

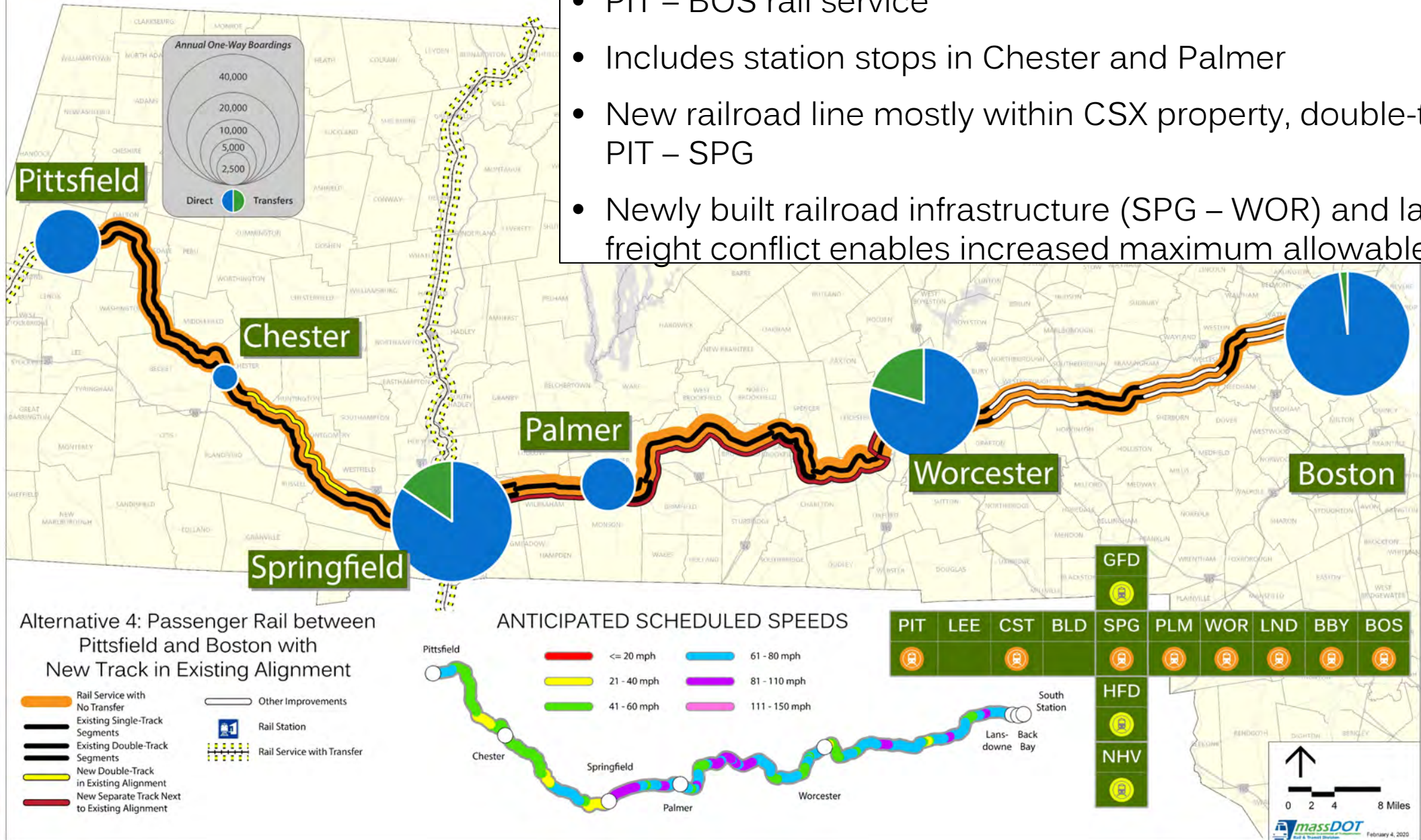
COMMUNITY IMPACTS	VALUE
Buildings – Residential	0
Buildings – Commercial	0
Buildings – Other	0
Buildings – TOTAL	0
Non-Rail/ROW Land (Square Feet)	717,303
Existing At-Grade Crossings	38
Improved At-Grade Crossings / New Grade Separations	30

COSTS	2020 DOLLARS
Capital Costs – PIT-SPG	\$498.3 M
Capital Costs – SPG-WOR	\$1,782.9 M
Capital Costs – WOR-BOS	\$725.4 M
Capital Costs – System (Vehicles + Supporting Facilities)	\$206.7 M
Capital Costs – TOTAL	\$3,213.3 M
Construction Cost per Annual Trip	\$21,868
Annual O&M Costs	\$51.6 M

