RED LINE @ KENDALL TRANSIT STUDY

Presentation to the
Transit Advisory Committee
October 7, 2015

OUTLINE

- MIT Kendall Square Project Overview
- Existing Transit Services
- City Red Line Questions
- Methodology
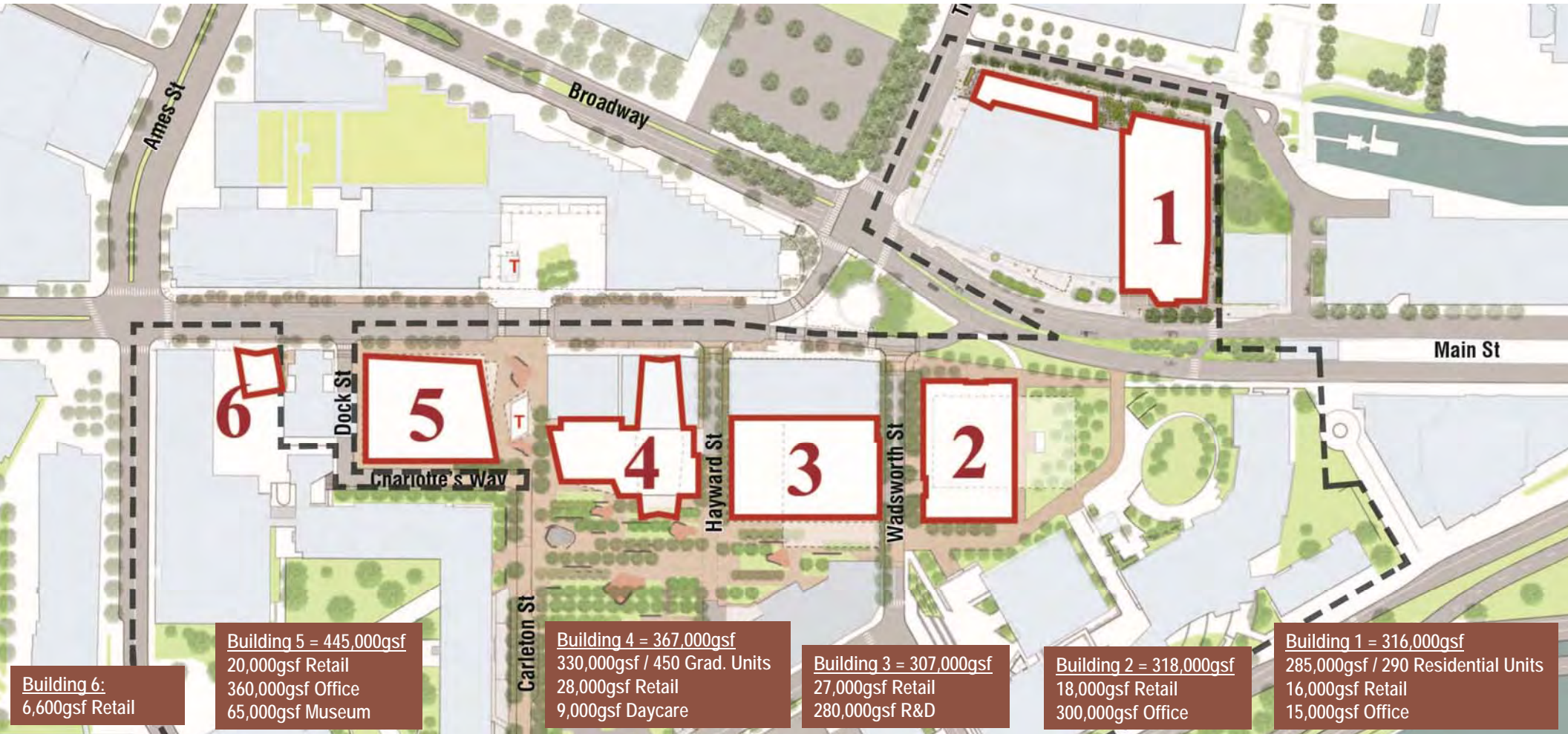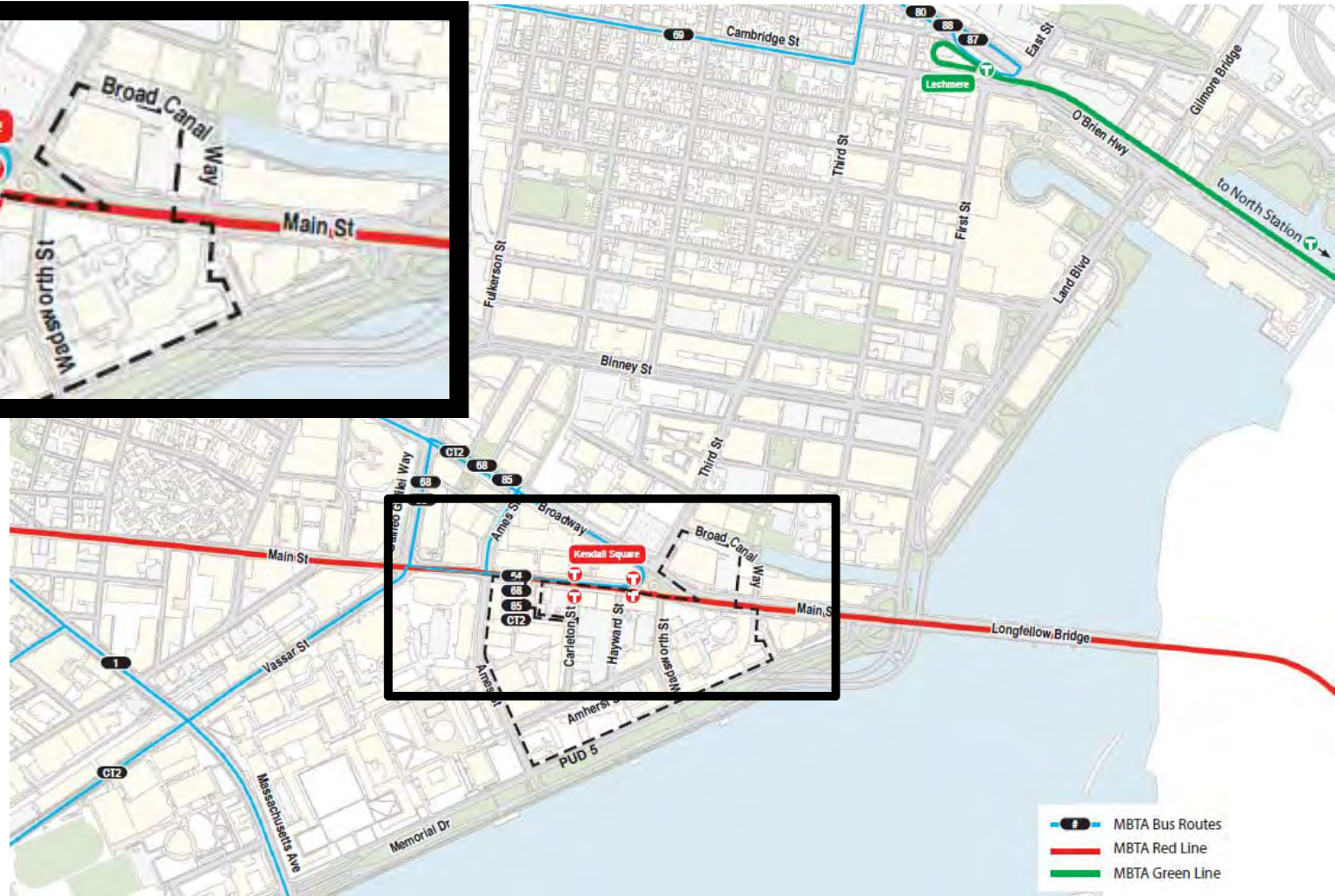- Data Collection
- Findings
- Q&A

