

December 8, 2014

VIA Email

Re: Ann Arbor Station Environmental Review
Architect's Project Number:
Ann Arbor Station Peak Boarding Ridership / Waiting Room Program Area

INTRODUCTION

The purpose of the following narrative and supporting documentation is to present a methodology for developing the appropriate level of peak boarding ridership that can be anticipated for the Ann Arbor intermodal station. The anticipated ridership will then form the basis for the required area of the waiting room for the multimodal train station. The basis for the anticipated ridership numbers outlined in this analysis is based on the latest and best information available. The number of occupants and required area will be based on the following factors:

- **Design Parameters** – This evaluation will be based on anticipated station passenger volumes as documented in MDOT's "Chicago – Detroit / Pontiac Passenger Rail Corridor Program Tier 1 EIS" Appendix E for a 10 round trip, full build out, 2055 scenario and current MDOT station boarding information. The current peak ridership trends per train will also be considered in this evaluation since no peak ridership per train has been developed for the full build-out condition. Pertinent information from these documents related to ridership are attached.
- **Peak Boarding Ridership** – The persons that generally utilize the station facility are those waiting to board a train. Persons deboarding a train generally leave for their destination and do not utilize the station and therefore do not impact the station size.
- **Train Schedule** – The highest level of persons waiting to board a train will occur when a westbound and an eastbound train depart the station at approximately the same time during peak ridership for one or both of the trains.
- **Train Equipment** – Except for rare occasions (Thanksgiving, Christmas, Spring Break, etc.) the rolling stock that will serve the Ann Arbor station in the future can accommodate a maximum of 460 riders.
- **Loading Factor** - To determine the peak board ridership at any station, the loading factor and the ratio of boarding to deboarding passengers needs to be considered along with the rolling stock capacity. The load factor is defined as a measure of capacity utilization of public transport services such as passenger railways. It is generally used to assess how efficiently a transport provider "fills seats" and generates fare revenue.
- **Program Waiting Room Area** – The program waiting room area recommendation is based on Amtrak Station Program and Planning Guide (2013) section 5.7.

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PEAK BOARDING RIDERSHIP

The change in Loading Factor at this station will determine the peak ridership for the station. The change that occurs at the Ann Arbor station for the full build-out condition (10 round trips, year 2055) is 25% (81% minus 56% - see attached). Based on current ridership records, the number of deboarding riders for west bound trains at the Ann Arbor station is approximately 12% of the number of peak boarding riders or an additional 3% (25% boarding x 12%) of Load Factor percentage to maintain the 25% total change in Load Factor. Based on these assumptions, approximately 28% of total rolling stock capacity would be taken at Ann Arbor. Due to slight seasonal variations in ridership an increase in this percentage to 35% is reasonable.

Based on current ridership trends, the highest boarding ridership occurs for the westbound trains heading for Chicago (see attached). The boarding ridership on the westbound trains is relatively equal between the three departing train times at 6:41 a.m., 12:17 p.m., and 7:21 p.m. except during the summer months when the westbound boarding ridership drops substantially at certain train boarding times. The eastbound train's boarding ridership is consistently around 11% of the westbound boarding ridership. The difference in the westbound and eastbound ridership numbers can be attributed to the location of the Ann Arbor station along the Chicago – Detroit / Pontiac line. The eastbound end of the line (Detroit / Pontiac) is relatively close to Ann Arbor and as a result would be far more accessible by car making the train a far less attractive option. This may change in the future as the Detroit area starts recovering economically and the increased number of trains makes daily commuting more practical.

In reviewing the proposed train schedules for the full build-out scenario (10 round trips) there are three times when an eastbound train and a westbound train would depart the station within 15 minutes or less of each other. The three times occur with the #700 (7:44 a.m.) eastbound train and the #709 (7:56 a.m.) westbound train, the #706 (11:10 a.m.) eastbound train and the #711 (11:10 a.m.) westbound train, and the #714 (4:06 p.m.) eastbound train and the #713 (4:17 p.m.) westbound train. The peak boarding ridership calculation would be as follows:

Peak Westbound Boarding Ridership	161 Riders = 460 x 35% (Based on train capacity and Loading Factor)
Peak Eastbound Boarding Ridership	<u>18 Riders (11% Westbound Ridership)</u>
Total Peak Boarding Ridership	179 Riders