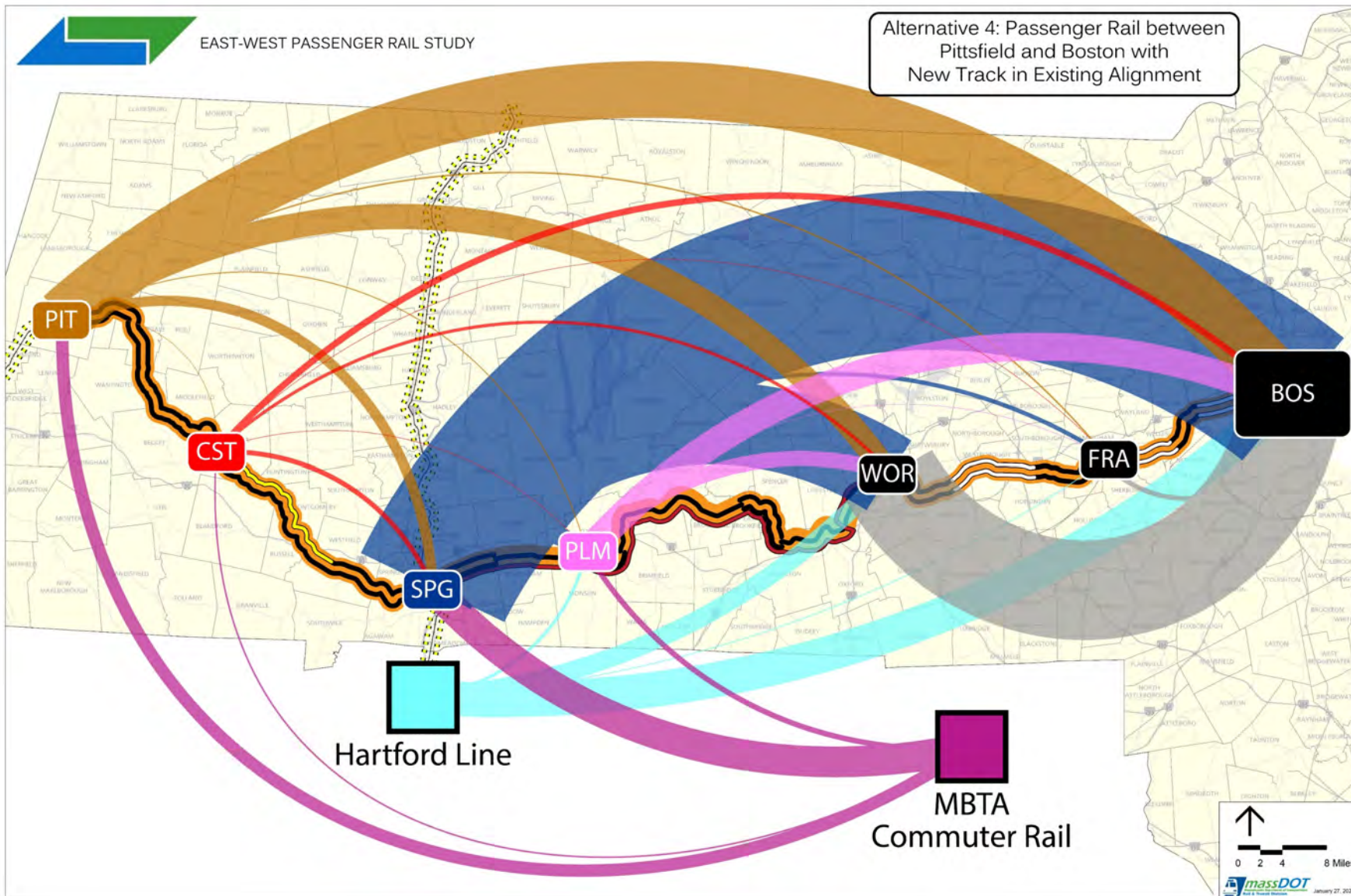


Alternative 4

- PIT – BOS rail service
- Includes station stops in Chester and Palmer
- New railroad line mostly within CSX property, double-track PIT – SPG
- Newly built railroad infrastructure (SPG – WOR) and lack of freight conflict enables increased maximum allowable speed



Alternative 4 – Ridership Patterns



- New rail alignment improves travel time
- More frequent service than Alt. 3 (9 round trips per day v. 7 round trips)
- Ridership increases at most stations – 387 total weekday riders
- Total annual ridership more than 60% higher than Alt. 3

Alternative 4 – Summary

FREQUENCY	ROUND-TRIPS
Weekday	9

SERVICE PERFORMANCE	ANNUAL BOARDINGS	WEEKDAY BOARDINGS	TRAVEL TIME *
Boston (South Station + Back Bay + Lansdowne)	35,650	118	-
Framingham (Lake Shore Limited)	700	2	N/A
Worcester (Direct)	22,650	75	0:53
Worcester (MBTA Transfers)	5,800	19	-
Palmer	6,700	22	1:31
Springfield (Direct)	28,750	95	1:47
Springfield (Hartford Line Transfers)	5,300	18	-
Chester	1,600	5	2:28
Pittsfield	9,950	33	2:59
TOTAL	117,100	387	-

* Depending on schedule, travel times may be up to 5 minutes faster or 10 minutes slower.

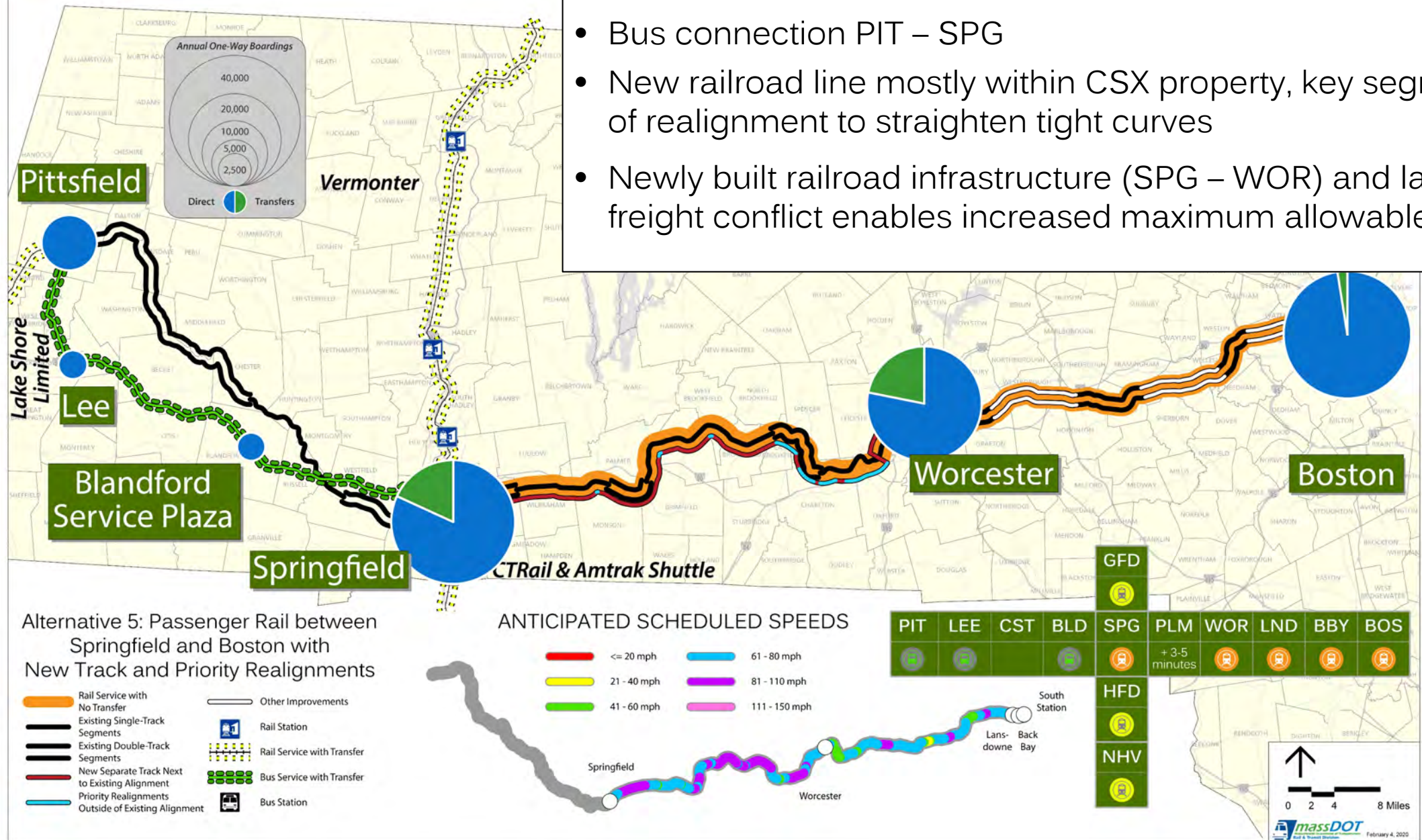
ENVIRONMENTAL IMPACTS	VALUE (SQ. FEET)
Wetlands + Open Water	549,294
Article 97 Lands	554,765
Area of Critical Environmental Concern (ACEC)	0