INTRODUCTION

PROJECT OVERVIEW

Building 6:
6,600gsf Retail

Building 5 = 445,000gsf
20,000gsf Retail
360,000gsf Office
65,000gsf Museum

Building 4 = 367,000gsf
330,000gsf / 450 Grad. Units
28,000gsf Retail
9,000gsf Daycare

Building 3 = 307,000gsf
27,000gsf Retail
280,000gsf R&D

Building 2 = 318,000gsf
18,000gsf Retail
300,000gsf Office

Building 1 = 316,000gsf
285,000gsf / 290 Residential Units
16,000gsf Retail
15,000gsf Office

PUBLIC TRANSPORTATION - KENDALL SQUARE

Focus on Red Line service at MIT/Kendall Station

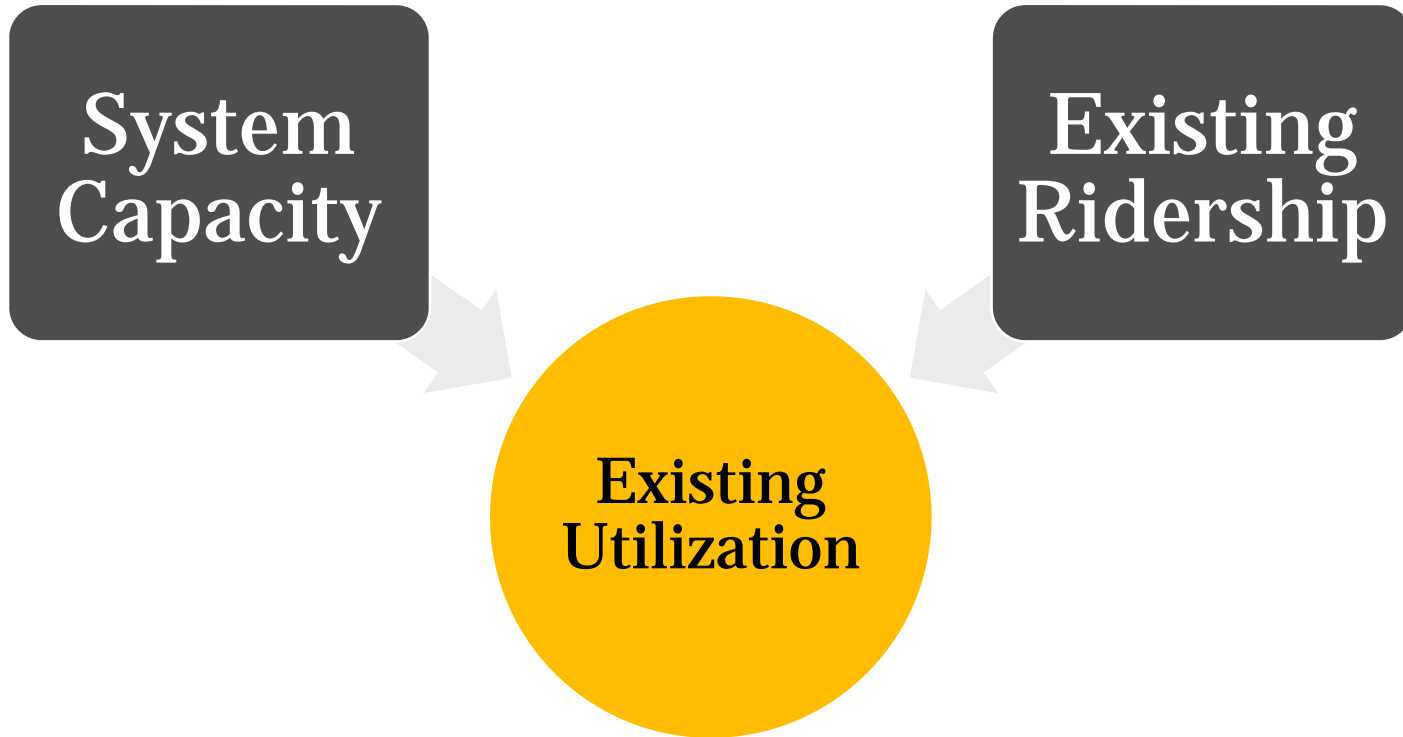# CITY QUESTIONS (RED LINE @ MIT/KENDALL STATION)

On-Time Performance

Wait Time

Peak of the Peak Service Analysis

TRANSIT ASSESSMENT METHODOLOGY

Existing Levels **+** **Proposed Project Trips** **=** **Build Levels**

EXISTING UTILIZATION

Frequency (# of trains)
x
Passenger Load Limit (# pass per train)
=

System Capacity

Existing Ridership

Existing Utilization

ANALYSIS VERSIONS

Data Input	Standard 2012-2013 MBTA Data	Enhanced 2012-2013 MBTA Data Adjusted	2015 Observations
System Capacity ➢ Frequency ➢ Passenger Load	• MBTA Schedules • MBTA Service Policy • No OTP adjustment	• MBTA Schedules • MBTA Service Policy • With OTP adjustment	• Actual counted trains • MBTA Service Policy
Existing Ridership	• MBTA Counts 2012/2013 (average counts in hourly increments) • No growth applied	• MBTA Counts 2012/2013 (average counts in hourly increments) • Grown to year 2015 year (per MBTA historical ridership data)	• Actual counts at station entrances (15 min increments) + Observations of passenger loads on each train during peak periods

OTP = On time performance

MBTA SERVICE DELIVERY POLICY

" ... average maximum number of passengers allowed per vehicle, to provide <u>a safe and comfortable ride</u>."

Red Line Policy Capacity = 167 passengers per car   REFERENCE POINT

- Standard Red Line 6-car train set operation = capacity for 1,002 passengers per train

- 167 passengers per car translates to 1.7 people standing to each seated passenger (avg. 60 seats on each car)

Red Line Crush Capacity = 269 passengers per car

- Standard Red Line 6-car train set operation = capacity for 1,614 passengers per train

- 269 passengers per car translates to 3.5 people standing to each seated passenger (avg. 60 seats on each car)

- Crush level is not used for planning purposes

STANDARD ANALYSIS
(RED LINE @ MIT/KENDALL SQ STATION)

Standard

MBTA data

- 2012/2013 counts for Red Line @ MIT/Kendall Station
- Average ridership counts in hourly increments

