

MBTA PATI: Data Collection, Scoring, and Reporting

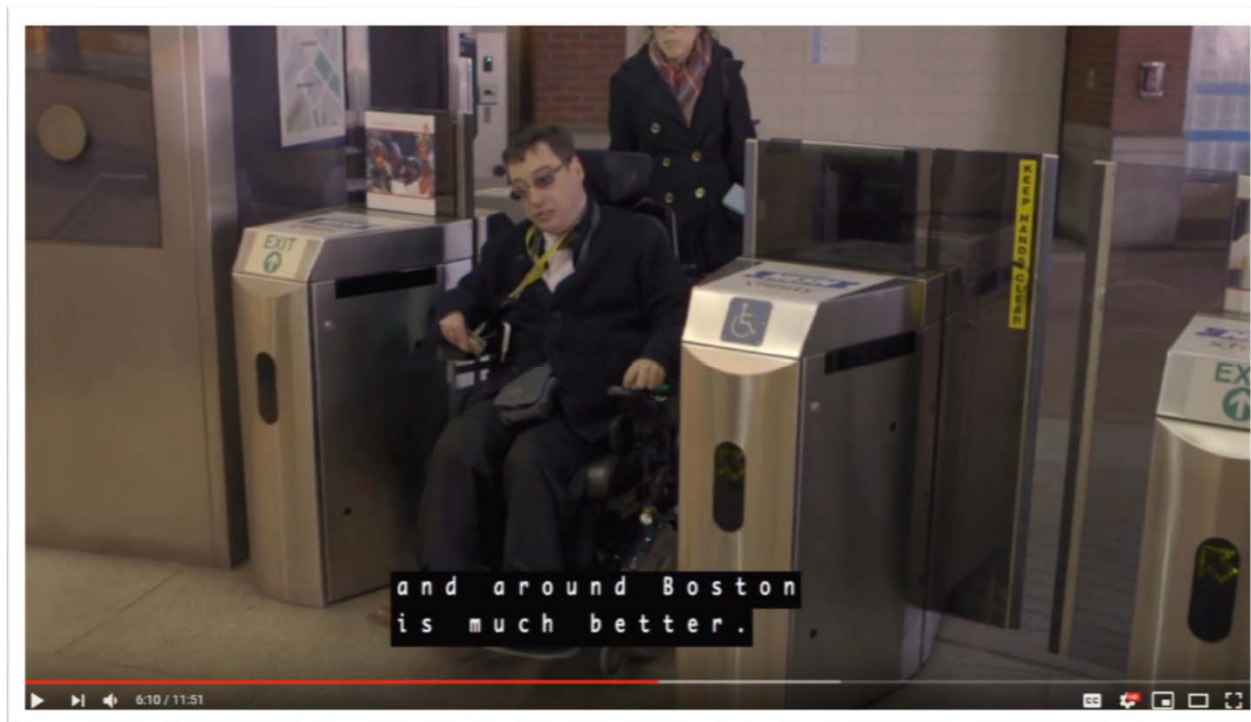
Bill Schwartz (Nelson Nygaard)
and Matt von Wahlde (Geonetics)



Presentation Overview

- The need for MBTA system-wide accessibility
- Plan for Accessible Transportation Infrastructure (PATI)
- Planning for data collection
- Database and website design
- Products
- Future work, lessons learned, and transferability

Need for Access



Plan for Accessible Transportation Infrastructure (PATI)

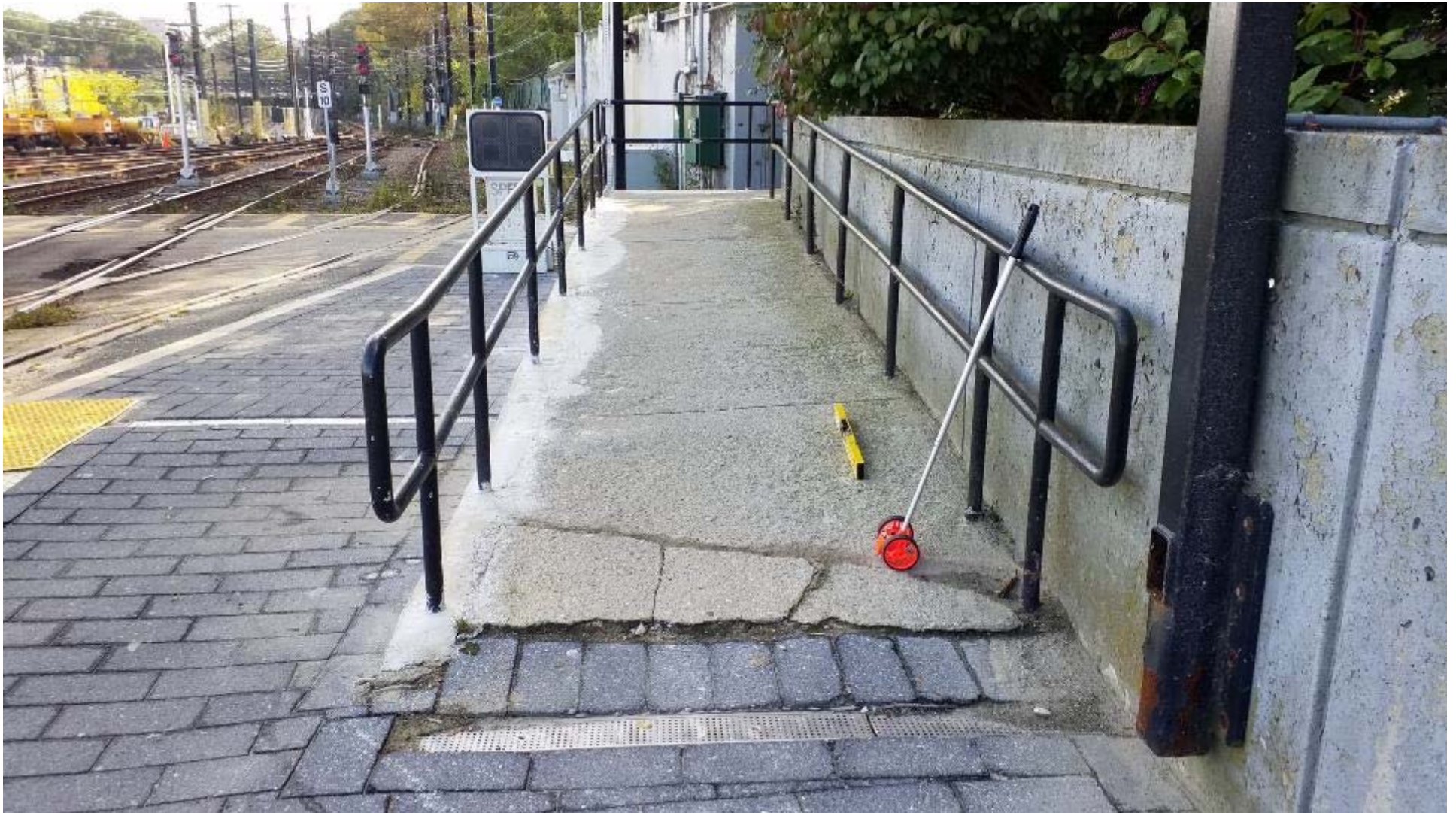
- 2006 landmark settlement agreement addressed training and elevator reliability
- MBTA vision for a fully accessible system
 - Need to identify barriers to access at all bus stops and accessible stations
 - Remove barriers at known inaccessible stations

















Bus and Rail Station Project

- Establish priorities for accessibility improvements
 - 177 accessible stations
 - 7,960 bus stops
 - Some accessible stations and 65 inaccessible stations excluded

Overall Approach

- To develop a comprehensive system to collect, store, query, and report station and stop accessibility survey data

Bus Stop Data Collection Scope

- Stop zone
- Landing pad – for ramp deployment
- Sidewalk
- Adjacent roadway
- Nearest crossing (if within 250 feet)
- Signs

Station Data Collection Scope

- Stations far more complex
- Outside-in approach



Data Collection Method

- Two-person crews
- Smart levels, wheels, tape, Android tablets
- Training, field testing, and retraining
- Field inspections and desk reviews
- Post-collection editing