COMMUNITY IMPACTS	VALUE
Buildings – Residential	27
Buildings – Commercial	52
Buildings – Other	12
Buildings – TOTAL	91
Non-Rail/ROW Land (Square Feet)	3,718,432
Existing At-Grade Crossings	38
Improved At-Grade Crossings / New Grade Separations	30

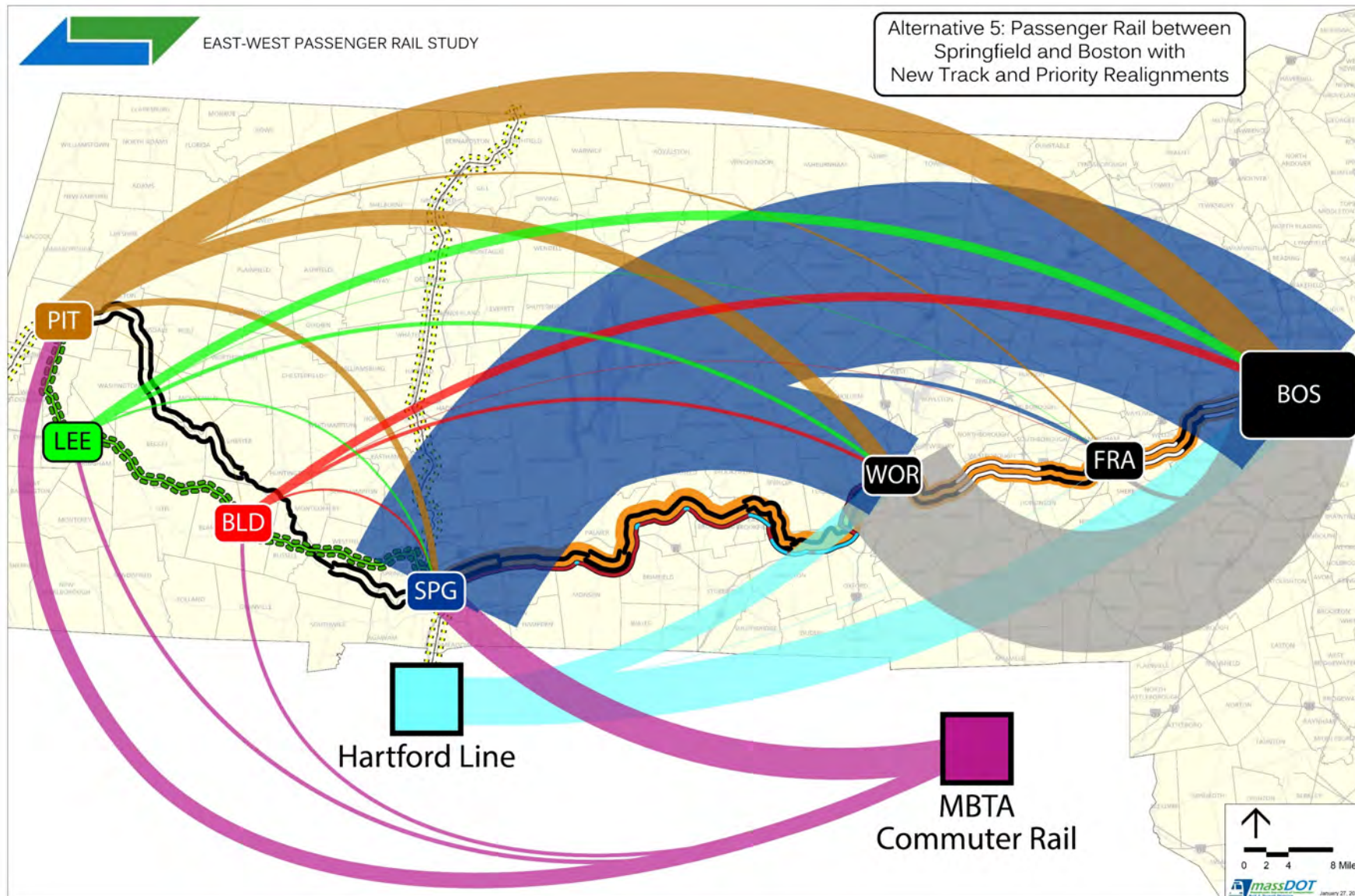
COSTS	2020 DOLLARS
Capital Costs – PIT-SPG	\$567.7 M
Capital Costs – SPG-WOR	\$3,300.3 M
Capital Costs – WOR-BOS	\$28.5 M
Capital Costs – System (Vehicles + Supporting Facilities)	\$233.9 M
Capital Costs – TOTAL	\$4,130.5 M
Construction Cost per Annual Trip	\$17,311
Annual O&M Costs	\$65.7 M

Alternative 5

- SPG – BOS rail service
- Bus connection PIT – SPG
- New railroad line mostly within CSX property, key segments of realignment to straighten tight curves
- Newly built railroad infrastructure (SPG – WOR) and lack of freight conflict enables increased maximum allowable speed



Alternative 5 – Ridership Patterns



- Same frequency as Alt. 4 with faster travel times
- Priority realignments between SPG – WOR
- No rail service to PIT (bus connection at SPG), PLM, CHS
- Overall ridership of 381 weekday riders is lower than Alt. 4

Alternative 5 – Summary

FREQUENCY	ROUND-TRIPS
Weekday	9

SERVICE PERFORMANCE	ANNUAL BOARDINGS	WEEKDAY BOARDINGS	TRAVEL TIME *
Boston (South Station + Back Bay + Lansdowne)	37,000	123	-
Framingham (Lake Shore Limited)	650	2	N/A
Worcester (Direct)	23,950	79	0:48
Worcester (MBTA Transfers)	6,700	22	-
Springfield (Direct)	29,300	97	1:34
Springfield (Hartford Line Transfers)	6,500	22	-
Blandford Service Plaza	1,850	6	2:05
Lee	1,950	6	2:25
Pittsfield	7,150	24	3:00
TOTAL	115,050	381	-

* Depending on schedule, travel times may be up to 5 minutes faster or 10 minutes slower.