Red Line	Frequency (# of trains/ peak hr)	Pax per car	Cars per train	CAPACITY (pax/peak hr)	Entering Pax Load	Utilization % Entering	Exiting Pax Load	Utilization % Exiting
AM								
Inbound	13	167	6	13,026	9,524	**73%**	8,513	**65%**
Outbound	13	167	6	13,026	4,784	**37%**	3,120	**24%**
PM								
Inbound	13	167	6	13,026	4,033	**31%**	5,469	**42%**
Outbound	13	167	6	13,026	8,094	**62%**	8,821	**68%**

ENHANCED ANALYSIS

Enhanced

MBTA data +

1.) Adjustment for growth

▪ 2012/2013 counts are grown to year 2015 (4% per year)

 ▪ growth rate developed from historical MBTA Red Line ridership (2007 to 2013);

 ▪ also reviewed ULI's Hub&Spoke rates

2.) Adjusted for On Time Performance

▪ Capacity reduced to account for trains not arriving as scheduled

 ▪ Source One: Monthly Scorecards Nov. 2014 lists Red Line OTP @ 95% (assumes 150% operating allowance for headway)

 ▪ Source : Annual Report for 2014 lists Red Line OTP @ 86% (uses passenger wait time)   USED FOR ANALYSIS / MORE CONSERVATIVE

ENHANCED ANALYSIS
(RED LINE @ MIT/KENDALL SQ STATION)

Red Line	CAPACITY * (pax/peak hr)	Entering Pax Load	Utilization % Entering	Exiting Pax Load	Utilization % Exiting
AM					
Inbound	11,202	10,713	**96%**	9,576	**85%**
Outbound	11,202	5,381	**48%**	3,510	**31%**
PM					
Inbound	11,202	4,537	**40%**	6,152	**55%**
Outbound	11,202	9,105	**81%**	9,922	**89%**

* 6 cars/train, 13 trains/peak hour, 167 pax/car, OTP = 0.86

OBSERVATION BASED ANALYSIS
(RED LINE @ MIT/KENDALL SQ STATION)

Observed

VHB Field Observations & Counts

1.) Methodology
- Coordination with MBTA (permit)
- 6 staff on platform, each assigned to one Red Line car (trains run in 6 car sets)
- Data collection over 2 days (May 12 & 13, 2015)
- AM peak period 7-10am & PM peak period 4-7pm
- Inbound and outbound platforms

2.) Data collected
- Train wheel stop time
- Door open time
- Door close time
- Wheel move time
- Car pax load at arrival
- Car pax load at departure
- Number of pax left behind on platform (Overcrowding vs. Destination)
- Platform crowding levels
- Video counts at each of the 4 station entrances of pax entering and exiting the station

OBSERVATION BASED ANALYSIS
(RED LINE @ MIT/KENDALL SQ STATION)

Red Line	Frequency (# of trains/ peak hr)	CAPACITY (pax/peak hr)	Entering Pax Load	Utilization % Entering	Exiting Pax Load	Utilization % Exiting
AM						
Inbound	14	14,028	13,300	**95%**	11,300	**81%**
Outbound	14	14,028	6,700	**48%**	3,500	**25%**
PM						
Inbound	12	12,024	4,900	**41%**	6,800	57%
Outbound	10	10,020	10,700	**107%**	11,800	**118%**

* 6 cars/train sets; 167 pax/car

Observed PM overcapacity due to MBTA operating 10 trains during the peak hour versus 13 scheduled trains