Data Management

- Requirements:
 - Mobile
 - Needed to work offline
 - Location collection challenges
 - Security
 - Planning
 - Reporting
 - Access

Data Issues and Syncing



Internet not always
available



Need to be able to see
others works



Collaboration on by
multiple teams on same
stations



Duplicate surveys

Planning



SYSTEM PROVIDED
FOR PLANNING
SURVEY WORK



DEFINE WORK AREAS
VIA MAP



SCHEDULE WORK
CREWS

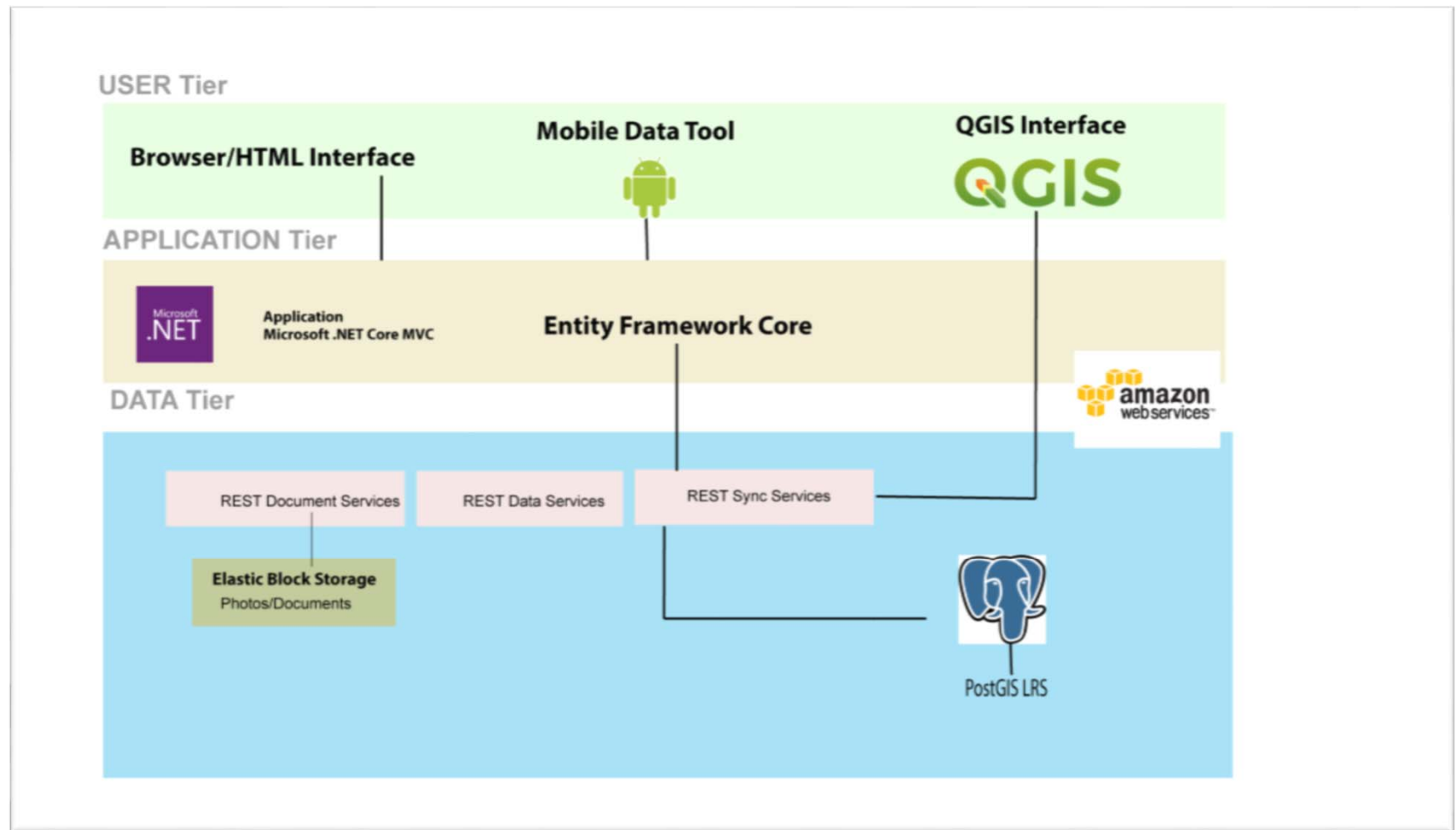


MONITOR PROGRESS



REALTIME FEEDBACK
FROM THE FIELD

Architecture and Technology

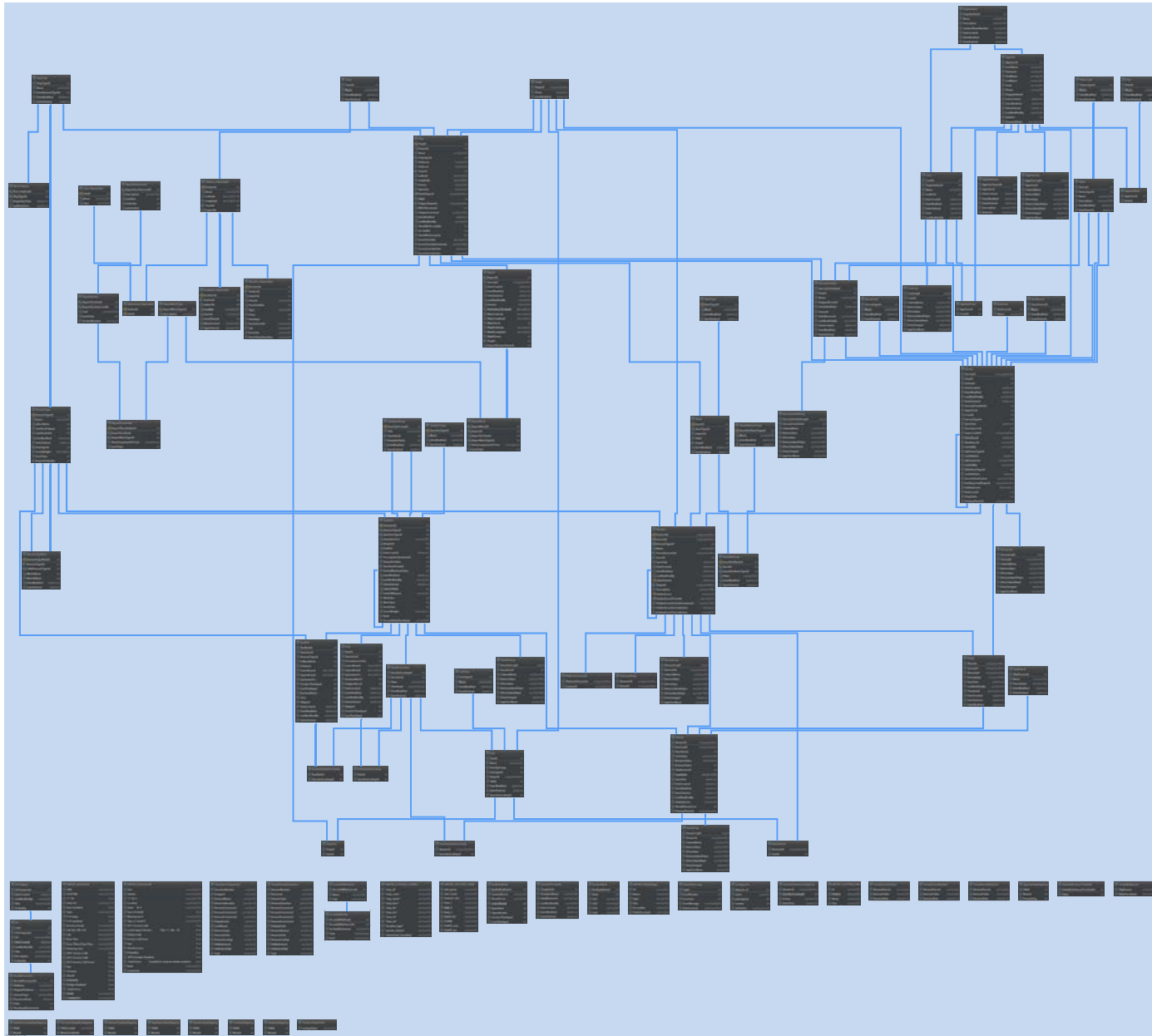


Data Modeling

Hierarchical
Facilities

Station Root: "Weymouth Landing/ East Braintree Root" 11 93

- 
- GEONETICS
- NELSON
NYGAARD



Custom Planning Tool

Scheduling: World Trade Center (187)