WAITING ROOM PROGRAM AREA

Amtrak recommends a waiting room area based on 20 s.f. for 50% of the total peak boarding ridership and 10 s.f. for the remainder of the peak boarding ridership. This calculates to:

$$\text{Waiting room program area} = (20 \text{ s.f.} \times \frac{1}{2} \times 179) + (10 \text{ s.f.} \times \frac{1}{2} \times 179) = \mathbf{2,685 \text{ s.f.}}$$

3.4 Full Build (10 DRTs and Improved Travel Time) Passenger Rail Forecast Results

Annual Passenger Rail Station Volumes

Station	2025 Annual Station Volume (thousand ONs and OFFs)	2035 Annual Station Volume (thousand ONs and OFFs)	2045 Annual Station Volume (thousand ONs and OFFs)	2055 Annual Station Volume (thousand ONs and OFFs)
Chicago Union Station, IL	1,672	1,946	2,271	2,644
Northwest Indiana, IN	35	41	47	55
Michigan City, IN	19	23	27	33
New Buffalo, MI	70	81	94	108
Niles, MI	79	91	107	124
Dowagiac, MI	17	19	23	27
Kalamazoo, MI	476	566	673	797
Battle Creek, MI	268	312	367	429
Albion, MI	10	12	14	16
Jackson, MI	155	179	208	240
Ann Arbor, MI	830	969	1,134	1,323
Dearborn, MI	418	483	560	647
Detroit, MI	384	440	507	582
Royal Oak, MI	199	231	268	311
Birmingham, MI	130	151	176	204
Pontiac, MI	90	108	129	154

Segment Loading Factors

Chicago-Detroit/Pontiac Passenger Rail Corridor Investment Plan Alternatives Identification and Evaluation

Passenger Rail Segment Loading Factors

Station Link	2025 Segment Loading Factor	2035 Segment Loading Factor	2045 Segment Loading Factor	2055 Segment Loading Factor
Chicago Union Station, IL-Hammond-Whiting, IN	50%	58%	68%	79%
Northwest Indiana, IN-Michigan City, IN	57%	66%	70%	90%
Michigan City, IN-New Buffalo, MI	57%	66%	70%	90%
New Buffalo, MI-Niles, MI	54%	63%	67%	86%
Niles, MI-Dowagiac, MI	54%	63%	66%	86%
Dowagiac, MI-Kalamazoo, MI	54%	62%	66%	85%
Kalamazoo, MI-Battle Creek, MI	57%	66%	70%	90%
Battle Creek, MI-Albion, MI	54%	63%	74%	86%
Albion, MI-Jackson, MI	54%	63%	74%	86%
Jackson, MI-Ann Arbor, MI	51%	60%	70%	81%
Ann Arbor, MI-Dearborn, MI	36%	41%	48%	56%
Dearborn, MI-Detroit, MI	24%	27%	32%	37%
Detroit, MI-Royal Oak, MI	12%	15%	17%	20%
Royal Oak, MI-Birmingham, MI	7%	8%	9%	11%
Birmingham, MI-Pontiac, MI	3%	3%	4%	5%

MDOT Ridership per Train 2014

Facility

Facility ID:

Facility Name:

Year	Trn #	Passenger Type	Boarded/Deboarded	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	N
2014	349	Incy.Rail	Boarded	0	0	0	0	5	69	86	83	38	0	
2014	349	Incy.Rail	Deboarded	0	0	0	0	0	0	0	0	0	0	
2014	350	Incy.Rail	Boarded	197	194	246	220	242	252	220	259	253	243	EASTBOUND 12:55 P.M.
2014	350	Incy.Rail	Deboarded	1,285	998	1,271	1,220	1,142	1,330	1,513	1,763	1,164	1,337	
2014	351	Incy.Rail	Boarded	1,658	1,593	1,688	2,039	2,229	2,239	2,642	2,586	1,774	1,840	WESTBOUND 6:41 A.M.
2014	351	Incy.Rail	Deboarded	159	94	146	132	166	141	130	130	107	139	
2014	352	Incy.Rail	Boarded	296	219	270	395	158	29	19	14	6	286	EASTBOUND 6:26 P.M.
2014	352	Incy.Rail	Deboarded	1,904	1,914	2,180	2,222	1,369	367	289	334	218	2,354	
2014	353	Incy.Rail	Boarded	1,751	1,874	2,058	2,044	1,289	462	425	514	417	2,112	WESTBOUND 12:17 P.M.
2014	353	Incy.Rail	Deboarded	202	238	249	366	151	49	56	75	49	267	
2014	354	Incy.Rail	Boarded	58	45	43	65	53	50	66	45	36	52	EASTBOUND 11:30 P.M.
2014	354	Incy.Rail	Deboarded	2,054	1,562	1,927	2,002	1,802	1,524	1,940	1,921	1,353	2,067	