PM Peak Hour - Red Line MIT/Kendall Sq. Station

Utilization% Comparison by Analysis Version
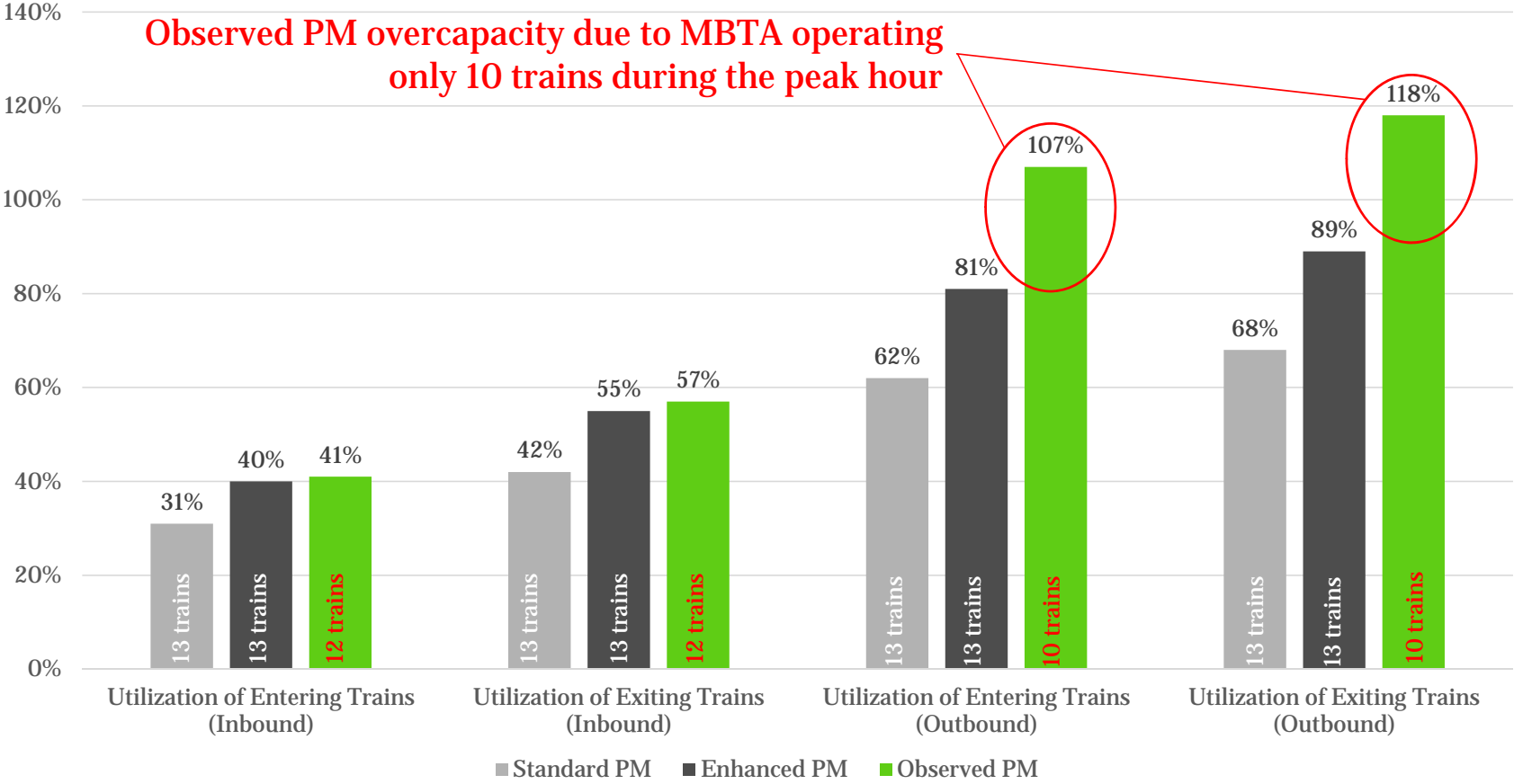
OTHER FINDINGS
(RED LINE @ MIT/KENDALL SQ STATION)

➢ Min. observed headways were in the 2 min. range
➢ Impacts to capacity, stemming from observed system issues
➢ Train car loads and platform loads unevenly distributed

(in MIN:SEC)	AM Inbound	AM Outbound	PM Inbound	PM Outbound
Scheduled Headway	4:30	4:30	4:30	4:30
Max. Avg. Wait Time	3:56	3:27	3:36	4:37
Min. Wait Time	1:55	1:35	2:12	1:46
Max. Wait Time	7:00	10:03	5:25	7:30
Scheduled Frequency	13 trains	13 trains	13 trains	13 trains
Observed Frequency	14 trains	14 trains	12 trains*	10 trains**
Scheduled Capacity (pax)	13,026	13,026	13,026	13,026
Observed Capacity (pax)	14,028	14,028	12,024	10,020

*PM Inbound=1 of 12 trains (8%) with major delay due to medical emergency;
**PM Outbound=6 of 10 trains (60%) with major delays due to signal problems at MGH station (4pm to 7pm)

OTHER FINDINGS
(RED LINE @ MIT/KENDALL SQ STATION)

Chart 3: Observed Passenger Load
Entering Inbound Platform (Southbound to Ashmont/Braintree)
(May 13, 2015, 7-10am)