Assigned To: STV #3

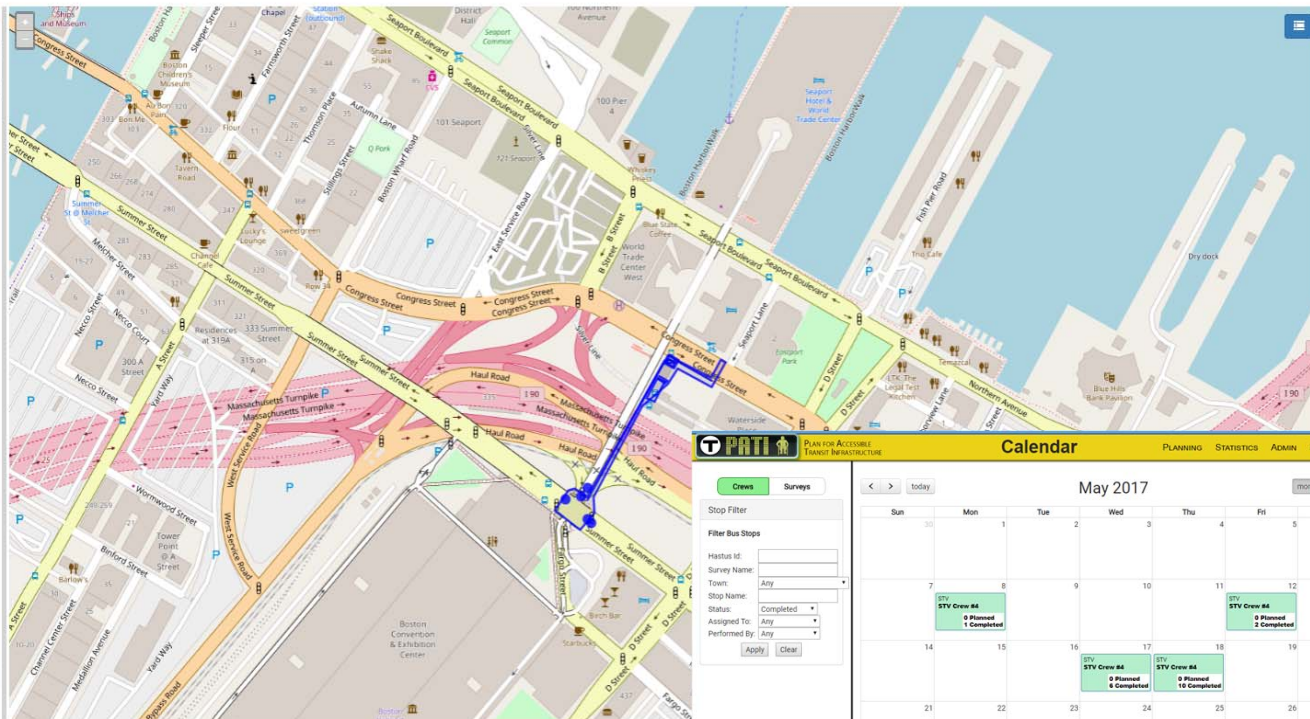
Scheduled Date: 9/19/2017

Name: World Trade Center: STV #3

Station Element Hierarchy

- Station Root Node
 - Station Exterior: "Street Level (1)"
 - Platform Area: "Platform Area 1"
 - Station Interior: "Station Interior Street Level"
 - Vertical Circulation: "To/From Inbound platform"
 - Station Exterior: "WTC Ave Level (2)"
 - Entrance Area: "WTC Ave Level 2 S Doors"
 - Entrance Area: "Street Level (1)"
 - Entrance Area: "WTC Level 2 N ELV"
 - Entrance Area: "WTC Level 2 N Doors"
 - Vertical Circulation: "To/From Outbound"
 - Vertical Circulation: "Congress Street to WTC Ave"**

Close Save Template Close



Calendar

PLANNING STATISTICS ADMIN RULES LOGOUT

May 2017

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

STV Crew #4
0 Planned
1 Completed

STV Crew #4
0 Planned
2 Completed

STV Crew #4
0 Planned
6 Completed

STV Crew #4
0 Planned
10 Completed

Stop Filter

Filter Bus Stops

Hastus ID:

Survey Name:

Stop Name:

Status:

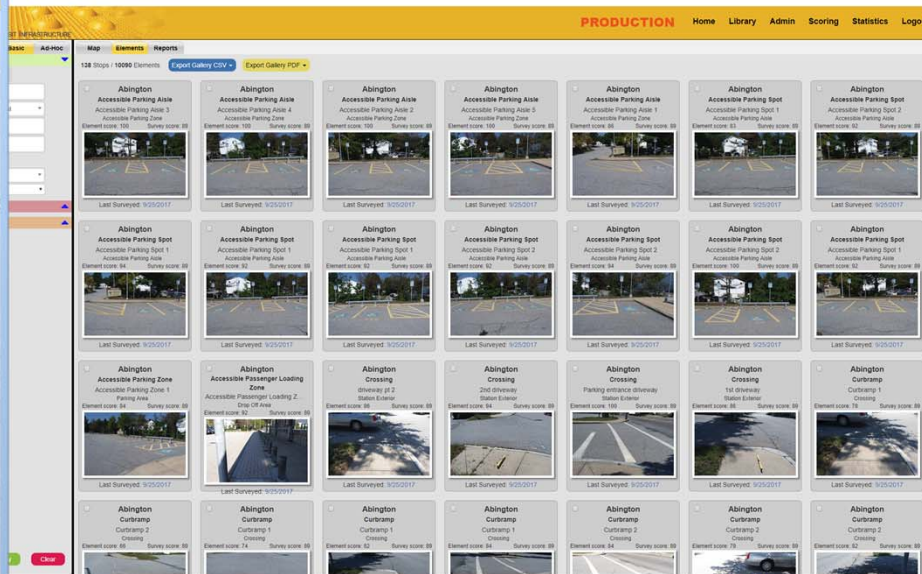
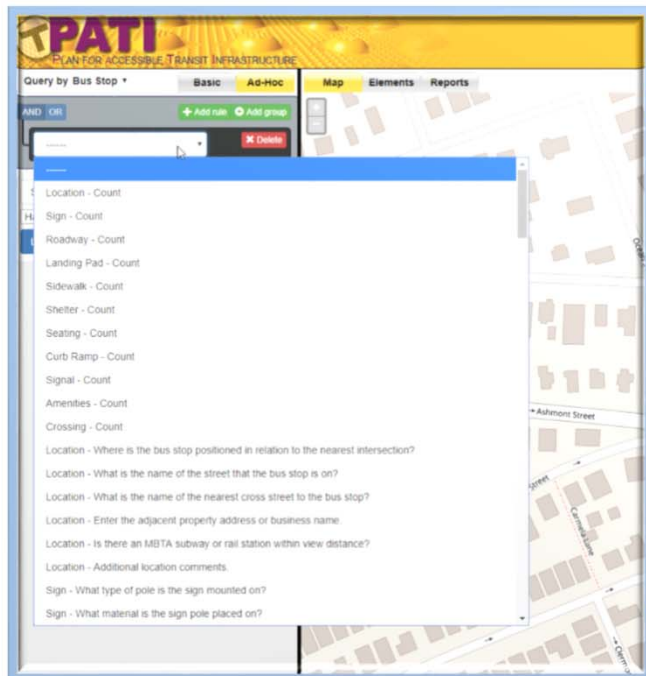
Assigned To:

Performed By:

Apply Clear

Reporting

- Needed easy to use tools to query and produce report of surveys a
- Town based summaries



Ad Hoc query

- Relational Database can't be flattened out into a spreadsheet
- Built a custom page to define complex queries

The screenshot shows a query builder interface with a grey header bar containing 'AND' and 'OR' buttons, and '+ Add rule' and '+ Add group' links. Below the header, there are three query rules, each in a dark grey box with a red 'Delete' button:

- Rule 1: 'Location - Additional location c' (dropdown) contains 'ramp' (text input).
- Rule 2: 'Sign - What type of pole is the' (dropdown) contains 'Round Pole' (dropdown).
- Rule 3: 'Landing Pad - What is the mat' (dropdown) contains 'Concrete' (dropdown).