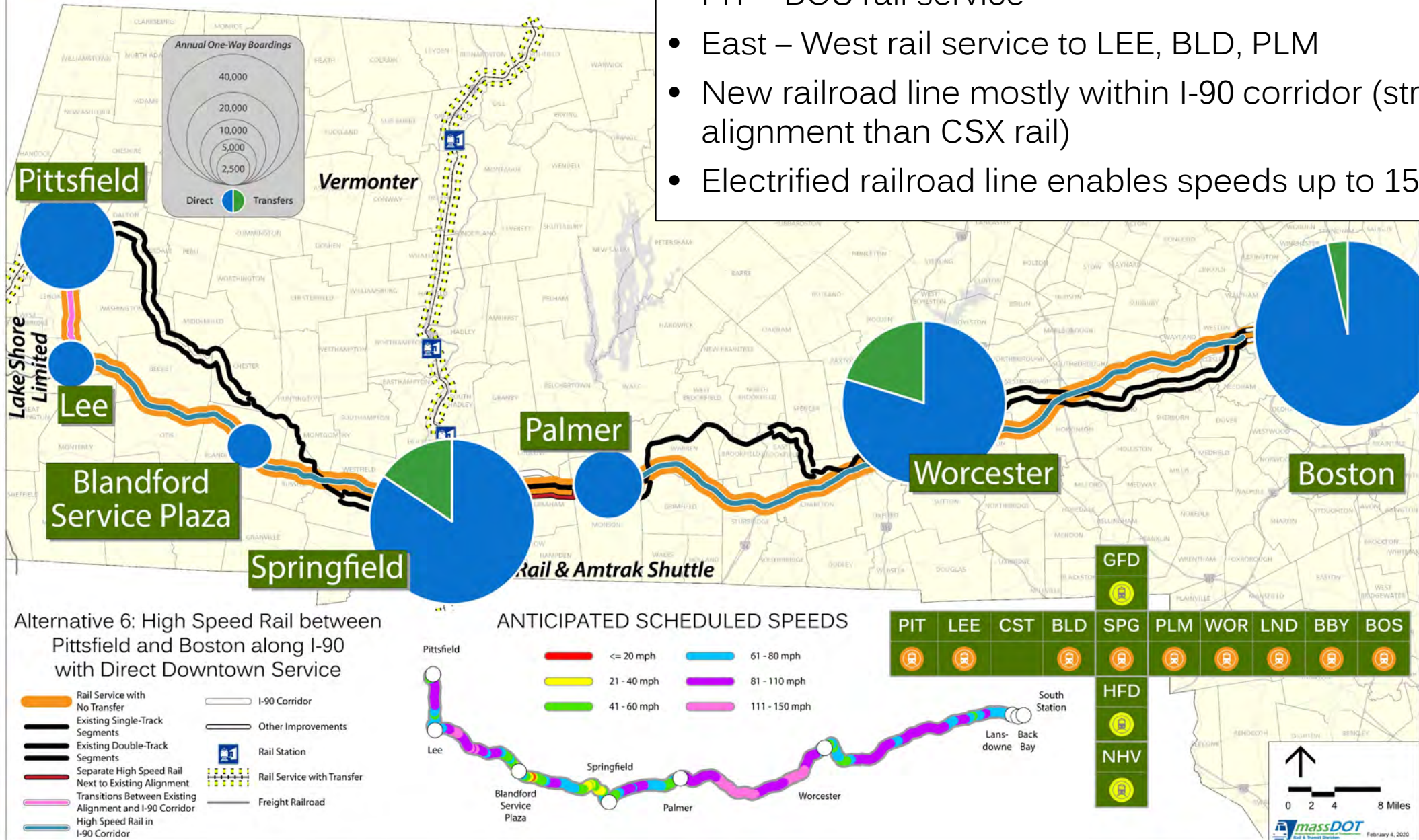
ENVIRONMENTAL IMPACTS	VALUE (SQ. FEET)
Wetlands + Open Water	729,354
Article 97 Lands	510,854
Area of Critical Environmental Concern (ACEC)	0

COMMUNITY IMPACTS	VALUE
Buildings – Residential	39
Buildings – Commercial	51
Buildings – Other	13
Buildings – TOTAL	103
Non-Rail/ROW Land (Square Feet)	4,235,386
Existing At-Grade Crossings	17
Improved At-Grade Crossings / New Grade Separations	11

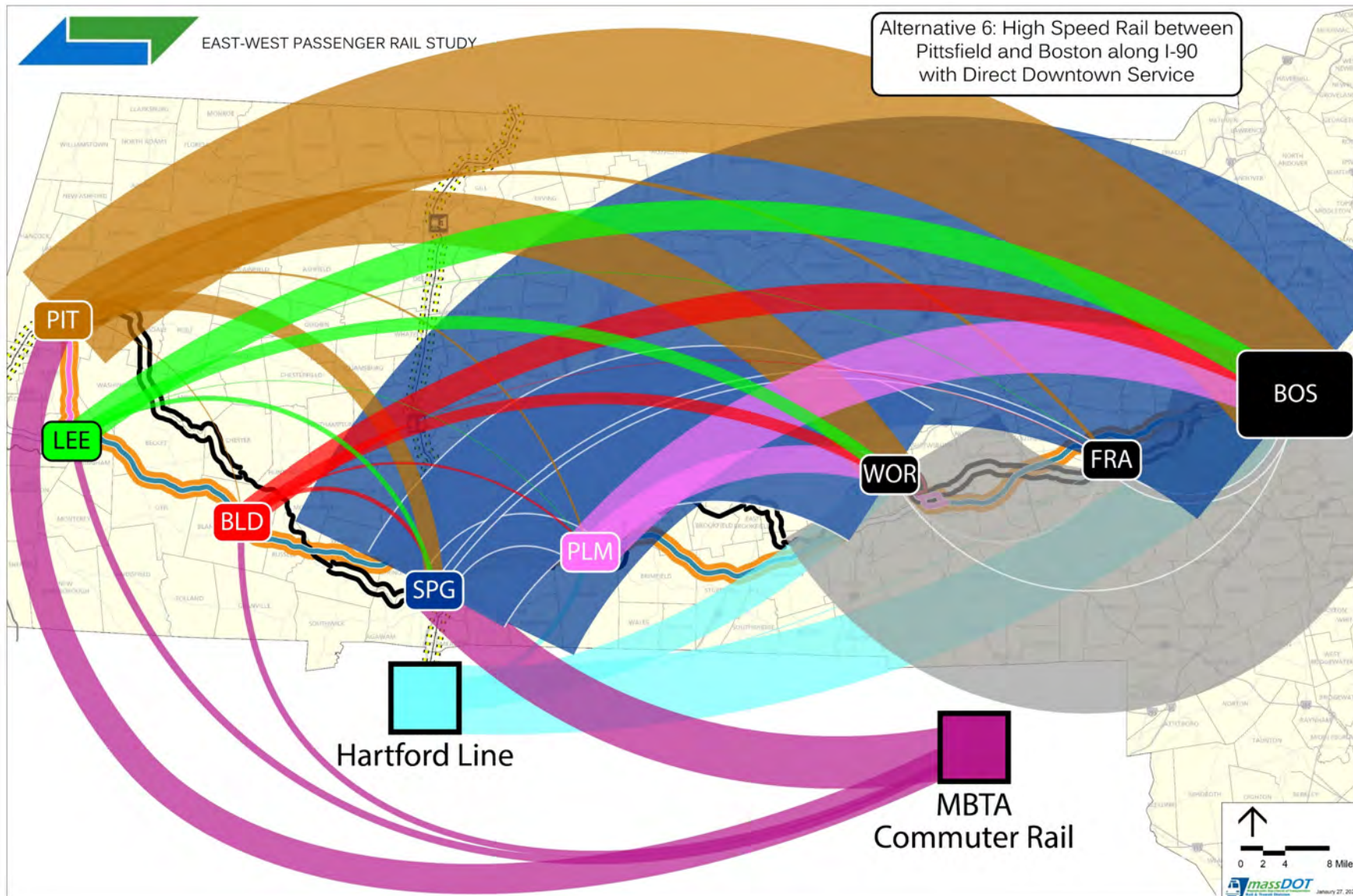
COSTS	2020 DOLLARS
Capital Costs – PIT-SPG	\$71.6 M
Capital Costs – SPG-WOR	\$4,963.6 M
Capital Costs – WOR-BOS	\$18.9 M
Capital Costs – System (Vehicles + Supporting Facilities)	\$127.2 M
Capital Costs – TOTAL	\$5,181.3 M
Construction Cost per Annual Trip	\$22,735
Annual O&M Costs	\$49.0 M