AM Peak Hour Inbound Entering Trains
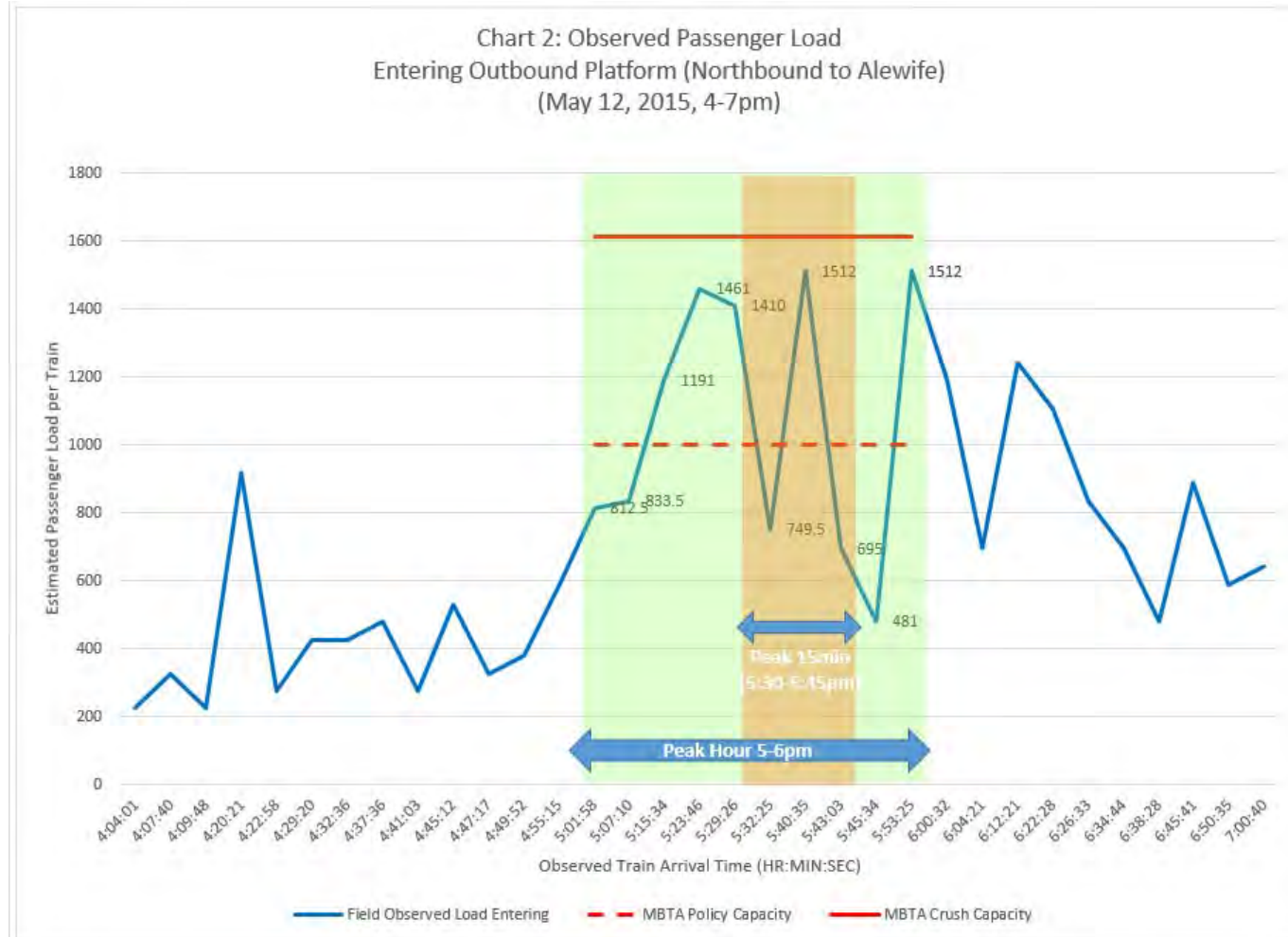
Peak 15 = 8:45-9:00am

Individual trains observed above policy; when averaged over entire hour utilization is at 95%

14 trains during peak hour

OTHER FINDINGS
(RED LINE @ MIT/KENDALL SQ STATION)

Chart 2: Observed Passenger Load
Entering Outbound Platform (Northbound to Alewife)
(May 12, 2015, 4-7pm)

PM Peak Hour Outbound Entering Trains

- Peak 15 = 5:30-5:45pm

- Between Policy and Crush; hourly average utilization at 107%.

- Signal problems from 4-7pm

- 10 trains during peak hour

- This graph shows entering trains only; 5 of the 10 <u>exiting</u> trains reported some "left behinds" on platform

19

TRANSIT ASSESSMENT METHODOLOGY

Existing Levels **+** Proposed Project Trips **=** Build Levels

MODE SPLIT DATA ASSUMPTIONS

Proposed Project Trips

Mode	R&D/Office	Residential	Retail	Academic/ Institutional
Auto	41%	32%	31%	27%
Transit	42%	30%	30%	41%
Walk	7%	25%	29%	15%
Bike	10%	10%	8%	14%
Other	0%	3%	2%	3%
Total	100%	100%	100%	100%

Source: K2C2 Study

PROPOSED PROJECT TRANSIT TRIPS
(MIT AT KENDALL SQUARE DEVELOPMENT)