At the bottom, there is a 'Save Query' button, a dropdown menu with 'Has dropoff area, but less than 2', and a 'Load Saved Query' button.

Scoring

TPATI PLAN FOR ACCESSIBLE TRANSIT INFRASTRUCTURE

Scoring Statistics Logout

Re-Score Stations

Walkway

Weight	Type	Question	Actions
	Numeric		Edit Rules
	Yes/No		Edit Rules
	Multi-Lookup		Edit Rules
	Lookup		Edit Rules
	Yes/No		Edit Rules
	Yes/No		Edit Rules
1	Numeric		Edit Rules
3	Yes/No		Edit Rules
2	Numeric		Edit Rules
3	Numeric	What is the narrowest width of the walkway?	Edit Rules
2	Numeric	What is the maximum cross slope along the walkway?	Edit Rules
3	Numeric	What is the maximum running slope along the walkway?	Edit Rules
	Yes/No	Is there a grating opening that is not installed perpendicular to circulation?	Edit Rules
2	Numeric	How wide is the worst grating openings?	Edit Rules
3	Yes/No	Are ground and floor surfaces stable, firm, and slip resistant?	Edit Rules
2	Lookup	What is the amount of cracking or visible surface defects in the walkway?	Edit Rules

30 100 Save Weights

Edit Rules

What is the narrowest width of the walkway? (0 - 120)

- When answered less than 36.00 assign a score of 25
- When answered between 36.00 and 60.00 assign a score of 50
- When answered between 60.00 and 84.00 assign a score of 75
- When answered greater than 84.00 assign a score of 100
- When answered equal to 60.00 assign a score of 50
- When answered equal to 36.00 assign a score of 25
- When answered equal to 84.00 assign a score of 100


☐ When skipped assign a score of

+ Add

Save changes Close

Hard Copy Reports

- System generates Word reports from database information
- Also used open source and commercial PDF tools to programmatically generate complex PDF's



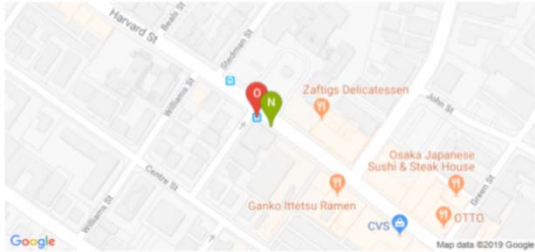
Survey report for stop #1306
On Harvard St @ Shailer St
Conducted in Brookline, MA
Completed on 09/22/2016 11:43 AM

Survey Info

Survey Name:	BSC Crew #1 09-22-2016	Time to complete:	-241.20:59:55.3759682
Assigned Crew:	N/A	Survey Start:	05/22/2017 8:43 AM
Completed Crew:	BSC Crew #1BUS	Survey End:	09/22/2016 11:43 AM
Completed By:	ishaw	Scheduled Date:	09/22/2016

Stop Info

Hastus ID:	1306	Town:	Brookline
Stop Name:	Harvard St @ Shailer St	Latitude:	42.343974
On Street:	Harvard St	Longitude:	-71.124518
At Street:	Shailer St		

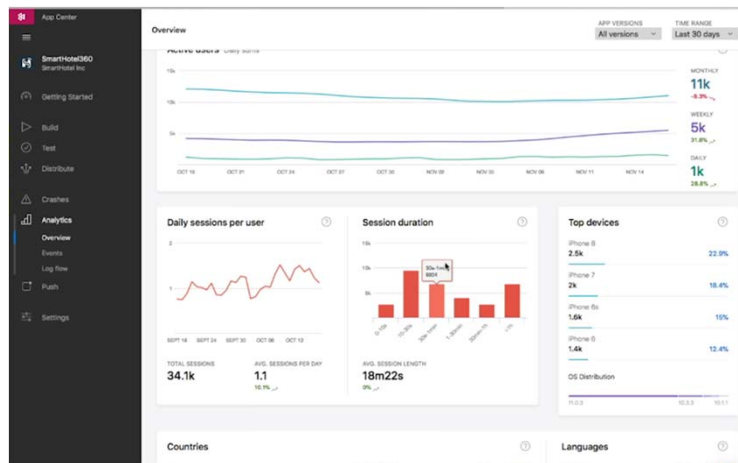


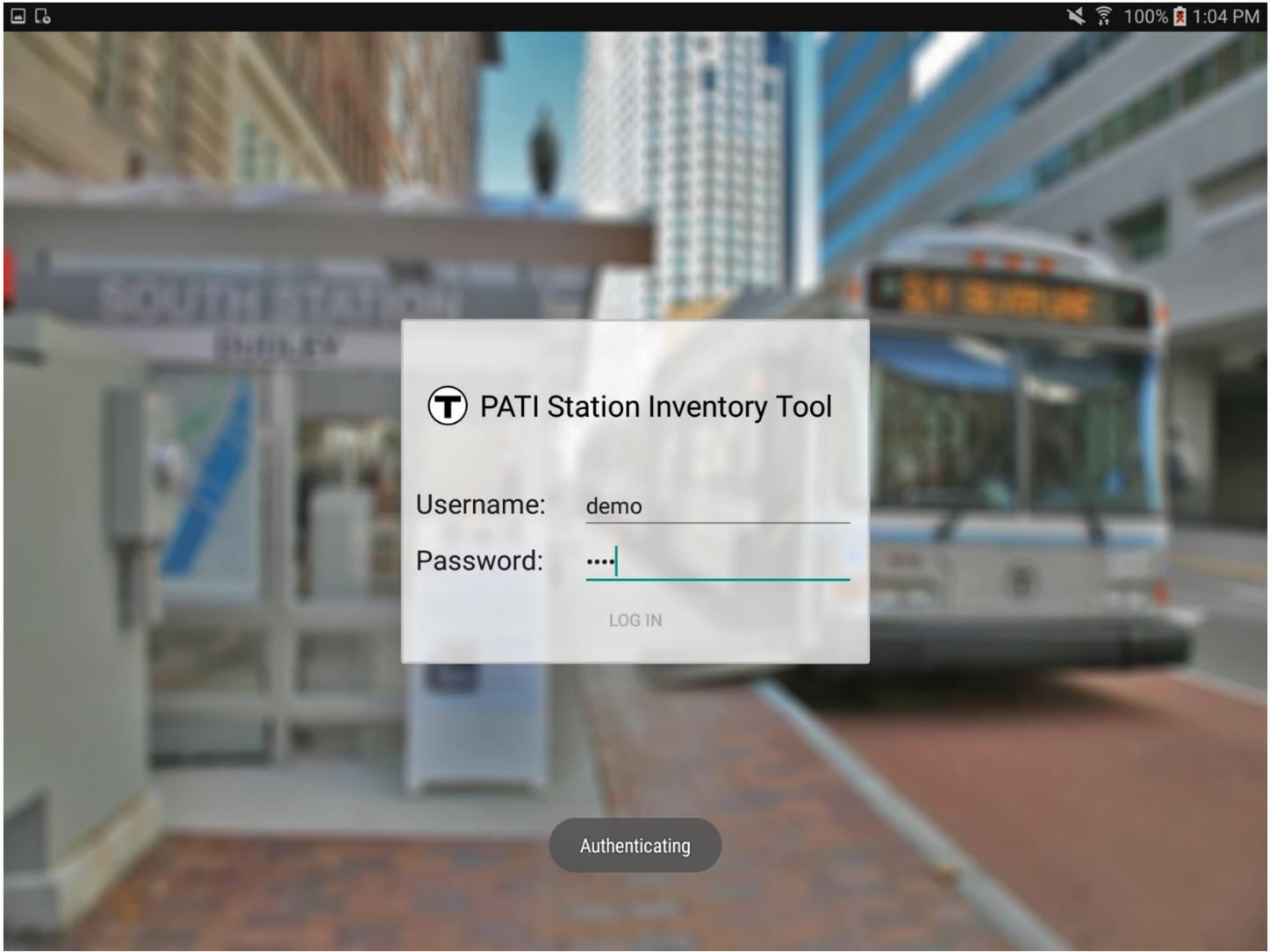
Survey report for stop #1306

1

Android Mobile

- Developed for Android Tablet
- Requirement for minimal training
- Used a technology called Xamarin
 - Cross platform development
- Deployed via Microsoft HockeyApp
 - Now called App Center