Alternative 6

- PIT – BOS rail service
- East – West rail service to LEE, BLD, PLM
- New railroad line mostly within I-90 corridor (straighter alignment than CSX rail)
- Electrified railroad line enables speeds up to 150 mph



Alternative 6 – Ridership Patterns



- More frequent than Alts 4 & 5
- Lower travel times
 - BOS-WOR: 0:44
 - BOS-SPG: 1:19
 - BOS-PIT: 2:18
- Ridership more than 2x Alts 4 & 5 – 820 weekday riders
- Ridership increases at all stations

Alternative 6 – Summary

FREQUENCY	ROUND-TRIPS
Weekday	17

SERVICE PERFORMANCE	ANNUAL BOARDINGS	WEEKDAY BOARDINGS	TRAVEL TIME *
Boston (South Station + Back Bay + Lansdowne)	77,850	258	-
Framingham (Lake Shore Limited)	950	3	N/A
Worcester (Direct)	49,850	165	0:44
Worcester (MBTA Transfers)	12,650	42	-
Palmer	11,150	37	1:03
Springfield (Direct)	53,650	178	1:19
Springfield (Hartford Line Transfers)	9,950	33	-
Blandford Service Plaza	4,950	16	1:47
Lee	5,200	17	2:04
Pittsfield	21,500	71	2:18
TOTAL	247,700	820	-

* Depending on schedule, travel times may be up to 5 minutes faster or 10 minutes slower.

ENVIRONMENTAL IMPACTS	VALUE (SQ. FEET)
Wetlands + Open Water	2,725,652
Article 97 Lands	2,715,672
Area of Critical Environmental Concern (ACEC)	4,648,979

COMMUNITY IMPACTS	VALUE
Buildings – Residential	58
Buildings – Commercial	123
Buildings – Other	25
Buildings – TOTAL	206
Non-Rail/ROW Land (Square Feet)	9,393,342
Existing At-Grade Crossings	6
Improved At-Grade Crossings / New Grade Separations	130

COSTS	2020 DOLLARS
Capital Costs – PIT-SPG	\$9,126.0 M
Capital Costs – SPG-WOR	\$7,738.1 M
Capital Costs – WOR-BOS	\$7,607.9 M
Capital Costs – System (Vehicles + Supporting Facilities)	\$470.5 M
Capital Costs – TOTAL	\$24,942.5 M
Construction Cost per Annual Trip	\$51,074
Annual O&M Costs	\$86.1 M

Summary of Preliminary Alternatives

Projected Ridership – 2040 Annual One-Way Boardings

Corridor Type	Shared – Existing Alignment	Shared – Existing Alignment	Shared – Existing Alignment	Shared – New Separate Track	Shared – New Separate Track	Separate Corridor – I-90
Alternative	1 – WOR-SPG, Upgraded	2 – BOS-SPG, Upgraded	3 – BOS-PIT, Upgraded + Realignment	4 – BOS-PIT, New Track	5 – BOS-SPG, New Track + Realignment	6 – BOS-PIT, High Speed Rail
<i>Weekday Round-Trips</i>	<i>4</i>	<i>6</i>	<i>7</i>	<i>9</i>	<i>9</i>	<i>17</i>
BOS + BBY + LAN	1,200	13,200	20,300	35,650	37,000	77,850
FRA (Lake Shore Limited)	100	750	700	700	650	950
WOR (Direct Access)	1,900	9,700	13,000	22,650	23,950	49,850
WOR (MBTA Transfers)	1,950	2,850	5,150	5,800	6,700	12,650
PLM	450	2,950	3,900	6,700	-	11,150
SPG (Direct Access)	2,300	11,650	16,750	28,750	29,300	53,650
SPG (HL Transfers)	650	3,950	5,100	5,300	6,500	9,950
BLD	400	400	-	-	1,850	4,950
CHS	-	-	950	1,600	-	-
LEE	200	400	-	-	1,950	5,200
PIT	2,000	2,150	6,400	9,950	7,150	21,500
TOTAL	11,150	48,000	72,250	117,100	115,050	247,700

Summary of Preliminary Alternatives (cont'd.)