Proposed Project Trips

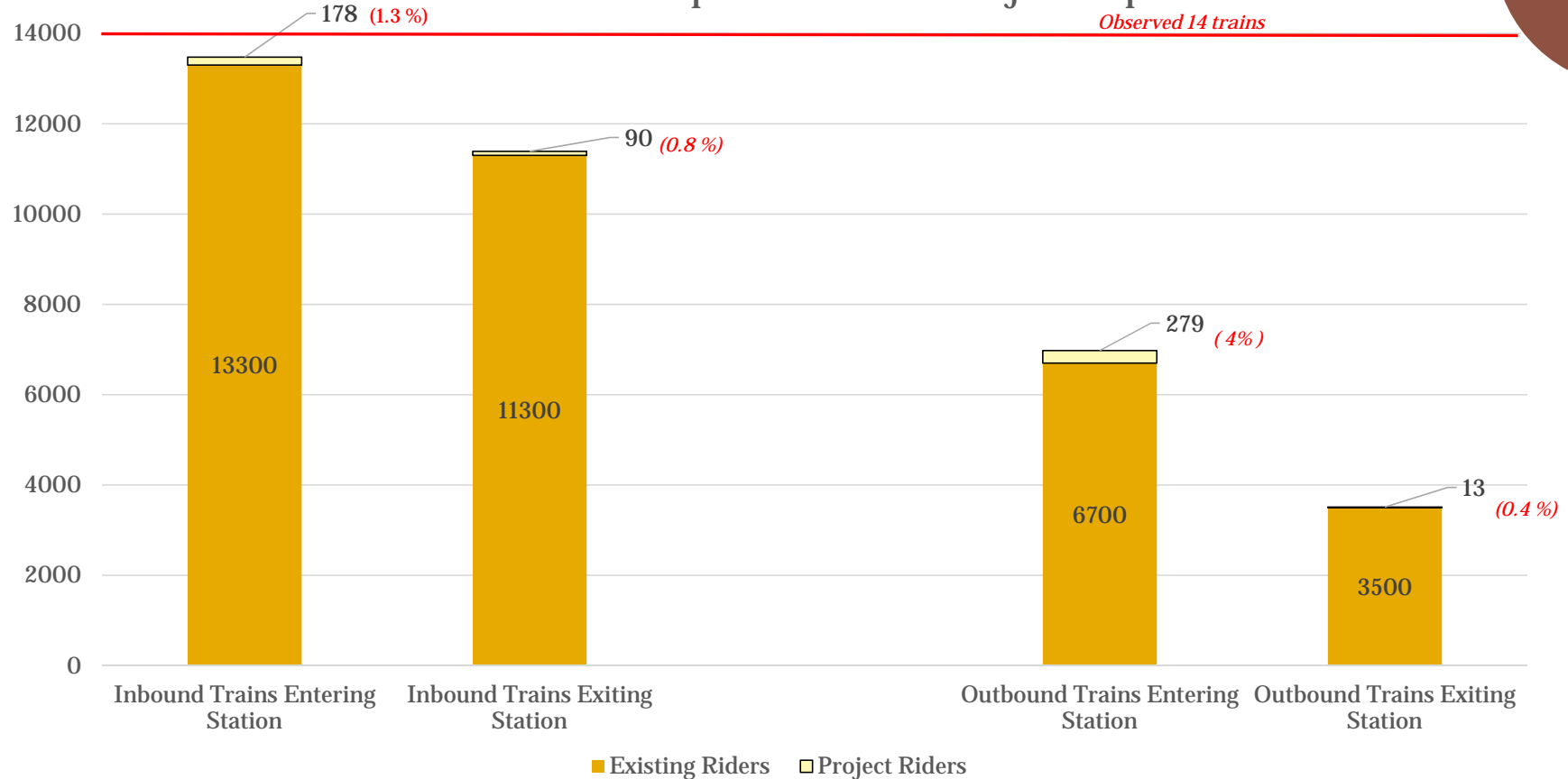|	AM Peak Hour			PM Peak Hour		
Mode	Trips From Project (Boardings)	Trips To Project (Alightings)	Total Project AM Trips	Trips From Project (Boardings)	Trips To Project (Alightings)	Total Project PM Trips
Red Line						
Inbound	90	178	268	198	129	327
Outbound	13	279	292	295	34	329

MIT/KENDALL SQ STATION – AM PEAK HOUR

Build Levels

Observed Ridership & Trains with Project Trips

- 178 (1.3 %) — Inbound Trains Entering Station: 13300
- *Observed 14 trains*
- 90 (0.8 %) — Inbound Trains Exiting Station: 11300
- 279 (4%) — Outbound Trains Entering Station: 6700
- 13 (0.4 %) — Outbound Trains Exiting Station: 3500