PATI Station Inventory Tool

Sync 85 % complete - Merging and storing data

Password:

LOG IN

Selecting Stations and Stops

21 Dry Dock:

Status: In-Process

ON

Sync Engine

SYNC NOW

Last synced today at 10:53 AM

Welcome, Matt

You are working as a member of crew: Geonetics #1

Surveys

Navigation

Questions

Map

Photos

Tools

Select a Station

START AD HOC

Geonetics #1

Scheduled Station Visits

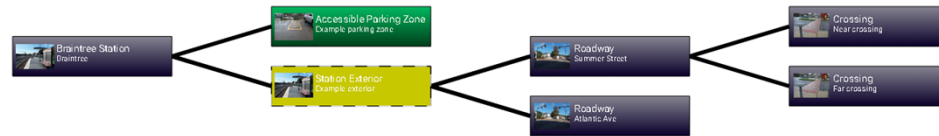
Station	Assigned To	Assigned Date	Status
Back Bay Station	Geonetics #1	7/6/2017	Closed
Braintree	Geonetics #1	7/17/2017	Published

Station Surveys

Station	Crew	Status	Synced	Last Updated	Elements	Answers
Braintree	Geonetics #1	Closed	Yes	7/19/2017	0	No
Braintree	Geonetics #1	In-Process	Yes	7/19/2017	3	No
21 Dry Dock	Geonetics #1	In-Process	Yes	7/19/2017	0	No
Braintree	Geonetics #1	Closed	Yes	7/19/2017	1	No
Braintree	Geonetics #1	In-Process	No	7/21/2017	1	Yes
Braintree	Geonetics #1	In-Process	Yes	7/19/2017	1	No
Braintree	Geonetics #1	In-Process	Yes	7/19/2017	1	No
Braintree	Geonetics #1	In-Process	Yes	7/19/2017	1	No
21 Dry Dock	Geonetics #1	Closed	Yes	7/19/2017	0	No
Back Bay Station	Geonetics #1	Closed	Yes	7/19/2017	0	No


Braintree:
 Status: Closed

Hello, Demo
 You are working as a member of crew: iansCrew



Add New Element

Select Element you wish to add:



OK

Cancel



Accessible Passenger Loading Zone

APZ 1



What is the material of the loading zone?



Does the vehicular route to and from accessible passenger loading zone have a vertical clearance less than 9.5' (114")?

☐ Yes ☒ No



Is a curb ramp provided between this accessible passenger loading zone and the accessible route?

☐ Yes ☒ No



What is the running slope of the accessible passenger loading zone?

5
(percent between 0 and 10)



What is the cross slope of the accessible passenger loading zone?

5
(percent between 0 and 10)



Surveys

Restroom

restroom 1

Navigation

Questions

Map

Photos

Tools

Is the entrance designated with international symbol of accessibility?

☒ Yes ☐ No



What type of Restroom is this? (Single User, Multi-User)



Does the restroom serve males or females?



What is the clear width of the door?

58

(inches between 0 and 60)



What is the height of the door hardware?

(inches between 0 and 96)

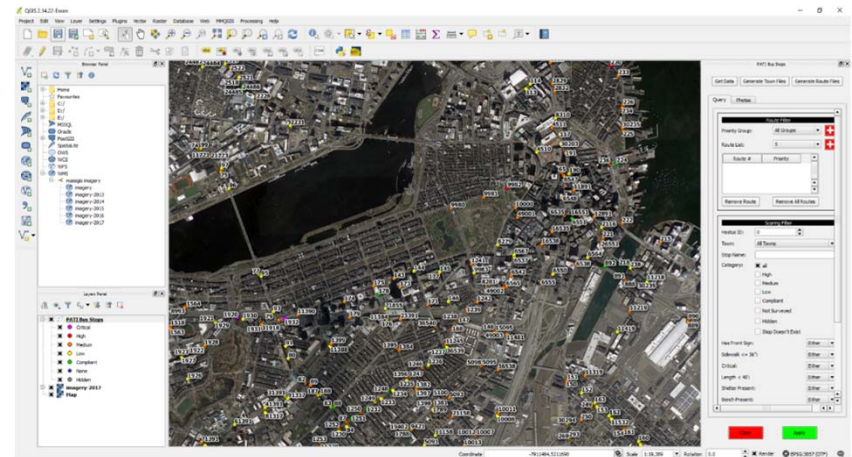


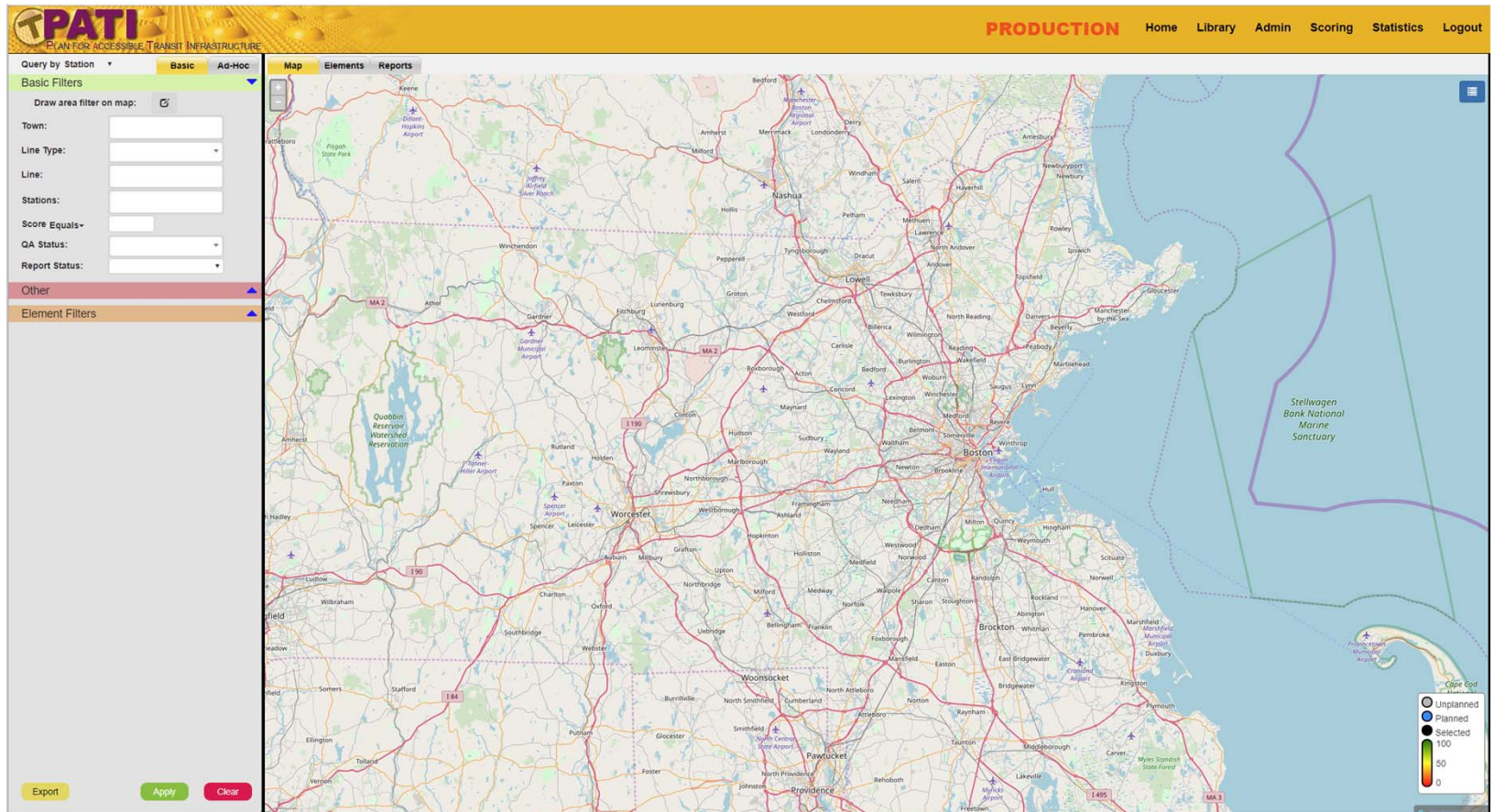
How much clear maneuvering space is provided on the pull side of the door?