Figure 4: Full Build 2035 Schedule

EASTBOUND

Station	Miles	Travel Times	Ar/Dp	Train Number											
				700	702	704	706	708	710	712	714	716	718	720	722
CHICAGO III.	0.0	0:00	Dp			6 00A	7 00A	8 00A	10 00A	1100A	12 00P	5 35P	6 00P	6 35P	7 35P
Suburban near Gary, Ind,	16.0	0:18	Dp					8 18A		11 18A		5 53P		6 53P	7 53P
Michigan City, Ind.	52.8	0:53	Dp							1153A		6 28P		7 28P	8 28P
New Buffalo, Mich.	62.9	1:02	Dp					10 02A	12 02P	1 02P		7 37P	8 02P	8 37P	9 37P
Niles, Mich.	89.8	1:22	Dp					10 22A	12 22P	1 22P		7 57P	8 22P	8 57P	9 57P
Dowagiac, Mich.	102.3	1:32	Dp					10 32A	12 32P	1 32P		8 07P		9 07P	10 07P
Kalamazoo, Mich.	138.3	2:01	Dp	6 01A	7 01A	8 40A	9 40A	1101A	1 01P	2 01P	2 40P	8 36P	9 01P	9 36P	10 36P
Battle Creek, Mich.	161.0	2:28	Dp	6 28A	7 28A		10 03A	1128A	1 28P	2 28P		9 03P	9 28P	10 03P	11 03P
Albion, Mich.	185.6	2:51	Dp	6 41A	7 41A					2 51P					
Jackson, Mich.	206.5	3:11	Dp	7 11A	8 11A			12 11A	2 11P	3 11P			10 11P	10 46P	
Ann Arbor, Mich.	243.5	3:44	Dp	7 44A	8 44A	10 06A	11 10A	12 44A	2 44P	3 44P	4 06P		10 44P	11 19P	
Dearborn, Mich.	273.5	4:09	Dp	8 09A	9 09A	10 31A	1135A	1 09A	3 09P	4 09P	4 31P		11 09P	11 44P	
DETROIT, MICH.	282.7	4:24	Ar	8 24A	9 24A	10 46A	1150A	1 24A	3 24P	4 24P	4 46P		11 24P	11 59P	
DETROIT, MICH.	282.7	4:27	Dp	8 27A			1153A	1 27A	3 27P	4 27P	4 49P		11 27P		
Royal Oak, Mich.	292.8	4:51	Dp	8 51A			12 17P	1 51A	3 51P	4 51P	5 13P		11 51P		
Birmingham, Mich.	297.1	4:58	Dp	8 58A			12 24P	1 58A	3 58P	4 58P	5 20P		11 58P		
PONTIAC, MICH.	305.4	5:16	Ar	9 16A			12 42P	2 16P	4 16P	5 16P	5 38P		12 16A		

Figure 4: Full Build 2035 Schedule

WESTBOUND

Station	Travel Times	Miles	Dp/Ar	Train Number												
				701	703	705	707	709	711	713	715	717	719	721	723	
PONTIAC, MICH.	0:00	0.0	Dp		4 03A	4 33A				9 46A	2 53P	3 35P			6 52P	7 20P
Birmingham, Mich.	0:13	8.3	Dp		4 16A	4 46A				9 59A	3 06P	3 48P			7 05P	7 33P
Royal Oak, Mich.	0:20	12.6	Dp		4 23A	4 53A				10 06A	3 13P	3 55P			7 12P	7 40P
DETROIT, MICH.	0:40	22.7	Ar		4 43A	5 13A				10 26A	3 33P	4 15P			7 32	8 00P
DETROIT, MICH.	0:43	22.7	Dp		4 46A	5 16A		7 15A	10 29A	3 36P	4 18P	5 05P	5 35P	7 35P	8 03P	
Dearborn, Mich.	0:54	31.9	Dp		4 57A	5 27A		7 26A	10 40A	3 47P	4 29P	5 16P	5 46P	7 46P	8 14P	
Ann Arbor, Mich.	1:24	61.9	Dp		5 27A	5 57A		7 56A	11 0A	4 17P	4 59P	5 46P	6 16P	8 16P	8 44P	
Jackson, Mich.	1:55	98.9	Dp		5 58A	6 28A		8 27A	11 41A	4 48P			6 47P	8 47P	9 15P	
Albion, Mich.	2:13	119.8	Dp					8 45A	11 59A				7 05P		9 33P	
Battle Creek, Mich.	2:40	144.4	Dp	5 43A	6 43A		7 43A	9 12A	12 26P	5 33P	6 06P		7 32P	9 32P	10 00P	
Kalamazoo, Mich.	3:01	167.1	Dp	6 11A	7 11A	7 41A	8 11A	9 40A	12 54P	6 01P	6 29P	7 11P	8 00P	10 00P	10 29P	
Dowagiac, Mich.	3:29	203.1	Dp	6 36A			8 36A		1 19P							10 53P
Niles, Mich.	3:42	215.6	Dp	6 49A	7 42A		8 49A		1 32P	6 39P						11 06P
New Buffalo, Mich.	4:01	242.5	Dp	7 10A	8 03A		9 10A		1 53P	7 00P						11 27P
Michigan City, Ind.	4:10	252.6	Dp	6 19A			8 19A		1 02P							10 36P
Suburban near Gary, IN	4:44	289.4	Dp	6 53A			8 53A		1 36P							11 10P
CHICAGO ,ILL.	5:06	305.4	Ar	7 15A	8 10A	8 21A	9 15A	10 20A	1 58P	7 05P	7 09P	7 51P				11 32P