Legend: ■ Existing Riders □ Project Riders
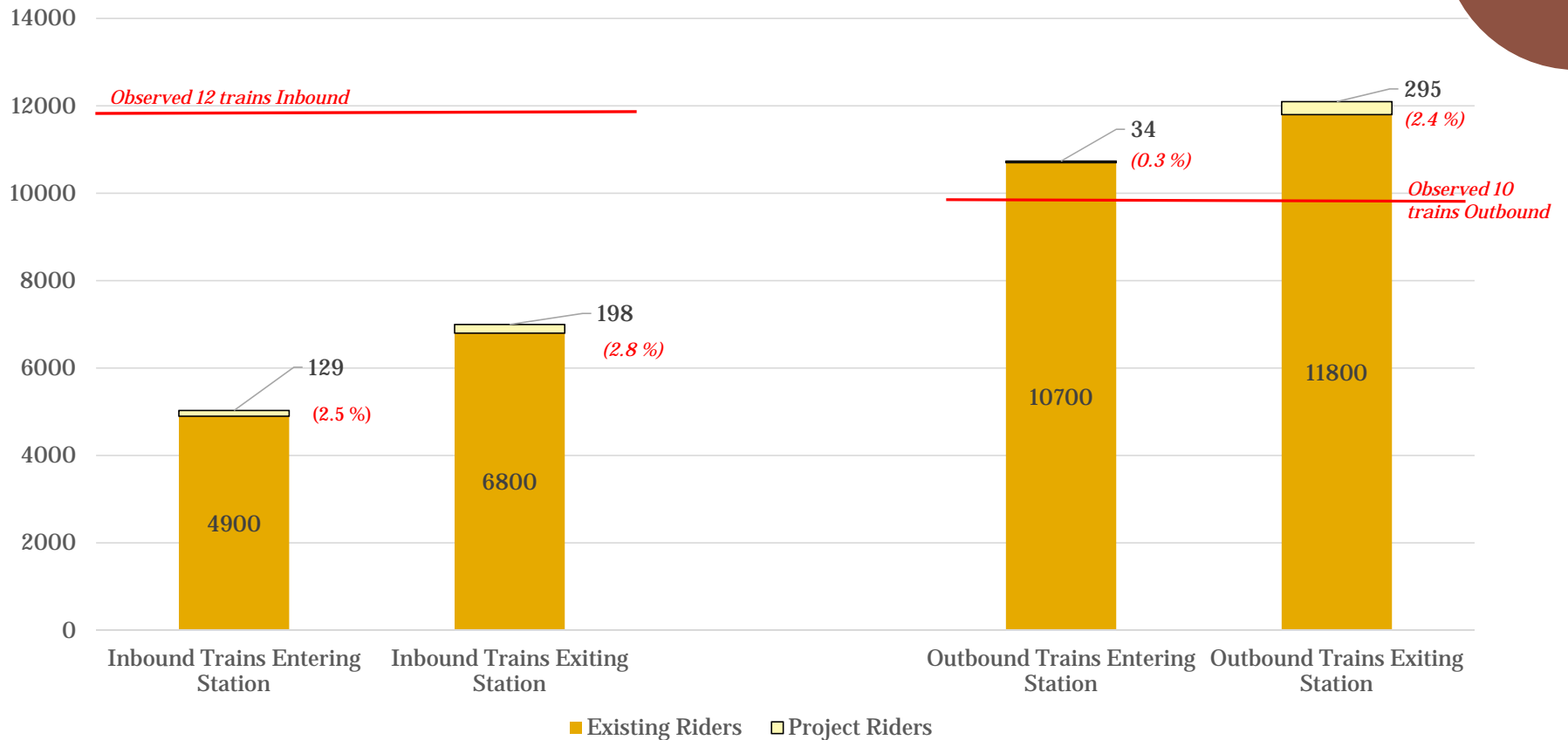
Assumes MBTA policy capacity of 167 pax/car and 6-car train sets

MIT/KENDALL SQ STATION – PM PEAK HOUR

Observed Ridership & Trains with Project Trips

Inbound Trains Entering Station: Existing Riders 4900, Project Riders 129 (2.5 %)

Inbound Trains Exiting Station: Existing Riders 6800, Project Riders 198 (2.8 %)

Outbound Trains Entering Station: Existing Riders 10700, Project Riders 34 (0.3 %)

Outbound Trains Exiting Station: Existing Riders 11800, Project Riders 295 (2.4 %)

Observed 12 trains Inbound

Observed 10 trains Outbound

■ Existing Riders   ☐ Project Riders

Assumes MBTA policy capacity of 167 pax/car and 6-car train sets

24

SUMMARY

- On-Time Performance Analysis
- Passenger Wait Time Analysis
- Peak of the Peak Service Analysis
- Two Day Observation Data
- Uneven platform and car passenger distribution
- Service ran at shorter headways than scheduled
- Observed overcapacity caused by fewer trains operating during the PM peak hour due to system issues
- Based on ridership observations, existing and new PM Project riders would be accommodated if scheduled 13 peak hour trains operate

THANK YOU