Projected Ridership – Daily One-Way Boardings

Corridor Type	Shared – Existing Alignment	Shared – Existing Alignment	Shared – Existing Alignment	Shared – New Separate Track	Shared – New Separate Track	Separate Corridor – I-90
Alternative	1 – WOR-SPG, Upgraded	2 – BOS-SPG, Upgraded	3 – BOS-PIT, Upgraded + Realignment	4 – BOS-PIT, New Track	5 – BOS-SPG, New Track + Realignment	6 – BOS-PIT, High Speed Rail
<i>Weekday Round-Trips</i>	<i>4</i>	<i>6</i>	<i>7</i>	<i>9</i>	<i>9</i>	<i>17</i>
BOS + BBY + LAN	4	44	67	118	123	258
FRA (Lake Shore Limited)	0	2	2	2	2	3
WOR (Direct Access)	6	32	43	75	79	165
WOR (MBTA Transfers)	6	9	17	19	22	42
PLM	1	10	13	22	-	37
SPG (Direct Access)	8	39	55	95	97	178
SPG (HL Transfers)	2	13	17	18	22	33
BLD	1	1	-	-	6	16
CHS	-	-	3	5	-	-
LEE	1	1	-	-	6	17
PIT	7	7	21	33	24	71
TOTAL	36	158	238	387	381	820

Summary of Preliminary Alternatives (cont'd.)

Travel Time to South Station (Up to 5 minutes faster / 10 minutes slower depending on schedule)

Corridor Type	Shared – Existing Alignment	Shared – Existing Alignment	Shared – Existing Alignment	Shared – New Separate Track	Shared – New Separate Track	Separate Corridor – I-90
Alternative	1 – WOR-SPG, Upgraded	2 – BOS-SPG, Upgraded	3 – BOS-PIT, Upgraded + Realignment	4 – BOS-PIT, New Track	5 – BOS-SPG, New Track + Realignment	6 – BOS-PIT, High Speed Rail
WOR	1:21	1:03	0:56	0:53	0:48	0:44
SPG	2:46	2:14	1:55	1:47	1:34	1:19
PIT	4:02	3:39	3:08	2:59	3:00	2:18

Summary of Preliminary Alternatives (cont'd.)

Environmental Impacts (Square Feet of Impact)

Corridor Type	Shared – Existing Alignment	Shared – Existing Alignment	Shared – Existing Alignment	Shared – New Separate Track	Shared – New Separate Track	Separate Corridor – I-90
Alternative	1 – WOR-SPG, Upgraded	2 – BOS-SPG, Upgraded	3 – BOS-PIT, Upgraded + Realignment	4 – BOS-PIT, New Track	5 – BOS-SPG, New Track + Realignment	6 – BOS-PIT, High Speed Rail
Wetlands + Open Water	49,921	49,921	60,136	549,294	729,354	2,725,652
Article 97 Lands	2,514	2,514	136,511	554,765	510,854	2,715,672
Area of Critical Env. Concern	0	0	0	0	0	4,648,979

Community Impacts

Alternative	1 – WOR-SPG, Upgraded	2 – BOS-SPG, Upgraded	3 – BOS-PIT, Upgraded + Realignment	4 – BOS-PIT, New Track	5 – BOS-SPG, New Track + Realignment	6 – BOS-PIT, High Speed Rail
Buildings – Residential	0	0	0	27	39	58
Buildings – Commercial	0	0	0	52	51	123
Buildings – Other	0	0	0	12	13	25
Buildings – TOTAL	0	0	0	91	103	206
Non-Rail/ROW Land (SF)	337,233	337,233	717,303	3,718,432	4,235,386	9,393,342
Existing At-Grade Xings	17	17	38	38	17	6
Improved At-Grade Xings/ New Grade-Separations	0	0	30	30	11	130

Preliminary Alternatives – Cost per Rider

2020 Dollars & 2040 Ridership

Corridor Type	Shared – Existing Alignment	Shared – Existing Alignment	Shared – Existing Alignment	Shared – New Separate Track	Shared – New Separate Track	Separate Corridor – I-90
Alternative	1 – WOR-SPG, Upgraded	2 – BOS-SPG, Upgraded	3 – BOS-PIT, Upgraded + Realignment	4 – BOS-PIT, New Track	5 – BOS-SPG, New Track + Realignment	6 – BOS-PIT, High Speed Rail
Capital Costs (\$M)	\$1,988.5	\$2,122.1	\$3,213.3	\$4,130.5	\$5,181.3	\$24,942.5
Annual O&M (\$M)	\$27.4	\$41.8	\$51.6	\$65.7	\$49.0	\$86.1
Construction Cost (\$M)	\$1,011.2	\$1,011.2	\$1,579.9	\$2,027.0	\$2,615.6	\$12,651.0
Annual Ridership	11,150	48,000	72,250	117,100	115,050	247,700
Construction Cost per Passenger Trip (\$)	\$90,689	\$21,067	\$21,868	\$17,311	\$22,735	\$51,074
10% Induced Demand Riders	1,115	4,800	7,225	11,710	11,505	24,770
Annual Ridership (10% Induced Demand)	12,265	52,800	79,475	128,810	126,555	272,470
Construction Cost per Passenger Trip + 10% (\$)	\$84,918	\$19,726	\$20,476	\$16,209	\$21,288	\$47,824
35% Induced Demand Riders	3,903	16,800	25,288	40,985	40,268	86,695
Annual Ridership (35% Induced Demand)	15,053	64,800	97,538	158,085	155,318	334,395
Construction Cost per Passenger Trip + 35% (\$)	\$71,268	\$16,555	\$17,185	\$13,604	\$17,866	\$40,137

Comparison Rail Projects

- Study Only – 2 Projects
 - Northern New England Intercity Rail Initiative (NNEIRI)
 - California High-Speed Rail (CAHSR)
- Construction Complete – 4 Projects
 - Downeaster (MA – NH – ME), Southeast High-Speed Rail (DC – VA – NC – GA), Chicago – St. Louis (IL – MO), Cascades (OR – WA – BC)
 - Funded by High Speed Intercity Passenger Rail (HSIPR) and Transportation Investment Generating Economic Recovery (TIGER) grants
 - Investments made between 2005 and 2015 – ridership monitored
 - Corridors with existing robust passenger service and good railroad infrastructure (up to passenger rail standards)
 - Incremental investments and ridership increases



Comparison Rail Study – NNEIRI

- Northern New England Intercity Rail Initiative (NNEIRI)
- Study of improved rail from to New Haven, Montreal via Springfield
- No improvements west of Springfield
- Lower design standards and level of rail improvements than East - West
- Capital cost = \$554-660 million (2016 dollars) for 98 miles
- Forecast = 107,200 annual riders



Comparison Rail Study – CAHSR

- California High-Speed Rail

- Initiated through state legislation, supported by state ballot initiative in 2008
- Speeds ranging from 90/125 mph in developed areas to 220 mph in more rural areas
- Phase 1 – San Francisco – Los Angeles/Anaheim (520 miles)
- Phase 2 – Extensions to Sacramento, San Diego (280 miles)
- Cost estimates
 - Initial system estimate: \$33.6 B (2008)
 - Final estimate for Phase 1: \$79.1 B, year of expenditure (2018)
- Ridership forecasts scaled back
 - Initial forecasts: 65.5 – 96.5 million annual riders (2008)
 - Final forecast for Phase 1 2040 (mature) ridership: 33.1 million annual riders (2014)
- February 2019, project scaled back to central portion (Bakersfield – Merced), continued planning and environmental work on full project