GIS Mapping Technology

- GeoServer
 - Open Source Map Server
- OpenLayers
 - Open Source Web map
- QGIS
 - Open source GIS tool
 - Custom PATI plugin





Query by Station ▾

Basic Ad-Hoc

AND OR

+ Add rule + Add group

Busway - Count ▾

greater ▾ 1

Busway - Count ▾

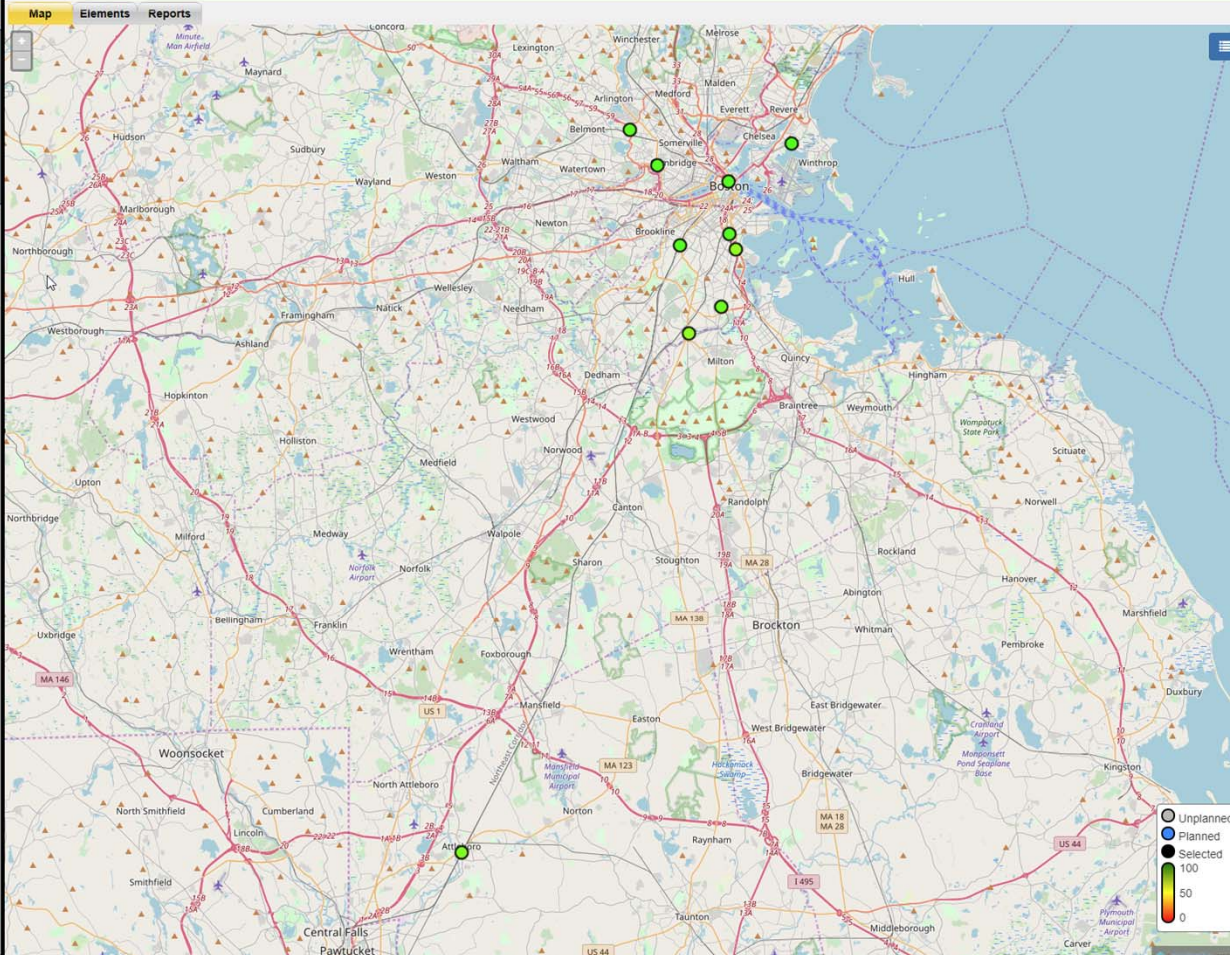
less or equal ▾ 2

Save Query

Has dropoff area, but less than 2 ▾

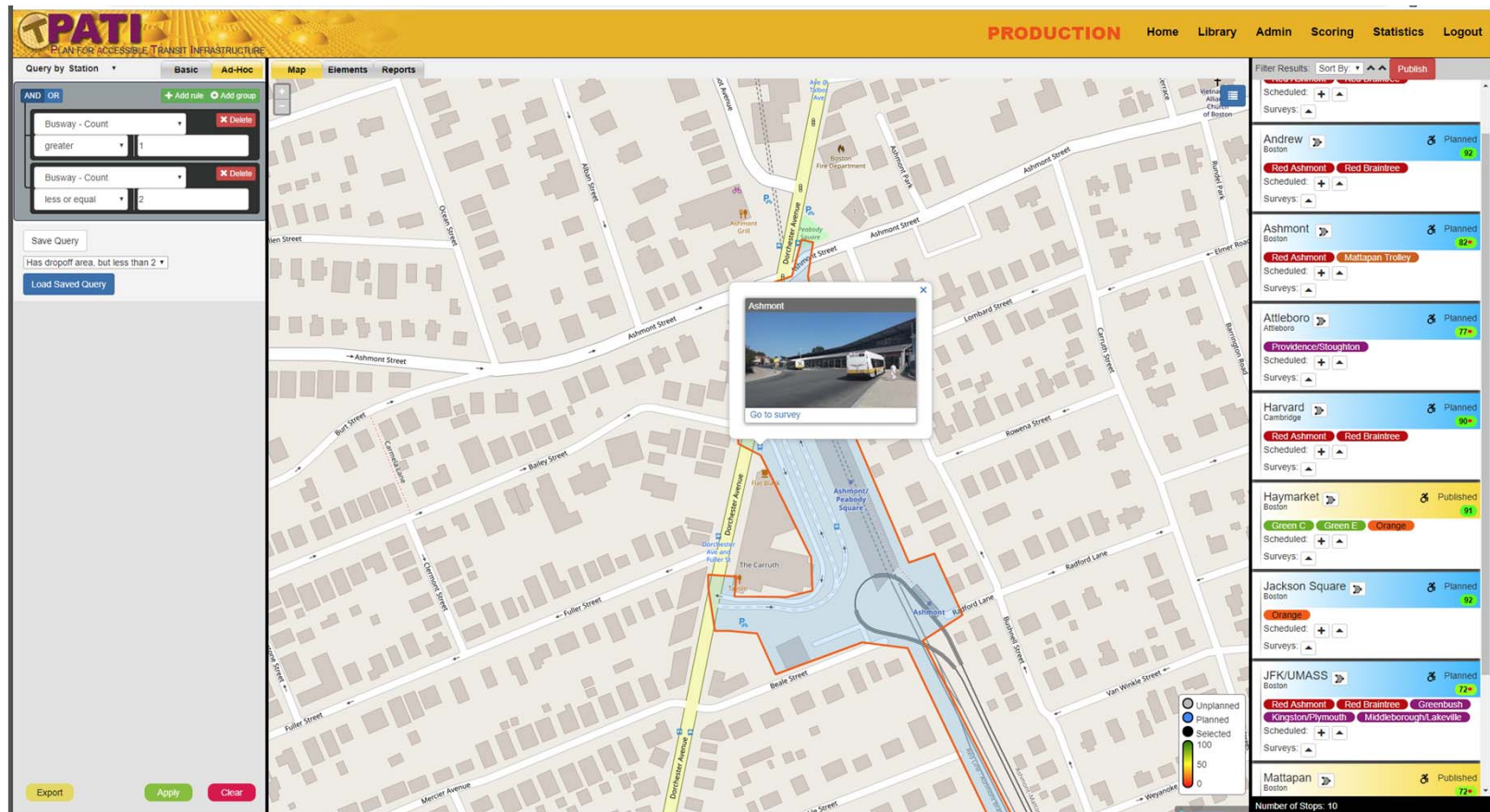
Load Saved Query

Export Apply Clear



Filter Results: Sort By ▾ Publish

Alewife Cambridge	Planned	87*
Red Ashmont Red Braintree	Scheduled: + ▴	
Surveys: ▴		
Andrew Boston	Planned	92
Red Ashmont Red Braintree	Scheduled: + ▴	
Surveys: ▴		
Ashmont Boston	Planned	82*
Red Ashmont Mattapan Trolley	Scheduled: + ▴	
Surveys: ▴		
Attleboro Attleboro	Planned	77*
Providence/Stoughton	Scheduled: + ▴	
Surveys: ▴		
Harvard Cambridge	Planned	90*
Red Ashmont Red Braintree	Scheduled: + ▴	
Surveys: ▴		
Haymarket Boston	Published	91
Green C Green E Orange	Scheduled: + ▴	
Surveys: ▴		
Jackson Square Boston	Planned	92
Orange	Scheduled: + ▴	
Surveys: ▴		
JFK/UMASS Boston	Planned	72*
Red Ashmont Red Braintree Greenbush Kingston/Plymouth Middleborough/Lakeville	Scheduled: + ▴	
Number of Stops: 10		



PRODUCTION
[Home](#)
[Library](#)
[Admin](#)
[Scoring](#)
[Statistics](#)
[Logout](#)

Harvard St @ Shaller St
Brookline

Performed By Crew: BSC Crew #1BUS
 Performed By User: shaw
 Date Started: 5/22/2017

 Date Completed: 9/22/2016
 Time To Complete: -505 hours
 Date Last Synced: 9/22/2016

Survey Source
Original Survey, View

QA Review
Not Reviewed

QA Status
Not Reviewed

Comment

Cancel
Update

Bus Stop Element Hierarchy
Number of Elements: 10

- Location: "Location"
 - Sign: "FRONT SIGN"
 - Roadway: "ROADWAY #1"
 - Landing Pad: "MAIN LANDING"
 - Sidewalk: "Sidewalk"
 - Seating: "SEATING #1"
 - Amenities: "Amenities"
 - Crossing: "CROSSING #1"

Survey Data
Map
Street View
Download as PDF

Location: Location

Where is the bus stop positioned in relation to the nearest intersection?

What is the name of the street that the bus stop is on?

What is the name of the nearest cross street to the bus stop?

Enter the adjacent property address or business name:

Is there an MBTA subway or rail station within view distance?

Additional location comments:

Other

Schedule Status:
Any

Survey Status:
Any

Edit Status:

Survey Closed Date

Equals
mm/dd/yyyy --:-- --

Element Filters

Advanced Bus Filters

Has Front Sign:
Either

Sidewalk \leq 36":
Either

Critical:
Either

Length < 40':
Either

Shelter Present:
Either

Bench Present:
Either

Curb Reveal < 4":
Either

Missing Ramps:
Either

Ramp Slope > 12%:
Either

Crossing within 25':