5. Program

5.7 Waiting Area Capacity

Waiting area type and capacities are dependent on the type of Amtrak service provided, and whether the station functions as an intermodal transportation center. At Category 1 stations and Category 2 stations with frequent train service, intermodal connections, and significant commuter rail operations, determining the overall waiting area capacity requires careful consideration of the schedules and peak loads of all services.

The Amtrak methodology to determine the space requirements for waiting areas should be used to develop the station program and is presented in the table here. This methodology is based on the type of Amtrak service provided at the station (State Corridor or Long Distance) and the station's daily ridership. Long Distance trains have different requirements than corridor trains, with the long distance traveler likely to arrive an hour or more before departure, requiring more seating than the high speed, regional or state corridor service passenger who typically arrives within fifteen to twenty minutes of train departure.

Waiting Area Capacity

Capacity Requirements are Determined by:

- Commuter vs. intercity differences—standing vs. seated passengers; and
- Seating for groups/space for luggage and carry-ons.

Formula	Comments
<p>1. Determine daily ridership at the station Daily Ridership=Annual Ridership (ons + offs)/270</p>	<p>Daily ridership is calculated by dividing total annual ridership by 270 days. This formula produces a higher number than typical daily ridership in order to account for peak conditions that occur on busy travel days, and variations in weekday/weekend and seasonal travel.</p>
<p>2. Determine peak hour ridership Six or more trains per day: Peak hour ridership (2 way)=0.15 x daily ridership Peak hour ridership (1 way)=0.65 x peak hour ridership (2 way)</p> <p>Fewer than 6 trains per day: Peak hour ridership (2 way)=daily ridership/number of trains per day Peak hour ridership (1 way)=0.65 x peak hour ridership (2 way)</p>	<p>For locations with six or more trains per day, peak hour ridership is calculated as 15 percent of daily ridership.</p> <p>For locations with fewer than six trains per day, peak hour traffic is calculated as daily ridership divided by the number of trains per day.</p>
<p>3. Determine waiting area space requirements Corridor Service Requirements Seated passengers area= $0.50 \times (\text{peak hour 1 way ridership}) \times 20 \text{ sf/person}$ Standing passengers area= $0.50 \times (\text{peak hour 1 way ridership}) \times 10 \text{ sf/person}$</p>	<p>Waiting area space requirements are determined based on the number of people waiting for a train at any given time (peak hour ridership 1 way), and on the waiting habits of the ridership population served. One way peak hour ridership numbers are used because those passengers de-boarding the train generally leave the station without utilizing the waiting area.</p>
<p>Long Distance Service Requirements Seated passenger area = $0.75 \times (\text{peak hour 1 way ridership}) \times 20 \text{ sf/person}$ Standing passengers area = $0.25 \times (\text{peak hour 1 way ridership}) \times 10 \text{ sf/person}$</p>	<p>Because of the short waiting time, it is assumed that corridor services require seating for only one-half of the peak hour 1 way ridership. And conversely, long distance services require seating for 75 percent of peak hour 1 way ridership. Area requirements are 20 square feet per seated passenger and 10 square feet per standing passenger.</p>