Comparison Rail Projects

- Downeaster
 - Began operations in 2001
 - Infrastructure and service improvements in 2007 (increase in speed and frequency) and 2012 (extension from Portland to Brunswick)
 - HSIPR and TIGER grants of \$121 million helped facilitate 53% increase in ridership (2005 – 2015)
- Southeast High-Speed Rail
 - Project encompasses infrastructure and service improvements to a range of corridors and services
 - Faster, more frequent service between Washington, DC and Richmond, VA
 - Less frequent regional, feeder and long-distance service south of Richmond
 - Grade crossing safety improvements, new/modernized stations
 - HSIPR and TIGER grants of \$954 million enabled 90% increase in ridership (2005 – 2015)



Comparison Rail Projects

- Chicago – St. Louis
 - Infrastructure improvements to enable up to 110 mph operations in several segments of the corridor
 - Upgraded bridges, new/improved rail sidings, grade crossing safety improvements
 - HSIPR and TIGER grants of \$1,582 million helped facilitate 136% increase in ridership (2005 – 2015)
- Cascades (Pacific Northwest Rail Corridor)
 - Improvements to US segment of Eugene – Portland – Olympia – Seattle – Vancouver rail line
 - Infrastructure and service improvements to a range of corridors and services
 - Two additional round trips added per day (six total)
 - Significant investment in Seattle King Street Station and Portland Union Station
 - HSIPR grants of \$890 million enabled 21% increase in ridership (2005 – 2015)



Preliminary Alternatives – Comparison Projects

Project Length & Capital Cost

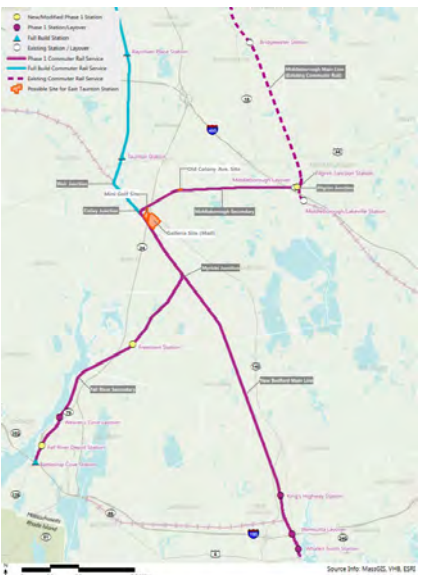
Project	Alt 3 – BOS-PIT	4 – BOS-PIT, New Track	6 – BOS-PIT, High Speed Rail	Northern New England Intercity Rail (Study Only)	California High-Speed Rail (Phase 1, Study Only)	Downeaster	Southeast Rail (DC – Atlanta)	Chicago – St. Louis Rail	Cascades Corridor
Miles	151	151	144	98	520	145	478	363	470
Capital Cost (\$M)	\$1,579.9	\$2,027.0	\$12,651.0	\$602	\$79,100	\$121	\$954	\$1,582	\$890

Annual Ridership & Capital Cost per New Rider

Project	Alt 3 – BOS-PIT	4 – BOS-PIT, New Track	6 – BOS-PIT, High Speed Rail	Northern New England Intercity Rail (Study Only)	California High-Speed Rail (Phase 1, Study Only)	Downeaster	Southeast Rail (DC – Atlanta)	Chicago – St. Louis Rail	Cascades Corridor
Baseline	3,900	3,900	3,900	2,300	-	275,000	703,000	244,000	623,000
New Riders	75,575	124,910	268,570	104,900	33,100,000	145,000	636,000	333,000	128,000
Total Riders	79,475	128,810	272,470	107,200	33,100,000	420,000	1,339,000	577,000	751,000
Capital Cost per New Rider	\$20,905	\$16,228	\$47,105	\$5,739	\$2,390	\$834	\$1,500	\$4,751	\$6,953

South Coast Rail Project

- MBTA Commuter Rail service to Fall River, New Bedford, other South Coast communities
- Phase 1 improvements to enable near-term service via existing Middleborough/Lakeville line
- Infrastructure improvements
 - Reconstruct tracks, junctions, sidings
 - Build new stations, support facilities, signal and positive train control systems
- Total infrastructure construction cost = \$525 m (2020 dollars)
- Expected to add 3,220 daily riders = 972,440 annual riders



Project Length & Capital Cost

Project	Alt 3 – BOS-PIT	4 – BOS-PIT, New Track	6 – BOS-PIT, High Speed Rail	South Coast Rail Phase 1
Miles	151	151	144	36
Capital Cost (\$M)	\$1,579.9	\$2,027.0	\$12,651.0	\$525

Annual Ridership & Capital Cost per New Rider

Project	Alt 3 – BOS-PIT	4 – BOS-PIT, New Track	6 – BOS-PIT, High Speed Rail	South Coast Rail Phase 1
Baseline	3,900	3,900	3,900	1,751,600
New Riders	75,575	124,910	268,570	972,440
Total Riders	79,475	128,810	272,470	2,724,040
Capital Cost per New Rider	\$20,905	58 \$16,228	\$47,105	\$540