Either

Perpendicular Crossing Within 200':

Export

Apply

Clear

PRODUCTION
[Home](#)
[Library](#)
[Admin](#)
[Scoring](#)
[Statistics](#)
[Logout](#)

Query by Station
Basic
Ad-Hoc

Basic Filters

Draw area filter on map:

Town:

Line Type:

Line:

Stations:

Score Equals:

QA Status:

Report Status:

Other

Schedule Status: Any

Survey Status: Any

Presumed Accessible: Either

Should Be Surveyed: Either

Edit Status:

Survey Closed Date Equals: mm/dd/yyyy -- --

Element Filters

Export
Apply
Clear

Map
Elements
Reports

Google
MBTA Properties
Gray Basemap
Survey Polygons
ESRI Imagery

Unplanned
Planned
Selected
100
50
0

Filter Results:
Sort By:
Publish

Scheduled:
Surveys:

Andover
Andover
Planned
67*

Haverhill
Scheduled:
Surveys:

Andrew
Boston
Planned
92

Red Ashmont
Red Braintree
Scheduled:
Surveys:

Aquarium
Boston
Planned
92

Blue
Scheduled:
Surveys:

Arlington
Boston
Planned
97*

Green B
Green C
Green D
Green E
Scheduled:
Surveys:

Ashland
Ashland
Planned
76*

Worcester
Scheduled:
Surveys:

Ashmont
Boston
Planned
92*

Red Ashmont
Mattapan Trolley
Scheduled:
Surveys:

Assembly
Somerville
Planned
90

Scheduled:
Surveys:





Attleboro
Attleboro
Planned
77*

Providence/Stoughton

Number of Stops: 273

Add Category +







Other Studies Green Line Type Study

-  **Green Line ADA Study Design Guidelines** ✓
Jacobs 2017 Green Line Stations ADA Alternatives and Concept Reports Project Design Criteria and Guidelines
7/10/2017
-  **Green Line ADA Study Field Inspections** ✓
Jacobs 2017 Green Line Stations ADA Alternatives and Concept Reports Field Inspections
7/10/2017
-  **Green Line Modernization Presentation to FCMB** ✓
Excludes appendices
5/7/2018
-  **Type Study of Platform Accessibility Upgrades** ✓
8/21/2017





System Technical Documentation

-  **PATI Technical Overview** ✓
Technical PATI system overview. Includes data dictionary, configuration, and hosting information.
10/31/2018
-  **Database Diagram** ✓
Entity Relationship Diagram in SVG format for PATI database
10/31/2018









Project Reports + Cover Photos

-  **Final Project Summary and Prioritization Report** ✓
Word version
10/31/2018
-  **Government Center** ✓
Cover Photo
10/31/2018
-  **Final Project Summary and Prioritization Report** ✓
PDF
10/31/2018
-  **Bus Cover Photo** ✓
10/31/2018
-  **Orientation Guide Word** ✓
10/31/2018
-  **Orientation Guide PDF** ✓
10/31/2018

Summary Report Ch 3 Graphics

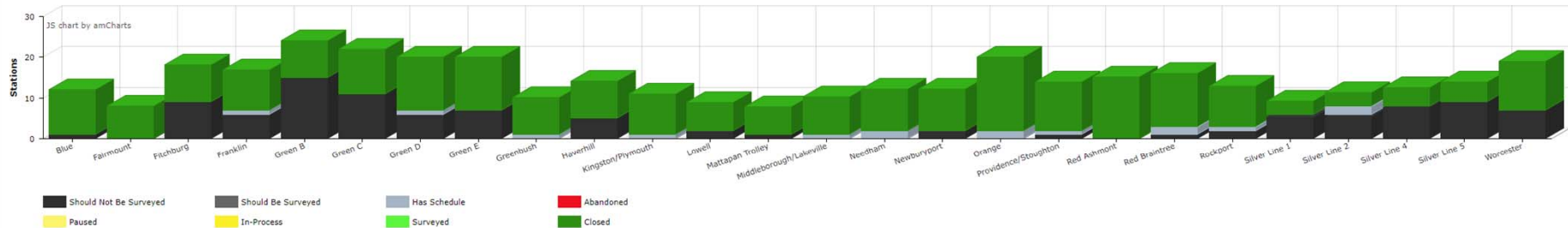
-  **Missing Front Bus Stop Sign** ✓
10/31/2018
-  **Missing Curb Ramps Mattapan** ✓
10/31/2018
-  **Dirt Landing Pad Roxbury** ✓
10/31/2018
-  **Narrow Sidewalk Quincy** ✓
10/31/2018