ANN ARBOR STATION ENVIRONMENTAL REVIEW

Ann Arbor, Michigan

STATION DESIGN CRITERIA AND PROGRAMMING - FULL BUILD OUT

12/8/2014

ROOM	Ann Arbor Amtrak					Existing Station	DESIGN CRITERIA SOURCES = Standards, Codes, Regulations, and Design Guidelines
	Occupancy	Space	Total	Space	Total	Total	
		Type	Spaces	N.S.F	N.S.F	N.S.F.	
Required Areas							
Vestibule	NA	Public	4	200	800	100	Amtrak Station Program And Planning Guide - 2013
Pay Telephone	NA	Public	4	25	100	In Waiting Area	Amtrak Station Program And Planning Guide - 2013
Waiting	179	Public	1	2,685	2685	1280	Amtrak Station Program And Planning Guide - 2013
Peak One Way Ridership x .5 x 20 s.f. / person							
Peak One Way Ridership x .5 x 10 s.f. / person							
Men's Toilet Room	NA	Public	1	400	400	200	Amtrak Station Program And Planning Guide - 2013
Women's Toilet Room	NA	Public	1	400	400	200	Amtrak Station Program And Planning Guide - 2013
Family Toilet Room	NA	Public	2	65	130	NA	
Janitor's Closet	NA	Secure	1	100	100	40	Amtrak Station Program And Planning Guide - 2013
Electric Water Cooler	2	Public	2	25	50	10	Amtrak Station Program And Planning Guide - 2013
Vending Area	4	Public	4	20	80	60	Amtrak Station Program And Planning Guide - 2013
Information Kiosk	NA	Public	1	150	150	0	Amtrak Station Program And Planning Guide - 2013
Passenger Information Display System (PIDS)	NA	Public	1	40	40	0	Amtrak Station Program And Planning Guide - 2013
Quik - Trak / e - Ticketing with Queing	4	Public	4	50	200	In Waiting Area	Amtrak Station Program And Planning Guide - 2013
News and Brochure Racks	NA	Public	1	150	150	In Waiting Area	Amtrak Station Program And Planning Guide - 2013
Amtrak IT Equipment	NA	Secure	1	100	100	0	Amtrak Station Program And Planning Guide - 2013
Mechanical / Water Service Room	NA	Secure	1	250	250	0	Amtrak Station Program And Planning Guide - 2013
Electrical Service Room	NA	Secure	1	100	100	0	Amtrak Station Program And Planning Guide - 2013
Ticket Office / Baggage Check	4	Secure	4	70	280	120	Amtrak Station Program And Planning Guide - 2013
Baggage Storage	NA	Secure	1	NA	NA	350	Amtrak Station Program And Planning Guide - 2013
Lost Baggage Storage	NA	Secure	1	NA	NA	0	Amtrak Station Program And Planning Guide - 2013
Baggage Work Area	NA	Secure	1	NA	NA	0	Amtrak Station Program And Planning Guide - 2013
Secure Baggage Storage	NA	Secure	1	NA	NA	0	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Office	NA	Secure	1	150	150	160	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Toilet	NA	Secure	1	40	40	0	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Work Niche	NA	Secure	2	25	50	0	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Locker Room	NA	Secure	1	100	100	0	Amtrak Station Program And Planning Guide - 2013
Ticket Agent's Break Room	NA	Secure	1	200	200	0	Amtrak Station Program And Planning Guide - 2013
Amtrak Storage	NA	Secure	1	100	100	45	Amtrak Station Program And Planning Guide - 2013
CCTV / Security Equipment Room	NA	Secure	1	30	30	0	Amtrak Station Program And Planning Guide - 2013
Building Canopies							Amtrak Station Program And Planning Guide - 2013
Intercity Bus Ticket Office / Information Window		Secure	1	100	100	0	Greyhound Station Program Requirements - 2014
Intercity Bus Terminal Manager's Office		Secure	1	120	120	0	Greyhound Station Program Requirements - 2014
Intercity Bus Accounting / Reports Office		Secure	1	120	120	0	Greyhound Station Program Requirements - 2014
Intercity Bus Office Equipment / Storage		Secure	1	100	100	0	Greyhound Station Program Requirements - 2014
Intercity Bus Baggage Storage and Cart Staging		Secure	1	150	150	0	Greyhound Station Program Requirements - 2014
Intercity Bus Warming Shelters							
Total Occupancy / Net Square Footage					7275	2565	
Grossing Factor - 25%					1819	641	
Total Gross Square Feet					9094	3206	