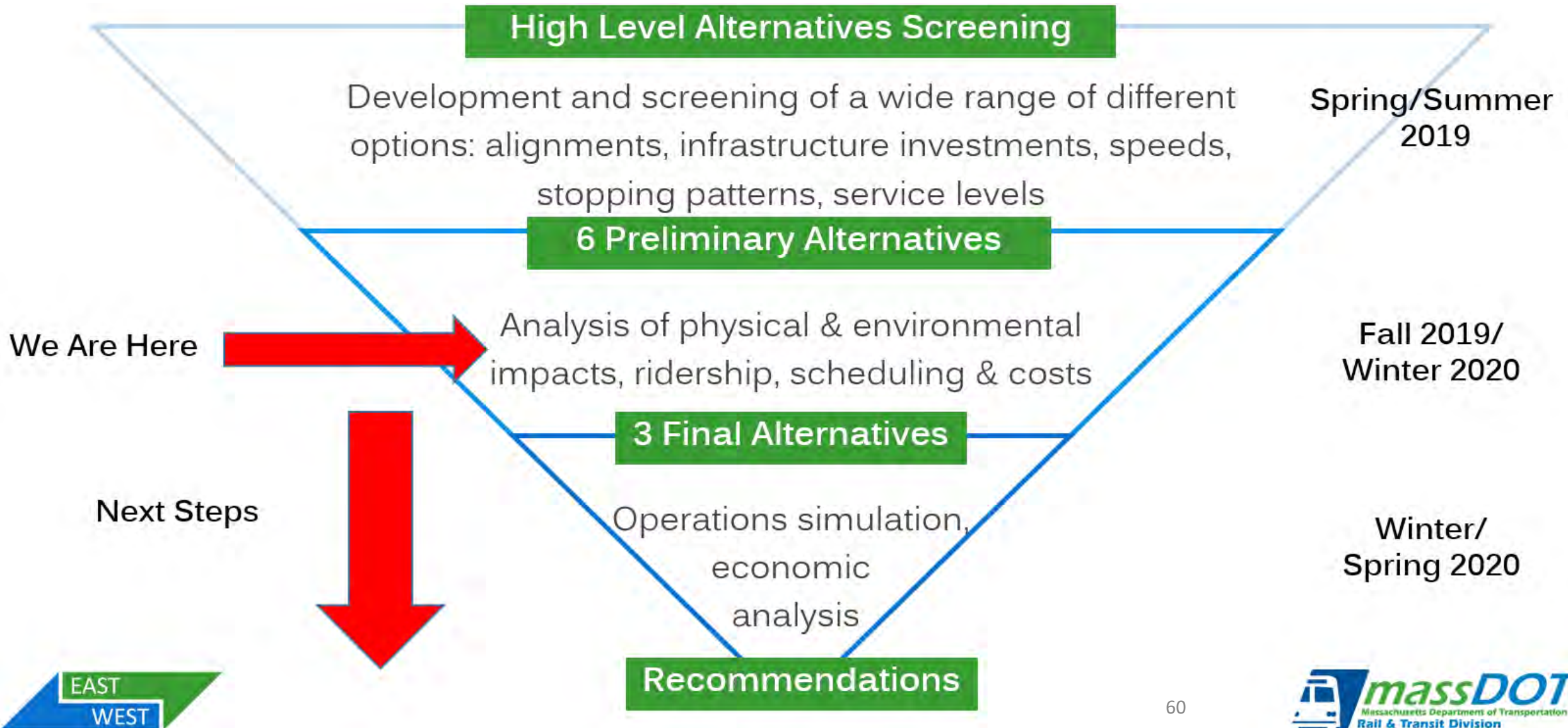
Next Steps

Advisory Committee Meeting #4 to Get Feedback, Answer Questions on Alternatives

Final Alternatives Analysis: Benefits, Impacts, Costs, and Tradeoffs

Advisory Committee Meeting #5, Public Meeting #3

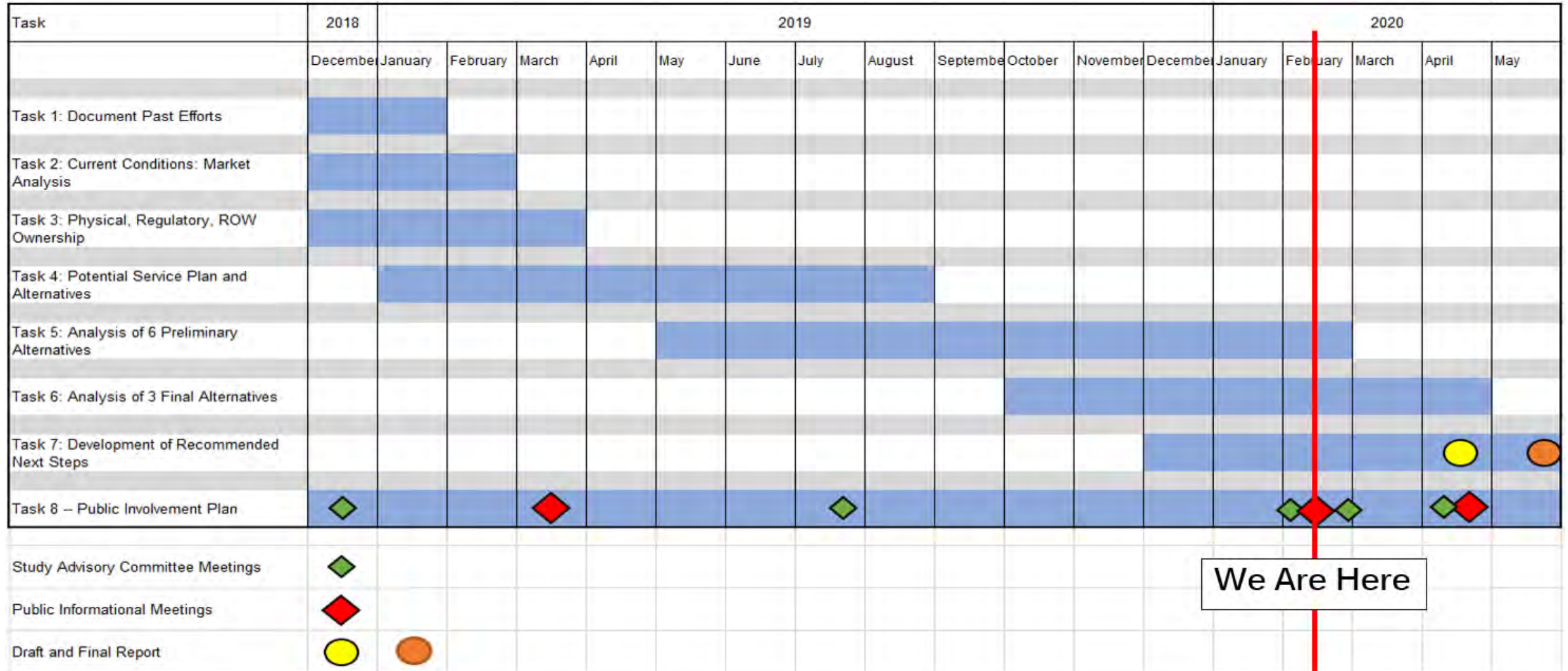
Alternatives Development & Analysis



3 Final Alternatives – Key Criteria for Short-Listing

- **Corridor and infrastructure investment**
 - Shared rail
 - Shared corridor, new rail
 - New corridor (I-90 corridor)
- **Service characteristics**
 - Communities served
 - Service frequency
- **Travel time**
- **Ridership projections**
- **Environmental and community impacts**
- **Costs and Benefits**
 - Capital costs
 - Operating & maintenance costs
 - Benefits – travel time, environmental benefits, reduction in crashes
- **What criteria should we use to narrow down to the final 3?**

Study Schedule



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