Summary Report Ch 5 Graphics

-  **Commuter Rail Tier A** ✓
Tier A inaccessible station priorities
10/31/2018
-  **Commuter Rail Tier B** ✓
Tier B inaccessible station priorities
10/31/2018
-  **Green Line Tier A Map** ✓
10/31/2018
-  **Green Line Tier B Map** ✓
10/31/2018
-  **Mission Park E Line** ✓
10/31/2018
-  **Englewood Station** ✓
10/31/2018
-  **West Newton 1** ✓
10/31/2018
-  **West Newton 2** ✓
10/31/2018

Survey Statistics Health

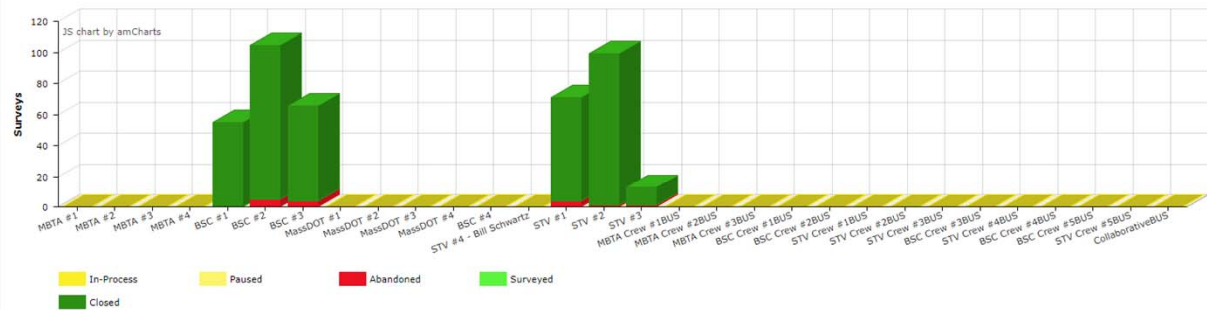
Station survey status count by line



Station Survey Status Counts

192 Total Station Surveys
0 In-Process Station Surveys
0 Paused Station Surveys
15 Abandoned Station Surveys
0 Surveied Station Surveys
177 Closed Station Surveys

Surveys by status and crew



Stations surveyed by date



Total Stations Surveyed Or Surveying

177 Stations

Total Elements Created

17624 Elements

Query by Station ▾

Basic

Ad-Hoc


Map

Elements

Reports

Search:

Basic Filters

Draw area filter on map: 

Town:

Line Type:

Commuter Rail ▾

Line:

Stations:


Score Equals


QA Status:






































▾

Report Status:

▾

Other 

Element Filters 

	Station 	Score 	Review Status 	Review Date 	Review Comment 	
	Abington	89	Report Finalized	10/26/2016	10/31 Project Complete	
	Anderson/Woburn	94	Report Finalized	10/30/2016	10/31 Project Complete	
	Andover	67*	Report Finalized	10/30/2016	10/31 Project Complete	
	Ashland	76*	Report Finalized	10/30/2016	10/31 Project Complete	
	Attleboro	77*	Report Finalized	10/30/2016	10/31 Project Complete	
	Back Bay	76*	Report Finalized	10/30/2016	10/31 Project Complete	
	Ballardvale	64*	Report Finalized	10/30/2016	10/31 Project Complete	
	Bellevue	61*	Report Finalized	10/30/2016	10/31 Project Complete	
	Beverly Depot	81*	Report Finalized	10/30/2016	10/31 Project Complete	
	Beverly Farms	75*	Report Finalized	10/30/2016	10/31 Project Complete	
	Bradford	67*	Report Finalized	10/30/2016	10/31 Project Complete	
	Braintree	82*	Report Finalized	10/30/2016	10/31 Project Complete	
	Brandels/Roberts	70*	Report Finalized	10/30/2016	10/31 Project Complete	
	Bridgewater	91	Report Finalized	10/30/2016	10/31 Project Complete	
	Brockton	86*	Report Finalized	10/30/2016	10/31 Project Complete	
	Campello	89	Report Finalized	10/30/2016	10/31 Project Complete	

Showing 1 to 102 of 102 entries

Export

Apply

Clear

Reporting Tools

- Microsoft Word
 - Using programming automation
 - .NET interop
 - PDF generation libraries
 - Active Reports

- 3.6 Interior
- 3.7 Vertical Circulation
- 3.8 Platform Area(s)
- 4 Low-Scoring Question Responses
- 5 Significant Issues and Noteworthy Observations
- 5.1 Significant Issues at Time of Survey
- 5.2 Miscellaneous Noteworthy Observations
- 6 Station Elements Scoring Below 100

1 Introduction

Through the Plan for Accessible Transit Infrastructure (PATI), the MBTA envisions and plans for a fully accessible system.

The first step of PATI is the survey of over 7,500+ bus stops and 177 rail stations in order to inventory and catalogue all significant barriers to access. Parallel to that effort, the MBTA, in conjunction with an external committee of disability stakeholders, is working to develop a process for setting priorities that can be replicated over time. For example, this may include prioritizing removal of barriers where RIDE pickups/drop-offs often take place or where other State of Good Repair (SGR) work is needed. This prioritization methodology will then be applied to the inventory of barriers to produce recommendations for their removal. Ultimately, PATI will yield a plan and recommendations for advancing a fully accessible MBTA system.

PATI will enable the Department of System Wide Accessibility, together with Capital Delivery, Engineering & Maintenance, and other departments to work with the disability community to remove barriers in a proactive rather than reactive manner.

A full discussion of the PATI project, covering data collection, scoring, reporting, and a glossary is provided in the PATI Companion Guide. This is the report for Abington Station.

2 Abington Station

Abington is a commuter rail station on the Kingston/Plymouth Line. Located in Abington, the station includes a parking area and a drop-off area. Train access is from a high platform (single track).

The map and satellite image below show the survey extents for this station. To conserve resources, because of programmed improvement projects, some MBTA-owned facilities were excluded from data collection.



Deficiency Threshold: 49

Report Finalized

Icons for Word, Excel, and PDF documents.

Additional Products

- Summary reporting
- Orientation guide

Top 5 Bus Routes Scored High Priority

Route	Stops	Number	Percent
78	111	16	14.4%
80	83	14	16.9%
100	35	11	31.4%
71	46	11	23.9%
84	36	8	22.2%

Top 5 Municipalities High Priority Bus Routes

Municipality	Stops	Number	Percent
Boston	1,969	49	2.5%
Quincy	496	26	5.2%
Lynn	419	23	5.5%
Arlington	163	19	11.7%
Malden	265	19	7.2%

Distribution of Station Scores

Station Type (Number of Platform Areas)	<70	71-80	81-90	>90	Total
Commuter Rail stations (1 platform area)	21	24	28	19	92
Commuter Rail stations (>1 platform area)	-	3	-	-	3
Rapid Transit stations (1 platform area)	1	12	42	14	69
Rapid Transit stations (>1 platform area)	-	-	4	2	6
Multimodal stations (Commuter and Rapid)	-	1	5	1	7
Total	22	40	79	36	177
Percent	12%	23%	45%	20%	100%

Future Work

- Address low-hanging fruit
- MBTA capital investment strategy
- Integration with other programs
- Resurveys

Lessons Learned

- Train and retrain
- Pilot phases help
- Plan and re-plan
- Images really matter and are hard to get right
- You can't anticipate everything

Lessons Learned

- Quality Control
- Allow sufficient time to define questions
- Consider how the data will be used
- How will it be updated going forward

Discussion